Reproduction de la topologie en implémentant le Protocole de Routage OSPF dans un Réseau

Introduction

Ce rapport documente la configuration et l'implémentation du protocole de routage **OSPF** dans un réseau, illustrée par une série de captures d'écran. L'objectif est de montrer les différentes étapes de mise en place des éléments réseaux et leur interaction.

1. Architecture du réseau

Voici la topologie du réseau utilisée pour l'implémentation du protocole **OSPF** :

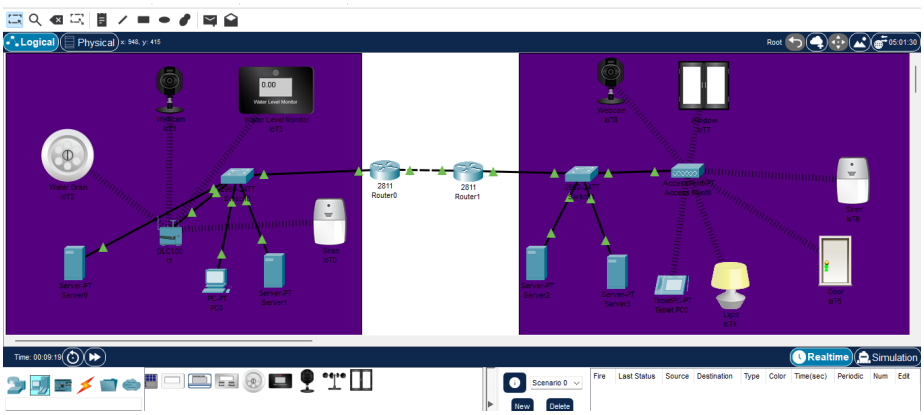


Figure 1: image 1

2. Configuration des réseaux sans fil

La configuration des points d'accès sans fil et des paramètres SSID est représentée ci-dessous :

3. Paramétrage du DHCP

Le serveur DHCP est configuré pour l'attribution dynamique des adresses IP aux périphériques IoT et autres équipements réseau :

4. Configuration des appareils IoT

Chaque appareil IoT est intégré au réseau via des paramètres spécifiques, incluant les configurations sans fil et d'adressage :

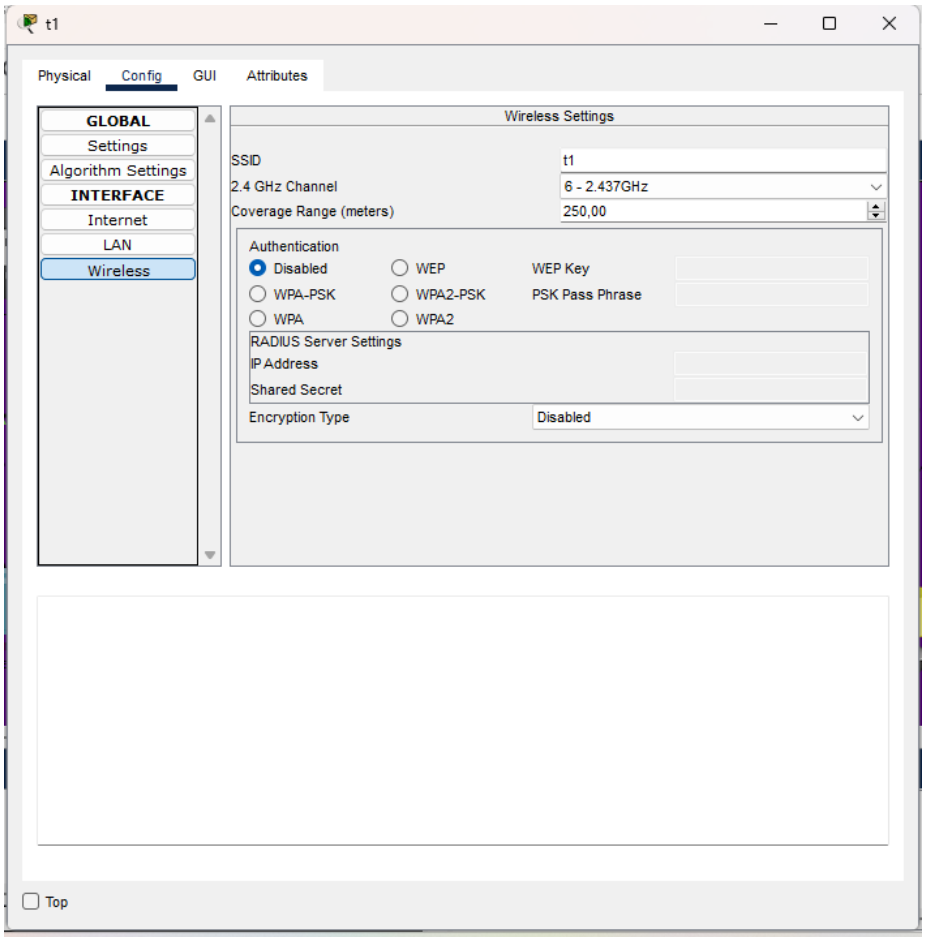


Figure 2: image 2

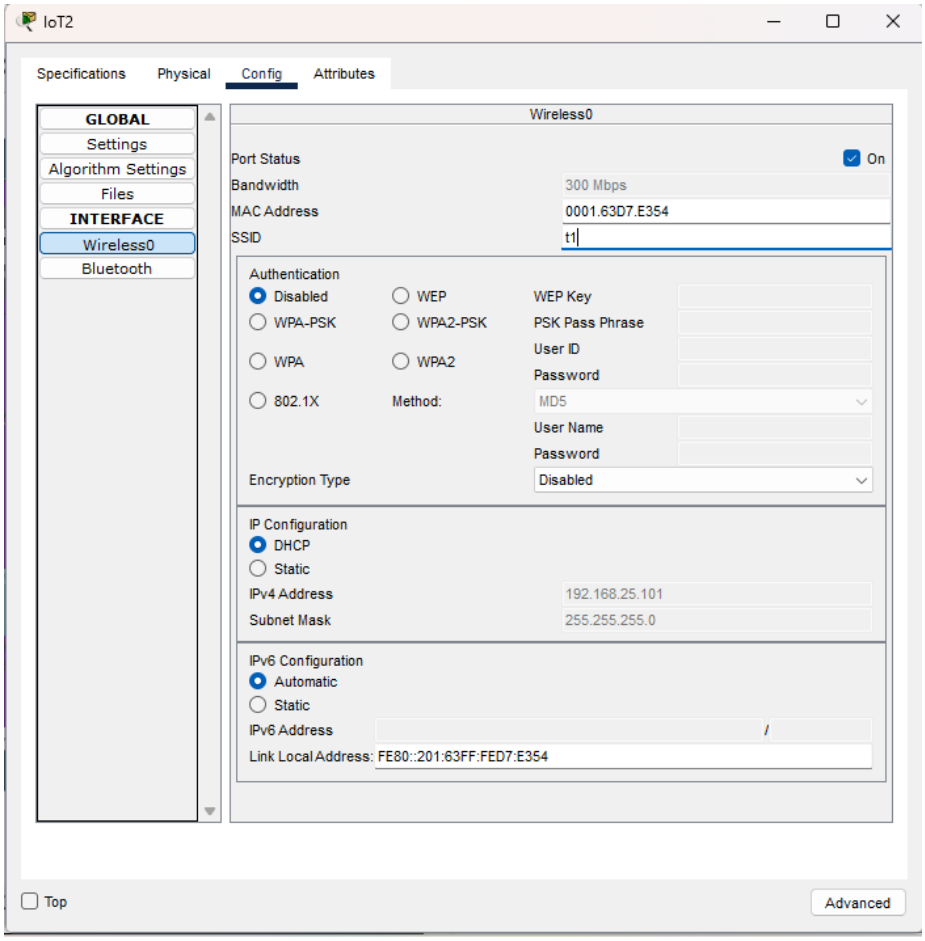


Figure 3: image 3

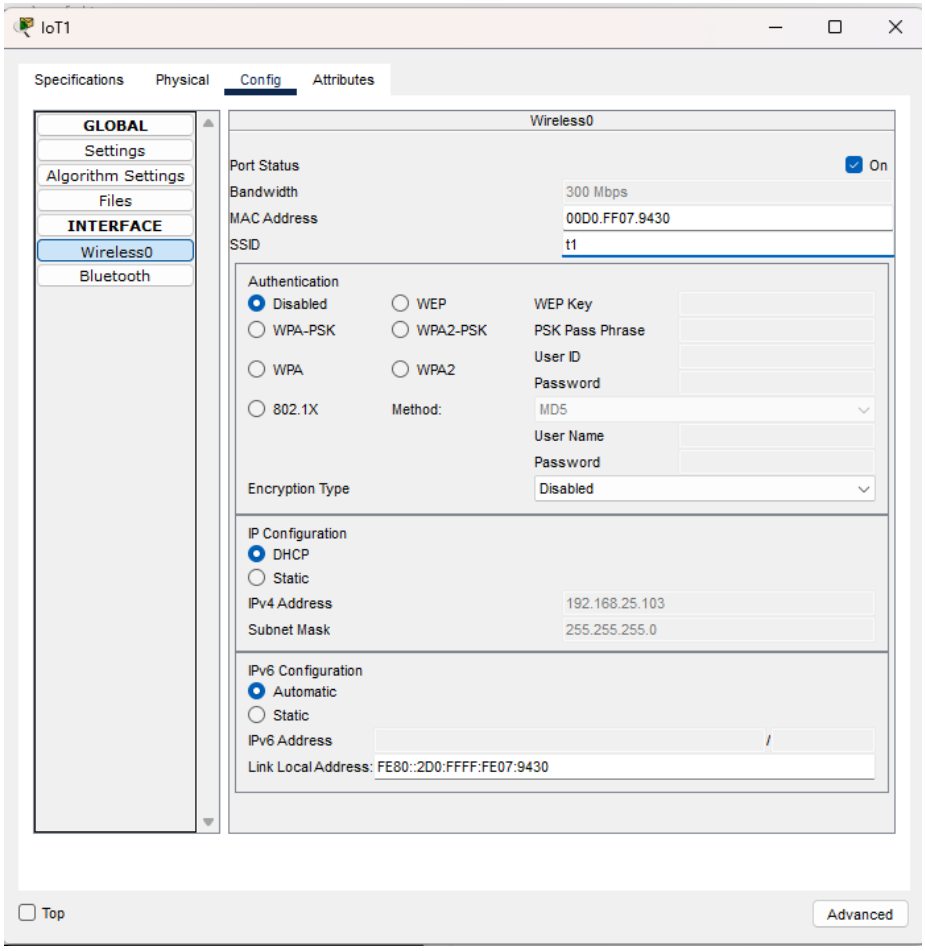
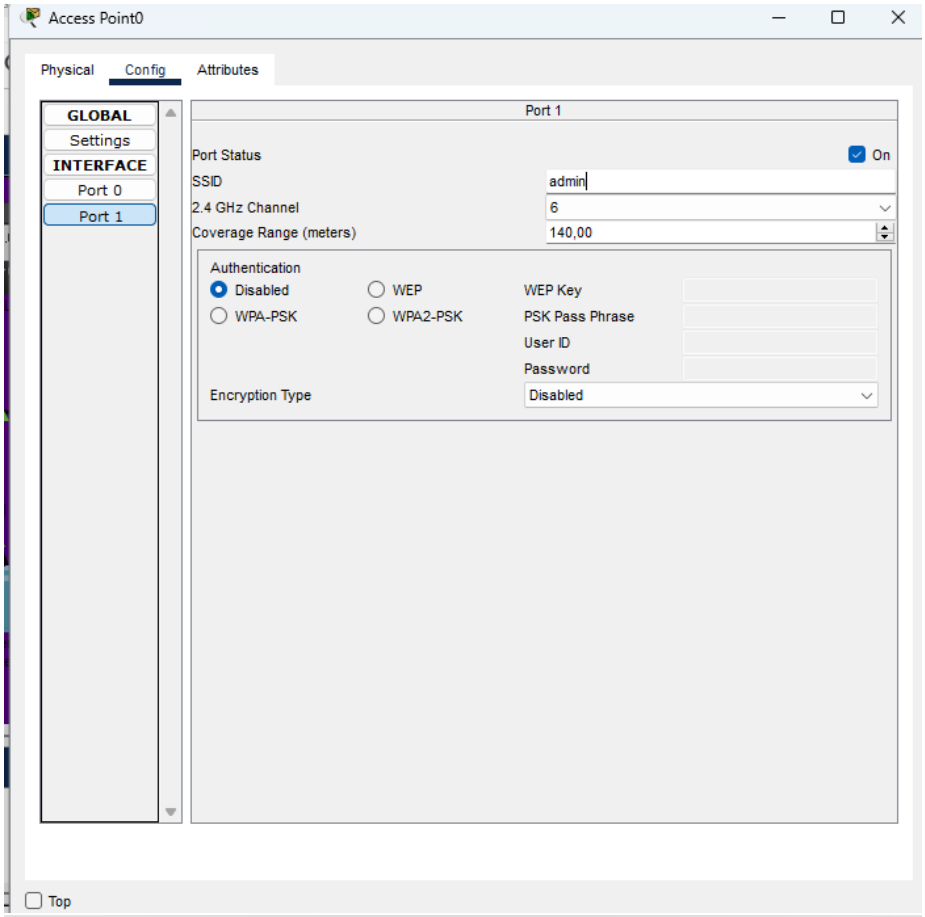
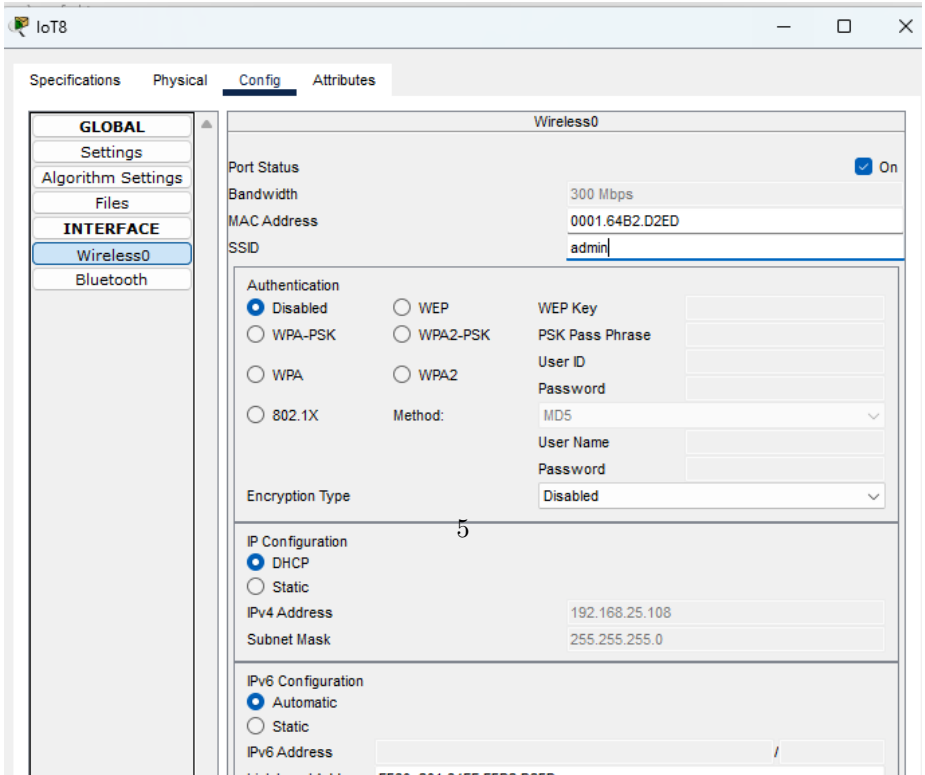


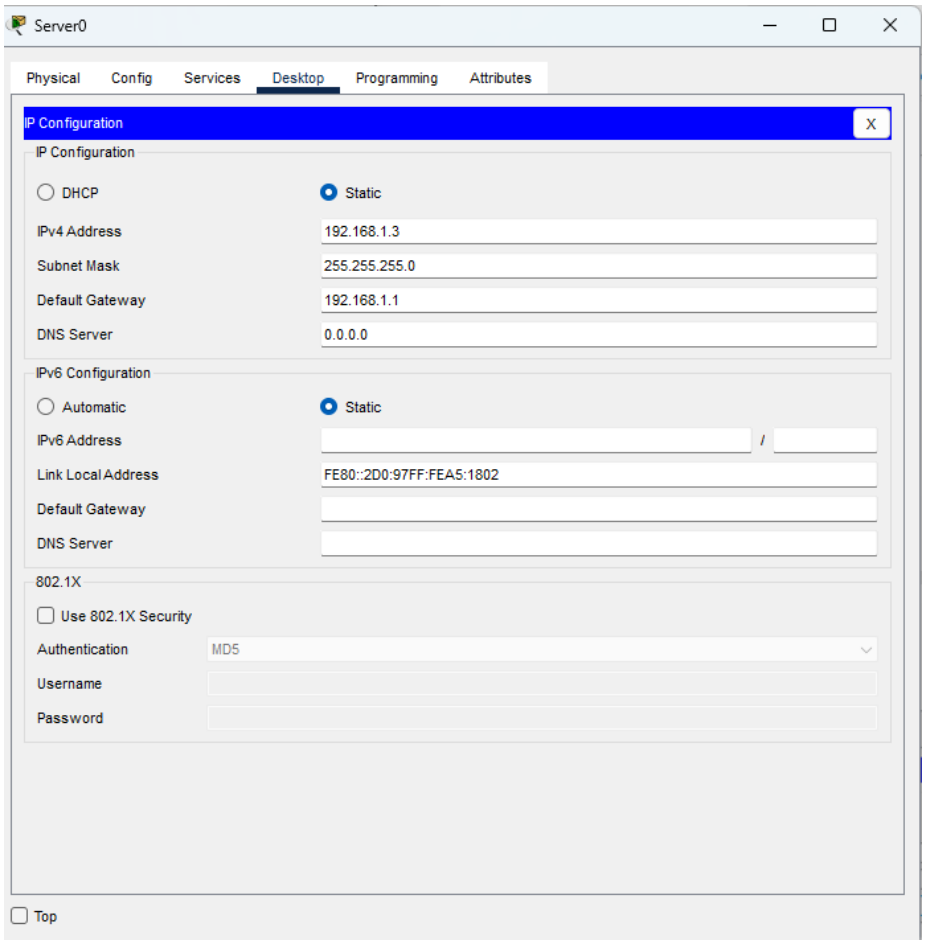
Figure 4: image 4

4.1 IoT1

4.2 IoT8







5. Paramétrage des serveurs

Les serveurs du réseau sont configurés avec des adresses statiques et intégrés au protocole OSPF pour assurer la redondance et l'interconnexion :

5.1 ServerIoT – Adressage et authentification

5.2 Configuration DHCP du serveur

5.3 Statique IPv4 et IPv6 sur ServerIoT

6. Sécurité et optimisation

L'authentification et le chiffrement sont des éléments essentiels à la sécurisation du réseau. Voici les configurations de **IoT8** montrant les paramètres de sécurité actuels et les éventuelles améliorations :

