CIS 83 LAB 5 - VLAN
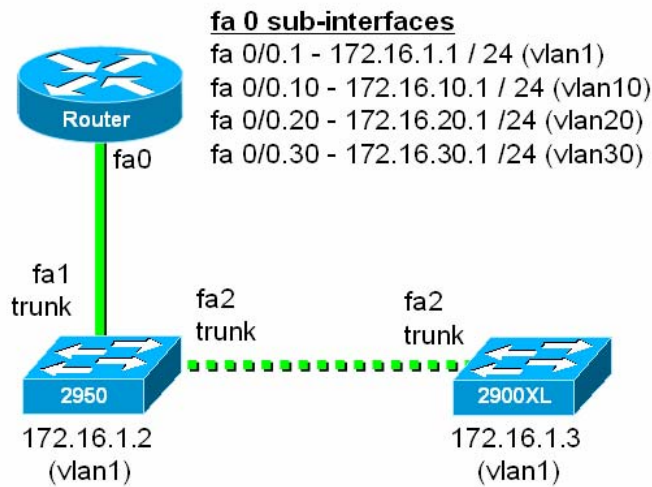**Rich Simms**
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Objective

The objective of this lab is to become familiar with configuring VLANs, VTP, trunking, ports and using a router for inter-VLAN routing.

Scenario

This lab was done using the basic router pod on NETLAB and the Cape Town pod in the lab. NETLAB lets you remotely access a pod of Cisco switches. The two Cisco switches were configured as shown below.

Topology

Final Running Configurations

2950	2900XL	Router
2950#show run Building configuration... Current configuration : 2496 bytes ! version 12.1 no service pad service timestamps debug uptime service timestamps log uptime no service password-encryption ! hostname 2950 ! ! ip subnet-zero ! ! spanning-tree mode pvst no spanning-tree optimize bpdu transmission spanning-tree extend system-id ! ! interface FastEthernet0/1 switchport mode trunk no ip address ! interface FastEthernet0/2 switchport mode trunk no ip address ! interface FastEthernet0/3 no ip address ! interface FastEthernet0/4 no ip address ! interface FastEthernet0/5 switchport access vlan 10 switchport mode access no ip address ! interface FastEthernet0/6 switchport access vlan 20 switchport mode access no ip address ! interface FastEthernet0/7 switchport access vlan 20 switchport mode access no ip address ! interface FastEthernet0/8 switchport access vlan 20 switchport mode access no ip address ! interface FastEthernet0/9 switchport access vlan 20 switchport mode access no ip address ! interface FastEthernet0/10 switchport access vlan 20	2900XL#show run Building configuration... Current configuration : 1443 bytes ! version 12.1 no service pad service timestamps debug uptime service timestamps log uptime no service password-encryption ! hostname 2900XL ! ! ip subnet-zero ! ! spanning-tree mode pvst no spanning-tree optimize bpdu transmission spanning-tree extend system-id ! ! ! ! interface FastEthernet0/1 ! interface FastEthernet0/2 switchport mode trunk ! interface FastEthernet0/3 ! interface FastEthernet0/4 ! interface FastEthernet0/5 ! interface FastEthernet0/6 ! interface FastEthernet0/7 ! interface FastEthernet0/8 ! interface FastEthernet0/9 ! interface FastEthernet0/10 switchport access vlan 20 switchport mode access ! interface FastEthernet0/11 switchport access vlan 20 switchport mode access ! interface FastEthernet0/12 switchport access vlan 20 switchport mode access ! interface FastEthernet0/13 ! interface FastEthernet0/14 ! interface FastEthernet0/15 ! interface FastEthernet0/16 !	Router#show run Building configuration... Current configuration : 1093 bytes ! version 12.2 service timestamps debug uptime service timestamps log uptime no service password-encryption ! hostname Router ! ! memory-size iomem 15 ip subnet-zero ! ! ! call rsvp-sync ! ! ! ! ! controller T1 1/0 framing sf linecode ami ! ! ! interface FastEthernet0/0 no ip address duplex auto speed auto ! interface FastEthernet0/0.1 encapsulation dot1Q 1 native ip address 172.16.1.1 255.255.255.0 ! interface FastEthernet0/0.10 encapsulation dot1Q 10 ip address 172.16.10.1 255.255.255.0 ! interface FastEthernet0/0.20 encapsulation dot1Q 20 ip address 172.16.20.1 255.255.255.0 ! interface FastEthernet0/0.30 encapsulation dot1Q 30 ip address 172.16.30.1 255.255.255.0 ! interface Serial0/0 no ip address shutdown no fair-queue ! interface BRI0/0 no ip address encapsulation hdlc

```
 switchport mode access
 no ip address
!
interface FastEthernet0/11
 switchport access vlan 20
 switchport mode access
 no ip address
!
interface FastEthernet0/12
 switchport access vlan 20
 switchport mode access
 no ip address
!
interface FastEthernet0/13
 switchport access vlan 20
 switchport mode access
 no ip address
!
interface FastEthernet0/14
 switchport access vlan 20
 switchport mode access
 no ip address
!
interface FastEthernet0/15
 switchport access vlan 20
 switchport mode access
 no ip address
!
interface FastEthernet0/16
 switchport access vlan 20
 switchport mode access
 no ip address
!
interface FastEthernet0/17
 switchport access vlan 20
 switchport mode access
 no ip address
!
interface FastEthernet0/18
 switchport access vlan 20
 switchport mode access
 no ip address
!
interface FastEthernet0/19
 switchport access vlan 20
 switchport mode access
 no ip address
!
interface FastEthernet0/20
 switchport access vlan 20
 switchport mode access
 no ip address
!
interface FastEthernet0/21
 switchport access vlan 30
 switchport mode access
 no ip address
!
interface FastEthernet0/22
 no ip address
!
interface FastEthernet0/23
 no ip address
!
interface FastEthernet0/24
 switchport mode access
 no ip address
!
interface Vlan1
 ip address 172.16.1.2
255.255.255.0
```

```
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 GigabitEthernet0/1
!
interface GigabitEthernet0/2
!
interface Vlan1
 ip address 172.16.1.3
255.255.255.0
 no ip route-cache
 shutdown
!
ip default-gateway 172.16.1.1
ip http server
!
line con 0
 exec-timeout 0 0
 logging synchronous
line vty 0 4
 password cisco
 login
line vty 5 15
 login
!
!
end

2900XL#
```

```
 shutdown
!
interface FastEthernet0/1
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface Serial0/1
 no ip address
 shutdown
!
ip classless
ip http server
!
!
dial-peer cor custom
!
!
!
!
line con 0
 exec-timeout 0 0
 logging synchronous
line aux 0
line vty 0 4
 login
!
end

Router#
```

```
 no ip route-cache
 shutdown
!
ip default-gateway 172.16.1.1
ip http server
!
!
line con 0
 exec-timeout 0 0
 logging synchronous
line vty 0 4
 password cisco
 login
line vty 5 15
 login
!
end

2950#
```

