

2117261

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Good extensive list of figures

Element 1

1. Introduction

Through this project, three different types of router configurations will be configured. These include, static, dynamic and DHCP. The network will include class A, B and C addressing.

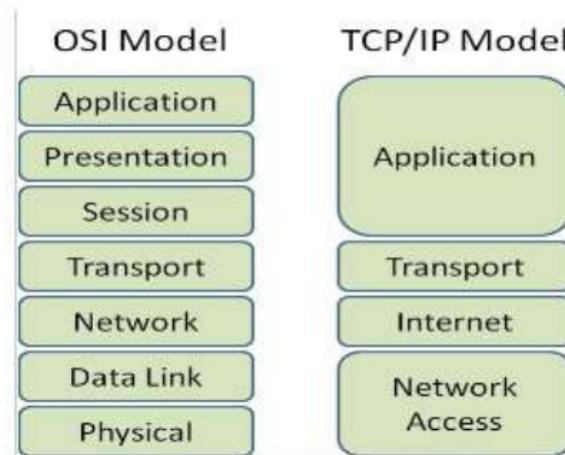
There is research into, OSI 7 layer and 4-layer models with reference to the network design, and encapsulation, broadcasting and port allocation.

The design stage includes, simplifying complex networks into three local area networks (LAN). These are then connected by two wider area networks (WAN). Static and dynamic addressing were tested. Also, DHCP addressing was implemented and tested.

Good accurate intro

2. Research

Network layers



Good image model

Figure 1 OSI 7-layer model and TCP/IP model

The TCP/IP model show how transmission between and defined computer and the internet can transpire. When networks need to interconnect and communicate, with different systems. The OSI 7-layer logic theory is used.

(Imperva, 2020)

TCP/IP	OSI
Implementation of OSI model	Reference model
Model around which Internet is developed	This is a theoretical model
Has only 4 layers	Has 7 layers
Considered more reliable	Considered a reference tool
Protocols are not strictly defined	Stricter boundaries for the protocols
Horizontal approach	Vertical approach
Combines the session and presentation layer in the application layer	Has separate session and presentation layer
Protocols were developed first and then the model was developed	Model was developed before the development of protocols
Supports only connectionless communication in the network layer	Supports connectionless and connection-oriented communication in the network layer

Figure 2 OSI/ TCP/IP comparison

Good comparison with good use of table

(Instrumentation, 2021) *Citation correct*

Above is the comparison between the two models.

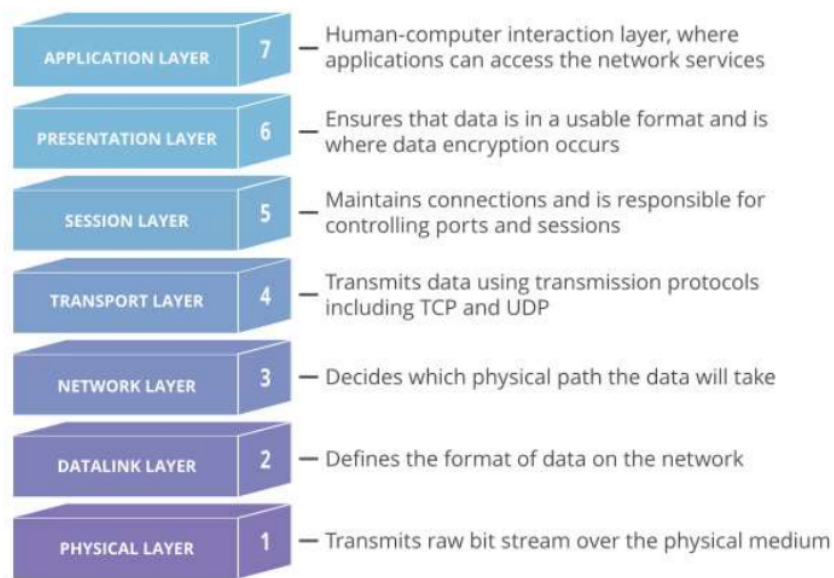


Figure 3 OSI model layers

(Cyberhoot, 2023) *Citation is correct*

The Four Layers Of the TCP/IP Model and Their Functions

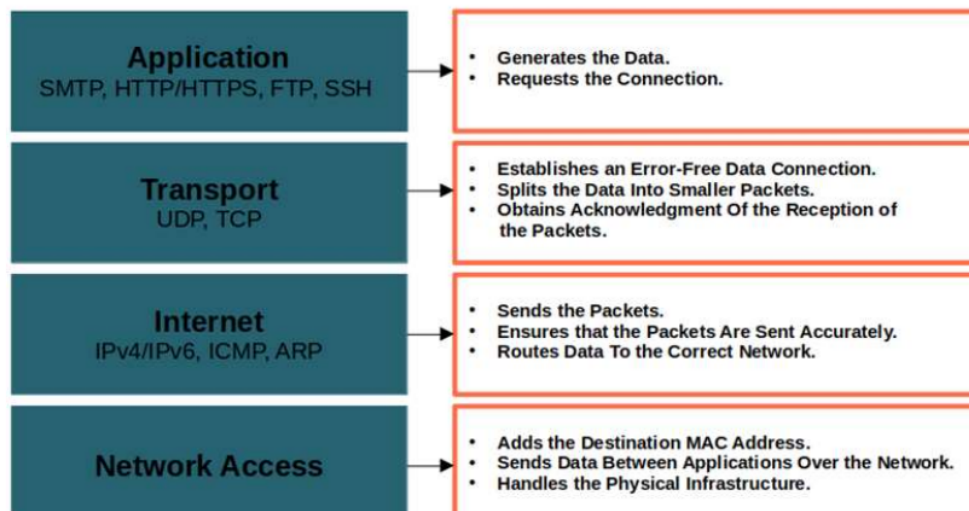


Figure 4 TCP/IP model layers

Good effort with these two model comparisons

(AVG, 2021)

Encapsulation

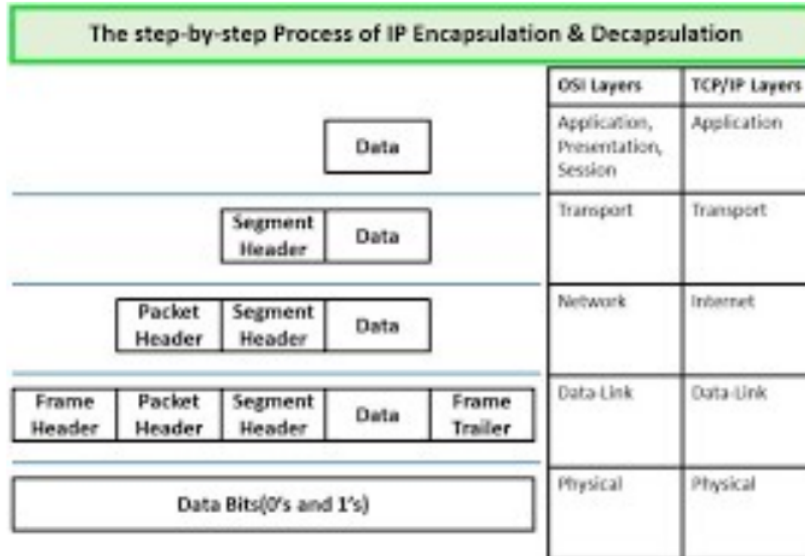


Figure 5 Encapsulation and decapsulation diagram

Relevant diagram

(Ranks, 2022)

When additional features are wanted, this can be attained by data encapsulation. This is also called data hiding. This incorporates extra information to the data. The protocol data is added to permit it to be sent through the layers of both layers. Encapsulation of information happens in the sending side. (target, 2022)

According to (ccna, 2022), "Just like with the TCP/IP layers, each OSI layer asks for services from the next lower layer. The lower layer encapsulates the higher layer's data between a header (Data Link protocols also add a trailer).

While the TCP/IP model uses terms like segment, packet and frame to refer to a data packet defined by a particular layer, the OSI model uses a different term: protocol data unit (PDU). A PDU represent a unit of data with headers and trailers for the particular layer, as well as the encapsulated data. Since the OSI model has 7 layers, PDUs are numbered from 1 to 7, with the Physical layer being the first one. For example, the term Layer 3 PDU refers to the data encapsulated at the Network layer of the OSI model."

Good points made

It should be noted that decapsulation is the receive process

Broadcasting

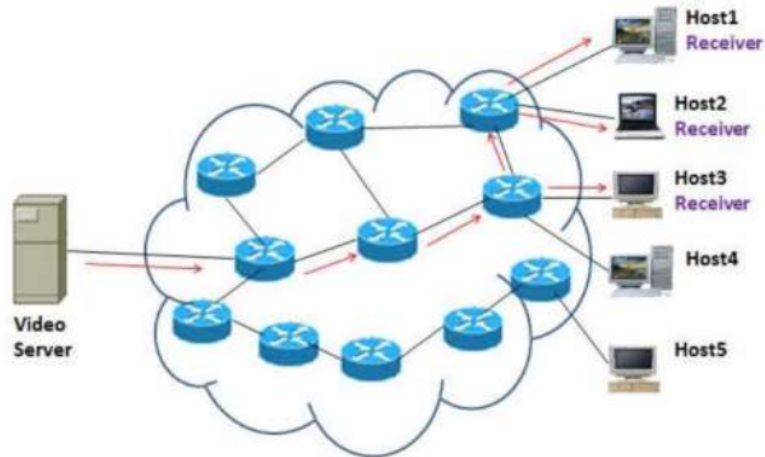


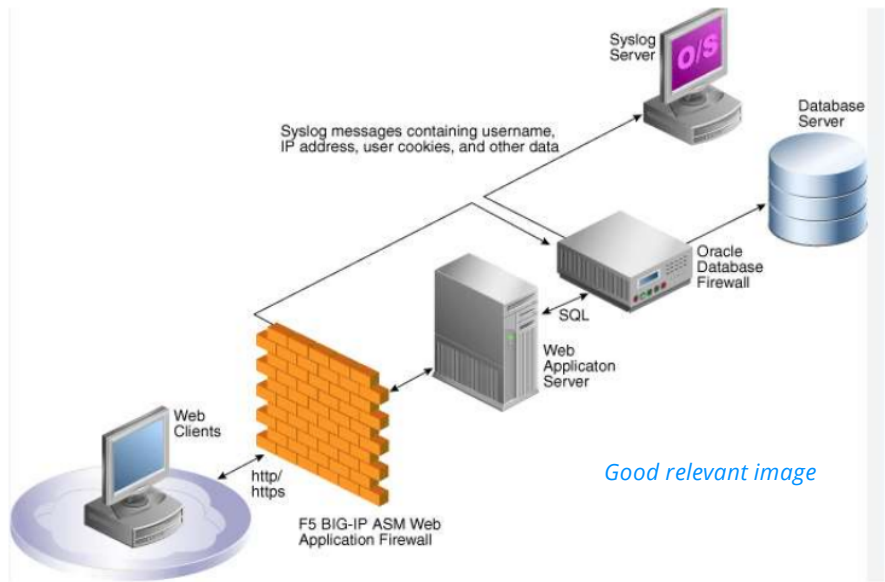
Figure 6 broadcasting diagram

(engineering, 2020)

When sending information to multiple devices through the network, broadcasting is involved. Through using address resolution protocol ARP, and internet protocol IP, and media access control MAC addresses, a handshake can be executed on a local area network LAN. Other forms of broadcasting are unicast and multicast. This allows multiple devices, or one sender and one receiver, to send and receive simultaneously. However, this may increase the broadcasting traffic, to solve this more broadcasting networks are needed. (engineering, 2020)

Good points included here. The main problem with broadcasting is not covered.

Port allocation



Good relevant image

Figure 7 Port allocation diagram

(Johanlouwers, 2023)

	Port allocation	
Ports	Port ID from	Port ID to
Well known	0	1023
Registered	1024	49151
Private, dynamic or ephemeral.	49152	65535

This table is very relevant

The well-known ports are randomly assigned. Those network processes that deliver system services used more regularly use these ports. The listed ports are allocated by the requesting body, these are the IANA, the internet assigned numbers authority. Private, dynamic or ephemeral ports are used are either automatic allocated ports or temporary ports. These are also allocated by the IANA.

