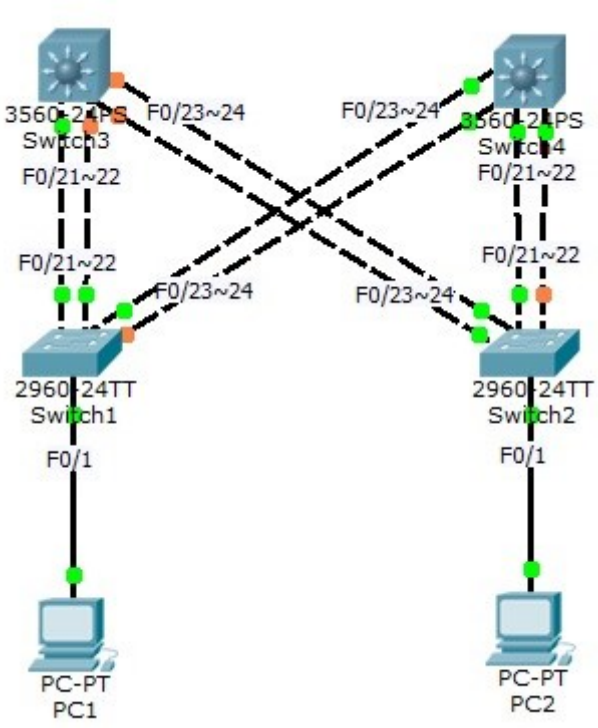
Lab 2.Virtual LANs

Objective

- Understand the LAN technologies of virtual LANs.

Topology



Host name	Interface	IPv4/IPv6 address	VLAN ID
Switch1	F0/1	N/A	VLAN 1
	F0/21~24	N/A	All VLANs (trunk)
Switch2	F0/1	N/A	VLAN 1
	F0/21~24	N/A	All VLANs (trunk)
Switch3	F0/1	N/A	VLAN 1
	F0/21~24	N/A	All VLANs (trunk)
	Vlan 11	IPv4: 192.168. 11 . 1 /24 ~~IPv6: 2001:2345:6789: 11 :: 1 /64~~	SVI
	Vlan 22	IPv4: 192.168. 22 . 1 /24 ~~IPv6: 2001:2345:6789: 22 :: 1 /64~~	SVI
Switch4	F0/1	N/A	VLAN 1
	F0/21~24	N/A	All VLANs (trunk)
	Vlan 11	IPv4: 192.168. 11 . 2 /24 ~~IPv6: 2001:2345:6789: 11 :: 2 /64~~	SVI
	Vlan 22	IPv4: 192.168. 22 . 2 /24 ~~IPv6: 2001:2345:6789: 22 :: 2 /64~~	SVI
PC1	FastEthernet 0	IPv4: 192.168. 11 . 11 /24 ~~IPv6: 2001:2345:6789: 11 :: 11 /64~~	N/A
PC2	FastEthernet 0	IPv4: 192.168. 22 . 22 /24 ~~IPv6: 2001:2345:6789: 22 :: 22 /64~~	N/A

Part 1 - Virtual LANs.

Step 1 - Create the VLANs.

1. Display the default VLANs in Switch1.
   Switch1# ***show vlan***

   Output of Switch1:

```
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
                                                Fa0/13, Fa0/14, Fa0/15, Fa0/16
                                                Fa0/17, Fa0/18, Fa0/19, Fa0/20
                                                Fa0/21, Fa0/22, Fa0/23, Fa0/24
                                                Gig0/1, Gig0/2
1002 fddi-default                     act/unsup
1003 token-ring-default               act/unsup
1004 fddinet-default                  act/unsup
1005 trnet-default                    act/unsup

  <omit output below>
```

2. How many default VLANs are there in Switch1?
   There are 5 default VLANs, including VLAN 1, 1002, 1003, 1004 and 1005.
   (Note: All default VLANs cannot be removed from the switch.)
3. What is VLAN 1?
   VLAN 1 is the default VLAN used for Ethernet.
   (Note: VLAN 1002 through 1005 are reserved for Token Ring and FDDI.)
4. Which ports belong to VLAN 1?
   All Ethernet ports, including Fa0/1 to Fa0/24 and Gig0/1 to Gig0/2.
   (Note: All Ethernet ports are assigned to VLAN 1 by default.)

