Continuous Assessment-II

Dissertation submitted in fulfilment of the requirements for the Degree of

BACHELOR OF TECHNOLOGY

in

COMPUTER SCIENCE AND ENGINEERING

– DATA SCIENCE WITH MACHINE LEARNING

By

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1. Introduction

CSE Solutions, a mid-sized enterprise, requires a network infrastructure for its 5-floor office building. This report details the network design, addressing the need for efficient communication and scalability. The design incorporates a mix of star and bus topologies, a VLSM-based IP addressing scheme, and dynamic routing to ensure seamless inter-floor connectivity.

2. Topology Selection

The network design employs a hybrid topology:

- **Floors 1-3:** Star topology. Each floor has a dedicated switch, and all computers on that floor connect to that switch. This provides high performance and fault tolerance.
- **Floors 4-5:** Bus topology. The switches on these floors are connected in a bus configuration.
-

3. IP Addressing Scheme and Subnet Allocation

The network uses public IP addresses. VLSM is used for efficient address allocation.

- **Floors 1-3:** Class B addressing (172.16.0.0/16)
- **Floors 4-5:** Class A addressing (10.0.0.0/8)
-

Subnet Allocation Table

Floor	Subnet Address	Subnet Mask	IP Address Range	Broadcast Address	Server(s)
Floor 1	172.16.0.0 /28	255.255.255.240	172.16.0.1 - 172.16.0.14	172.16.0.15	HTTP
Floor	172.16.0.16	255.255.255.240	172.16.0.17	172.16.0.31	DNS

2	/28		- 172.16.0.30		
Floor 3	172.16.0.32 /28	255.255.255.240	172.16.0.33 - 172.16.0.46	172.16.0.47	FTP
Floor 4	10.0.0.0 /28	255.255.255.240	10.0.0.1 - 10.0.0.14	10.0.0.15	None
Floor 5	10.0.0.16 /28	255.255.255.240	10.0.0.17 - 10.0.0.30	10.0.0.31	DHCP, Email

4.Router Interface IP Addresses and Subnet Masks

Router	Interface To	IP Address	Subnet Mask
Router 1	**Floor 1**	**172.16.0.1/17**	**255.255.128.0**
Router 1	**Router 2**	**192.168.1.1/30**	**255.255.255.252**
Router 2	**Floor 2**	**172.16.128.1/23**	**255.255.254.0**
Router 2	**Router 1**	**192.168.1.2/30**	**255.255.255.252**
Router 2	**Router 3**	**192.168.1.5/30**	**255.255.255.252**
Router 3	**Floor 3**	**172.16.130.1/17**	**255.255.128.0**
Router 3	**Router 2**	**192.168.1.6/30**	**255.255.255.252**
Router 3	**Router 4**	**192.168.1.9/30**	**255.255.255.252**
Router 4	**Floor 4**	**10.0.0.1/26**	**255.255.255.192**
Router 4	**Router 3**	**192.168.1.10/30**	**255.255.255.252**

Router 4	**Router 5**	**192.168.1.13/30**	**255.255.255.252**
Router 5	**Floor 5**	**10.0.0.65/23**	**255.255.254.0**
Router 5	**Router 4**	**192.168.1.14/30**	**255.255.255.252**

4. Routing Strategy

Dynamic routing using RIP is implemented to facilitate communication between floors. Routers are configured as follows:

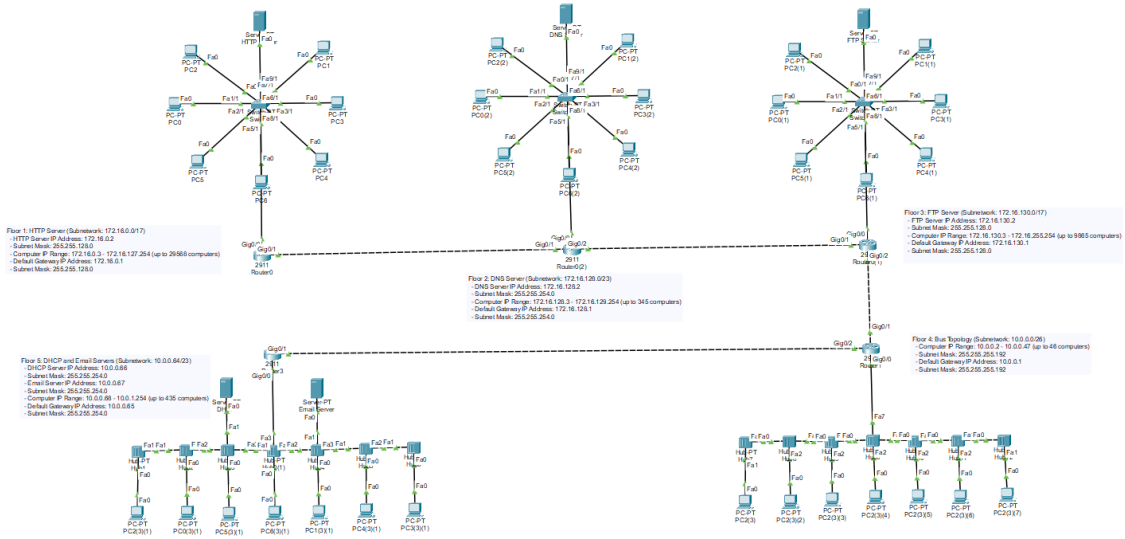
- **Routers:** 5 routers are used.
    - Router 1: Connects to the switch on Floor 1.
    - Router 2: Connects to the switch on Floor 2.
    - Router 3: Connects to the switch on Floor 3.
    - Router 4: Connects to the switch on Floors 4 and 5.
    - Router 5: Connects to Router 1, 2, 3, and 4.
- **Inter-Floor Connectivity:** Routers 1, 2, 3, and 4 connect to Router 5 in a star topology.
-

5. Innovations and Scalability

- **Hybrid Topology Optimization:** The combination of star and bus topologies optimizes both performance and cost. The star topology on Floors 1-3 provides high performance and fault tolerance for critical services. The bus topology on Floors 4-5 provides a cost-effective solution.
- **VLSM for Efficient Addressing:** VLSM ensures efficient use of the IP address space by allocating the minimum number of addresses required per floor.
- **Dynamic Routing:** RIP automates route propagation and adaptation to network changes, simplifying management and improving resilience.
- **Scalability:** The design can be scaled by adding more switches and routers as the company grows. The VLSM scheme allows

for easy expansion of the IP address allocation.

