

assignment 1

by Sean Jones

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HND Electrical & Electronic Engineering

NETWORKING SYSTEMS FOR ENGINEERS

PSDE 5034

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*List of contents should be sub-
divided for each element heading.*

No list of figures.

Element 1

Task 1 Research:

(computernetworkingnotes, 2019) states that “The OSI (Open System Interconnection) Reference Model is the comprehensive set of standards and rules for hardware manufacturers and software developers” it is suggested that the 7 layer model is useful for fault finding and designing a network. (techcress, 2019)suggests that the 7 layer is set up from perspective of the human eye on what use the information or data is to the user. (techcress, 2019) states “Layer one – the application layer, is closest to the person while layer seven – the physical layer is where the network receives and transmits raw data.”

Error messages and web pages not loading correctly. C.I.F.S on Printers and Serial Ports. Emails won't send or receive. Telnet commands non responsive TFTP, Telnet SMTP Send and receive error messages.	Application	Any general popup error messages on your desktop start looking here. Check your browser settings, install patches for software or re-installations can help.
Handling data encryption on your router, WPA2-ENT, WPA2-PSK, RADIUS Server encryption.	Presentation	Troubleshooting should begin with the applications that create files such as .asc .jpg .midi .fla quicktime in the layer above.
As the name suggest this layer sets up and terminates conversations between users. Errors in netbios over tcpip. DNS and SQL abnormalities may also be found here.	Session	In Windows 7 - 10 run 'cmd.exe' before 'nbtstat'. sigverif nslookup Try also the vast amount of 'net' commands! Has your user turned on file and network and or printer sharing?
NetBois and NetBEUI, TCP and ARP correct port number configuration are vital in making sure your transfer completes successfully.	Transport	We use 'Wireshark' to examine the packet headers and examine what is happening at this layer. Suggest you put some time into learning this software. Access lists and firewall settings errors can also cause problems here.
IP Addressing functions Routing and Forwarding, Internetworking and error handling. OSPF, EIGRP, RIP1 and RIP2 are found here.	Network	Running of the 'route print' commands in your command prompt to see your routing table. Similar to 'show ip route' in Cisco ios can show common errors. What result is 'ping' giving you? Check hierarchy for congestion control. Duplicate IP addressing.
Conversion of packets into bits takes place here. This is where you'll find your switches and hubs.	Datalink	Run 'arp -a' and 'tracert' to check addressing we also use 'Wireshark' to check packet deliverability. What results are you getting from 'ipconfig' and 'ping'? In IOS try 'show interface', 'show spanning-tree' etc
As the name suggests, check the 'physical' connection between your hardware, are connections 'lighting up'?	Physical	Has your secretary knocked out a cable? has the cleaner pulled one out and even worse plugged it back in the wrong interface? These are worth checking first. Get yourself some cable testing tools. In IOS try 'show interface' and 'show module' commands.

This detail needs to be summarised and enlarged.

Figure 1 7layer osi model (cisnet-solutions, n.d.)

Encapsulation is a translation for data to said it across networks. (computerhope, 2019) states “When referring to networking, encapsulation is the process of taking data from one protocol and translating it into another protocol, so the data can continue across a network. For example, a TCP/IP packet contained within an ATM frame is a form of encapsulation.” When data is sent the TCP adds a frame to the packet to allows the data to send. This then gets decasualised to retrieve the data.

Broadcasting is where 1 source sends data to multiple recipients at the same time. This will be a packet sent from 1 device on a network to every other device.an example of the types of broadcasting is a multicast where a designated group within a network is chosen to send the data to instead of everything inside a network. There re broadcasting IDs to allow the packet to go to the correct recipient.

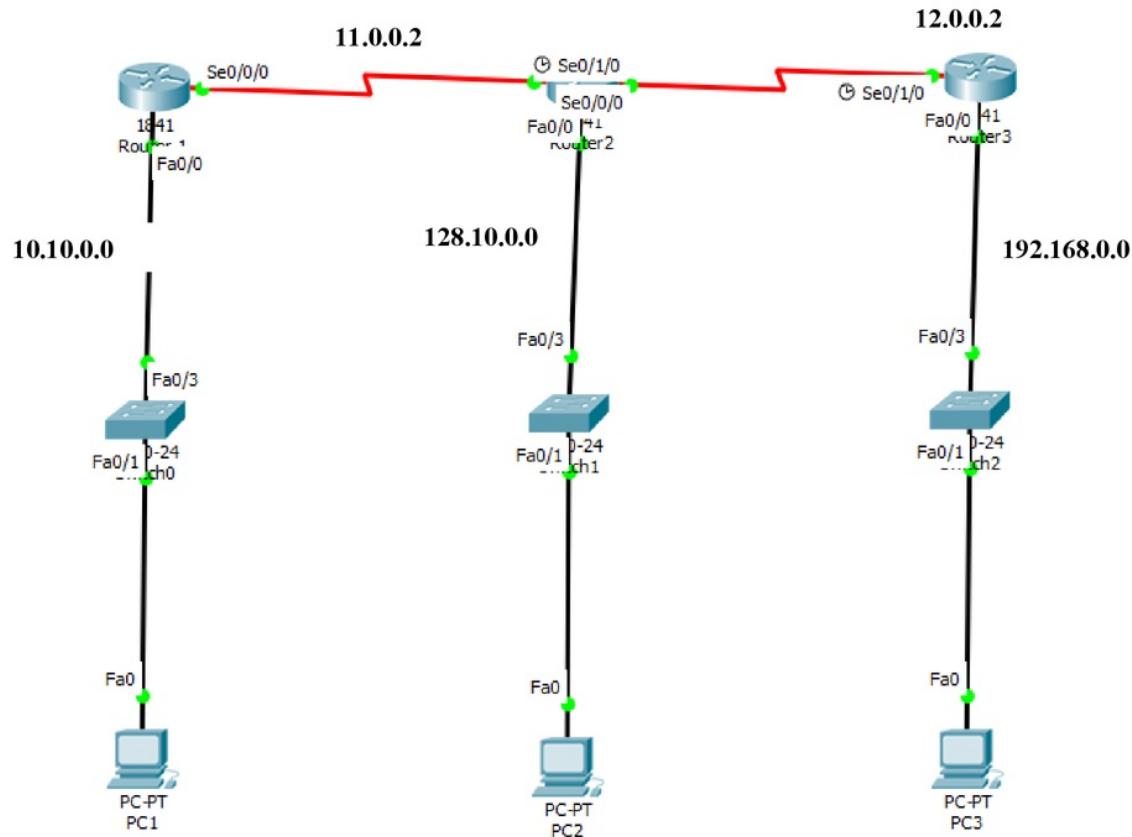
(internet-guide, 2019) states “A port number uses 16 bits and so can therefore have a value from 0 to 65535 decimal” networks can communicate in different protocols. The packet has to be formatted

to communicate in the correct protocol to its recipient. Certain ports are allocated to protocols in order to be in the correct format to send the packet.

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

*The research should have diagrams or images to help explain each category.
The image here is not clear. There are some explanations which are reasonable.*

A 3 LAN network is assembled with 2 WAN connections between them.



Task 2:

3 types of address schemes are created for the LAN networks.

PC0 network is class A

10.0.0.0 – network address

10.0.0.1 – gateway address

10.0.0.3 – initial device address

PC1 network is class B

128.10.0.0– network address

128.10.0.3– gateway address

128.10.0.1– initial device address

PC3 network is class C

192.168.0.0 – network address

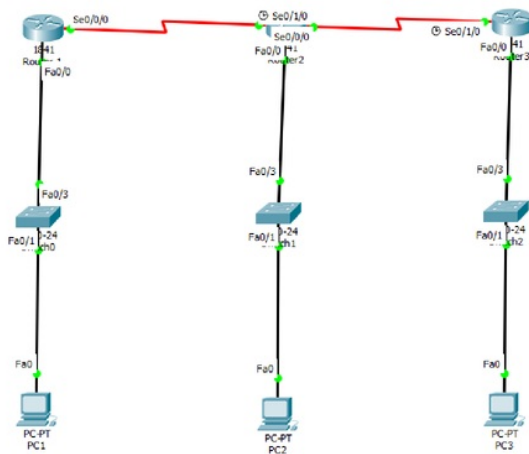
192.168.0.1 – gateway address

192.168.0.2 – initial device address

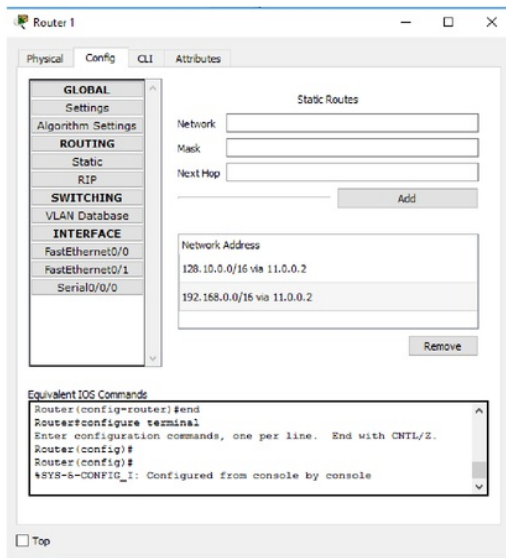
*Addressing
scheme is correct
and covers the
three classes.
The WAN
addresses are
your choice.*

Task3:

Static routing is used to communicate data between the routers with a serial connection. This routing requires each and every network and destination of the packet information being supplied.