(Stationx, 2020)

Good points included in the explanation

Research is good and includes significant points. There are significant points and application examples that could have been included.

3. Design requirements

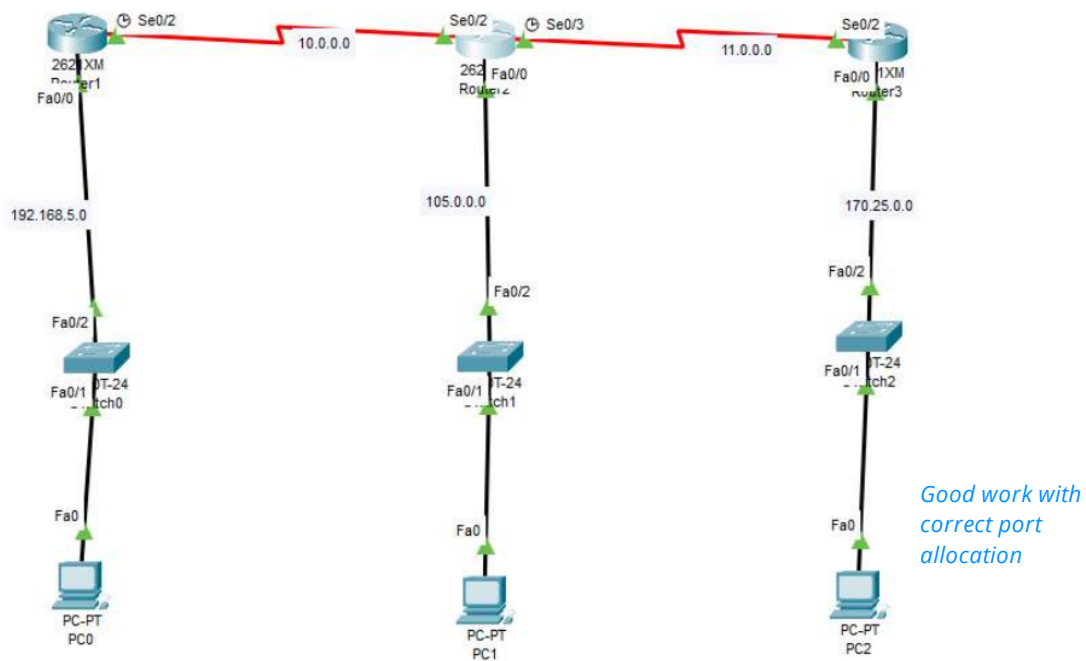


Figure 8 Network setup

Above is the three LAN's created. They are connected by two WAN's. For every router there is a PC device, which all connected by a network switch. The IP of the LAN's are configured into three classes A, B, and C.

Good explanation

Below the addressing schemes for the three LAN networks with unique addresses assigned can be seen.

Addressing scheme

Class C: 1

192.168.5.0 – net address

192.168.5.254 – gateway address

192.168.5.1 – initial device address

Class A: 2

105.0.0.0 – net address

105.0.0.254 – gateway address

105.0.0.1 – initial device address

Class B: 3

170.25.0.0 – net address

170.25.0.254 – gateway address

170.25.0.1 – initial device address

Routers:

R0 – 10.0.0.1

R1- 10.0.0.2 11.0.0.1

R3- 11.0.0.2

Excellent work

4. Implementation

Static routing

Static routing is used to connect to specific networks. The figures below include the static routing for routers 1,2, and 3. These are network types A, B, and C.

Network Address
105.0.0.0/8 via 10.0.0.2
170.25.0.0/16 via 10.0.0.2

Good evidence provided

Figure 11 Static routing for router 1

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

```
C 10.0.0.0/8 is directly connected, Serial0/2
S 105.0.0.0/8 [1/0] via 10.0.0.2
S 170.25.0.0/16 [1/0] via 10.0.0.2
C 192.168.5.0/24 is directly connected, FastEthernet0/0
```

Figure 12 Router 1 IP route

Network Address
192.168.5.0/24 via 10.0.0.1
170.25.0.0/16 via 11.0.0.2

Good evidence

Figure 13 Static routing for router 2

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

```
C 10.0.0.0/8 is directly connected, Serial0/2
C 11.0.0.0/8 is directly connected, Serial0/3
C 105.0.0.0/8 is directly connected, FastEthernet0/0
S 170.25.0.0/16 [1/0] via 11.0.0.2
S 192.168.5.0/24 [1/0] via 10.0.0.1
```

Figure 14 Router 2 IP route

Network Address

105.0.0.0/8 via 11.0.0.1

192.168.5.0/24 via 11.0.0.1

Good evidence

Figure 15 Static routing for router 3

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

```
C 11.0.0.0/8 is directly connected, Serial0/2
S 105.0.0.0/8 [1/0] via 11.0.0.1
C 170.25.0.0/16 is directly connected, FastEthernet0/0
S 192.168.5.0/24 [1/0] via 11.0.0.1
```

Figure 16 Router 3 IP route

Good evidence given for static routing implementation via the tables

Dynamic routing

Dynamic routing is used when the existing settings of the network router, sends or forwards the information by a differed route or set destination. Below is the dynamic routing for routers 1, 2, and 3.

Good valid point

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#ver 2
Router(config-router)#net 192.168.5.0
Router(config-router)#net 10.0.0.0
Router(config-router)#net 105.0.0.0
Router(config-router)#^Z
^
% Invalid input detected at '^' marker.

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

Figure 17 Router 1 dynamic routing

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#ver 2
Router(config-router)#net 105.0.0.0
Router(config-router)#net 10.0.0.0
Router(config-router)#net 11.0.0.0
Router(config-router)#net 192.168.5.0
Router(config-router)#net 170.25.0.0
Router(config-router)#^Z
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
?Bad filename
%Error parsing filename (Bad file number)
Router#
```

Figure 18 Router 2 dynamic routing

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#ver 2
Router(config-router)#net 170.25.0.0
Router(config-router)#net 11.0.0.0
Router(config-router)#net 105.0.0.0
Router(config-router)#^Z
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
?Bad filename
%Error parsing filename (Bad file number)
Router#
```

Good evidence of configuration

Figure 19 Router 3 dynamic routing

Routing Table for Router1				
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	105.0.0.0/8	---	10.0.0.2	1/0
S	170.25.0.0/16	---	10.0.0.2	1/0
C	192.168.5.0/24	FastEthernet0/0	---	0/0

Figure 20 Router 1 routing table

Routing Table for Router2				
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	105.0.0.0/8	FastEthernet0/0	---	0/0
S	170.25.0.0/16	---	11.0.0.2	1/0
S	192.168.5.0/24	---	10.0.0.1	1/0

Figure 21 Router 2 routing table

Routing Table for Router3				
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	105.0.0.0/8	---	11.0.0.1	1/0
C	170.25.0.0/16	FastEthernet0/0	---	0/0
S	192.168.5.0/24	---	11.0.0.1	1/0

Figure 22 Router 3 routing table

Tables are correct with all networks present in the correct tables

DHCP (dynamic addressing)

Below is the DHCP addressing for routers 1, 2, and 3. Router below is configured as the control, and the other two are configured using helper addresses.

Dynamic addressing across networks using DHCP:

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip dhcp pool net1
Router(dhcp-config)#net 192.168.5.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.5.254
Router(dhcp-config)#dns-server 192.168.5.254
Router(dhcp-config)#exit
Router(config)#ip dhcp pool net2
Router(dhcp-config)#net 105.0.0.0 255.0.0.0
Router(dhcp-config)#default-router 105.0.0.254
Router(dhcp-config)#dns-server 105.0.0.254
Router(dhcp-config)#exit
Router(config)#ip dhcp pool net3
Router(dhcp-config)#net 170.25.0.0 255.255.0.0
Router(dhcp-config)#default-router 170.25.0.254
Router(dhcp-config)#dns-server 170.25.0.254
Router(dhcp-config)#exit
Router(config)#
```

Good evidence of configuration

Figure 23 Dynamic addressing across networks using DHCP

Without helper address

IP Configuration	
☒ DHCP	☐ Static
DHCP request successful.	
IPv4 Address	192.168.5.1
Subnet Mask	255.255.255.0
Default Gateway	192.168.5.254
DNS Server	192.168.5.254

Good test

Figure 24 Dynamic address configuration for PC0

IP Configuration	
☒ DHCP	☐ Static
DHCP failed. APIPA is being used.	
IPv4 Address	169.254.212.211
Subnet Mask	255.255.0.0
Default Gateway	0.0.0.0
DNS Server	0.0.0.0

Error is identified

Figure 25 Dynamic address configuration for PC1

IP Configuration

☒ DHCP ☐ Static DHCP failed. APIPA is being used.

IPv4 Address 169.254.107.185

Subnet Mask 255.255.0.0

Default Gateway 0.0.0.0

DNS Server 0.0.0.0

Error is identified

Figure 26 Dynamic address configuration for PC2

Configure DHCP helper address for Router2 and Router3 for cross network comms:

```
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int f0/0
Router(config-if)#ip helper-address 10.0.0.1
Router(config-if)#exit
Router(config)#
```

Figure 27 DHCP helper address PC1

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int f0/0
Router(config-if)#ip helper-address 10.0.0.1
^
% Invalid input detected at '^' marker.
Router(config-if)#ip helper-address 10.0.0.1
Router(config-if)#exit
Router(config)#
```

Helper addresses are configured

Figure 28 DHCP helper address PC2

☒ DHCP ☐ Static

IP Address 105.0.0.1

Subnet Mask 255.0.0.0

Default Gateway 105.0.0.254

DNS Server 105.0.0.254

Good test

Figure 29 PC 1 helper address

☒ DHCP ☐ Static	
IP Address	170.25.0.1
Subnet Mask	255.255.0.0
Default Gateway	170.25.0.254
DNS Server	170.25.0.254

Good test

Figure 30 PC 0 helper address

Address exclusion configuration using Router1 as control device:

```

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip dhcp exclude-address 192.168.5.10
      ^
% Invalid input detected at '^' marker.

Router(config)#ip dhcp exclude-address 192.168.5.10
      ^
% Invalid input detected at '^' marker.

Router(config)#ip dhcp excluded-address 192.168.5.10
Router(config)#ip dhcp excluded-address 105.0.0.1 105.0.0.10
Router(config)#ip dhcp excluded-address 192.168.5.1 192.168.5.10
Router(config)#ip dhcp excluded-address 170.25.0.1 170.25.0.10
Router(config)#
  
```

Exclusions are configured

Figure 31 Address exclusion configuration

IP Configuration	
☒ DHCP ☐ Static	
IPv4 Address	192.168.5.11
Subnet Mask	255.255.255.0
Default Gateway	192.168.5.254
DNS Server	192.168.5.254

Test showing result of exclusions

Figure 32 Excluded address for PC 0

IP Configuration	
☒ DHCP	☐ Static
IPv4 Address	105.0.0.11
Subnet Mask	255.0.0.0
Default Gateway	105.0.0.254
DNS Server	105.0.0.254

Good test

Figure 33 Excluded address for PC 1

IP Configuration	
☒ DHCP	☐ Static
IPv4 Address	170.25.0.11
Subnet Mask	255.255.0.0
Default Gateway	170.25.0.254
DNS Server	170.25.0.254

Good test

Figure 34 Excluded address for PC 2

5. Testing and analysis

Static

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	PC0	PC2	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC1	PC2	ICMP		0.000	N	2	(edit)	(delete)
	Successful	PC1	PC0	ICMP		0.000	N	3	(edit)	(delete)
	Successful	PC2	PC1	ICMP		0.000	N	4	(edit)	(delete)
	Successful	PC2	PC0	ICMP		0.000	N	5	(edit)	(delete)

Good set of test results that prove all the configurations are correct

Figure 35 Static routing testing

These tests include communications for the devices in both directions for the static routing. All tests were successful. The test used is the packet tracer.

