在 Catalyst 交換器之間設定 802.1Q 主幹連線

目錄

簡介

本檔案介紹執行Cisco IOS®軟體的Cisco Catalyst交換器之間IEEE 802.1Q (dot1q)中繼的差異。

必要條件

需求

嘗試此組態之前，請確保符合以下要求：

- IEEE 802.1Q中繼的知識
- 使用指令行介面(CLI)設定Catalyst 3560和Catalyst 6500系列交換器的知識

採用元件

本文中的資訊係根據以下軟體和硬體版本：

- 執行Cisco IOS軟體版本12.2(25)SEA的Catalyst 3560交換器
- 運行Cisco IOS軟體版本12.1(26)E1的Catalyst 6509交換機

本文中的資訊是根據特定實驗室環境內的裝置所建立。文中使用到的所有裝置皆從已清除（預設）的組態來啟動。如果您的網路運作中，請確保您瞭解任何指令可能造成的影響。

背景資訊

本文檔提供運行Cisco IOS®軟體的Cisco Catalyst 3560交換機與Catalyst 6500系列交換機之間的IEEE 802.1Q (dot1q)中繼的示例配置。主幹連線是在兩個裝置之間，透過點對點連結，從多個VLAN 攜帶流量的方式。

在傳統平台上，有兩種方法可以實施乙太網中繼：

1. 交換器間連結通訊協定(ISL)—Cisco專有通訊協定
2. 802.1Q - IEEE標準

Catalyst元件

本檔案中的Catalyst 3560和6500組態亦適用於執行Cisco IOS軟體的其他Catalyst交換器。

注意：請參閱以下文檔以瞭解各種Catalyst交換機支援的中繼方法：

- 在Catalyst交換機上實施中繼的系統要求

注意：本文檔僅包括來自交換機的配置檔案以及相關示例 show 命令的輸出。有關如何在Catalyst交換機之間配置802.1Q TRUNK的詳細資訊，請參閱以下文檔：

- 配置VLAN 的配置VLAN中繼部分- Catalyst 3560系列交換機
- 配置第2層乙太網介面的瞭解VLAN中繼部分-運行Cisco IOS軟體的Catalyst 4500系列交換機

背景理論

IEEE 802.1Q使用內部標籤機制。中繼裝置插入4位元組的標籤以標識幀所屬的VLAN，然後重新計算幀校驗序列(FCS)。如需詳細資訊，請參閱下列檔案：

- 交換機間鏈路和IEEE 802.1Q幀格式

注意：以下是針對此配置的重要說明：

- Catalyst 3560/3750系列交換機上的任何乙太網介面都可以支援802.1Q和ISL封裝。預設情況下，Catalyst 3550交換機上的乙太網介面是第2層(L2)埠。

- Catalyst 6500/6000系列交換機上的任何乙太網埠都可以支援802.1Q和ISL封裝。

- 預設情況下，運行Cisco IOS軟體的Catalyst 4500系列交換機支援ISL和802.1Q中繼模式。除了在WS-X4418-GB和WS-X4412-2GB-T模組上阻塞Gigabit埠外，所有介面均支援此功能。這些埠不支援ISL並且僅支援802.1Q中繼。埠3至18阻塞WS-X4418-GB模組上的千兆埠。埠1至12阻塞WS-X4412-2GB-T模組上的千兆埠。

注意：如果埠與背板的連線超額訂閱，則該埠為阻塞埠。

- Catalyst 6500和Catalyst 4500平台之間的主要區別是預設介面配置。運行Cisco IOS軟體的Catalyst 6500交換機的預設關閉模式下的介面是第3層(L3)路由埠。運行Cisco IOS軟體的Catalyst 4500交換機啟用了所有介面。預設情況下，這些介面是L2交換機埠。

- 當802.1Q封裝用於Catalyst 3750交換機上的中繼介面時，可在 show interface 輸出中看到殘幀，因為61-64位元組的有效802.1Q封裝資料包（包括q標籤）被Catalyst 3750交換機算作是過小幀，即使這些資料包被正確地轉發。