Additional Outputs

| 2950 | ```
2950#show vlan

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/1, Fa0/4, Fa0/22, Fa0/23
                                                Fa0/24
10   Accounting                       active    Fa0/5
20   Marketing                        active    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
30   Engineering                      active    Fa0/21
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
10   enet  100010     1500  -      -      -        -    -        0      0
20   enet  100020     1500  -      -      -        -    -        0      0
30   enet  100030     1500  -      -      -        -    -        0      0
1002 fddi  101002     1500  -      -      -        -    -        0      0

VLAN Type  SAID       MTU   Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
---- ----- ---------- ----- ------ ------ -------- ---- -------- ------ ------
1003 tr    101003     1500  -      -      -        -    -        0      0
1004 fdnet 101004     1500  -      -      -        ieee -        0      0
1005 trnet 101005     1500  -      -      -        ibm  -        0      0

Remote SPAN VLANs
-------------------------------------------------------------------------------


Primary Secondary Type              Ports
------- --------- ----------------- ------------------------------------------

2950#2950#show vtp status
VTP Version                     : 2
Configuration Revision          : 4
Maximum VLANs supported locally : 64
Number of existing VLANs        : 8
VTP Operating Mode              : Server
VTP Domain Name                 : group1
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Disabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0xAF 0x65 0x97 0x40 0xDD 0x4B 0xCE 0xE0
Configuration last modified by 172.16.1.2 at 3-1-93 00:26:16
Local updater ID is 172.16.1.2 on interface Vl1 (first interface found)
2950#

2950#show int fa 0/5 switchport
Name: Fa0/5
Switchport: Enabled
Administrative Mode: static access
Operational Mode: down
Administrative Trunking Encapsulation: dot1q
Negotiation of Trunking: Off
Access Mode VLAN: 10 (Accounting)
Trunking Native Mode VLAN: 1 (default)
Voice VLAN: none
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Administrative private-vlan trunk native VLAN: none
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: none
Administrative private-vlan trunk private VLANs: none
Operational private-vlan: none
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL
Protected: false