Below is the routing table from "Router1"



This is what the command line interface of “Router1” looks like after static routing.

```
Router(config)#do 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

C    10.0.0.0/8 is directly connected, FastEthernet0/0
C    11.0.0.0/8 is directly connected, Serial0/0/0
S    128.10.0.0/16 [1/0] via 11.0.0.2
S    192.168.0.0/16 [1/0] via 11.0.0.2

Router(config)#
```

Below is the routing table from “Router2”

Static Routes

Network

Mask

Next Hop

Network Address

10.10.0.0/16 via 11.0.0.1

192.168.0.0/16 via 12.0.0.2

This is what the command line interface of “Router2” looks like after static routing.

```

Router(config)#do 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

 10.0.0.0/16 is subnetted, 1 subnets
S    10.10.0.0 [1/0] via 12.0.0.1
C    11.0.0.0/8 is directly connected, Serial0/1/0
C    12.0.0.0/8 is directly connected, Serial0/0/0
C    128.10.0.0/16 is directly connected, FastEthernet0/0
S    192.168.0.0/16 [1/0] via 12.0.0.2

Router(config)#

```

Below is the routing table from "Router3"

Static Routes

Network

Mask

Next Hop

Network Address

128.10.0.0/16 via 12.0.0.1

10.10.0.0/16 via 12.0.0.1

This is what the command line interface of "Router3" looks like after static routing.

```

Router(config)#do 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

 10.0.0.0/16 is subnetted, 1 subnets
S    10.10.0.0 [1/0] via 12.0.0.1
C    12.0.0.0/8 is directly connected, Serial0/1/0
S    128.10.0.0/16 [1/0] via 12.0.0.1
C    192.168.0.0/24 is directly connected, FastEthernet0/0

Router(config)#

```

Router Static

To ensure that the communication between networks works correctly every pc is pinged to each other in every combination to ensure that the address and rip routing is correct.

	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete	
1	Successful	PC0	PC3	ICMP	Blue	0.000	N	0	(edit)	(delete)	
2	Successful	PC0	PC2	ICMP	Green	0.000	N	1	(edit)	(delete)	
3	Successful	PC3	PC2	ICMP	Red	0.000	N	2	(edit)	(delete)	
4	Successful	PC3	PC0	ICMP	Yellow	0.000	N	3	(edit)	(delete)	

Testing is successful for

● Successful	PC2	PC3	ICMP	0.000	N	4	(edit)	(delete)
● Successful	PC2	PC0	ICMP	0.000	N	5	(edit)	(delete)

The test reveals that all devices can communicate together correctly in both directions faultlessly. This is a simulation of a real life ping command that could be done on the command prompt function on a PC to send and receive packets to devices.

Task 4:

A more effective way of routing the networks is RIP routing (Routing Information Protocol). This just involves listing all the networks that wish to have data transmitted between in every router.

Router 1 command line interface prompt of the rip routing is shown below

RIP is the dynamic routing method.

```
network 10.0.0.0
Router(config-router)#network 11.0.0.0
Router(config-router)#network 12.0.0.0
Router(config-router)#network 192.168.0.0
Router(config-router)#network 128.10.0.0
Router(config-router)#
```

Router2 command line interface prompt of the rip routing is shown below

```
Router(config)#
Router(config)#router rip
Router(config-router)#network 10.0.0.0
Router(config-router)#network 11.0.0.0
Router(config-router)#network 12.0.0.0
Router(config-router)#network 192.168.0.0
Router(config-router)#network 128.10.0.0
Router(config-router)#
```

Router 3 command line interface prompt of the rip routing is shown below

```
Router(config)#
Router(config)#router rip
Router(config-router)#network 10.0.0.0
Router(config-router)#network 11.0.0.0
Router(config-router)#network 12.0.0.0
Router(config-router)#network 192.168.0.0
Router(config-router)#network 128.10.0.0
Router(config-router)#
```

RIP is configured on all routers

The RIP routing tables can be shown on the cisco software by clicking the magnifying glass and clicking on the router. Below shows the routing tables for these networks.

Router1

Type	Network	Port	Next Hop IP	Metric
C	10.0.0.0/8	FastEthernet0/0	---	0/0
C	11.0.0.0/8	Serial0/0/0	---	0/0
R	12.0.0.0/8	Serial0/0/0	11.0.0.2	120/1
S	128.10.0.0/16	---	11.0.0.2	1/0
S	192.168.0.0/16	---	11.0.0.2	1/0
R	192.168.0.0/24	Serial0/0/0	11.0.0.2	120/2

Router 2

Type	Network	Port	Next Hop IP	Metric
R	10.0.0.0/8	Serial0/1/0	11.0.0.1	120/1
S	10.10.0.0/16	---	11.0.0.1	1/0
C	11.0.0.0/8	Serial0/1/0	---	0/0
C	12.0.0.0/8	Serial0/0/0	---	0/0
C	128.10.0.0/16	FastEthernet0/0	---	0/0
S	192.168.0.0/16	---	12.0.0.2	1/0

Router 3

Routing Table for Router3				
Type	Network	Port	Next Hop IP	Metric
R	10.0.0.0/8	Serial0/1/0	12.0.0.1	120/2
S	10.10.0.0/16	---	12.0.0.1	1/0
R	11.0.0.0/8	Serial0/1/0	12.0.0.1	120/1
C	12.0.0.0/8	Serial0/1/0	---	0/0
S	128.10.0.0/16	---	12.0.0.1	1/0
C	192.168.0.0/24	FastEthernet0/0	---	0/0

Within the router the RIP routing is configured as follows.

Router 1

```

Router#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

C    10.0.0.0/8 is directly connected, FastEthernet0/0
C    11.0.0.0/8 is directly connected, Serial0/0/0
R    12.0.0.0/8 [120/1] via 11.0.0.2, 00:00:17, Serial0/0/0
S    128.10.0.0/16 [1/0] via 11.0.0.2
S    192.168.0.0/16 [1/0] via 11.0.0.2
R    192.168.0.0/24 [120/2] via 11.0.0.2, 00:00:17, Serial0/0/0

```

Router#

Router2

```

Router(config)#do 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

      10.0.0.0/16 is subnetted, 1 subnets
S        10.10.0.0 [1/0] via 11.0.0.1
C        11.0.0.0/8 is directly connected, Serial0/1/0
C        12.0.0.0/8 is directly connected, Serial0/0/0
C        128.10.0.0/16 is directly connected, FastEthernet0/0
S        192.168.0.0/16 [1/0] via 12.0.0.2

Router(config)#

```

Router3

```

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter
area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external
type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E -
EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia -
IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

10.0.0.0/16 is subnetted, 1 subnets
S    10.10.0.0 [1/0] via 12.0.0.1
C    12.0.0.0/8 is directly connected, Serial0/1/0
S    128.10.0.0/16 [1/0] via 12.0.0.1
C    192.168.0.0/24 is directly connected, FastEthernet0/0
Router(config)#

```

RIP routing is configured and the images show the direct connection, via and router pathways.

Just like static routing the routing and network addressing is tested by pinging each device to each other in every variation.

ire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Ec
	Successful	PC1	PC2	ICMP		0.000	N	0	(€
	Successful	PC0	PC1	ICMP		0.000	N	1	(€
	Successful	PC0	PC2	ICMP		0.000	N	2	(€

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Ec
	Successful	PC1	PC0	ICMP		0.000	N	3	(€
	Successful	PC2	PC0	ICMP		0.000	N	4	(€
	Successful	PC2	PC1	ICMP		0.000	N	5	(€

Tests are successful which shows the RIP is correct.

