Universidad De Las Américas Puebla

Ingeniería en Robótica y Telecomunicaciones

Departamento de computación, electrónica y mecatrónica.

En el curso:

LABORATORIO DE REDES DE COMPUTADORAS

O23-LRT4052-1

Impartido por:

Dr. Eduardo Javier Jiménez López

Práctica 8:

Configuración y Simulación de VLAN etiquetadas.

Proyecto que presentan:

André Federico López Hernández - 167564

Jesús Alberto Betancourt Nevares - 166352

Jonathan Eliasib Rosas Tlaczani - 168399

Objective

- Create two tagged VLANs

- Interconnecting VLANs

Introduction

A VLAN defined on Extreme equipment can be port-based, tagged (802.1Q), MAC-based or protocol-based. It is worth mentioning that the 802.1Q standard inserts a tag into each data packet, which contains a specific VLAN ID and is used on trunk links.

Abstract

This lab report explores the implementation and functionality of tagged VLANs (Virtual Local Area Networks) using Cisco Packet Tracer. VLANs are crucial in network design for segmenting broadcast domains and improving network efficiency. Tagged VLANs, specifically, involve assigning a unique VLAN identifier (VLAN ID) to each frame, allowing for the segregation of traffic in a more granular manner. The purpose of this experiment is to understand the configuration and behavior of tagged VLANs within a simulated network environment.

Theorical Analysis

VLANs are used to logically segment a network into different broadcast domains, enhancing network performance and security. Tagged VLANs, also known as IEEE 802.1Q VLANs,

involve inserting a VLAN tag in the Ethernet frame header. This tag contains the VLAN ID, allowing switches to identify and process the frame accordingly. The IEEE 802.1Q standard ensures interoperability among different vendors' equipment.

Key theoretical concepts include:

1. VLAN ID: A numerical identifier assigned to each VLAN, ranging from 1 to 4095.
2. IEEE 802.1Q: The industry standard for VLAN tagging, specifying how VLAN information is included in Ethernet frames.
3. Trunk Links: Network links configured to carry traffic for multiple VLANs, supporting tagged frames.
4. Access Links: Links dedicated to a specific VLAN, typically used for end devices.

Methodology

Part I: Default configuration

Download from the TFTP server the <default_configuration> configuration supported in the second part of Part II of Part I. Restart the computer when prompted. Verify that ports 1 to 5 are enabled. Connect the equipment available in the lab according to the following schematic. Connect a PC to port 6 and verify that there is communication between the switch and the PC.

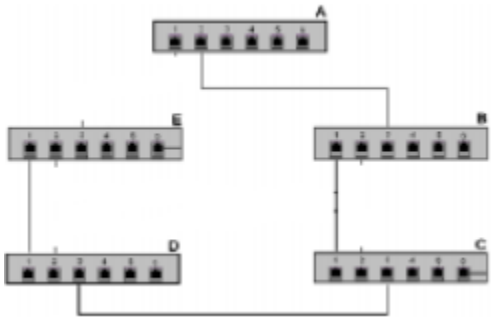

Figure 1. Physical connection of Extreme equipment

Part II: Creating tagged VLANs

Log in to the switch with administrator privileges and create a VLAN named BLUE and verify that it has been created. Specify the tag of this VLAN to be equal to 10 with the following command: configure vlan AZUL tag 10

Then create a VLAN named GREEN and specify its associated tag to be equal to 20. Verify whether or not both VLANs have ports assigned to them.

Part III: Adding tagged and untagged ports to existing VLANs

Use the following command on switch A, C, and E, to add ports 1 and 2 to VLANs BLUE and GREEN and specify that they are tagged:

configure vlan BLUE add ports 1,2 tagged.

configure vlan GREEN add ports 1,2 tagged

Use the following commands on switch B and D, to add port 2 to BLUE and GREEN VLANs and specify that it is tagged:

configure vlan BLUE add ports 2 tagged

configure vlan GREEN add ports 2 tagged

Enable the following ports:- Switch A, B, C, D and E

enable ports 2

- Switch A, C and E

enable ports 1

Remove Port 5 and 6 from the default VLAN on all switches and add them to the following VLANs according to the switch being configured (this port will not be tagged):

- Switch A, C and Dconfigure vlan BLUE add ports 6.

