VLAN Interoperability

This Application Notes relates to the following Dell PowerConnect™ products:

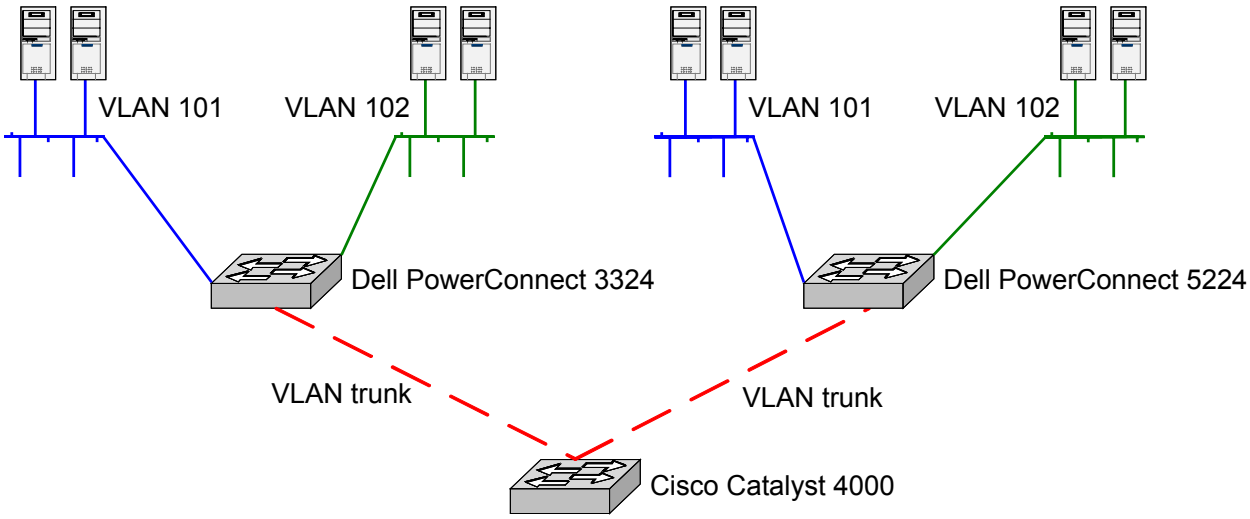
- PowerConnect 33xx
- PowerConnect 52xx

Abstract

This Application Note explains how to implement virtual LANs (VLANs) across networks built from Dell PowerConnect and Cisco Catalyst® switches. This document provides sample configurations for setting up static VLAN trunks between the two platforms, and also discusses how to reduce administrative overhead by dynamically propagating VLAN information across switches.

Applicable Network Scenarios

The following diagram shows a switched network using VLANs. Two Dell PowerConnect switches, both with member ports in VLANs 101 and 102, have “trunk links” to one Cisco Catalyst 4000. Trunk links should carry traffic between multiple VLANs on multiple switches, but switches with trunk links should forward traffic only to member ports for each VLAN. For example, broadcasts on VLAN 101 should propagate to all interfaces on all switches associated with that VLAN – but none of the traffic should be seen on the interfaces associated with VLAN 102. In this example, trunk links make it possible for VLAN scope to be extended beyond a single switch.



Note that the trunk links between the Dell and Cisco switches are broken, as indicated by the broken lines. This is because Dell and Cisco devices have different default mechanisms for dynamic exchange of VLAN information. Cisco Catalyst switches’ default mechanism is the proprietary VLAN trunking protocol (VTP). In contrast, Dell PowerConnect switches use the standards-based GARP VLAN registration protocol (GVRP) for dynamic exchange of VLAN configuration information.

Because the Dell and Cisco switches use different protocols by default, no exchange of VLAN control traffic will take place – and thus no intra-VLAN traffic will flow between the Dell and Cisco switches.

By disabling VTP and enabling GVRP on the Cisco switch, it is possible to exchange intra-VLAN data and control information in mixed Dell-Cisco environments.

Technology Background

A VLAN is a single logical broadcast domain comprised of interfaces on one or more switches. Not all interfaces on a switch must be members of a given VLAN; in fact, a major benefit of VLANs is the ability to subdivide one physical switch into multiple logical networks. The “virtual” aspect of VLANs is that they enable the construction of multiple virtual networks out of one physical switch, or vice versa; a single VLAN may span multiple physical switches through the use of trunk links.

The VLAN implementation in Dell PowerConnect and Cisco Catalyst switches is based on the IEEE 802.1Q standard. It is possible to set up statically defined VLANs between Dell and Cisco switches simply by configuring each switch port to be a member of a given VLAN.

For dynamic VLAN setup, Dell PowerConnect switches support GARP VLAN Registration Protocol (GVRP). GVRP reduces administrative overhead by automatically propagating VLAN modifications made to one switch across all other switches in a given network. As noted, GVRP will not work correctly with Cisco Catalyst switches unless VTP is first put into transparent mode (disabled) and GVRP is enabled.

