

# 在Catalyst交換機之間配置802.1Q中繼

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## 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)主幹的差異。

## 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中繼知識
- 使用指令行介面(CLI)設定Catalyst 3560和Catalyst 6500/6000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

本檔案將提供執行Cisco IOS<sup>®</sup>軟體的Cisco Catalyst 3550/3560/3750交換器與執行Cisco IOS軟體的Catalyst 6500/6000系列交換器或Catalyst 4500/4000系列交換器之間的IEEE 802.1Q(dot1q)主幹組態範例。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。

實施乙太網中繼的兩種方法是：

- 交換器間連結通訊協定(ISL) — 思科專有通訊協定
- 802.1Q - IEEE標準

## Catalyst元件

本檔案中的Catalyst 3560設定也適用於執行Cisco IOS軟體的Catalyst 3550/3750交換器。本檔案中的Catalyst 6500/6000設定也適用於執行Cisco IOS軟體的Catalyst 4500/4000系列交換器。

**注意：**請參閱以下文檔以瞭解各種Catalyst交換機所支援的中繼方法：

- [在Catalyst交換機上實施](#)中繼的系統要求

**註：**本文檔僅包含交換機的配置檔案和相關示例的輸出 `show` 指令。有關如何在Catalyst交換器之間設定802.1Q主幹的詳細資訊，請參閱以下檔案：

- [配置VLAN](#) - Catalyst 3560系列交換器的配置VLAN中繼部分
- 配置第2層乙太網介面 — 運行Cisco IOS軟體的Catalyst 4500系列交換機的[瞭解VLAN Trunk部分](#)

## 背景理論

IEEE 802.1Q使用內部標籤機制。中繼裝置插入一個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，請參閱以下檔案：

- [InterSwitch鏈路和IEEE 802.1Q幀格式](#)
- [Catalyst 4500/4000、5500/5000和6500/6000系列交換器 \(使用802.1Q封裝和Cisco CatOS系統軟體\) 之間中繼的802.1Q中繼的基本特徵部分](#)

**注意：**下面是此配置需要記住的重要說明：

- Catalyst 3550/3560/3750系列交換器上的任何乙太網路介面都可以支援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系列交換器上的任何乙太網路連線埠均可支援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模組上阻塞千兆埠外，所有介面均支援此功能。這些埠不支援ISL，僅支援802.1Q中繼。埠3到18阻塞了WS-X4418-GB模組上的Gigabit埠。埠1到12阻塞了WS-X4412-2GB-T模組上的Gigabit埠。

**註：**如果埠與背板的連線超額使用，則該埠為阻塞埠。

- Catalyst 6500/6000和Catalyst 4500平台之間的主要區別是預設介面組態。執行Cisco IOS軟體的Catalyst 6500/6000交換器上的介面處於關閉模式，預設為第3層(L3)路由連線埠。執行Cisco IOS軟體的Catalyst 4500/4000交換器已啟用所有介面。預設情況下，介面是L2交換機埠。
- 在Catalyst 3750交換器上的主幹介面上使用802.1Q封裝時，可以在上看到殘餘訊框 `show interface` 輸出，因為Catalyst 3750交換器將包含q標籤的61-64位元組的有效802.1Q封裝封包計數為過小訊框，即使這些封包已正確轉送。如需更多詳細資訊，請參閱Cisco錯誤ID [CSCec14238](#)。

