

2119714

by Iwan Griffiths

Submission date: 16-May-2024 04:00PM (UTC+0100)

Submission ID: 233982169

File name: 17369_Iwan_Griffiths_2119714_183328_1978410534.pdf (3.79M)

Word count: 5681

Character count: 37306

Course: HND Electrical and Electronic Engineering

Module: SGEE5007

Assignment: NETWORKING SYSTEMS FOR ENGINEERS

Name: Iwan Griffiths

University number: 2119714

Date submitted: 16/05/2024

Contents

Table of figures	4
Element 1	6
Task 1	6
Research.....	6
Task 2	9
Task 3	9
Static Routing configuration	9
Task 4 - Configure the 3 routers for dynamic routing using RIP	16
Task 5	20
Dynamic addressing across networks using DHCP	20
Test DHCP without Helper Address configuration.....	21
Configure DHCP helper address for Router 1 and Router 2 for cross network comms.....	22
Test dynamic addressing with helper address configured in Router 1 and Router 2.....	23
Address exclusion configuration using Router1 as control device	24
Test for excluded addresses.....	24
The final test to show the running configuration of the routers.....	25
Evaluation	25
Element 2	26
Introduction	26
Network design using CIDR/28 subnetting.....	26
Networks subnetting CIDR/28.....	26
RIP Routing.....	29
CIDR/27 and CIDR/30.....	32
VLANs London Router/Switch for CIDR/27 sub network.....	35
Network utilizing vlan	38
Ping tests to prove vlans circuits.....	39
Evaluation	39
Element 3	40
VLAN implemented on a switch.....	40
Testing the dynamics of the PLC web server over the VLAN Network.	44
Evaluation	45
Works Cited.....	46
Appendix.....	47
Router 0 test	47
Router 1 Test.....	48

Router 2 test run.....	49
London vlan switch running – config	50
London router running-config.....	51
Paris router running-config	52
Element 3 Vlan config	53

[Good detailed table of contents](#)

Table of figures

Figure 1 - OSI vs TCP/IP (Geeks for Geeks, 2023).....	6
Figure 2 - Network	10
Figure 3 - Router 0 config.....	10
Figure 4 - Router 0 CLI.....	11
Figure 5 - Router 1 config.....	12
Figure 6 - router 1 CLI	13
Figure 7 - Router 2 config.....	14
Figure 8 - Router 2 CLI.....	15
Figure 9 - Successful configuration test	15
Figure 10 - router 0 RIP	16
Figure 11 - router 1 RIP	17
Figure 12 - Router 2 RIP	18
Figure 13 - router 0 table	18
Figure 14 - router 1 table	19
Figure 15 - router 2 table	19
Figure 16 - successful router rip test	19
Figure 17 - Router 1 DHCP Config	20
Figure 18 - PC0 DHCP config	21
Figure 19 - Figure 19 – PC1 DHCP config w/o helper address	21
Figure 20 - Figure 19 – PC0 DHCP config w/o helper address	21
Figure 21 - Router 1 with DHCP helper address configured	22
Figure 22 - Router 2 with DHCP helper address configured	23
Figure 23 - PC1 DHCP With helper address.....	23
Figure 24 - PC2 DHCP With helper address.....	24
Figure 25 - Router 0 with address exclusion config	24
Figure 26 - PC0 successful test for excluded addresses.....	24
Figure 27 - PC1 successful test for excluded addresses.....	25
Figure 28 – PC2 successful test for excluded addresses.....	25
Figure 29 - Network design using CIDR/28 subnetting	26
Figure 30 - RIP Routing config for Rome	29
Figure 31 - Routing table for rome	29
Figure 32 - RIP Routing config for London	30
Figure 33 - Routing table for London	30
Figure 34 - RIP Routing config for Paris.....	30
Figure 35 - Routing table for Paris	31
Figure 36 - Testing table for RIP routing (successful)	31
Figure 37 - Rome CIDR/27 and CIDR/30 CLI.....	33
Figure 38 – London CIDR/27 and CIDR/30 CLI	33
Figure 39 – Paris CIDR/27 and CIDR/30 CLI.....	33
Figure 40 - Routing Table for Router Rome	34
Figure 41 - Routing Table for Router London	34
Figure 42 - Routing Table for Router Paris.....	35
Figure 43 - Successful RIP routing test for CIDR/27 and CIDR/30.....	35
Figure 44 - London route	36
Figure 45 - London switch vlan config.....	37
Figure 46 - Network with vlan.....	38

Figure 47 - IP route as shown form Paris router.....	38
Figure 48 - Test from PC1 Paris host to London vlan 2 PC1 London.....	39
Figure 49 - Test from PC1 Rome to PC2 London.....	39
Figure 50 - Network Topology	40
Figure 51 - Set - up for physical test	40
Figure 52 - Ping test on physical system	41
Figure 53 - Ping test on physical system	41
Figure 54 - PLC webserver Activation	41
Figure 55 - File extensions added for the program.....	42
Figure 56 - Default tags for motor	42
Figure 57 - webdata tags.....	42
Figure 58 - webdata tags.....	42
Figure 59 - Motor PWM function.....	43
Figure 60 - main function block	43
Figure 61 -	44
Figure 62 - VLAN set-up	44
Figure 63 - 20%PWM speed.....	44
Figure 64 - Watch Table	45
Figure 65 - Motor running at 20%.....	45

Good extensive table of figures

Element 1

Task 1

Research

OSI 7 layer and 4 layer models with reference to the network design.

Two reference models often used in network design are the TCP/IP (Transmission Control Protocol/Internet Protocol) model and the OSI (Open Systems Interconnection) model.

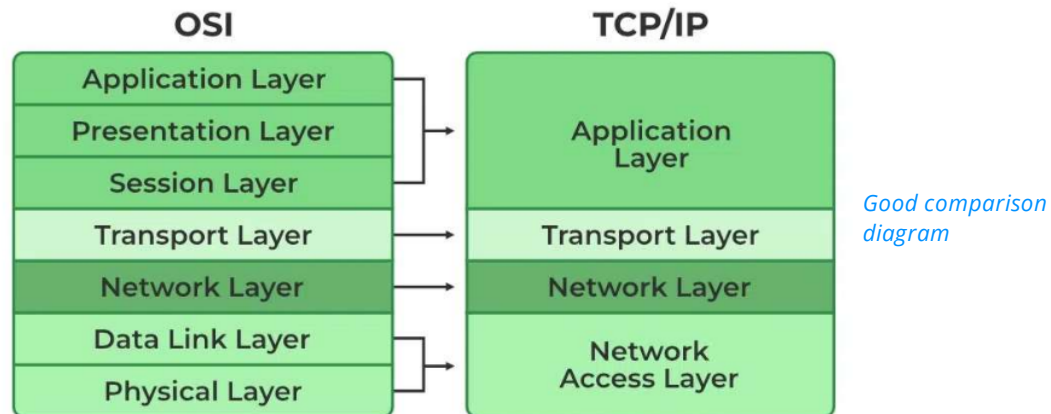


Figure 1 - OSI vs TCP/IP (Geeks for Geeks, 2023) [Correct citation](#)

The OSI model is a conceptual framework that divides the operations of a computer or communications system into seven abstraction levels. Every layer has a distinct function and offers a common interface for system-to-system communication. The OSI model's seven levels are as follows:

Layer 1 is the physical layer, the physical transfer of data across the network medium is handled by this layer. It contains physical interface, electrical signal, cable, and connection standards.

Layer 2 is the data link layer. Within a local network segment, error detection and correction as well as node-to-node communication are handled within the layer. It covers protocols including MAC (Media Access Control) addresses, Ethernet, and Wi-Fi.

Layer 3 is the network layer, it enables end-to-end communication between several subnets or network segments. It manages packet forwarding, addressing, and routing.

Layer 4 is the transport layer, the layer ensures that data is reliably transmitted between hosts. Its functions include segmentation, reassembly, flow control, and error recovery.

Layer 5 is the session layer, the layer sets up, manages, and terminates communication sessions between applications. It is responsible for session establishment, maintenance, and synchronisation.

Layer 6 is the presentation layer, the layer handles data formatting, encryption, and compression to ensure efficient transmission. It converts data to a format that the application layer understands.

Finally layer 7 is the application layer, the layer delivers network services directly to end users or applications. It comprises protocols for email, file transfer, web browsing, and other application-level operations. (Geeks For Geeks, 2024)

OSI 7 layer model is identified

The TCP/IP paradigm is a simple, four-layer conceptual model that is widely used in modern networking, particularly on the Internet. It is built on protocols created for the ARPANET project and serves as the foundation for today's Internet. The TCP/IP paradigm consists of four layers:

Layer 1 is the Network access layer or link layer, as with the first two layers of the OSI architecture, the link layer handles physical and data-link layer functions. It includes both the physical and data-link levels from the OSI paradigm. - Encapsulation (What is it and how does it work).

Layer 2 is the internet layer, the layer it enables end-to-end communication between several subnets or network segments. It offers routing and addressing capabilities for packet switching across various networks.

Layer 3 is the transport layer, the layer ensures that data is reliably transmitted between hosts. It assures consistent data transfer between hosts and offers end-to-end communication capabilities.

Finally layer 4 is the application layer, The application layer incorporates features from the OSI model's session, presentation, and application levels. It delivers application-level services and interfaces to end-user applications. (Geeks for Geeks, 2023)

Good points included

Broadcasting

Broadcasting is a computer network communication process that allows one sender to communicate data or messages to several recipients at the same time. In broadcasting, the sender (or source) sends a single message, which is received and processed by all devices in the network segment or broadcast domain. This communication process is widely used in local area networks (LANs) and is required for a variety of network activities and services.

Unicast is the communication between a single sender and a single recipient.

Multicast refers to communication between a single sender and multiple selected recipients.

Broadcast allows for the communication from one sender to all devices in a network segment.

(Ionos, 2023)

Good points included, but the problem with broadcasting is not covered.

Port allocation (ports are software and are allocated to protocols. Explain this).

In networking, a port is a communication endpoint that allows several applications and services to share the same network interface. Each network communication between devices includes both IP addresses and port numbers, which work together to direct data to the appropriate application or service on the target device.

Port numbers are 16-bit unsigned integers that range from 0 to 65535. They are separated into three ranges. Well-known ports (0–1023): Reserved for system services and regularly used protocols. For example, HTTP uses port 80, HTTPS uses port 443, while FTP uses port 21. Registered ports (1024–49151): The Internet Assigned Numbers Authority (IANA) assigns certain applications or services upon request. They are widely utilised in client-server applications and protocols. Dynamic or private ports (49152–65535): Client apps can use these ports to connect temporarily. When an application opens a network connection session, the operating system dynamically allocates these resources.

Software ports are identified and explained

When an application or service attempts to establish a network connection, it provide a source and destination port. For outgoing connections, the operating system usually chooses an available source port from the dynamic port range (49152–65535). The protocol or service being contacted determines the destination port (for example, HTTP uses port 80). For inbound connections, the server application or service specifies the destination port, while the client's operating system selects the source port at random from the dynamic port range. (Harber, 2021) *Good example*

Task 2

The network comprises three routers, three switch-boards, and three computers: two stationary PCs and one laptop. The routers are connected using serial lines, and each router is connected to a computer using a switch board via LAN.

Class c	
Net address	192.168.2.0
gateway Address	192.168.2.254
initial Device Address	192.168.2.1

Table 1- Class C LAN Network

Class B	
Net address	170.22.0.0
gateway Address	170.22.0.254
initial Device Address	170.22.0.1

Table 2 - Class B LAN Network

Class A	
Net address	102.0.0.0
gateway Address	102.0.0.254
initial Device Address	102.0.0.1

Table 3 - Class B LAN Network

Task 3

Static Routing configuration

Routers	
R0	10.0.0.1
R1	10.0.0.2
	11.0.0.1
R2	11.0.0.2

Table 4 - Routers for LAN Network

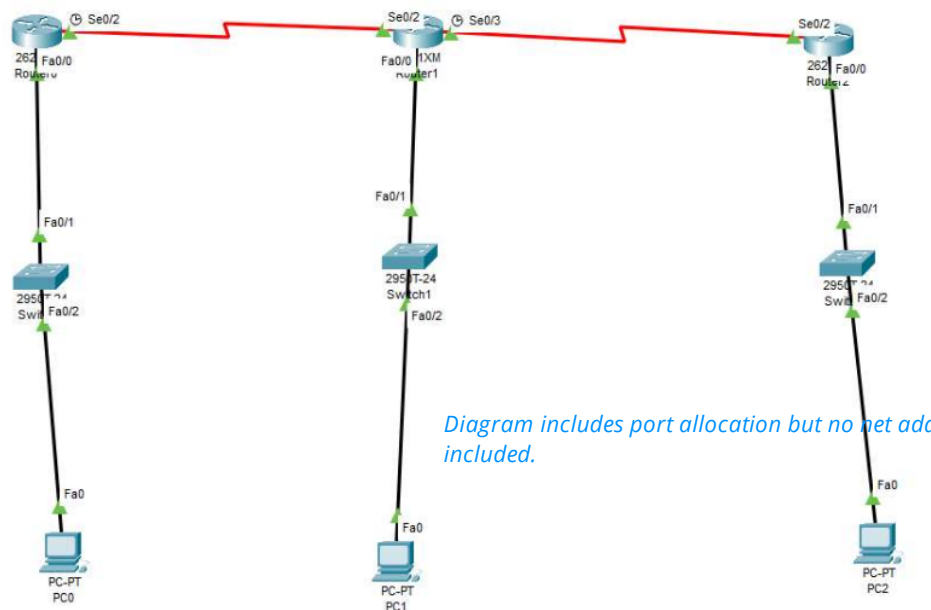


Figure 2 - Network

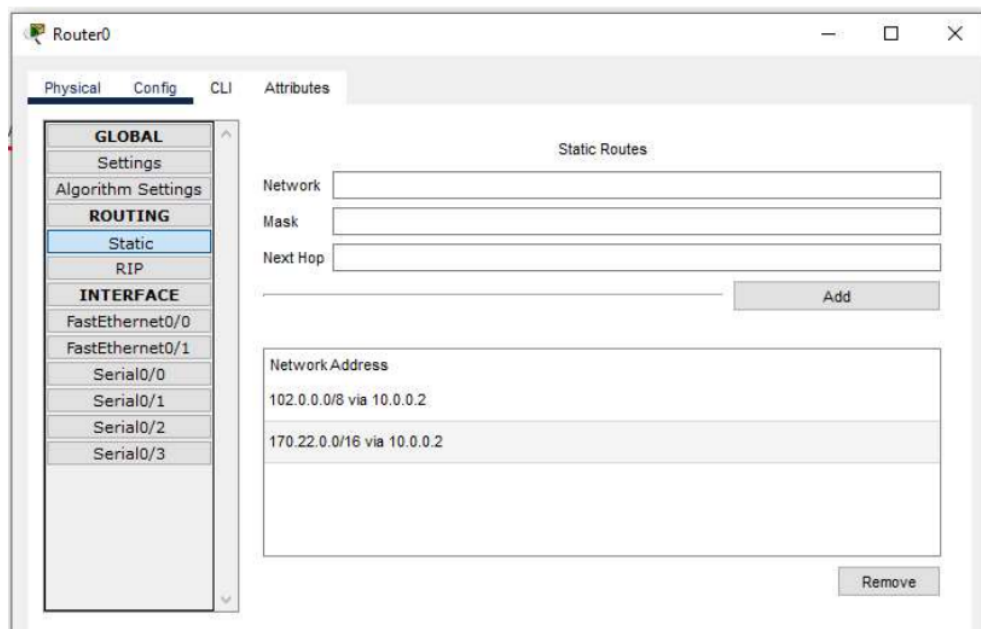
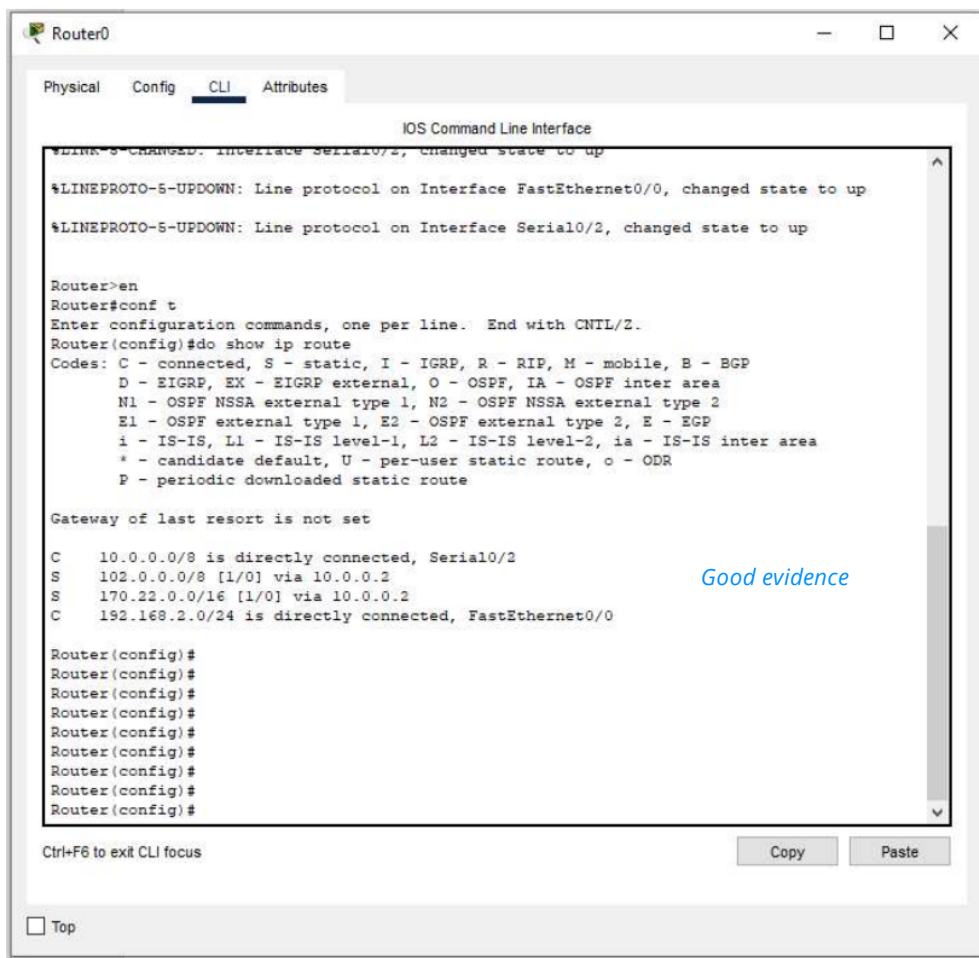