6. Deployment & Monitoring



Total Number of Networks:

- LAN Networks (One per floor): 5
- Point-to-Point Networks (Between routers): 4 (Router 1 to Router 5, Router 2 to Router 5, Router 3 to Router 5, Router 4 to Router 5)
- Total Networks: 9
-

Total Number of LANs:

- Each floor has 1 LAN.
- There are 5 floors.
- Total LANs: 5
-

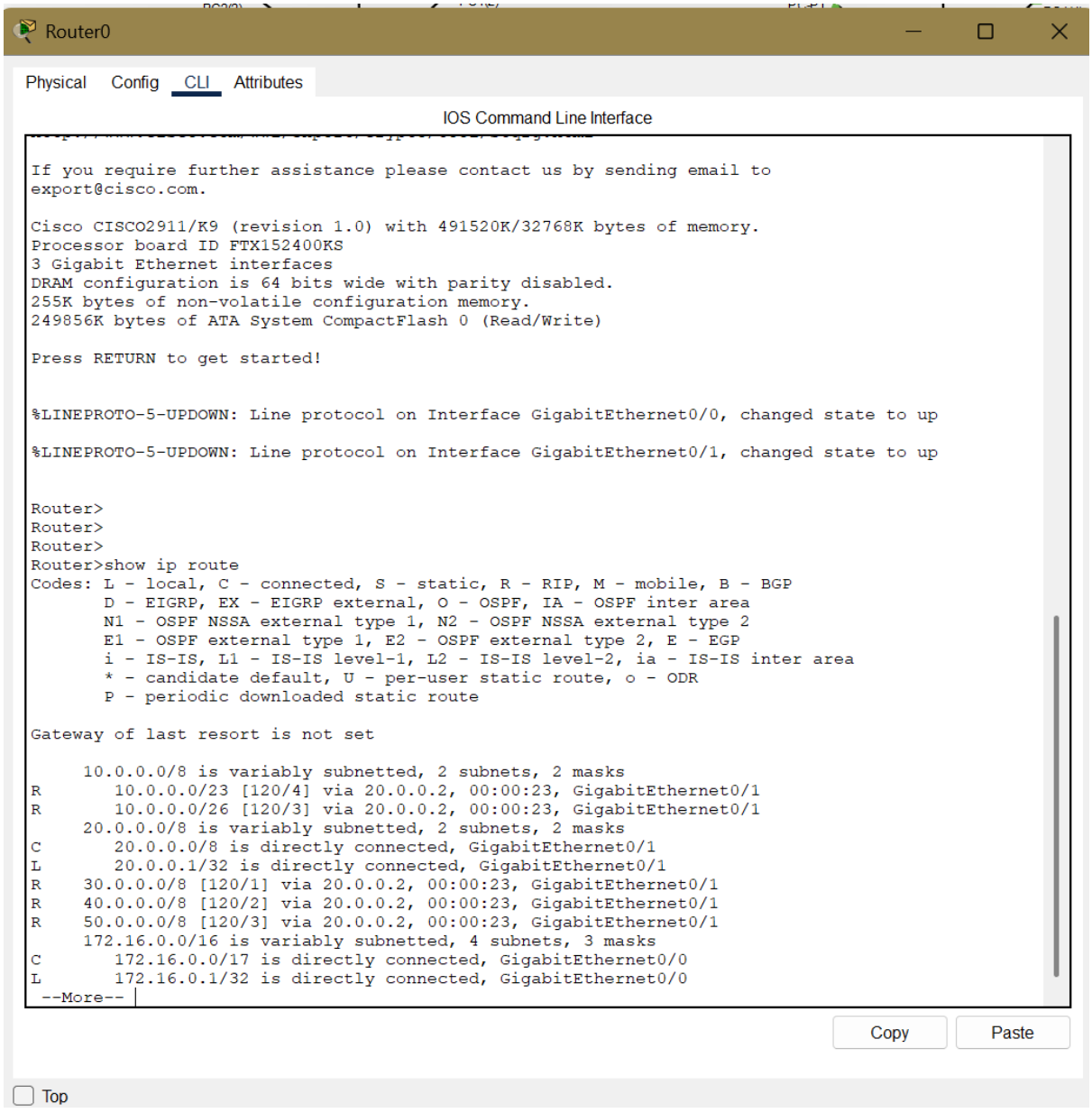
Total Number of Default Gateways:

Each LAN has a unique default gateway (router interface IP) to handle outbound traffic.

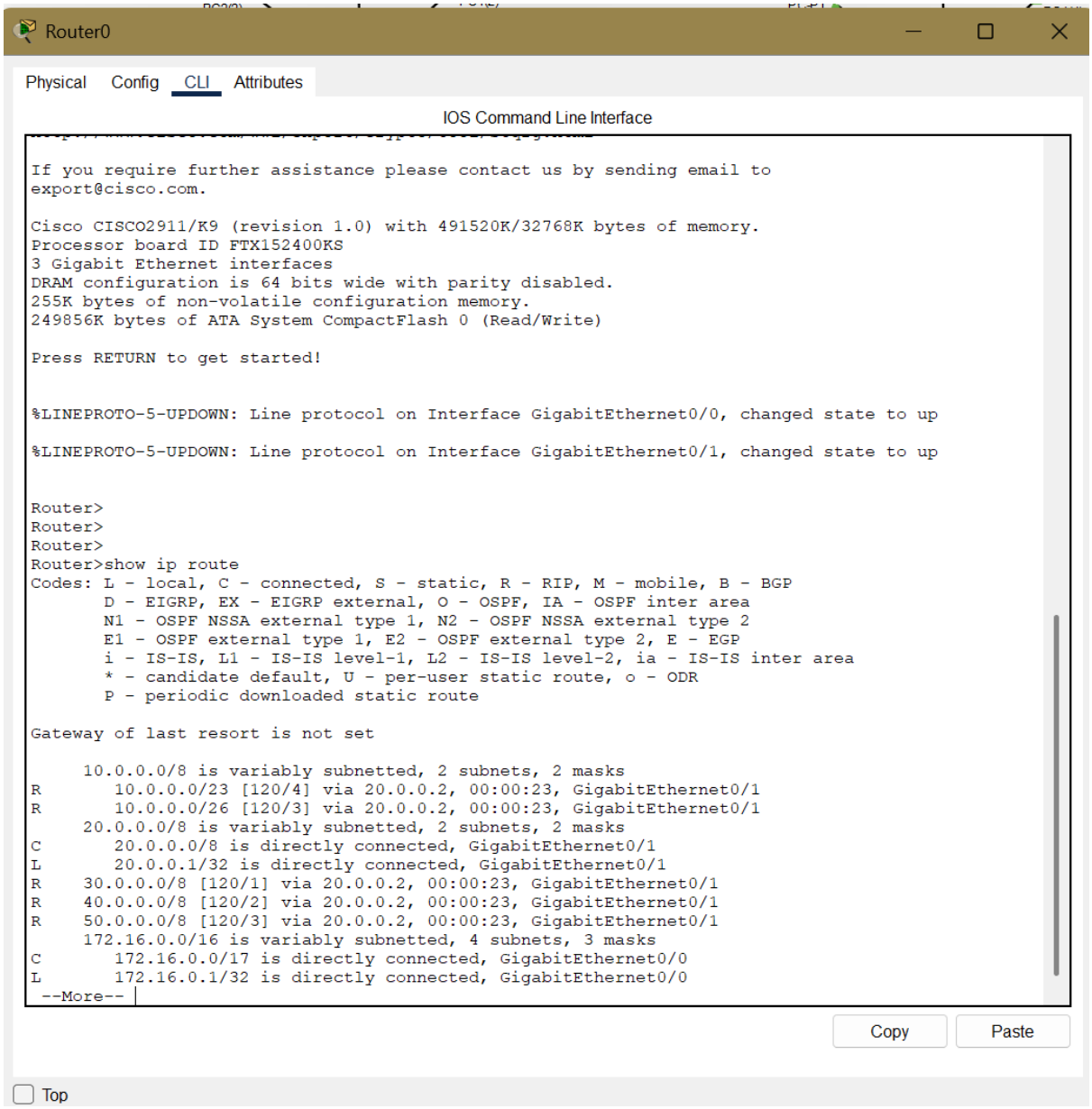
- 1 per floor = 5 default gateways

Routing tables

Router 1:



Router 2:


Router0
Physical
Config
CLI
Attributes
IOS Command Line Interface
If you require further assistance please contact us by sending email to
export@cisco.com.
Cisco CISCO2911/K9 (revision 1.0) with 491520K/32768K bytes of memory.
Processor board ID FTX152400KS
3 Gigabit Ethernet interfaces
DRAM configuration is 64 bits wide with parity disabled.
255K bytes of non-volatile configuration memory.
249856K bytes of ATA System CompactFlash 0 (Read/Write)
Press RETURN to get started!
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
Router>
Router>
Router>
Router>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
R 10.0.0.0/23 [120/4] via 20.0.0.2, 00:00:23, GigabitEthernet0/1
R 10.0.0.0/26 [120/3] via 20.0.0.2, 00:00:23, GigabitEthernet0/1
20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 20.0.0.0/8 is directly connected, GigabitEthernet0/1
L 20.0.0.1/32 is directly connected, GigabitEthernet0/1
R 30.0.0.0/8 [120/1] via 20.0.0.2, 00:00:23, GigabitEthernet0/1
R 40.0.0.0/8 [120/2] via 20.0.0.2, 00:00:23, GigabitEthernet0/1
R 50.0.0.0/8 [120/3] via 20.0.0.2, 00:00:23, GigabitEthernet0/1
172.16.0.0/16 is variably subnetted, 4 subnets, 3 masks
C 172.16.0.0/17 is directly connected, GigabitEthernet0/0
L 172.16.0.1/32 is directly connected, GigabitEthernet0/0
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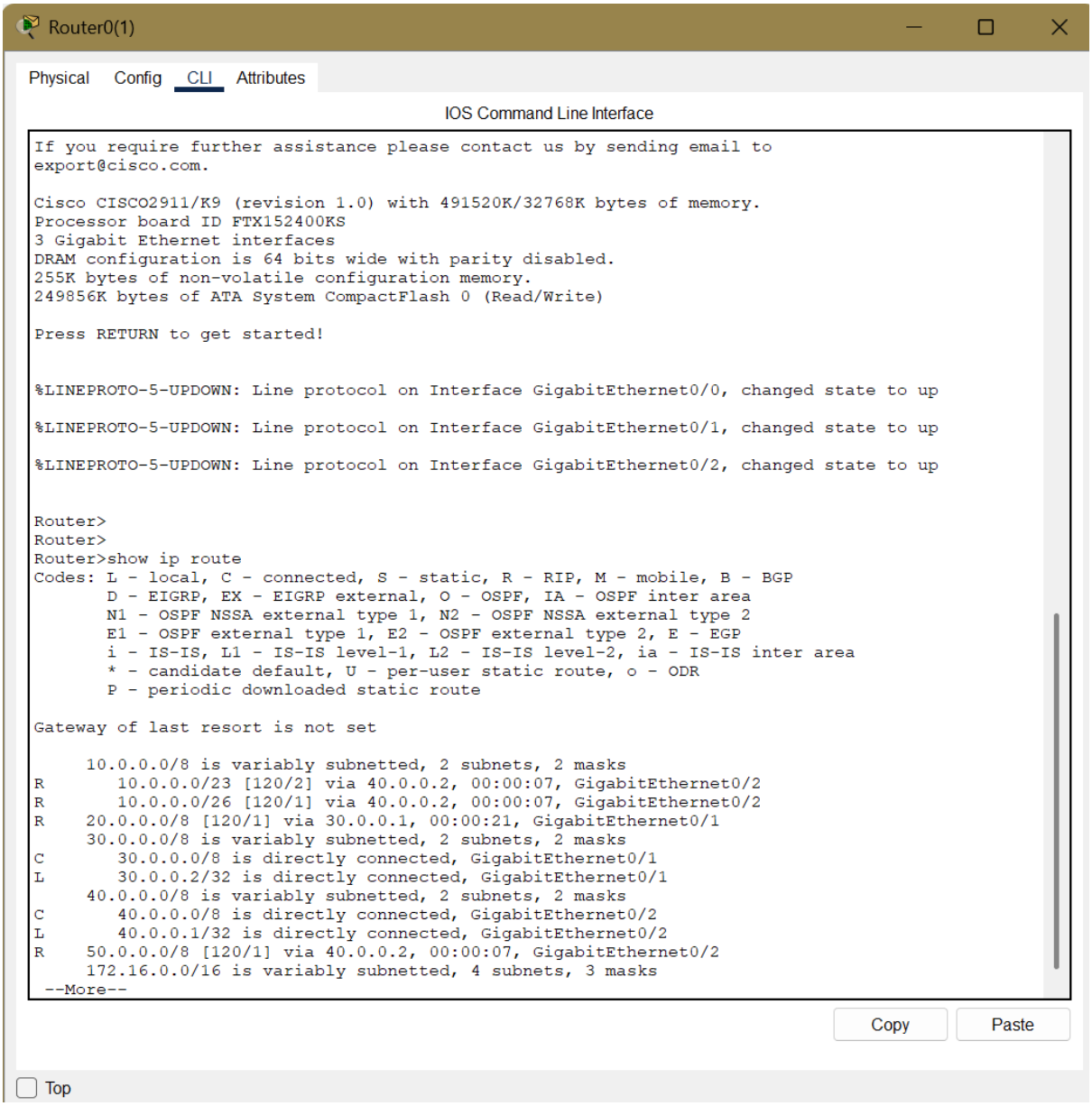
Router 3:


Router0(1)
Physical
Config
CLI
Attributes
IOS Command Line Interface
If you require further assistance please contact us by sending email to
export@cisco.com.
Cisco CISCO2911/K9 (revision 1.0) with 491520K/32768K bytes of memory.
Processor board ID FTX152400KS
3 Gigabit Ethernet interfaces
DRAM configuration is 64 bits wide with parity disabled.
255K bytes of non-volatile configuration memory.
249856K bytes of ATA System CompactFlash 0 (Read/Write)
Press RETURN to get started!
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to up
Router>
Router>
Router>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
R 10.0.0.0/23 [120/2] via 40.0.0.2, 00:00:07, GigabitEthernet0/2
R 10.0.0.0/26 [120/1] via 40.0.0.2, 00:00:07, GigabitEthernet0/2
R 20.0.0.0/8 [120/1] via 30.0.0.1, 00:00:21, GigabitEthernet0/1
30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 30.0.0.0/8 is directly connected, GigabitEthernet0/1
L 30.0.0.2/32 is directly connected, GigabitEthernet0/1
40.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 40.0.0.0/8 is directly connected, GigabitEthernet0/2
L 40.0.0.1/32 is directly connected, GigabitEthernet0/2
R 50.0.0.0/8 [120/1] via 40.0.0.2, 00:00:07, GigabitEthernet0/2
172.16.0.0/16 is variably subnetted, 4 subnets, 3 masks
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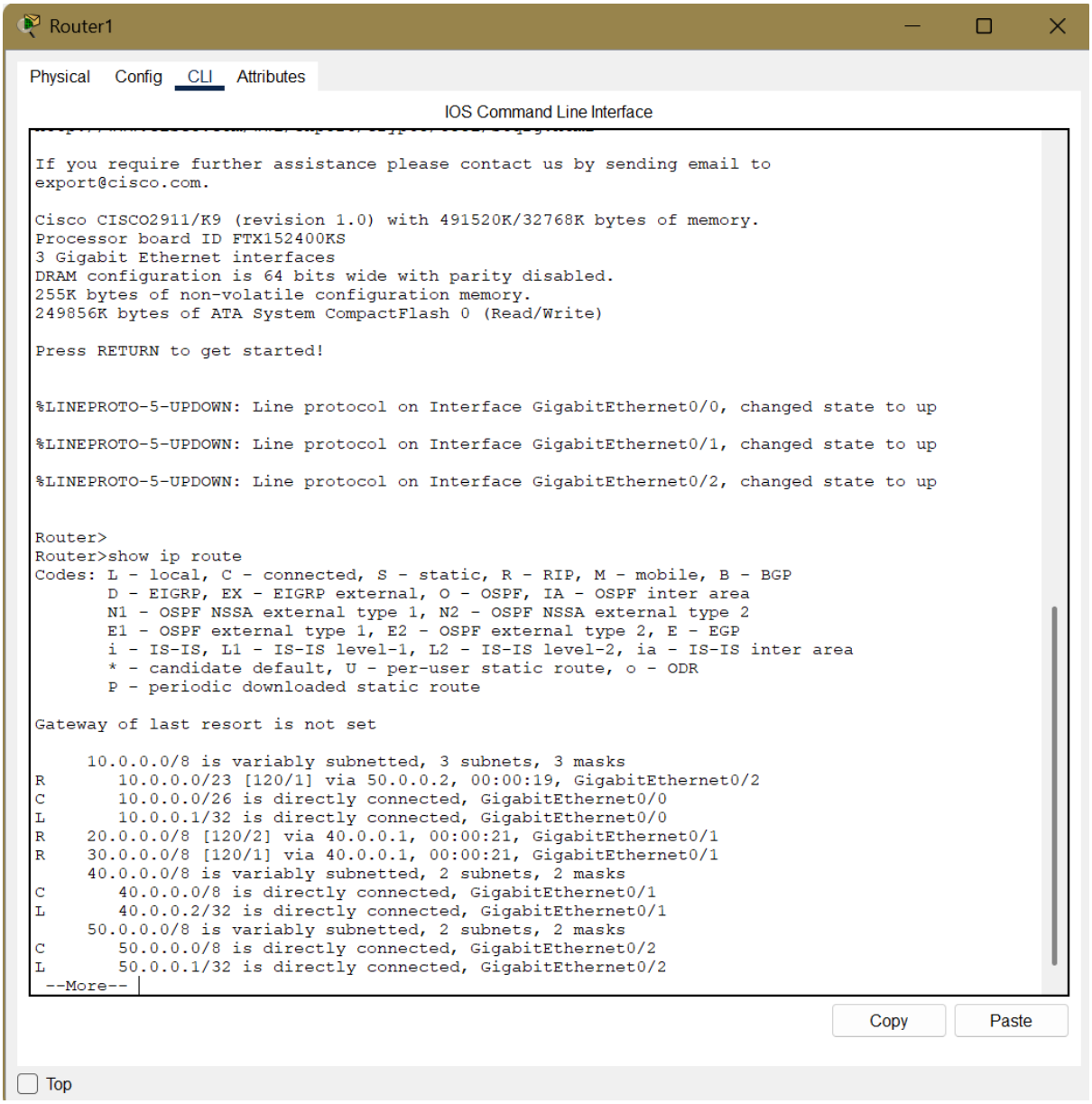
Router 4:


Router1
Physical
Config
CLI
Attributes
IOS Command Line Interface
If you require further assistance please contact us by sending email to
export@cisco.com.
Cisco CISCO2911/K9 (revision 1.0) with 491520K/32768K bytes of memory.
Processor board ID FTX152400KS
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DRAM configuration is 64 bits wide with parity disabled.
255K bytes of non-volatile configuration memory.
249856K bytes of ATA System CompactFlash 0 (Read/Write)
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%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to up
Router>
Router>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
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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, 3 subnets, 3 masks
R 10.0.0.0/23 [120/1] via 50.0.0.2, 00:00:19, GigabitEthernet0/2
C 10.0.0.0/26 is directly connected, GigabitEthernet0/0
L 10.0.0.1/32 is directly connected, GigabitEthernet0/0
R 20.0.0.0/8 [120/2] via 40.0.0.1, 00:00:21, GigabitEthernet0/1
R 30.0.0.0/8 [120/1] via 40.0.0.1, 00:00:21, GigabitEthernet0/1
40.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 40.0.0.0/8 is directly connected, GigabitEthernet0/1
L 40.0.0.2/32 is directly connected, GigabitEthernet0/1
50.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 50.0.0.0/8 is directly connected, GigabitEthernet0/2
L 50.0.0.1/32 is directly connected, GigabitEthernet0/2
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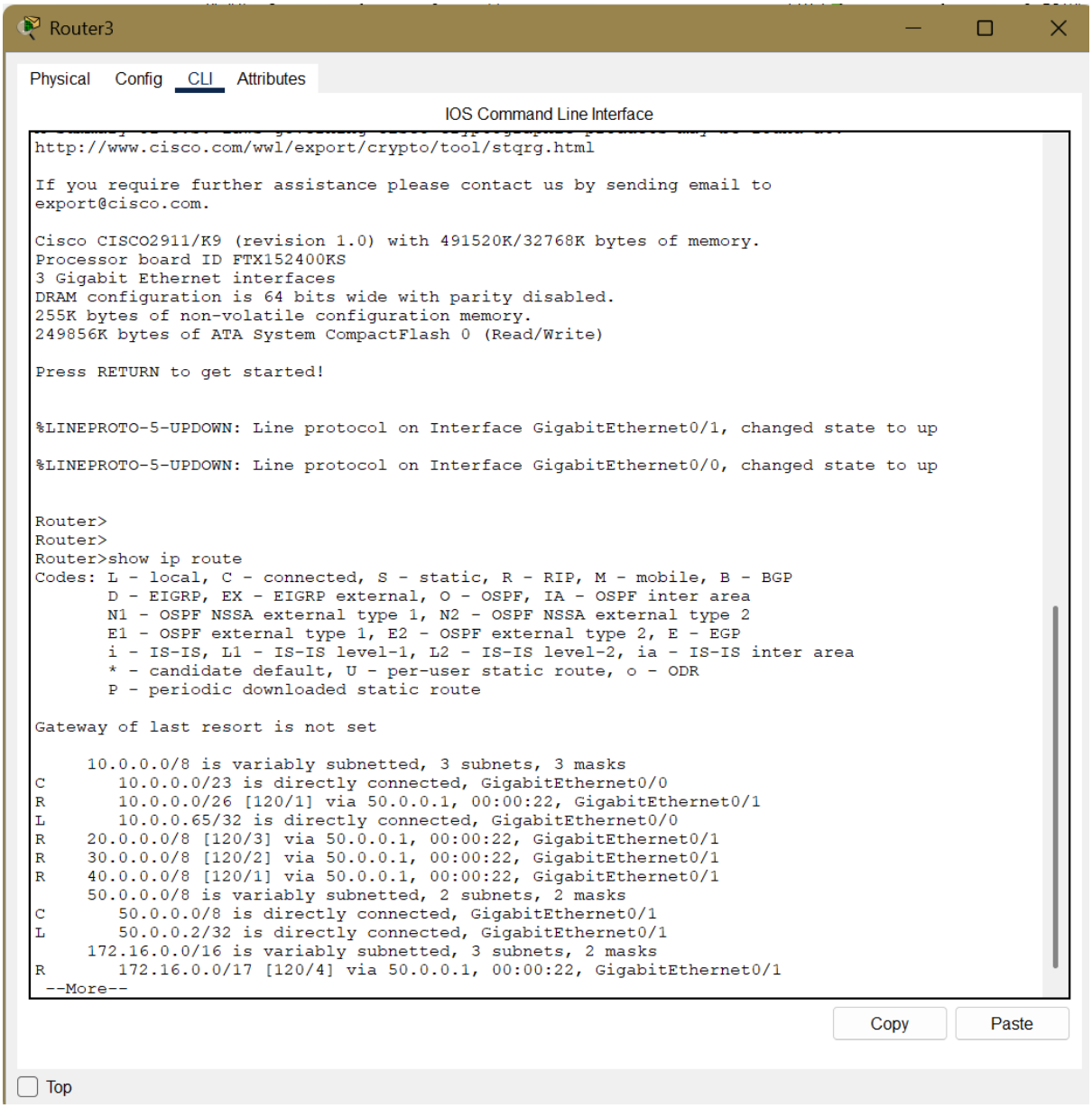
Router 5:


Router3
Physical
Config
CLI
Attributes
IOS Command Line Interface
http://www.cisco.com/wwl/export/crypto/tool/stqrg.html
If you require further assistance please contact us by sending email to
export@cisco.com.
Cisco CISCO2911/K9 (revision 1.0) with 491520K/32768K bytes of memory.
Processor board ID FTX152400KS
3 Gigabit Ethernet interfaces
DRAM configuration is 64 bits wide with parity disabled.
255K bytes of non-volatile configuration memory.
249856K bytes of ATA System CompactFlash 0 (Read/Write)
Press RETURN to get started!
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
Router>
Router>
Router>show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
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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, 3 subnets, 3 masks
C 10.0.0.0/23 is directly connected, GigabitEthernet0/0
R 10.0.0.0/26 [120/1] via 50.0.0.1, 00:00:22, GigabitEthernet0/1
L 10.0.0.65/32 is directly connected, GigabitEthernet0/0
R 20.0.0.0/8 [120/3] via 50.0.0.1, 00:00:22, GigabitEthernet0/1
R 30.0.0.0/8 [120/2] via 50.0.0.1, 00:00:22, GigabitEthernet0/1
R 40.0.0.0/8 [120/1] via 50.0.0.1, 00:00:22, GigabitEthernet0/1
50.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 50.0.0.0/8 is directly connected, GigabitEthernet0/1
L 50.0.0.2/32 is directly connected, GigabitEthernet0/1
172.16.0.0/16 is variably subnetted, 3 subnets, 2 masks
R 172.16.0.0/17 [120/4] via 50.0.0.1, 00:00:22, GigabitEthernet0/1
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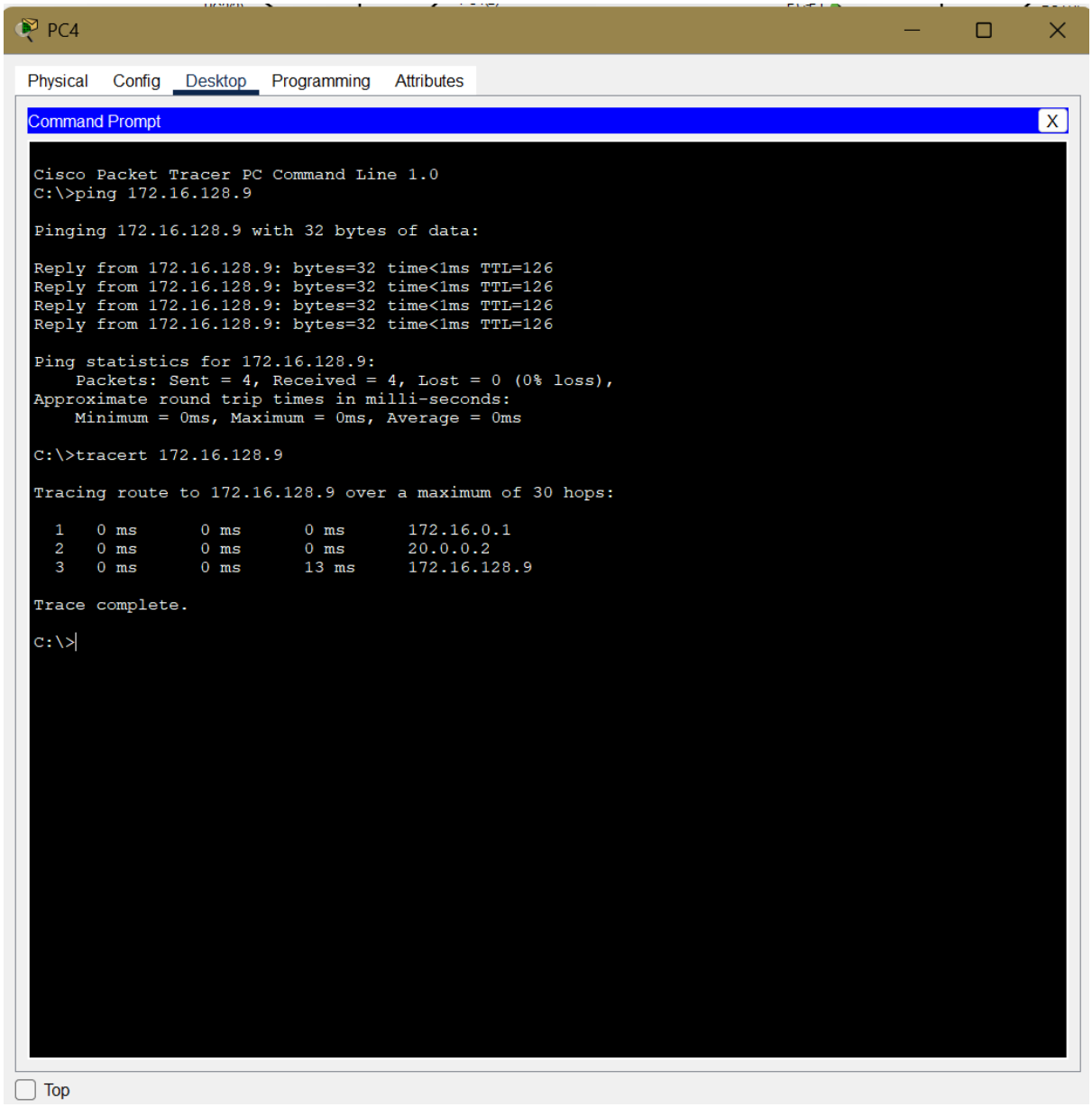
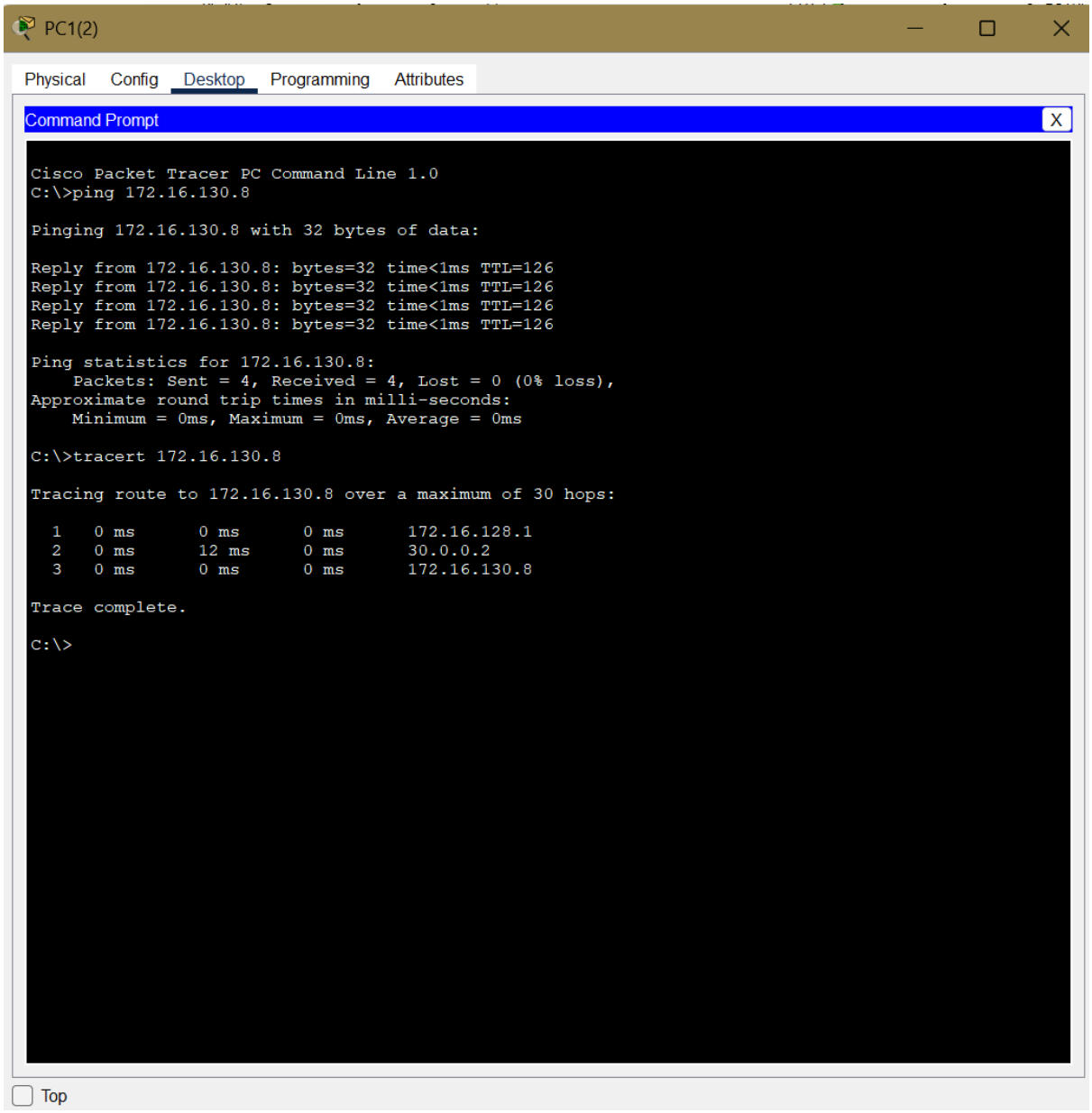
Ping and TraceRT