The test proves the correct workings of the RIP routing

Task 5:

Dynamic host control protocol is the third option to route the networks together using a helper address. Router 1 is set as the control router with the other routers having helper addresses set to enable the dynamic routing (DHCP)

Router1 configuration of DHCP

```

Router(dhcp-config)#net 10.0.0.0 255.0.0.0
Router(dhcp-config)#default-router 10.0.0.1
Router(dhcp-config)#dns-server 10.0.0.1
Router(dhcp-config)#exit
Router(config)#
Router(config)#ip dhcp pool net2
Router(dhcp-config)#net 128.10.0.0 255.255.0.0
Router(dhcp-config)#default-router 128.10.0.3
Router(dhcp-config)#dns-server 128.10.0.3
Router(dhcp-config)#exit
Router(config)#
Router(config)#ip dhcp pool net3
Router(dhcp-config)#net 192.168.0.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.0.1
Router(dhcp-config)#dns-server 192.168.0.1
Router(dhcp-config)#exit

% Invalid input detected at '^' marker.

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

Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip dhcp pool net3
Router(dhcp-config)#net 192.168.0.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.0.1
Router(dhcp-config)#dns-server 192.168.0.1
Router(dhcp-config)#exit

```

*Configuration
of
DHCP
with
network
pools.*

Test DHCP:

Device PC1

☒ DHCP	☐ Static
IP Address	10.0.0.1
Subnet Mask	255.0.0.0
Default Gateway	10.0.0.1
DNS Server	10.0.0.1

The system develops a dynamic ip address

Device PC2

☒ DHCP	☐ Static
IP Address	169.254.43.70
Subnet Mask	255.255.0.0
Default Gateway	0.0.0.0
DNS Server	0.0.0.0

Device PC3

☒ DHCP	☐ Static
IP Address	169.254.8.30
Subnet Mask	255.255.0.0
Default Gateway	0.0.0.0
DNS Server	0.0.0.0

This is a default address and not the correct one because the helper address is not configured.

Because the configuration of the devices is not correct default addresses have been set. Helper ip addresses need to be set in the routers to get into the networks. These addresses will control the serial port addresses. These helper addresses are shown below.

Router2

```
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 11.0.0.1
Router(config-if)#exit
Router(config)#
```

Router3

```
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 11.0.0.1
Router(config-if)#exit
Router(config)#
```

Helper address config

This updated helper address is then tested as below

Device PC2

☒ DHCP	☐ Static
IP Address	128.10.0.1
Subnet Mask	255.255.0.0
Default Gateway	128.10.0.3
DNS Server	128.10.0.3

Device PC3

☒ DHCP	☐ Static
IP Address	192.168.0.2
Subnet Mask	255.255.255.0
Default Gateway	192.168.0.1
DNS Server	192.168.0.1

DHCP is now correct.

Some address need to be excluded to prevent them getting a random address. This is done as shown below.

Router1

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip dhcp excluded-address 192.168.0.0
Router(config)#ip dhcp excluded-address 10.0.0.1 10.0.0.10
Router(config)#ip dhcp excluded-address 128.10.0.1 128.10.0.10
Router(config)#ip dhcp excluded-address 192.168.0.1 192.168.0.10
Router(config)#
```

Exclusion addresses have been specified here.

This is tested as below

Device PC1

☒ DHCP	☐ Static
IP Address	10.0.0.11
Subnet Mask	255.0.0.0
Default Gateway	10.0.0.1
DNS Server	10.0.0.1

Device PC2

☒ DHCP	☐ Static
IP Address	128.10.0.11
Subnet Mask	255.255.0.0
Default Gateway	128.10.0.3
DNS Server	128.10.0.3

Test result of exclusion addresses.

Device PC3

☒ DHCP	☐ Static
IP Address	192.168.0.11
Subnet Mask	255.255.255.0
Default Gateway	192.168.0.1
DNS Server	192.168.0.1

This test shows that the address 1-10 has been excluded from the addressing in each local networking.

Another test to show the correct configuration of the routers

Router1 running configuration:

```

interface FastEthernet0/0
ip address 10.10.0.1 255.0.0.0
duplex auto
speed auto
!
interface FastEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
ip address 11.0.0.1 255.0.0.0
!
interface Vlan1
no ip address
shutdown
!
router rip
network 10.0.0.0
network 11.0.0.0
network 12.0.0.0
network 128.10.0.0
network 192.168.0.0
!
ip classless
ip route 128.10.0.0 255.255.0.0 11.0.0.2
ip route 192.168.0.0 255.255.0.0 11.0.0.2

```

*Report from router config.
This shows all the
configuration associated
with the router.*

Router2 running configuration:

```

interface FastEthernet0/0
ip address 128.10.0.3 255.255.0.0
ip helper-address 11.0.0.1
duplex auto
speed auto
!

```

```
interface FastEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
ip address 12.0.0.1 255.0.0.0
!
interface Serial0/1/0
ip address 11.0.0.2 255.0.0.0
clock rate 64000
!
interface Vlan1
no ip address
shutdown
!
router rip
network 10.0.0.0
network 11.0.0.0
network 12.0.0.0
network 128.10.0.0
network 192.168.0.0
!
ip classless
ip route 10.10.0.0 255.255.0.0 11.0.0.1
ip route 192.168.0.0 255.255.0.0 12.0.0.2
```

Router3 running configuration:

```
interface FastEthernet0/0
ip address 192.168.0.1 255.255.255.0
ip helper-address 11.0.0.1
duplex auto
speed auto
!
interface FastEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/1/0
ip address 12.0.0.2 255.0.0.0
clock rate 2000000
!
interface Vlan1
no ip address
shutdown
!
router rip
```