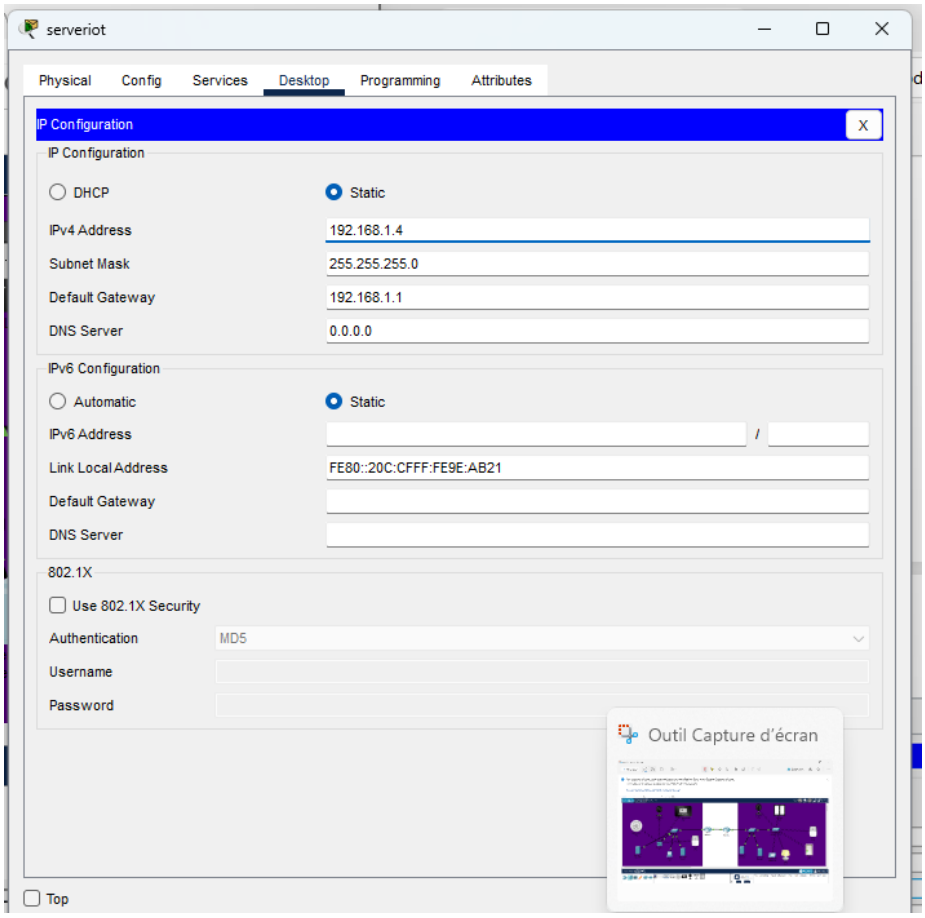


Figure 5: image 8

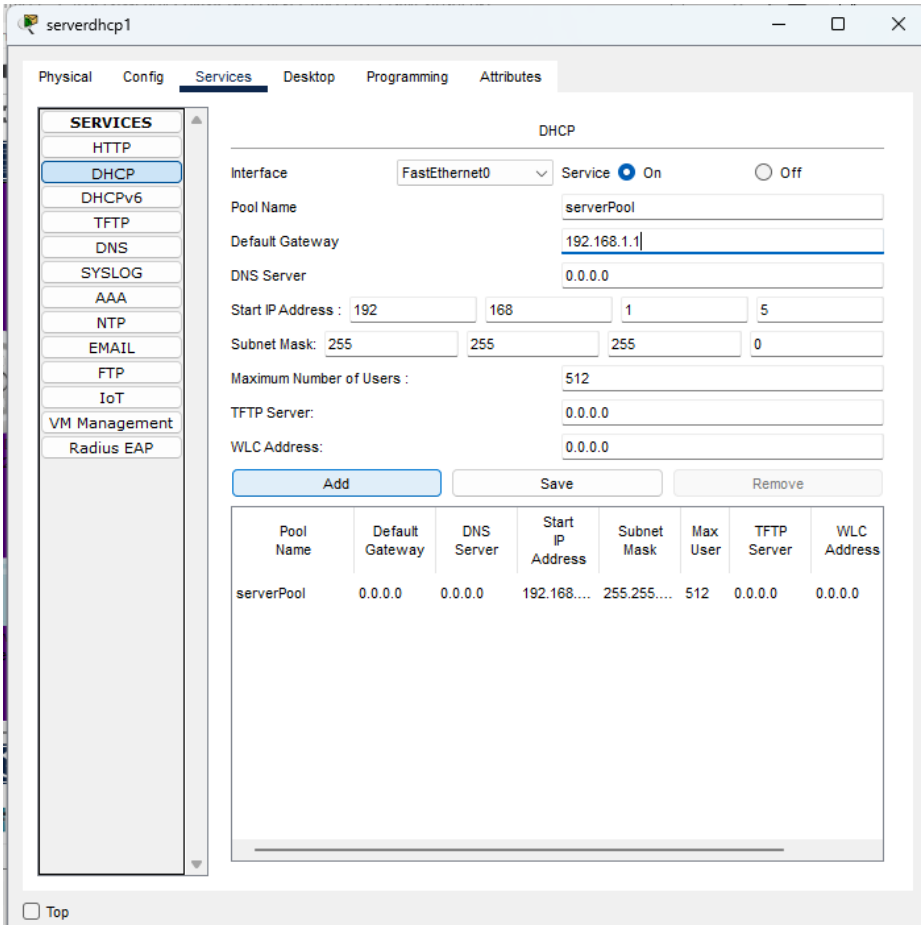


Figure 6: image 9

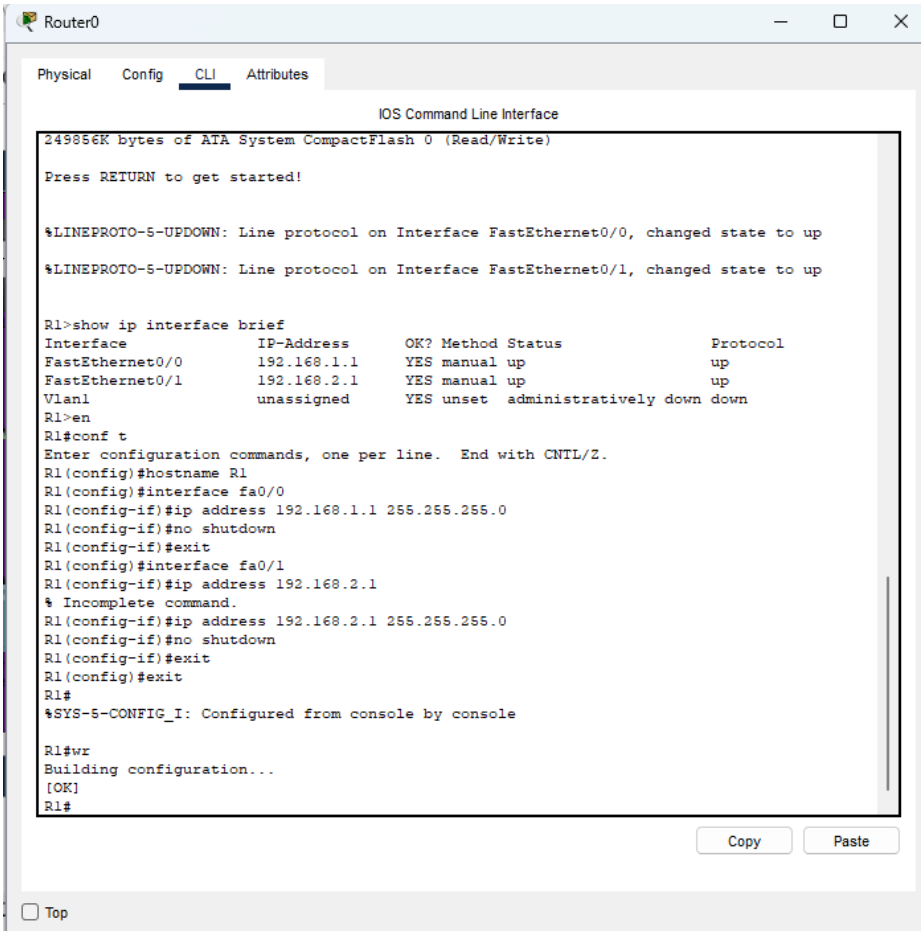


Figure 7: image 10

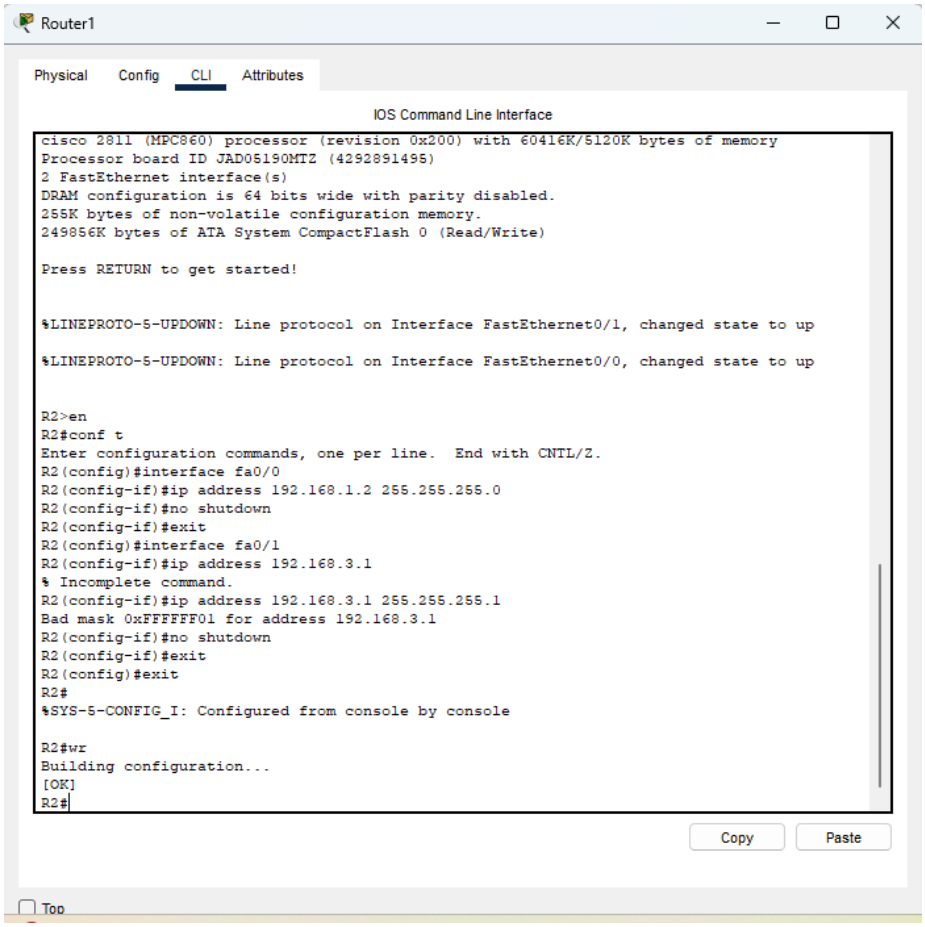
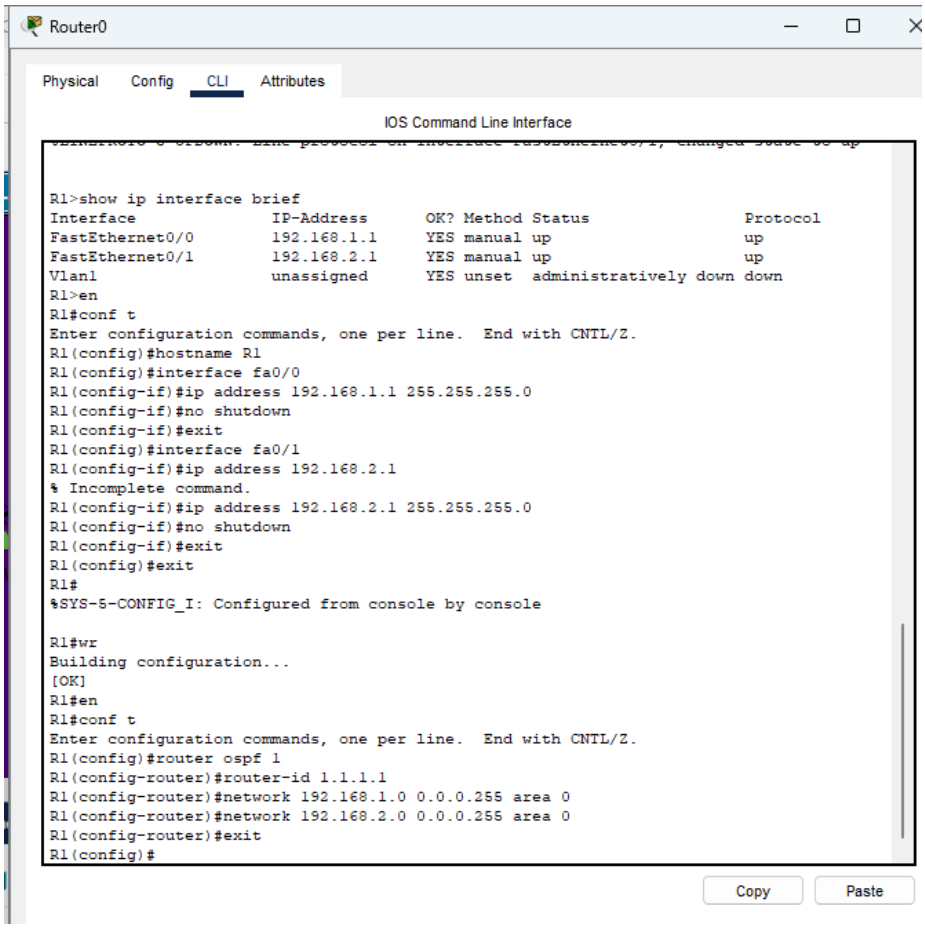
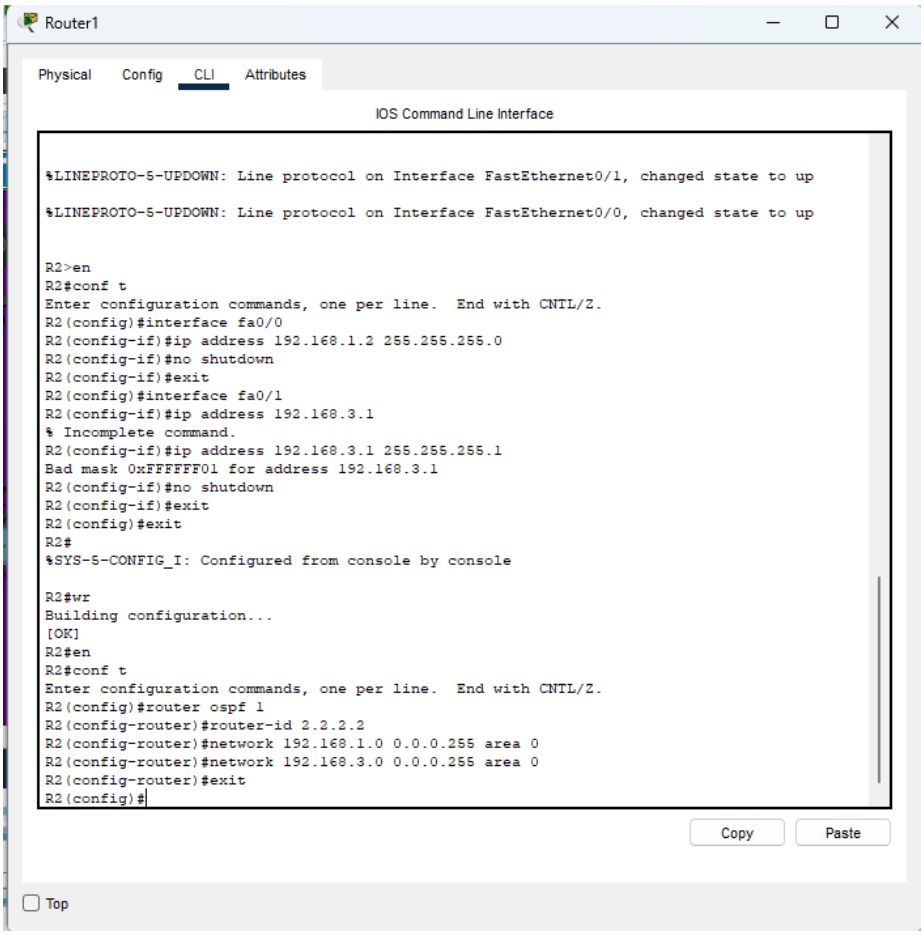


Figure 8: image 11

7. Analyse et amélioration

L'implémentation actuelle de **OSPF** garantit une connectivité robuste et évolutive. Des améliorations peuvent être apportées en intégrant un mécanisme **de segmentation VLAN** et en optimisant les méthodes de routage pour améliorer l'efficacité du réseau.





Conclusion

L'implémentation du **protocole OSPF** dans un réseau permet d'assurer une **gestion dynamique des routes**, améliorant ainsi la redondance et la performance globale. Une sécurisation renforcée via **WPA2-PSK et des authentifications plus robustes** serait un axe d'amélioration majeur, en particulier dans un environnement intégrant des **appareils IoT**.

Configuration d'un réseau IoT dans Cisco Packet Tracer

Introduction

Ce rapport décrit la mise en place et la configuration d'un réseau **IoT** dans **Cisco Packet Tracer**, incluant l'architecture réseau, les paramètres des appareils, la gestion DHCP, et l'intégration du routage dynamique. Chaque section est accompagnée des **captures d'écran** illustrant les étapes clés.

