CCNA4 Case Study

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Phase 1: Addressing the WAN

1.0 IP addressing Scheme

Number of addresses required	Network address	Subnet Mask	Max Number of Hosts possible	Network Name	Location
250	172.16.1.0/22	255.255.252.0	255/253 usable	VLAN 1	Cork
250	172.16.4.0/22	255.255.252.0	255/253 usable	VLAN 2	Cork
250	172.16.8.0/22	255.255.252.0	255/253 usable	VLAN 3	Cork
172	172.16.16.0/22	255.255.252.0	255/253 usable	Galway LAN	Galway
172	172.16.17.0/22	255.255.252.0	255/253 usable	Galway LAN	Galway
172	172.16.18.0/22	255.255.252.0	255/253 usable	Galway LAN	Galway
3	172.16.255.234/28	255.255.248.0	8/6 usable	Mgmt	Cork
2	172.16.255.244/30	255.255.255.252	4/2 usable	Router Gal/Cork	Gal/Cork
2	172.16.255.248/30	255.255.255.252	4/2 usable	Router Cork/Bel	Cork/Bel
2	172.16.255.252/30	255.255.255.252	4/2 usable	Router Lim/Bel	Lim/Bel

1.1 Router Addressing

Galway Router							
Interface Number	Description and Purpose	DCE/DTE	Clock Rate	Network Name	Network Number	Interface IP address	Subnet Mask
Serial 0/0	Galway	DTE	N/A	Galway	172.16.255.0/30	172.16.255.244	255.255.255.244
Ethernet 0/0	Galway	N/A	N/A	Galway	172.16.16.0/22	172.16.16.1	255.255.252.0
Loopback 0	Galway	N/A	N/A	Galway	172.16.32.0	172.16.32.1	255.255.255.255

Cork Router							
Interface Number	Description and Purpose	DCE/DTE	Clock Rate	Network Name	Network Number	Interface IP address	Subnet Mask
Serial 0/0	Cork	DTE	N/A	Cork	172.16.255.0/30	172.16.255.245	255.255.255.252
Serial 0/1	Cork	DTE	N/A	Cork	172.16.255.0/30	172.16.255.248	255.255.255.252
Ethernet 0/0	Cork	N/A	N/A	Cork	172.16.1.0/22	172.16.1.1	255.255.252.0
Loopback 0	Cork	N/A	N/A	Cork	172.16.32.0	172.16.32.2	255.255.255.255

Belfast Router							
Interface Number	Description and Purpose	DCE/DTE	Clock Rate	Network Name	Network Number	Interface IP address	Subnet Mask
Serial 0/0	Belfast	DCE	56000	Belfast	172.16.255.0/30	172.16.255.249	255.255.255.252
Serial 0/1	Belfast	DTE	N/A	Belfast	172.16.255.0/30	172.16.255.252	255.255.255.252
Ethernet 0/0	Belfast	N/A	N/A	Belfast	10.0.0.0/24	10.0.0.1	255.255.252.0
Loopback 0	Belfast	N/A	N/A	Belfast	172.16.32.0	172.16.32.3	255.255.255.255

Limerick Router							
Interface Number	Description and Purpose	DCE/DTE	Clock Rate	Network Name	Network Number	Interface IP address	Subnet Mask
Serial 0/0	Limerick	DCE	56000	Limerick	172.16.255.0/30	172.16.255.253	255.255.255.252
Ethernet 0/0	Limerick	N/A	N/A	Limerick	N/A	N/A	N/A
Loopback 0	Limerick	N/A	N/A	Limerick	172.16.32.0	172.16.32.4	255.255.255.255

1.2 Switch Addressing and Configuration

Cork Switch									
Interface	Description	Speed	Duplex	Network Name	Network Number	Subnet Mask	VLAN	Por Type	Encapsulation
F0/2 –F0/7	VLAN 1	100 Mbps	Full-Duplex	VLAN 1	172.16.1.0 /24	255.255 .255.0	1	Access	802.1Q
F0/8 -F0/11	VLAN 2	100 Mbps	Full-Duplex	VLAN 2	172.16.1.0 /24	255.255 .255.0	2	Access	802.1Q
F0/12 – F0/15	VLAN 3	100 Mbps	Full-Duplex	VLAN 3	172.16.1.0 /24	255.255 .255.0	3	Access	802.1Q
F0/23 – F0/24	Trunking	100 Mbps	Full-Duplex	N/A	N/A	N/A		Trunk	802.1Q