注意：請注意，運行Cisco IOS XE的最新Catalyst交換機（例如3650/3850及更高版本）不再支援ISL協定。

設定

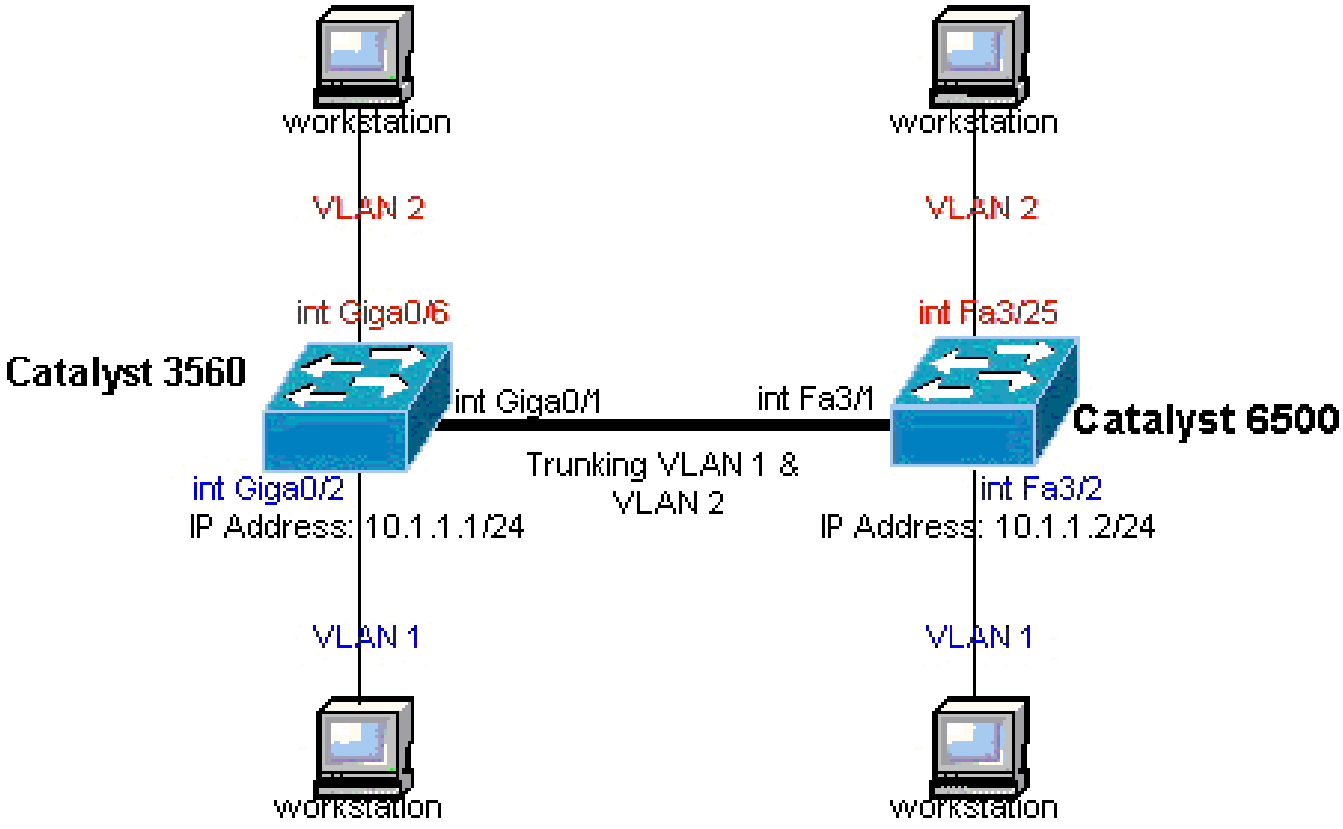
本節提供用於設定本文件中所述功能的資訊。

網路圖表

此文件使用以下網路設定：

注意：Catalyst 3560上的千兆乙太網介面是10/100/1000 Mbps協商乙太網介面。因此，在此網路圖表中，Catalyst 3560上的千

兆連線埠連線到Catalyst 6500上的快速乙太網路(100 Mbps)連線埠。



網路圖表

組態

本檔案使用下列組態：

- Catalyst 3560交換器

- Catalyst 6500交換器

Catalyst 3560交換器
<#root> *!--- Notice: This example creates VLAN 1 and VLAN 2* *!--- and sets the VLAN Trunk Protocol (VTP) mode to transparent. Use your* *!--- network as a basis and set the VTP mode accordingly. For more details,*

```
!--- refer to Configuring VLANs.


 version 12.2
 no service pad
 service timestamps debug uptime
 service timestamps log uptime
 no service password-encryption
 !
 hostname 3560
 !

!--- This is the privileged mode password for the example.

 enable password mysecret
 !
 ip subnet-zero
 !
 vtp mode transparent
 !

!--- VLAN 2 is created. This is visible only when you set VTP mode
!--- to transparent.

 vlan 2
 !


!--- The Gigabit Ethernet interface on the Catalyst 3560 is a 10/100/1000 Mbps
!--- negotiated Ethernet interface. Therefore, the Gigabit port on the
!--- Catalyst 3560 is connected to a Fast Ethernet port on the Catalyst 6500.
!--- Configure the trunk on the Gigabit Ethernet 0/1 interface.

 interface GigabitEthernet0/1

!--- Configure trunk encapsulation as dot1q.
!--- For details on trunking, refer to Configuring VLANs.


switchport trunk encapsulation dot1q