```
network 10.0.0.0
network 11.0.0.0
network 12.0.0.0
network 128.10.0.0
network 192.168.0.0
!
ip classless
ip route 128.10.0.0 255.255.0.0 12.0.0.1
ip route 10.10.0.0 255.255.0.0 12.0.0.1
```

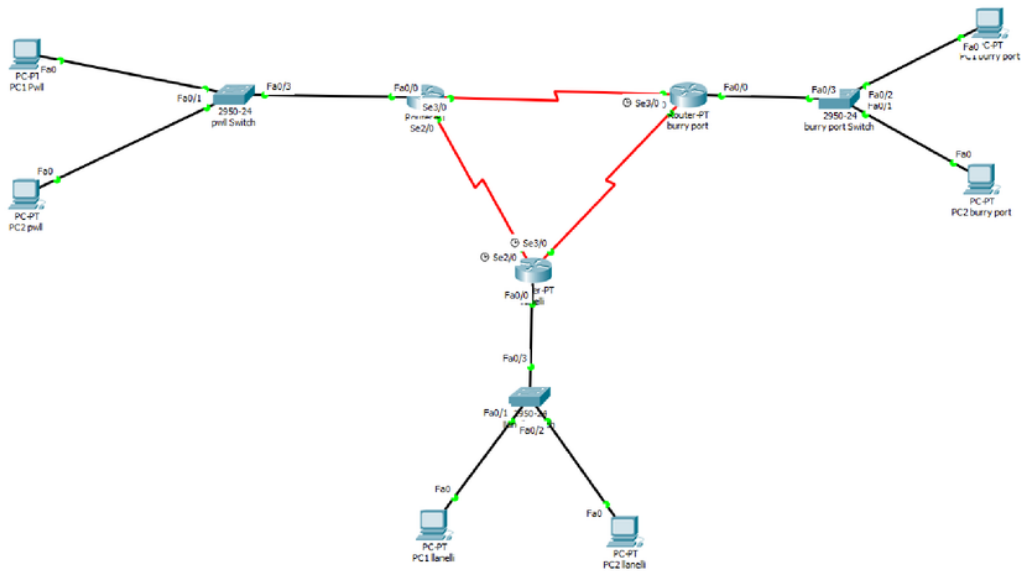
Evaluation

it was found out that dynamic addressing was better than static addressing due to it could be set up remotely with the addressing where as static needed every individual device set up. Dynamic routing was a much simpler way of routing the networks together as it was just the network addresses typed in. DHCP required helper address to be entered into the master device to find the other IP addresses. Exclusions were used in this system to eliminate unwanted ip address that are already used. It was found that the OSI 7 layers model was used for reference. The most important layers were 3 being the routers and 2 being the switch in a network connection.

*Evaluation is
good and
there are
some good
points to
consider for
the next
element.*

Element 2

A CIDR/28 network is created and is shown below



Networks subnetting CIDR/28

The subnet masks of the first 3 octet are locked at 255.255.255.0 and cannot be changed so only the last octet can have the number of networks and hosts varied.

A 28 is used which makes the increment number 16. This gives a possible 16 networks that can be used with 14 hosts possible in every network. The number 0 in every network is used for the network number and the highest possible number in a network is used for broadcast.

The network goes up in increments of 16 as the last binary number in the network address is 16 so it's not possible for any smaller increments

The networks used will be:

192	168	200	16
192	168	200	32
192	168	200	48
192	168	200	64
192	168	200	80
192	168	200	96

CIDR/28 Pwll Network 1 (192.168.200.16)

The values in the green area are the networks and the yellow are the hosts

Subnet mask	1	1	1	1	0	0	0	0	255.255.255.240
	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	Fastethernet 0/0 addr 30
	0	0	0	1	1	1	1	1	Broadcast 31

CIDR/28 Llanelli Network 2 (192.168.200.32)

Subnet mask	1	1	1	1	0	0	0	0	255.255.255.240
	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
	0	0	1	0	1	1	1	1	Broadcast 47

CIDR/28 Burry Port Network 3 (192.168.200.48)

Subnet mask	1	1	1	1	0	0	0	0	255.255.255.240
	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
	0	0	1	1	1	1	1	1	Broadcast 63

Pwll – Burry Port Network 4 (192.168.200.65)

Pwll Router	0	1	0	0	0	0	0	1	Fastethernet 0/0 addr 65
Burry Port Router	0	1	0	0	0	0	1	0	Fastethernet 0/1 addr 66

Good effort with this. The address scheme looks good.

Burry Port – Llanelli Network 5 (192.168.200.80)

Llanelli Router	0	1	0	1	0	0	0	1	Fastethernet 0/0 addr 81
Burry Port Router	0	1	0	1	0	0	1	0	Fastethernet 0/0 addr 82

Llanelli – Pwll Network 6 (192.168.200.96)

Llanelli Router	0	1	1	0	0	0	0	1	Fastethernet 0/1 addr 97
Pwll Router	0	1	1	0	0	0	1	0	Fastethernet 0/1 addr 98

RIP routing table for Pwll

Routing Table for pwll

Type	Network	Port	Next Hop IP	Metric
C	192.168.200.16/28	FastEthernet0/0	---	0/0
R	192.168.200.32/28	Serial2/0	192.168.200.97	120/1
R	192.168.200.48/28	Serial3/0	192.168.200.66	120/1
C	192.168.200.64/28	Serial3/0	---	0/0
R	192.168.200.80/28	Serial2/0	192.168.200.97	120/1
R	192.168.200.80/28	Serial3/0	192.168.200.66	120/1

Rip routing table for llanelli

Routing Table for llanelli

Type	Network	Port	Next Hop IP	Metric
R	192.168.200.16/28	Serial2/0	192.168.200.98	120/1
C	192.168.200.32/28	FastEthernet0/0	---	0/0
R	192.168.200.48/28	Serial3/0	192.168.200.82	120/1
R	192.168.200.64/28	Serial2/0	192.168.200.98	120/1
R	192.168.200.64/28	Serial3/0	192.168.200.82	120/1
C	192.168.200.80/28	Serial3/0	---	0/0

Rip routing table for burry port

Routing Table for burry port

Type	Network	Port	Next Hop IP	Metric
R	192.168.200.16/28	Serial3/0	192.168.200.65	120/1
R	192.168.200.32/28	Serial2/0	192.168.200.81	120/1
C	192.168.200.48/28	FastEthernet0/0	---	0/0
C	192.168.200.64/28	Serial3/0	---	0/0
C	192.168.200.80/28	Serial2/0	---	0/0
R	192.168.200.96/28	Serial3/0	192.168.200.65	120/1

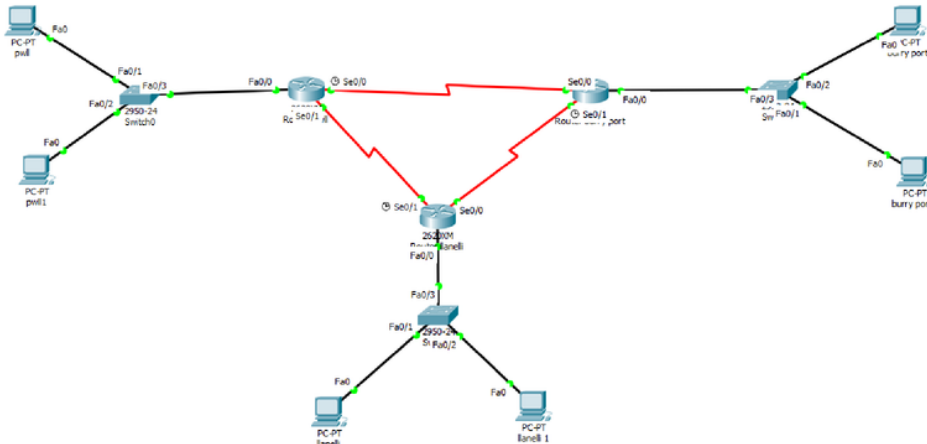
The network is tested by pinging across the subnetworks. Below shows the successful communication

R
I
P
r
o
u
t
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n
g
i
s
c
o
n
f
i
g
u
r
e
d
a
s

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC1 Pwll	PC1 burry p...	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC2 b...	PC2 llanelli	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC1 ll...	PC2 pwll	ICMP		0.000	N	2	(edit)	(delete)

Tests are successful

CIDR/27 and CIDR/30



The LAN networks are CIDR/27 and the WAN networks a CIDR/30 are used

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 Llanelli 1
Net addr 32	0	0	1	0	0	0	1	0	Next host addr 34 Llanelli 2
Net addr 32	0	0	1	1	1	1	1	0	Highest Router addr 62 Llanelli Router
Net addr 64	0	1	0	0	0	0	0	1	Lowest host addr 65 Pwll 1
Net addr 64	0	1	0	0	0	0	1	0	Next host addr 66 Pwll 2
Net addr 64	0	1	0	1	1	1	1	0	Highest Router addr 94 Pwll Router
Net addr 80	0	1	1	0	0	0	0	1	Lowest host addr 97 Burry Port 1
Net addr 80	0	1	1	0	0	0	1	0	Next host addr 98 Burry Port 2
Net addr 80	0	1	1	1	1	1	1	0	Highest Router addr 126 Pwll Router

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 Llanelli serial 0/0
Net addr 4	0	0	0	0	0	1	1	0	Highest interface addr 6 Burry Port serial 0/0

Net addr 8	0	0	0	0	1	0	0	1	Lowest interface addr 9 Llanelli serial 0/1
Net addr 8	0	0	0	0	1	0	1	0	Highest interface addr 10 Pwll serial 0/0
Net addr 12	0	0	0	0	1	1	0	1	Lowest interface addr 13 Pwll serial 0/1
Net addr 12	0	0	0	0	1	1	1	0	Highest interface addr 14 Burry Port serial 0/1

These networks are then tested below

VLSM is correct and LAN nets are CIDR/27 and WAN nets are CIDR/30

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	pwll	burry port	ICMP		0.000	N	0	(edit)	(delete)
	Successful	burry ...	llanelli 1	ICMP		0.000	N	1	(edit)	(delete)
	Successful	llanelli	pwll 1	ICMP		0.000	N	2	(edit)	(delete)

The routing table is shown as below

Tests are good and test across each WAN.

Routing Table for Router pwll

Type	Network	Port	Next Hop IP	Metric
C	192.168.200.4/30	Serial0/0	---	0/0
C	192.168.200.8/30	Serial0/1	---	0/0
R	192.168.200.12/30	Serial0/0	192.168.200.6	120/1
R	192.168.200.12/30	Serial0/1	192.168.200.10	120/1
C	192.168.200.32/27	FastEthernet0/0	---	0/0
R	192.168.200.64/27	Serial0/1	192.168.200.10	120/1
R	192.168.200.96/27	Serial0/0	192.168.200.6	120/1

```
Router>en
Router#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

```
192.168.200.0/24 is variably subnetted, 6 subnets, 2 masks
C    192.168.200.4/30 is directly connected, Serial0/0
C    192.168.200.8/30 is directly connected, Serial0/1
R    192.168.200.12/30 [120/1] via 192.168.200.6, 00:00:18, Serial0/0
                        [120/1] via 192.168.200.10, 00:00:24, Serial0/1
C    192.168.200.32/27 is directly connected, FastEthernet0/0
R    192.168.200.64/27 [120/1] via 192.168.200.10, 00:00:24, Serial0/1
R    192.168.200.96/27 [120/1] via 192.168.200.6, 00:00:18, Serial0/0
```