1. Topologie du réseau

La configuration générale du réseau est illustrée ci-dessous :

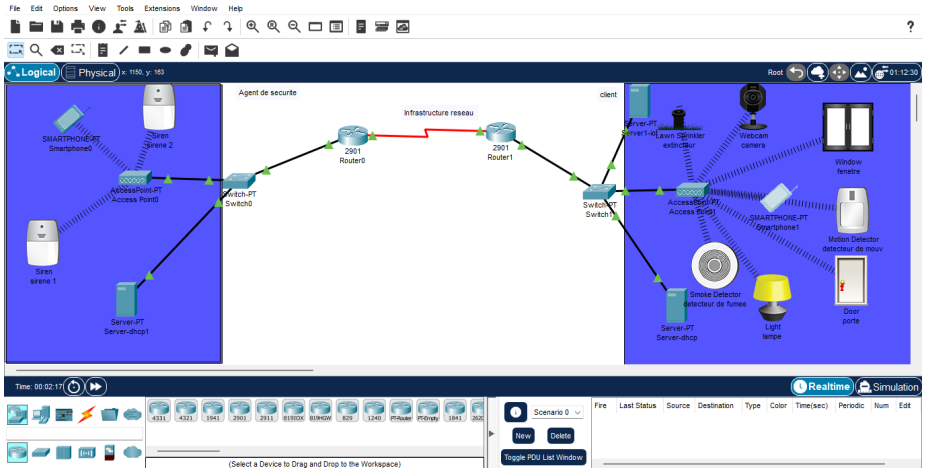


Figure 9: image 14

2. Configuration des points d'accès

Les **points d'accès Wi-Fi** sont configurés pour permettre aux **périphériques IoT** de se connecter :

3. Paramétrage des serveurs DHCP

Les **serveurs DHCP** sont mis en place pour distribuer les adresses IP aux différents équipements du réseau :

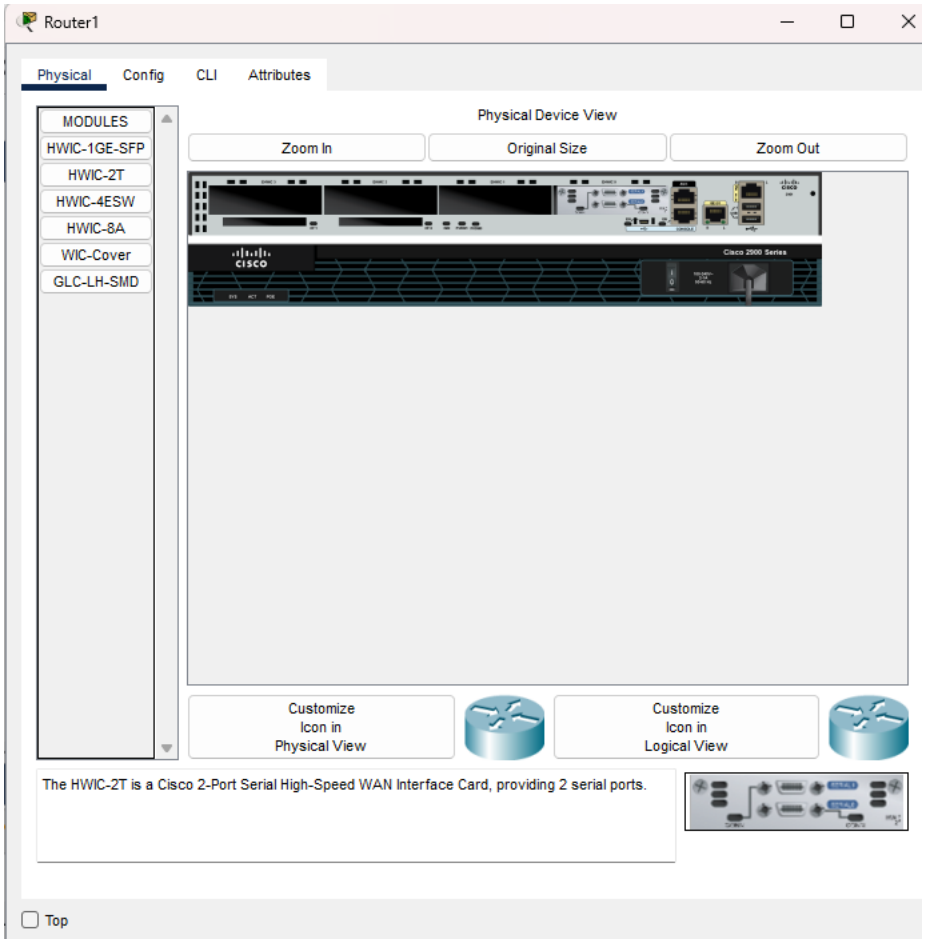
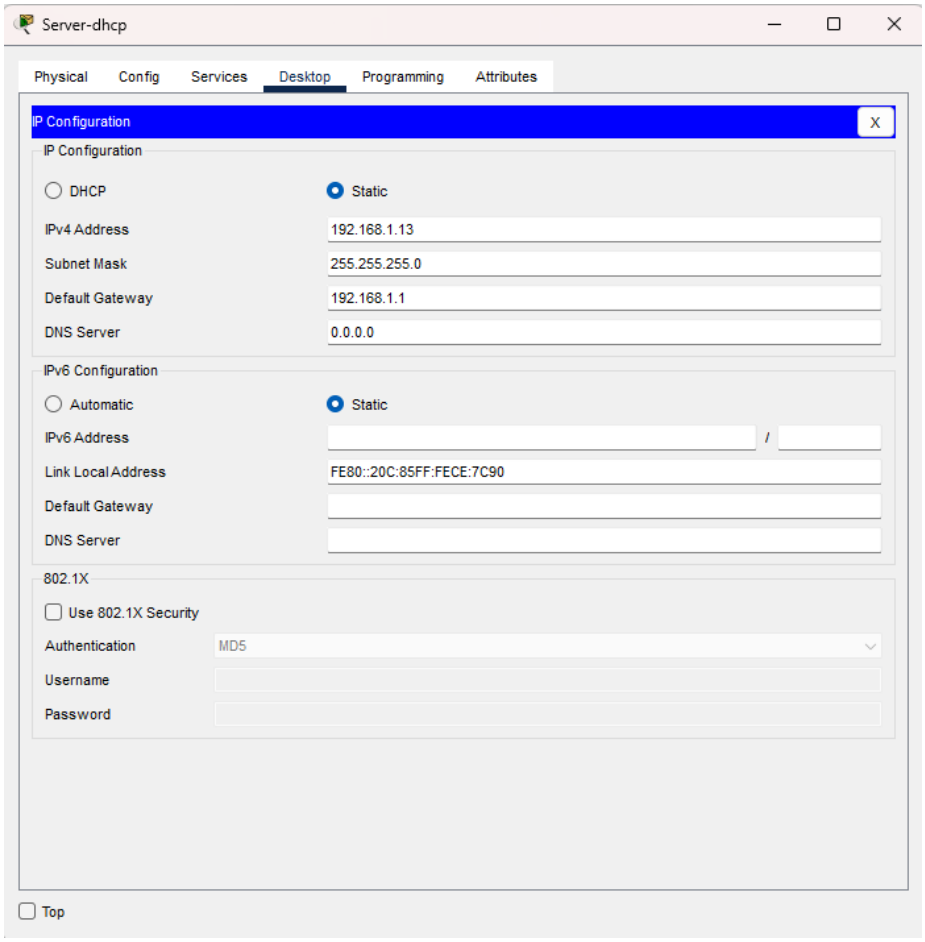
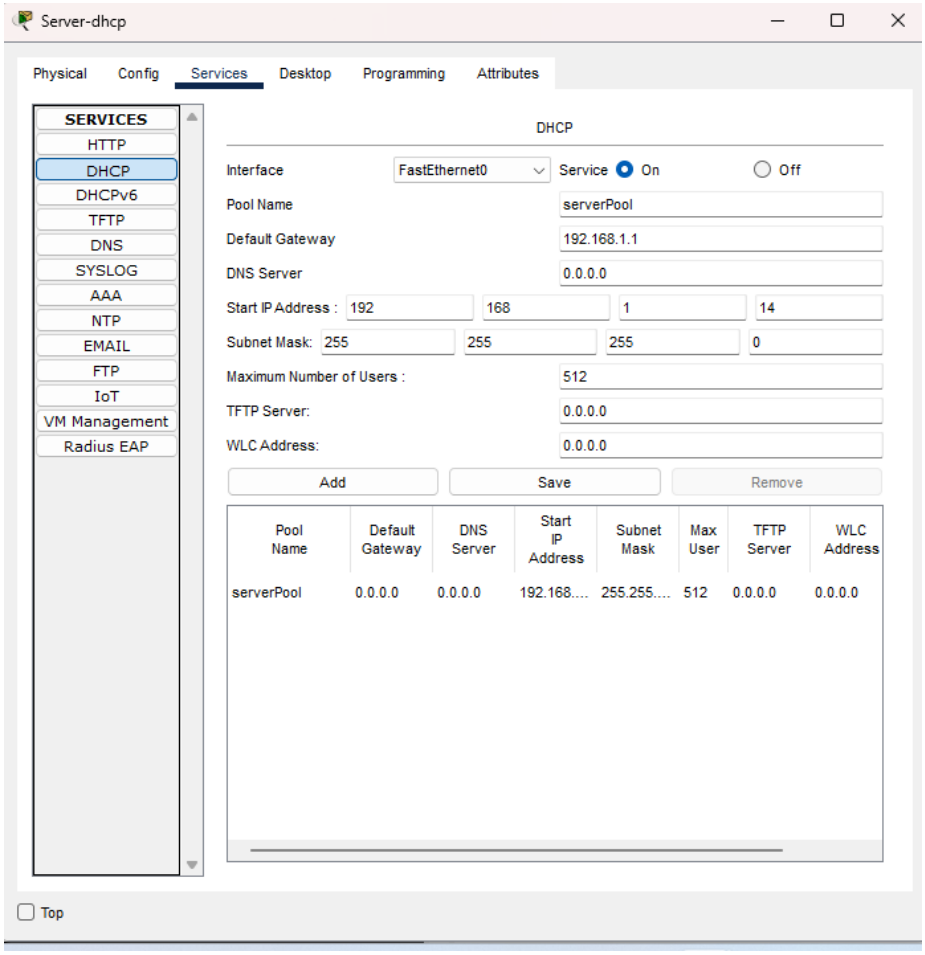


Figure 10: image 15


Server-dhcp
Physical
Config
Services
Desktop
Programming
Attributes
IP Configuration
X
IP Configuration
DHCP
Static
IPv4 Address
192.168.1.13
Subnet Mask
255.255.255.0
Default Gateway
192.168.1.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
/
Link Local Address
FE80::20C:85FF:FECE:7C90
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top



4. Configuration des appareils IoT

Les **périphériques IoT** sont configurés avec leurs paramètres réseau et authentification.

4.1 IoT0

4.2 IoT3

4.3 IoT8

5. Sécurisation des accès et authentification

Les paramètres de sécurité et d'authentification des **appareils IoT et points d'accès** sont examinés :

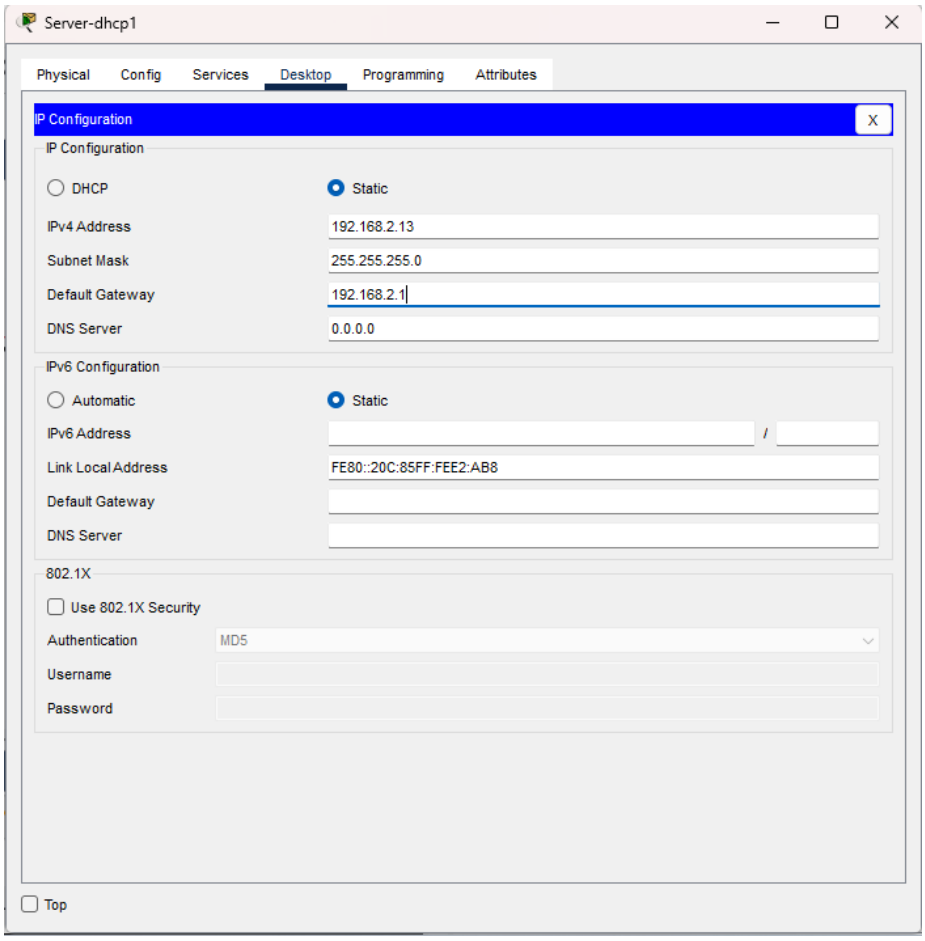


Figure 11: image 18

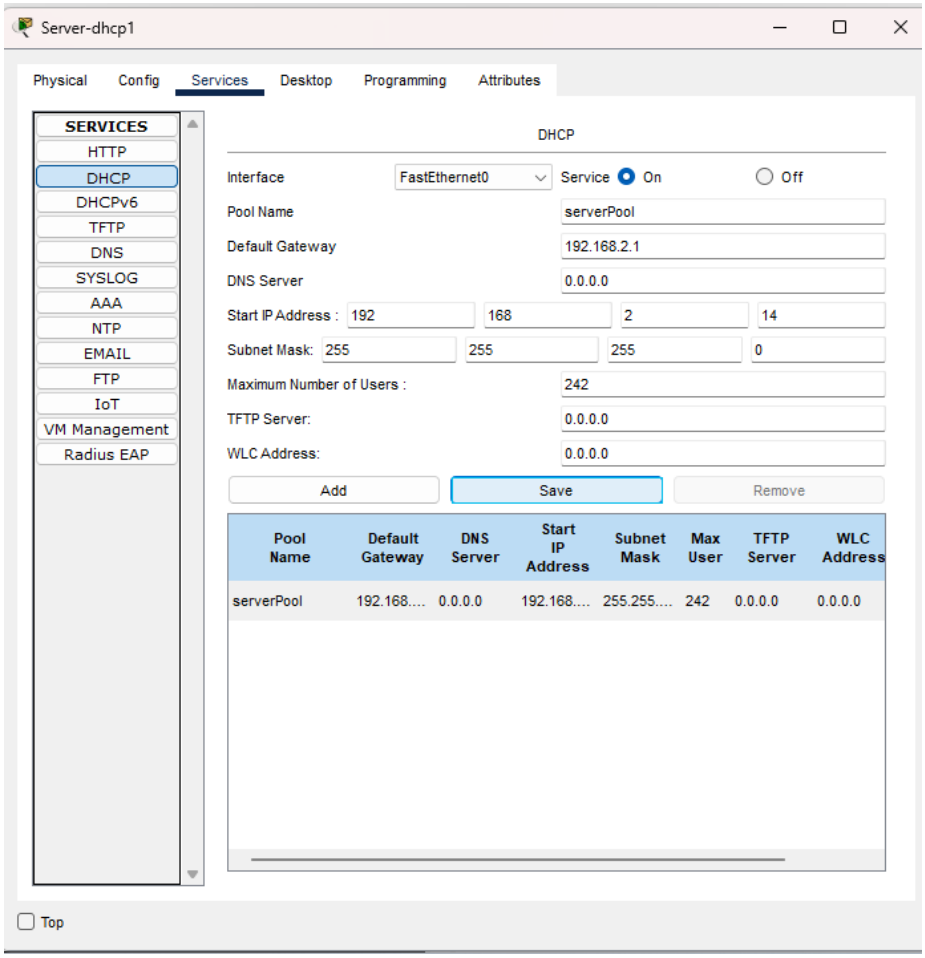


Figure 12: image 19

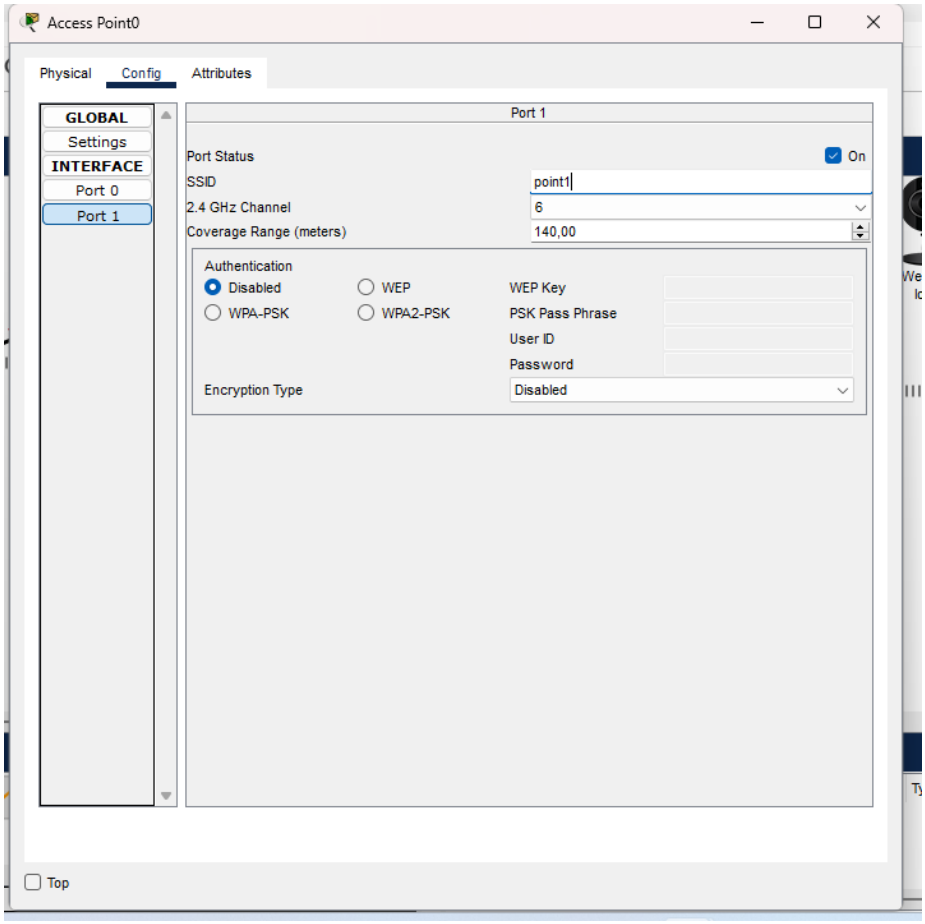
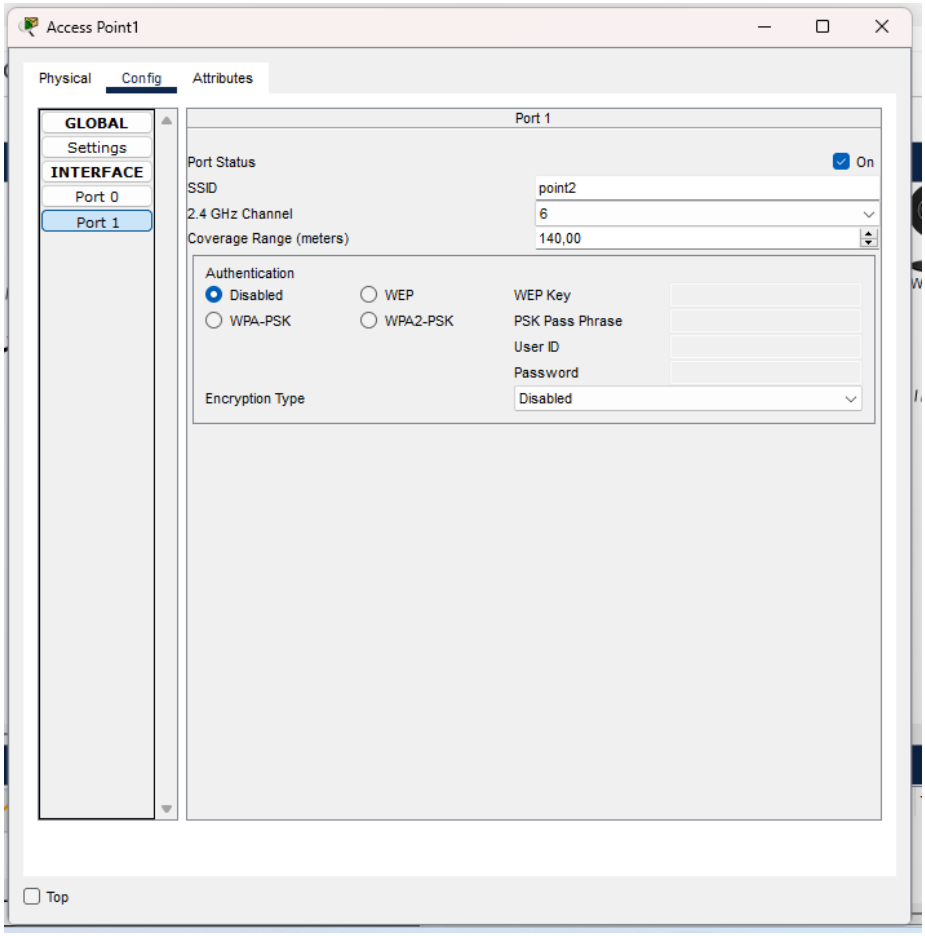
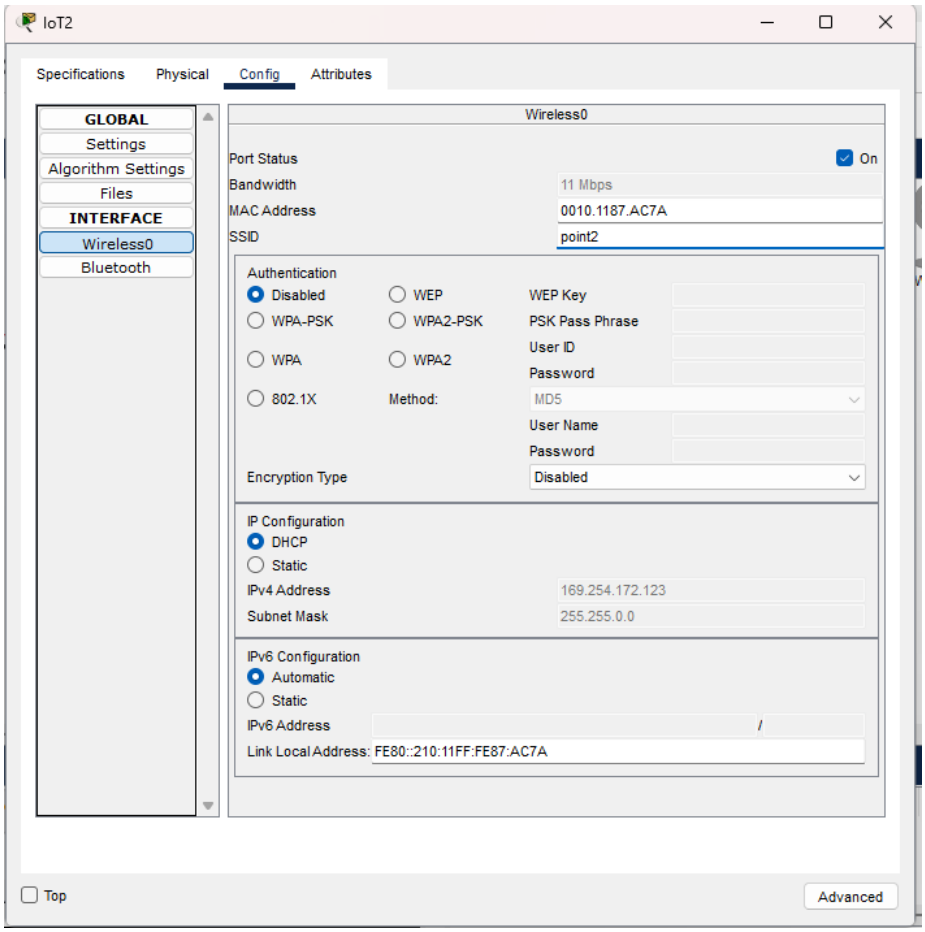