5. Configure VTP on Switch1 to advertise the VLAN configuration to all other switches.
   (Note: VLAN Trunking Protocol (VTP) is a Cisco proprietary protocol that designed to maintain VLAN configuration consistency across multiple switches within a VTP domain. VTP reduces the complexities of VLAN management in a switched LAN.)
   Switch1(config)# ***vtp version*** 2
   (Note: VTP has version 1 and version 2. The two versions are not interoperable.)
   Switch1(config)# ***vtp domain*** cisco

```
Changing VTP domain name from NULL to cisco
```

   (Note: The VTP domain name can be between 1 and 32 characters in length.)
   ~~Switch1(config)# ***vtp password*** cisco~~

```
Setting device VLAN database password to cisco
```

   ~~(Note: If the VTP domain has been secured, configure a password using the ***vtp password*** command. The password must be between 8 and 64 characters in length.)~~
   Switch1(config)# ***vtp mode server***

```
Device mode already VTP SERVER.
```

   (Note: VTP switches operate in one of three modes: Server, Client and Transparent.)

6. Configure the trunking protocol, IEEE 802.1Q, on the trunk ports of all switches.

(Note: VTP runs on the trunk links.)
Switch1~4(config)# ***interface range FastEthernet*** 0/21 – 24
(Note: The ***range*** keyword allows to select several interfaces and configure them all together.)
Switch3~4(config-if-range)# ***switchport trunk encapsulation dot1q***
(Note: Switch1 and Switch2 are Cisco 2950/2960 switches, and the ***switchport trunk encapsulation dot1q*** command is not supported, because the IEEE 802.1Q is the only available trunking protocol in Cisco 2950/2960 switches.)
Switch1~4(config-if-range)# ***switchport trunk native vlan*** 1
(Note: An IEEE 802.1Q trunk link is inherently associated with tagged frames that are tagged with a VLAN ID. Whereas a native VLAN allows the untagged frames can traverse the trunk link, which maintains backward compatibility with the legacy devices that do not support VLANs.)
(Note: The native VLAN must be matched on each end of the IEEE 802.1Q trunk link. VLAN 1 is the default native VLAN.)
Switch1~4(config-if-range)# ***switchport mode trunk***
(Note: The ***switchport mode*** is ***dynamic desirable*** for the ports in Cisco 2950 switches, but is ***dynamic auto*** in Cisco 2960 and 3560/3560 switches by default. The ***dynamic desirable*** will negotiate to be ***trunk***, but the ***dynamic auto*** will not negotiate to be ***trunk*** unless ***trunk*** is manually configured on either side of the link.

7. Display the status of VTP in Switch1.
   Switch1# ***show vtp status***

   Output of Switch1:

```
VTP Version                     : 2
Configuration Revision          : 0
Maximum VLANs supported locally : 255
Number of existing VLANs        : 5
VTP Operating Mode              : Server
VTP Domain Name                 : cisco
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Enabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0xD3 0xB6 0xBB 0x4C 0x5A 0xC4 0xD1 0x9E
Configuration last modified by 0.0.0.0 at 3-1-93 00:00:19
Local updater ID is 0.0.0.0 (no valid interface found)
```

8. Create a new VLAN (the first VLAN) with a default name in Switch1.
   Switch1(config)# ***vlan*** 11
   (Note: VLAN configurations are stored in a file, called vlan.dat, located in the flash memory of the switch. To remove all VLAN settings, use the ***delete flash:vlan.dat*** command and reload the switch.)