!--- Enable trunking on the interface.



switchport mode trunk


  no ip address
  snmp trap link-status
 !
 !

!--- Interfaces Gigabit Ethernet 0/2 through 0/5 are placed in VLAN 1.
!--- In order to configure the interface as an L2 port,
!--- refer to the Configuring Ethernet Interfaces section
!--- of Configuring Interface Characteristics. All L2 ports are placed
!--- in VLAN 1, by default.

 interface GigabitEthernet0/2
```

```
switchport mode access

 no ip address
 snmp trap link-status
!
interface GigabitEthernet0/3


switchport mode access

 no ip address
 snmp trap link-status
!
!
interface GigabitEthernet0/4


switchport mode access


 no ip address
 snmp trap link-status
!
interface GigabitEthernet0/5


switchport mode access

 no ip address
 snmp trap link-status
!
!

!--- Interfaces Gigabit Ethernet 0/6 through 0/12 are placed in VLAN 2.

interface GigabitEthernet0/6


switchport access vlan 2
 switchport mode access

no ip address
snmp trap link-status
!

!--- Output suppressed.

!
interface GigabitEthernet0/12

 switchport access vlan 2
 switchport mode access

 no ip address
 snmp trap link-status
!
interface Vlan1

!--- This is the IP address for management.

ip address 10.1.1.1 255.255.255.0
!
ip classless
ip http server
!
```

```
!
line con 0
transport input none
line vty 0 4

!--- This is the privileged mode password for the example.

password mysecret
login
line vty 5 15
login
!
end
```