Proposed Solution

Overview

To implement VLAN trunks using GVRP between Dell PowerConnect switches and Cisco Catalyst 4000s, use the following steps:

On Dell PowerConnect switches:

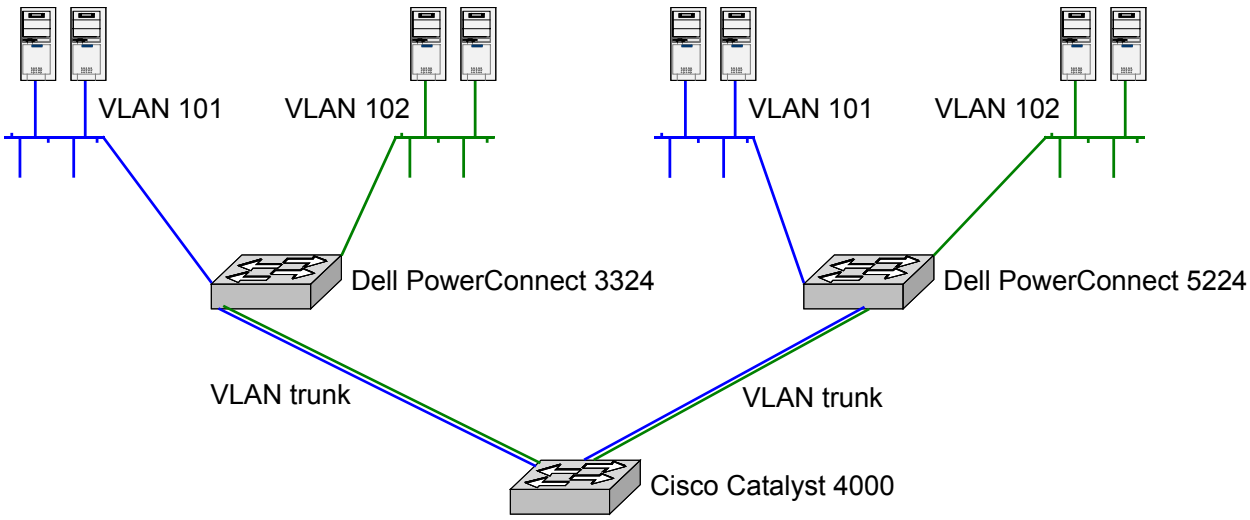
1. Create VLANs in the VLAN database.
2. Assign VLANs to associated interfaces.
3. Place uplink interfaces into trunking mode
4. Configure allowed VLANs to be tagged.
5. Enable GVRP.

On the Cisco Catalyst 4000:

6. Place uplink interfaces into trunking mode.
7. Enable GVRP.

Typical Network Designs

We will set up two VLANs using GVRP for dynamic exchange of VLAN configuration information across switches. As the diagram shows, two VLANs span three physical switches.



Step-By-Step Instructions

The following configuration guidelines work with any Dell PowerConnect 33xx or 52xx switch.

NOTE: For GVRP to work, all switches must support it, and all must have member ports assigned to respective VLANs. However, once GVRP is set up, *it is not necessary to configure trunking on each switch as VLANs are added, moved or deleted, assuming the trunk previously has not been deleted.* GVRP automatically propagates information about such changes.

The Cisco configuration guidelines work with any Cisco Catalysts that supports GVRP. This particular configuration was verified with a Cisco Catalyst 4000 running Cisco IOS Version 12.1(13)EA1).

1. Create VLANs 101 and 102.

PowerConnect 3324:

```
console(config)# vlan database
console(config-vlan)# vlan 101-102
```

PowerConnect 5224:

```
console(config)# vlan database
console(config-vlan)# vlan 101 name vlan_101 media ethernet
console(config-vlan)# vlan 102 name vlan_102 media ethernet
```

2. Assign VLANs to associated interfaces:

PowerConnect 3324:

```
console(config)# interface ethernet 1/e2
console(config-if)# switchport access vlan 101
console(config-if)# exit
console(config)# interface ethernet 1/e3
console(config-if)# switchport access vlan 102
```

```
console(config-if)# exit
```

PowerConnect 5224:

```
console(config)# interface ethernet 1/2
console(config-if)# switchport allowed vlan add 101
console(config-if)# switchport native vlan 101
console(config-if)# exit
console(config)# interface ethernet 1/3
console(config-if)# switchport allowed vlan add 102
console(config-if)# switchport native vlan 102
console(config-if)# exit
```

3. Configure trunking mode on uplink interfaces.

PowerConnect 3324:

```
console(config)# interface ethernet 1/e1
console(config-if)# switchport mode trunk
console(config-if)# switchport trunk allowed vlan add 101,102
console(config-if)# exit
```

PowerConnect 5224:

```
console(config)# interface ethernet 1/1
console(config-if)# switchport mode trunk
console(config-if)# switchport allowed vlan add 101,102 tagged
console(config-if)# exit
```

4. Enable GVRP.

PowerConnect 3324:

```
console(config)# gvrp enabled
```

PowerConnect 5224:

```
console(config)# interface ethernet 1/1
console(config-if)# switchport gvrp
console(config-if)# exit
```

5. Enable trunking on Cisco interfaces.

```
Catalyst_4000(config)# int fa0/1
Catalyst_4000(config-if)# switchport mode trunk
Catalyst_4000(config-if)# exit
Catalyst_4000(config)# int fa0/24
Catalyst_4000(config-if) switch port mode trunk
Catalyst_4000(config-if) exit
```

6. Enable GVRP on trunk interfaces:

```
Catalyst_4000(config)# set vtp mode transparent
Catalyst_4000(config)# set gvrp enable
Catalyst_4000(config)# set gvrp dynamic-vlan-creation enable
```

Conclusion

We have now successfully set up VLANs with trunking and GVRP in a network comprised of Dell PowerConnect and Cisco Catalyst switches. GVRP will automatically propagate any future VLANs additions, moves or changes across all trunk links as these occur.