9. Display the first VLAN in Switch1.
   Switch1# ***show vlan***

Output of Switch1:

```
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
                                                Fa0/13, Fa0/14, Fa0/15, Fa0/16
                                                Fa0/17, Fa0/18, Fa0/19, Fa0/20

                                                Gig0/1, Gig0/2
11   VLAN0011                         active
1002 fddi-default                     act/unsup
1003 token-ring-default               act/unsup
1004 fddinet-default                  act/unsup
1005 trnet-default                    act/unsup

  <omit output below>
```

10. What is the default name for the first VLAN?
    VLAN0011

11. Create another new VLAN (the second VLAN) with a user-defined name in Switch1.
    Switch1(config)# ***vlan*** 22
    Switch1(config-vlan)# ***name*** MyVLAN22

12. Display the second VLAN in Switch1.
    Switch1# ***show vlan***

    Output of Switch1:

```
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
                                                Fa0/13, Fa0/14, Fa0/15, Fa0/16
                                                Fa0/17, Fa0/18, Fa0/19, Fa0/20

                                                Gig0/1, Gig0/2
11   VLAN0011                         active
22   MyVLAN22                         active
1002 fddi-default                     act/unsup
1003 token-ring-default               act/unsup
1004 fddinet-default                  act/unsup
1005 trnet-default                    act/unsup

  <omit output below>
```

13. Which ports belong to these two new VLANs?
    None.

    (Note: A created VLAN remains unused until it is mapped to the switched ports.)

14. Display the status of VTP in Switch1.
    Switch1# ***show vtp status***

Output of Switch1:

```
VTP Version                     : 2
Configuration Revision          : 3
Maximum VLANs supported locally : 255
Number of existing VLANs        : 7
VTP Operating Mode              : Server
VTP Domain Name                 : cisco
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Enabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0xC1 0x39 0x66 0x5E 0x6A 0x3C 0x0A 0x9E
Configuration last modified by 0.0.0.0 at 3-1-93 00:04:39
Local updater ID is 0.0.0.0 (no valid interface found)
```

15. What is the configuration revision number in Switch1?

    3. (The value of the configuration revision number will vary, but should be greater than zero now.)

    (Note: The configuration revision number starts at zero. As changes are made to VLAN configuration, the configuration revision number is increased incrementally by one, or n + 1. The number continues to increment until it reaches 2,147,483,648 (=2^{31}). When it reaches that point, the counter will reset back to zero.)

16. Display the VLANs in Switch2, Switch3 and Switch4.

    Switch2~4# ***show vlan***

    Output of Switch2:

```
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
                                                Fa0/13, Fa0/14, Fa0/15, Fa0/16
                                                Fa0/17, Fa0/18, Fa0/19, Fa0/20

                                                Gig0/1, Gig0/2
11   VLAN0011                         active
22   MyVLAN22                         active

  <omit output below>
```

    Output of Switch3:

```
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
                                                Fa0/13, Fa0/14, Fa0/15, Fa0/16
                                                Fa0/17, Fa0/18, Fa0/19, Fa0/20

                                                Gig0/1, Gig0/2
11   VLAN0011                         active
22   MyVLAN22                         active

  <omit output below>
```

Output of Switch4:

```
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
                                                Fa0/13, Fa0/14, Fa0/15, Fa0/16
                                                Fa0/17, Fa0/18, Fa0/19, Fa0/20

                                                Gig0/1, Gig0/2
11   VLAN0011                         active
22   MyVLAN22                         active

  <omit output below>
```

17. Are the new VLANs in Switch2, Switch3 and Switch4?
    Yes, the two new VLANs are in Switch2, Switch3 and Switch4.

Step 2 - Assign the switched ports to the VLANs.

18. Assign the port (e.g. interface FastEthernet 0/1 of Switch1) connected to PC1 to the first VLAN in Switch1.
    Switch1(config)# ***interface FastEthernet*** 0/1
    Switch1(config-if)# ***switchport mode access***
    Switch1(config-if)# ***switchport access vlan*** 11

19. Display the port assignment in Switch1.
    Switch1# ***show vlan***

    Output of Switch1:

```
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/2, Fa0/3, 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, Gig0/1
                                                Gig0/2
11   VLAN0011                         active    Fa0/1
22   MyVLAN22                         active

  <omit output below>
```

20. Assign the ports (e.g. interface FastEthernet 0/1 of Switch2) connected to PC2 to the second VLAN in Switch2.
    Switch2(config)# ***interface FastEthernet*** 0/1
    Switch2(config-if)# ***switchport mode access***
    Switch2(config-if)# ***switchport access vlan*** 22