Figure 3 - Router 0 config



Good evidence

Figure 4 - Router 0 CLI

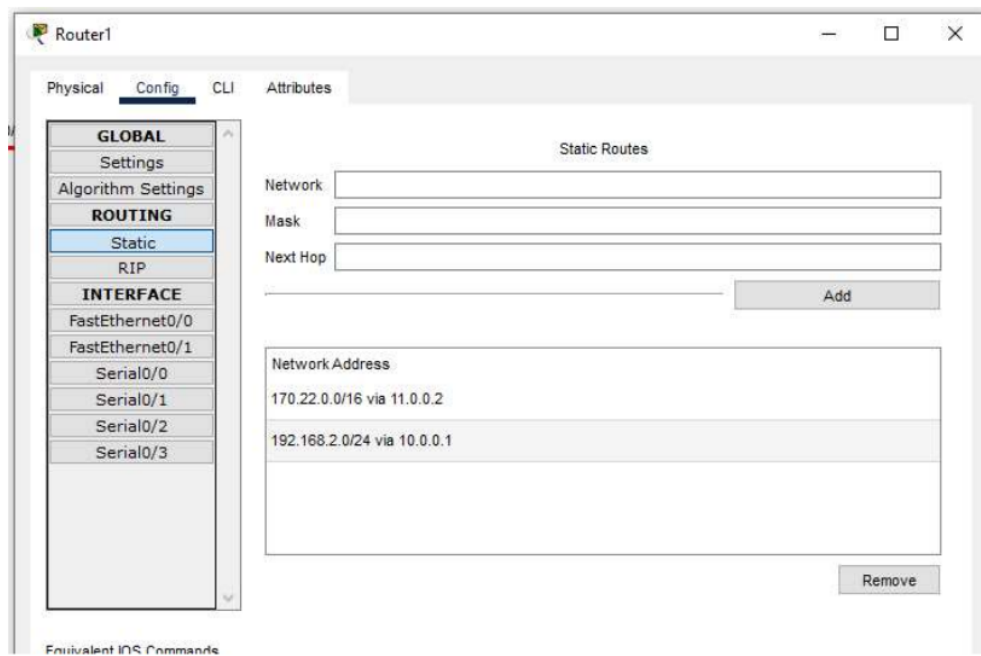


Figure 5 - Router 1 config

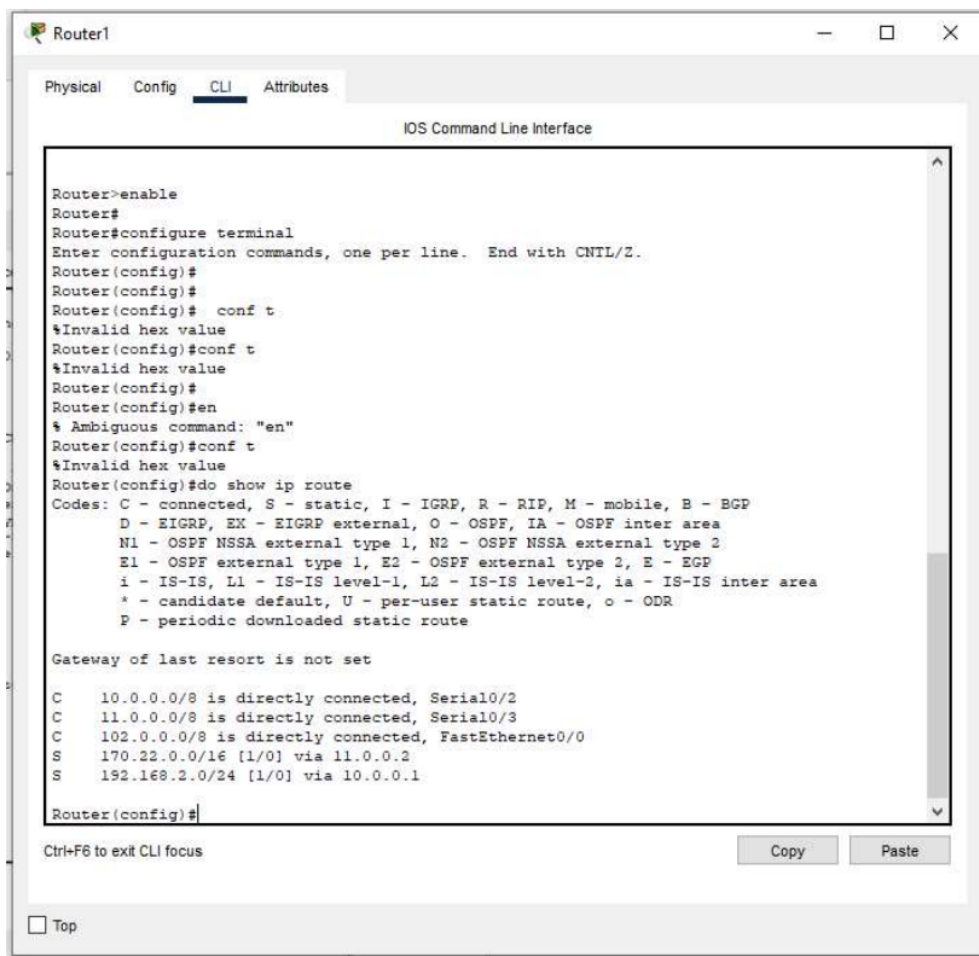


Figure 6 - router 1 CLI

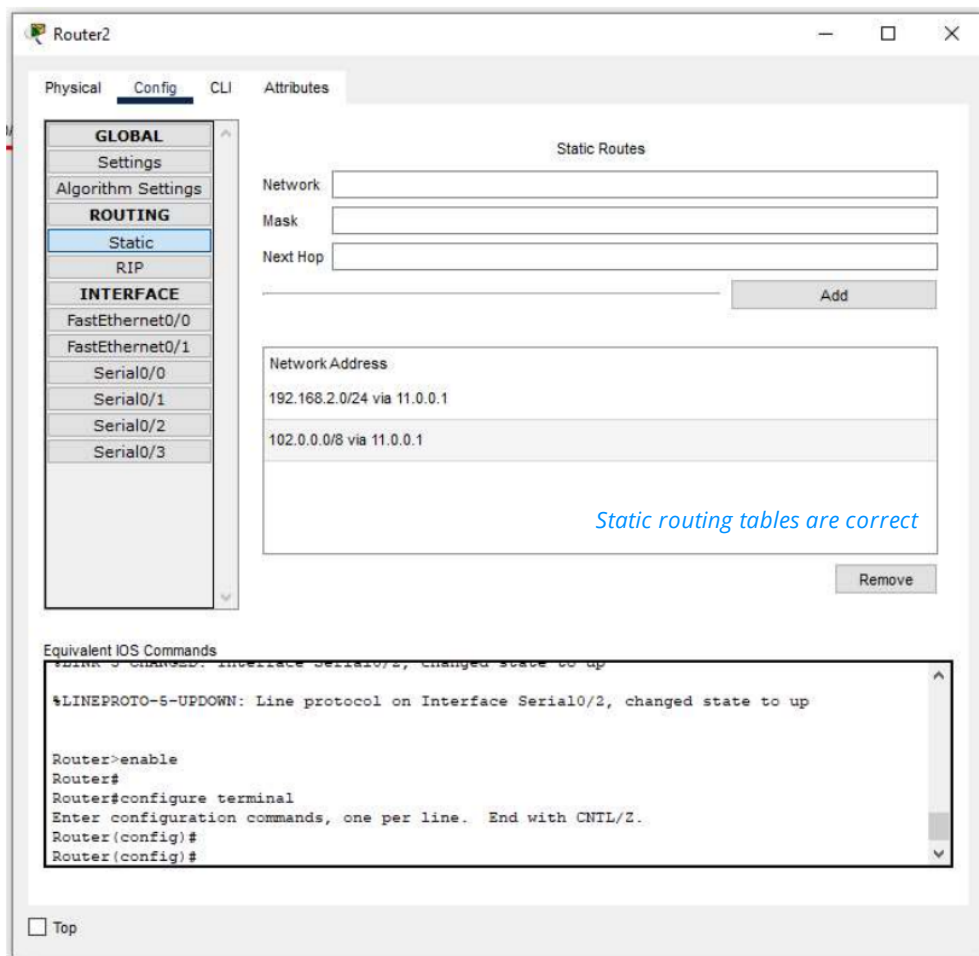


Figure 7 - Router 2 config

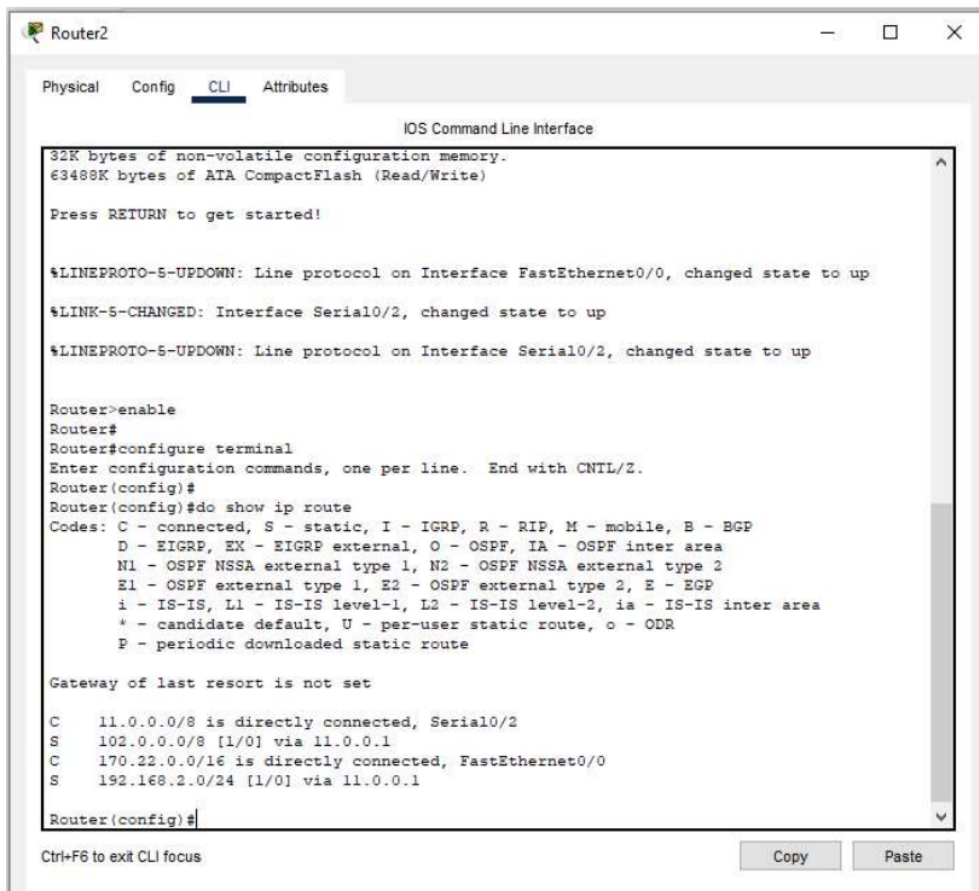


Figure 8 - Router 2 CLI

This needs a heading

PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	PC1	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC1	PC0	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC0	PC2	ICMP		0.000	N	2	(edit)	(delete)
	Successful	PC2	PC0	ICMP		0.000	N	3	(edit)	(delete)
	Successful	PC1	PC2	ICMP		0.000	N	4	(edit)	(delete)
	Successful	PC2	PC1	ICMP		0.000	N	5	(edit)	(delete)

Good test results

Figure 9 - Successful configuration test

The test demonstrates the comms in both directions for all devices with no failures. This test uses the ping command in packet tracer where a packet is transmitted from one device to another.