Catalyst 6500交換器

<#root>

```
!--- Notice: This example creates VLAN 1 and VLAN 2 and sets
!--- the VTP mode to transparent. Use your network as a basis and set the VTP
!--- mode accordingly. For more details, refer to Configuring VLANs.


Current configuration : 4812 bytes
version 12.1
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Cat6500
!
vtp mode transparent
ip subnet-zero
!
!
mls flow ip destination
mls flow ipx destination
!

!--- This is the privileged mode password for the example.

enable password mysecret
!
redundancy
mode rpr-plus
main-cpu
auto-sync running-config
auto-sync standard
!
!

!--- This enables VLAN 2.

vlan 2
!
interface GigabitEthernet1/1
 no ip address
 shutdown
```

```
 !
 interface GigabitEthernet1/2
  no ip address
  shutdown
 !

!--- The Gigabit Ethernet interface on the Catalyst 3560 is a 10/100/1000 Mbps
!--- negotiated Ethernet interface. Therefore, the Gigabit port on the Catalyst 3560
!--- is connected to a Fast Ethernet port on the Catalyst 6500.

 interface FastEthernet3/1
  no ip address

!--- You must issue the switchport command once,
!--- without any keywords, in order to configure the interface as an L2 port for the
!--- Catalyst 6500 series switch that runs Cisco IOS Software.
!--- On a Catalyst 4500 series switch that runs Cisco IOS Software, all ports are L2
!--- ports by default. Therefore, if you do not change the default configuration,
!--- you do not need to issue the switchport command.



switchport



!--- Configure trunk encapsulation as dot1q.
!--- For more details on trunking, refer to
!--- Configuring LAN Ports for Layer 2 Switching for the Catalyst 6500 series switch
!--- that runs Cisco IOS Software, or  Configuring Layer 2 Ethernet Interfaces
!--- for the Catalyst 4500/4000 series switch that runs Cisco IOS Software.



switchport trunk encapsulation dot1q



!--- Enable trunking on the interface.



switchport mode trunk

 !

!--- Configure interfaces Fast Ethernet 3/2 through 3/24 to be in access mode.
!--- By default, all access ports are configured in VLAN 1.

 interface FastEthernet3/2
  no ip address


switchport
  switchport mode access

 !


!--- Output suppressed.
```

```
 !
 interface FastEthernet3/24
  no ip address

  switchport
  switchport mode access

 !

!--- Fast Ethernet 3/25 through 3/48 are placed in VLAN 2.


 interface FastEthernet3/25
  no ip address


switchport



switchport access vlan 2
  switchport mode access

 !


!--- Output suppressed.

 !
 interface FastEthernet3/48
  no ip address

  switchport
  switchport access vlan 2
  switchport mode access

 !
 !
 interface Vlan1

!--- This is the IP address for management.

  ip address 10.1.1.2 255.255.255.0
 !
 !
 ip classless
 no ip http server
 !
 !
 ip classless
 ip http server
 !
 line con 0
 exec-timeout 0 0
 transport input none
 line vty 0 4

!--- This is the Telnet password for the example.

 password mysecret
 login

 !
 end
```

注意：如果為不存在的VLAN分配介面，該介面將關閉，直到您在VLAN資料庫中建立VLAN。有關詳細資訊，請參閱配置VLAN 的建立或修改乙太網VLAN 部分。

驗證

使用本節內容，確認您的組態是否正常運作。在Catalyst 3560/3750/6500/4500交換器上，使用以下命令：

- **show interfaces <interface_type module/port> trunk**
- **show interfaces <interface_type module/port> switchport**
- **show vlan**
- **show vtp status**

show

命令輸出示例

Catalyst 3560交換器

- **show interfaces <interface_type module/por> trunk** —此命令顯示介面的中繼配置以及能夠透過中繼為其傳輸流量的VLAN編號。

<#root>

3560#

show interface gigabitethernet 0/1 trunk

```
Port      Mode         Encapsulation  Status        Native vlan


Gi0/1     on           802.1q         trunking      1



Port      Vlans allowed on trunk
Gi0/1     1 4094

Port      Vlans allowed and active in management domain
Gi0/1     1-2

Port      Vlans in spanning tree forwarding state and not pruned
Gi0/1     1-2
```

•

show interfaces <interface_type module/port> switchport —此命令顯示介面的交換機埠配置。

在顯示器中，選中Operational Mode 和Operational Trunking Encapsulation 欄位。

```
    <#root>

3560#


show interface gigabitethernet 0/1 switchport


Name: Gi0/1
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
```

•

show vlan -此命令提供有關VLAN及屬於特定VLAN的埠的資訊。

<#root>

```
3560#
```

```
show vlan
```

```
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Gi0/2, Gi0/3, Gi0/4, Gi0/5
2    VLAN0002                         active    Gi0/6, Gi0/7, Gi0/8, Gi0/9
                                                Gi0/10, Gi0/11, Gi0/12

1002 fddi-default                     act/unsup
1003 token-ring-default               act/unsup
1004 fddinet-default                  act/unsup
1005 trnet-default                    act/unsup

!--- Output suppressed.
```

註：輸出中顯示的埠僅為接入埠。但是，配置為中繼以及處於未連線狀態的埠也顯示在**show vlan**輸出中。

•

show vtp status —此命令顯示有關VTP管理域、狀態和計數器的一般資訊。

<#root>

3560#

show vtp status

VTP Version : 2
Configuration Revision : 0
Maximum VLANs supported locally : 1005
Number of existing VLANs : 6