Phase 2: Configuring the Routers and OSPF

Router Name	Protocol	Addressing	Role	
Galway	RIP version 2	172.16.255.242 255.255.255.252		
		172.16.16.0 255.255.252.0		
Cork	OSPF	172.16.255.245.0 0.0.0.3		
		172.16.255.242 0.0.0.3		
		172.16.1.0 0.0.0.255		
		172.16.4.0 0.0.3.255		
		172.16.8.1 0.0.3.255		
		172.16.16.1 0.0.3.255		
		172.16.234.1 0.0.3.255		
	RIP version 2	172.16.255.242 255.255.255.252		
		172.16.255.245 255.255.255.252		
		172.16.1.0 255.255.252.0		
		172.16.4.0 255.255.252.0		
		172.16.8.0 255.255.252.0		
		172.16.234.1 255.255.252.0		
		172.16.16.1 255.255.252.0		
Belfast	OSPF	172.16.255.248 0.0.0.3		
		172.16.255.245 0.0.0.3		
		10.0.0.0 0.0.0.255		
Limerick	OSPF	172.16.255.248 0.0.0.3		

Phase 3: Configuring NAT, Frame Relay Simulation, and ACL's

The NAT configurations will be set on the Belfast router. The NAT configurations will allow for traffic heading to the ISP to be translated into one address.

```
ip nat pool public-access 192.168.1.6 192.168.1.6 netmask 255.255.255.252
access-list 1 permit 172.16.0.0 0.0.255.255
ip nat inside source list 1 pool public-access

interface serial 0/0
ip nat inside
ip nat translation timeout 120
interface serial 0/1
ip nat inside
ip nat translation timeout 120
interface fastethernet 0/0
ip nat outside
ip nat translation timeout 120
```

The configurations in the table are the configurations that must be entered into the Belfast router. NAT is configured on both serial interfaces to ensure that data transmitting from each interface to the ISP will be translated. The ISP must be configured to be a web page and the IP address must be configured as directed in the intructions.

Frame relay will need to be configured on the serial 0/0 interface on the cork router and the serial 0/0 interface on the galway router. Since we do not have the equipment

necessary to implement a frame relay switch, we will simply configure a direct serial link with frame relay configured.

Refer to config files

To manage traffic going to the ISP, we need to setup an ACL to block HTTP traffic going through the serial interface on the galway LAN. The ACL should be similar to the one show in the table.

```
interface serial 0/0
ip access-group 101 out
access-list 101 permit tcp 172.16.16.0 0.0.3.255 10.0.0.2 0.0.0.0 eq http
access-list 101 deny any 10.0.0.2 0.0.0.0
access-list 101 permit any any
```

Phase 4: Configuring VLAN's and DHCP

DHCP needs to be configured on the Galway router to assign IP addresses dynamically to the Galway LAN. The configurations should resemble what you see below.

```
ip dhcp pool galway
network 172.16.16.0 255.255.252.0
default-router 172.16.16.1
dns-server 172.16.16.1
exit

ip dhcp excluded-address 172.16.16.1
interface fastethernet 0/0
ip helper-address 172.16.16.1
```

VLAN configurations should resemble what you see below. The router configurations should resemble the data in the table below.

```
interface fastethernet 0/0
no shutdown
interface fastethernet 0/0.1
encapsulation dot1q 1 native
ip address 172.16.234.1 255.255.252.0

interface fastethernet 0/0.2
encapsulation dot1q 2 native
ip address 172.16.1.1 255.255.252.0

interface fastethernet 0/0.3
encapsulation dot1q 3 native
ip address 172.16.4.1 255.255.252.0

interface fastethernet 0/0.4
encapsulation dot1q 4 native
ip address 172.16.8.1 255.255.252.0
no shutdown
```

exit

The switch configurations are to be like the data in the table below.