Figure 13: image 20


Access Point1
Physical
Config
Attributes
GLOBAL
Settings
INTERFACE
Port 0
Port 1
Port 1
Port Status
On
SSID
point2
2.4 GHz Channel
6
Coverage Range (meters)
140,00
Authentication
Disabled
WEP
WPA-PSK
WPA2-PSK
WEP Key
PSK Pass Phrase
User ID
Password
Encryption Type
Disabled
Top



6. Configuration OSPF sur les routeurs

Les **routeurs** sont configurés avec le **protocole de routage OSPF**, assurant une **connectivité dynamique** et une **résilience du réseau**.

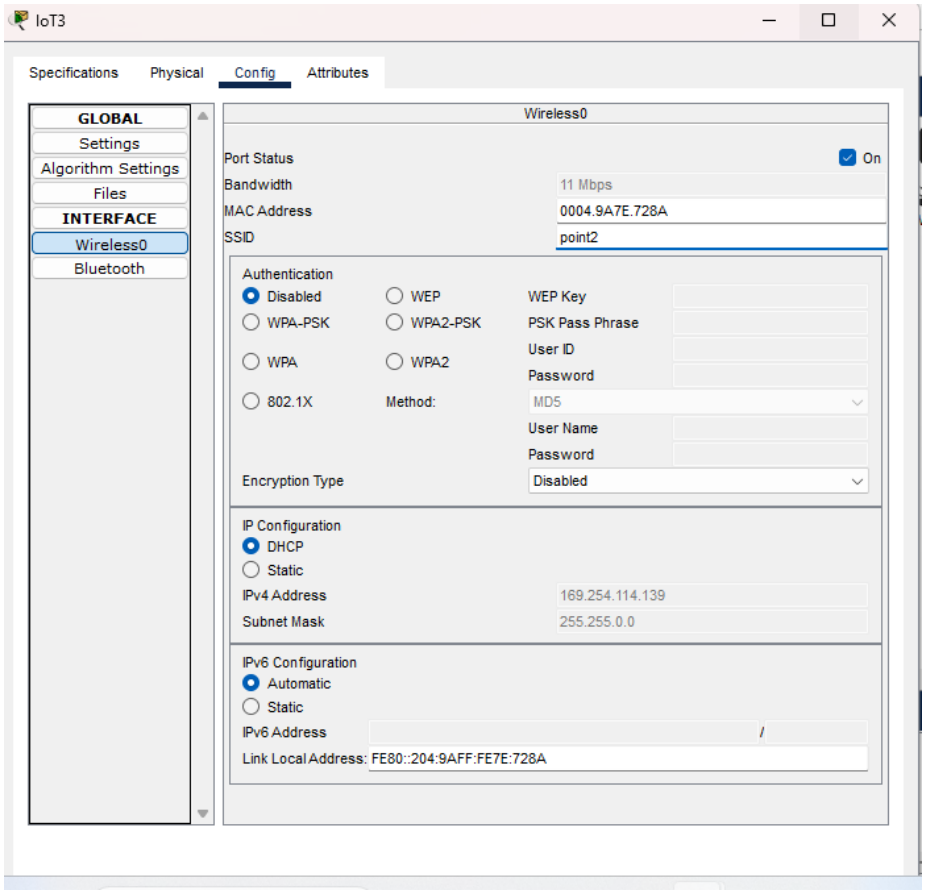
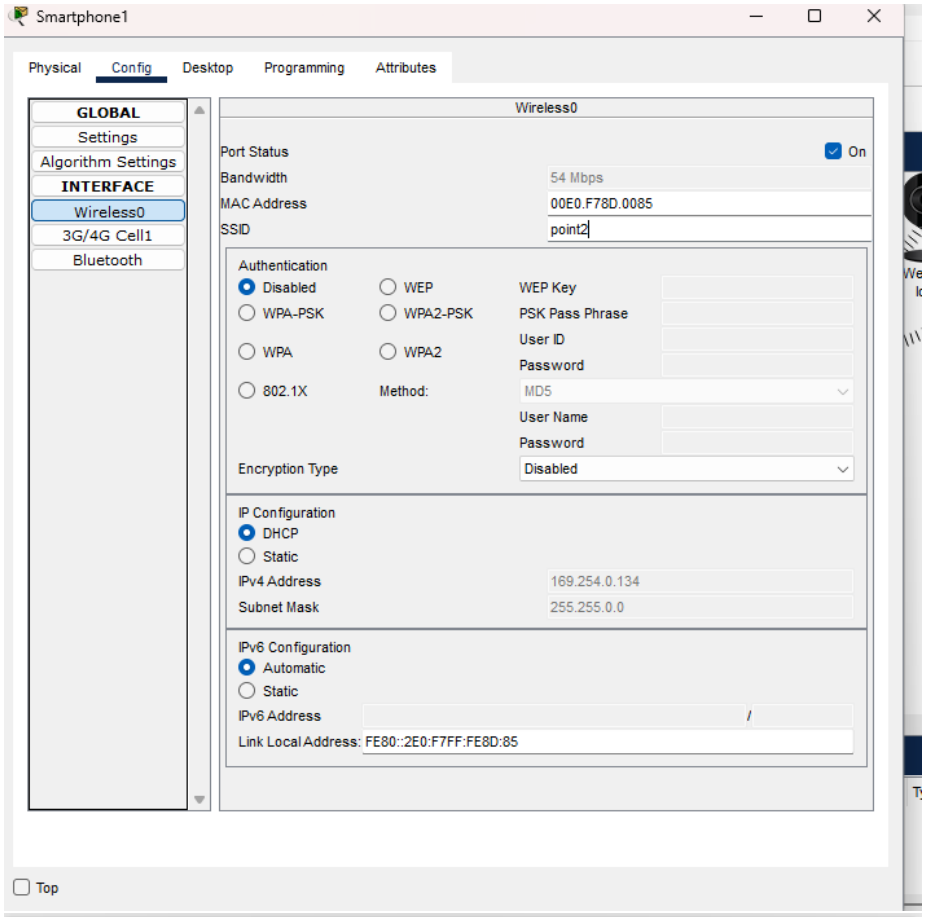
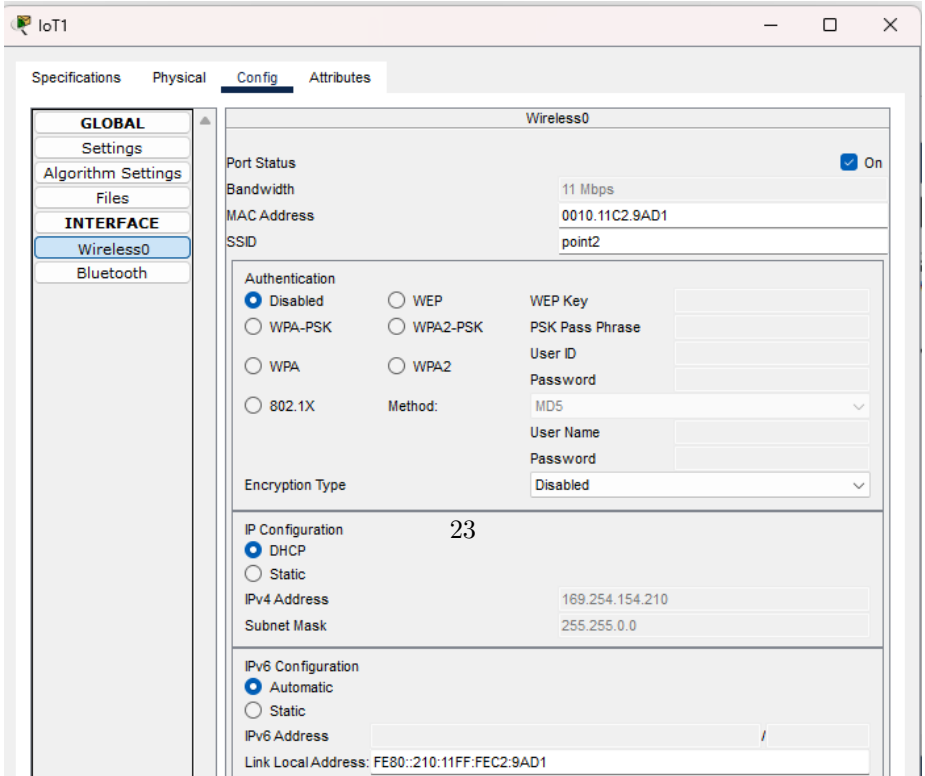


Figure 14: image 23

6.1 Routeur R1 - Configuration OSPF

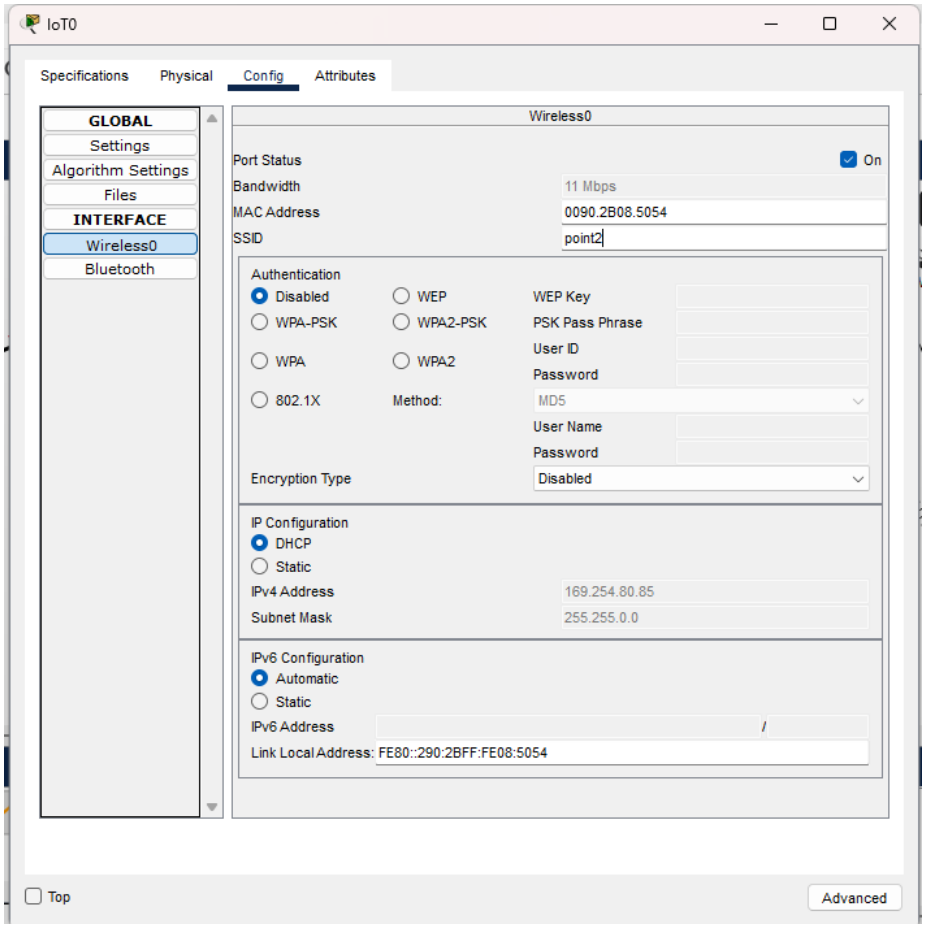
6.2 Routeur R2 - Vérification des routes

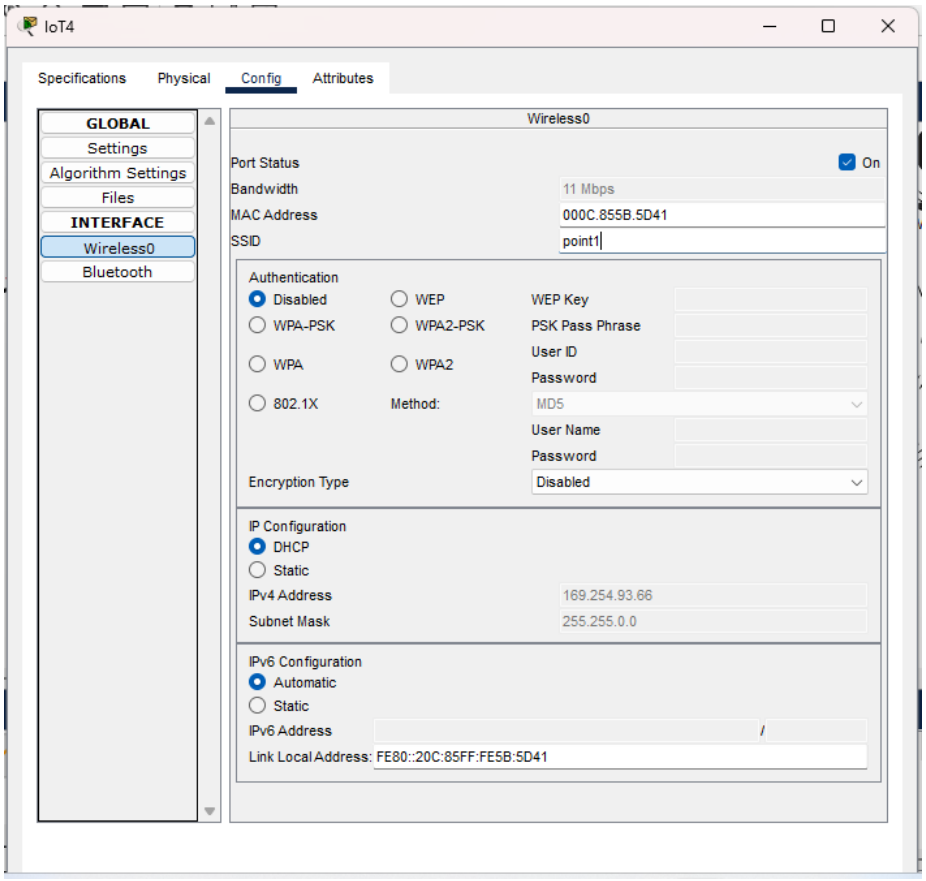




7. Tests de connectivité

Les **tests `ping` et `traceroute`** confirment la stabilité et la bonne communication entre les appareils :





8. Interface web du serveur IoT

Le **serveur IoT** est accessible via une interface web, permettant de gérer les **appareils connectés** et définir des **règles d'automatisation**.