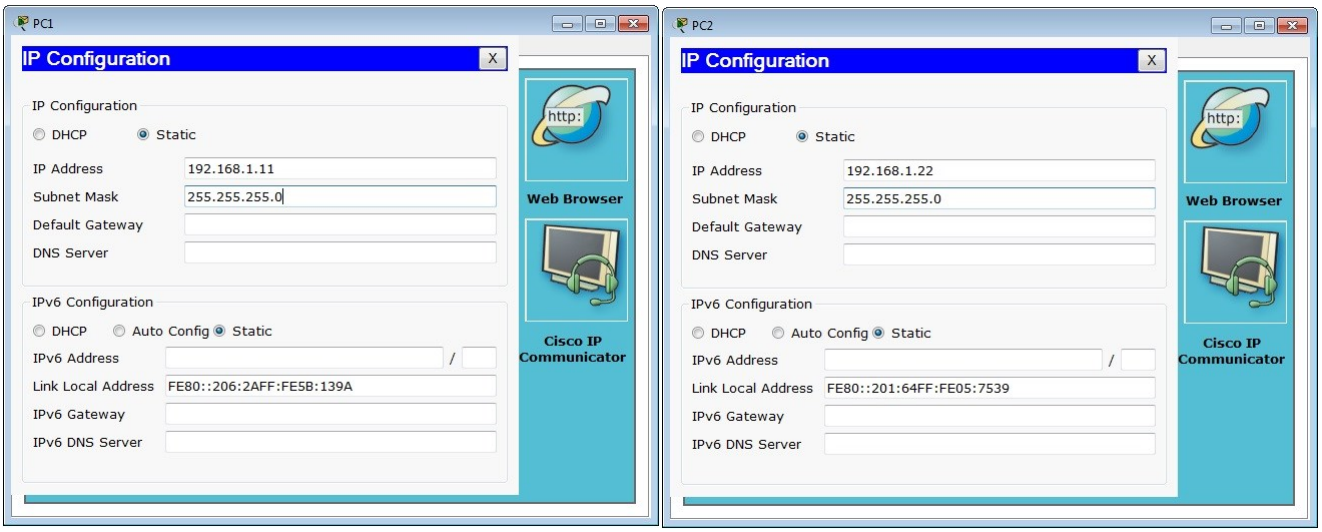
21. Display the port assignment in Switch2.
    Switch2# ***show vlan***

Output of Switch2:

```
VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/2, Fa0/3, 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, Gig0/1
                                                 Gig0/2
11   VLAN0011                          active
22   MyVLAN22                          active    Fa0/1

  <omit output below>
```

Step 3 - Create a gateway for VLAN communications.

22. Configure and verify the IPv4 address of PC1 and PC2, using the applications, IP Configuration and Command Prompt.



PC1~2:\> ***ipconfig***

Output of PC1:

```
FastEthernet0 Connection:(default port)
Link-local IPv6 Address.....: FE80::206:2AFF:FE5B:139A
IP Address.....: 192.168.1.11
Subnet Mask.....: 255.255.255.0
Default Gateway.....: 0.0.0.0
```

Output of PC2:

```
FastEthernet0 Connection:(default port)
Link-local IPv6 Address.....: FE80::201:64FF:FE05:7539
IP Address.....: 192.168.1.22
Subnet Mask.....: 255.255.255.0
Default Gateway.....: 0.0.0.0
```