Task 4 - Configure the 3 routers for dynamic routing using RIP

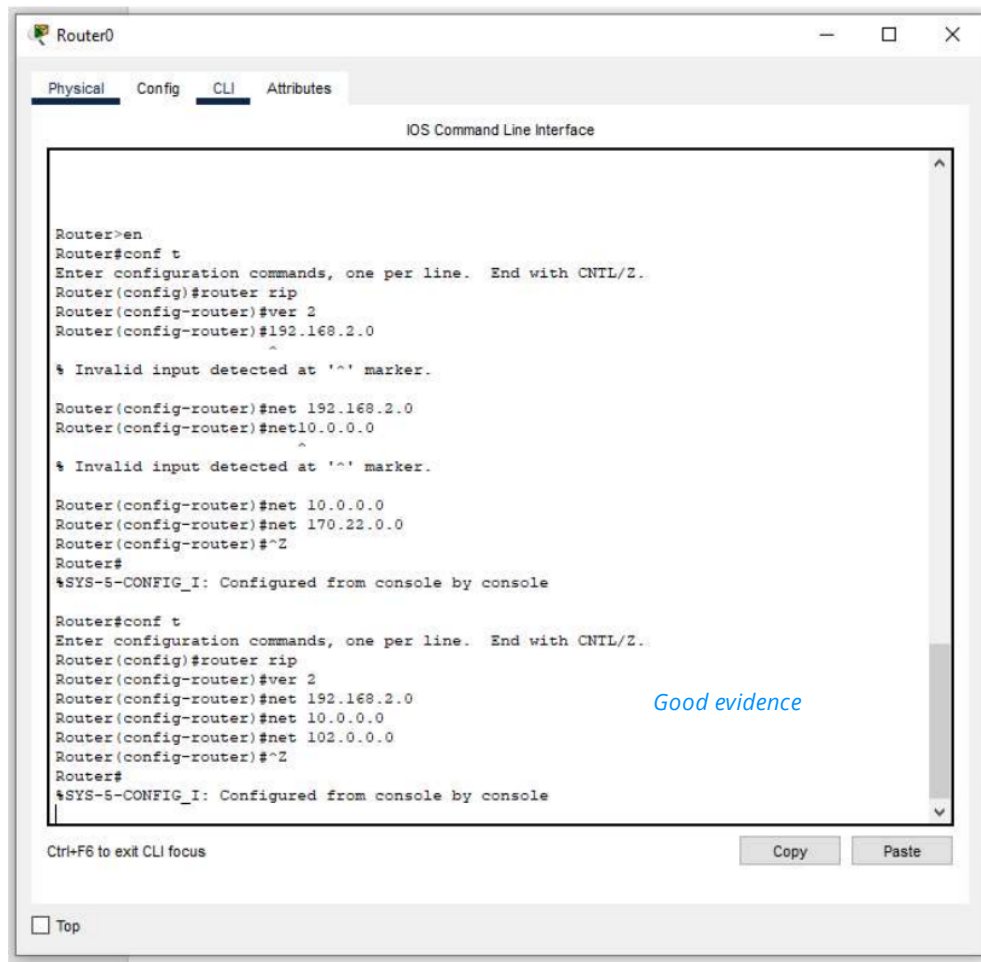


Figure 10 - router 0 RIP

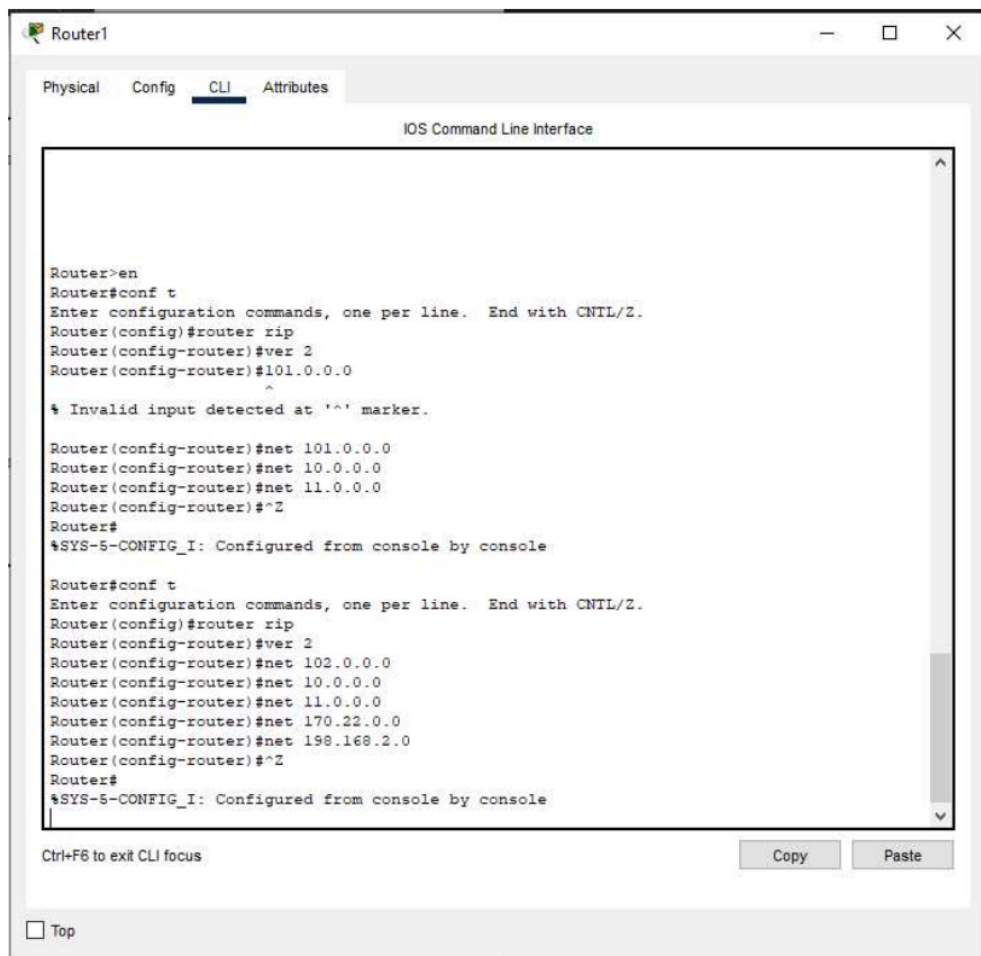


Figure 11 - router 1 RIP

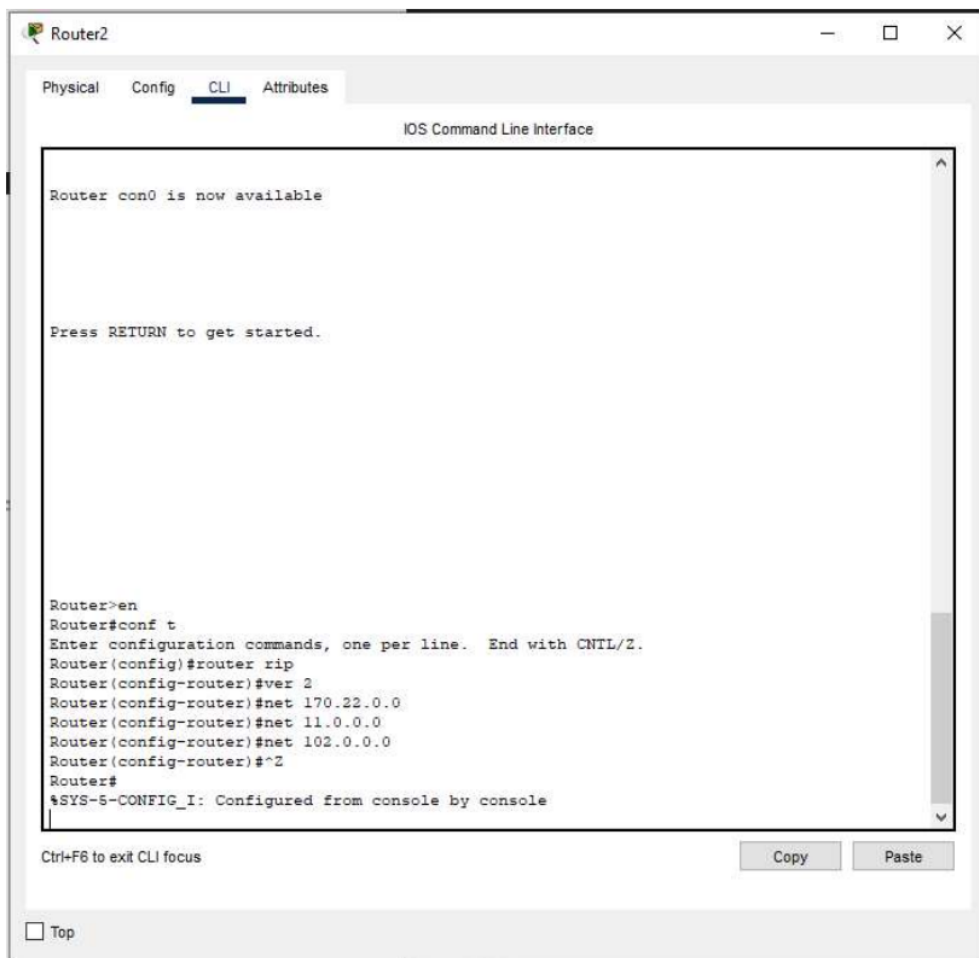


Figure 12 - Router 2 RIP

Type	Network	Port	Next Hop IP	Metric
C	10.0.0.0/8	Serial0/2	---	0/0
R	11.0.0.0/8	Serial0/2	10.0.0.2	120/1
S	102.0.0.0/8	---	10.0.0.2	1/0
S	170.22.0.0/16	---	10.0.0.2	1/0
C	192.168.2.0/24	FastEthernet0/0	---	0/0

Figure 13 - router 0 table

Routing Table for Router1				
Type	Network	Port	Next Hop IP	Metric
C	10.0.0.0/8	Serial0/2	---	0/0
C	11.0.0.0/8	Serial0/3	---	0/0
C	102.0.0.0/8	FastEthernet0/0	---	0/0
S	170.22.0.0/16	---	11.0.0.2	1/0
S	192.168.2.0/24	---	10.0.0.1	1/0

Figure 14 - router 1 table

Routing Table for Router2				
Type	Network	Port	Next Hop IP	Metric
R	10.0.0.0/8	Serial0/2	11.0.0.1	120/1
C	11.0.0.0/8	Serial0/2	---	0/0
S	102.0.0.0/8	---	11.0.0.1	1/0
C	170.22.0.0/16	FastEthernet0/0	---	0/0
S	192.168.2.0/24	---	11.0.0.1	1/0

RIP tables are correct

Figure 15 - router 2 table

Heading needed

PDU List Window										
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	PC1	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC1	PC0	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC0	PC2	ICMP		0.000	N	2	(edit)	(delete)
	Successful	PC2	PC0	ICMP		0.000	N	3	(edit)	(delete)
	Successful	PC1	PC2	ICMP		0.000	N	4	(edit)	(delete)
	Successful	PC2	PC1	ICMP		0.000	N	5	(edit)	(delete)

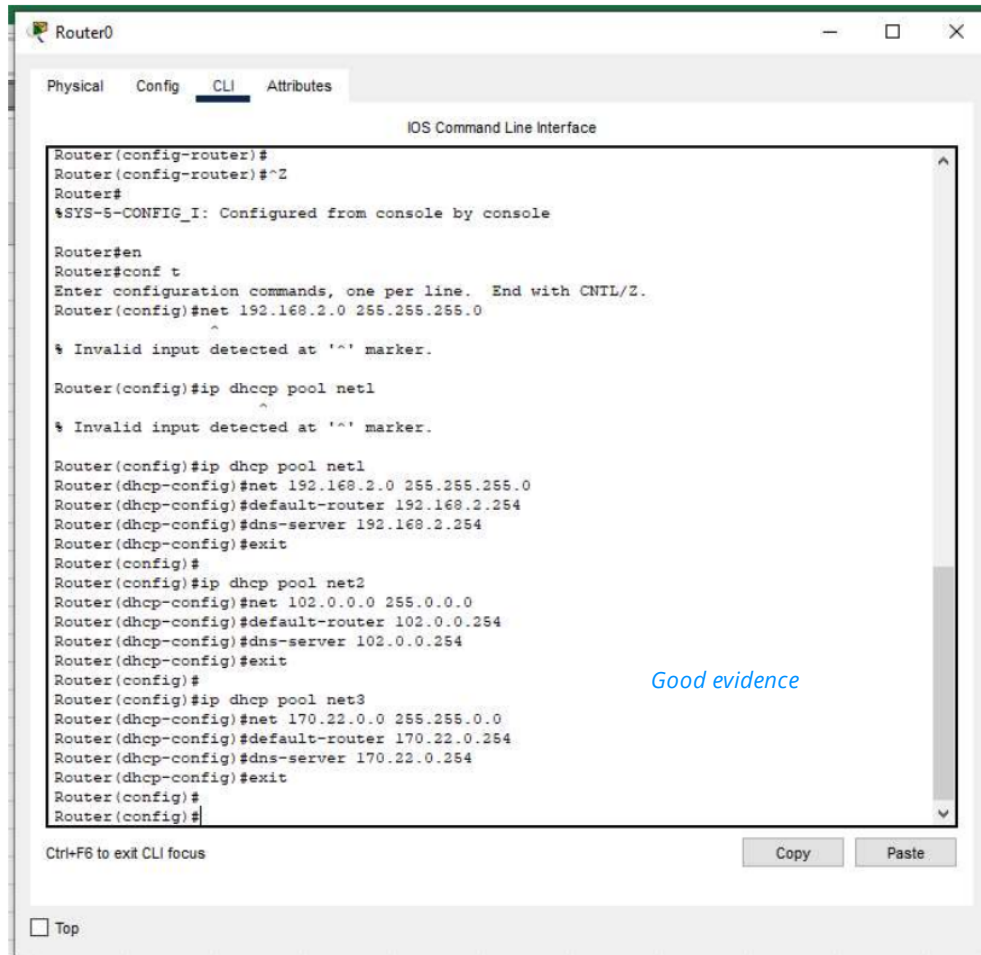
Good test results

Figure 16 - successful router rip test

Task 5

Dynamic addressing across networks using DHCP

Router R1 is configured as the control router and routers R2 and R3 are configured without the helper address for dynamic addressing using DHCP.



The screenshot shows the CLI of Router0 with the following configuration commands:

```
Router(config-router)#
Router(config-router)#^Z
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#net 192.168.2.0 255.255.255.0
^
% Invalid input detected at '^' marker.

Router(config)#ip dhcp pool net1
^
% Invalid input detected at '^' marker.

Router(config)#ip dhcp pool net1
Router(dhcp-config)#net 192.168.2.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.2.254
Router(dhcp-config)#dns-server 192.168.2.254
Router(dhcp-config)#exit
Router(config)#
Router(config)#ip dhcp pool net2
Router(dhcp-config)#net 102.0.0.0 255.0.0.0
Router(dhcp-config)#default-router 102.0.0.254
Router(dhcp-config)#dns-server 102.0.0.254
Router(dhcp-config)#exit
Router(config)#
Router(config)#ip dhcp pool net3
Router(dhcp-config)#net 170.22.0.0 255.255.0.0
Router(dhcp-config)#default-router 170.22.0.254
Router(dhcp-config)#dns-server 170.22.0.254
Router(dhcp-config)#exit
Router(config)#
Router(config)#
```

Good evidence

Ctrl+F6 to exit CLI focus

Copy Paste

☐ Top

Figure 17 - Router 1 DHCP Config

Test DHCP without Helper Address configuration

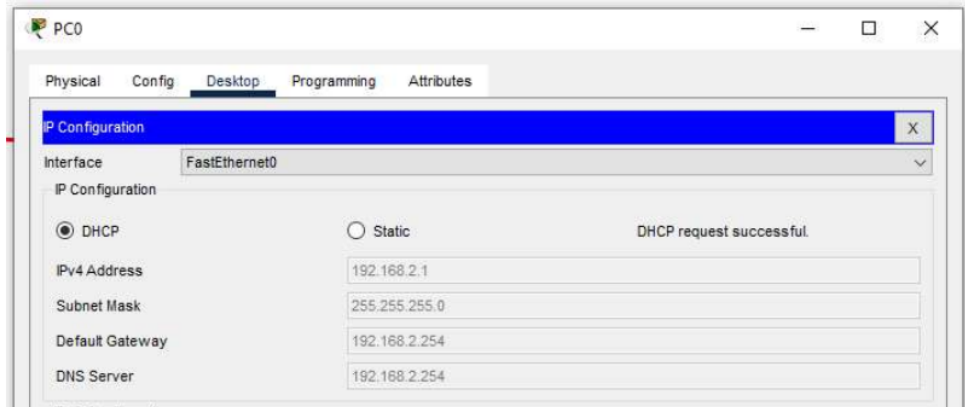


Figure 18 - PC0 DHCP config

PC0 sets configuration dynamically

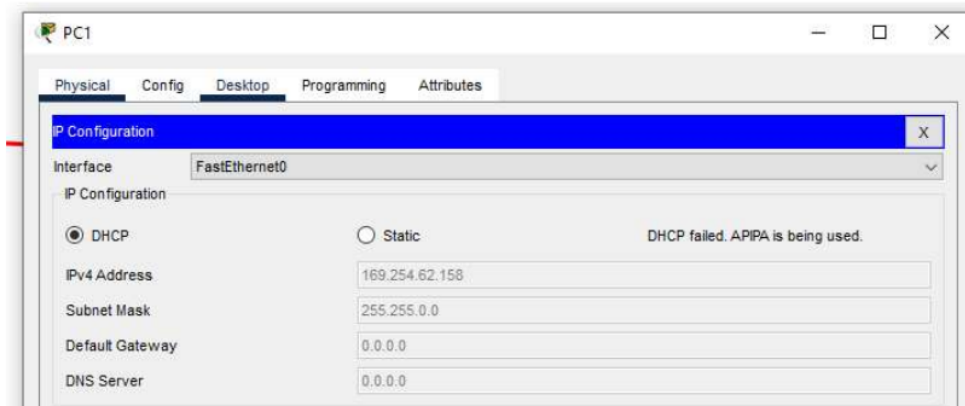
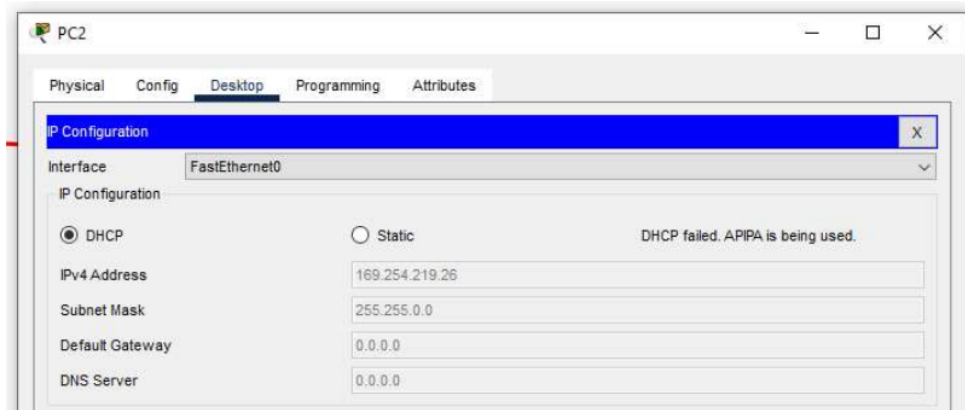