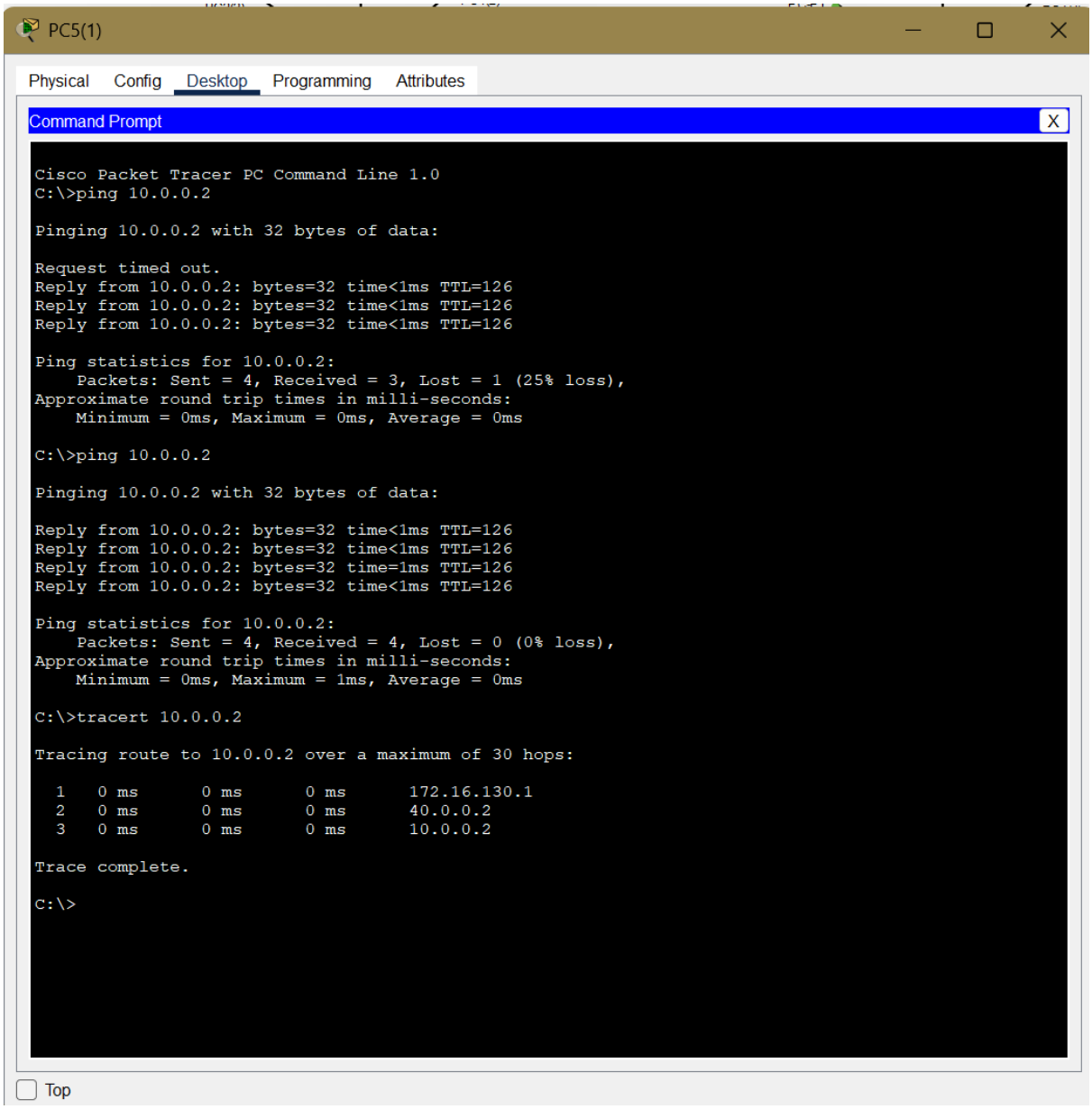
Ping and tracert from floor 1 to floor 2



