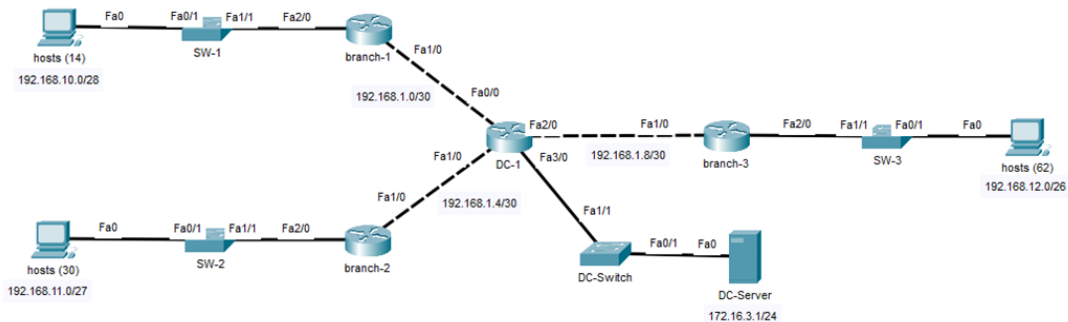


Subnetting

Lab Summary

Configure IP addressing for three new branch offices with Class C subnetting based on the tables provided.

Figure 1 Lab Topology



Lab Configuration

Start Packet Tracer File: **subnetting.pkt**

Table 1 WAN Segment Subnets

Hostname	WAN Segment	Interface	Subnet Mask
branch-1	192.168.1.1	Fa1/0	255.255.255.252
branch-2	192.168.1.5	Fa1/0	255.255.255.252
branch-3	192.168.1.9	Fa1/0	255.255.255.252
DC-1	192.168.1.2	Fa0/0	255.255.255.252
DC-1	192.168.1.6	Fa1/0	255.255.255.252
DC-1	192.168.1.10	Fa2/0	255.255.255.252

Table 2 LAN Segment Subnets

Hostname	Hosts	LAN Segment	Interface	Subnet Mask
branch-1	14	192.168.10.0	Fa2/0	255.255.255.240
branch-2	30	192.168.11.0	Fa2/0	255.255.255.224
branch-3	62	192.168.12.0	Fa2/0	255.255.255.192

Table 3 Class C Subnetting Table

Subnet Mask	Subnet Bits	Subnets	Host Bits	*Hosts
255.255.255.0	none	1	8	254
255.255.255.128	1	2	7	126
255.255.255.192	2	4	6	62
255.255.255.224	3	8	5	30
255.255.255.240	4	16	4	14
255.255.255.248	5	32	3	6
255.255.255.252	6	64	2	2

* The number of hosts addresses does not include the network address and broadcast address. They are reserved for each subnet and are not assignable to host interfaces or device interfaces. For example 4 host bits = $2^4 = 16 - 2 = 14$

Click on *branch-1* icon and select *CLI* folder.

Step 1: Enter global configuration mode

```
branch-1> enable  
branch-1# configure terminal
```

Step 2: Configure LAN interface Fa2/0

```
branch-1(config)# interface fastethernet2/0  
branch-1(config-if)# description LAN Interface  
branch-1(config-if)# ip address 192.168.10.14 255.255.255.240  
branch-1(config-if)# no shutdown
```

Step 3: Configure WAN interface Fa1/0

```
branch-1(config-if)# interface fastethernet1/0  
branch-1(config-if)# description link to DC-1  
branch-1(config-if)# ip address 192.168.1.1 255.255.255.252  
branch-1(config-if)# no shutdown  
branch-1(config)# end  
branch-1# copy running-config startup-config
```

Click on *branch-2* icon and select *CLI* folder.

Step 4: Enter global configuration mode

```
branch-2> enable  
branch-2# configure terminal
```

Step 5: Configure LAN interface Fa2/0

```
branch-2(config)# interface fastethernet2/0  
branch-2(config-if)# description LAN Interface  
branch-2(config-if)# ip address 192.168.11.30 255.255.255.224  
branch-2(config-if)# no shutdown
```

Step 6: Configure WAN interface Fa1/0

```
branch-2(config)# interface fastethernet1/0  
branch-2(config-if)# description link to DC-1  
branch-2(config-if)# ip address 192.168.1.5 255.255.255.252  
branch-2(config-if)# no shutdown  
branch-2(config)# end  
branch-2# copy running-config startup-config
```

Click on *branch-3* icon and select *CLI* folder.