Llanelli routing table is shown below

Routing Table for Router Llanelli				
Type	Network	Port	Next Hop IP	Metric
R	192.168.200.4/30	Serial0/0	192.168.200.14	120/1
R	192.168.200.4/30	Serial0/1	192.168.200.9	120/1
C	192.168.200.8/30	Serial0/1	---	0/0
C	192.168.200.12/30	Serial0/0	---	0/0
R	192.168.200.32/27	Serial0/1	192.168.200.9	120/1
C	192.168.200.64/27	FastEthernet0/0	---	0/0
R	192.168.200.96/27	Serial0/0	192.168.200.14	120/1

```

Router>en
Router#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

    192.168.200.0/24 is variably subnetted, 6 subnets, 2 masks
R       192.168.200.4/30 [120/1] via 192.168.200.14, 00:00:12, Serial0/0
        [120/1] via 192.168.200.9, 00:00:20, Serial0/1
C       192.168.200.8/30 is directly connected, Serial0/1
C       192.168.200.12/30 is directly connected, Serial0/0
R       192.168.200.32/27 [120/1] via 192.168.200.9, 00:00:20, Serial0/1
C       192.168.200.64/27 is directly connected, FastEthernet0/0
R       192.168.200.96/27 [120/1] via 192.168.200.14, 00:00:12, Serial0/0

Router#

```

Burly port rip routing table

Routing Table for Router burly port

Type	Network	Port	Next Hop IP	Metric
C	192.168.200.4/30	Serial0/0	---	0/0
R	192.168.200.8/30	Serial0/1	192.168.200.13	120/1
R	192.168.200.8/30	Serial0/0	192.168.200.5	120/1
C	192.168.200.12/30	Serial0/1	---	0/0
R	192.168.200.32/27	Serial0/0	192.168.200.5	120/1
R	192.168.200.64/27	Serial0/1	192.168.200.13	120/1
C	192.168.200.96/27	FastEthernet0/0	---	0/0

```

Router>en
Router#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

192.168.200.0/24 is variably subnetted, 6 subnets, 2 masks
C       192.168.200.4/30 is directly connected, Serial0/0
R       192.168.200.8/30 [120/1] via 192.168.200.13, 00:00:16, Serial0/1
        [120/1] via 192.168.200.5, 00:00:25, Serial0/0
C       192.168.200.12/30 is directly connected, Serial0/1
R       192.168.200.32/27 [120/1] via 192.168.200.5, 00:00:25, Serial0/0
R       192.168.200.64/27 [120/1] via 192.168.200.13, 00:00:16, Serial0/1
C       192.168.200.96/27 is directly connected, FastEthernet0/0
Router#

```

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4. VLANS Llanelli Router/Switch for CIDR/27 sub network

FastEthernet 0/0.100	0	1	0	0	0	0	0	1	Net addr 65 i/f addr 94
FastEthernet 0/0.101	1	0	0	0	0	0	0	1	Net addr 129 i/f addr 130

Llanelli Switch – FastEthernet 0/27 – linked to London Router with encapsulation vlan 100 and vlan 101

Llanelli Switch – FastEthernet 0/1 – set as vlan 100 linked to PC1 London

Llanelli Switch – FastEthernet 0/2 – set as vlan 101 linked to PC2 London

Llanelli Switch show vlan

VLAN Name Status Ports

1 default active 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

100 vlan100 active Fa0/1

101 vlan101 active Fa0/2

1002 fddi-default act/unsup

1003 token-ring-default act/unsup

1004 fddinet-default act/unsup

1005 trnet-default act/unsup

VLAN Type SAID MTU Parent RingNo BridgeNo Stp BrdgMode Trans1 Trans2

1 enet 100001 1500 ----- 0 0

100 enet 100100 1500 ----- 0 0

101 enet 100101 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
```

London vlan switch running – config

```
Switch#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 Switch
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
switchport access vlan 100
switchport mode access
!
interface FastEthernet0/2
switchport access vlan 101
switchport mode access
!
interface FastEthernet0/3
switchport mode trunk
!
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
!
interface Vlan1
no ip address
shutdown
!
!
!
!
line con 0
end

```

VLAN config is correct and the tests prove successful

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0 pwill	PC5 burry p...	ICMP		0.000	N	0	(edit)	
	Successful	PC4 b...	PC7 llanelli	ICMP		0.000	N	1	(edit)	
	Successful	PC7 ll...	PC1 pwill	ICMP		0.000	N	2	(edit)	

Acl test

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC7 ll...	PC1 pwl	ICMP		0.000	N	0	(edit)	
	Failed	PC6 ll...	PC1 pwl	ICMP		0.000	N	1	(edit)	

*Test fail here
is due to the
ACL config
which denies
the PC6
comms.*

Rip routing table on vlan

Routing Table for Router llanelli					
Type	Network	Port	Next Hop IP	Metric	
R	192.168.200.4/30	Serial0/0	192.168.200.9	120/1	
R	192.168.200.4/30	Serial0/1	192.168.200.14	120/1	
C	192.168.200.8/30	Serial0/0	---	0/0	
C	192.168.200.12/30	Serial0/1	---	0/0	
R	192.168.200.32/27	Serial0/0	192.168.200.9	120/1	
C	192.168.200.64/27	FastEthernet0/0.100	---	0/0	
R	192.168.200.96/27	Serial0/1	192.168.200.14	120/1	
C	192.168.200.128/27	FastEthernet0/0.101	---	0/0	

Pwll ruunnng config

R0#show running-config
Building configuration...

Current configuration : 767 bytes

```
!  
version 12.2  
no service timestamps log datetime msec  
no service timestamps debug datetime msec  
no service password-encryption  
!  
hostname R0  
no ip cef  
no ipv6 cef  
interface FastEthernet0/0  
ip address 192.168.200.62 255.255.255.224
```

```
ip access-group 2 out
duplex auto
speed auto
interface Serial0/0
ip address 192.168.200.5 255.255.255.252
clock rate 64000
interface Serial0/1
ip address 192.168.200.9 255.255.255.252
router rip
version 2
network 192.168.200.0
ip classless
ip flow-export version 9
access-list 1 deny host 192.168.200.66
access-list 1 permit any
access-list 2 deny host 192.168.200.65
access-list 2 permit any
line con 0
line aux 0
line vty 0 4
login
end
```

*This is the
ACL that
denies PC6 in
the test
shown earlier.*

Burry port running config

```
R0#show running-config
Building configuration...
```

```
Current configuration : 767 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname R0
!
!
!
!
!
!
!
no ip cef
no ipv6 cef
```

```
!
!  
!  
!  
!  
!  
!  
!  
!  
!  
!  
!  
!  
!  
!  
!  
!  
  
interface FastEthernet0/0  
ip address 192.168.200.62 255.255.255.224  
ip access-group 2 out  
duplex auto  
speed auto  
!  
interface Serial0/0  
ip address 192.168.200.5 255.255.255.252  
clock rate 64000  
!  
interface Serial0/1  
ip address 192.168.200.9 255.255.255.252  
!  
router rip  
version 2  
network 192.168.200.0  
!  
ip classless  
ip flow-export version 9  
access-list 1 deny host 192.168.200.66  
access-list 1 permit any  
access-list 2 deny host 192.168.200.65  
access-list 2 permit any  
!line con 0  
line aux 0  
line vty 0 4  
login  
End
```

Llanelli

```
R0#show running-config
Building configuration...
```

Current configuration : 767 bytes

!

version 12.2

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

!

```
hostname R0
```

!

!

!

!

!

!

1

1

no ip cef

no ipv6 cef

!

!

!

!

!

!

!

!

!

1

1

i

1

1

i

1

1

!