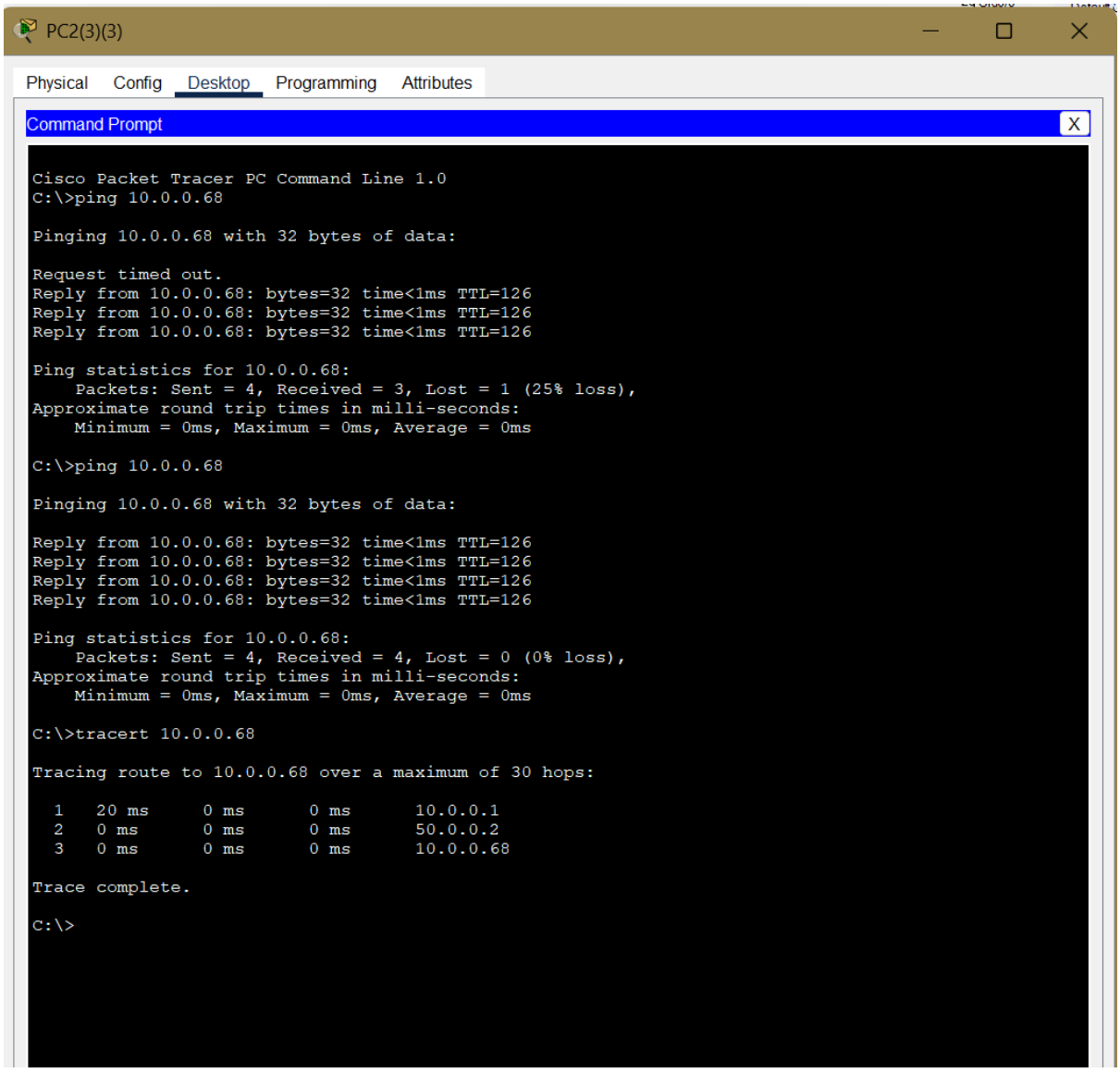
Ping and tracert from floor 2 to floor 3