Figure 19 - Figure 19 – PC1 DHCP config w/o helper address



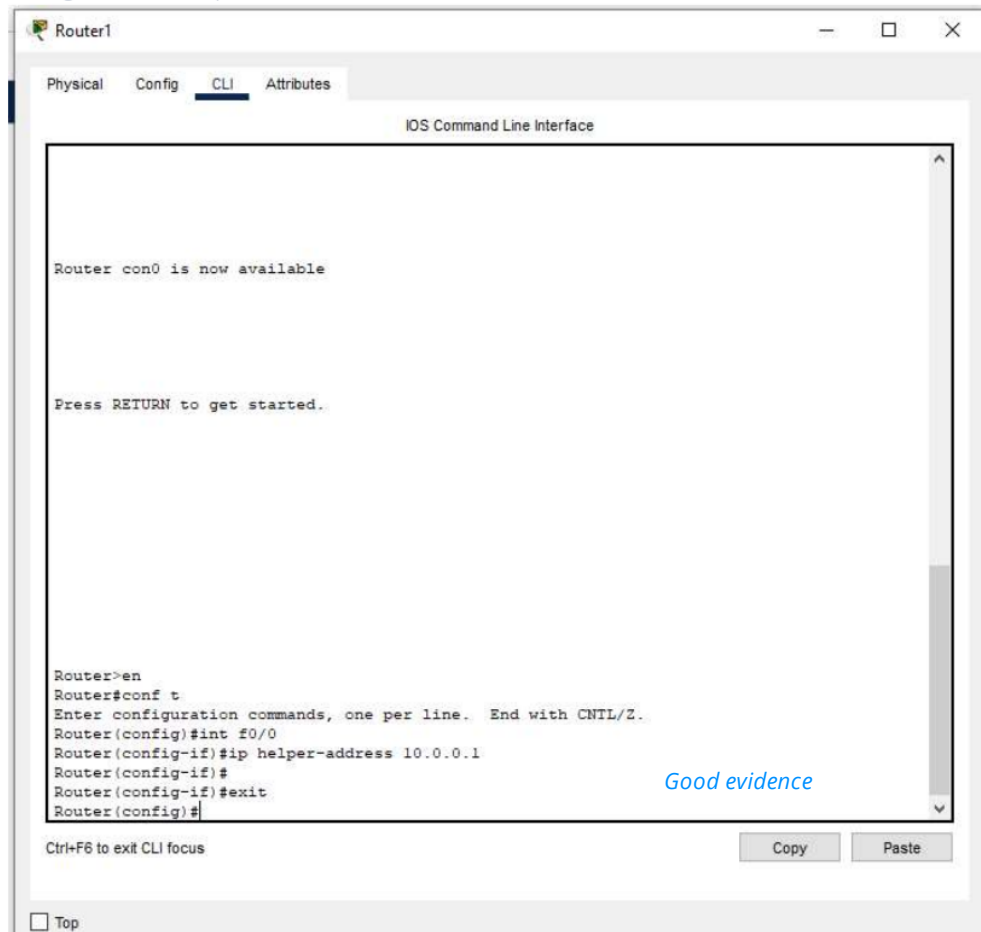
Errors are identified

Figure 20 - Figure 19 – PC0 DHCP config w/o helper address

Incorrect address setting for PC1 and PC2, resulting in a default address. This is because the router requires the helper address to communicate across the network. The helper address is the control router's serial port (10.0.0.1).

Good explanation

Configure DHCP helper address for Router 1 and Router 2 for cross network comms



Good evidence

Figure 21 - Router 1 with DHCP helper address configured

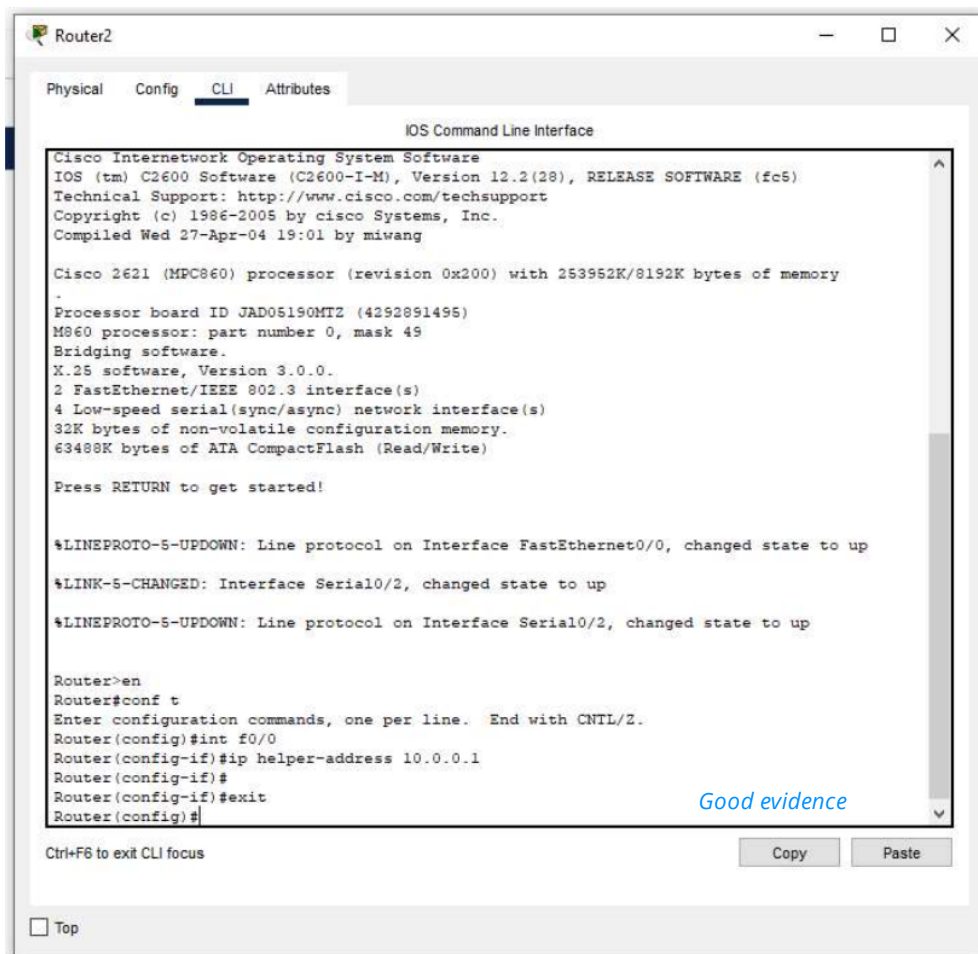


Figure 22 - Router 2 with DHCP helper address configured

Test dynamic addressing with helper address configured in Router 1 and Router 2

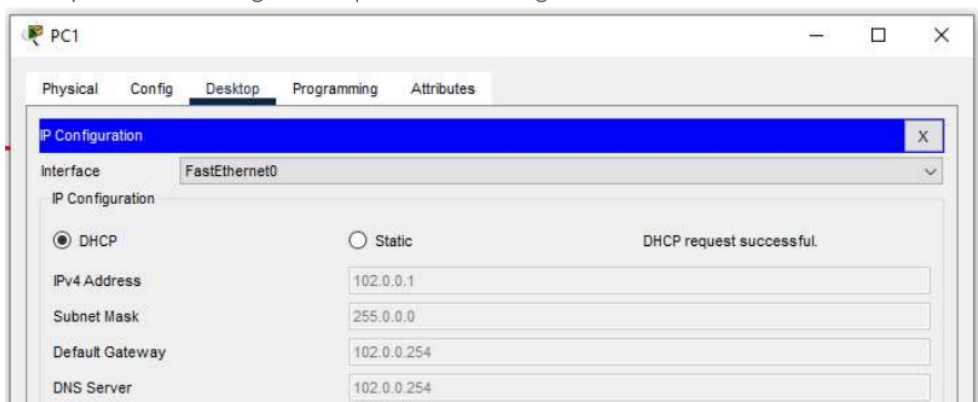
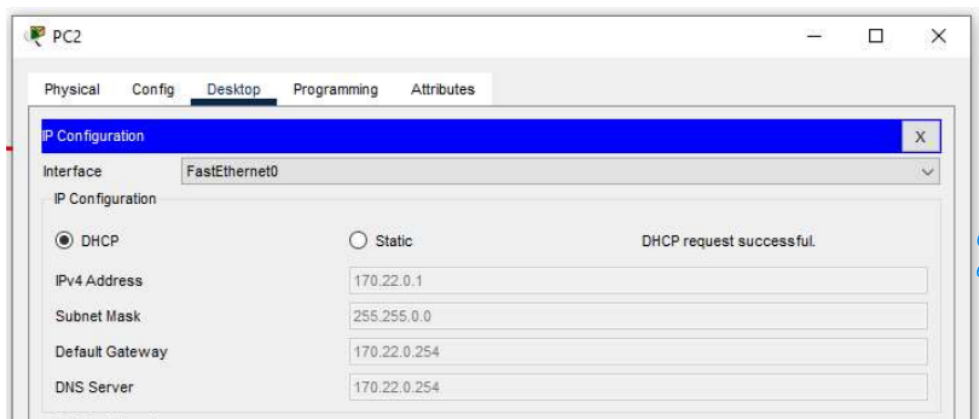


Figure 23 - PC1 DHCP With helper address

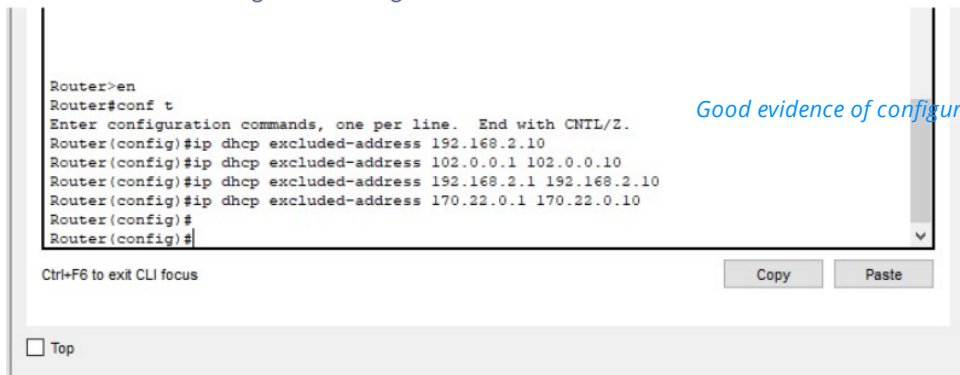


Good test with errors cleared

Figure 24 - PC2 DHCP With helper address

The test shows that devices PC1 and PC2 on routers 2 and 3 are now configured dynamically.

Address exclusion configuration using Router1 as control device



Good evidence of configuration

Figure 25 - Router 0 with address exclusion config

Test for excluded addresses

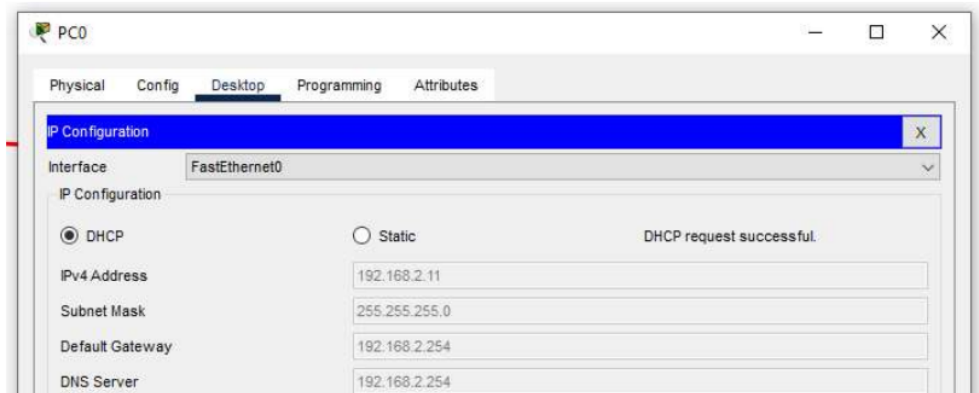


Figure 26 - PC0 successful test for excluded addresses

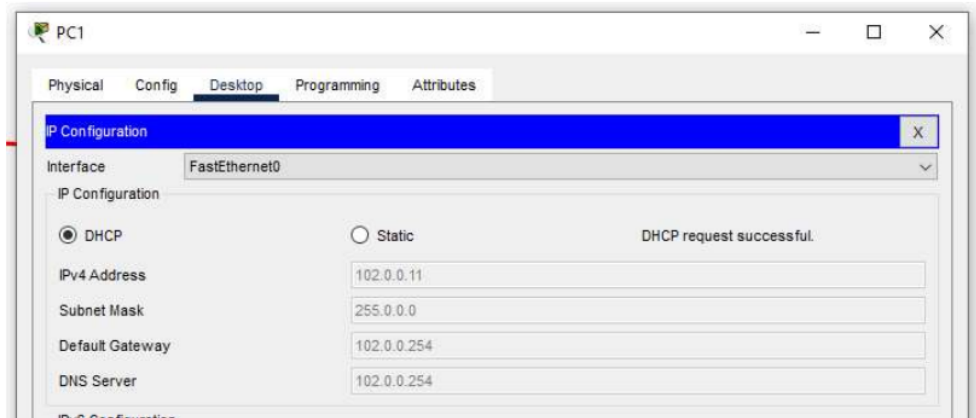


Figure 27 - PC1 successful test for excluded addresses

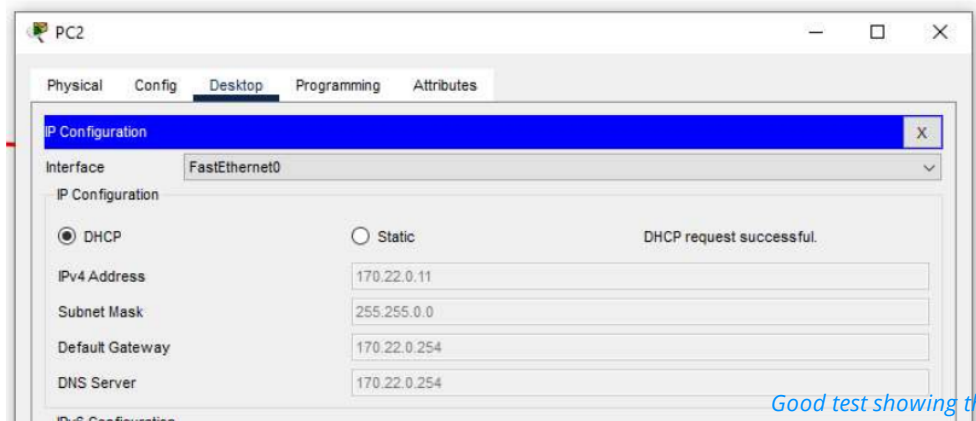


Figure 28 - PC2 successful test for excluded addresses

Good test showing the excluded addresses. First 10 addresses are excluded

The test proves that the excluded addresses form 1 to 10 in each LAN has been successful and this means that addresses for specific controllers can be kept static and not be affected by the DHCP dynamic addressing protocol. *Good explanation*

The final test to show the running configuration of the routers

Results of testing can be found in appendix *Good set of router reports showing all configurations*

Evaluation

Using study into the layout of those activities, the task of using multiple routing methods and IP classes might be conducted.

Static routing was investigated, in which each device and router must be manually setup via the terminal. The RIP dynamic routing allowed many devices to be routed significantly faster, and the router could be configured remotely as long as the router's IP address was known. Dynamic Host Communication Protocol (DHCP) is more difficult to configure on the router, but once configured, the connected devices do not need to be configured because an IP address is allocated to them automatically. This type of routing also allows specific addresses to be omitted from the automatic assignment of addresses to devices.