Dynamic

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	PC0	PC2	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC1	PC2	ICMP		0.000	N	2	(edit)	(delete)
	Successful	PC1	PC0	ICMP		0.000	N	3	(edit)	(delete)
	Successful	PC2	PC1	ICMP		0.000	N	4	(edit)	(delete)
	Successful	PC2	PC0	ICMP		0.000	N	5	(edit)	(delete)

Good set of results in both directions

Figure 36 Dynamic routing testing

These tests include communications for the devices in both directions for the static routing. All tests were successful. The test used is the packet tracer.

Routing tests for DHCP are in appendix.

DHCP test is indicated above and the reports in appendix show the configured addresses

6. Evaluation

The projects requirement has been encountered. The three LAN's have been connected by two WAN's, with different IP. Displaying the three classes of network, A, B, and C. The static routing was completed and was successful as it was tested using the packet tracer. Every router was configured manually. To quicken the routing, dynamic routing was configured. This also included manual configuring from the terminal. The IP address for the routers was found. Then DHCP routing was configured. This allowed the devices to be allocated IP addresses automatically. After all routing types, the routing was tested and successful. The application lines up with research.

Good evaluation that sets the theme for the next stage E2

Element 2

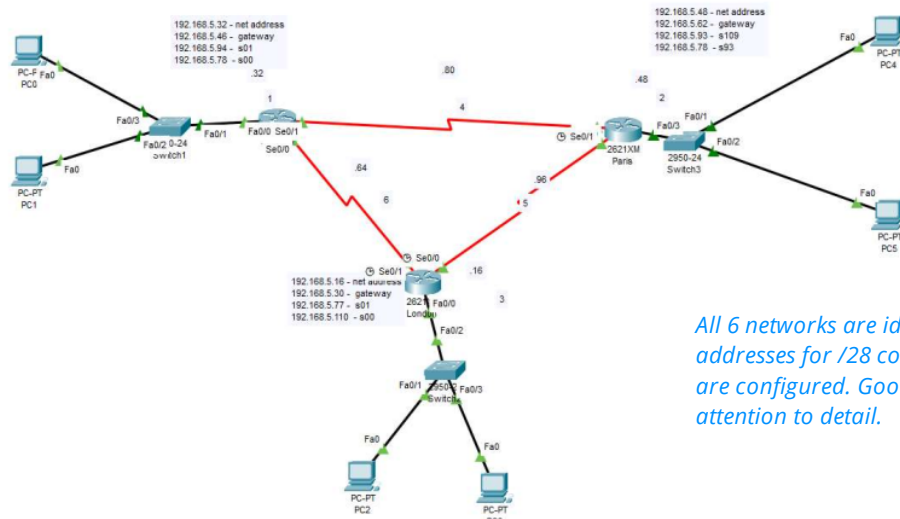
1. Introduction

This element moves on from element one. A new network was built with three LAN's again connected by two WAN's again. CIDR/28 which is classless inter domain routing was used. The routing method uses RIP routing and implemented in WAN's. Then, CIDR/27 and CIDR/30 and VLAN, are also applied. With VLAN's letting systems to work as one broadcast domain.

Three WAN's this time, but same number of routers

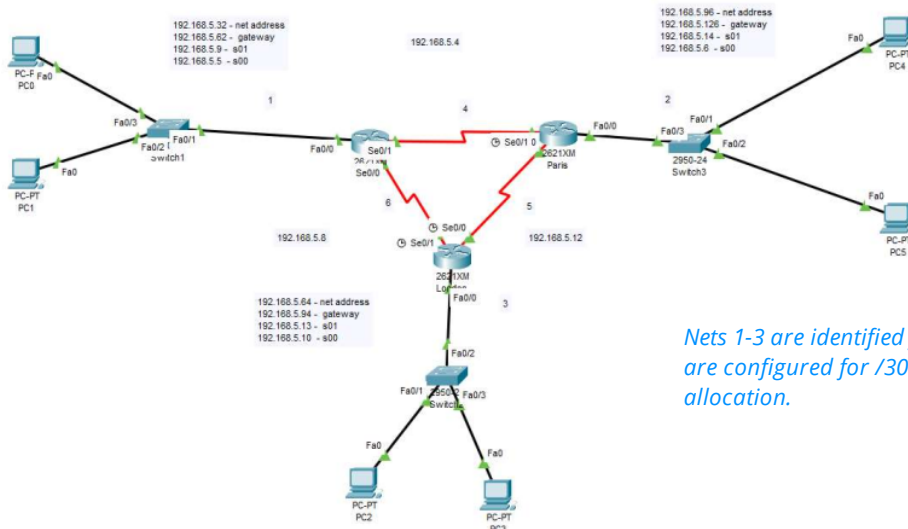
2. System configuration

CIDR/28



All 6 networks are identified with net addresses for /28 configuration. All ports are configured. Good work here with attention to detail.

CIDR/27 CIDR/30



Nets 1-3 are identified for /27 and nets 4-6 are configured for /30 with correct port allocation.

Good effort here to understand the different configurations.

CIDR/28

LAN Networks 1, 2 and 3

CIDR/28 London Network 3 Lan address 16 (192.168.5.16)

Below are the addresses for the CIDR/28 subnetting.

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 16	0	0	0	1	0	0	0	1	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	Fast Ethernet 0/0 addr 30
Broadcast	0	0	0	1	1	1	1	1	Broadcast 31

CIDR/28 Rome Network 1 Lan address 32 (192.168.5.32)

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
Broadcast	0	0	1	0	1	1	1	1	Broadcast 47

CIDR/28 Paris Network 2 Lan address 48 (192.168.5.48)

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

Good work with address configuraion for nets

Below are the addresses for the CIDR/28 WAN subnetting.

WAN Networks 4, 5 and 6

London – Rome Network 6 Network address 64 (192.168.5.64)

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 (192.168.5.80)

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 (192.168.5.96)

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

*Excellent work
here*

3. Implementation

Subnetting RIP routing CIDR/28

```

Rome
Physical Config CLI Attributes
IOS Command Line Interface
2 Low-speed serial(sync/async) network interface(s)
32K bytes of non-volatile configuration memory.
63488K bytes of ATA CompactFlash (Read/Write)
Press RETURN to get started!

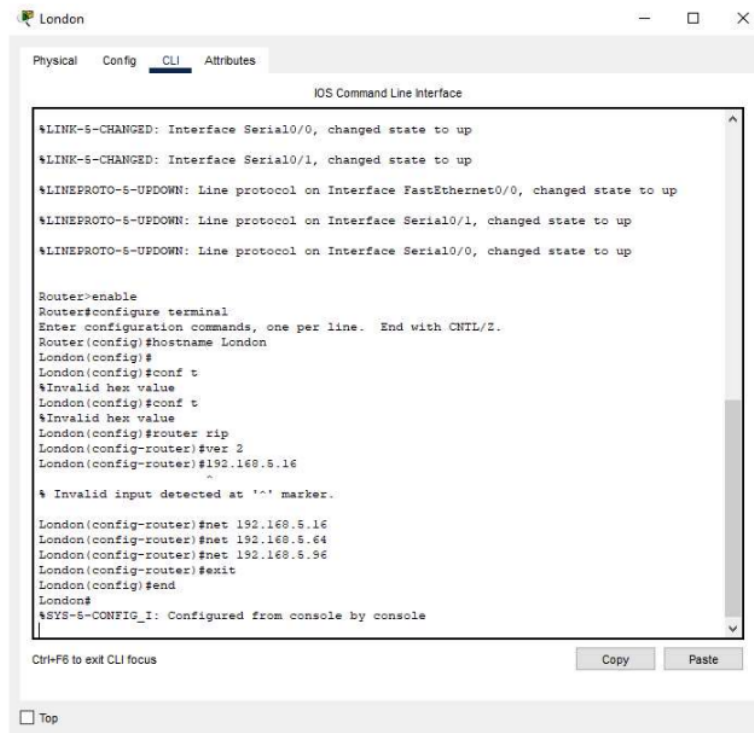
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
%LINK-5-CHANGED: Interface Serial0/0, changed state to up
%LINK-5-CHANGED: Interface Serial0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed state to up

Router>enable
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#hostname Rome
Rome(config)#
Rome(config)#router rip
Rome(config-router)#ver 2
Rome(config-router)#192.168.5.32

% Invalid input detected at '^' marker.

Rome(config-router)#net 192.168.5.32
Rome(config-router)#net 192.168.5.64
Rome(config-router)#net 192.168.5.80
Rome(config-router)#exit
Rome(config)#
  
```

Figure 37 Dynamic routing for Rome router



London

Physical Config CLI Attributes

IOS Command Line Interface

```
%LINK-5-CHANGED: Interface Serial0/0, changed state to up
%LINK-5-CHANGED: Interface Serial0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed state to up

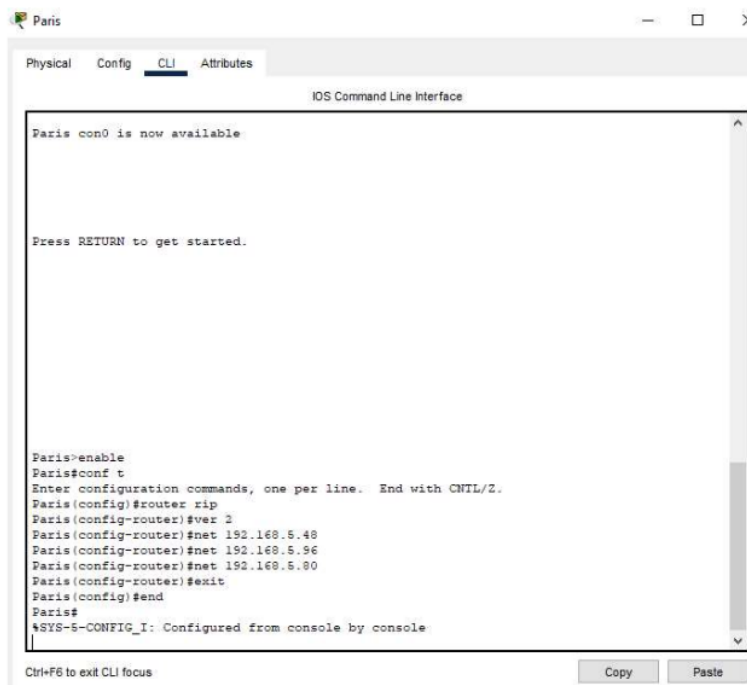
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname London
London(config)#
London(config)#conf t
%Invalid hex value
London(config)#conf t
%Invalid hex value
London(config)#router rip
London(config-router)#ver 2
London(config-router)#192.168.5.16
London(config-router)#net 192.168.5.16
London(config-router)#net 192.168.5.64
London(config-router)#net 192.168.5.96
London(config-router)#exit
London(config)#end
London#
%SYS-5-CONFIG_I: Configured from console by console
```

Ctrl+F6 to exit CLI focus

Copy Paste

☐ Top

Figure 38 Dynamic routing for London router



Paris

Physical Config CLI Attributes

IOS Command Line Interface

```
Paris con0 is now available

Press RETURN to get started.

Paris>enable
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 192.168.5.48
Paris(config-router)#net 192.168.5.96
Paris(config-router)#net 192.168.5.80
Paris(config-router)#exit
Paris(config)#end
Paris#
%SYS-5-CONFIG_I: Configured from console by console
```

Ctrl+F6 to exit CLI focus

Copy Paste

Figure 39 Dynamic routing for Paris router

Good evidence of configuration

Below are the routing table after completing the CIRD/28 routing. All of the /28 addresses can be seen.