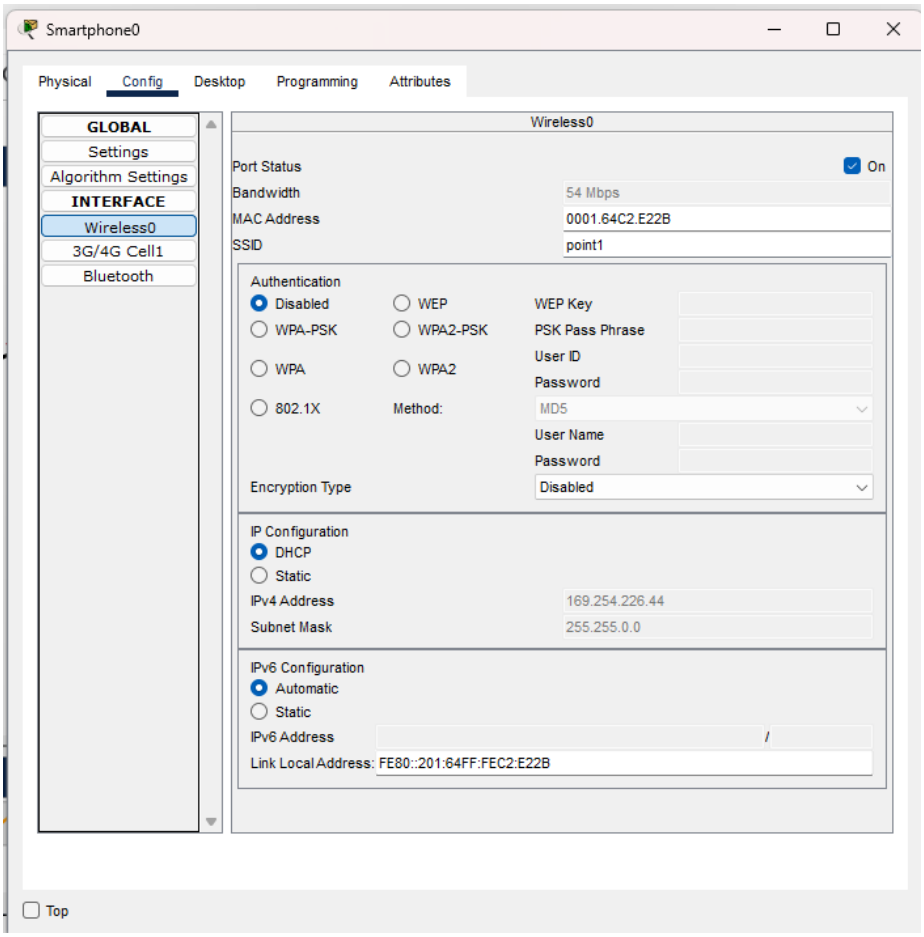
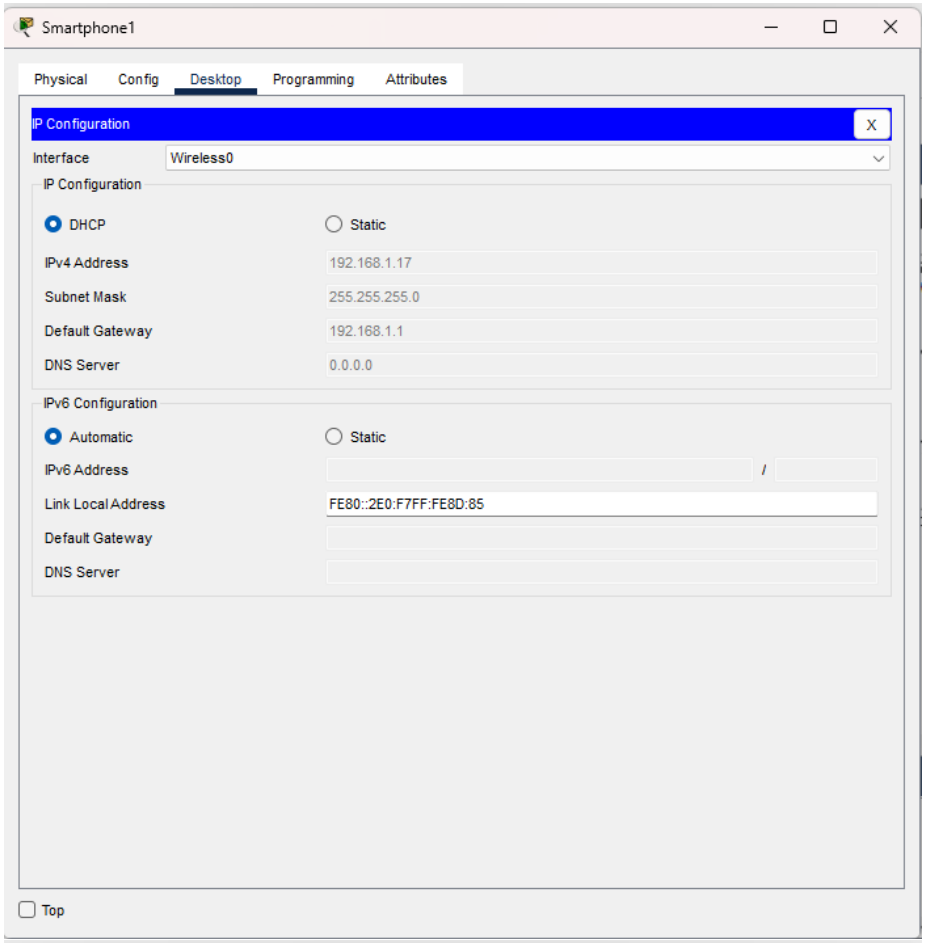
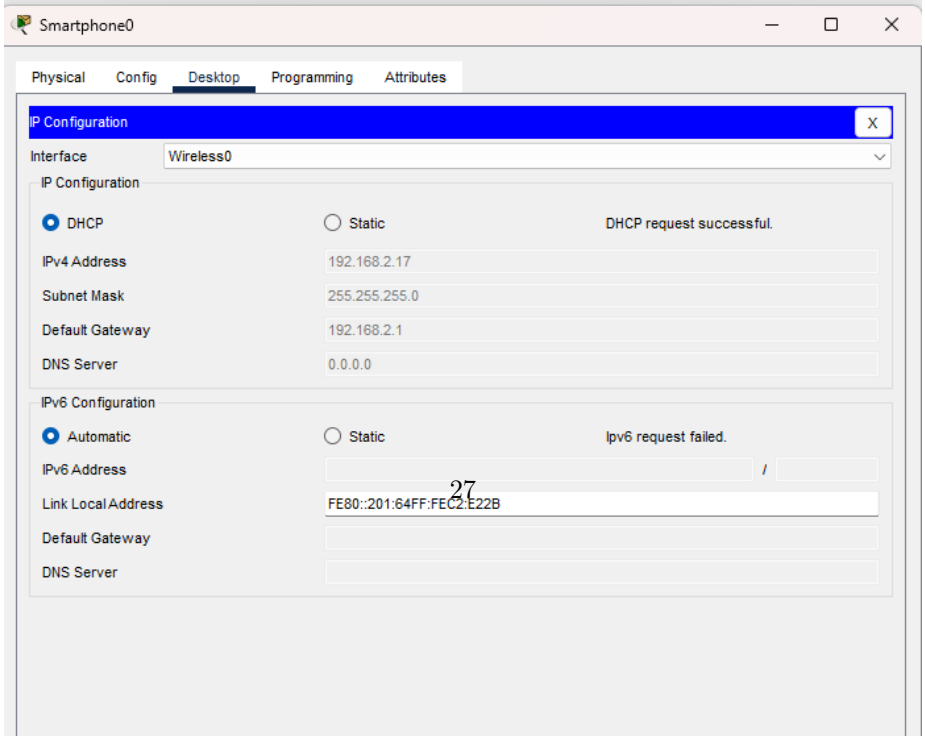


Figure 15: image 28

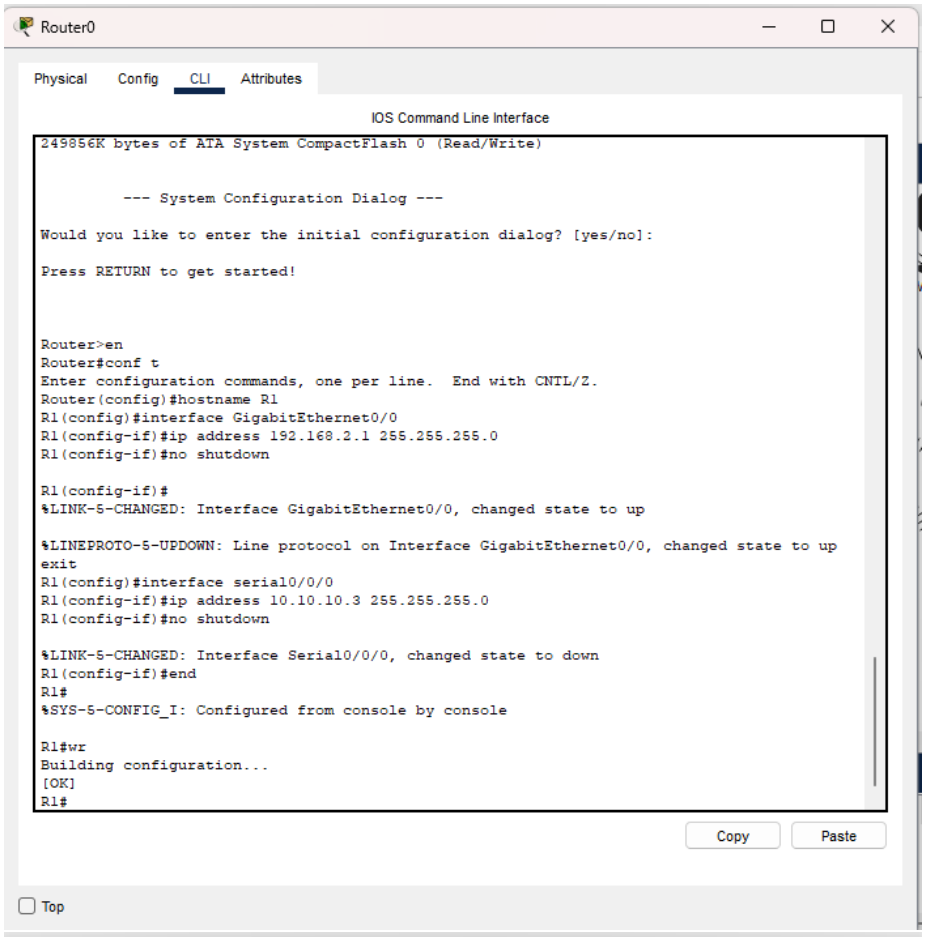
8.1 Accès au serveur

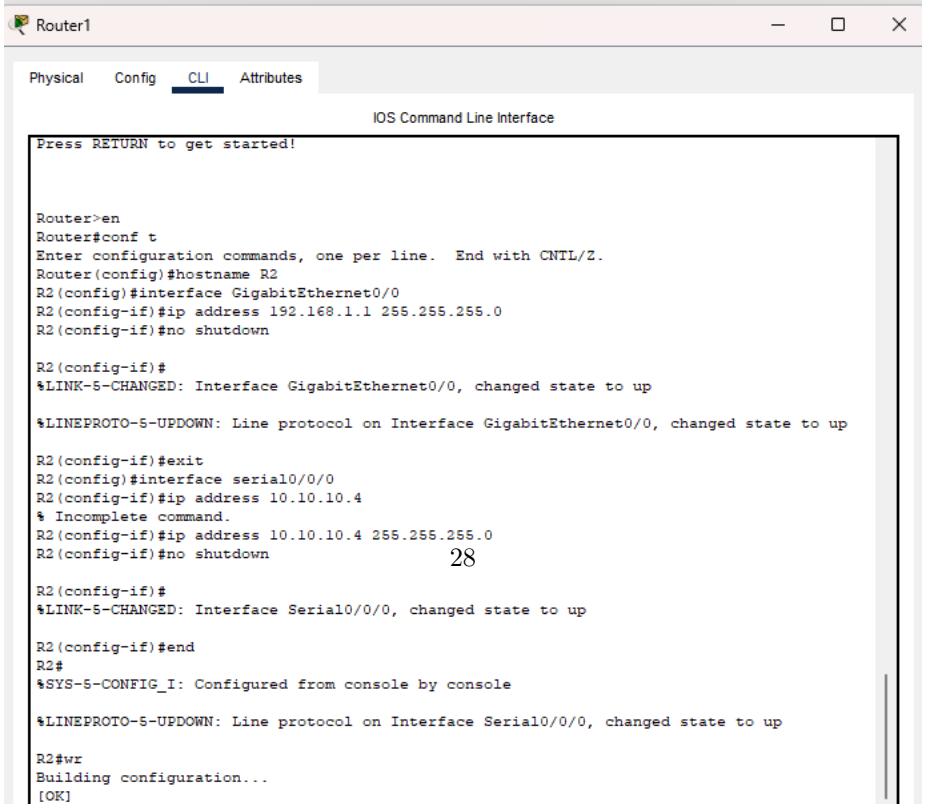
8.2 Gestion des appareils





8.3 Paramètres de contrôle et automatisation

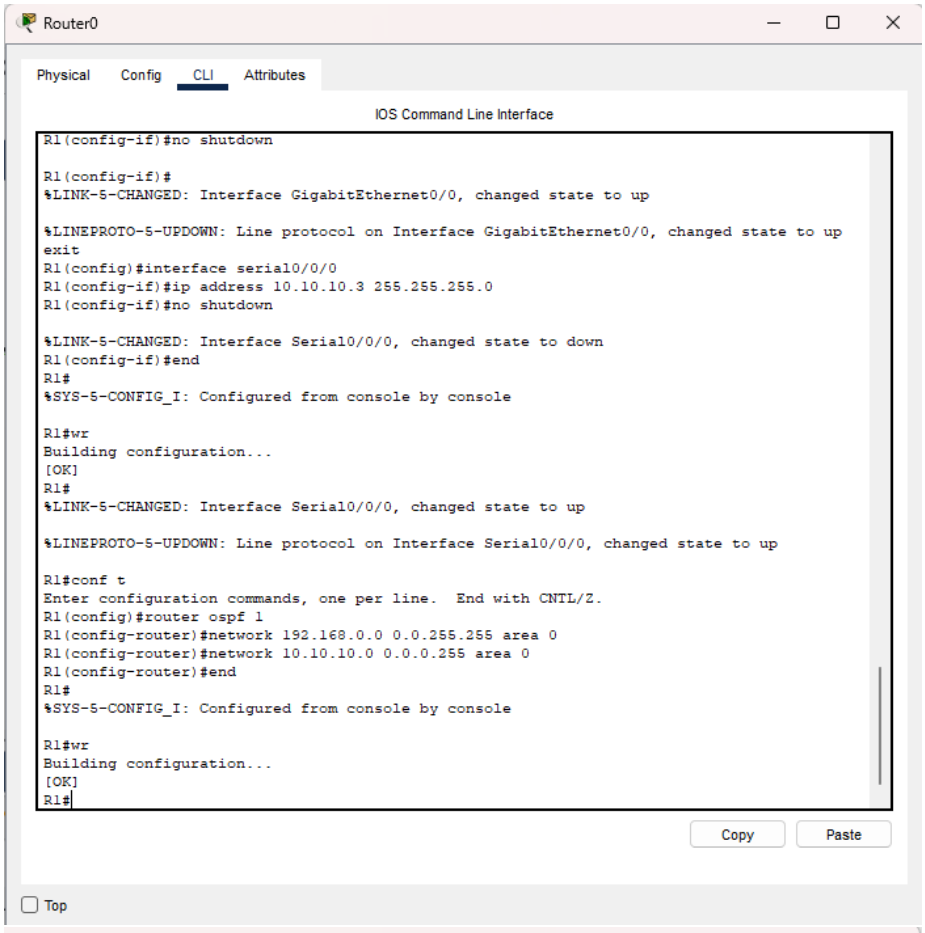


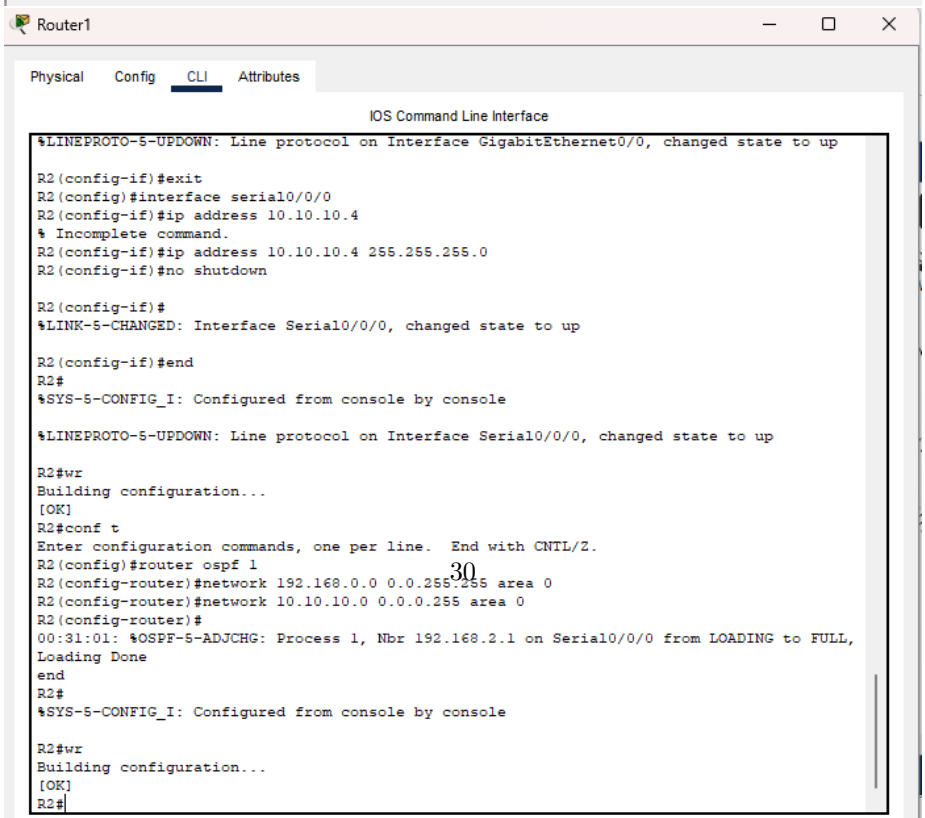


9. Configuration avancée des périphériques IoT

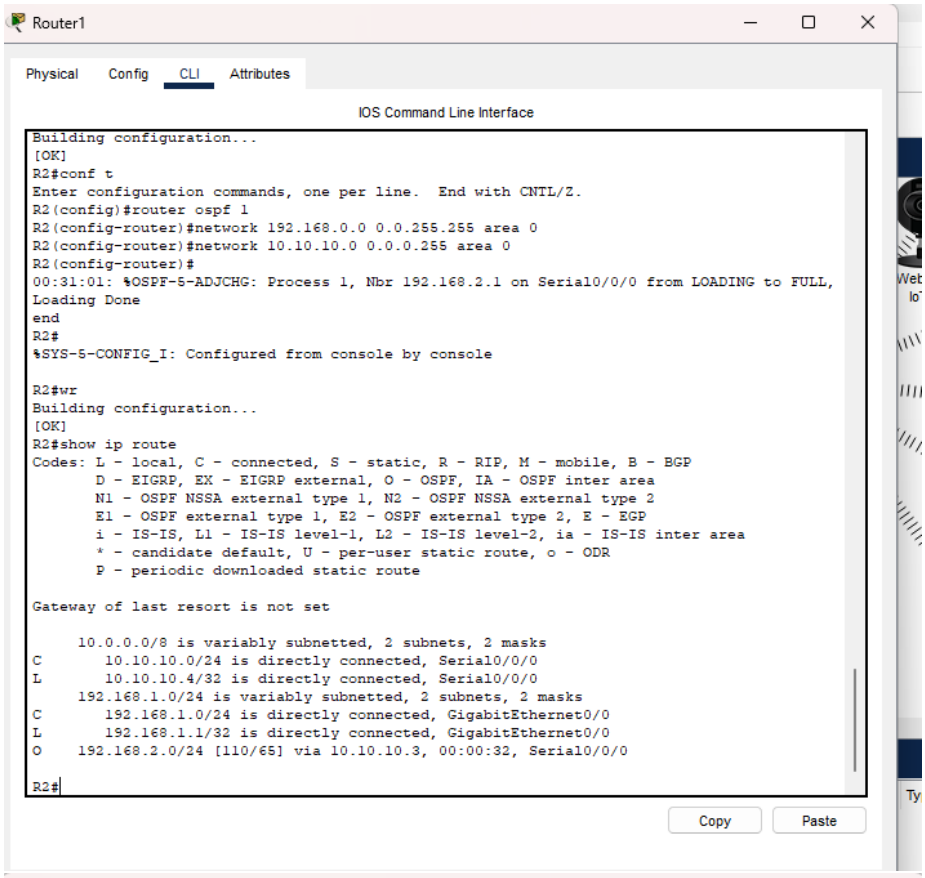
Cette section intègre les paramètres détaillés des périphériques IoT.

