

配置在Catalyst L2固定配置交换机和路由器 (InterVLAN路由)之间的EtherChannel和802.1q Trunking

目录

[简介](#)

[先决条件](#)

[要求](#)

[使用的组件](#)

[规则](#)

[背景理论](#)

[配置](#)

[网络图](#)

[配置](#)

[验证](#)

[Catalyst 2950 show 命令](#)

[Cisco 7200 路由器 show 命令](#)

[故障排除](#)

[相关信息](#)

简介

本文档提供了 Cisco Catalyst 第 2 层 (L2) 固定配置交换机和 Cisco 路由器之间的快速以太通道 (FEC) 和 IEEE 802.1Q 中继的配置示例。Catalyst L2 固定配置交换机包括 2900/3500XL、2940、2950/2955 和 2970 交换机。本文档使用的是 Cisco 7200 路由器，但是您可以使用支持 EtherChannel 和 802.1Q 中继的其他路由器取得同样结果。本文档的[要求部分](#)提供支持 EtherChannel 和 802.1Q 中继的路由器列表。

先决条件

要求

尝试进行此配置之前，请注意以下要求：

- FEC 和 802.1Q 中继功能在运行 Cisco IOS® 软件 12.0(5.2)WC(1) 版及更新版本的 Catalyst L2 固定配置交换机上可用。由于硬件的限制，Catalyst 2940 和 2955/2950 交换机不支持交换机间链路协议 (ISL) 中继。
- Cisco 路由器支持 Cisco IOS 软件 12.0(T) 版及更新版本中的 EtherChannel 和 802.1Q 中继功能。但是，并非所有路由器都支持这两项功能。使用下表可以确定哪个路由器平台支持 FEC 以及 802.1Q 中继功能：¹对 EtherChannel 支持的一例外在 Cisco 2600、3600 及 3700 系列路由器

是，当您安装NM-16ESW或NM-36ESW以太网交换机网络模块时。每个模块最多支持六个 EtherChannel，每个 EtherChannel 捆绑中最多八个端口。²↑RSP =路由交换机处理器

使用的组件

此配置使用以下软件和硬件版本开发并测试：

- 运行 Cisco IOS 软件版本 12.1(9)EA1d 的 Catalyst 2950 交换机
- 运行 Cisco IOS 软件版本 12.2(3) 的 Cisco 7200 路由器。

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您使用的是真实网络，请确保您已经了解所有命令的潜在影响。

规则

有关文档规则的详细信息，请参阅 [Cisco 技术提示规则](#)。

背景理论

EtherChannel 通过将多个等速端口分配到同一个逻辑信道小组，在快速以太网(FE)和千兆以太网(GE)之间提供递增速度。EtherChannel 结合了速率高达 800 Mbps 的多个 FE 或速率高达 8 Gbps 的 GE。该组合提供交换机、路由器和服务器之间的容错、高速链路。中继是指在二个设备之间的点到点链路上传输来自多个 VLAN 的数据流。在交换机和路由器之间配置中继的目的是提供 VLAN 间通信。在园区网络中，将中继配置在 EtherChannel 链路上，以便在高带宽通道上传输多个 VLAN 信息。

配置

本部分提供有关如何配置本文档所述功能的信息。

有关本文档中所使用的命令的解释，请参阅以下文档：

- [配置 EtherChannel](#) (在 Catalyst 2950 上)
- 在 Catalyst 2950 上[配置 VLAN](#)的[配置 VLAN 中继部分](#)
- 在路由器上[配置 LAN 接口](#)的[配置快速以太通道](#)部分
- 路由器上的 [Cisco IOS IEEE 802.1Q 支持](#)

注意：在本文档中的 Catalyst 2950 交换机的命令和配置适用于运行 Cisco IOS 软件 12.1(6)EA2 版及更新版本的交换机。如果运行的是 Cisco IOS 软件 12.0(5.2)WC(1) 版，则需要为配置使用不同的命令。有关运行 Cisco IOS 软件 12.0(5.2)WC(1) 版的交换机的配置，请参阅以下文档：