Ping and tracert from floor 3 to floor 4

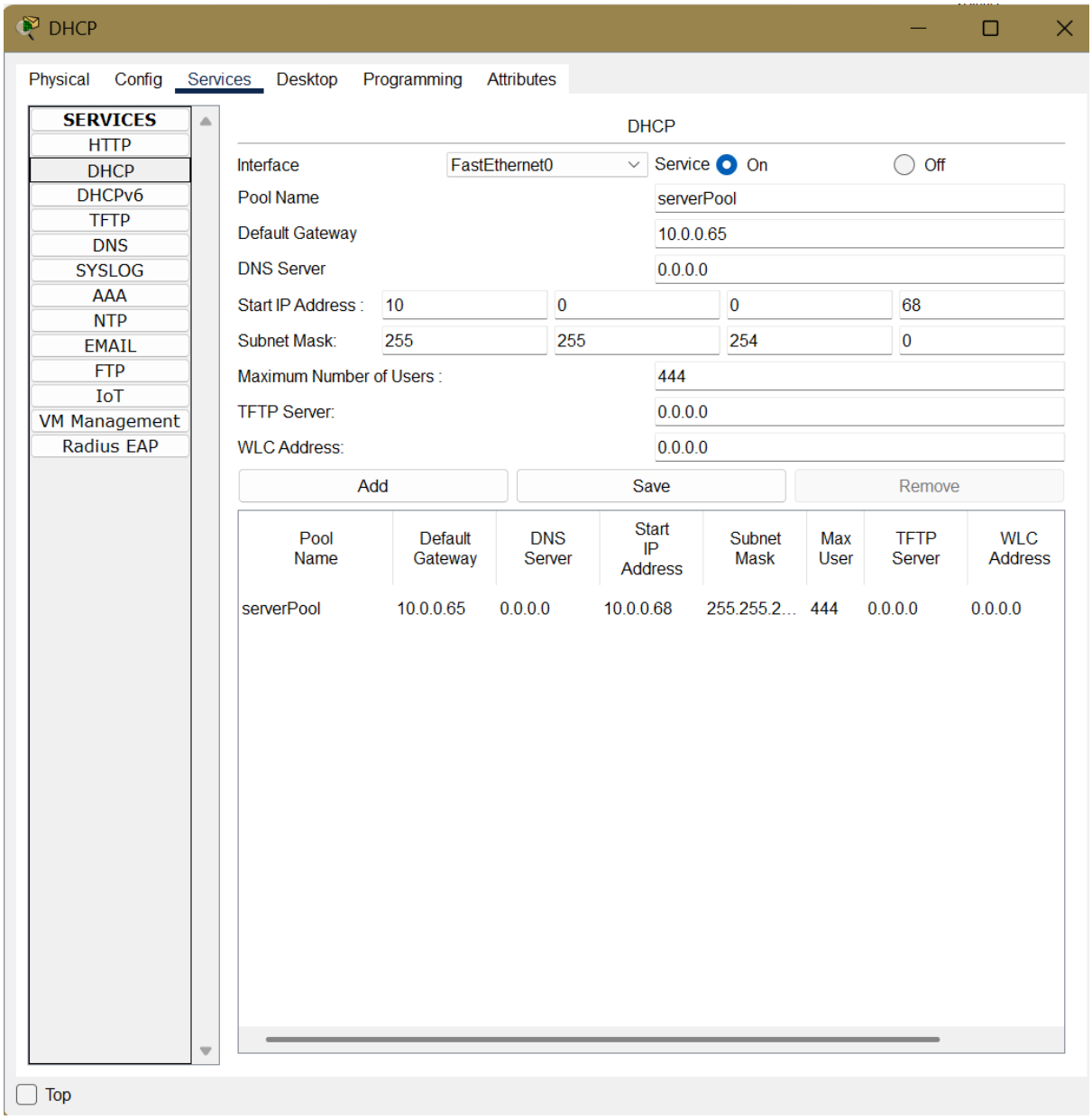


Ping and tracert from floor 4 to floor 5

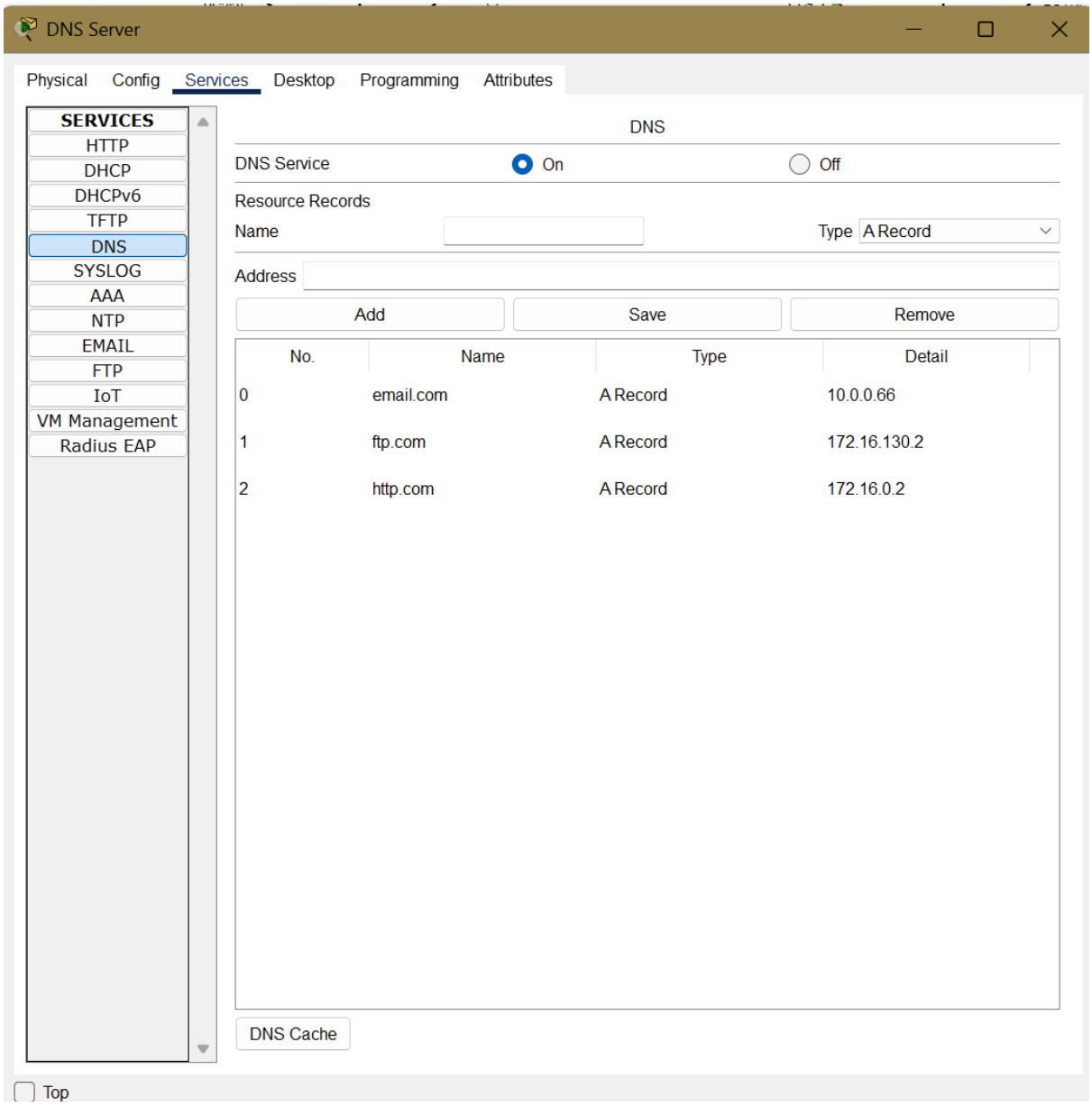


Servers:

DHCP



DNS



7. **GitHub Repository**:
   The full project (including configs, diagrams, and documentation) is uploaded to GitHub for tracking and collaboration. https://github.com/Aare007/CSE-307_CA_2.git

8. Conclusion:

This structured network design ensures efficient, scalable, and faulttolerant communication within Media Network Solutions. The mix of topologies, optimized IP addressing, and static routing provides a costeffective yet reliable solution for the enterprise.