- Switch B or Econfigure vlan GREEN add ports 6

Experimental Results

```
* SISTEMASSWITCH.15 # config vl verde add port 2
* SISTEMASSWITCH.16 # sh vl azul
VLAN Interface with name azul created by user
        Admin State:    Enabled         Tagging:        802.1Q Tag 10
        Virtual router: VR-Default
        IPv6:           None
        STPD:           None
        Protocol:       Match all unfiltered protocols
        Loopback:       Disabled
        NetLogin:       Disabled
        QosProfile:     None configured
        Egress Rate Limit Designated Port: None configured
        Flood Rate Limit QosProfile:       None configured
        Ports:   1.       (Number of active ports=0)
           Untag:       1
        Flags:    (*) Active, (!) Disabled, (g) Load Sharing port
                  (b) Port blocked on the vlan, (m) Mac-Based port
                  (a) Egress traffic allowed for NetLogin
                  (u) Egress traffic unallowed for NetLogin
                  (t) Translate VLAN tag for Private-VLAN
                  (s) Private-VLAN System Port, (L) Loopback port
                  (e) Private-VLAN End Point Port
                  (x) VMAN Tag Translated port

* SISTEMASSWITCH.17 #
```

Figure 2. sh vlan azul

```
D:\Users\166468>ping 192.168.80.15

Pinging 192.168.80.15 with 32 bytes of data:
Reply from 192.168.80.15: bytes=32 time=891ms TTL=255
Reply from 192.168.80.15: bytes=32 time=20ms TTL=255
Reply from 192.168.80.15: bytes=32 time=3ms TTL=255
Reply from 192.168.80.15: bytes=32 time=7ms TTL=255

Ping statistics for 192.168.80.15:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 3ms, Maximum = 891ms, Average = 230ms
```

Figure 3. Pinging 80

```
* SISTEMASSWITCH.13 # config vl def del port 2
* SISTEMASSWITCH.14 # sh vl def
VLAN Interface with name Default created by user
        Admin State:    Enabled         Tagging:        802.1Q Tag 1
        Virtual router: VR-Default
        Primary IP    : 192.168.80.15/24
        IPv6:           None
        STPD:           s0(Disabled,Auto-bind)
        Protocol:       Match all unfiltered protocols
        Loopback:       Disabled
        NetLogin:       Disabled
        QosProfile:     None configured
        Egress Rate Limit Designated Port: None configured
        Flood Rate Limit QosProfile:       None configured
        Ports:   24.      (Number of active ports=1)
           Untag:       3,      4,      5,      6,      7,      8,      9,
                       10,     11,     12,     13,     14,     15,     16,
                       17,     18,     19,     20,     21,     22,     23,
                      *24,     25,     26
        Flags:    (*) Active, (!) Disabled, (g) Load Sharing port
                  (b) Port blocked on the vlan, (m) Mac-Based port
                  (a) Egress traffic allowed for NetLogin
                  (u) Egress traffic unallowed for NetLogin
                  (t) Translate VLAN tag for Private-VLAN
                  (s) Private-VLAN System Port, (L) Loopback port
                  (e) Private-VLAN End Point Port
Press <SPACE> to continue or <Q> to quit:
```

Figure 4. sh vlan default

```
SISTEMASSWITCH.2 # sh vl def
VLAN Interface with name Default created by user
        Admin State:    Enabled         Tagging:        802.1Q Tag 1
        Virtual router: VR-Default
        Primary IP    : 192.168.80.15/24
        IPv6:           None
        STPD:           s0(Disabled,Auto-bind)
        Protocol:       Match all unfiltered protocols
        Loopback:       Disabled
        NetLogin:       Disabled
        QosProfile:     None configured
        Egress Rate Limit Designated Port: None configured
        Flood Rate Limit QosProfile:       None configured
        Ports:   26.      (Number of active ports=1)
           Untag:       1,      2,      3,      4,      5,      6,      7,
                        8,      9,     10,     11,     12,     13,     14,
                       15,     16,     17,     18,     19,     20,     21,
                       22,     23,    *24,     25,     26
        Flags:    (*) Active, (!) Disabled, (g) Load Sharing port
                  (b) Port blocked on the vlan, (m) Mac-Based port
                  (a) Egress traffic allowed for NetLogin
                  (u) Egress traffic unallowed for NetLogin
                  (t) Translate VLAN tag for Private-VLAN
                  (s) Private-VLAN System Port, (L) Loopback port
                  (e) Private-VLAN End Point Port
```