- 在 Catalyst 2950 上[管理交换机](#)的[创建 EtherChannel 端口组](#)部分
- 在 Catalyst 2950 上[创建和维护 VLAN](#)的[VLAN 中继工作原理](#)部分

注意：要查找本文档所用命令的其他信息，请使用[命令查找工具](#)（[仅限注册用户](#)）。

网络图

本文档使用以下网络设置：

注意：本地 VLAN 是在 Catalyst 接口上配置中继之前配置在该接口上的 VLAN。默认情况下，所有

的接口位于 VLAN 1。因此，VLAN 1 是可更改的本地 VLAN。在 802.1Q 中继上，除本地 VLAN 以外的所有 VLAN 数据包都被标记。在中继的两边必须以同样的方式配置本地 VLAN。这样，路由器或交换机在接收到没有标记的帧时能够认定该帧属于哪个 VLAN。在此部分的图表中，VLAN 10 已配置为本地 VLAN。对于 VLAN 间路由，务必在连接到交换机的所有工作站上配置默认网关。此默认网关是您在子接口上配置的 IP 地址。您要在路由器上为每个 VLAN 创建子接口。在本示例中，工作站 1 用默认网关 10.10.10.1 配置。此网关是子接口端口信道 1.10 的 IP 地址。工作站 2 用默认网关 10.10.11.1 配置。此网关是子接口端口信道 1.20 的 IP 地址。

配置

本文档使用以下配置：

- [Catalyst 2950 交换机](#)
- [Cisco 7200 路由器](#)