```
interface FastEthernet0/0
```

ip address 192.168.200.62 255.255.255.224

```
ip access-group 2 out
```

duplex auto

speed auto

```
!  
interface Serial0/0  
ip address 192.168.200.5 255.255.255.252  
clock rate 64000  
!  
interface Serial0/1  
ip address 192.168.200.9 255.255.255.252  
!  
router rip  
version 2  
network 192.168.200.0  
!  
ip classless  
!  
ip flow-export version 9  
!  
!  
access-list 1 deny host 192.168.200.66  
access-list 1 permit any  
access-list 2 deny host 192.168.200.65  
access-list 2 permit any  
!  
!  
!  
!  
!  
line con 0  
!  
line aux 0  
!  
line vty 0 4  
login  
!  
!  
!  
end
```

All router configuration reports show all configurations associated with the router.

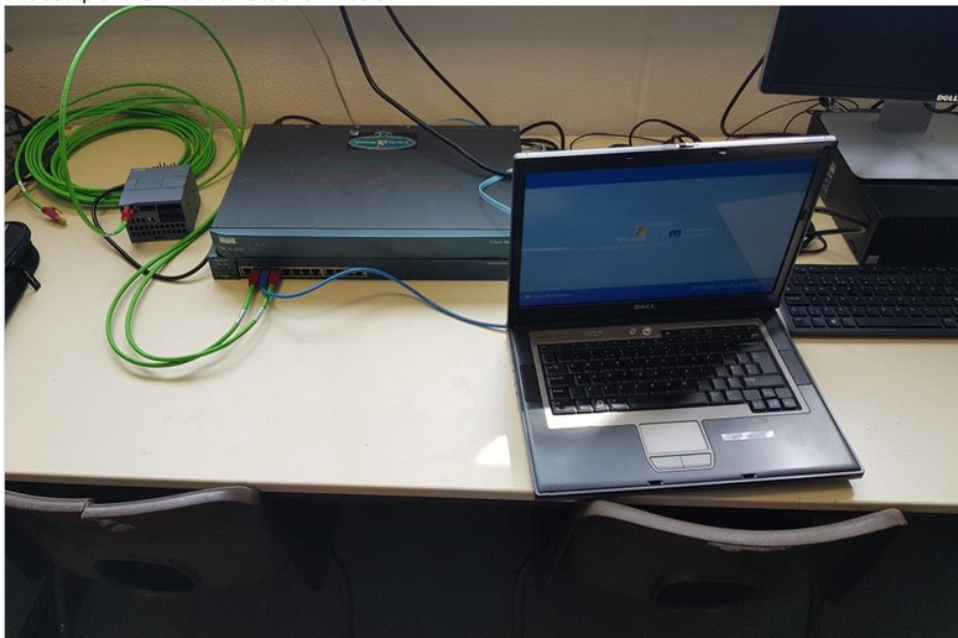
Element 3

Set up

A server and switch is used to create a link between the PLC and the internet for remote access of the PLC over an http page. Below is a server on top of a switch.

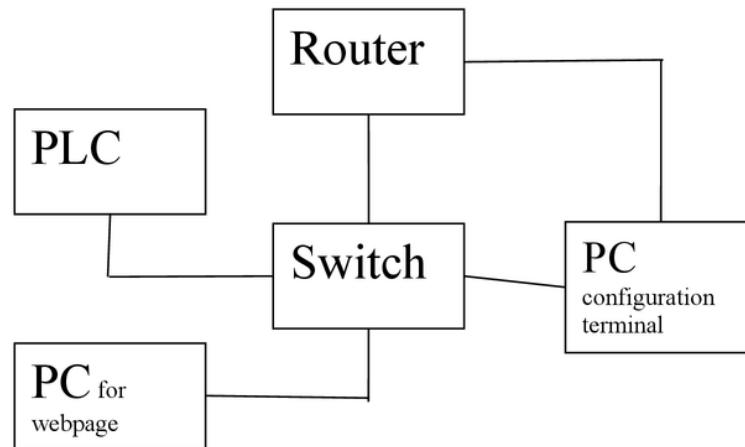


The setup of the PLC and PC is shown below



*Good
images of
practical
setup.*

This shows the Ethernet and configuration terminal connections

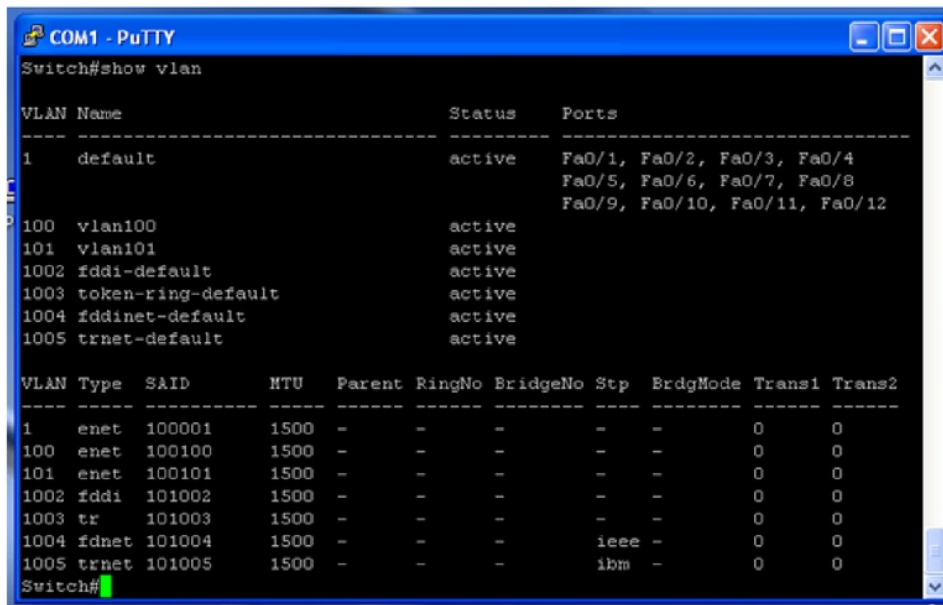


Good use of block diagram.

The configuration terminal now is accessed to set the switch and router up to be able to communicate across the network.

What you need here is a topological view of the system with all devices labelled and port identification.

The switch is setup first. VLANs active with no interface connections

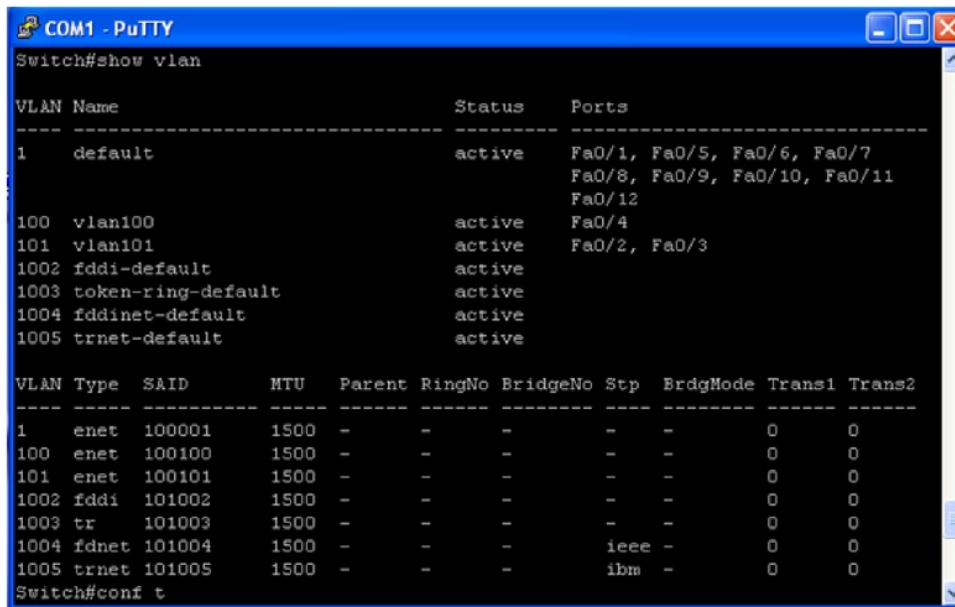


```
COM1 - PuTTY
Switch#show vlan

VLAN Name                Status    Ports
-----
1    default                active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                           Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                           Fa0/9, Fa0/10, Fa0/11, Fa0/12
100  vlan100                 active
101  vlan101                 active
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
100  enet    100100    1500  -      -      -        -   -         0      0
101  enet    100101    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
Switch#
```

Interface connections configured with VLANs



```
COM1 - PuTTY
Switch#show vlan

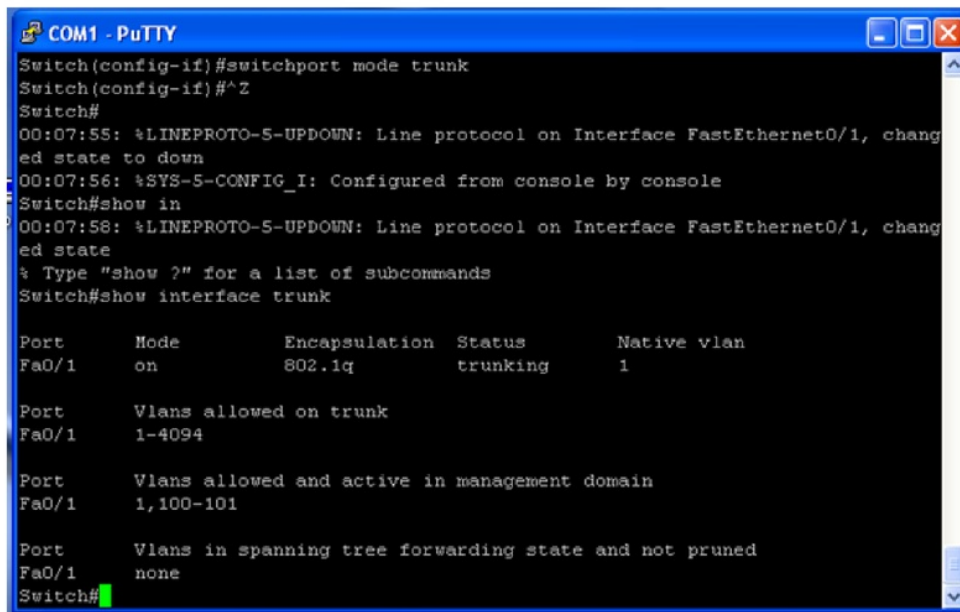
VLAN Name                Status    Ports
-----
1    default                active    Fa0/1, Fa0/5, Fa0/6, Fa0/7
                                           Fa0/8, Fa0/9, Fa0/10, Fa0/11
                                           Fa0/12
100  vlan100                 active    Fa0/4
101  vlan101                 active    Fa0/2, 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
100  enet    100100    1500  -      -      -        -   -         0      0
101  enet    100101    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
Switch#conf t
```

Image shows
Vlans configured
with interfaces.

Encapsulation test for VLAN 100 and 101

This encapsulation is to translate the data into the correct protocol for the frame that is required for the message.