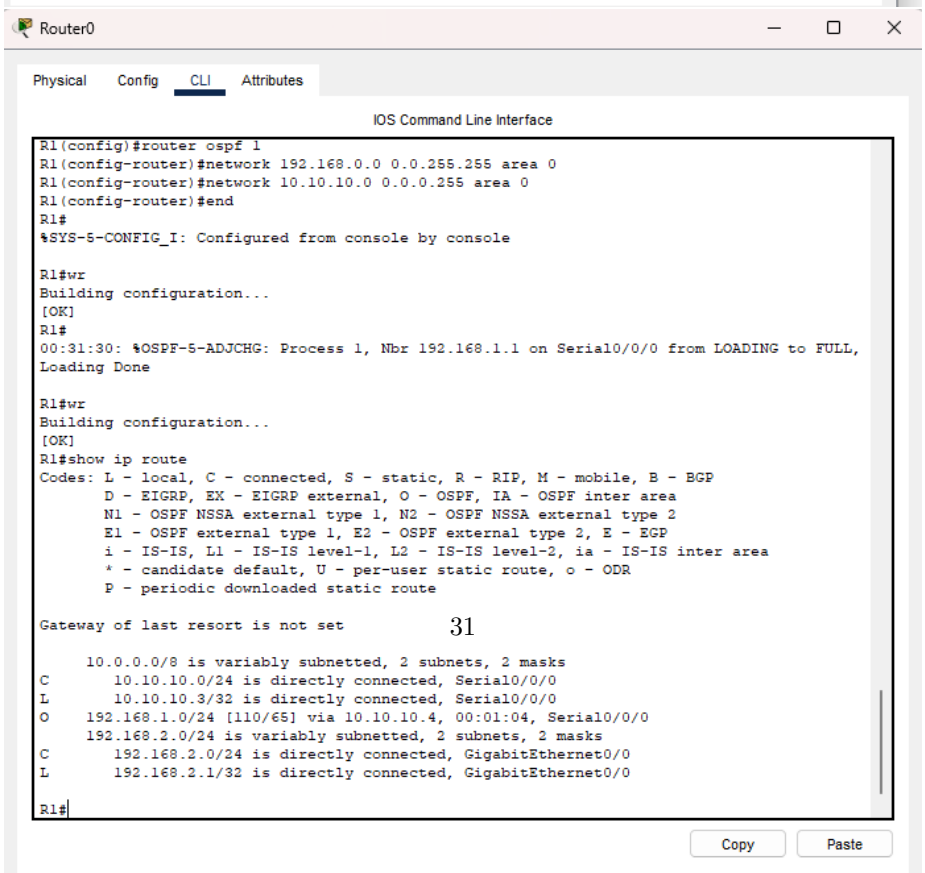
9.1 IoT4


Router0
Physical
Config
CLI
Attributes
IOS Command Line Interface
R1(config-if)#no shutdown
R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
exit
R1(config)#interface serial0/0/0
R1(config-if)#ip address 10.10.10.3 255.255.255.0
R1(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
R1(config-if)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console
R1#wr
Building configuration...
[OK]
R1#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router ospf 1
R1(config-router)#network 192.168.0.0 0.0.255.255 area 0
R1(config-router)#network 10.10.10.0 0.0.0.255 area 0
R1(config-router)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console
R1#wr
Building configuration...
[OK]
R1#
Copy
Paste
Top

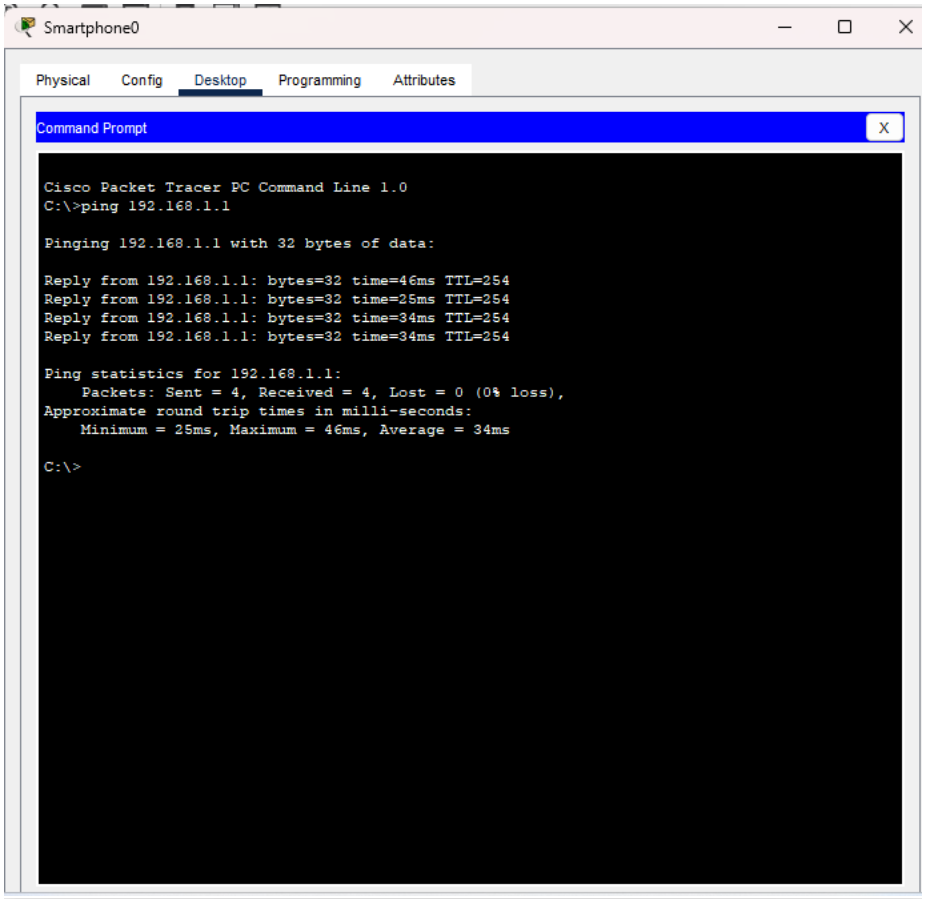

Router1
Physical
Config
CLI
Attributes
IOS Command Line Interface
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
R2(config-if)#exit
R2(config)#interface serial0/0/0
R2(config-if)#ip address 10.10.10.4
% Incomplete command.
R2(config-if)#ip address 10.10.10.4 255.255.255.0
R2(config-if)#no shutdown
R2(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
R2(config-if)#end
R2#
%SYS-5-CONFIG_I: Configured from console by console
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
R2#wr
Building configuration...
[OK]
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#router ospf 1
R2(config-router)#network 192.168.0.0 0.0.255.255 area 0
R2(config-router)#network 10.10.10.0 0.0.0.255 area 0
R2(config-router)#
00:31:01: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.2.1 on Serial0/0/0 from LOADING to FULL,
Loading Done
end
R2#
%SYS-5-CONFIG_I: Configured from console by console
R2#wr
Building configuration...
[OK]
R2#

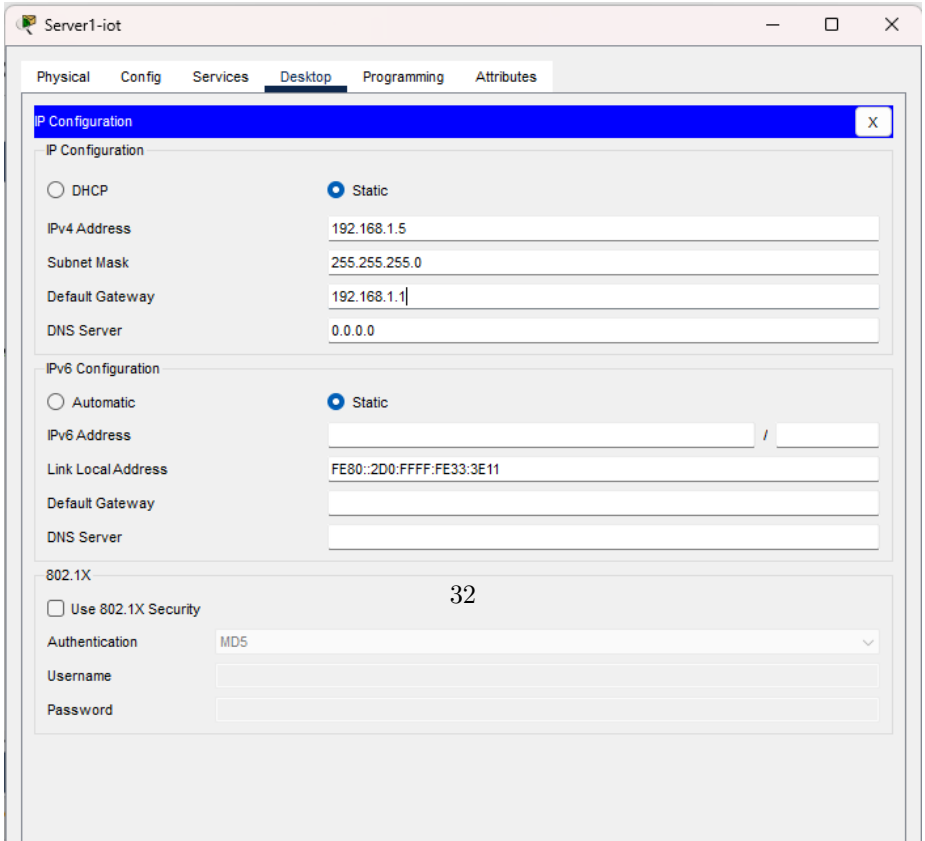
9.2 IoT5


Router1
Physical
Config
CLI
Attributes
IOS Command Line Interface
Building configuration...
[OK]
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#router ospf 1
R2(config-router)#network 192.168.0.0 0.0.255.255 area 0
R2(config-router)#network 10.10.10.0 0.0.0.255 area 0
R2(config-router)#
00:31:01: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.2.1 on Serial0/0/0 from LOADING to FULL,
Loading Done
end
R2#
%SYS-5-CONFIG_I: Configured from console by console
R2#wr
Building configuration...
[OK]
R2#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route
Gateway of last resort is not set
10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 10.10.10.0/24 is directly connected, Serial0/0/0
L 10.10.10.4/32 is directly connected, Serial0/0/0
192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.168.1.0/24 is directly connected, GigabitEthernet0/0
L 192.168.1.1/32 is directly connected, GigabitEthernet0/0
O 192.168.2.0/24 [110/65] via 10.10.10.3, 00:00:32, Serial0/0/0
R2#
Copy
Paste

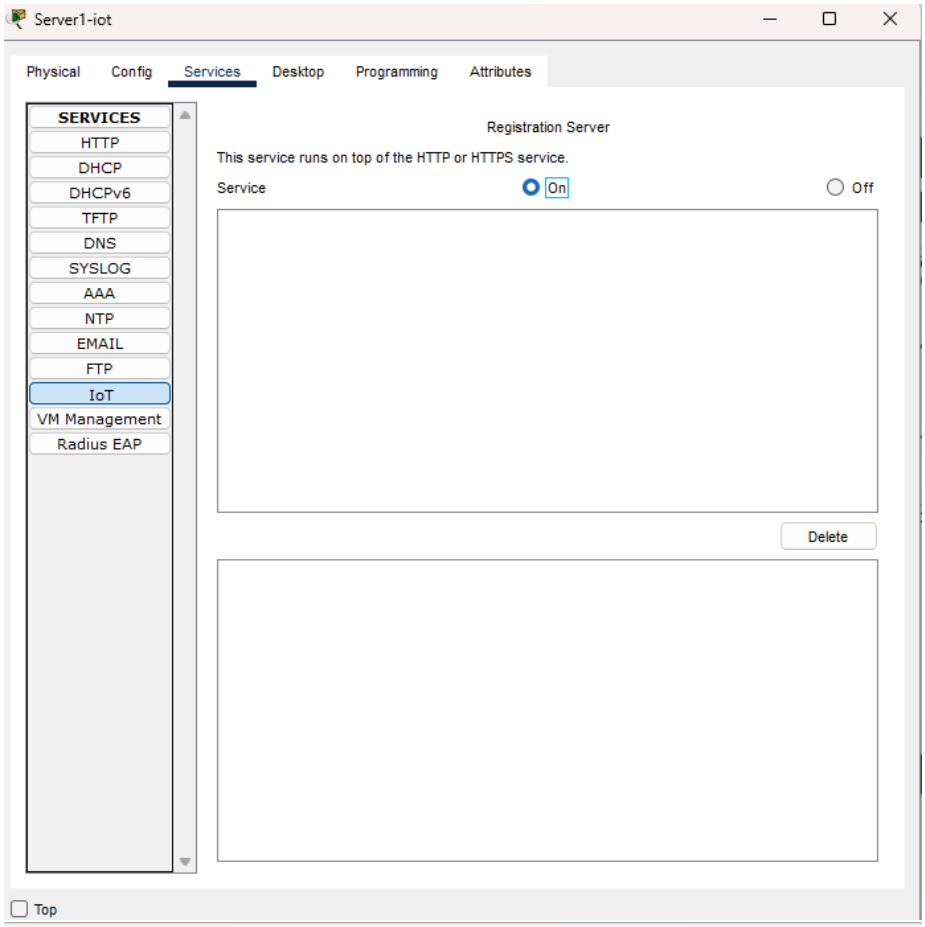

Router0
Physical
Config
CLI
Attributes
IOS Command Line Interface
R1(config)#router ospf 1
R1(config-router)#network 192.168.0.0 0.0.255.255 area 0
R1(config-router)#network 10.10.10.0 0.0.0.255 area 0
R1(config-router)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console
R1#wr
Building configuration...
[OK]
R1#
00:31:30: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.1.1 on Serial0/0/0 from LOADING to FULL,
Loading Done
R1#wr
Building configuration...
[OK]
R1#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route
Gateway of last resort is not set
10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 10.10.10.0/24 is directly connected, Serial0/0/0
L 10.10.10.3/32 is directly connected, Serial0/0/0
O 192.168.1.0/24 [110/65] via 10.10.10.4, 00:01:04, Serial0/0/0
192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.168.2.0/24 is directly connected, GigabitEthernet0/0
L 192.168.2.1/32 is directly connected, GigabitEthernet0/0
R1#
Copy
Paste

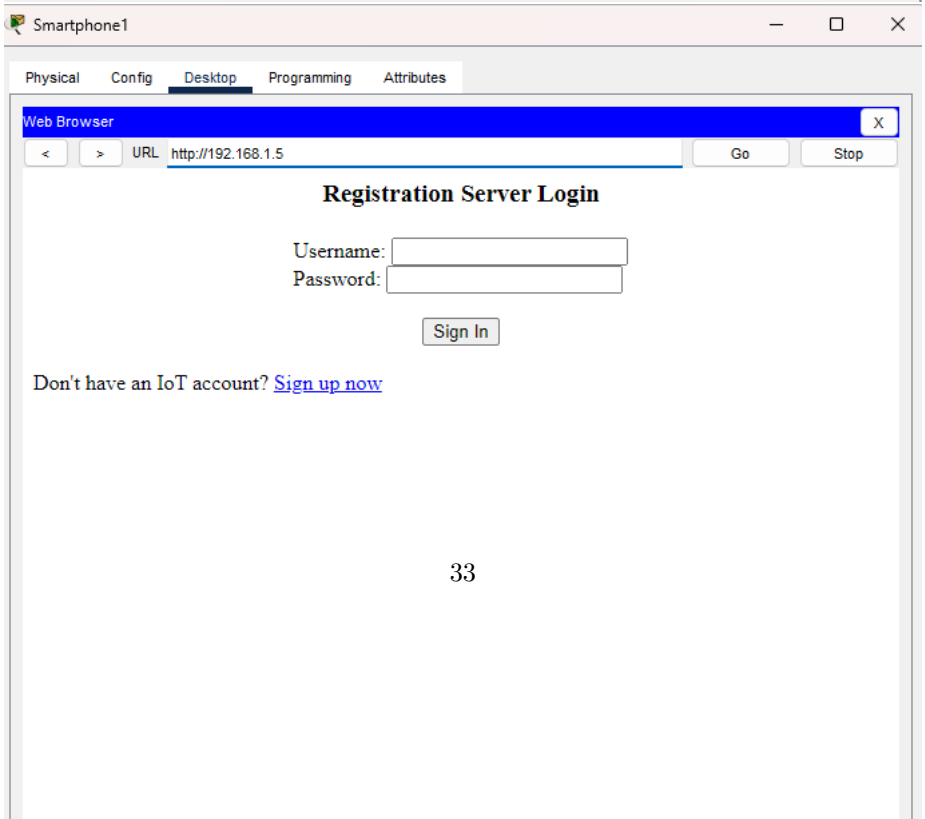
9.3 IoT6


Smartphone0
Physical
Config
Desktop
Programming
Attributes
Command Prompt
X
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.1
Pinging 192.168.1.1 with 32 bytes of data:
Reply from 192.168.1.1: bytes=32 time=46ms TTL=254
Reply from 192.168.1.1: bytes=32 time=25ms TTL=254
Reply from 192.168.1.1: bytes=32 time=34ms TTL=254
Reply from 192.168.1.1: bytes=32 time=34ms TTL=254
Ping statistics for 192.168.1.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 25ms, Maximum = 46ms, Average = 34ms
C:\>

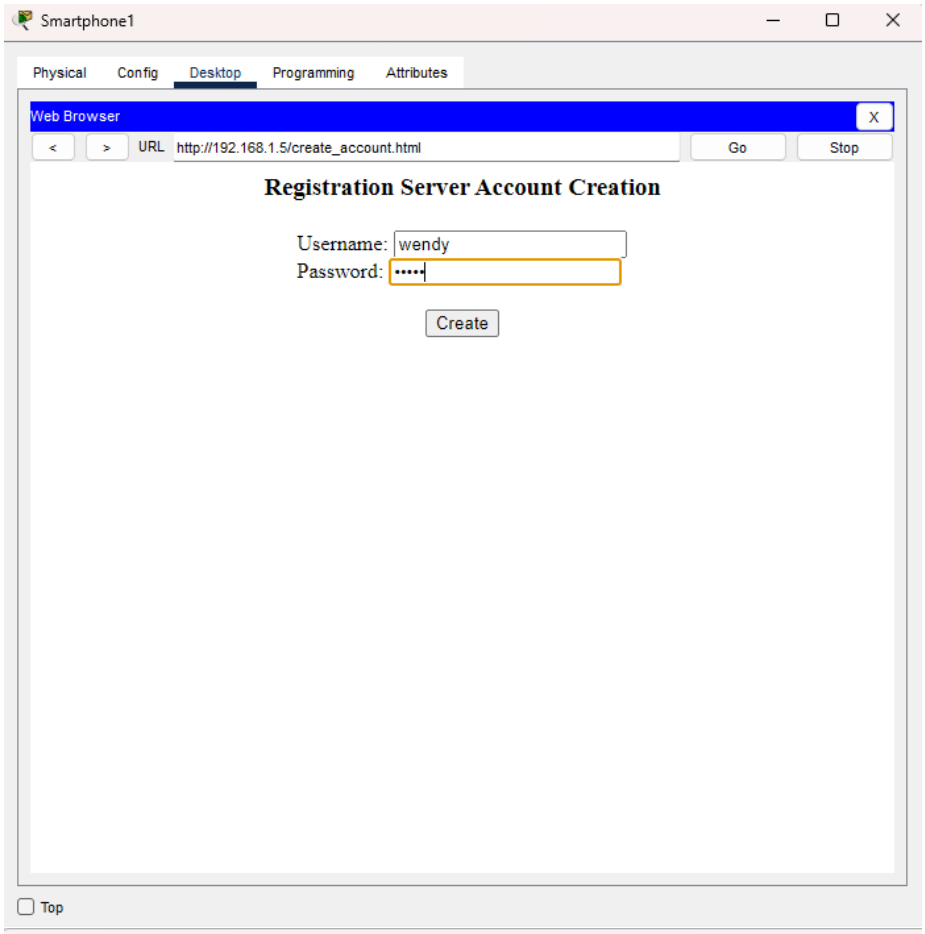

Server1-iot
Physical
Config
Services
Desktop
Programming
Attributes
IP Configuration
X
IP Configuration
DHCP
Static
IPv4 Address
192.168.1.5
Subnet Mask
255.255.255.0
Default Gateway
192.168.1.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::2D0:FFFF:FE33:3E11
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password