Catalyst 2950 交换机

```
Cat2950#
Cat2950# configure terminal Enter configuration
commands, one per line. End with CNTL/Z. !--- Set the
VLAN Trunk Protocol (VTP) mode to server, !--- and set
the VTP domain name to cisco. Cat2950(config)# vtp mode
server Setting device to VTP SERVER mode
Cat2950(config)# vtp domain cisco Changing VTP domain
name from VitalCom to cisco !--- Create two VLANs: VLAN
10 and VLAN 20. Cat2950(config)# vlan 10 Cat2950(config-
vlan)# exit Cat2950(config)# vlan 20 Cat2950(config-
vlan)# exit !--- Configure ports Fa0/5 through Fa0/14 in
VLAN 10, !--- and configure ports Fa0/15 through Fa0/26
in VLAN 20. Cat2950(config)# interface range fa0/5 - 14
Cat2950(config-if-range)# switchport access vlan 10
Cat2950(config-if-range)# exit Cat2950(config)#
interface range fa0/15 - 26 Cat2950(config-if-range)#
switchport access vlan 20 Cat2950(config-if-range)# ^Z
Cat2950# 00:32:39: %SYS-5-CONFIG I: Configured from
console by console !--- Configure the management
interface so that you can access !--- the switch
remotely with Telnet. Cat2950# configure terminal
Cat2950(config)# interface vlan 10 Cat2950(config-if)#
ip address 10.10.10.10 255.255.255.0 Cat2950(config-if)#
no shutdown 00:24:07: %LINK-3-UPDOWN: Interface Vlan10,
changed state to up Cat2950(config-if)# ^Z 00:24:12:
%SYS-5-CONFIG I: Configured from console by console
Cat2950# configure terminal Enter configuration
commands, one per line. End with CNTL/Z. !--- Configure
the default gateway so that you can access !--- the
switch from any VLAN. The default gateway is !--- the IP
address of the subinterface on the router for VLAN 10.
Cat2950(config)# ip default-gateway 10.10.10.1 !---
Configure a logical channel interface. Cat2950(config)#
interface port-channel 1 Cat2950(config-if)# exit !---
Assign ports to the logical channel interface in order
to form !--- an EtherChannel. !--- Note: Set the channel
mode on the switch to on because the Cisco 7200 !---
router on the other end does not support Port
Aggregation Protocol (PAgP). Cat2950(config)# interface
fa0/2 Cat2950(config-if)# channel-group 1 mode on
Cat2950(config-if)# exit Cat2950(config)# 00:25:38:
%LINK-3-UPDOWN: Interface Port-channel1, changed state
to up 00:25:39: %LINEPROTO-5-UPDOWN: Line protocol on
```

```
Interface Port-channell, changed state to up
Cat2950(config)# interface fa0/3 Cat2950(config-if)#
channel-group 1 mode on Cat2950(config-if)# exit !--- In
order to configure trunking over EtherChannel, enable
trunking !--- over the logical channel interface.
Cat2950(config)# interface port-channel 1
Cat2950(config-if)# switchport mode trunk
Cat2950(config-if)# 00:27:14: %LINEPROTO-5-UPDOWN: Line
protocol on Interface FastEthernet0/2, changed state to
down 00:27:14: %LINEPROTO-5-UPDOWN: Line protocol on
Interface FastEthernet0/3, changed state to down
00:27:14: %LINEPROTO-5-UPDOWN: Line protocol on
Interface Port-channell, changed state to down 00:27:17:
%LINEPROTO-5-UPDOWN: Line protocol on Interface
FastEthernet0/2, changed state to up 00:27:17:
%LINEPROTO-5-UPDOWN: Line protocol on Interface
FastEthernet0/3, changed state to up 00:27:18: %LINK-3-
UPDOWN: Interface Port-channell, changed state to up
00:27:19: %LINEPROTO-5-UPDOWN: Line protocol on
Interface Port-channell, changed state to up !---
Configure VLAN 10 as the native VLAN for untagged
traffic. Cat2950(config-if)# switchport trunk native
vlan 10 Cat2950(config-if)# ^Z 00:24:12: %SYS-5-
CONFIG I: Configured from console by console Cat2950#
```

```
Cat2950# show running-config Building configuration...
Current configuration : 2390 bytes ! version 12.1 no
service pad service timestamps debug uptime service
timestamps log uptime no service password-encryption !
hostname Cat2950 ! ! ip subnet-zero vtp domain VitalCom
vtp mode transparent ! vlan 10 ! vlan 20 ! spanning-tree
extend system-id ! ! interface Port-channell switchport
trunk native vlan 10 switchport mode trunk no ip address
flowcontrol send off ! interface FastEthernet0/1 no ip
address ! interface FastEthernet0/2 switchport trunk
native vlan 10 switchport mode trunk no ip address
channel-group 1 mode on ! interface FastEthernet0/3
switchport trunk native vlan 10 switchport mode trunk no
ip address channel-group 1 mode on ! interface
FastEthernet0/4 no ip address ! interface
FastEthernet0/5 switchport access vlan 10 no ip address
! !--- Output suppressed. ! interface FastEthernet0/15
switchport access vlan 20 no ip address ! !--- Output
suppressed. interface FastEthernet0/26 switchport access
vlan 20 no ip address ! interface Vlan10 ip address
10.10.10.10 255.255.255.0 no ip route-cache ! ip
default-gateway 10.10.10.1 ip http server ! ! line con 0
line vty 5 15 ! end Cat2950#
```