```
COM1 - PuTTY
Switch(config-if)#switchport mode trunk
Switch(config-if)#^Z
Switch#
00:07:55: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down
00:07:56: %SYS-5-CONFIG_I: Configured from console by console
Switch#show in
00:07:58: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state
% Type "show ?" for a list of subcommands
Switch#show interface trunk

Port      Mode      Encapsulation  Status        Native vlan
Fa0/1     on        802.1q         trunking      1

Port      Vlans allowed on trunk
Fa0/1     1-4094

Port      Vlans allowed and active in management domain
Fa0/1     1,100-101

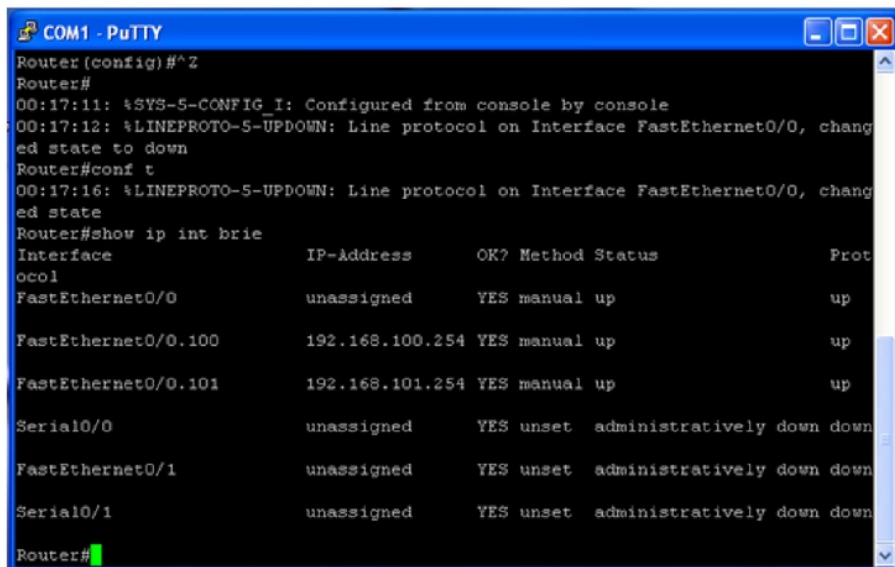
Port      Vlans in spanning tree forwarding state and not pruned
Fa0/1     none
Switch#
```

The router is now setup. Various amounts of VLANs can be created on a single gateway. There is a maximum of 199 gateways that can be allocated in the sub interface configuration. The inter VLAN sub interface gateways are

192.168.100.254
192.168.101.254

The two gateways are identified for trunking.

Configuration of sub interfaces 0.100 and 0.101 (inter VLAN routing)



```
COM1 - PuTTY
Router(config)#^Z
Router#
00:17:11: %SYS-5-CONFIG_I: Configured from console by console
00:17:12: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to down
Router#conf t
00:17:16: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state
Router#show ip int brief
Interface                               IP-Address      OK? Method Status  Prot
ocol
FastEthernet0/0                         unassigned      YES manual up       up
FastEthernet0/0.100                     192.168.100.254 YES manual up       up
FastEthernet0/0.101                     192.168.101.254 YES manual up       up
Serial0/0                               unassigned      YES unset  administratively down down
FastEthernet0/1                         unassigned      YES unset  administratively down down
Serial0/1                               unassigned      YES unset  administratively down down
Router#
```

(Router run) Showing sub interfacing and gateways assigned

```
COM1 - PuTTY
!
interface FastEthernet0/0
no ip address
no ip directed-broadcast
duplex auto
speed auto
!
interface FastEthernet0/0.100
encapsulation dot1Q 100
ip address 192.168.100.254 255.255.255.0
no ip directed-broadcast
!
interface FastEthernet0/0.101
encapsulation dot1Q 101
ip address 192.168.101.254 255.255.255.0
no ip directed-broadcast
!
interface Serial0/0
no ip address
no ip directed-broadcast
no ip route-cache
shutdown
--More--
```

Sub interfacing is configured using two separate gateway addresses.

Router configuration

```
C:\WINDOWS\system32\cmd.exe

Pinging 192.168.101.2 with 32 bytes of data:
Reply from 192.168.101.2: bytes=32 time=2ms TTL=30
Reply from 192.168.101.2: bytes=32 time<1ms TTL=30
Reply from 192.168.101.2: bytes=32 time<1ms TTL=30
Reply from 192.168.101.2: bytes=32 time<1ms TTL=30

Ping statistics for 192.168.101.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\Documents and Settings\Administrator>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : 
    IP Address. . . . . : 192.168.101.3
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.101.254

C:\Documents and Settings\Administrator>
C:\Documents and Settings\Administrator>ping 192.168.101.2

Pinging 192.168.101.2 with 32 bytes of data:
Reply from 192.168.101.2: bytes=32 time=2ms TTL=30
Reply from 192.168.101.2: bytes=32 time<1ms TTL=30
Reply from 192.168.101.2: bytes=32 time<1ms TTL=30
Reply from 192.168.101.2: bytes=32 time<1ms TTL=30

Ping statistics for 192.168.101.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

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

*Ping
command
test*

Pinging PLC to insure that the routing has been set up correctly. This test proves the routing of the network.

```
C:\Users\Leils>ping 192.168.101.3

Pinging 192.168.101.3 with 32 bytes of data:
Reply from 192.168.101.3: bytes=32 time<1ms TTL=127
Reply from 192.168.101.3: bytes=32 time<1ms TTL=127
Reply from 192.168.101.3: bytes=32 time<1ms TTL=127
Reply from 192.168.101.3: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.101.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

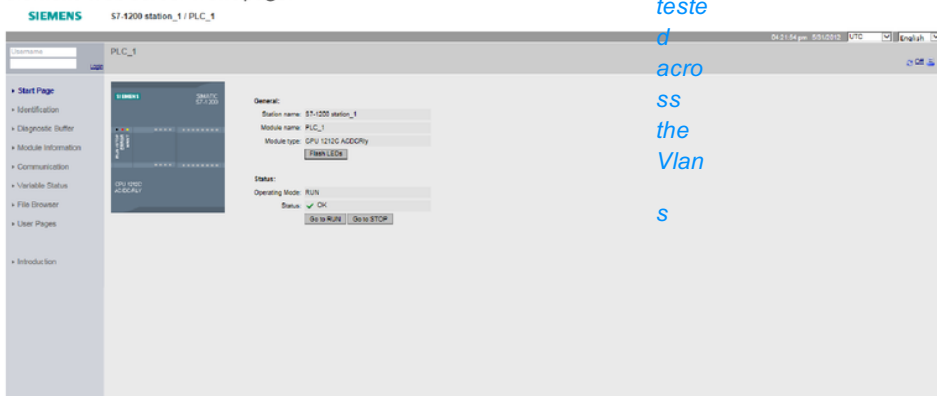
C:\Users\Leils>ping 192.168.101.2

Pinging 192.168.101.2 with 32 bytes of data:
Request timed out.
Reply from 192.168.101.2: bytes=32 time=1ms TTL=29
Reply from 192.168.101.2: bytes=32 time=1ms TTL=29
Reply from 192.168.101.2: bytes=32 time=1ms TTL=29

Ping statistics for 192.168.101.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms
```

vlan 100 - vlan 101 ping test

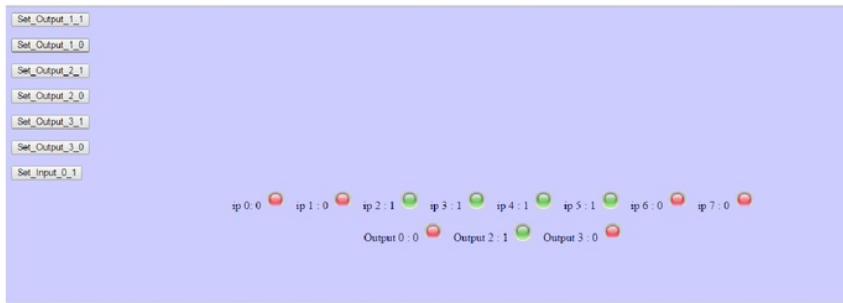
Siemens web server front page.