Figure 5. sh vlan default

```
Total number of VLAN(s) : 2
* SISTEMASSWITCH.7 # create vlan verde
* SISTEMASSWITCH.8 # config vl verde tag 20
* SISTEMASSWITCH.9 # sh vl
--------------------------------------------------------------------------------
Name            VID  Protocol Addr        Flags               Proto  Ports  Virtual
                                                                       Active router
                                                                       /Total
--------------------------------------------------------------------------------
azul            10   ---------------------------------------- ANY    0 /0   VR-Default
Default         1    192.168.80.15  /24  -----------T---------- ANY    1 /26  VR-Default
Mgmt            4095 ---------------------------------------- ANY    0 /1   VR-Mgmt
verde           20   ---------------------------------------- ANY    0 /0   VR-Default
--------------------------------------------------------------------------------
Flags : (C) EAPS Control VLAN, (d) NetLogin Dynamically created VLAN,
        (D) VLAN Admin Disabled, (E) ESRP Enabled, (f) IP Forwarding Enabled,
        (F) Learning Disabled, (i) ISIS Enabled, (L) Loopback Enabled,
        (l) MPLS Enabled, (m) IPmc Forwarding Enabled,
        (M) Translation Member VLAN or Subscriber VLAN, (n) IP Multinetting Enabled,
        (N) Network Login VLAN, (o) OSPF Enabled, (O) Flooding Disabled, (p) PIM Enabled,
        (P) EAPS protected VLAN, (r) RIP Enabled, (R) Sub-VLAN IP Range Configured,
        (s) Sub-VLAN, (S) Super-VLAN, (t) Translation VLAN or Network VLAN,
        (T) Member of STP Domain, (V) VPLS Enabled, (v) VRRP Enabled

Total number of VLAN(s) : 4
```

Figure 6. create vlan verde

```
* SISTEMASSWITCH.21 # sh vl
--------------------------------------------------------------------------------
Name            VID  Protocol Addr        Flags               Proto  Ports  Virtual
                                                                       Active router
                                                                       /Total
--------------------------------------------------------------------------------
azul            10   192.168.70.5   /24  ----------------------- ANY    1 /1   VR-Default
Default         1    192.168.80.15  /24  -----------T---------- ANY    1 /24  VR-Default
Mgmt            4095 ---------------------------------------- ANY    0 /1   VR-Mgmt
verde           20   192.168.60.5   /24  ----------------------- ANY    0 /1   VR-Default
--------------------------------------------------------------------------------
Flags : (C) EAPS Control VLAN, (d) NetLogin Dynamically created VLAN,
        (D) VLAN Admin Disabled, (E) ESRP Enabled, (f) IP Forwarding Enabled,
        (F) Learning Disabled, (i) ISIS Enabled, (L) Loopback Enabled,
        (l) MPLS Enabled, (m) IPmc Forwarding Enabled,
        (M) Translation Member VLAN or Subscriber VLAN, (n) IP Multinetting Enabled,
        (N) Network Login VLAN, (o) OSPF Enabled, (O) Flooding Disabled, (p) PIM Enabled,
        (P) EAPS protected VLAN, (r) RIP Enabled, (R) Sub-VLAN IP Range Configured,
        (s) Sub-VLAN, (S) Super-VLAN, (t) Translation VLAN or Network VLAN,
        (T) Member of STP Domain, (V) VPLS Enabled, (v) VRRP Enabled

Total number of VLAN(s) : 4
```