Routing Table for Rome

Type	Network	Port	Next Hop IP	Metric
R	192.168.5.16/28	Serial0/0	192.168.5.77	120/1
C	192.168.5.32/28	FastEthernet0/0	---	0/0
R	192.168.5.48/28	Serial0/1	192.168.5.93	120/1
C	192.168.5.64/28	Serial0/0	---	0/0
C	192.168.5.80/28	Serial0/1	---	0/0
R	192.168.5.96/28	Serial0/0	192.168.5.77	120/1

Figure 40 Routing table for Rome

Routing Table for London

Type	Network	Port	Next Hop IP	Metric
C	192.168.5.16/28	FastEthernet0/0	---	0/0
R	192.168.5.32/28	Serial0/1	192.168.5.78	120/1
R	192.168.5.48/28	Serial0/0	192.168.5.109	120/1
C	192.168.5.64/28	Serial0/1	---	0/0
R	192.168.5.80/28	Serial0/0	192.168.5.109	120/1
R	192.168.5.80/28	Serial0/1	192.168.5.78	120/1

Figure 41 Routing table for London

Routing Table for Paris

Type	Network	Port	Next Hop IP	Metric
R	192.168.5.16/28	Serial0/0	192.168.5.110	120/1
R	192.168.5.32/28	Serial0/1	192.168.5.94	120/1
C	192.168.5.48/28	FastEthernet0/0	---	0/0
R	192.168.5.64/28	Serial0/0	192.168.5.110	120/1
R	192.168.5.64/28	Serial0/1	192.168.5.94	120/1
C	192.168.5.80/28	Serial0/1	---	0/0

Routing tables are correct

Figure 42 Routing table for Paris

CIDR/27 and CIDR/30

Below are the addresses for the CIDR/27 and CIDR/30 subnetting.

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 Paris

Good work

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 work with this section

Subnetting RIP routing CIDR/27 CIDR/30

Below is the CLI for the routing, the command line interface allows the routing to be implemented.

```
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 192.168.5.32
Rome(config-router)#net 192.168.5.8
Rome(config-router)#net 192.168.5.4
Rome(config-router)#exit
Rome(config)#
```

Figure 43 RIP routing for Rome

```
London(config)#router rip
London(config-router)#ver 2
London(config-router)#net 192.168.5.64
London(config-router)#net 192.168.5.12
London(config-router)#net 192.168.5.8
London(config-router)#exit
London(config)#
```

```
London con0 is now available
```

Figure 44 RIP routing for London

```
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 192.168.5.96
Paris(config-router)#net 192.168.5.12
Paris(config-router)#net 192.168.5.4
Paris(config-router)#exit
Paris(config)#
```

Good evidence of configuration

Figure 45 RIP routing for Paris

CIDR typo error

Below are the routing table after completing the CIRD/27 CIRD/230 routing. All of the /27 and the /30 addresses can be seen.

Routing Table for London

Type	Network	Port	Next Hop IP	Metric
R	192.168.5.4/30	Serial0/0	192.168.5.14	120/1
R	192.168.5.4/30	Serial0/1	192.168.5.9	120/1
C	192.168.5.8/30	Serial0/1	---	0/0
C	192.168.5.12/30	Serial0/0	---	0/0
R	192.168.5.32/27	Serial0/1	192.168.5.9	120/1
C	192.168.5.64/27	FastEthernet0/0	---	0/0

Figure 46 Routing table for London

Routing Table for Rome

Type	Network	Port	Next Hop IP	Metric
C	192.168.5.4/30	Serial0/1	---	0/0
C	192.168.5.8/30	Serial0/0	---	0/0
R	192.168.5.12/30	Serial0/0	192.168.5.10	120/1
R	192.168.5.12/30	Serial0/1	192.168.5.6	120/1
C	192.168.5.32/27	FastEthernet0/0	---	0/0
R	192.168.5.64/27	Serial0/0	192.168.5.10	120/1

Figure 47 Routing table for Rome

Routing Table for Paris

Type	Network	Port	Next Hop IP	Metric
C	192.168.5.4/30	Serial0/1	---	0/0
R	192.168.5.8/30	Serial0/0	192.168.5.13	120/1
R	192.168.5.8/30	Serial0/1	192.168.5.5	120/1
C	192.168.5.12/30	Serial0/0	---	0/0
R	192.168.5.32/27	Serial0/1	192.168.5.5	120/1
R	192.168.5.64/27	Serial0/0	192.168.5.13	120/1

Good config evidence

Figure 48 Routing table for Paris

VLAN

VLAN is used to send data and to be broadcast across systems. To reduce broadcasting traffic VLAN's are used. As in the exact domain, the information broadcast will be received by every device. Doing all of this whilst being able to have security options and protocols.

This is a good point, Vlan's do offer security

4. 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

Excellent work here. The extra address (158) has been added for the additional gateway on the trunk network

London Router – FastEthernet 0/0.1 ip address 192.168.30.94 255.255.255.224

London Router – FastEthernet 0/0.2 ip address 192.168.30.158 255.255.255.224

London Switch – FastEthernet 0/24 – linked to London Router with encapsulation vlan 2 and vlan 3

London Switch – FastEthernet 0/2 – set as vlan 2 linked to PC1 London

London Switch – FastEthernet 0/3 – set as vlan 3 linked to PC2 London

Below is the IP interface, which confirms the implementation of the VLAN

```
---
London#show ip int bri
Interface      IP-Address      OK? Method Status      Protocol
FastEthernet0/0 unassigned      YES manual up          up
FastEthernet0/0.2 192.168.5.94    YES manual up          up
FastEthernet0/0.3 192.168.5.158   YES manual up          up
FastEthernet0/1    unassigned      YES unset  administratively down down
Serial0/0         192.168.5.13    YES manual up          up
Serial0/1         192.168.5.10    YES manual up          up
London#
```

Good evidence showing the inter Vlan routing for gateways .94 and .158

Figure 49 IP interface

4. Testing and analysis

CIDR/28 test table

On the conclusion of the CIDR/28 implantation. The system was tested. Below this can be seen. All test came back successfully. The packet tracer was again used for the testing.



The screenshot shows a 'PDU List Window' with a table of test results. The table has columns: Fire, Last Status, Source, Destination, Type, Color, Time(sec), Periodic, Num, Edit, and Delete. There are five rows of data, all with 'Successful' status and 'ICMP' type.

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	PC4	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC4	PC0	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC3	PC5	ICMP		0.000	N	2	(edit)	(delete)
	Successful	PC5	PC3	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 set of test results

Figure 50 CIDR/28 test table

CIDR/27 CIDR/30 test table

On the conclusion of the CIDR/27 CIDR/30 implantation. The system was tested. Below this can be seen. All test came back successfully. The packet tracer was again used for the testing.



The screenshot shows a 'PDU List Window' with a table of test results. The table has columns: Fire, Last Status, Source, Destination, Type, Color, Time(sec), Periodic, and Num. There are five rows of data, all with 'Successful' status and 'ICMP' type.

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num
	Successful	PC3	PC5	ICMP		0.000	N	0
	Successful	PC4	PC2	ICMP		0.000	N	1
	Successful	PC1	PC2	ICMP		0.000	N	2
	Successful	PC3	PC0	ICMP		0.000	N	3
	Successful	PC0	PC4	ICMP		0.000	N	4
	Successful	PC5	PC1	ICMP		0.000	N	5

Good set of test results

Figure 51 CIDR/27 30 test table

VLAN test table

On the conclusion of the VLAN implantation. The system was tested. Below this can be seen. All test came back successfully. The packet tracer was again used for the testing.



The screenshot shows a 'PDU List Window' with a table of test results. The table has columns: Fire, Last Status, Source, Destination, Type, Color, Time(sec), Periodic, Num, Edit, and Delete. There are two rows of data, both with 'Successful' status and 'ICMP' type.

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

Good test

Using the ping command this proves the VLAN circuits. The test was conducted from two PC's.

```

C:\>PING 192.168.5.97

Pinging 192.168.5.97 with 32 bytes of data:

Reply from 192.168.5.97: bytes=32 time=12ms TTL=126
Reply from 192.168.5.97: bytes=32 time=4ms TTL=126
Reply from 192.168.5.97: bytes=32 time=5ms TTL=126
Reply from 192.168.5.97: bytes=32 time=8ms TTL=126

Ping statistics for 192.168.5.97:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 4ms, Maximum = 12ms, Average = 7ms

C:\>

```

Figure 52 London to Paris

```

C:\>PING 192.168.5.129

Pinging 192.168.5.129 with 32 bytes of data:

Reply from 192.168.5.129: bytes=32 time=7ms TTL=126
Reply from 192.168.5.129: bytes=32 time=8ms TTL=126
Reply from 192.168.5.129: bytes=32 time=9ms TTL=126
Reply from 192.168.5.129: bytes=32 time=18ms TTL=126

Ping statistics for 192.168.5.129:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 7ms, Maximum = 18ms, Average = 10ms

C:\>

```

Good test across Vlan's

Figure 53 Rome to London

5. Evaluation

The projects requirement has been encountered. The three LAN's have been connected by two WAN's, with different IP. From using classless inter domain routing and VLAN's, the project was successful as it was tested and proven. Using these methods, the necessary IP addresses were created. All CIDR methods used version two of the RIP routing. This then allowed the gateway to be found. The both methods found the applied routes using the show IP route.

The VLAN method was confirmed by using the packet tracer application and was successful and was further confirmed by using the ping application to ping across two PC's, sending and receiving a packet of data.

All stages were implemented and tested successfully.

Three

Good point

Good evaluation

Element 3

1. Introduction

This element carry's on from element two. There was one local area network, and the other two PC's were configured to be the network terminal and another to be the PLC terminal. VLAN's were implemented over the LAN. As the system is configured, the Siemens website server was constructed, over the WAN. *Point is made*

2. System configuration requirements

Below the system topology diagram can be seen. From using the London switch, the VLAN system was configured. The system was implemented by using a Siemens PLC, the Cisco router, two PC's and a Cisco switch.