The PLC can now communicate via a web server and send receive data via an http page. This can allow inputs from the PLC to be displayed and outs to be set via the screen. This would be very useful in situations where remote HMIs would be required in several places across a factory. The front page looks as below. The link for this page is found in the link "user pages" above. This can have multiple pages instead of just the 1 as below.

Test

The buttons on the left are the force outputs and the indicators are the returning inputs and status of outputs. Test 1 inputs 00111100 outputs 010

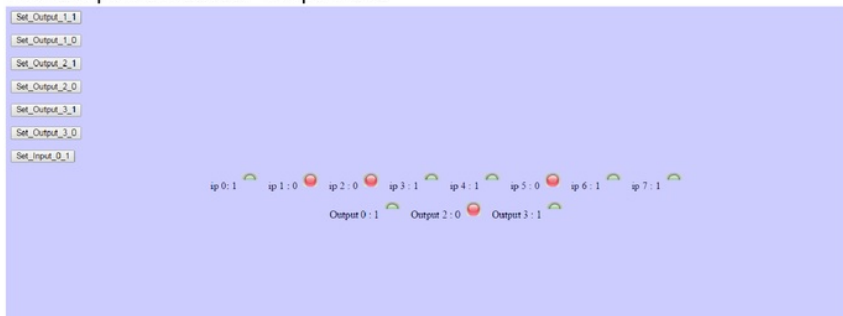


The PLC has the matching IO on the indicators



*Test for
the web
page
control
with PLC*

Test 2 inputs 10011011 outputs 101





Test 3 Inputs 10010000 Outputs 100



There is no explanation of the HTML program here.

Web page monitor for PLC inputs and controls

Conclusion

This is correct here, the Cisco devices did actually have to be cleared so that the memory was empty. A VLAN trunk

VLANs were configured and tested that there was no communication on a Cisco router and switch. This insured there was a blank starting ground. The inter VLAN routing was configured to allow communication in 2 directions across this system. The protocol used was trunk and the VLANs had individual gateways.

A ping test allowed the network addressing to be proven between the hosts before connecting the switch the PLC for the webserver.

Google chrome was used to access the PLC via a HTTP protocol. This allowed to access the PLC IO remotely and proved the workings of the VLAN configuration

Recommendations

This system can be expanded to allow use on non-wired devices. It could be linked to a wireless router which could give easy access from a phone or tablet device. This would be extremely useful on big productions lines as it's virtually a mobile HMI.

Conclusion has good points and the recommendation for a wireless system is valid.

assignment 1

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

60/100

PAGE 1

PAGE 2

Text Comment. List of contents should be sub-divided for each element heading.

Text Comment. No list of figures.

PAGE 3

Text Comment. This detail needs to be summarised and enlarged.

PAGE 4

Text Comment. The research should have diagrams or images to help explain each category. The image here is not clear. There are some explanations which are reasonable.

PAGE 5

Text Comment. Addressing scheme is correct and covers the three classes. The WAN addresses are your choice.

PAGE 6

PAGE 7

Text Comment. Routers are configured correctly for static routing.

Text Comment. Testing is successful for the addressing and routing.

PAGE 8

Text Comment. RIP is the dynamic routing method.

Text Comment. RIP is configured on all routers

PAGE 9

PAGE 10

PAGE 11

Text Comment. RIP routing is configured and the images show the direct connection, via and router pathways.

Text Comment. Tests are successful which shows the RIP is correct.

PAGE 12

Text Comment. Configuration of DHCP with network pools.

PAGE 13

Text Comment. This is a default address and not the correct one because the helper address is not configured.

Text Comment. Helper address config

PAGE 14

Text Comment. DHCP is now correct.

Text Comment. Exclusion addresses have been specified here.

Text Comment. Test result of exclusion addresses.

PAGE 15

Text Comment. Report from router config. This shows all the configuration associated with the router.

PAGE 16

PAGE 17

PAGE 18

Text Comment. Evaluation is good and there are some good points to consider for the next element.

PAGE 19

Text Comment. Subnet addresses for CIDR/28

PAGE 20

Text Comment. Good effort with this. The address scheme looks good.

PAGE 21

Text Comment. RIP routing is configured as shown in the images.

PAGE 22

Text Comment. Tests are successful

PAGE 23

Text Comment. VLSM is correct and LAN nets are CIDR/27 and WAN nets are CIDR/30

Text Comment. Tests are good and test across each WAN.

PAGE 24

PAGE 25

PAGE 26

Text Comment. RIP routing for the VLSM network is configured as shown here.

PAGE 27

PAGE 28

Text Comment. VLAN config is correct and the tests prove successful

PAGE 29

Text Comment. Test fail here is due to the ACL config which denies the PC6 comms.

Text Comment. This is the ACL that denies PC6 in the test shown earlier.

Text Comment. All router configuration reports show all configurations associated with the router.

Text Comment. Good images of practical setup.

Text Comment. Good use of block diagram.

Text Comment. What you need here is a topological view of the system with all devices labelled and port identification.

Text Comment. Image shows Vlans configured with interfaces.

Text Comment. The two gateways are identified for trunking.

Text Comment. Sub interfacing is configured using two separate gateway addresses.

Text Comment. Ping commands test the Vlan comms.

Text Comment. Comms is tested across the Vlans

Text Comment. Test for the web page control with PLC

PAGE 41

Text Comment. Web page monitors PLC inputs and controls outputs.

Text Comment. There is no explanation of the HTML program here.

PAGE 42

Text Comment. This is correct here, the Cisco devices did actually have to be cleared so that the memory was empty. A good point.

Text Comment. Conclusion has good points and the recommendation for a wireless system is valid.

GRADING FORM: CSG-RUBIC

SEAN JONES

60

RESEARCH-INFORMED LITERATURE



Research has been carried out but more sources are required and there needs to be more images / diagrams to support your explanations. 4/10

4/10

KNOWLEDGE AND UNDERSTANDING



Element1. The simple network system has been designed and implemented by defining the requirements from the larger system. 6/10

19/30

Element2. The network parameters were configured for the larger main network which included CIDR28, VLSM 27 and 30 implementation. This was done and tested. The six networks were all configured correctly with good understanding shown. 7/10
Element3. Practical configuration was completed and tested. Vlans all tested good and the PLC was programmed from across the Vlan using TIA software on a laptop PC. The web server was accessed using the ip address set on the PLC. Images were taken to prove the tests. No explanation for the HTML program in the web server was given. 6/10

ANALYSIS



Element1. The test results showed the network operating as expected with no faults. The operation of the network was explained well and the images support the test results. 3.5/5
Element2. The test results of the network configuration were successful and explained reasonably well. Each part of the configuration was tested and explained where needed. The images were good and supported your explanations 7/10
Element3. The results from the practical network showed that the Vlans and inter Vlan routing was configured. This was confirmed by the programming and control of the PLC across Vlans. Images support the test results with this test. However there is no listing or explanation of the HTML program that was downloaded to the server or web server configuration. 5.5/10

16/25

PRACTICAL APPLICATION AND DEP.



Element1. Design and implementation was achieved using good methods by which the address scheme of the three classes of ip address was designed first and then applied to the network for testing. Each LAN was tested individually. WAN networks were implemented after LAN tests were completed. 3/5
Element2. Each section of this element was done separately. The CIDR/28 was implemented firstly and then the VLSM. VLSM was tested using ping commands. The Vlans were implemented and tested locally first to prove config had no errors. Tests proved positive. The ACL configuration provided the security which was implemented successfully. This was proved with testing by sending and receiving data packets. 3.5/5
Element3. Vlans were configured on the Cisco router and switch. The PLC program was done using a laptop on a separate Vlan. The PLC server was downloaded with a htm file and using the ip address of the PLC this was tested. No explanation for the HTML program. 5.5/10

12/20

SKILLS FOR PROFESSIONAL PRAC.



Element1. The quality of this element is very good. The images are clear. Only the research is an issue with this element. 3/5
Element2. This element covered all that was required. There are some spelling errors in the report. 3.5/5
Element3. This element covered most of the tasks in good detail but did not cover the HTML program. 2.5/5

9/15