VTP Operating Mode : Transparent

VTP Domain Name :
VTP Pruning Mode : Disabled
VTP V2 Mode : Disabled
VTP Traps Generation : Disabled
MD5 digest : 0x4A 0x55 0x17 0x84 0xDB 0x99 0x3F 0xD1
Configuration last modified by 10.1.1.1 at 0-0-00 00:00:00

3560#

ping 10.1.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms
3560#

Catalyst 6500交換器

- **show interfaces <interface_type module/port> trunk** -此命令顯示介面的中繼配置以及能夠透過中繼為其傳輸流量的VLAN編號。

<#root>

Cat6500#

show interfaces fastethernet 3/1 trunk

Port Mode Encapsulation Status Native vlan

Fa3/1 on 802.1q trunking 1

Port Vlans allowed on trunk
Fa3/1 1 4094

Port Vlans allowed and active in management domain
Fa3/1 1-2

Port Vlans in spanning tree forwarding state and not pruned
Fa3/1 1-2

- **show interfaces <interface_type module/port> switchport** —此命令顯示介面的交換機埠配置。 在顯示器中，選中 Operational Mode 和Operational Trunking Encapsulation 欄位。

<#root>

cat6500#

show interface fastethernet 3/1 switchport

Name: Fa3/1
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

- **show vlan** -此命令提供有關VLAN及屬於特定VLAN的埠的資訊。

<#root>

Cat6500#

show vlan

```
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa3/2, Fa3/3, Fa3/4, Fa3/5
                                                Fa3/6, Fa3/7, Fa3/8, Fa3/9
                                                Fa3/10, Fa3/11, Fa3/12, Fa3/13
                                                Fa3/14, Fa3/15, Fa3/16, Fa3/17
                                                Fa3/18, Fa3/19, Fa3/20, Fa3/21
                                                Fa3/22, Fa3/23, Fa3/24
2    VLAN0002                         active    Fa3/25, Fa3/26, Fa3/27, Fa3/28
                                                Fa3/29, Fa3/30, Fa3/31, Fa3/32
                                                Fa3/33, Fa3/34, Fa3/35, Fa3/36
                                                Fa3/37, Fa3/38, Fa3/39, Fa3/40
                                                Fa3/41, Fa3/42, Fa3/43, Fa3/44
                                                Fa3/45, Fa3/46, Fa3/47, Fa3/48
1002 fddi-default                      act/unsup
1003 token-ring-default                act/unsup
1004 fddinet-default                   act/unsup
1005 trnet-default                     act/unsup
```

注意：顯示的埠僅限已配置為第2層非中繼（接入）埠的埠。配置為中繼以及未連線狀態的埠也顯示在**show vlan**輸出中。有關詳細資訊，請參閱配置用於第2層交換的LAN埠的「配置用於第2層交換的LAN介面」部分。

- **show vtp status** —此命令顯示有關VTP管理域、狀態和計數器的一般資訊。

<#root>

```
Cat6500#


show vtp status


VTP Version                     : 2
Configuration Revision          : 0
Maximum VLANs supported locally : 1005
Number of existing VLANs        : 6
VTP Operating Mode              : Transparent
VTP Domain Name                 :
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Disabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0xBF 0x86 0x94 0x45 0xFC 0xDF 0xB5 0x70
Configuration last modified by 10.1.1.2 at 0-0-00 00:00:00
```

- **ping**

```
<#root>

Cat6500#


ping 10.1.1.1


Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms
```

相關資訊

- Catalyst 3560系列交換器組態指南
- Catalyst 4500系列交換器組態指南

- Catalyst 6500系列交換器組態指南
- 思科技術支援與下載

關於此翻譯

思科已使用電腦和人工技術翻譯本文件，讓全世界的使用者能夠以自己的語言理解支援內容。請注意，即使是最佳機器翻譯，也不如專業譯者翻譯的內容準確。Cisco Systems, Inc. 對這些翻譯的準確度概不負責，並建議一律查看原始英文文件（提供連結）。