Cisco 7200 路由器

```
Cisco7200#
Cisco7200# configure terminal Enter configuration
commands, one per line. End with CNTL/Z. !--- Create a
logical channel interface in order to form an
EtherChannel. Cisco7200(config)# interface port-channel
1 Cisco7200(config-if)# exit !--- Configure the ports
Fa3/0 and Fa4/0 as members of the !--- logical channel
in order to form an EtherChannel group.
Cisco7200(config)# interface fa3/0 Cisco7200(config-if)#
channel-group 1 FastEthernet3/0 added as member-1 to
port-channell Cisco7200(config-if)# exit
Cisco7200(config)# 00:25:06: %LINEPROTO-5-UPDOWN: Line
protocol on Interface Port-channell, changed state to up
Cisco7200(config)# interface fa4/0 Cisco7200(config-if)#
channel-group 1 FastEthernet4/0 added as member-2 to
```

```

port-channel1 Cisco7200(config-if)# exit !--- Configure
subinterfaces over port channel for VLAN 10 and VLAN 20
!--- in order to configure trunking over EtherChannel.
Assign the IP address !--- to interVLAN routing.
Configure VLAN 10 as the native VLAN !--- for untagged
traffic. Cisco7200(config)# interface port-channel 1.10
Cisco7200(config-subif)# encapsulation dot1Q 10 native
Cisco7200(config-subif)# ip address 10.10.10.1
255.255.255.0 Cisco7200(config-subif)# exit
Cisco7200(config)# interface port-channel 1.20
Cisco7200(config-subif)# encapsulation dot1Q 20
Cisco7200(config-subif)# ip address 10.10.11.1
255.255.255.0 Cisco7200(config-subif)# exit
Cisco7200(config)# exit Cisco7200#

Cisco7200# show running-config Building configuration...
Current configuration : 987 bytes ! version 12.2 service
timestamps debug uptime service timestamps log uptime no
service password-encryption ! hostname Cisco7200 !! ip
subnet-zero !!! call rsvp-sync !! interface Port-
channel1 no ip address hold-queue 150 in ! interface
Port-channel1.10 encapsulation dot1Q 10 native ip
address 10.10.10.1 255.255.255.0 ! interface Port-
channel1.20 encapsulation dot1Q 20 ip address 10.10.11.1
255.255.255.0 ! !--- Output suppressed. ! interface
FastEthernet3/0 no ip address channel-group 1 !
interface FastEthernet4/0 no ip address channel-group 1
! ip classless no ip http server !!! gatekeeper
shutdown !! line con 0 line aux 0 line vty 5 15 ! end

```

验证

本部分提供可用于确认您的配置是否正常运行的信息。

[命令输出解释程序工具](#) ([仅限注册用户](#)) 支持某些 **show** 命令，使用此工具可以查看对 **show** 命令输出的分析。

Catalyst 2950 show 命令

- **show etherchannel**
- **show interfaces interface-id switchport**
- **show interfaces interface-id** 中继

show etherchannel

show etherchannel 命令显示 EtherChannel 信息。此命令还显示负载均衡或帧分配方案、端口和端口信道信息。命令语法为：

```
show etherchannel [channel-group-number] {brief | detail | load-balance | port | port-channel |
summary}
```

注意： 此命令应该在一行上。

```

Cat2950# show etherchannel 1 detail Group state = L2 Ports: 2 Maxports = 8 Port-channels: 1 Max
Port-channels = 1 Ports in the group: ----- Port: Fa0/2 ----- Port state =
Up Mstr In-Bndl Channel group = 1 Mode = On/FEC Gchange = 0 Port-channel = Po1 GC = 0x00010001
Pseudo port-channel = Po1 Port index = 0 Load = 0x00 Age of the port in the current state:
00d:17h:51m:49s Port: Fa0/3 ----- Port state = Up Mstr In-Bndl Channel group = 1 Mode =
On/FEC Gchange = 0 Port-channel = Po1 GC = 0x00010001 Pseudo port-channel = Po1 Port index = 0

```

```
Load = 0x00 Age of the port in the current state: 00d:17h:51m:49s Port-channels in the group: --
----- Port-channel: Po1 ----- Age of the Port-channel = 00d:17h:54m:02s
Logical slot/port = 1/0 Number of ports = 2 GC = 0x00010001 HotStandBy port = null Port state =
Port-channel Ag-Inuse Ports in the Port-channel: Index Load Port EC state -----+-----+-----+
----- 0 00 Fa0/2 on 0 00 Fa0/3 on Time since last port bundled: 00d:17h:51m:50s Fa0/3 Time
since last port Un-bundled: 00d:17h:51m:53s Fa0/3 Cat2950#
```