23. Test the connectivity from PC1 to PC2 using ***ping***.
PC1:\> ***ping*** 192.168.1.22

Output of PC1:

```
Pinging 192.168.1.22 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.1.22:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

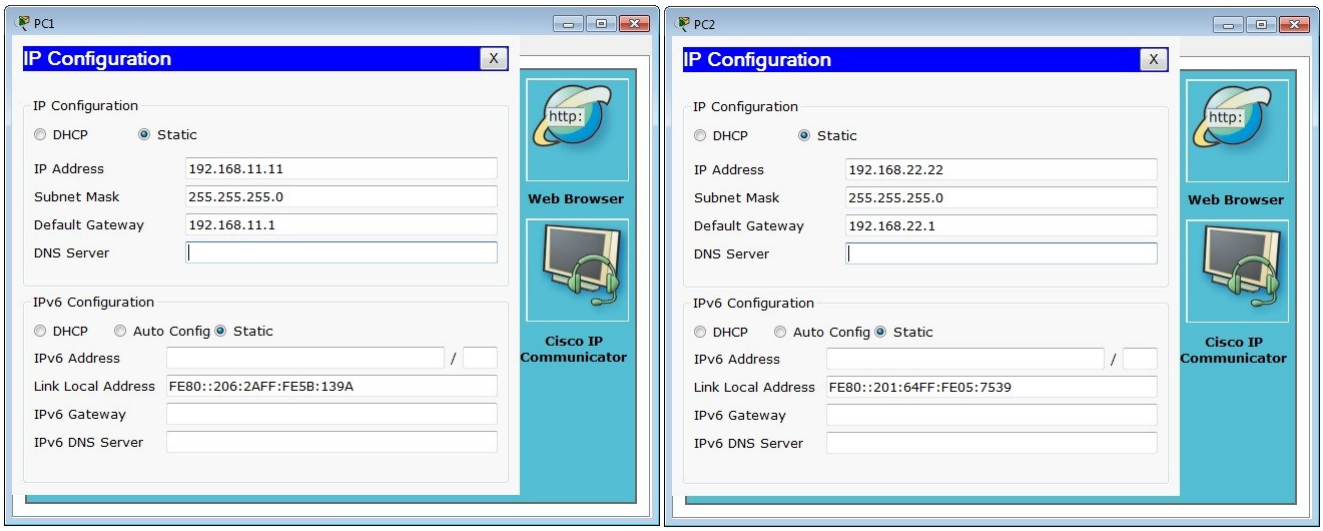
24. Why the ping is unsuccessful?
    PC1 and PC2 are in the different VLANs, thus they cannot communicate without a gateway.

25. Enable the IPv4 routing process in Switch3.
    Switch3(config)# ***ip routing***

26. Configure Switch3 as the default gateway of PC1 and PC2.
    (Note: Each SVI in a layer 3 switch is used as the default gateway for its VLAN.)
    Switch3(config)# ***interface vlan*** 11
    Switch3(config-if)# ***ip address*** 192.168.11.1 255.255.255.0
    Switch3(config-if)# ***no shutdown***

    Switch3(config)# ***interface vlan*** 22
    Switch3(config-if)# ***ip address*** 192.168.22.1 255.255.255.0
    Switch3(config-if)# ***no shutdown***

27. Configure and verify the IPv4 address and default gateway of PC1 and PC2, using the applications, IP Configuration and Command Prompt.



PC1~2:\> ***ipconfig***

Output of PC1:

```
FastEthernet0 Connection:(default port)
Link-local IPv6 Address.....: FE80::206:2AFF:FE5B:139A
IP Address.....: 192.168.11.11
Subnet Mask.....: 255.255.255.0
Default Gateway.....: 192.168.11.1
```

Output of PC2:

```
FastEthernet0 Connection:(default port)
Link-local IPv6 Address.....: FE80::201:64FF:FE05:7539
IP Address.....: 192.168.22.22
Subnet Mask.....: 255.255.255.0
Default Gateway.....: 192.168.22.1
```

28. Test the connectivity from PC1 to PC2 using ***ping***.
    PC1:\> ***ping*** 192.168.22.22

    Output of PC1:

```
Pinging 192.168.22.22 with 32 bytes of data:

Reply from 192.168.22.22: bytes=32 time=11ms TTL=127
Reply from 192.168.22.22: bytes=32 time=0ms TTL=127
Reply from 192.168.22.22: bytes=32 time=1ms TTL=127
Reply from 192.168.22.22: bytes=32 time=0ms TTL=127