Good observation. This is because the RIP routing method allows alternative routing paths to be selected automatically.

Element 2

Introduction

This element builds upon the knowledge and skills utilised during element 1 to create a new network with CIDR/27, CIDR/30, VLAN, and ACL. Throughout this element, CIDR/28 will be utilised to gain a better grasp of how CIDR works and how it is implemented in a larger network using RIP routing. *Requirements identified*

Network design using CIDR/28 subnetting

London

The network will be triangular, connecting three routers in Rome, Paris, and London. There will be six different networks: three LAN networks and three WAN networks. The LAN networks are the connections between routers and PCs, whereas the WAN networks are inter-router networks. *Good point made*

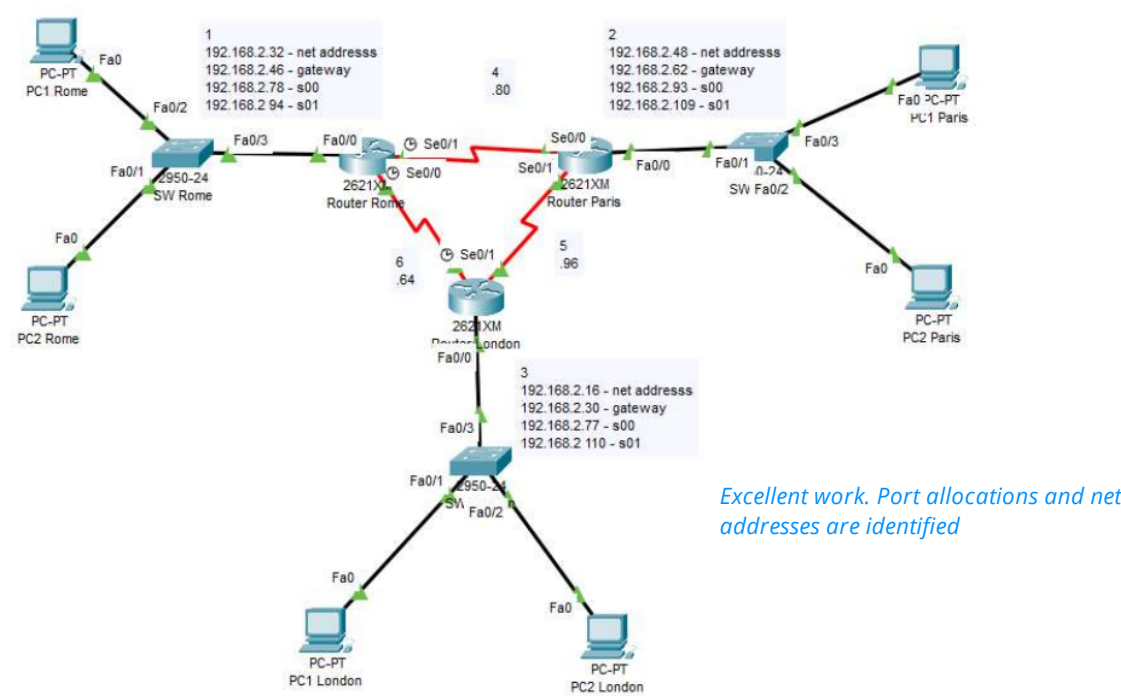


Figure 29 - Network design using CIDR/28 subnetting

Networks subnetting CIDR/28

LAN Networks 1, 2 and 3

CIDR/28	London	Network 3	Lan address 16 [192.168.2.16]					
Subnet mask	1	1	1	1	0	0	0	255.255.255.240 /28
	0	0	0	0	0	0	0	Not used
Net addr 16	0	0	0	1	0	0	0	Lowest host addr 17

Net addr 16	0	0	0	1	0	0	1	0	Next host addr 18
Default gateway	0	0	0	1	1	1	1	0	Fastethernet 0/0 addr 30
Broadcast	0	0	0	1	1	1	1	1	Broadcast 31

CIDR/28 Rome Network 1 Lan address 32 [192.168.2.32]

Subnet mask	1	1	1	1	0	0	0	0	255.255.255.240 /28
	0	0	0	0	0	0	0	0	Not used
Net addr 32	0	0	1	0	0	0	0	1	Lowest host addr 33
Net addr 32	0	0	1	0	0	0	1	0	Next host addr 34
Default gateway	0	0	1	0	1	1	1	0	Fastethernet 0/0 addr 46
Broad cast	0	0	1	0	1	1	1	1	Broadcast 47

CIDR/28 Paris Network 2 Lan address 48 [192.168.2.48]

Subnet mask	1	1	1	1	0	0	0	0	255.255.255.240 /28
	0	0	0	0	0	0	0	0	Not used
Net addr 48	0	0	1	1	0	0	0	1	Lowest host addr 49
Net addr 48	0	0	1	1	0	0	1	0	Next host addr 50
Default gateway	0	0	1	1	1	1	1	0	Fastethernet 0/0 addr 62
Broadcast	0	0	1	1	1	1	1	1	Broadcast 63

WAN Networks 4, 5 and 6**London – Rome Network 6 Network address 64**

London Router	0	1	0	0	1	1	0	1	Serial 0/0 addr 77
Rome Router	0	1	0	0	1	1	1	0	Serial 0/1 addr 78

Rome – Paris Network 4 Network address 80

Paris Router	0	1	0	1	1	1	0	1	Serial 0/0 addr 93
Rome Router	0	1	0	1	1	1	1	0	Serial 0/0 addr 94

Paris –London Network 5 Network address 96

Paris Router	0	1	1	0	1	1	0	1	Serial 0/1 addr 109
London Router	0	1	1	0	1	1	1	0	Serial 0/1 addr 110

RIP Routing

Good work here. Address schema is identified for /28

```
Rome(config)#conf t
%Invalid hex value
Rome(config)#router rip
Rome(config-router)#ver 2
Rome(config-router)#net 192.168.2.32
Rome(config-router)#net 192.168.2.64
Rome(config-router)#net 192.168.2.80
Rome(config-router)#exit
Rome(config)#^Z
Rome#
%SYS-5-CONFIG_I: Configured from console by console
```

Good evidence

Figure 30 - RIP Routing config for Rome

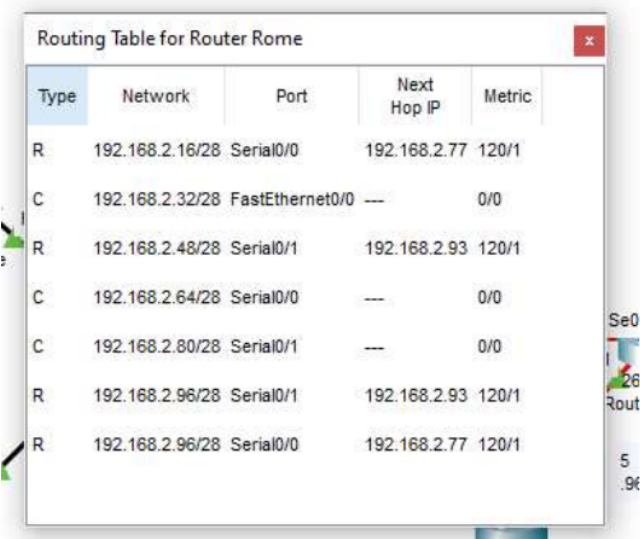


Figure 31 - Routing table for rome

```

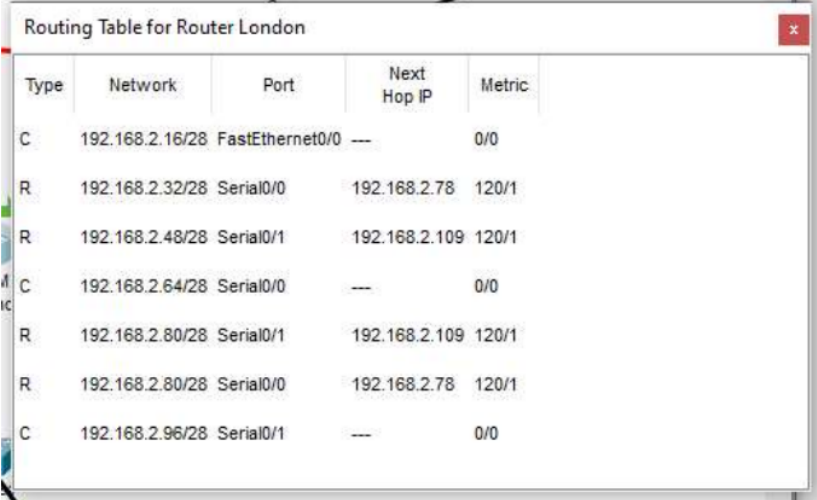
London(config)#router rip
London(config-router)#ver 2
London(config-router)#net 192.168.2.16
London(config-router)#.168.2.
^
% Invalid input detected at '^' marker.

London(config-router)#net 192.168.64
^
% Invalid input detected at '^' marker.

London(config-router)#net 192.168.2.64
London(config-router)#net 192.168.2.96
London(config-router)#exit
London(config)#
London(config)#end
London#
%SYS-5-CONFIG_I: Configured from console by console

```

Figure 32 - RIP Routing config for London



Type	Network	Port	Next Hop IP	Metric
C	192.168.2.16/28	FastEthernet0/0	---	0/0
R	192.168.2.32/28	Serial0/0	192.168.2.78	120/1
R	192.168.2.48/28	Serial0/1	192.168.2.109	120/1
C	192.168.2.64/28	Serial0/0	---	0/0
R	192.168.2.80/28	Serial0/1	192.168.2.109	120/1
R	192.168.2.80/28	Serial0/0	192.168.2.78	120/1
C	192.168.2.96/28	Serial0/1	---	0/0

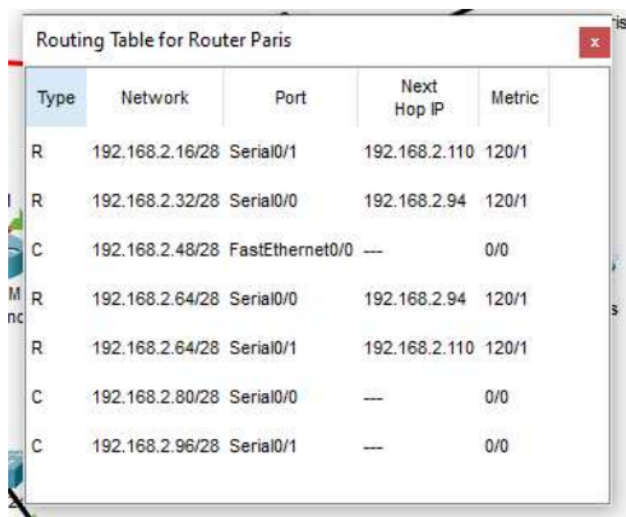
Figure 33 - Routing table for London

```

Paris(config)#router rip
Paris(config-router)#router rip
Paris(config-router)#ver 2
Paris(config-router)#net 192.168.2.48
Paris(config-router)#net 192.168.2.96
Paris(config-router)#net 192.168.2.80
Paris(config-router)#exit
Paris(config)#^Z
Paris#
%SYS-5-CONFIG_I: Configured from console by console

```

Figure 34 - RIP Routing config for Paris



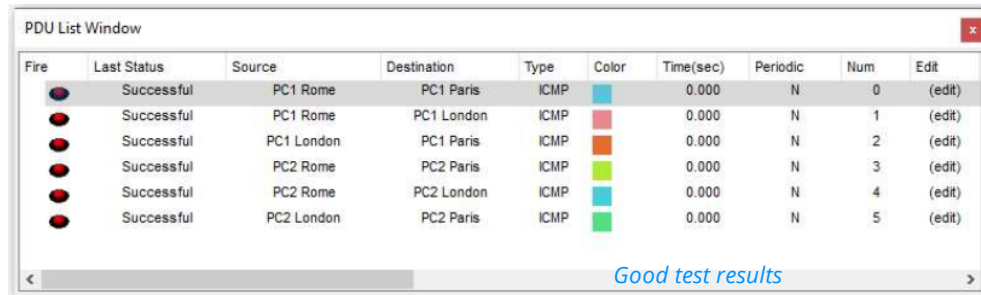
Routing Table for Router Paris

Type	Network	Port	Next Hop IP	Metric
R	192.168.2.16/28	Serial0/1	192.168.2.110	120/1
R	192.168.2.32/28	Serial0/0	192.168.2.94	120/1
C	192.168.2.48/28	FastEthernet0/0	---	0/0
R	192.168.2.64/28	Serial0/0	192.168.2.94	120/1
R	192.168.2.64/28	Serial0/1	192.168.2.110	120/1
C	192.168.2.80/28	Serial0/0	---	0/0
C	192.168.2.96/28	Serial0/1	---	0/0

RIP tables are correct

Figure 35 - Routing table for Paris

Heading needed here



PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	PC1 Rome	PC1 Paris	ICMP		0.000	N	0	(edit)
	Successful	PC1 Rome	PC1 London	ICMP		0.000	N	1	(edit)
	Successful	PC1 London	PC1 Paris	ICMP		0.000	N	2	(edit)
	Successful	PC2 Rome	PC2 Paris	ICMP		0.000	N	3	(edit)
	Successful	PC2 Rome	PC2 London	ICMP		0.000	N	4	(edit)
	Successful	PC2 London	PC2 Paris	ICMP		0.000	N	5	(edit)

Good test results

Figure 36 - Testing table for RIP routing (successful)

CIDR/27 and CIDR/30

CIDR/27 is used for LAN networks, which require fewer networks but typically have a large number of devices per network.

CIDR/27 Networks 1,2 and 3

Subnet mask	1	1	1	0	0	0	0	0	255.255.255.224
	0	0	0	0	0	0	0	0	Not used
Net addr 32	0	0	1	0	0	0	0	1	Lowest host addr 33 Rome 1
Net addr 32	0	0	1	0	0	0	1	0	Next host addr 34 Rome 2
Net addr 32	0	0	1	1	1	1	1	0	Highest Router addr 62 Rome Router
Net addr 64	0	1	0	0	0	0	0	1	Lowest host addr 65 London 1
Net addr 64	0	1	0	0	0	0	1	0	Next host addr 66 London 2
Net addr 64	0	1	0	1	1	1	1	0	Highest Router addr 94 London Router
Net addr 96	0	1	1	0	0	0	0	1	Lowest host addr 97 Paris 1
Net addr 96	0	1	1	0	0	0	1	0	Next host addr 98 Paris 2
Net addr 96	0	1	1	1	1	1	1	0	Highest Router addr 126 London Router

Good address schema for /27

CIDR/30 Networks 4,5 and 6

Subnet mask	1	1	1	1	1	1	0	0	255.255.255.252
	0	0	0	0	0	0	0	0	Not used
Net addr 4	0	0	0	0	0	1	0	1	Lowest interface addr 5 Rome serial 0/0
Net addr 4	0	0	0	0	0	1	1	0	Highest interface addr 6 Paris serial 0/0
Net addr 8	0	0	0	0	1	0	0	1	Lowest interface addr 9 Rome serial 0/1
Net addr 8	0	0	0	0	1	0	1	0	Highest interface addr 10 London serial 0/0
Net addr 12	0	0	0	0	1	1	0	1	Lowest interface addr 13 London serial 0/1
Net addr 12	0	0	0	0	1	1	1	0	Highest interface addr 14 Paris serial 0/1

Good address schema for /30

```

Rome#en
Rome#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Rome(config)#router rip
Rome(config-router)#ver 2
Rome(config-router)#net 192.168.2.32
Rome(config-router)#net 192.168.2.4
Rome(config-router)#net 192.168.2.8
Rome(config-router)#^Z
Rome#
%SYS-5-CONFIG_I: Configured from console by console

```

Figure 37 - Rome CIDR/27 and CIDR/30 CLI

```

London>en
London#conf t
Enter configuration commands, one per line. End with CNTL/Z.
London(config)#router rip
London(config-router)#ver 2
London(config-router)#net 192.168.2.64
London(config-router)#net 192.168.2.8
London(config-router)#net 192.168.2.12
London(config-router)#^Z
London#
%SYS-5-CONFIG_I: Configured from console by console

```

Good evidence for RIP routing for CIDR /27 and /30

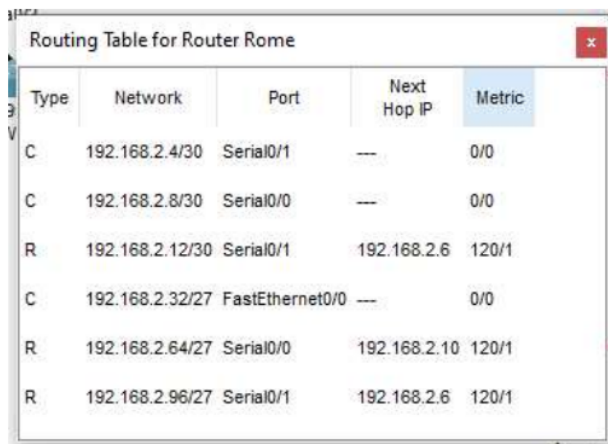
Figure 38 – London CIDR/27 and CIDR/30 CLI

```

Paris>en
Paris#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Paris(config)#router rip
Paris(config-router)#ver 2
Paris(config-router)#net 192.168.2.96
Paris(config-router)#net 192.168.2.4
Paris(config-router)#net 192.168.2.12
Paris(config-router)#^Z
Paris#
%SYS-5-CONFIG_I: Configured from console by console

```

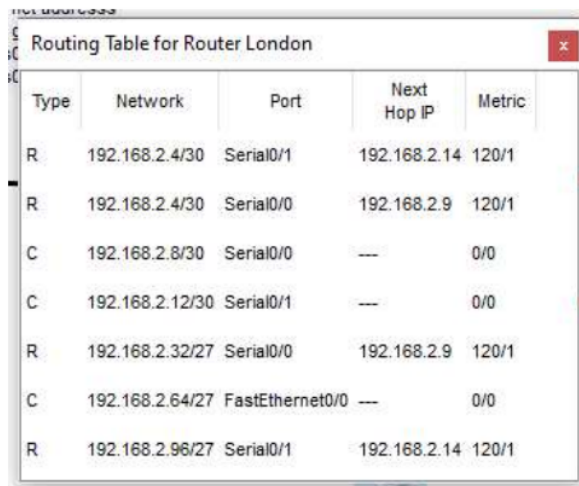
Figure 39 – Paris CIDR/27 and CIDR/30 CLI



A screenshot of a network configuration window titled "Routing Table for Router Rome". It displays a table with five columns: Type, Network, Port, Next Hop IP, and Metric. The table contains six entries for various IP ranges and their corresponding ports and next hops.