Appliance trust: none
``` |

```
2950#show int fa 0/2 switchport
Name: Fa0/2
Switchport: Enabled
Administrative Mode: trunk
Operational Mode: trunk
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: dot1q
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Voice VLAN: none
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Administrative private-vlan trunk native VLAN: none
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: none
Administrative private-vlan trunk private VLANs: none
Operational private-vlan: none
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL
Protected: false

Appliance trust: none
2950#
```

2900XL

```
2900XL#show vlan

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/1, Fa0/4, Fa0/5, Fa0/6
                                                Fa0/7, Fa0/8, Fa0/9, Fa0/13
                                                Fa0/14, Fa0/15, Fa0/16, Fa0/17
                                                Fa0/18, Fa0/19, Fa0/20, Fa0/21
                                                Fa0/22, Fa0/23, Fa0/24, Gi0/1
                                                Gi0/2
10   Accounting                       active
20   Marketing                        active    Fa0/10, Fa0/11, Fa0/12
30   Engineering                      active
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
10   enet  100010     1500  -      -      -        -    -        0      0
20   enet  100020     1500  -      -      -        -    -        0      0
30   enet  100030     1500  -      -      -        -    -        0      0

VLAN Type  SAID       MTU   Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
---- ----- ---------- ----- ------ ------ -------- ---- -------- ------ ------
1002 fddi  101002     1500  -      -      -        -    -        0      0
1003 tr    101003     1500  -      -      -        -    srb      0      0
1004 fdnet 101004     1500  -      -      -        ieee -        0      0
1005 trnet 101005     1500  -      -      -        ibm  -        0      0

Remote SPAN VLANs
-------------------------------------------------------------------------------


Primary Secondary Type            Ports
------- --------- --------------- ------------------------------------------


2900XL#show vtp status
VTP Version                     : 2
Configuration Revision          : 4
Maximum VLANs supported locally : 250
Number of existing VLANs        : 8
VTP Operating Mode              : Client
VTP Domain Name                 : group1
VTP Pruning Mode                : Disabled
```

```
                        VTP V2 Mode                     : Disabled
                        VTP Traps Generation            : Disabled
                        MD5 digest                      : 0xAF 0x65 0x97 0x40 0xDD 0x4B 0xCE 0xE0
                        Configuration last modified by 172.16.1.2 at 3-1-93 00:26:16
                        2900XL#


                        2900XL# show int fa 0/2 switchport
                        Name: Fa0/2
                        Switchport: Enabled
                        Administrative Mode: trunk
                        Operational Mode: trunk
                        Administrative Trunking Encapsulation: dot1q
                        Operational Trunking Encapsulation: dot1q
                        Negotiation of Trunking: On
                        Access Mode VLAN: 1 (default)
                        Trunking Native Mode VLAN: 1 (default)
                        Voice VLAN: none
                        Administrative private-vlan host-association: none
                        Administrative private-vlan mapping: none
                        Administrative private-vlan trunk native VLAN: none
                        Administrative private-vlan trunk encapsulation: dot1q
                        Administrative private-vlan trunk normal VLANs: none
                        Administrative private-vlan trunk private VLANs: none
                        Operational private-vlan: none
                        Trunking VLANs Enabled: ALL
                        Pruning VLANs Enabled: 2-1001
                        Capture Mode Disabled
                        Capture VLANs Allowed: ALL
                        Protected: false
                        Unknown unicast blocked: disabled
                        Unknown multicast blocked: disabled
                        Appliance trust: none