注意：只有註冊思科使用者才能訪問內部思科工具和資訊。

## 設定

本節提供用於設定本文件中所述功能的資訊。

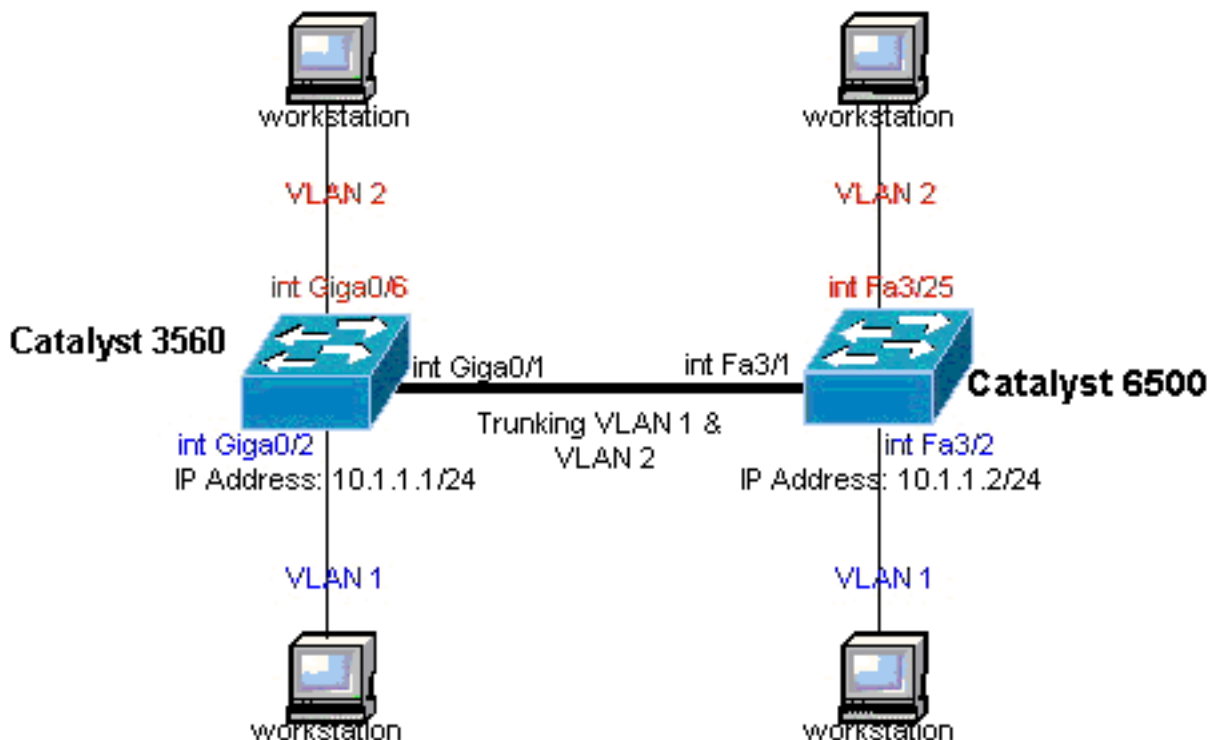
注意：使用命令查詢工具可獲取本節中使用的命令的詳細資訊。

注意：只有註冊思科使用者才能訪問內部思科工具和資訊。

## 網路圖表

本檔案會使用以下網路設定：

註:Catalyst 3560上的Gigabit乙太網路介面是10/100/1000 Mbps交涉乙太網路介面。因此，在此網路圖中，Catalyst 3560上的Gigabit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

本檔案會使用以下設定：

- [Catalyst 3560交換器](#)
- [Catalyst 6500交換器](#)

### Catalyst 3560交換器

```
!--- 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
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 !--- Confi
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 se
! line con 0 transport input none line vty 0 4 !--- This is the privileged mode password for the exampl
password mysecret login line vty 5 15 login ! end

```

## Catalyst 6500交換器

```

!--- 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-encrypti
hostname Cat6500 ! vtp mode transparent ip subnet-zero ! ! mls flow ip destination mls flow ipx destina
!--- This is the privileged mode password for the example. enable password mysecret ! redundancy mode r
plus main-cpu auto-sync running-config auto-sync standard ! ! !--- This enables VLAN 2. vlan 2 ! ! inte
GigabitEthernet1/1 no ip address shutdown ! interface GigabitEthernet1/2 no ip address shutdown ! !---
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.
!--- For more details, refer to Configuring Layer 2 Ethernet Interfaces
!--- for the Catalyst 4500 series switch that runs Cisco IOS Software. 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 encapsulat
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.
!--- For more details, 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. 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.
!--- For more details, 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. 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 ht
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

```

**註：**如果將介面分配給不存在的VLAN，則該介面將關閉，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。

輸出直譯器工具(OIT)支援 `show` 指令。使用OIT檢視分析 `show` 命令輸出。

**注意：**只有註冊思科使用者才能訪問內部思科工具和資訊。

在Catalyst 3550/3560/3750/6500/4500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`

## 樣本 `show` 命令輸出

### Catalyst 3560交換器

- `show interfaces interface_type module/port trunk` — 此命令顯示介面的TRUNK組態以及流量能夠通過TRUNK傳輸的VLAN編號。

```
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。在顯示中，檢查Operational Mode和Operational Trunk Encapsulation欄位。

```

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** — 此命令會提供有關VLAN以及屬於特定VLAN的連線埠的資訊。

```

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訪問埠。但設定為中繼且處於「notconnected」狀態的連線埠也會顯示在show vlan 輸出中。

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

```

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/porttrunk** — 此命令顯示介面的TRUNK組態以及流量能夠通過TRUNK傳輸的VLAN編號。

```
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/portswitchport** — 此命令顯示介面的交換機埠配置。在顯示中，檢查Operational Mode和Operational Trunk Encapsulation欄位。

```
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** — 此命令會提供有關VLAN以及屬於特定VLAN的連線埠的資訊。

```
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

```

!--- Output suppressed.

註：顯示的埠只是已配置為第2層非中繼（訪問）埠的那些埠。設定為中繼且處於「notconnected」狀態的連線埠也會顯示在show vlan 輸出中。有關詳細資訊，請參閱[為第2層交換配置LAN埠中的為第2層交換配置LAN介面](#)。

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

```

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**

```

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

```

## 疑難排解

目前尚無適用於此組態的具體疑難排解資訊。有關中繼和802.1Q配置的常見問題，請參閱[使用802.1Q封裝和Cisco CatOS系統軟體的Catalyst 4500/4000、5500/5000和6500/6000系列交換機之間的中繼](#)文檔的[常見錯誤](#)部分。

## 相關資訊

- [使用 PortFast 和其他命令修復工作站啟動連線延遲](#)
- [Catalyst 3560系列交換器設定指南](#)
- [Catalyst 4500系列交換器設定指南](#)
- [Catalyst 6500系列交換器設定指南](#)
- [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）。