hostname Cork_S interface vlan1 ip address 172.16.255.235 255.255.255.248 no shutdown exit ip default-gateway 172.16.255.234 exit vlan database vlan 2 name vlan2 vlan 3 name vlan3 exit config terminal interface fastethernet 0/1 switchport mode access switchport access vlan 1 interface fastethernet 0/2 switchport mode access switchport access vlan 1 interface fastethernet 0/3 switchport mode access switchport access vlan 1 interface fastethernet 0/4 switchport mode access switchport access vlan 1 interface fastethernet 0/5 switchport mode access switchport access vlan 2 interface fastethernet 0/6 switchport mode access switchport access vlan 2 interface fastethernet 0/7 switchport mode access switchport access vlan 2 interface fastethernet 0/8 switchport mode access switchport access vlan 2   interface fastethernet 0/9

```
switchport mode access
switchport access vlan 3
interface fastethernet 0/10
switchport mode access
switchport access vlan 3
interface fastethernet 0/11
switchport mode access
switchport access vlan 3
interface fastethernet 0/12
switchport mode access
switchport access vlan 3


interface fastethernet 0/24
switchport mode trunk
exit
```

Phase 5: Verification and Testing

Belfast Router

```
Hostname Belfast
interface fastethernet 0/0
ip address 10.0.0.1 255.0.0.0
no shutdown
exit

interface loopback 0
ip address 172.16.32.3 255.255.255.255
no shutdown
exit

interface serial 0/0
ip address 172.16.255.246 255.255.255.252
clockrate 56000
no shutdown
exit

interface serial 0/1
ip address 172.16.255.249 255.255.255.252
clockrate 56000
no shutdown
exit

ip host Galway 172.16.16.1 172.16.255.243
ip host Limerick 172.16.255.250
ip host Belfast 172.16.255.246 172.16.255.249 10.0.0.1
ip host Cork 172.16.255.242 172.16.255.245 172.16.1.1
```

```
router ospf 1
network 172.16.255.248 0.0.0.3 area 0
network 172.16.255.245 0.0.0.3 area 0
exit

line console 0
password cisco
login
exit
line vty 0 4
password cisco
login
exit
enable password cisco
enable secret class

ip nat pool public-access 192.168.1.6 192.168.1.6 netmask 255.255.255.252
access-list 1 permit 172.16.0.0 0.0.255.255
ip nat inside source list 1 pool public-access

interface serial 0/0
ip nat inside
ip nat translation timeout 120
interface serial 0/1
ip nat inside
ip nat translation timeout 120
interface fastethernet 0/0
ip nat outside
ip nat translation timeout 120
```

Cork Router

```
Hostname Cork
interface fastethernet 0/0
no shutdown
interface fastethernet 0/0.1
encapsulation dot1q 1 native
ip address 172.16.234.1 255.255.248.0

interface fastethernet 0/0.2
encapsulation dot1q 2 native
ip address 172.16.1.1 255.255.252.0

interface fastethernet 0/0.3
encapsulation dot1q 3 native
ip address 172.16.4.1 255.255.252.0
```

```
interface fastethernet 0/0.4
encapsulation dot1q 4 native
ip address 172.16.8.1 255.255.252.0
no shutdown
exit

interface loopback 0
ip address 172.16.32.2 255.255.255.255
no shutdown
exit

interface serial 0/0
ip address 172.16.255.242 255.255.255.252
encapsulation frame-relay
no shutdown
exit

interface serial 0/1
ip address 172.16.255.245 255.255.255.252
no shutdown
exit

ip host Galway 172.16.16.1 172.16.255.243
ip host Limerick 172.16.255.250
ip host Belfast 172.16.255.246 172.16.255.249 10.0.0.1
ip host Cork 172.16.255.242 172.16.255.245 172.16.234.1

router ospf 1
network 172.16.255.245 0.0.0.3 area 0
network 172.16.255.242 0.0.0.3 area 0
network 172.16.1.0 0.0.3.255 area 0
network 172.16.4.0 0.0.3.255 area 0
network 172.16.8.0 0.0.3.255 area 0
network 172.16.234.0 0.0.7.255 area 0
redistribute ospf
exit

router rip
version 2
network 172.16.255.242 255.255.252.0
network 172.16.255.245 255.255.252.0
network 172.16.1.0 255.255.252.0
network 172.16.4.0 255.255.252.0
network 172.16.8.1 255.255.252.0
network 172.16.234.1 255.255.252.0
```

```
redistribute rip subnets
exit

line console 0
password cisco
login
exit
line vty 0 4
password cisco
login
exit
enable password cisco
enable secret class
```