Type	Network	Port	Next Hop IP	Metric
C	192.168.2.4/30	Serial0/1	---	0/0
C	192.168.2.8/30	Serial0/0	---	0/0
R	192.168.2.12/30	Serial0/1	192.168.2.6	120/1
C	192.168.2.32/27	FastEthernet0/0	---	0/0
R	192.168.2.64/27	Serial0/0	192.168.2.10	120/1
R	192.168.2.96/27	Serial0/1	192.168.2.6	120/1

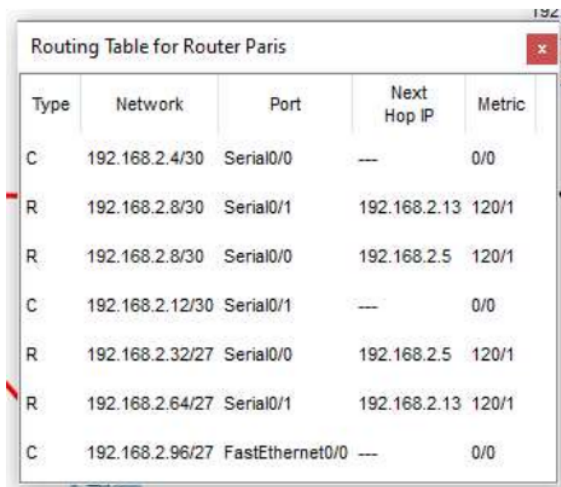
Figure 40 - Routing Table for Router Rome



A screenshot of a network configuration window titled "Routing Table for Router London". It displays a table with five columns: Type, Network, Port, Next Hop IP, and Metric. The table contains seven entries for various IP ranges and their corresponding ports and next hops.

Type	Network	Port	Next Hop IP	Metric
R	192.168.2.4/30	Serial0/1	192.168.2.14	120/1
R	192.168.2.4/30	Serial0/0	192.168.2.9	120/1
C	192.168.2.8/30	Serial0/0	---	0/0
C	192.168.2.12/30	Serial0/1	---	0/0
R	192.168.2.32/27	Serial0/0	192.168.2.9	120/1
C	192.168.2.64/27	FastEthernet0/0	---	0/0
R	192.168.2.96/27	Serial0/1	192.168.2.14	120/1

Figure 41 - Routing Table for Router London



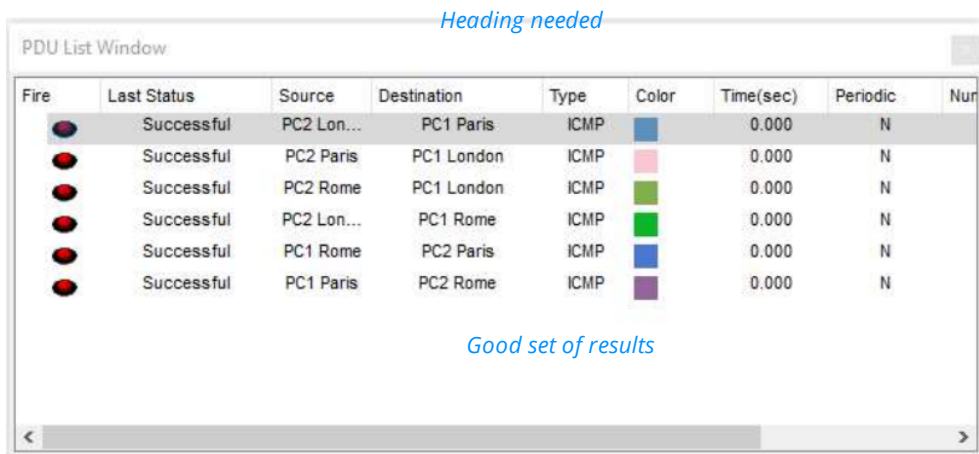
Routing Table for Router Paris

Type	Network	Port	Next Hop IP	Metric
C	192.168.2.4/30	Serial0/0	---	0/0
R	192.168.2.8/30	Serial0/1	192.168.2.13	120/1
R	192.168.2.8/30	Serial0/0	192.168.2.5	120/1
C	192.168.2.12/30	Serial0/1	---	0/0
R	192.168.2.32/27	Serial0/0	192.168.2.5	120/1
R	192.168.2.64/27	Serial0/1	192.168.2.13	120/1
C	192.168.2.96/27	FastEthernet0/0	---	0/0

Routing tables are correct

Figure 42 - Routing Table for Router Paris

Heading needed



PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Nur
	Successful	PC2 Lon...	PC1 Paris	ICMP		0.000	N	
	Successful	PC2 Paris	PC1 London	ICMP		0.000	N	
	Successful	PC2 Rome	PC1 London	ICMP		0.000	N	
	Successful	PC2 Lon...	PC1 Rome	ICMP		0.000	N	
	Successful	PC1 Rome	PC2 Paris	ICMP		0.000	N	
	Successful	PC1 Paris	PC2 Rome	ICMP		0.000	N	

Good set of results

Figure 43 - Successful RIP routing test for CIDR/27 and CIDR/30

VLANS London Router/Switch for CIDR/27 sub network

FastEthernet 0/0.1	0	1	0	1	1	1	1	0	Net addr 64 i/f addr 94
FastEthernet 0/0.2	1	0	0	1	1	1	1	0	Net addr 128 i/f addr 158
PC1 London	0	1	0	0	0	0	0	1	Net addr 64 host addr 65
PC2 London	1	0	0	0	0	0	0	1	Net addr 128 host addr 129

Additional address identified

Good address schema for Vlan with Inter-Vlan routing gateways

```
London#show ip int brief
Interface      IP-Address      OK? Method Status      Protocol
FastEthernet0/0 unassigned      YES manual up          up
FastEthernet0/0.2 192.168.2.94    YES manual up          up
FastEthernet0/0.3 192.168.2.158   YES manual up          up
FastEthernet0/1    unassigned      YES NVRAM administratively down down
Serial0/0         192.168.2.10    YES manual up          up
Serial0/1         192.168.2.13    YES manual up          up
London#
```

Good evidence

Ctrl+F6 to exit CLI focus

☐ Top

Figure 44 - London route ...

```
SW London
Physical Config CLI Attributes
IOS Command Line Interface

London#show vlan

VLAN Name                Status    Ports
-----
1    default              active    Fa0/1, Fa0/4, Fa0/5, Fa0/6
                                           Fa0/7, Fa0/8, Fa0/9, Fa0/10
                                           Fa0/11, Fa0/12, Fa0/13, Fa0/14
                                           Fa0/15, Fa0/16, Fa0/17, Fa0/18
                                           Fa0/19, Fa0/20, Fa0/21, Fa0/22
                                           Fa0/23, Fa0/24
2    vlan2                active    Fa0/2
3    vlan3                active    Fa0/3
1002 fddi-default        active
1003 token-ring-default  active
1004 fddinet-default     active
1005 trnet-default       active

VLAN Type  SAID      MTU    Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
-----
1    enet    100001   1500    -      -      -      -      -      0      0
2    enet    100002   1500    -      -      -      -      -      0      0
3    enet    100003   1500    -      -      -      -      -      0      0
1002 fddi   101002   1500    -      -      -      -      -      0      0
1003 tr     101003   1500    -      -      -      -      -      0      0
1004 fdnet  101004   1500    -      -      -      ieee  -      0      0
1005 trnet  101005   1500    -      -      -      ibm   -      0      0

VLAN Type  SAID      MTU    Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
-----

Remote SPAN VLANs
-----

Primary Secondary Type      Ports
-----

London#
London#conf t
Enter configuration commands, one per line. End with CNTL/Z.
London(config)#int f0/24
London(config-if)#switchport mode trunk

London(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/24, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/24, changed state to up
^Z
London#
%SYS-5-CONFIG_I: Configured from console by console

London#show interface trunk
Port      Mode          Encapsulation  Status      Native vlan
Fa0/24    on            802.1q         trunking    1

Port      Vlans allowed on trunk
Fa0/24    1-1005

Port      Vlans allowed and active in management domain
```

Ctrl+F6 to exit CLI focus

Copy Paste

Top

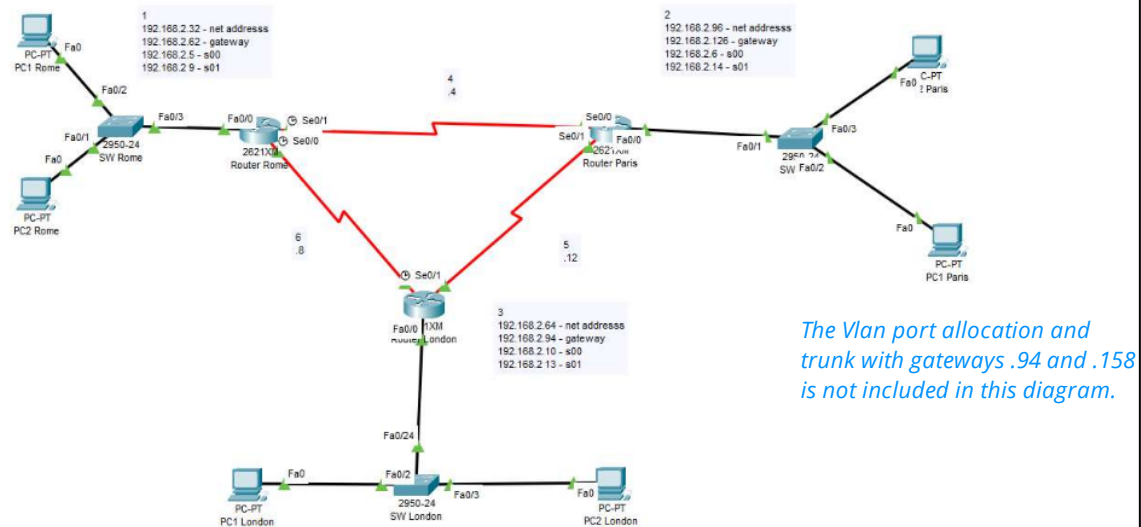
Figure 45 - London switch vlan config

Vlan running config can be seen in the appendix

Network utilizing vlan

The VLAN will be configured on the Paris router from network 2. The VLAN networking is created and tested using CIDR/27 and CIDR/30. The premise of VLAN networking is to connect two distinct networks to the same port of a router via a switch. First, PC1's IP address is changed to one of the accessible networks in CIDR/27.

The new IP address is 198.169.2.96, with the default gateway 198.169.2.126.



The Vlan port allocation and trunk with gateways .94 and .158 is not included in this diagram.

Figure 46 - Network with vlan

```

Paris>en
Paris#show ip route
Codes: C - connected, S - static, I - IGRP, 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

192.168.2.0/24 is variably subnetted, 7 subnets, 2 masks
C    192.168.2.4/30 is directly connected, Serial0/0
R    192.168.2.8/30 [120/1] via 192.168.2.13, 00:00:10, Serial0/1
     [120/1] via 192.168.2.5, 00:00:28, Serial0/0
C    192.168.2.12/30 is directly connected, Serial0/1
R    192.168.2.32/27 [120/1] via 192.168.2.5, 00:00:28, Serial0/0
R    192.168.2.64/27 [120/1] via 192.168.2.13, 00:00:10, Serial0/1
C    192.168.2.96/27 is directly connected, FastEthernet0/0
R    192.168.2.128/27 [120/1] via 192.168.2.13, 00:00:10, Serial0/1

Paris#
  
```

Figure 47 - IP route as shown from Paris router

Ping tests to prove vlans circuits

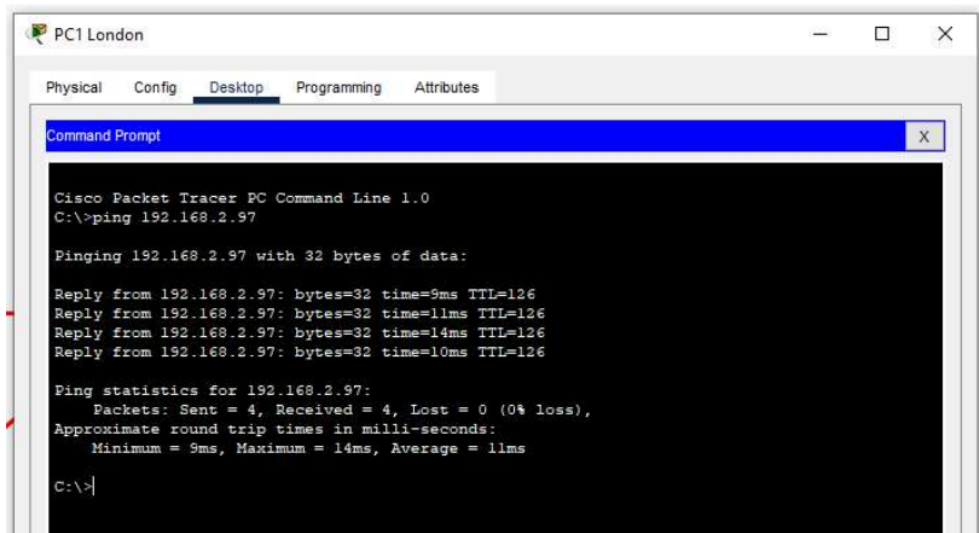


Figure 48 - Test from PC1 Paris host to London vlan 2 PC1 London

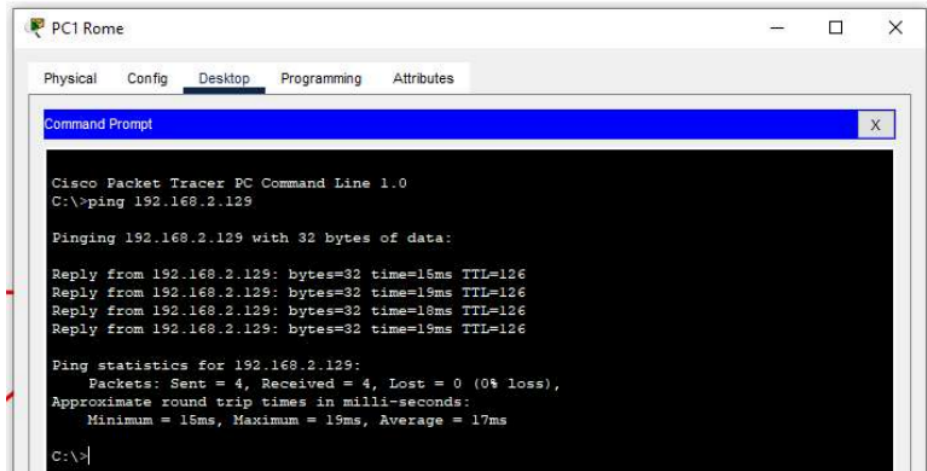


Figure 49 - Test from PC1 Rome to PC2 London

Good test over Vlans.