Figure 7. sh vlan

```
* SISTEMASSWITCH.28 # sh vlan verde
VLAN Interface with name verde created by user
        Admin State:    Enabled         Tagging:        802.1Q Tag 20
        Virtual router: VR-Default
        Primary IP    : 192.168.60.5/24
        IPv6:           None
        STPD:           None
        Protocol:       Match all unfiltered protocols
        Loopback:       Disabled
        NetLogin:       Disabled
        QosProfile:     None configured
        Egress Rate Limit Designated Port: None configured
        Flood Rate Limit QosProfile:       None configured
        Ports:   3.       (Number of active ports=0)
           Untag:       2
           Tag:         5,      6
        Flags:    (*) Active, (!) Disabled, (g) Load Sharing port
                  (b) Port blocked on the vlan, (m) Mac-Based port
                  (a) Egress traffic allowed for NetLogin
                  (u) Egress traffic unallowed for NetLogin
                  (t) Translate VLAN tag for Private-VLAN
                  (s) Private-VLAN System Port, (L) Loopback port
                  (e) Private-VLAN End Point Port
                  (x) VMAN Tag Translated port
```

Figure 8. sh vlan verde

```
* SISTEMASSWITCH.25 # config vl azul add port 6 tagged
* SISTEMASSWITCH.26 # config vl verde add port 6 tagged
* SISTEMASSWITCH.27 # sh vl azul
VLAN Interface with name azul created by user
        Admin State:    Enabled         Tagging:        802.1Q Tag 10
        Virtual router: VR-Default
        Primary IP    : 192.168.70.5/24
        IPv6:           None
        STPD:           None
        Protocol:       Match all unfiltered protocols
        Loopback:       Disabled
        NetLogin:       Disabled
        QosProfile:     None configured
        Egress Rate Limit Designated Port: None configured
        Flood Rate Limit QosProfile:       None configured
        Ports:   3.       (Number of active ports=1)
           Untag:      *1
           Tag:         5,      6
        Flags:    (*) Active, (!) Disabled, (g) Load Sharing port
                  (b) Port blocked on the vlan, (m) Mac-Based port
                  (a) Egress traffic allowed for NetLogin
                  (u) Egress traffic unallowed for NetLogin
                  (t) Translate VLAN tag for Private-VLAN
                  (s) Private-VLAN System Port, (L) Loopback port
                  (e) Private-VLAN End Point Port
                  (x) VMAN Tag Translated port
```

Figure 9. sh vlan azul

```
SISTEMASSWITCH.1 # sh VLAN
-------------------------------------------------------------------------------
Name            VID  Protocol Addr        Flags                Proto  Ports  Virtual
                                                                       Active router
                                                                       /Total
-------------------------------------------------------------------------------
Default         1    192.168.80.15  /24  -----------T----------- ANY    1 /26  VR-Default
Mgmt            4095 ------------------------------------------- ANY    0 /1   VR-Mgmt
-------------------------------------------------------------------------------
Flags : (C) EAPS Control VLAN, (d) NetLogin Dynamically created VLAN,
        (D) VLAN Admin Disabled, (E) ESRP Enabled, (f) IP Forwarding Enabled,
        (F) Learning Disabled, (i) ISIS Enabled, (L) Loopback Enabled,
        (l) MPLS Enabled, (m) IPmc Forwarding Enabled,
        (M) Translation Member VLAN or Subscriber VLAN, (n) IP Multinetting Enabled,
        (N) Network Login VLAN, (o) OSPF Enabled, (O) Flooding Disabled, (p) PIM Enabled,
        (P) EAPS protected VLAN, (r) RIP Enabled, (R) Sub-VLAN IP Range Configured,
        (s) Sub-VLAN, (S) Super-VLAN, (t) Translation VLAN or Network VLAN,
        (T) Member of STP Domain, (V) VPLS Enabled, (v) VRRP Enabled

Total number of VLAN(s) : 2
```