show interfaces interface-id switchport

show interfaces interface-id switchport 命令在输出的管理模式和管理中继封装字段显示交换端口配置。

```
Cat2950# show interfaces port-channel 1 switchport Name: Po1 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: 10 (VLAN0010) Trunking VLANs Enabled: ALL Pruning VLANs Enabled: 2-1001
Protected: false Voice VLAN: none (Inactive) Appliance trust: none Cat2950#
```

show interfaces interface-id 中继

show interfaces interface-id trunk 命令显示接口的中继配置。

```
Cat2950# show interfaces port-channel 1 trunk Port Mode Encapsulation Status Native vlan Po1 on
802.1q trunking 10 Port Vlans allowed on trunk Po1 1-4094 Port Vlans allowed and active in
management domain Po1 1,10,20 Port Vlans in spanning tree forwarding state and not pruned Po1
1,10,20 Cat2950#
```

[Cisco 7200 路由器 show 命令](#)

- **show interfaces port-channel channel-number**
- **show interfaces interface.subinterface**

show interfaces port-channel channel-number

您可以使用 **show interfaces port-channel channel-number** 命令来验证端口信道接口和信道成员端口。

```
Cisco7200# show interfaces port-channel 1 Port-channell is up, line protocol is up Hardware is
FEChannel, address is 00d0.63b2.8854 (bia 0000.0000.0000) MTU 1500 bytes, BW 200000 Kbit, DLY
100 usec, reliability 255/255, txload 1/255, rxload 1/255 Encapsulation 802.1Q Virtual LAN, Vlan
ID 1., loopback not set Keepalive set (10 sec) ARP type: ARPA, ARP Timeout 04:00:00 No. of
active members in this channel: 2 Member 0 : FastEthernet3/0 , Unknown duplex, 100Mb/s Member 1
: FastEthernet4/0 , Unknown duplex, 100Mb/s Last input 00:00:00, output never, output hang never
Last clearing of "show interface" counters never Queueing strategy: fifo Output queue 0/80, 0
drops; input queue 0/150, 0 drops 5 minute input rate 0 bits/sec, 1 packets/sec 5 minute output
rate 0 bits/sec, 0 packets/sec 79434 packets input, 6020431 bytes Received 2099 broadcasts, 0
runt, 0 giants, 0 throttles 0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored 0 watchdog 0
input packets with dribble condition detected 1137 packets output, 359153 bytes, 0
underruns(0/0/0) 6 output errors, 0 collisions, 6 interface resets 0 babbles, 0 late collision,
0 deferred 0 lost carrier, 0 no carrier 0 output buffer failures, 0 output buffers swapped out
Cisco7200#
```

show interfaces interface.subinterface

您可以使用 **show interfaces interface.subinterface** 命令来验证中继配置。

```
Cisco7200# show interfaces port-channel 1.10 Port-channell.10 is up, line protocol is up
Hardware is FEChannel, address is 00d0.63b2.8854 (bia 0000.0000.0000) Internet address is
10.10.10.1/24 MTU 1500 bytes, BW 200000 Kbit, DLY 100 usec, reliability 255/255, txload 1/255,
rxload 1/255 Encapsulation 802.1Q Virtual LAN, Vlan ID 10. ARP type: ARPA, ARP Timeout 04:00:00
Cisco7200# Cisco7200# show interfaces port-channel 1.20 Port-channell.20 is up, line protocol is
up Hardware is FEChannel, address is 00d0.63b2.8854 (bia 0000.0000.0000) Internet address is
10.10.11.1/24 MTU 1500 bytes, BW 200000 Kbit, DLY 100 usec, reliability 255/255, txload 1/255,
```

rxload 1/255 Encapsulation 802.1Q Virtual LAN, Vlan ID 20. ARP type: ARPA, ARP Timeout 04:00:00
Cisco7200#

[故障排除](#)

目前没有针对此配置的故障排除信息。

[相关信息](#)

- [LAN 产品支持页](#)
- [LAN 交换技术支持页](#)
- [技术支持和文档 - Cisco Systems](#)