Good image of prac setup

Figure 54 System setup

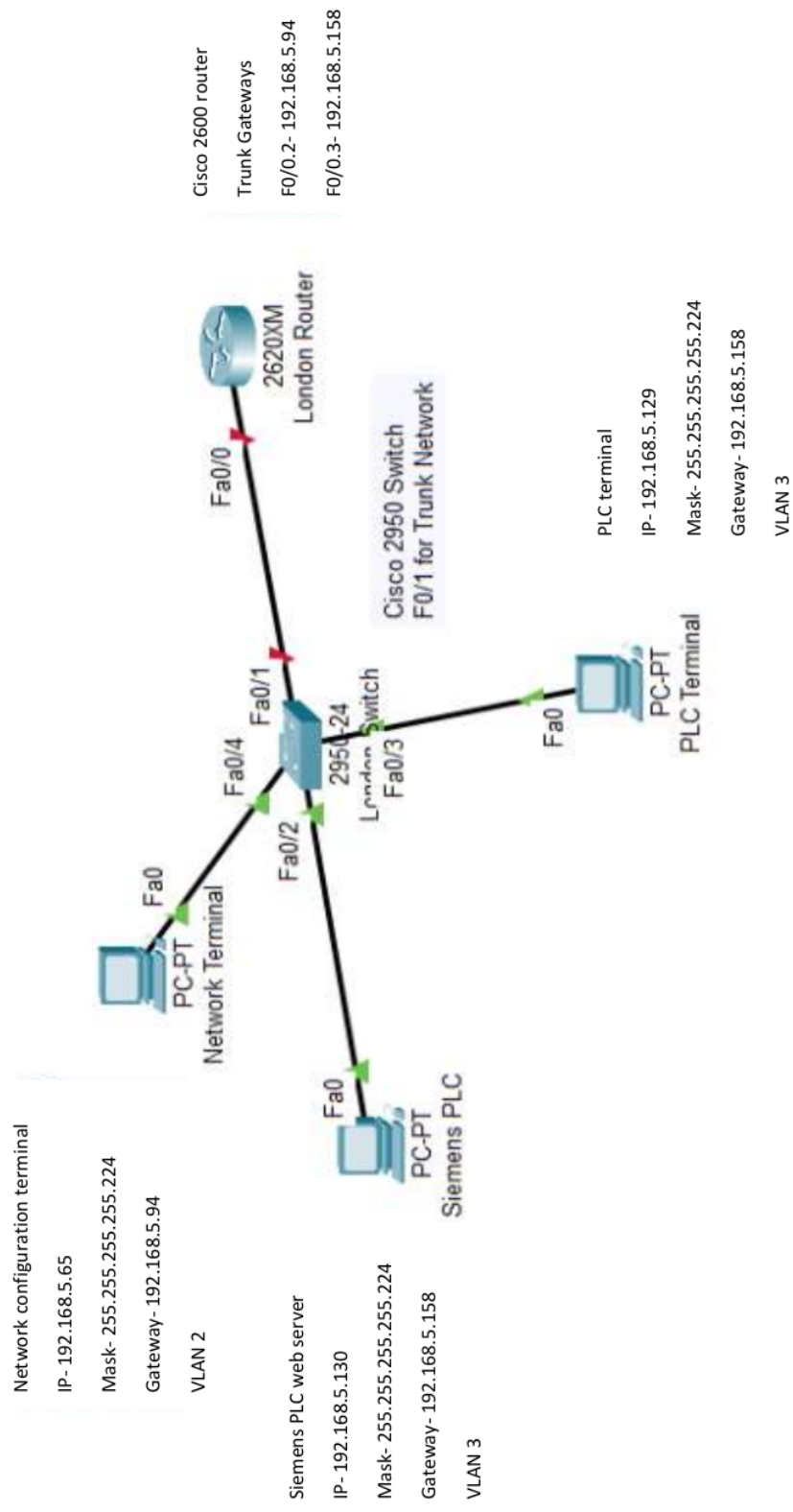


Figure 55 System topology

Excellent work with this topology and port allocation

3. Implementation

Siemens web server

Activate the web server for the PLC

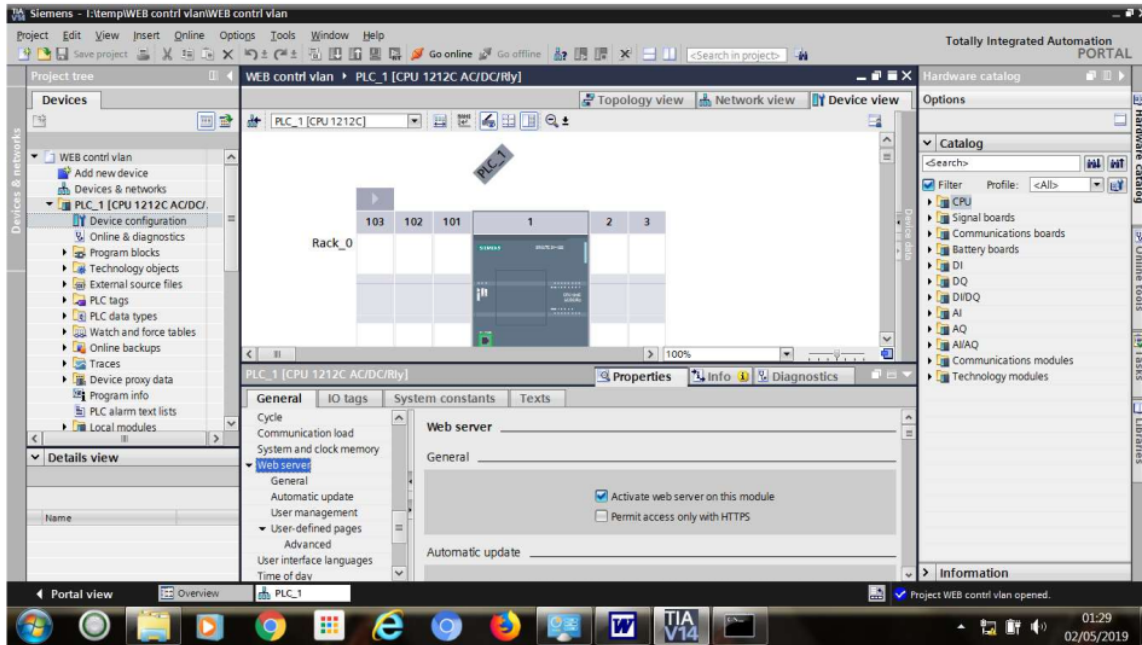


Figure 56 Web server activated

Good evidence of web server activation

Add the file extensions for the web program

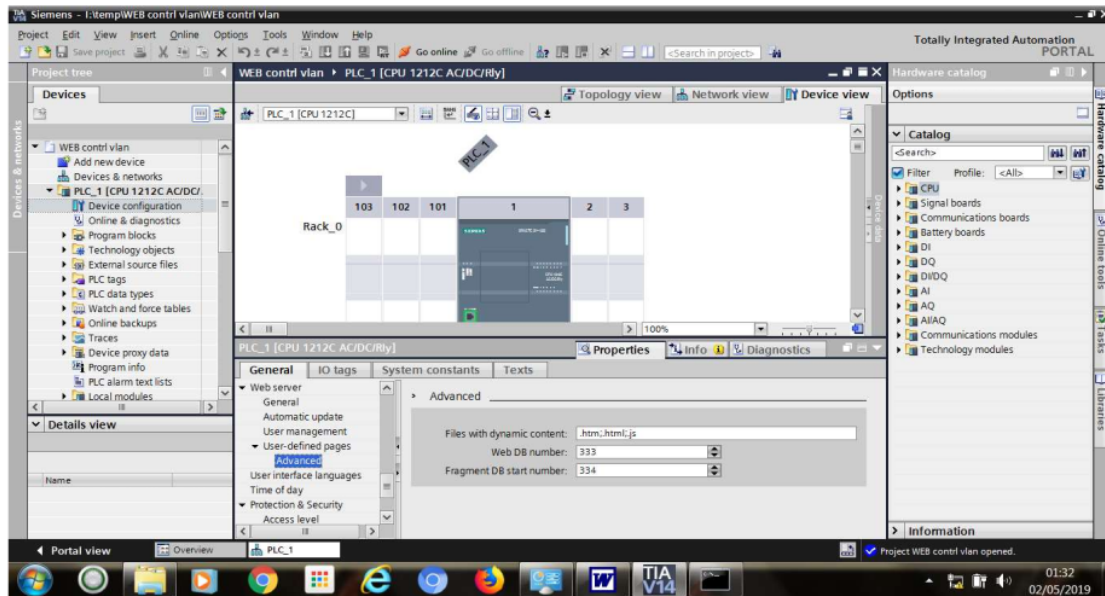


Figure 57 File extensions

Here the file extensions are .html, .htm and .js. Other file extensions can be .json. HTML – Hypertext, mark-up Language HTM – Allowable short version of HTML. Both extensions are permitted. .js – JavaScript (jQuery, ajax). json – an extension library of JavaScript The .js generally is not accepted on PLC models lower than 1500. Therefore the .js program can be embedded in the HTML or HTM using .json. Graphic extensions can be used also such as .png and .gif and can be embedded in the ajax scripts. The LED's are .png images.
Default tags created.

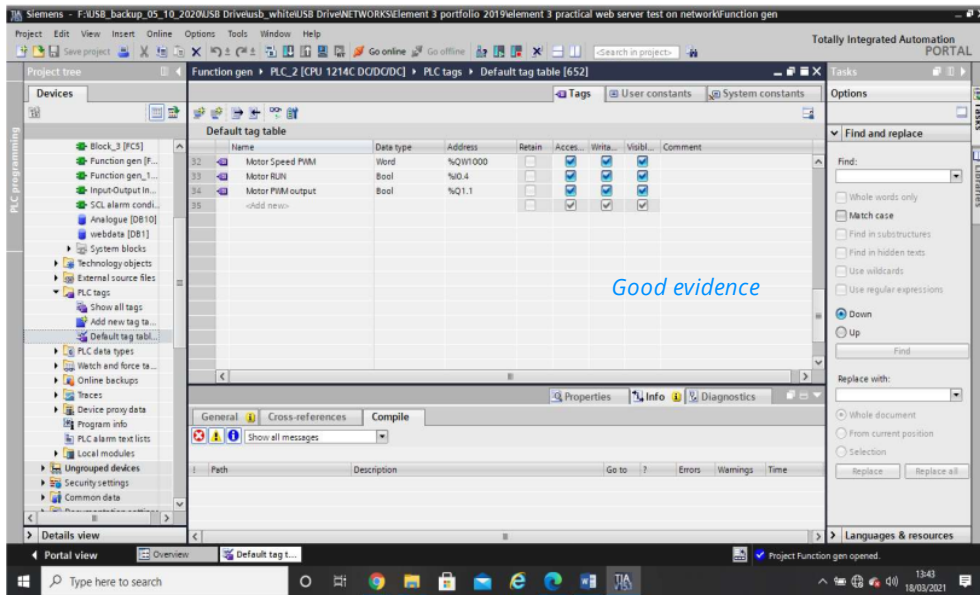


Figure 58 Default tags

Create the tags in the web data [DB1] data block:

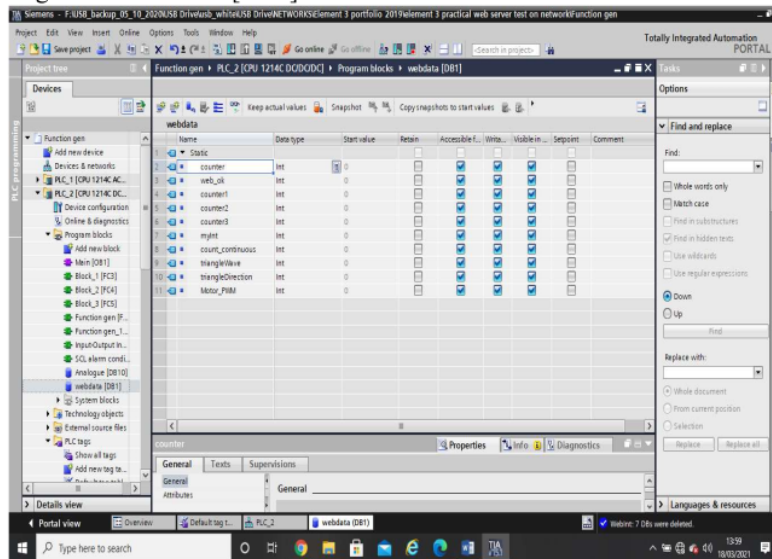


Figure 59 Data block

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

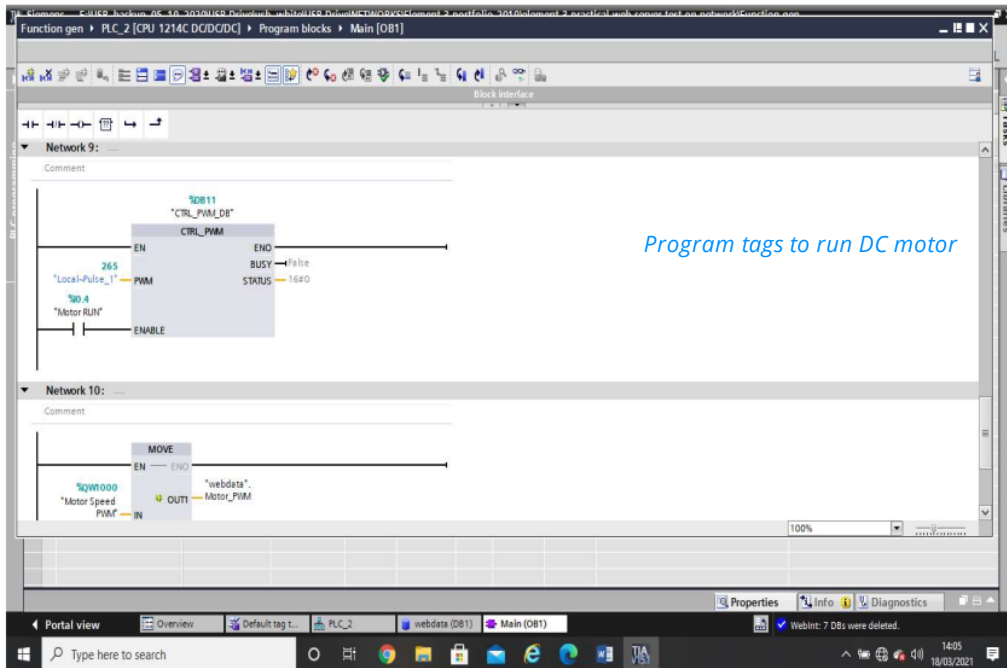


Figure 60 PLC PWM function

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

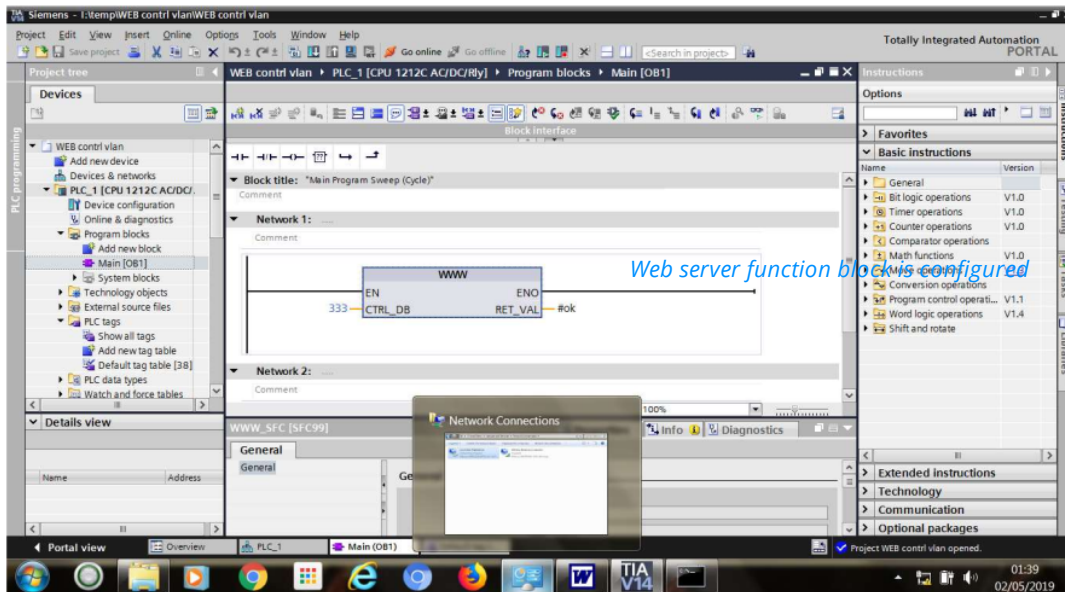


Figure 61 Main function block

The web server is now configured and is ready for web pages to be downloaded. Download the index .html page with the http:// source for the Motor Switch.htm page as shown.

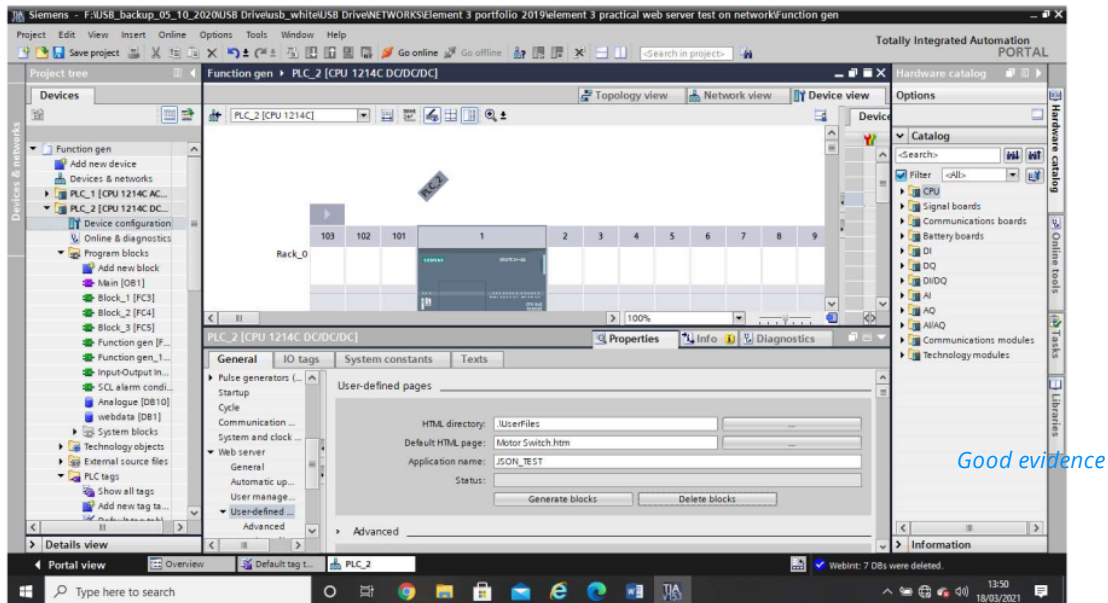


Figure 62 Web configuration

Once the page is ready, generate the web data blocks to download the web pages on the PLC server. Set the VLAN gateway IP address (router gateway) in the PLC as shown

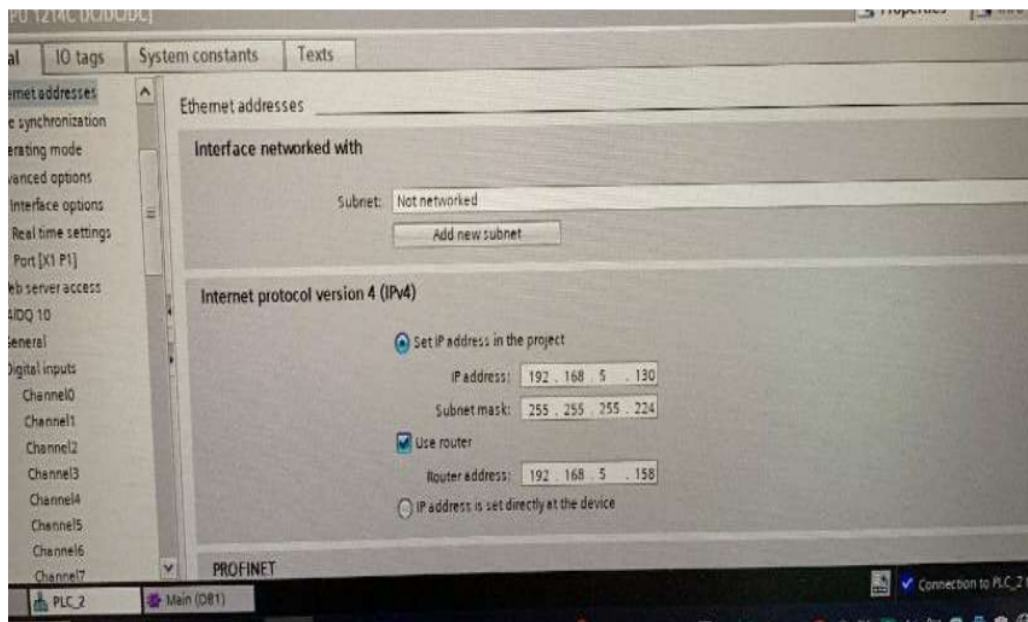


Figure 63 IP address configured

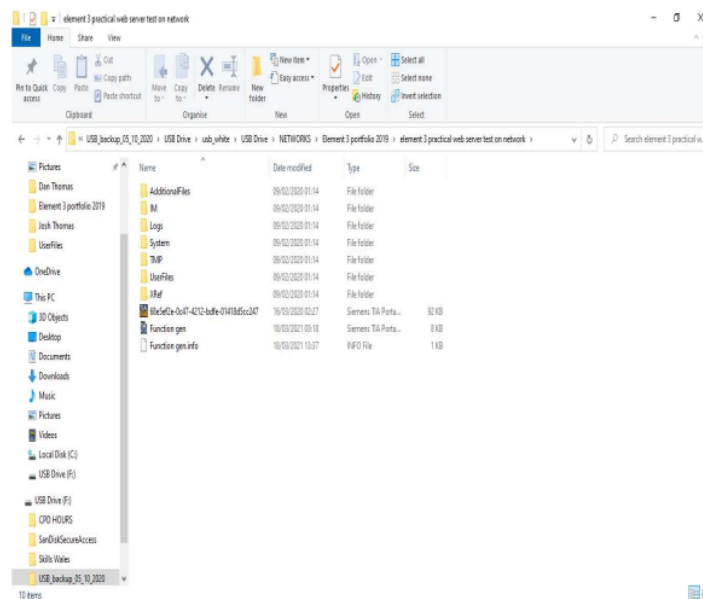


Figure 64 JavaScript files

A short-embedded program using HTML and two images can visually represent PLC conditions. This is the way that Industry 4.0 is being developed especially with PLC's. The next development stage is to implement the JavaScript libraries such as jQuery and json which enable real time data monitoring without page refresh. This will have a smoother graphic and increased speed of data refresh. Applications such as motor speed control and variable data values can be implemented as web pages for remote control and monitoring. The pages here are in the 'User Files' and include: Motor Switch.htm which is the main file downloaded to the PLC server.

Good explanation

VLANs

Implement part of the network practically with hardware where a terminal can configure and control an industrial device such as a PLC over a WAN network. Test the device using appropriate protocols for connectivity and security.

VLAN configuration:

```
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

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//////////

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

Router(config-subif) # IP address 192.168.5.94 255.255.255.224

Router(config-subif) #no shutdown

Router(config-subif) #exit

Router(config)#int f0/0.3

Router(config-subif) #encapsulation dot1Q 3

Router(config-subif) #IP address 192.168.5.158 255.255.255.224

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//////////

Note: Don't forget to implement the gateways on the PC's and PLC

PLC gateway – 192.168.5.158

Terminal PC – 192.168.5.94

PLC program control PC – 192.168.5.158

Reset the Cisco Switch:

Switch#delete vlan.dat

Switch#reload

Reset the Cisco Router:

Good evidence of configuration

Router#erase start up-config

Router#reload

Test the IP config of any PC from the command line:

C>ipconfig

Discrepancies from VLAN Element 2:

Switch used in Element 2 system – 2950-24 – this is a 24-channel switch

Switch used in Element 3 system – 2950-12 – this is a 12-channel switch

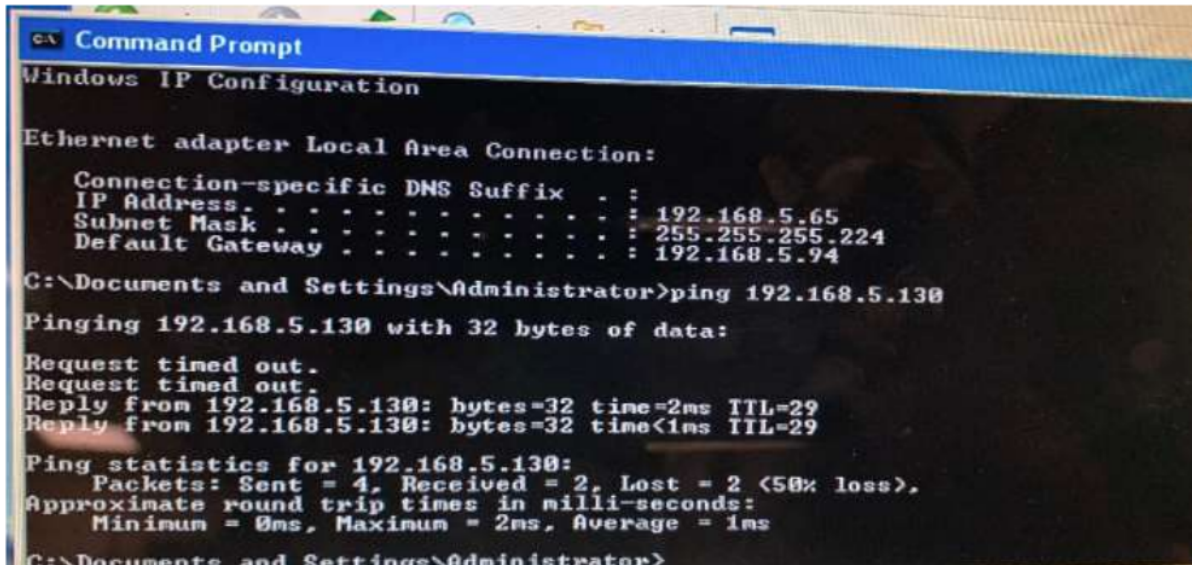
The Trunk port used in Element 2 was F0/24

The trunk port used in Element 3 was F0/1

Good work here with discrepancies

4. Testing and analysis

Below is the IP configuration testing.