Figure 10. sh vlan

```
* SISTEMASSWITCH.17 # sh vl verde
VLAN Interface with name verde created by user
        Admin State:    Enabled         Tagging:        802.1Q Tag 20
        Virtual router: VR-Default
        IPv6:           None
        STPD:           None
        Protocol:       Match all unfiltered protocols
        Loopback:       Disabled
        NetLogin:       Disabled
        QosProfile:     None configured
        Egress Rate Limit Designated Port: None configured
        Flood Rate Limit QosProfile:       None configured
        Ports:   1.       (Number of active ports=0)
           Untag:       2
        Flags:    (*) Active, (!) Disabled, (g) Load Sharing port
                  (b) Port blocked on the vlan, (m) Mac-Based port
                  (a) Egress traffic allowed for NetLogin
                  (u) Egress traffic unallowed for NetLogin
                  (t) Translate VLAN tag for Private-VLAN
                  (s) Private-VLAN System Port, (L) Loopback port
                  (e) Private-VLAN End Point Port
                  (x) VMAN Tag Translated port
```

Figure 11. sh vlan verde

```
D:\Users\Usernet01>ping 192.168.70.5

Pinging 192.168.70.5 with 32 bytes of data:
Reply from 192.168.70.5: bytes=32 time=1ms TTL=255
Reply from 192.168.70.5: bytes=32 time<1ms TTL=255
Reply from 192.168.70.5: bytes=32 time<1ms TTL=255
Reply from 192.168.70.5: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.70.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

D:\Users\Usernet01>
```

Figure 12. Pinging 70.5

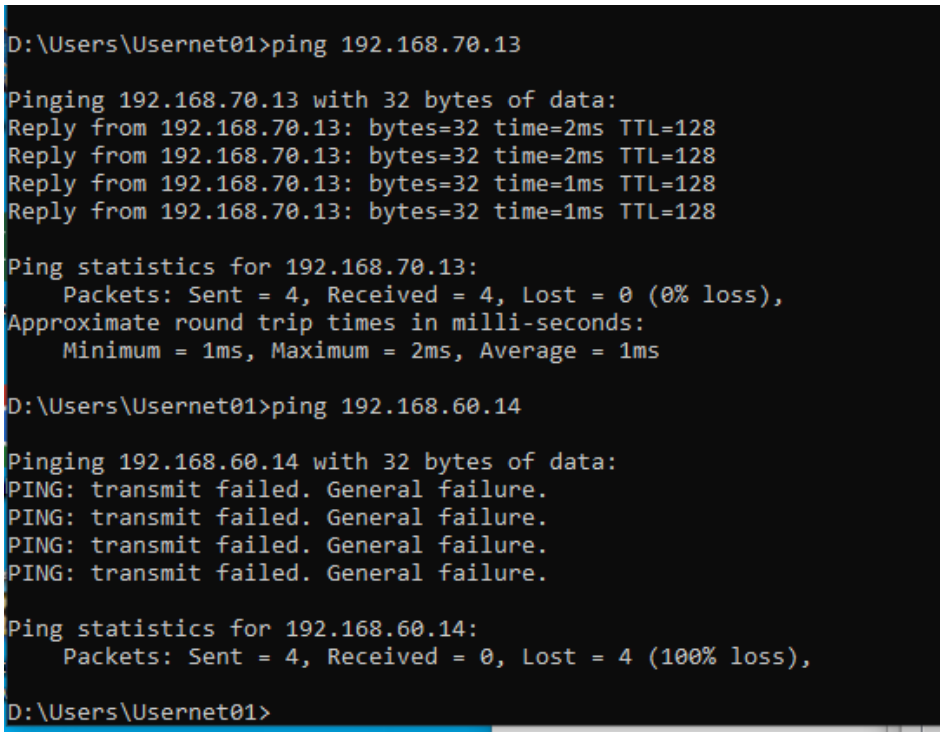

Figure 13. Pinging 70.3

Conclusions

This experiment demonstrated the successful implementation and functionality of tagged VLANs in a simulated network environment using Cisco Packet Tracer. The configuration of VLANs, trunk links, and end devices was executed according to the IEEE 802.1Q standard. The segregation of broadcast domains through VLANs was confirmed, highlighting the importance of VLANs in network design for efficient traffic management and enhanced security. Understanding and implementing tagged VLANs are essential skills for network administrators to optimize network performance in real-world scenarios.

Bibliography

http://www.extremenetworks.com