Ping statistics for 192.168.22.22:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 11ms, Average = 3ms
```

29. Is the ping successful?
    Yes.

Part 2 - Redundant virtual LANs.

Step 1 - Link redundancy.

30. Configure EtherChannel using LACP in all switches.
    (Note: EtherChannel can multiply a number of physical links between the switches to increase the overall speed of switch-to-switch communication. EtherChannel provides link redundancy because the overall physical links are seen as one logical link, assuming at least one physical link is present, the logical link remains functional, even if its overall throughput decreases because of a lost link within the EtherChannel.)
    (Note: Link Aggregation Control Protocol (LACP) is part of an IEEE 802.3ad specification that allows several physical ports to be bundled to form a single logical channel. LACP can configure up to 16 ports to form a channel. Eight of the ports are in active mode and the other eight are in standby mode. When any of the active ports fail, a standby port becomes active.)

    Switch1(config)# ***interface range FastEthernet*** 0/21 – 22
    Switch1(config-if-range)# ***channel-protocol lacp***
    Switch1(config-if-range)# ***channel-group*** 1 ***mode active***
    Switch1(config)# ***interface range FastEthernet*** 0/23 – 24
    Switch1(config-if-range)# ***channel-protocol lacp***
    Switch1(config-if-range)# ***channel-group*** 4 ***mode active***

    Switch2(config)# ***interface range FastEthernet*** 0/21 – 22
    Switch2(config-if-range)# ***channel-protocol lacp***
    Switch2(config-if-range)# ***channel-group*** 2 ***mode active***
    Switch2(config)# ***interface range FastEthernet*** 0/23 – 24
    Switch2(config-if-range)# ***channel-protocol lacp***
    Switch2(config-if-range)# ***channel-group*** 3 ***mode active***

    Switch3(config)# ***interface range FastEthernet*** 0/21 – 22
    Switch3(config-if-range)# ***channel-protocol lacp***
    Switch3(config-if-range)# ***channel-group*** 1 ***mode active***
    Switch3(config)# ***interface range FastEthernet*** 0/23 – 24
    Switch3(config-if-range)# ***channel-protocol lacp***
    Switch3(config-if-range)# ***channel-group*** 3 ***mode active***

    Switch4(config)# ***interface range FastEthernet*** 0/21 – 22
    Switch4(config-if-range)# ***channel-protocol lacp***
    Switch4(config-if-range)# ***channel-group*** 2 ***mode active***
    Switch4(config)# ***interface range FastEthernet*** 0/23 – 24
    Switch4(config-if-range)# ***channel-protocol lacp***
    Switch4(config-if-range)# ***channel-group*** 4 ***mode active***

    (Note: In EtherChannel, it is mandatory that all ports have the same speed, duplex mode, and VLAN information.)

31. Display the status of EtherChannel in all switches.
    Switch1~4# ***show etherchannel summary***

Output of Switch1:

```
  <omit output above>

Number of channel-groups in use: 2
Number of aggregators:           2

Group  Port-channel  Protocol    Ports
------+-------------+-----------+-----------------------------------------------

1      Po1(SU)           LACP   Fa0/21(P) Fa0/22(P)
4      Po4(SU)           LACP   Fa0/23(P) Fa0/24(P)
```

Output of Switch2:

```
  <omit output above>

Number of channel-groups in use: 2
Number of aggregators:           2

Group  Port-channel  Protocol    Ports
------+-------------+-----------+-----------------------------------------------

2      Po2(SU)           LACP   Fa0/21(P) Fa0/22(P)
3      Po3(SU)           LACP   Fa0/23(P) Fa0/24(P)
```

Output of Switch3:

```
  <omit output above>

Number of channel-groups in use: 2
Number of aggregators:           2

Group  Port-channel  Protocol    Ports
------+-------------+-----------+-----------------------------------------------

1      Po1(SU)           LACP   Fa0/21(P) Fa0/22(P)
3      Po3(SU)           LACP   Fa0/23(P) Fa0/24(P)
```

Output of Switch4:

```
  <omit output above>

Number of channel-groups in use: 2
Number of aggregators:           2

Group  Port-channel  Protocol    Ports
------+-------------+-----------+-----------------------------------------------