Cork Switch

```
hostname Cork_S
interface vlan1
ip address 172.16.235.1 255.255.248.0
no shutdown
exit

ip default-gateway 172.16.234.0
exit

vlan database
vlan 2 name vlan2
vlan 3 name vlan3
exit

config terminal
interface fastethernet 0/1
switchport mode access
switchport access vlan 1
interface fastethernet 0/2
switchport mode access
switchport access vlan 1
interface fastethernet 0/3
switchport mode access
switchport access vlan 1
interface fastethernet 0/4
switchport mode access
switchport access vlan 1

interface fastethernet 0/5
```

```
switchport mode access
switchport access vlan 2
interface fastethernet 0/6
switchport mode access
switchport access vlan 2
interface fastethernet 0/7
switchport mode access
switchport access vlan 2
interface fastethernet 0/8
switchport mode access
switchport access vlan 2


interface fastethernet 0/9
switchport mode access
switchport access vlan 3
interface fastethernet 0/10
switchport mode access
switchport access vlan 3
interface fastethernet 0/11
switchport mode access
switchport access vlan 3
interface fastethernet 0/12
switchport mode access
switchport access vlan 3

interface fastethernet 0/24
switchport mode trunk
exit
```

Galway Router

```
Hostname Galway
interface fastethernet 0/0
ip address 172.16.16.1 255.255.252.0
no shutdown
exit

interface loopback 0
ip address 172.16.32.1 255.255.255.255
no shutdown
exit

interface serial 0/0
ip address 172.16.255.243 255.255.248.0
encapsulation frame-relay
```

```
no shutdown
exit

ip host Galway 172.16.16.1 172.16.255.243
ip host Limerick 172.16.255.250
ip host Belfast 172.16.255.246 172.16.255.249 10.0.0.1
ip host Cork 172.16.255.242 172.16.255.245 172.16.1.1

router rip
version 2
network 172.16.255.242 255.255.255.252
network 172.16.16.0 255.255.252.0
exit

line console 0
password cisco
login
exit
line vty 0 4
password cisco
login
exit
enable password cisco
enable secret class

interface serial 0/0
ip access-group 101 out
ip access-list 101 permit tcp 172.16.8.0 0.0.3.255 10.0.0.2 0.0.0.0 eq http
access-list 101 deny any 10.0.0.2 0.0.0.0
access-list 101 permit any any

config terminal
ip dhcp pool galway
network 172.16.8.0 255.255.255.0
default-router 172.16.8.1
dns-server 172.16.8.1
exit

ip dhcp excluded-address 172.16.8.1
interface fastethernet 0/0
ip helper-address 172.16.8.1
```

Limerick Router

```
Hostname Limerick
interface loopback 0
ip address 172.16.32.4 255.255.255.255
```

```
no shutdown
exit

interface serial 0/0
ip address 172.16.255.250 255.255.255.252
no shutdown
exit

ip host Galway 172.16.16.1 172.16.255.243
ip host Limerick 172.16.255.250
ip host Belfast 172.16.255.246 172.16.255.249 10.0.0.1
ip host Cork 172.16.255.242 172.16.255.245 172.16.1.1

router ospf 1
network 172.16.255.248 0.0.0.3 area 0
exit

line console 0
password cisco
login
exit
line vty 0 4
password cisco
login
exit
enable password cisco
enable secret class
```

Cloud Router (Simulating a Frame Relay switch)

```
hostname Cloud

frame-relay switching
interface serial 0/0
no ip address
encapsulation frame-relay
clockrate 56000
frame-relay intf-type dce
frame-relay route 21 interface serial 0/1 20
no shutdown
exit

frame-relay switching
interface serial 0/1
no ip address
encapsulation frame-relay
clockrate 56000
```

```
frame-relay intf-type dce
frame-relay route 20 interface serial 0/0 21
no shutdown

line console 0
password cisco
login
exit
line vty 0 4
password cisco
login
exit
enable password cisco
enable secret class
```