```
CA Command Prompt
Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : 
    IP Address. . . . . : 192.168.5.65
    Subnet Mask . . . . . : 255.255.255.224
    Default Gateway . . . . . : 192.168.5.74

C:\Documents and Settings\Administrator>ping 192.168.5.130

Pinging 192.168.5.130 with 32 bytes of data:
Request timed out.
Request timed out.
Reply from 192.168.5.130: bytes=32 time=2ms TTL=29
Reply from 192.168.5.130: bytes=32 time<1ms TTL=29

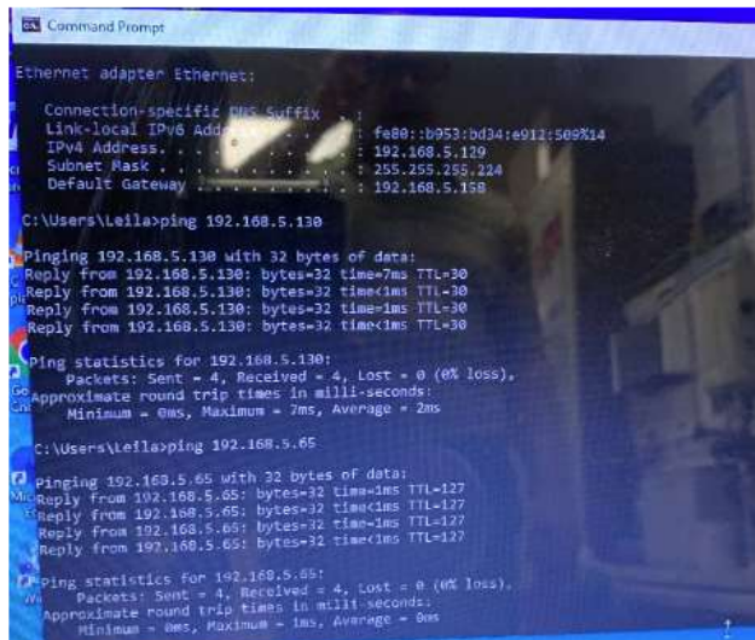
Ping statistics for 192.168.5.130:
    Packets: Sent = 4, Received = 2, Lost = 2 (50% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 1ms

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

Figure 65 Ip configuration

Good test showing ping form host to destination

Below are the ping tests.



```
CA Command Prompt

Ethernet adapter Ethernet:

    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::b953:bd34:e911:5e9%14
    IPv4 Address. . . . . : 192.168.5.129
    Subnet Mask . . . . . : 255.255.255.224
    Default Gateway . . . . . : 192.168.5.158

C:\Users\Leila>ping 192.168.5.130

Pinging 192.168.5.130 with 32 bytes of data:
Reply from 192.168.5.130: bytes=32 time=7ms TTL=30
Reply from 192.168.5.130: bytes=32 time<1ms TTL=30
Reply from 192.168.5.130: bytes=32 time<1ms TTL=30
Reply from 192.168.5.130: bytes=32 time<1ms TTL=30

Ping statistics for 192.168.5.130:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 7ms, Average = 2ms

C:\Users\Leila>ping 192.168.5.65

Pinging 192.168.5.65 with 32 bytes of data:
Reply from 192.168.5.65: bytes=32 time<1ms TTL=127
Reply from 192.168.5.65: bytes=32 time<1ms TTL=127
Reply from 192.168.5.65: bytes=32 time<1ms TTL=127
Reply from 192.168.5.65: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.5.65:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

Figure 66 Ping tests

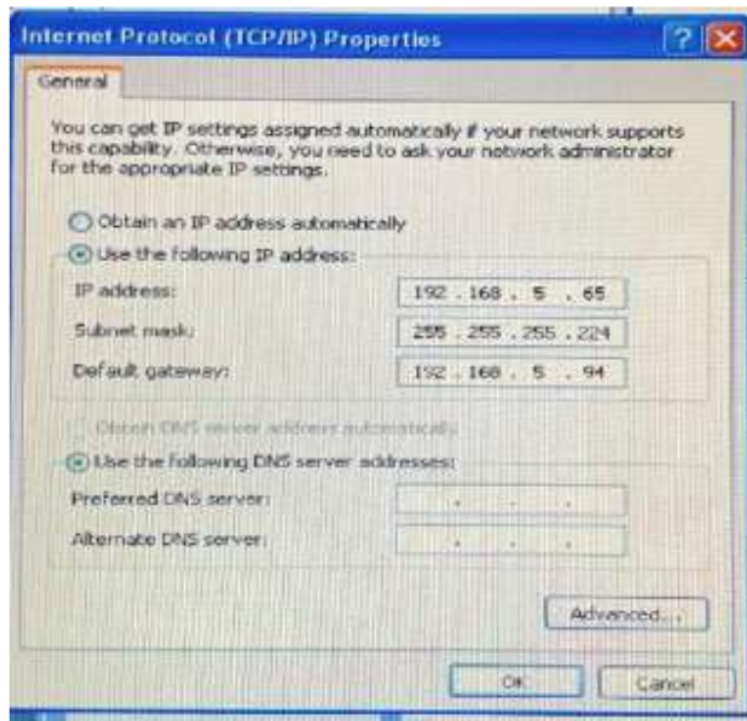
Good test showing host to destination

Below show the IP addresses implemented.



Good evidence of address config

Figure 67 PLC terminal IP address



Good evidence

Figure 68 Network configuration terminal IP address

DC motor running with 35% PWM duty cycle selected and motor run status on:

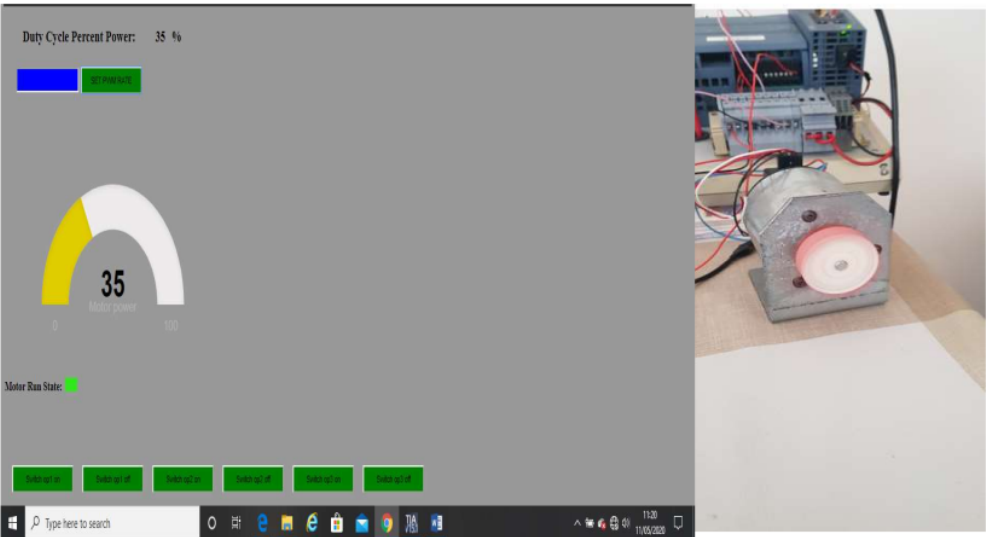


Figure 69 Test 1

Test proves program running on PLC and displayed over Vlan onto browser screen

Watch table:

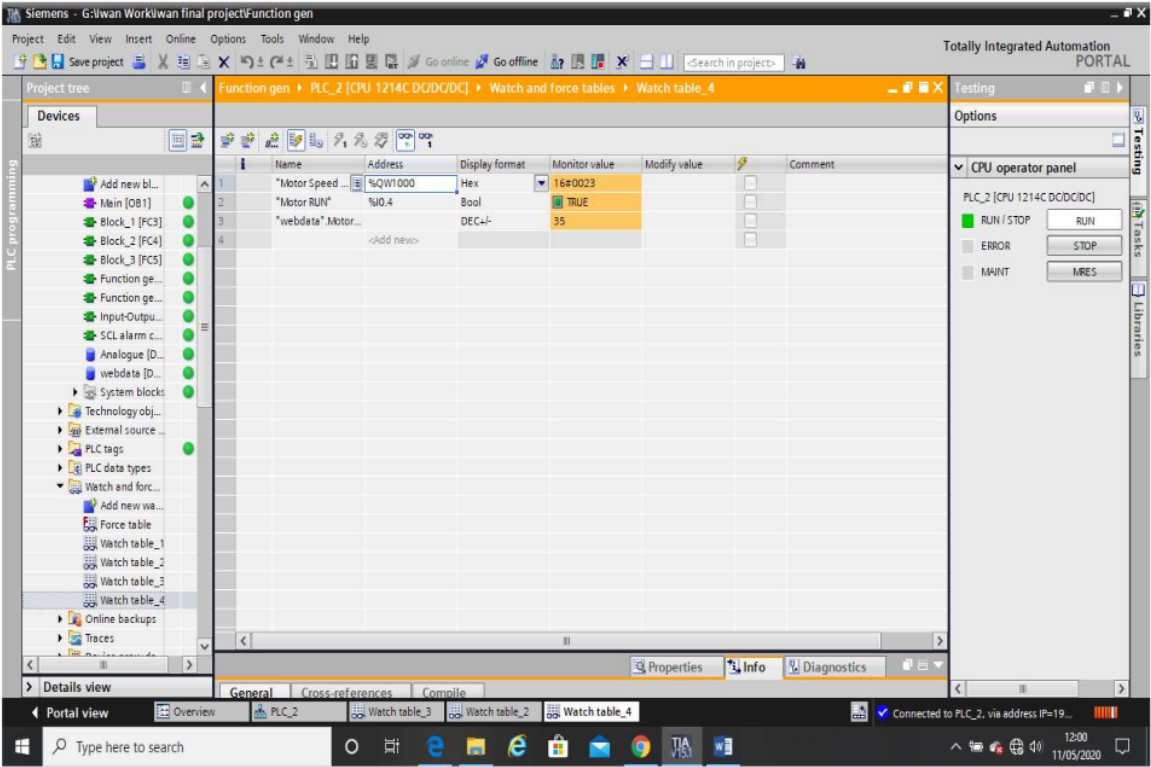


Figure 70 Watch table for test 1

DC motor running with 60% PWM duty cycle selected and motor run status on:

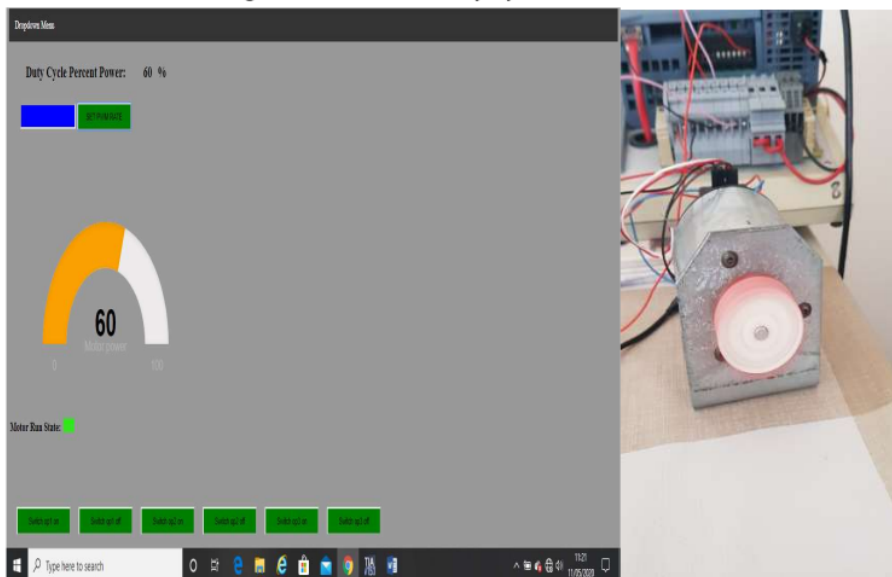


Figure 71 Test 2

Watch table:

Good test result

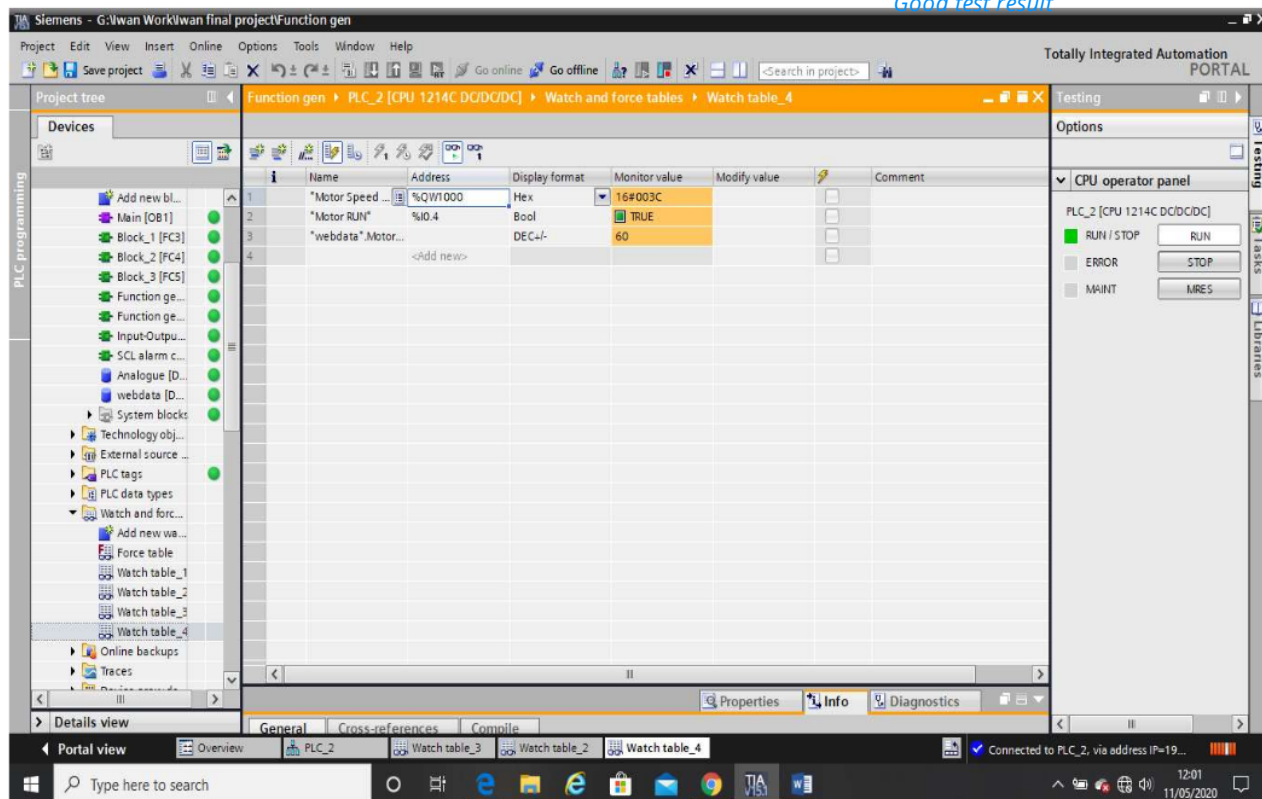


Figure 72 Watch table for test 2

5. Evaluation

This final element was successful and met all specification requested. The project proves the uncomplicated HTML program reduces conditions of the PLC. It also shows the development of industry 4.0 by using and programming using jQuery.

All testing using the DC motor was successful, as the motor was still close to the PLC and PC's, the principle will still carry if it was not in close proximity and on the other side of the college. With only minor adjustments. *This is the point here*

The use of JavaScript was used, it was used for the website server. By using JavaScript libraries such as jQuery and json they enable real time data monitoring without page refresh.

All testing using the web server was successful and all IP addresses were implemented correctly over the VLAN.

Good evaluation

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Good number of sources

Appendix

Routing reports from element one

PC 1 test

Router>en

Router#show run

Building configuration...

Current configuration: 1453 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 192.168.5.10

ip dhcp excluded-address 105.0.0.1 105.0.0.10

ip dhcp excluded-address 192.168.5.1 192.168.5.10

ip dhcp excluded-address 170.25.0.1 170.25.0.10

ip dhcp pool net1

ip dhcp pool net1

network 192.168.5.0 255.255.255.0

default-router 192.168.5.254

dns-server 192.168.5.254

ip dhcp pool net2

network 105.0.0.0 255.0.0.0

default-router 105.0.0.254

dns-server 105.0.0.254

ip dhcp pool net3

network 150.25.0.0 255.255.0.0

default-router 170.25.0.254

dns-server 170.25.0.254

no ip cef

no ipv6 cef

interface FastEthernet0/0

ip address 192.168.5.254 255.255.255.0

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 105.0.0.0
network 192.168.5.0
ip classless
ip route 105.0.0.0 255.0.0.0 10.0.0.2
ip route 170.25.0.0 255.255.0.0 10.0.0.2
ip flow-export version 9
line con 0
line aux 0
line vty 0 4
login
end
```

