

# EtherChannel e entroncamento entre os Switches de Camada 2 Catalyst e o Exemplo de Configuração dos Switches 2948G-L3/4908G-L3

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## [Introduction](#)

Este documento descreve a instalação de um EtherChannel e de um entroncamento 802.1Q entre os switches Catalyst 2950 e Catalyst 2948G-L3. O EtherChannel pode ser chamado de Fast EtherChannel (FEC) ou Gigabit EtherChannel (GEC), dependendo da velocidade das interfaces e portas usadas para criá-lo.

**Observação:** o switch Catalyst 2950 suporta somente truncamento 802.1Q e não suporta entroncamento ISL (Inter-Switch Link Protocol). Os switches Catalyst 2948G-L3 e Catalyst 4908G-L3 compartilham a mesma imagem de software, de modo que a configuração do Catalyst 2948G-L3 usada neste documento também se aplica ao switch Catalyst 4908G-L3.

Neste exemplo de configuração, duas interfaces Fast Ethernet em um switch Catalyst 2950 são agrupadas em uma FEC com duas interfaces Fast Ethernet de um switch Catalyst 2948G-L3. FEC, GEC, canal de porta e grupo de canais se refere ao EtherChannel neste documento.

## [Antes de Começar](#)

### [Conventions](#)

Para obter mais informações sobre convenções de documento, consulte as [Convenções de dicas técnicas Cisco](#).

## [Prerequisites](#)

Este documento descreve a configuração de exemplo dos switches e a saída dos comandos **show** relacionados. Para obter detalhes e advertências ou diretrizes específicas sobre switches individuais, consulte os seguintes documentos:

- Switch Catalyst 2950 Configurando EtherChannel
- Switch Catalyst 2950 configurando troncos de VLAN
- [Switch Catalyst 2948G-L3 Configurando EtherChannel](#)
- [Switch Catalyst 2948G-L3 Configurando o encapsulamento de VLAN](#)

## [Componentes Utilizados](#)

As informações neste documento são baseadas nas versões de software e hardware abaixo.

- Switch Catalyst 2948G-L3 executando Cisco IOS® Software 12.0(14)W5(20)
- Switch Catalyst 2950 executando Cisco IOS Software 12.1(12c)EA1

As informações neste documento foram criadas a partir de dispositivos em um ambiente de laboratório específico. All of the devices used in this document started with a cleared (default) configuration. Se você estiver trabalhando em uma rede ativa, certifique-se de que entende o impacto potencial de qualquer comando antes de utilizá-lo.

## [Material de Suporte](#)

Do ponto de vista da configuração, o switch Catalyst 2948G-L3 é um roteador. Ele usa uma linha de comando do Cisco IOS e, por padrão, todas as interfaces são interfaces roteadas.

O switch Catalyst 2948G-L3 não estende suas VLANs por padrão. Como todas as interfaces são interfaces roteadas, cada interface deve pertencer a uma rede ou sub-rede diferente. Se você deseja que duas ou mais interfaces pertençam à mesma sub-rede, o bridging precisa ser configurado nessas interfaces.

O switch Catalyst 2948G-L3 não suporta protocolos de negociação encontrados em outros switches Catalyst, como o VLAN Trunk Protocol (VTP), Dynamic Trunking Protocol (DTP) e Port Aggression Protocol (PAgP). Recomenda-se que esses protocolos sejam desligados nas interfaces do Catalyst 2950 que se conectam ao switch Catalyst 2948G-L3.

No switch Catalyst 2948G-L3, todo o tráfego recebido na VLAN nativa em um tronco é roteado no software. Isso significa que esse tráfego é enviado à CPU. Quando uma grande quantidade de tráfego é enviada nesta VLAN, ela pode resultar em uma alta carga de CPU no switch Catalyst 2948G-L3 e ter um efeito adverso no desempenho da rede. Recomenda-se criar uma VLAN fictícia (como a VLAN 99) que possa se tornar a VLAN nativa do tronco. Todo o tráfego do usuário é enviado sobre as outras VLANs e são roteados em hardware, o que leva a um melhor desempenho.

## [Configurar](#)

Nesta seção, você encontrará informações para configurar os recursos descritos neste documento.

**Observação:** para encontrar informações adicionais sobre os comandos usados neste documento, use a [ferramenta Command Lookup Tool](#) (somente clientes [registrados](#)).

## [Criando um canal de portas](#)

Ao configurar o EtherChannel, é recomendável criar um canal de porta seguindo as etapas abaixo. Isso evitará possíveis problemas com o Spanning-Tree Protocol (STP) durante o processo de configuração. Um loop STP pode ocorrer se um lado estiver configurado como um canal antes que o outro lado esteja configurado como um canal. Como resultado, o switch pode colocar as interfaces envolvidas no loop no status `Errordisabled`. As etapas a seguir são diretrizes para este cenário de configuração específico.