Step 7: Enter global configuration mode

```
branch-3> enable  
branch-3# configure terminal
```

Step 8: Configure LAN interface Fa2/0

```
branch-3(config)# interface fastethernet2/0  
branch-3(config-if)# description LAN Interface  
branch-3(config-if)# ip address 192.168.12.62 255.255.255.192  
branch-3(config-if)# no shutdown
```

Step 9: Configure WAN interface Fa1/0

```
branch-3(config)# interface fastethernet1/0  
branch-3(config-if)# description link to DC-1  
branch-3(config-if)# ip address 192.168.1.9 255.255.255.252  
branch-3(config-if)# no shutdown
```

Click on *DC-1* icon and select *CLI* folder.

Step 10: Enter global configuration mode

```
DC-1> enable  
DC-1# configure terminal
```

Step 11: Configure WAN interface Fa0/0

```
DC-1(config)# interface fastethernet0/0  
DC-1(config-if)# description link to branch-1  
DC-1(config-if)# ip address 192.168.1.2 255.255.255.252  
DC-1(config-if)# no shutdown
```

Step 12: Configure WAN interface Fa1/0

```
DC-1(config)# interface fastethernet1/0  
DC-1(config-if)# description link to branch-2  
DC-1(config-if)# ip address 192.168.1.6 255.255.255.252  
DC-1(config-if)# no shutdown
```

Step 13: Configure WAN interface Fa2/0

```
DC-1(config)# interface fastethernet2/0  
DC-1(config-if)# description link to branch-3  
DC-1(config-if)# ip address 192.168.1.10 255.255.255.252  
DC-1(config-if)# no shutdown  
DC-1(config)# end  
DC-1# copy running-config startup-config
```

Step 14: Configure default gateway address on branch office hosts.

Hosts (14)

Config Folder

IP Configuration

Default Gateway: **192.168.10.14**

Hosts (30)

Config Folder

IP Configuration

Default Gateway: **192.168.11.30**

Hosts (62)

Config Folder

IP Configuration

Default Gateway: **192.168.12.62**

Step 15: Verify Lab

List the running configuration of each branch router to verify the IP address and subnet mask assigned are correct for LAN/WAN interfaces. In addition ping the neighbor interfaces and data center server from hosts at each branch.

```
branch-1# show running-config
branch-2# show running-config
branch-3# show running-config
hosts (branch-1): c:\> ping 172.16.3.1
hosts (branch-2): c:\> ping 172.16.3.1
hosts (branch-3): c:\> ping 172.16.3.1
```

Lab Notes

The subnetting requirements are based on the number of new hosts considering there are often more network devices than employees. The following describes how the subnet mask length determines the maximum number of host assignments available. For instance with branch-1 the assigned subnet mask (/28) allocates 4 bits to the host portion. The binary conversion of $2^4 = 16$ hosts minus the network address (all zeros) and broadcast address (all ones). In addition there are 4 bits of the 4th octet are being subnetted from the Class C address.

That allocates 16 subnets (2^4) with 14 host assignments per subnet. The subnets could be assigned to new branch offices for that region or new network devices. The point-to-point WAN links require only two IP addresses and as a result typically are assigned the serial (/30) subnet mask. The loopback addresses are assigned as a host (/32) address and installed in the routing table with that prefix length.

Branch-1

network (/28) | **hosts** = 4 bits (1-14)

255.255.255.240 (/28) = 11111111.11111111.11111111.1111 0000

Branch-2

network (/27) | **hosts** = 5 bits (1-30)

255.255.255.224 (/27) = 11111111.11111111.11111111.111 00000

Branch-3

network (/26) | **hosts** = 6 bits (1-62)

255.255.255.192 (/26) = 11111111.11111111.11111111.11 000000