                        2900XL# show int fa 0/5 switchport
                        Name: Fa0/5
                        Switchport: Enabled
                        Administrative Mode: dynamic desirable
                        Operational Mode: static access
                        Administrative Trunking Encapsulation: dot1q
                        Operational Trunking Encapsulation: native
                        Negotiation of Trunking: On
                        Access Mode VLAN: 1 (default)
                        Trunking Native Mode VLAN: 1 (default)
                        Voice VLAN: none
                        Administrative private-vlan host-association: none
                        Administrative private-vlan mapping: none
                        Administrative private-vlan trunk native VLAN: none
                        Administrative private-vlan trunk encapsulation: dot1q
                        Administrative private-vlan trunk normal VLANs: none
                        Administrative private-vlan trunk private VLANs: none
                        Operational private-vlan: none
                        Trunking VLANs Enabled: ALL
                        Pruning VLANs Enabled: 2-1001
                        Capture Mode Disabled
                        Capture VLANs Allowed: ALL
                        Protected: false
                        Unknown unicast blocked: disabled
                        Unknown multicast blocked: disabled
                        Appliance trust: none
                        2900XL#
```

| Router | ```
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, su - IS-IS summary, 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
``` |
|--------|---------|

```
        172.16.0.0/24 is subnetted, 4 subnets
C       172.16.30.0 is directly connected, FastEthernet0/0.30
C       172.16.20.0 is directly connected, FastEthernet0/0.20
C       172.16.10.0 is directly connected, FastEthernet0/0.10
C       172.16.1.0 is directly connected, FastEthernet0/0.1
Router#show ip int brief
Interface               IP-Address      OK? Method Status              Prot
ocol
FastEthernet0/0         unassigned      YES manual up                  up

FastEthernet0/0.1       172.16.1.1      YES manual up                  up

FastEthernet0/0.10      172.16.10.1     YES manual up                  up

FastEthernet0/0.20      172.16.20.1     YES manual up                  up

FastEthernet0/0.30      172.16.30.1     YES manual up                  up

Serial0/0               unassigned      YES manual administratively down down

BRI0/0                  unassigned      YES manual administratively down down

BRI0/0:1                unassigned      YES unset  administratively down down

BRI0/0:2                unassigned      YES unset  administratively down down

FastEthernet0/1         unassigned      YES manual administratively down down

Serial0/1               unassigned      YES manual administratively down down

Router#
```

Summary

The Cisco switches are highly customizable. In this lab we configured VLANs, utilized VTP, set up trunking and did inter-VLAN routing with a router.

This lab was done on NetLab and on the Cape Town pod in the lab. For the pod it was necessary to use a cross-over cable between the switches.

VLANs let you group ports together. Packets stay within a VLAN and do not flow to other VLANs just as if they were on separate switches. The configuration was straightforward in NetLab however on the Cape Town lab pod some minor IOS differences were observed between a 2900XL and a 2950. For example the 2950 supported port ranges and the 2950XL did not. The 2900XL had to be configured one port at a time.

VTP was straightforward in NetLab and the Pod. This is a very useful feature for having consistent VLAN naming across multiple switches from a single database of information.

Trunking performed as advertised and all packets going through the trunk were correctly channeled back into their respective VLANs on the other end. Ports were manually configured to be trunked rather rely on default settings.

Inter-VLAN routing allows traffic between VLANs using a router. This worked fine in NetLab but would not initially work on the Cape Town pod. The router had an old version of IOS that

did not support the encapsulation command on the sub-interfaces. After updating the router to v12.2 the encapsulation dot1q command was available and inter-VLAN routing became possible.

Commands

```
! Clearing out a switch (privilege mode)
clear port-security dynamic
delete flash:vlan.dat
erase startup-config
reload

! Configuring VTP client (privilege mode)
vlan database
 vtp client
 vtp domain corporate
 vtp password cisco
 exit

! Configuring VTP server (privilege mode)
vlan database
vtp server
vtp domain corporate
vtp password cisco
vlan 10 name accounting
vlan 20 name marketing
vlan 30 name engineering
exit

! Configuring access ports on 2950
int range fa 0/19 - 24
 switchport mode access
 switchport access vlan 30

! Configuring access ports on 2900XL
int fa 0/19
 switchport mode access
 switchport access vlan 30

! Configuring trunks on 2900xl
int fa 0/1
 switchport trunk encaps dot1q
 switchport mode trunk


! Configuring trunks on 2950
int fa 0/1
 switchport mode trunk

! Switch management network settings
int vlan1
 ip address 17.16.1.2 255.255.255.0
 no shut
!
ip default-gateway 172.16.1.1

! Verify switch configurations
show run
show vtp status
show vlan
```

```
show spanning-tree
show int fa 0/1 switchport

! Configure sub-interfaces on a router
int fa0/0
 no shut
int fa0/0.1
 encaps dot1Q 1 native
 ip address 172.16.1.1 255.255.255.0
 no shut
int fa0/0.10
 encaps dot1Q 10
 ip address 172.16.10.1 255.255.255.0
 no shut
int fa0/0.20
 encaps dot1Q 20
 ip address 172.16.20.1 255.255.255.0
 no shut
int fa0/0.30
 encaps dot1Q 30
 ip address 172.16.30.1 255.255.255.0
 no shut
```