2      Po2(SU)           LACP   Fa0/21(P) Fa0/22(P)
4      Po4(SU)           LACP   Fa0/23(P) Fa0/24(P)
```

Step 2 - Gateway redundancy.

32. Configure gateway redundancy using FHRPs in Switch3 and Switch4.
(Note: An end device, e.g. a PC, is typically configured with a single default gateway. There is no dynamic method by which the end device can determine the IP address of a new gateway if the default gateway fails. First Hop Redundancy Protocol (FHRP), e.g. Hot Standby Router Protocol (HSRP), provides redundant default gateways for end devices with no end-user configuration necessary. When the active gateway fails, it transits the standby gateway to the new active gateway role.)

33. Configure the active gateways for the first VLAN and the second VLAN in Switch3.
    Switch3(config)# ***interface vlan*** 11
    Switch3(config-if)# ***standby*** 11 ***ip*** 192.168.11.254
    Switch3(config-if)# ***standby*** 11 ***priority*** 100
    Switch3(config-if)# ***standby*** 11 ***preempt***

    Switch3(config)# ***interface vlan*** 22
    Switch3(config-if)# ***standby*** 22 ***ip*** 192.168.22.254
    Switch3(config-if)# ***standby*** 22 ***priority*** 100
    Switch3(config-if)# ***standby*** 22 ***preempt***

34. Enable the IPv4 routing process in Switch4.
    Switch4(config)# ***ip routing***

35. Configure the standby gateways for the first VLAN and the second VLAN in Switch4.

    Switch4(config)# ***interface vlan*** 11
    Switch4(config-if)# ***ip address*** 192.168.11.2 255.255.255.0
    Switch4(config-if)# ***no shutdown***
    Switch4(config-if)# ***standby*** 11 ***ip*** 192.168.11.254
    Switch4(config-if)# ***standby*** 11 ***priority*** 99
    Switch4(config-if)# ***standby*** 11 ***preempt***

    Switch4(config)# ***interface vlan*** 22
    Switch4(config-if)# ***ip address*** 192.168.22.2 255.255.255.0
    Switch4(config-if)# ***no shutdown***
    Switch4(config-if)# ***standby*** 22 ***ip*** 192.168.22.254
    Switch4(config-if)# ***standby*** 22 ***priority*** 99
    Switch4(config-if)# ***standby*** 22 ***preempt***

    (HSRP is a Cisco proprietary protocol for setting up a fault-tolerant default gateway. The primary gateway with the highest configured priority operates as a virtual gateway with a virtual IP address. It responds to the ARP request from end devices with the MAC address 0000.0c07.acXX where XX is the HSRP group ID (converted to a hexadecimal value). If the primary gateway should fail, the gateway with the next-highest priority available in the HSRP group would take over the virtual IP address and answer ARP requests with the same mac address, thus achieving transparent default gateway fail-over.)

36. Display the status of the active gateway and the standby gateway in Switch3 and Switch4.
    Switch3~4# ***show standby brief***

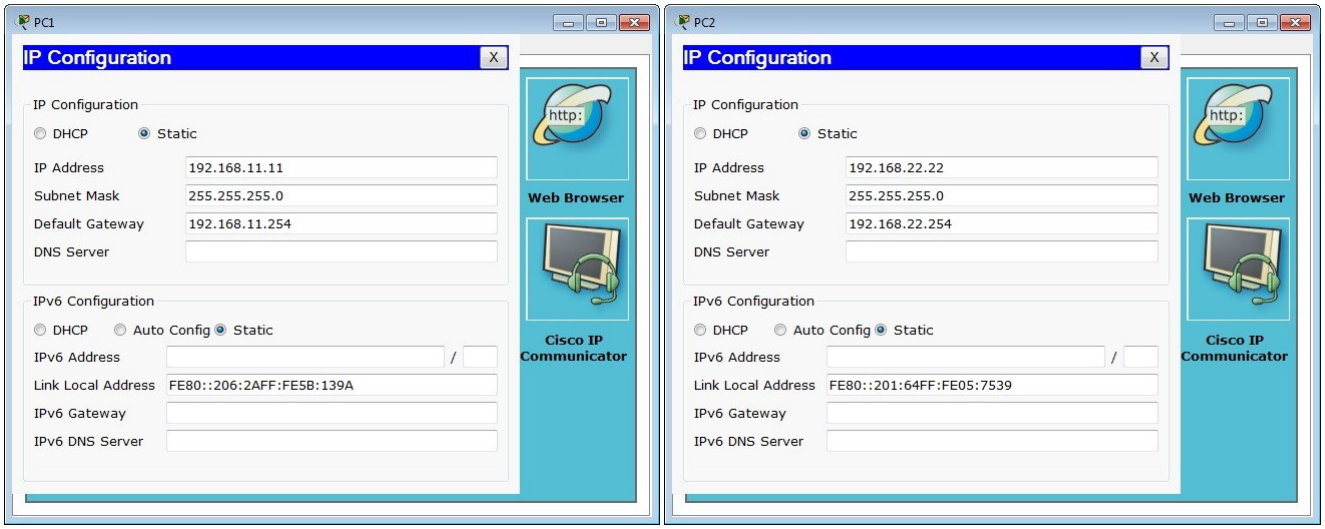
    Output of Switch3:

```
  <omit output above>

Interface   Grp  Pri P State    Active          Standby         Virtual IP
Vl11        11   100 P Active   local           192.168.11.2    192.168.11.254
Vl12        22   100 P Active   local           192.168.22.2    192.168.22.254
```

Output of Switch4:

```
  <omit output above>

Interface    Grp  Pri P State    Active          Standby         Virtual IP
Vl1          11   99  P Standby  192.168.11.1    local           192.168.11.254
Vl2          22   99  P Standby  192.168.22.1    local           192.168.22.254
```

37. Configure and verify the IPv4 address and default gateway of PC1 and PC2, using the applications, IP Configuration and Command Prompt.



PC1~2:\> ***ipconfig***

Output of PC1:

```
FastEthernet0 Connection:(default port)
Link-local IPv6 Address.....: FE80::206:2AFF:FE5B:139A
IP Address.....: 192.168.11.11
Subnet Mask.....: 255.255.255.0
Default Gateway.....: 192.168.11.254
```

Output of PC2:

```
FastEthernet0 Connection:(default port)
Link-local IPv6 Address.....: FE80::201:64FF:FE05:7539
IP Address.....: 192.168.22.22
Subnet Mask.....: 255.255.255.0
Default Gateway.....: 192.168.22.254
```

38. Test the hop-by-hop connectivity from PC1 to PC2 using ***tracert***.
PC1:\> ***tracert*** 192.168.22.22

Output of PC1:

```
Tracing route to 192.168.22.22 over a maximum of 30 hops:

  1    1 ms      0 ms      3 ms      192.168.11.1
  2    11 ms     0 ms      0 ms      192.168.22.22

Trace complete.
```

39. What is the IP address of the default gateway used by PC1?

192.168.11.1

40. Turn off the active gateways for the first VLAN and the second VLAN in Switch3.
(Note: By default, HSRP does NOT do load balancing. The active gateway always handles all of the traffic, while the standby gateway sits unused, unless there is the active gateway failure.)
Switch3(config)# ***interface vlan*** 11
Switch3(config-if)# ***shutdown***

Switch3(config)# ***interface vlan*** 22
Switch3(config-if)# ***shutdown***

41. Display the status of the active gateway and the standby gateway in Switch4.
Switch4# ***show standby brief***

Output of Switch4:

```
  <omit output above>

Interface   Grp  Pri P State    Active          Standby         Virtual IP
Vl1         11   99  P Active   local           unknown         192.168.11.254
Vl2         22   99  P Active   local           unknown         192.168.22.254
```

42. Test the hop-by-hop connectivity from PC1 to PC2 using ***tracert***.
PC1:\> ***tracert*** 192.168.22.22

Output of PC1:

```
Tracing route to 192.168.22.22 over a maximum of 30 hops:

  1    20 ms     1 ms      0 ms      192.168.11.2
  2    0 ms      0 ms      0 ms      192.168.22.22

Trace complete.
```

43. What is the IP address of the default gateway used by PC1?
192.168.11.2