London router running config can be seen in the appendix

Paris router running config can be seen in the appendix

Evaluation

The use of CIDR networks and VLANs have been demonstrated by creating and thoroughly testing the networks to ensure that every portion and component functions as expected. The knowledge gained will be utilised in the next element.

Element 3

VLAN implemented on a switch

The purpose of this element will be to implement a network component with hardware that allows a terminal to configure and control an industrial device such as a PLC via a WAN network. The device's connectivity and security will then be tested with the proper protocols. *Good points*

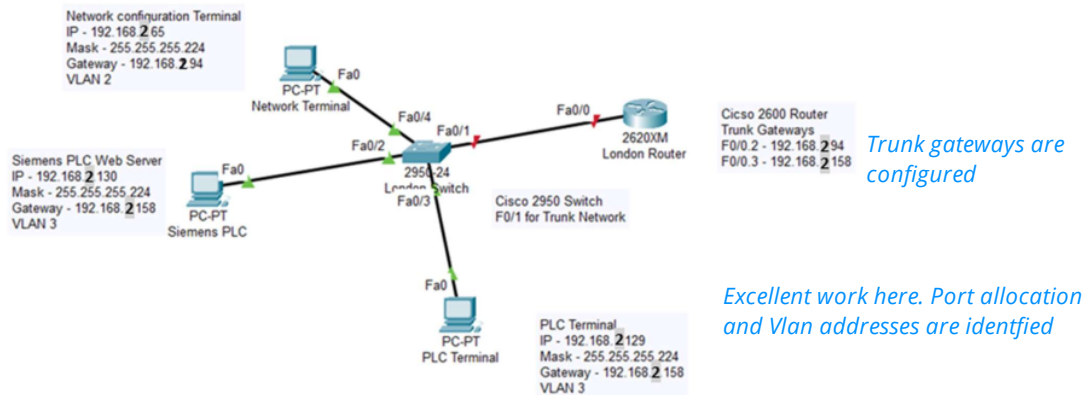


Figure 50 - Network Topology

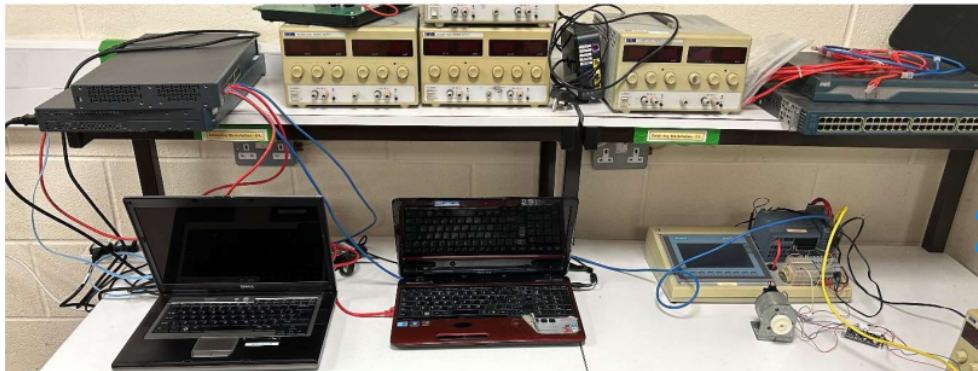
The hardware used for the physical testing are as follows

Laptop PC's x 2

Siemens PLC

Cisco 2600 router

Cisco 2950 switch



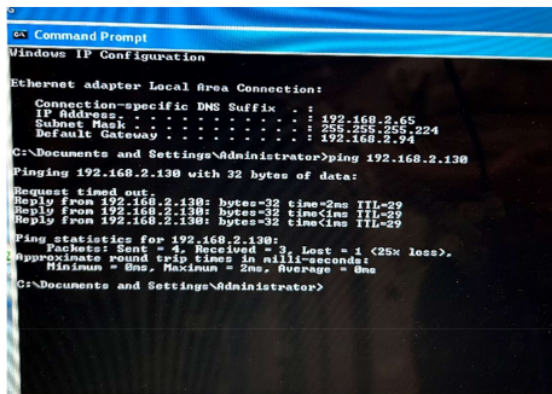
Good prac setup image

Figure 51 - Set - up for physical test

The Vlan configuration can be found in the appendix of the switch and the router

Once the switch and the router had been configured, the connections could be tested using ping tests via command prompts. Pinging from 192.168.2.65 to 192.168.2.130 and vice versa.

This should have a heading



```
Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix . : 
    IP Address. . . . . : 192.168.2.65
    Subnet Mask . . . . . : 255.255.255.224
    Default Gateway . . . . . : 192.168.2.94

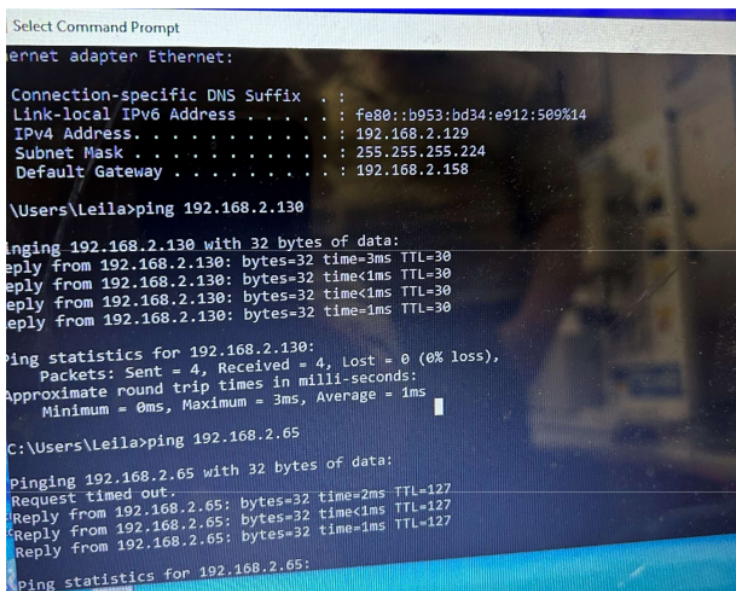
C:\Documents and Settings\Administrator>ping 192.168.2.130

Pinging 192.168.2.130 with 32 bytes of data:
Request timed out.
Reply from 192.168.2.130: bytes=32 time=2ms TTL=29
Reply from 192.168.2.130: bytes=32 time<1ms TTL=29
Reply from 192.168.2.130: bytes=32 time<1ms TTL=29

Ping statistics for 192.168.2.130:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\Documents and Settings\Administrator>
```

Figure 52 - Ping test on physical system



```
Select Command Prompt

Ethernet adapter Ethernet:

    Connection-specific DNS Suffix . : 
    Link-local IPv6 Address . . . . . : fe80::b953:bd34:e912:509%14
    IPv4 Address. . . . . : 192.168.2.129
    Subnet Mask . . . . . : 255.255.255.224
    Default Gateway . . . . . : 192.168.2.158

\Users\Leila>ping 192.168.2.130

Pinging 192.168.2.130 with 32 bytes of data:
Reply from 192.168.2.130: bytes=32 time=3ms TTL=30
Reply from 192.168.2.130: bytes=32 time<1ms TTL=30
Reply from 192.168.2.130: bytes=32 time<1ms TTL=30
Reply from 192.168.2.130: bytes=32 time=1ms TTL=30

Ping statistics for 192.168.2.130:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 3ms, Average = 1ms

C:\Users\Leila>ping 192.168.2.65

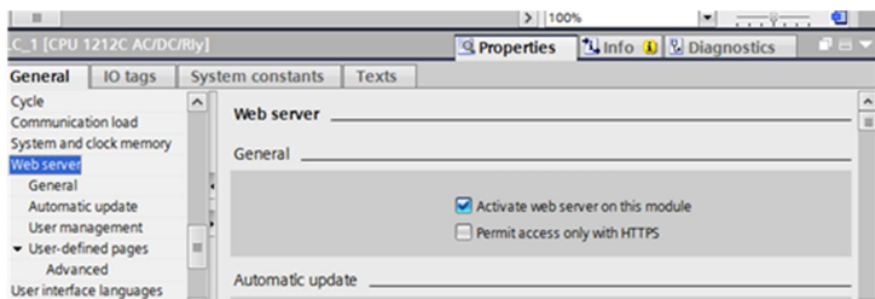
Pinging 192.168.2.65 with 32 bytes of data:
Request timed out.
Reply from 192.168.2.65: bytes=32 time=2ms TTL=127
Reply from 192.168.2.65: bytes=32 time<1ms TTL=127
Reply from 192.168.2.65: bytes=32 time=1ms TTL=127

Ping statistics for 192.168.2.65:
```

Network ping tests across Vlan from host

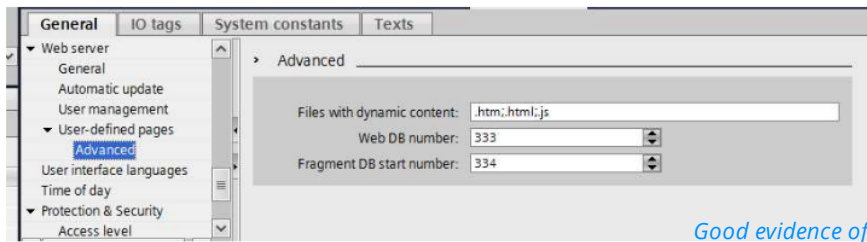
Figure 53 - Ping test on physical system

Firstly a new project was created and the web server was configured as shown below.



Good evidence

Figure 54 - PLC webserver Activation



Good evidence of server files in PLC

Figure 55 - File extensions added for the program

Here, the file extensions are .html, .htm, and .js. Other file extensions that can be used are .json.

HTML- Hypertext Markup Language.

HTM - An acceptable abbreviated variant of HTML. Both extensions are permitted.

.js - JavaScript (e.g. jQuery, ajax)

.json - JavaScript extension library.

On PLC models less than 1500, the .js file is typically not recognised. As a result, the .js programme can be incorporated in HTML or HTM files using .json.

Graphic extensions, such as .png and .gif, can also be inserted in ajax scripts. The LEDs are PNG pictures.

The default tags for motor control and monitor were then created:

Good explanation of program files

Default tag table			
Name	Data type	Address	
Motor Speed PWM	Word	%QW1000	
Motor RUN	Bool	%I0.4	
Motor PWM output	Bool	%Q1.1	

Figure 56 - Default tags for motor

The tags in the webdata [DB1] datablock were then created:

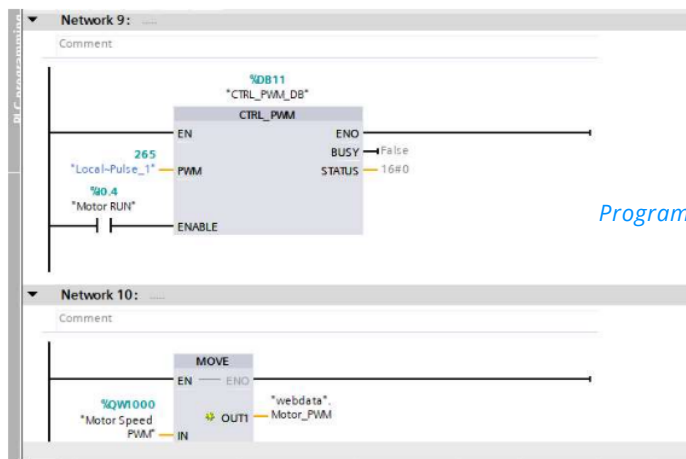
11	Motor_PWM	Int	0
----	-----------	-----	---

Figure 57 - webdata tags

3	web_ok	Int
---	--------	-----

Figure 58 - webdata tags

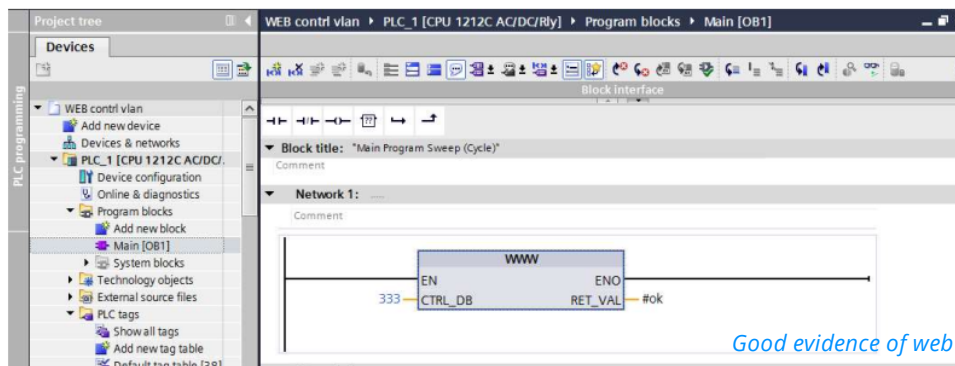
The Motor drive PWM function is in the main part of the PLC program:



Program blocks to drive DC motor from web browser

Figure 59 - Motor PWM function

In the main function block add the web server as shown below.



Good evidence of web server function block. This is the most important block

Figure 60 - main function block

The web server is now configured and is ready for web pages to be downloaded.

The index .html page with the http:// source for the Motor Switch.htm page was then downloaded as shown below.

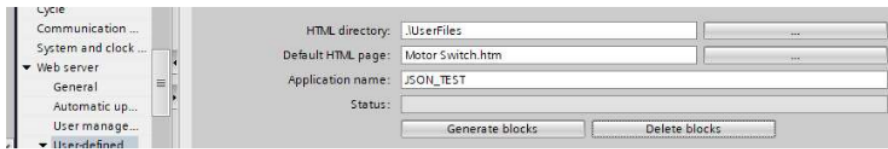


Figure 61 -

Once the page was ready, the web data blocks were generated to download the web pages on the PLC server. *Good point*

The VLAN gateway ip address (router gateway) was set up in the PLC as shown below.

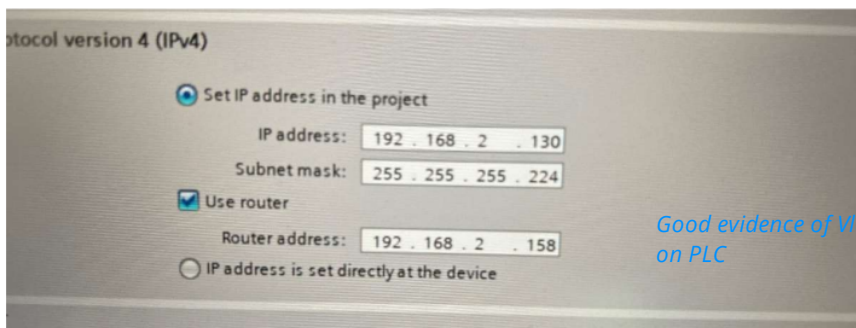


Figure 62 - VLAN set-up

Testing the dynamics of the PLC web server over the VLAN Network.

Via the PLC webserver the speed of the motor was adjusted and the dynamics were observed to check the connections of the network.

Firstly the DC motor was observed running with 20% PWM duty cycle selected and motor run status on:

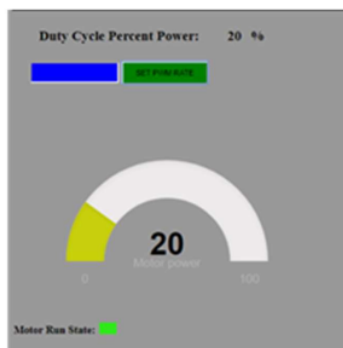


Figure 63 - 20%PWM speed

Name	Address	Display format	Monitor value
*Motor Speed ...	%QW1000	Hex	16#0014
*Motor RUN"	%I0.4	Bool	TRUE
webdata.Motor...		DEC+/-	20

Figure 64 - Watch Table

Good test evidence



Figure 65 - Motor running at 20%

The motor was observed changing speed as the speed was adjusted remotely from the web client.