test pc 2

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

```
Current configuration : 995 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 105.0.0.254 255.0.0.0
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 105.0.0.0
network 170.25.0.0
network 192.168.5.0
ip classless
ip route 192.168.5.0 255.255.255.0 10.0.0.1
ip route 170.25.0.0 255.255.0.0 11.0.0.2
ip flow-export version 9
line con 0
line aux 0
line vty 0 4
login
end
```

test pc 3

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

```
Current configuration : 950 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 170.25.0.254 255.255.0.0
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 105.0.0.0
network 170.25.0.0
ip classless
ip route 105.0.0.0 255.0.0.0 11.0.0.1
ip route 192.168.5.0 255.255.255.0 11.0.0.1
ip flow-export version 9
line con 0
line aux 0
line vty 0 4
login
end
```

Good evidence in the reports from the routers

71 /100

PAGE 1

PAGE 2

PAGE 3

Text Comment. Good detailed table of contents

PAGE 4

PAGE 5

Text Comment. Good extensive list of figures

PAGE 6

Text Comment. Good accurate intro

PAGE 7

Text Comment. Good image model

Text Comment. Good comparison with good use of table

Text Comment. Citation correct

PAGE 8

Text Comment. Citation is correct

Text Comment. Good effort with these two model comparisons

PAGE 9

Text Comment. Relevant diagram

Text Comment. Good points made

Text Comment. It should be noted that decapsulation is the receive process

PAGE 10

Text Comment. Good points included here. The main problem with broadcasting is not covered.

PAGE 11

Text Comment. Good relevant image

Text Comment. This table is very relevant

Text Comment. Good points included in the explanation

Text Comment. Research is good and includes significant points. There are significant points and application examples that could have been included.

PAGE 12

Text Comment. Good work with correct port allocation

Text Comment. Good explanation

PAGE 13

Text Comment. Excellent work

PAGE 14

Text Comment. Good evidence provided

Text Comment. Good evidence

PAGE 15

Text Comment. Good evidence

Text Comment. Good evidence given for static routing implementation via the tables

PAGE 16

Text Comment. Good valid point

PAGE 17

Text Comment. Good evidence of configuration

PAGE 18

Text Comment. Tables are correct with all networks present in the correct tables

PAGE 19

Text Comment. Good evidence of configuration

Text Comment. Good test

Text Comment. Error is identified

PAGE 20

Text Comment. Error is identified

Text Comment. Helper addresses are configured

Text Comment. Good test

PAGE 21

Text Comment. Good test

Text Comment. Exclusions are configured

Text Comment. Test showing result of exclusions

PAGE 22

Text Comment. Good test

Text Comment. Good test

PAGE 23

Text Comment. Good set of test results that prove all the configurations are correct

Text Comment. Good set of results in both directions

Text Comment. DHCP test is indicated above and the reports in appendix show the configured addresses

PAGE 24

Text Comment. Good evaluation that sets the theme for the next stage E2

PAGE 25

Text Comment. Three WAN's this time, but same number of routers

PAGE 26

Text Comment. All 6 networks are identified with net addresses for /28 configuration. All ports are configured. Good work here with attention to detail.

Text Comment. Nets 1-3 are identified for /27 and nets 4-6 are configured for /30 with correct port allocation.

Text Comment. Good effort here to understand the different configurations.

PAGE 27

Text Comment. Good work with address configuraion for nets

PAGE 28

Text Comment. Excellent work here

PAGE 29

Text Comment. Good evidence of configuration

PAGE 30

Text Comment. Routing tables are correct

Text Comment. Good work

Text Comment. Good work with this section

Text Comment. Good evidence of configuration

Text Comment. CIDR typo error

Text Comment. Good config evidence

Text Comment. This is a good point, Vlan's do offer security

Text Comment. Excellent work here. The extra address (158) has been added for the additional gateway on the trunk network

Text Comment. Good evidence showing the inter Vlan routing for gateways .94 and .158

Text Comment. Good set of test results

Text Comment. Sentences are too short

Text Comment. Good set of test results

Text Comment. Good test

Text Comment. Good test across Vlan's

Text Comment. Three

Text Comment. Good point

Text Comment. Good evaluation

PAGE 38

Text Comment. Point is made

PAGE 39

Text Comment. Good image of prac setup

PAGE 40

Text Comment. Excellent work with this topology and port allocation

PAGE 41

Text Comment. Good evidence of web server activation

PAGE 42

Text Comment. Good evidence

PAGE 43

Text Comment. Program tags to run DC motor

Text Comment. Web server function block is configured

PAGE 44

Text Comment. Good evidence

Text Comment. Good evidence of router gateway configured on PLC

PAGE 45

Text Comment. Good explanation

PAGE 46

PAGE 47

Text Comment. Good evidence of configuration

Text Comment. Good work here with discrepancies

Text Comment. Good test showing ping form host to destination

Text Comment. Good test showing host to destination

Text Comment. Good evidence of address config

Text Comment. Good evidence

Text Comment. Test proves program running on PLC and displayed over Vlan onto browser screen

Text Comment. Good test result

Text Comment. This is the point here

Text Comment. Good evaluation

Text Comment. Good number of sources

Text Comment. Good evidence in the reports from the routers

GRADING FORM: CSG-RUBIC

ELIAS THOMAS

0

RESEARCH-INFORMED LITERATURE



Research could have been further investigated , however relevant ref sources are included. Decapsulation should have been identified in more detail.

6/10

KNOWLEDGE AND UNDERSTANDING



E1 - designed with a good schematic address table and implemented using the chosen address scheme. Unique addresses have been identified and implemented. 7.5/10

E2 - address tables are correct and CIDR config processes are implemented with good address plans. VLAN config is explained. All port allocation is detailed. 7/10.

E2. Minor error in intro where there are 3 WAN's not 2.

E3 - practical is detailed and each step is explained. The function calls have been explained. 7.5/10

22/30

ANALYSIS



E1 - test evidence is included and explained. The tests are successful and in a good order. Excluded addresses test images show excluded addresses. Good evaluation. 3.5/5

E2- 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.

7/10

E3 - practical VLAN test evidence is provided and indicate the correct functioning of the network. The PLC functions are tested with evidence directly from the PLC and web browser. Very good evidence of test results. Very good evaluation. 7.5/10

18/25

PRACTICAL APPLICATION AND DEP.



E1 - implementation includes all the technical evidence, and a good evaluation. The testing proved successful. 3.5/5

E2 - implementation evidence for CIDR is included. Good address plan and schematic diagrams. Explanations are good. 3/5

E3 - very good practical carried out with substantial evidence to support outcomes. Explanations and evaluation are good. 7.5/10

14/20

SKILLS FOR PROFESSIONAL PRAC.



Report structure and quality are good. 11/15

11/15