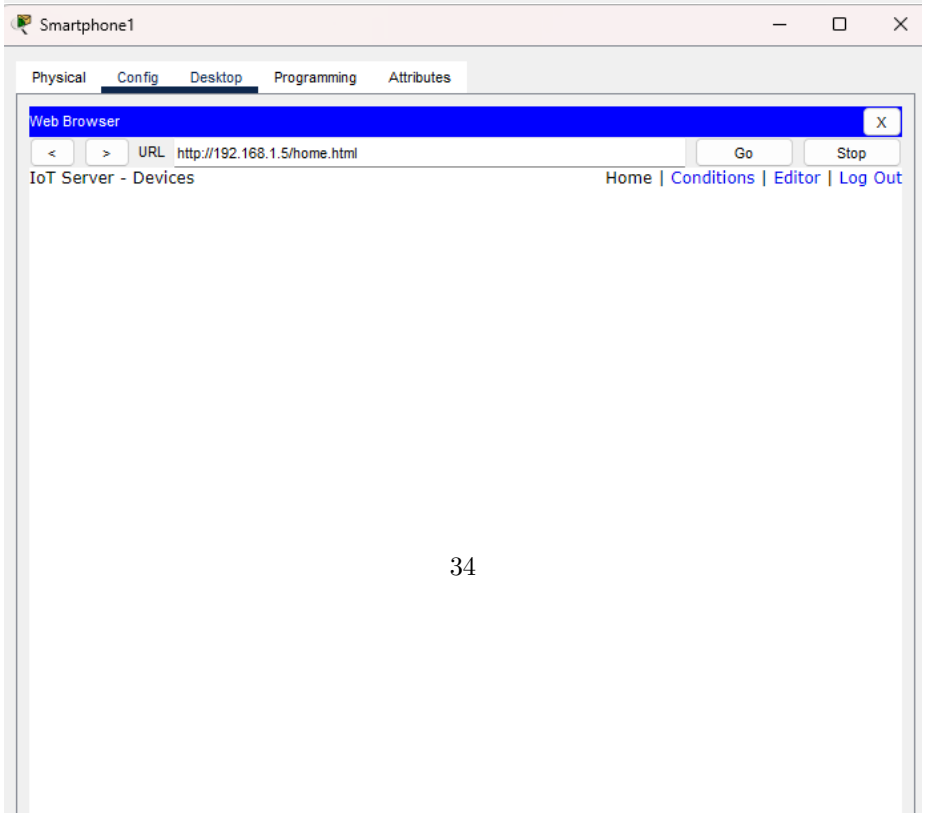
9.4 IoT7


Server1-iot
Physical
Config
Services
Desktop
Programming
Attributes
SERVICES
HTTP
DHCP
DHCPv6
TFTP
DNS
SYSLOG
AAA
NTP
EMAIL
FTP
IoT
VM Management
Radius EAP
Registration Server
This service runs on top of the HTTP or HTTPS service.
Service
On
Off
Delete
Top


Smartphone1
Physical
Config
Desktop
Programming
Attributes
Web Browser
X
URL
http://192.168.1.5
Go
Stop
Registration Server Login
Username:
Password:
Sign In
Don't have an IoT account? Sign up now

9.5 IoT9


Smartphone1
Physical
Config
Desktop
Programming
Attributes
Web Browser
X
<
>
URL
http://192.168.1.5/create_account.html
Go
Stop
Registration Server Account Creation
Username: wendy
Password: •••••
Create
Top


Smartphone1
Physical
Config
Desktop
Programming
Attributes
Web Browser
X
<
>
URL
http://192.168.1.5/home.html
Go
Stop
IoT Server - Devices
Home | Conditions | Editor | Log Out

10. Optimisation du réseau

Cette section analyse les **paramètres réseaux avancés** et propose des améliorations.

10.1 Configuration du serveur IoT

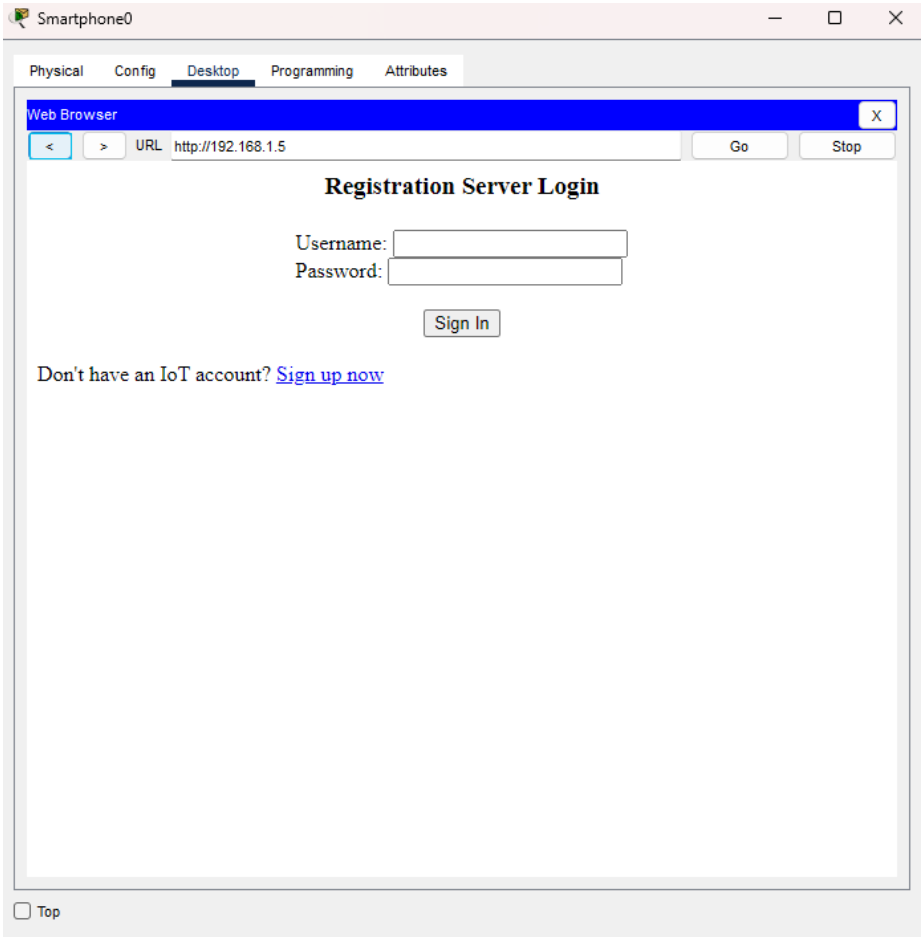
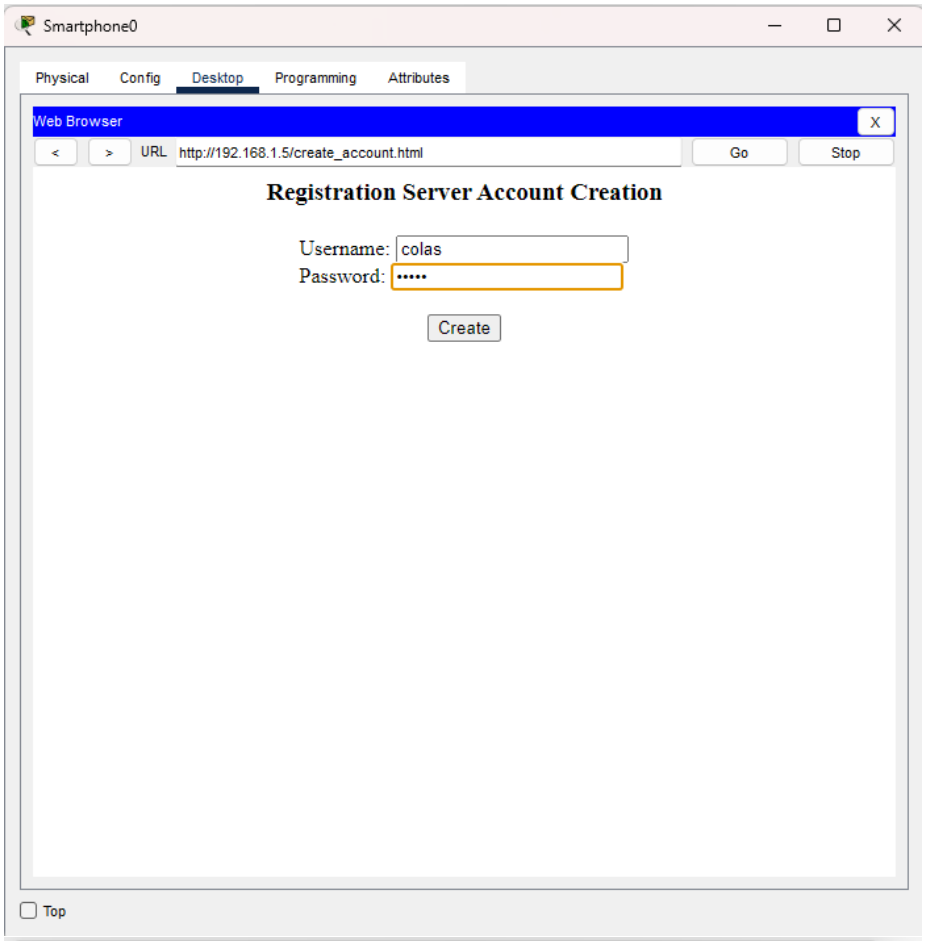
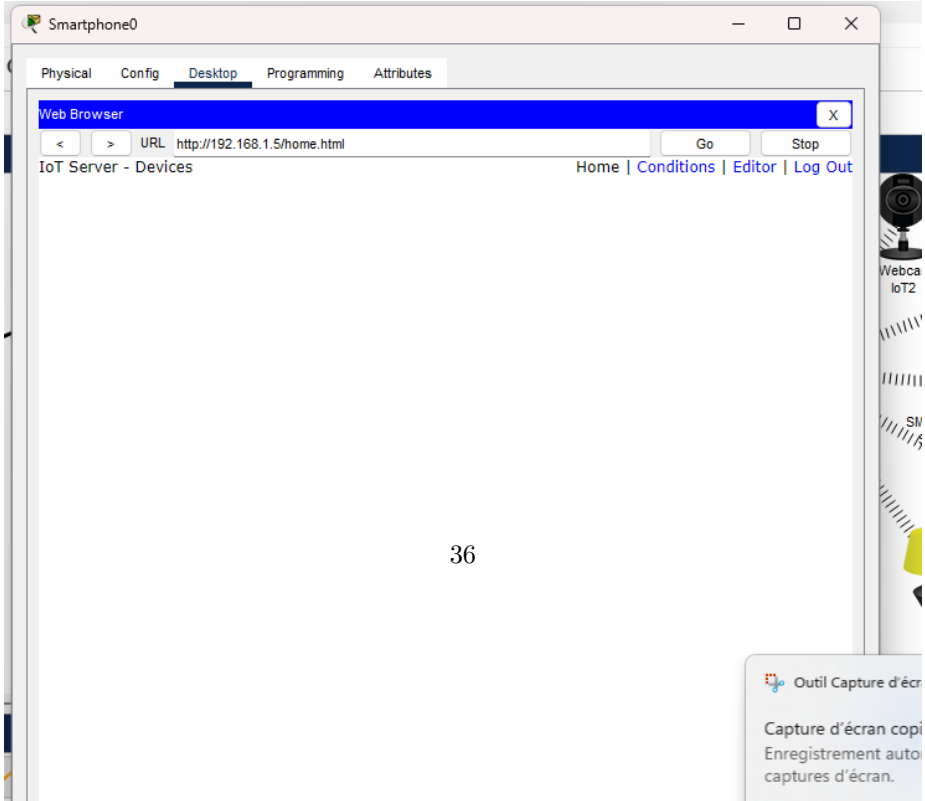