Evaluation

This final part demonstrated that a simple HTML programme and two.png files may accurately depict the conditions of a PLC. The element was created as a prototype with the PLC adjacent to the PC, but in a real-life application, with some security in place, the PC and PLC might be on opposite sides of the planet. That is the underlying notion of Industry 4.0, which is now being developed. In theory, all equipment in Industry 4.0 can be connected and communicate with one another, offering far more feedback from production and increasing the possibilities for self-diagnosis. What is more essential is that all of that communication occurs across an Ethernet network, allowing it to be used in a wider range of applications, as demonstrated in this part 3. Future PLC system development and Java script implementation could enable the usage of complex web pages with capabilities comparable to or greater than HMI screens. And, with proper security, it could be connected to the global network and accessed and monitored from anywhere in the world.

Good points made. The advantages of Vlan could have been included.

Works Cited

Geeks for Geeks, 2023. *TCP/IP Model*. [Online]

Available at: <https://www.geeksforgeeks.org/tcp-ip-model/>

[Accessed 20 April 2024].

Geeks For Geeks, 2024. *What is OSI Model? – Layers of OSI Model*. [Online]

Available at: <https://www.geeksforgeeks.org/open-systems-interconnection-model-osi/>

[Accessed 23 April 2024].

Harber, L., 2021. *Port number*. [Online]

Available at: <https://www.techtarget.com/searchnetworking/definition/port-number>

[Accessed 21 April 2024].

Ionos, 2023. *What is Broadcasting*. [Online]

Available at: [https://www.ionos.co.uk/digitalguide/server/know-](https://www.ionos.co.uk/digitalguide/server/know-how/broadcast/#:~:text=A%20broadcast%20in%20a%20computer,other%20participants%20in%20the%20network.)

[how/broadcast/#:~:text=A%20broadcast%20in%20a%20computer,other%20participants%20in%20the%20network.](https://www.ionos.co.uk/digitalguide/server/know-how/broadcast/#:~:text=A%20broadcast%20in%20a%20computer,other%20participants%20in%20the%20network.)

[Accessed 23 April 2024].

Limited sources used

Appendix

Router 0 test

```
Router>en
Router#show run
Building configuration...
```

```
Current configuration : 1455 bytes
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
hostname Router
ip dhcp excluded-address 192.168.2.10
ip dhcp excluded-address 102.0.0.1 102.0.0.10
ip dhcp excluded-address 192.168.2.1 192.168.2.10
ip dhcp excluded-address 170.22.0.1 170.22.0.10
ip dhcp pool net1
network 192.168.2.0 255.255.255.0
default-router 192.168.2.254
dns-server 192.168.2.254
ip dhcp pool net2
network 102.0.0.0 255.0.0.0
default-router 102.0.0.254
dns-server 102.0.0.254
ip dhcp pool net3
network 170.22.0.0 255.255.0.0
default-router 170.22.0.254
dns-server 170.22.0.254
no ip cef
no ipv6 cef
interface FastEthernet0/0
ip address 192.168.2.254 255.255.255.0
duplex auto
speed auto
interface FastEthernet0/1
no ip address
duplex auto
speed auto
shutdown
interface Serial0/0
no ip address
clock rate 2000000
shutdown
interface Serial0/1
no ip address
clock rate 2000000
shutdown
interface Serial0/2
```

```
ip address 10.0.0.1 255.0.0.0
clock rate 2000000
interface Serial0/3
no ip address
clock rate 2000000
shutdown
router rip
version 2
network 10.0.0.0
network 102.0.0.0
network 170.22.0.0
network 192.168.2.0
ip classless
ip route 102.0.0.0 255.0.0.0 10.0.0.2
ip route 170.22.0.0 255.255.0.0 10.0.0.2
ip flow-export version 9
line con 0
line aux 0
line vty 0 4
login
end
```

Router 1 Test

```
Router>en
Router#show run
Building configuration...
```

```
Current configuration : 1012 bytes
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
hostname Router
no ip cef
no ipv6 cef
interface FastEthernet0/0
ip address 102.0.0.254 255.0.0.0
ip helper-address 10.0.0.1
duplex auto
speed auto
interface FastEthernet0/1
no ip address
duplex auto
speed auto
shutdown
interface Serial0/0
no ip address
clock rate 2000000
```

```
shutdown
interface Serial0/1
no ip address
clock rate 2000000
shutdown
interface Serial0/2
ip address 10.0.0.2 255.0.0.0
interface Serial0/3
ip address 11.0.0.1 255.0.0.0
clock rate 2000000
router rip
version 2
network 10.0.0.0
network 11.0.0.0
network 101.0.0.0
network 102.0.0.0
network 170.22.0.0
network 198.168.2.0
ip classless
ip route 170.22.0.0 255.255.0.0 11.0.0.2
ip route 192.168.2.0 255.255.255.0 10.0.0.1
ip flow-export version 9
line con 0
line aux 0
line vty 0 4
login
end
```

Router 2 test run

```
Router>en
Router#show run
Building configuration...
```

```
Current configuration : 948 bytes
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
hostname Router
no ip cef
no ipv6 cef
interface FastEthernet0/0
ip address 170.22.0.254 255.255.0.0
ip helper-address 10.0.0.1
duplex auto
speed auto
interface FastEthernet0/1
```

```
no ip address
duplex auto
speed auto
shutdown
interface Serial0/0
no ip address
clock rate 2000000
shutdown
interface Serial0/1
no ip address
clock rate 2000000
shutdown
interface Serial0/2
ip address 11.0.0.2 255.0.0.0
interface Serial0/3
no ip address
clock rate 2000000
shutdown
router rip
version 2
network 11.0.0.0
network 102.0.0.0
network 170.22.0.0
ip classless
ip route 192.168.2.0 255.255.255.0 11.0.0.1
ip route 102.0.0.0 255.0.0.0 11.0.0.1
ip flow-export version 9
line con 0
line aux 0
line vty 0 4
login
end
```

London vlan switch running – config

```
London>en
London#show running-config
Building configuration...

Current configuration : 1141 bytes
version 12.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
hostname London
spanning-tree mode pvst
spanning-tree extend system-id
interface FastEthernet0/1
```

```
interface FastEthernet0/2
switchport access vlan 2
switchport mode access
interface FastEthernet0/3
switchport access vlan 3
switchport mode access
interface FastEthernet0/4
interface FastEthernet0/5
interface FastEthernet0/6
interface FastEthernet0/7
interface FastEthernet0/8
interface FastEthernet0/9
interface FastEthernet0/10
interface FastEthernet0/11
interface FastEthernet0/12
interface FastEthernet0/13
interface FastEthernet0/14
interface FastEthernet0/15
interface FastEthernet0/16
interface FastEthernet0/17
interface FastEthernet0/18
interface FastEthernet0/19
interface FastEthernet0/20
interface FastEthernet0/21
interface FastEthernet0/22
interface FastEthernet0/23
interface FastEthernet0/24
switchport mode trunk
interface Vlan1
no ip address
shutdown
line con 0
line vty 0 4
login
line vty 5 15
login
end
```

[London router running-config](#)

```
London>en
London#show running-config
Building configuration...

Current configuration : 859 bytes
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
```

```
no service password-encryption
hostname London
no ip cef
no ipv6 cef
interface FastEthernet0/0
no ip address
duplex auto
speed auto
interface FastEthernet0/0.2
encapsulation dot1Q 2
ip address 192.168.2.94 255.255.255.224
interface FastEthernet0/0.3
encapsulation dot1Q 3
ip address 192.168.2.158 255.255.255.224
interface FastEthernet0/1
no ip address
duplex auto
speed auto
shutdown
interface Serial0/0
ip address 192.168.2.10 255.255.255.252
interface Serial0/1
ip address 192.168.2.13 255.255.255.252
clock rate 2000000
router rip
version 2
network 192.168.2.0
ip classless
ip flow-export version 9
line con 0
line aux 0
line vty 0 4
login
end
```

Paris router running-config

```
Paris#show running-config
Building configuration...
```

```
Current configuration : 675 bytes
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
hostname Paris
no ip cef
no ipv6 cef
```

```

interface FastEthernet0/0
ip address 192.168.2.126 255.255.255.224
duplex auto
speed auto
interface FastEthernet0/1
no ip address
duplex auto
speed auto
shutdown
interface Serial0/0
ip address 192.168.2.6 255.255.255.252
interface Serial0/1
ip address 192.168.2.14 255.255.255.252
router rip
version 2
network 192.168.2.0
ip classless
ip flow-export version 9
line con 0
line aux 0
line vty 0 4
login
end

```

Good evidence of router reports

Element 3 Vlan config

```

Switch>enable
Switch#conf t
Switch(config)#vlan 2
Switch(config-vlan)#name vlan2
Switch(config-vlan)#exit
Switch(config)#vlan 3
Switch(config-vlan)#name vlan3
Switch(config-vlan)#exit
Switch(config)#^Z
Switch#show vlan
////////////////////////////////report on vlan config////////////////////////////////
Switch#conf t
Switch(config)#int f0/2
Switch(config-if)#switchport mode access

```

```
Switch(config-if)#switchport access vlan 3
Switch(config-if)#exit
```

```
Switch(config)#int f0/3
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 3
Switch(config-if)#exit
```

```
Switch(config)#int f0/4
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 2
Switch(config-if)#exit
Switch(config)#^Z
Switch#
Switch#show vlan
////////report shows vlans with port config////////
End of VLAN configuration
```

Good evidence of Vlan and Inter-Vlan config

Inter VLAN routing

Switch config:

```
Switch#conf t
Switch(config)#int f0/1
Switch(config-if)#switchport mode trunk
Switch(config-if)#^Z
Switch#
```

```
Switch#show interface trunk
////////report shows trunk config////////
////////might have to show this again after router config////////
```

Trunk comms channel is set

Router config:

```
Router>enable
```

```
Router#conf t
```

```
Router(config)#int f0/0
```

```
Router(config-if)#no shutdown
```

```
Router(config-if)#exit
```

```
Router(config)#int f0/0
```

```
Router(config-if)#no ip address
```

```
Router(config-if)#exit
```

```
Router(config)#int f0/0.2
```

```
Router(config-subif)#encapsulation dot1Q 2 Inter-Vlan routing is set
```

```
Router(config-subif)#ip address 192.168.1.94 255.255.255.224
```

```
Router(config-subif)#no shutdown
```

```
Router(config-subif)#exit
```

```
Router(config)#int f0/0.3 Inter-Vlan routing is set
```

```
Router(config-subif)#encapsulation dot1Q 3
```

```
Router(config-subif)#ip address 192.168.1.158 255.255.255.224
```

```
Router(config-subif)#no shutdown
```

```
Router(config-subif)#exit
```

```
Router(config)#^Z
```

```
Router#show ip interfaces brie
```

```
//////////report int status for f0/0.2 and f0/0.3//////////
```

```
Router#show run
```

```
//////////running config for router//////////
```

64/100

PAGE 1

PAGE 2

PAGE 3

Text Comment. Good detailed table of contents

PAGE 4

PAGE 5

Text Comment. Good extensive table of figures

PAGE 6

Text Comment. Good comparison diagram

Text Comment. Correct citation

PAGE 7

Text Comment. OSI 7 layer model is identified

Text Comment. Good points included

Text Comment. Good points included, but the problem with broadcasting is not covered.

Text Comment. Software ports are identified and explained

PAGE 8

Text Comment. Good example

PAGE 9

PAGE 10

Text Comment. Diagram includes port allocation but no net addresses are included.

PAGE 11

Text Comment. Good evidence

PAGE 12

PAGE 13

PAGE 14

Text Comment. Static routing tables are correct

PAGE 15

Text Comment. This needs a heading

Text Comment. Good test results

PAGE 16

Text Comment. Good evidence

PAGE 17

PAGE 18

PAGE 19

Text Comment. RIP tables are correct

Text Comment. Heading needed

Text Comment. Good test results

Text Comment. Good evidence

Text Comment. Errors are identified

Text Comment. Good explanation

Text Comment. Good evidence

Text Comment. Good evidence

Text Comment. Good test with errors cleared

Text Comment. Good evidence of configuration

Text Comment. Good test showing the excluded addresses. First 10 addresses are excluded

Text Comment. Good explanation

Text Comment. Good set of router reports showing all configurations

Text Comment. Good observation. This is because the RIP routing method allows alternative routing paths to be selected automatically.

Text Comment. Requirements identified

Text Comment. London

Text Comment. Good point made

Text Comment. Excellent work. Port allocations and net addresses are identified

PAGE 27

PAGE 28

PAGE 29

Text Comment. Good work here. Address schema is identified for /28

Text Comment. Good evidence

PAGE 30

PAGE 31

Text Comment. RIP tables are correct

Text Comment. Heading needed here

Text Comment. Good test results

PAGE 32

Text Comment. Good address schema for /27

Text Comment. Good address schema for /30

PAGE 33

Text Comment. Good evidence for RIP routing for CIDR /27 and /30

PAGE 34

PAGE 35

Text Comment. Routing tables are correct

Text Comment. Heading needed

Text Comment. Good set of results

Text Comment. Additional address identified

Text Comment. Good address schema for Vlan with Inter-Vlan routing gateways

PAGE 36

Text Comment. Good evidence

PAGE 37

Text Comment. Good evidence

PAGE 38

Text Comment. The Vlan port allocation and trunk with gateways .94 and .158 is not included in this diagram.

PAGE 39

Text Comment. Good test over Vlans.

PAGE 40

Text Comment. Good points

Text Comment. Trunk gateways are configured

Text Comment. Excellent work here. Port allocation and Vlan addresses are identified

Text Comment. Good prac setup image

PAGE 41

Text Comment. This should have a heading

Text Comment. Network ping tests across Vlan from host

Text Comment. Good evidence

PAGE 42

Text Comment. Good evidence of server files in PLC

Text Comment. Good explanation of program files

Text Comment. Program blocks to drive DC motor from web browser

Text Comment. Good evidence of web server function block. This is the most important block

Text Comment. Good point

Text Comment. Good evidence of Vlan gateway net address set on PLC

Text Comment. Good test evidence

Text Comment. Good point

Text Comment. Good points made. The advantages of Vlan could have been included.

Text Comment. Limited sources used

Text Comment. Good evidence of router reports

Text Comment. Good evidence of Vlan and Inter-Vlan config

Text Comment. Trunk comms channel is set

PAGE 55

Text Comment. Inter-Vlan routing is set

Text Comment. Inter-Vlan routing is set

GRADING FORM: CSG-RUBIC

IWAN GRIFFITHS

0

RESEARCH-INFORMED LITERATURE



Research includes good points relevant to requirements. Problem with broadcast is not covered.
Encapsulation is not included.
Limited ref sources.

4/10

KNOWLEDGE AND UNDERSTANDING



E1. Diagram of networks does not include net addresses. Headings missing to identify content. There is evidence of configuration for static and dynamic functions.
Explanations of dynamic functions are good and demonstrate a good understanding. 6/10
E2. Headings missing in some parts with testing. Good set of reslts with /28 and evidence.

19/30

Vlan port allocation and gateways not included in schematic diagram.

Evaluation does not cover the significant points.

Vlan test methods are good. 6.5/10

E3. Vlan diagram includes all the details with good evidence included.

Prac is explained with good points made.

Good test methods used.

Evaluation has good points. 6.5/10

ANALYSIS



E1. test evidence is included and explained. The tests are successful and in a good order. Evaluation has good points. 3.5/5

E2. The test results prove the operation of the network for all CIDR arrangements. The VLAN is developed from the final CIDR design and tests prove the configuration. Headings missing to identify content.

Limited evaluation. 6.5/10

E3. Practical VLAN test evidence is provided and indicates the correct functioning of the network. The PLC functions are tested but with no evidence directly from the PLC for browser matching. A reasonable evaluation. 7/10

17/25

PRACTICAL APPLICATION AND DEP.



E1 - Implementation has been carried out, however address schema table evidence is missing. Testing procedure tested every device in every direction and proved successful. 3/5

E2 - Implementations for CIDR are successful.

13/20

Network was further developed for VLAN configuration. 3/5

E3 - The practical network has been successfully implemented and tested. The PLC router test evidence is included. 7/10

SKILLS FOR PROFESSIONAL PRAC.



Report is in good order with good content. Some headings missing which do not spoil the report. Good use of appendix.

11/15