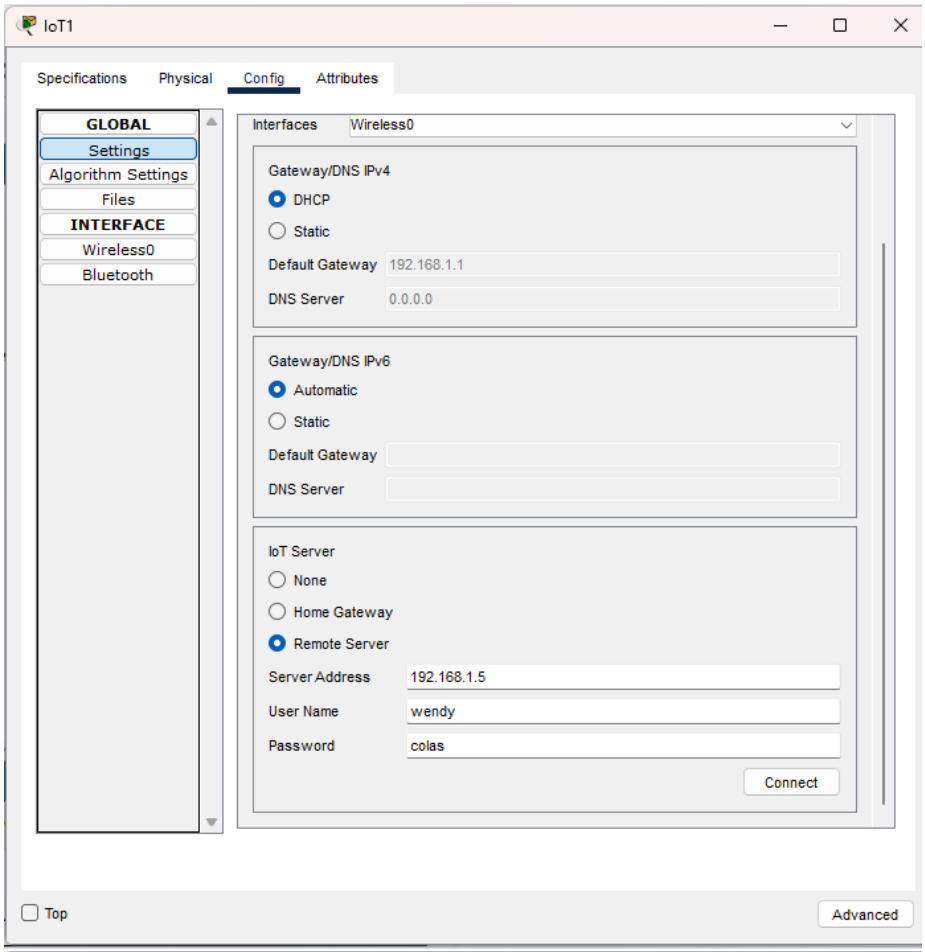
Figure 16: image 43

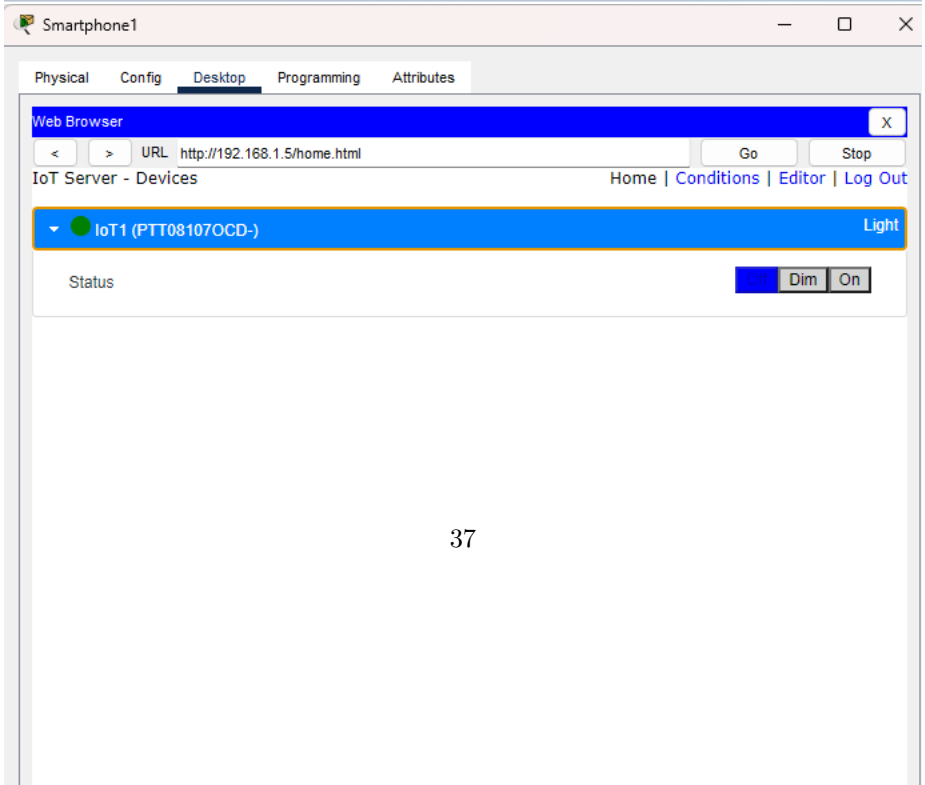
10.2 Vérification des adresses IP



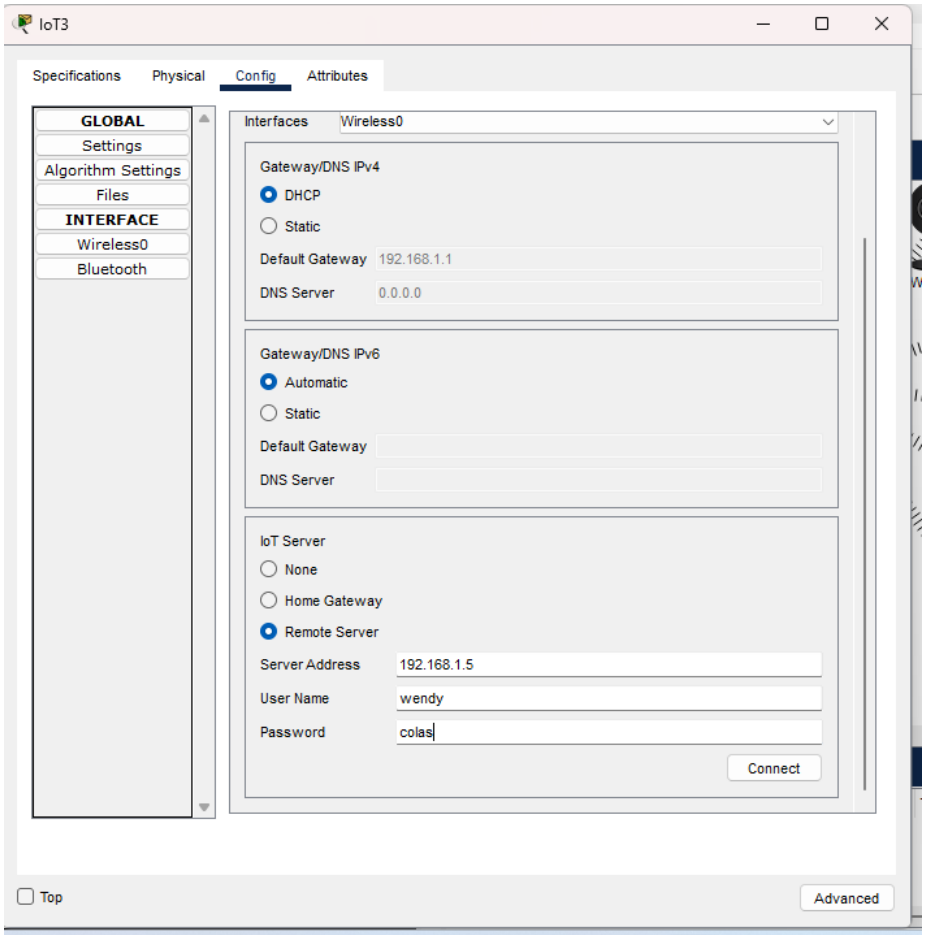


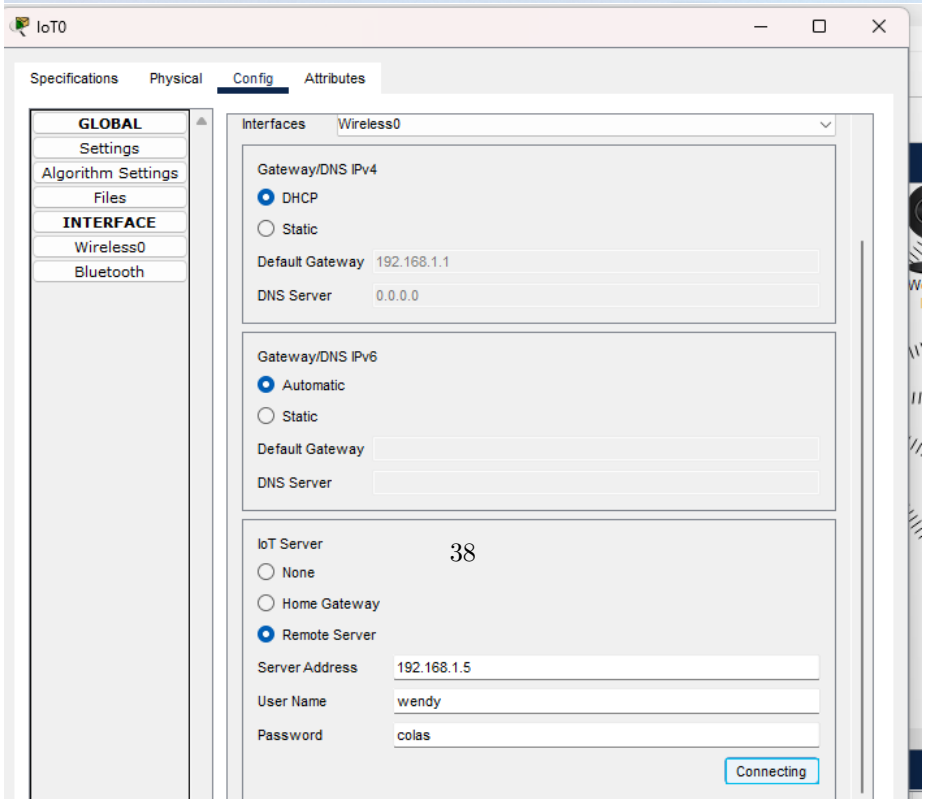
10.3 Analyse des performances réseau



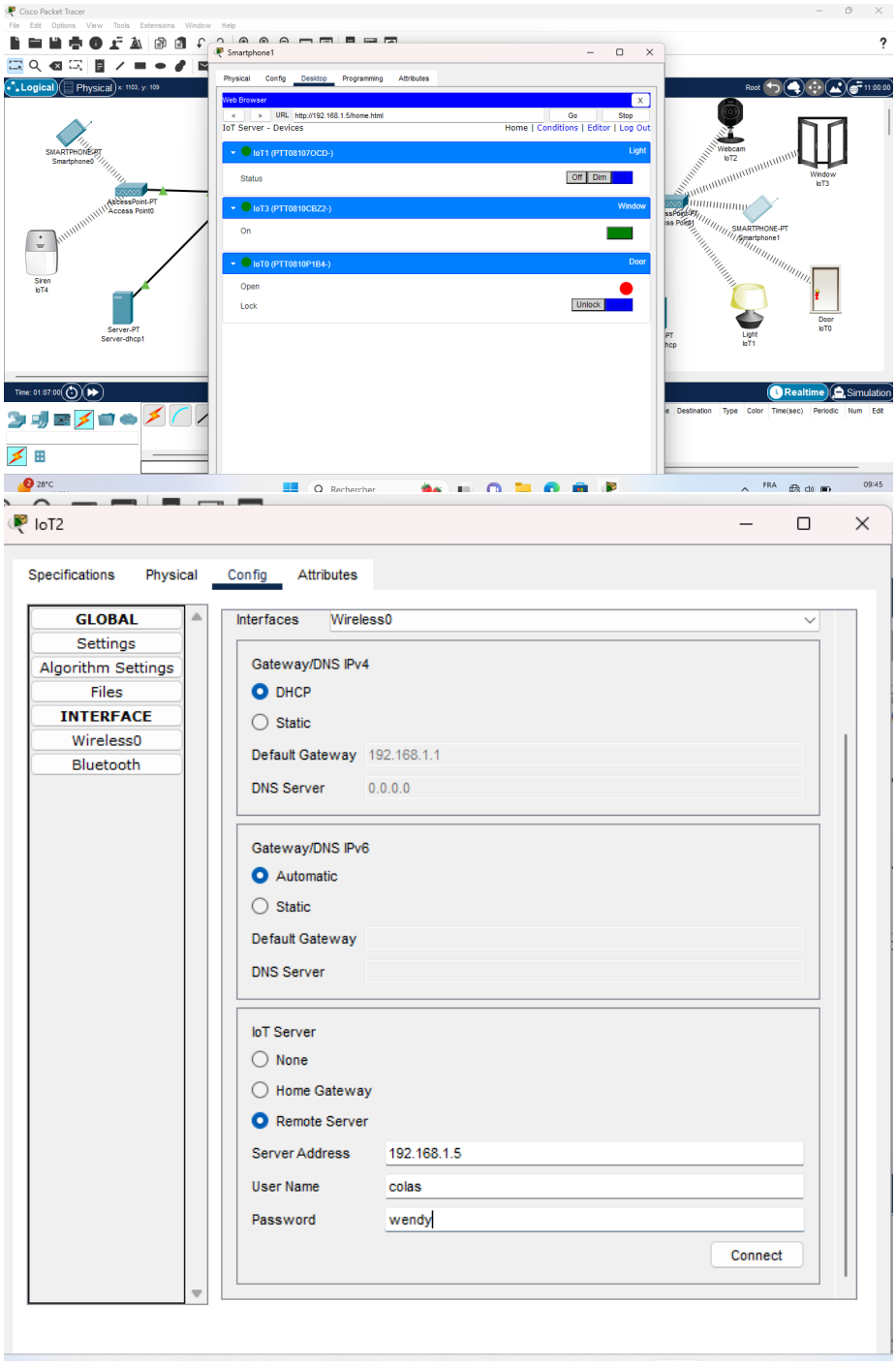


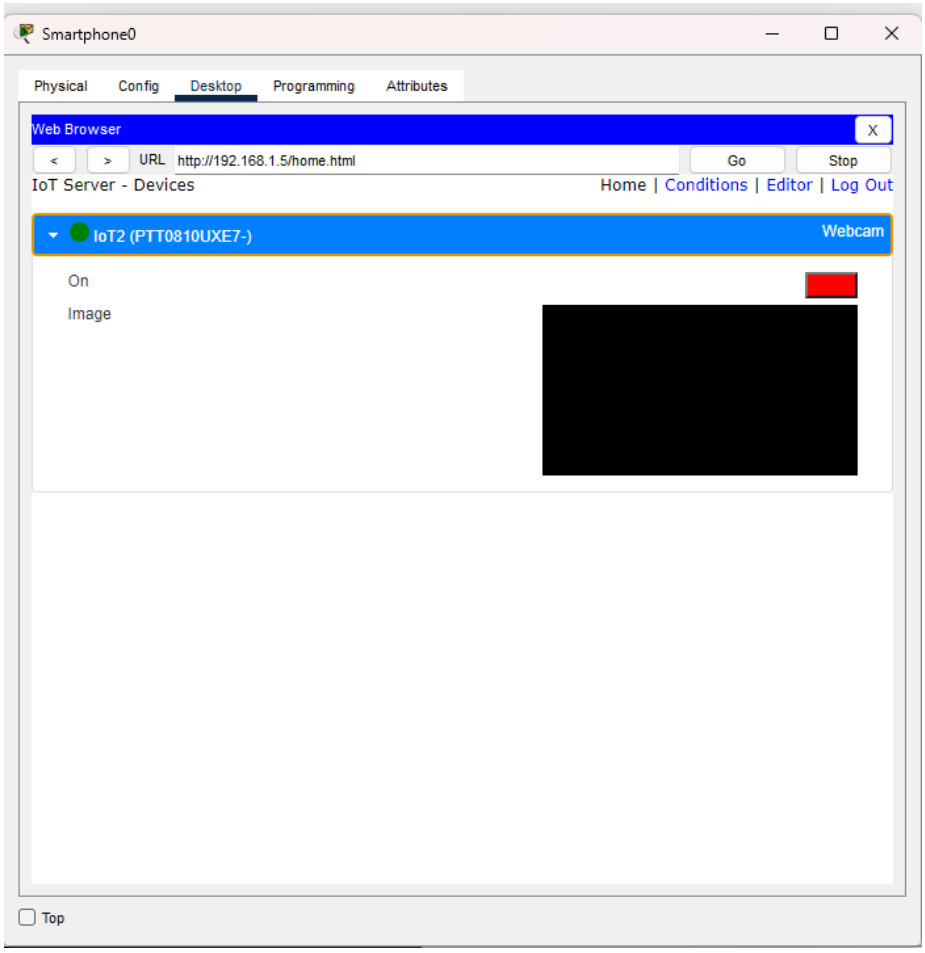
10.4 Tests complémentaires

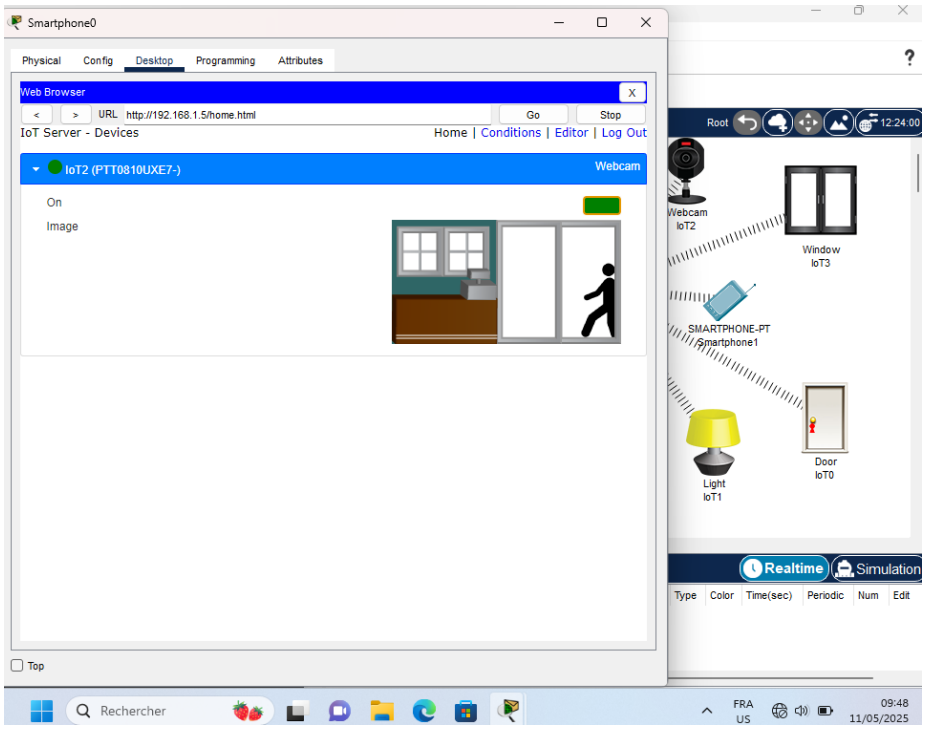


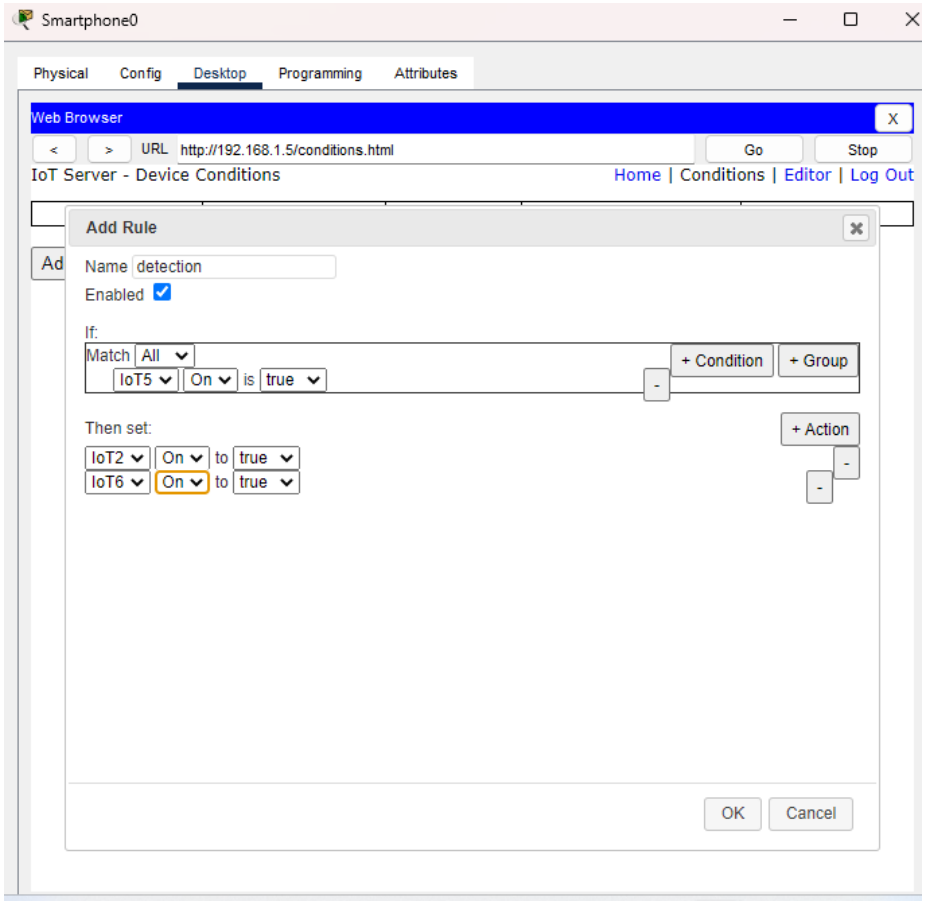


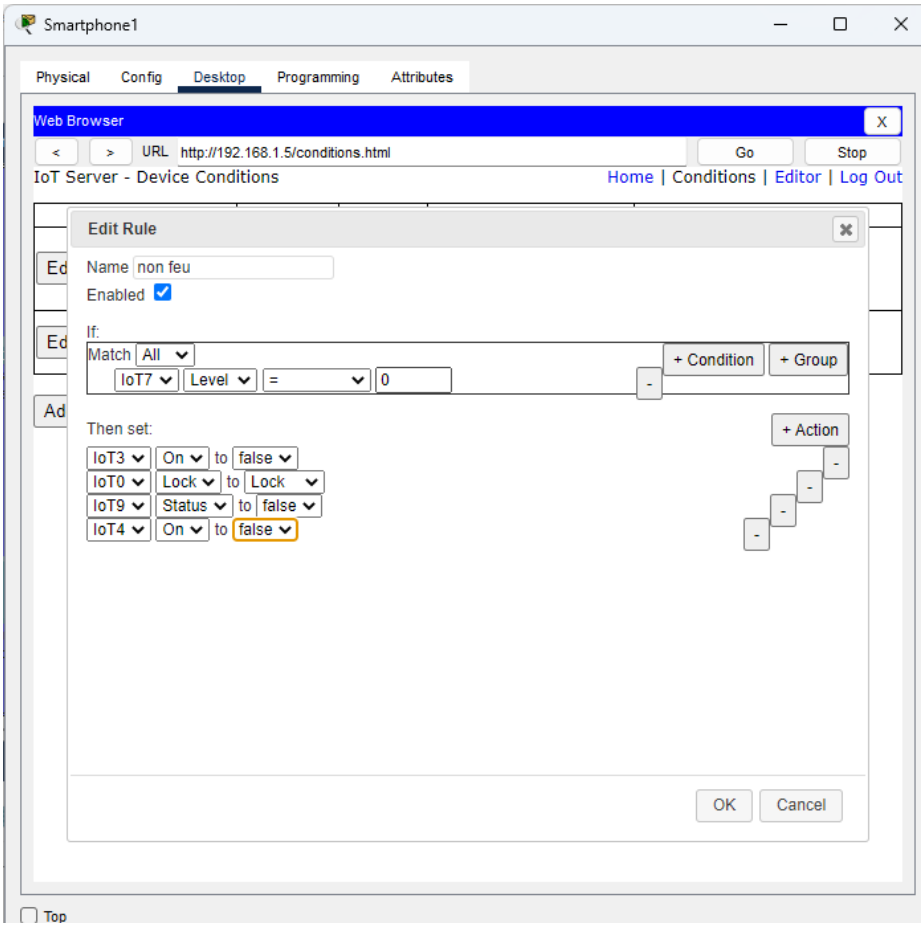
10.5 Finalisation des tests et ajustements




Smartphone0
Physical
Config
Desktop
Programming
Attributes
Web Browser
X
<
>
URL
http://192.168.1.5/home.html
Go
Stop
IoT Server - Devices
Home | Conditions | Editor | Log Out
IoT2 (PTT0810UXE7-)
Webcam
On
Image
Top


Smartphone0
Physical
Config
Desktop
Programming
Attributes
Web Browser
URL http://192.168.1.5/home.html
Go
Stop
IoT Server - Devices
Home | Conditions | Editor | Log Out
IoT2 (PTT0810UXE7-)
Webcam
On
Image
Top
Root
12:24:00
Webcam
IoT2
Window
IoT3
SMARTPHONE-PT
Smartphone1
Door
IoT0
Light
IoT1
Realtime
Simulation
Type
Color
Time(sec)
Periodic
Num
Edit
Rechercher
FRA
US
09:48
11/05/2025


Smartphone0
Physical
Config
Desktop
Programming
Attributes
Web Browser
X
<
>
URL
http://192.168.1.5/conditions.html
Go
Stop
IoT Server - Device Conditions
Home | Conditions | Editor | Log Out
Add Rule
Name
detection
Enabled
If:
Match
All
IoT5
On
is
true
+ Condition
+ Group
-
Then set:
+ Action
IoT2
On
to
true
IoT6
On
to
true
-
-
OK
Cancel



Conclusion

Ce rapport documente l'ensemble du **processus de configuration d'un réseau IoT** dans **Cisco Packet Tracer**, illustrant la mise en place des **serveurs DHCP, des routeurs OSPF, des points d'accès Wi-Fi et des appareils IoT**. Il met en avant la nécessité de sécuriser les **connexions IoT** et d'optimiser la **gestion des équipements** pour garantir un **réseau performant et résilient**.