No switch Catalyst 2948G-L3:

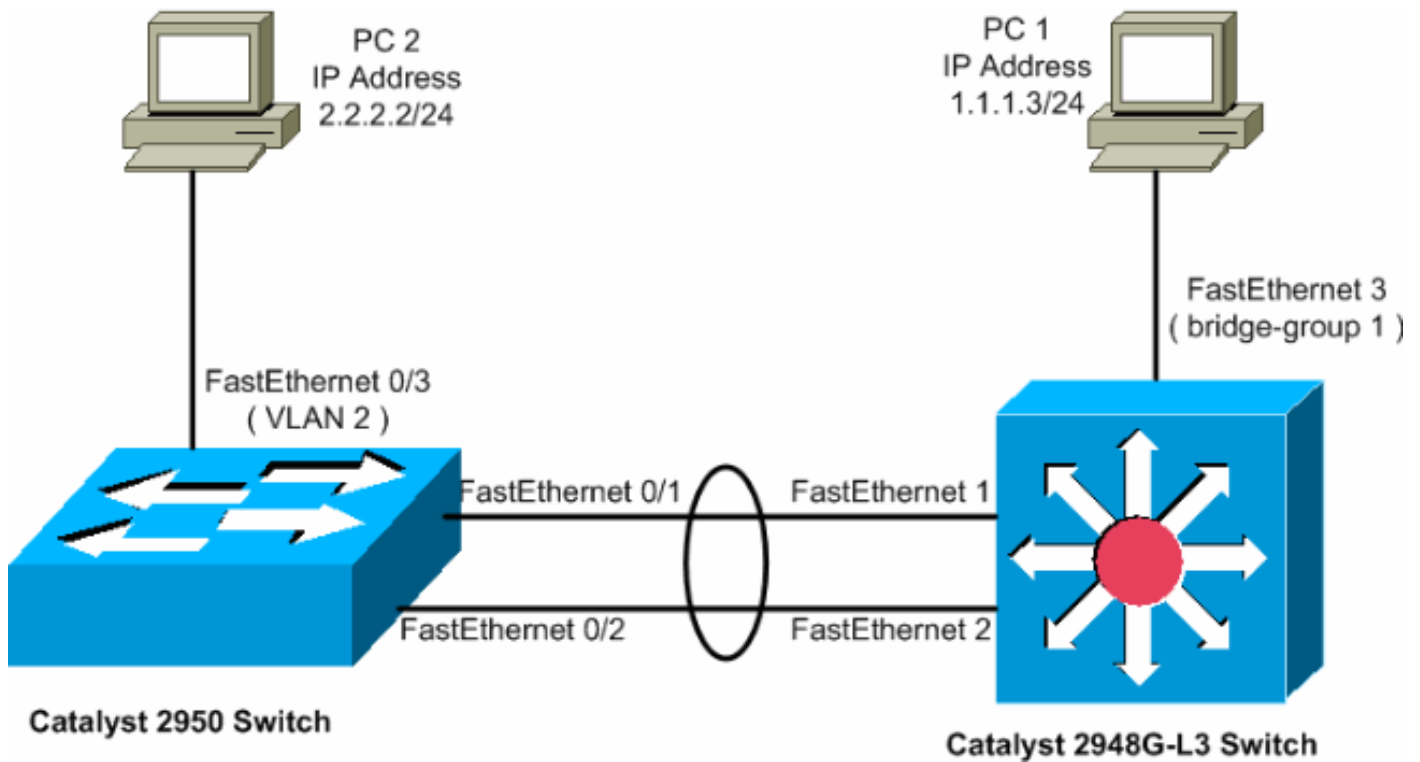
1. Configure as interfaces a serem usadas na canalização de portas no modo `desligado` administrativamente.
2. Crie o canal da porta (grupo de canais). O canal de porta transporta VLANs diferentes, portanto, crie uma subinterface para cada VLAN presente no tronco. Em um tronco 802.1Q, todos os pacotes que passam pelo tronco são marcados, exceto o tráfego na VLAN nativa. Por causa disso, você precisa distinguir a subinterface correspondente à VLAN nativa colocando a palavra-chave "nativa" no final. Como mencionado anteriormente, é melhor usar uma VLAN fictícia que não tenha tráfego de usuário.
3. O switch Catalyst 2948G-L3 tem, por padrão, todas as portas roteadas. Para que as portas em 2948G-L3 possam se comunicar em diferentes VLANs no 2950, é necessário implementar o bridging. As interfaces (e subinterfaces) que pertencem à mesma VLAN (rede ou sub-rede) devem ser configuradas para pertencer ao mesmo grupo de bridge. Para rotear entre esses diferentes grupos de bridge, o Integrated Routing and Bridging (IRB) deve estar ativado.

No switch Catalyst 2950:

1. Configure as interfaces que pertencerão ao canal como um tronco e verifique se o DTP está desligado. Isso é feito emitindo o comando **`switchport nonegotiate`** nas interfaces físicas. Configure uma VLAN fictícia (VLAN 99 neste exemplo) no banco de dados de VLAN que será usado como a VLAN nativa no tronco. A menos que especificado de outra forma, a VLAN nativa em um tronco 802.1Q é a VLAN 1. Você precisa especificar em ambas as interfaces que está usando a VLAN 99 como a VLAN nativa. Isso é feito emitindo o comando **`switchport trunk native vlan 99`**.
2. Crie o canal de porta e certifique-se de definir o modo de canal como `ligado` (isso desliga o PAgP).
3. Reative as interfaces que foram desativadas anteriormente no switch Catalyst 2948G-L3 emitindo o comando **`no shut`**.

## [Diagrama de Rede](#)

Este documento utiliza a instalação de rede mostrada no diagrama abaixo.



## Configurações

Este documento utiliza as configurações mostradas abaixo.

- [Catalyst 2948G-L3](#)
- [Catalyst 2950](#)

### Catalyst 2948G-L3

```
2948G-L3#show run
```

```
!--- The following configuration shows how to configure
Catalyst 2948G-L3 !--- for bridging and connect to a
Catalyst 2950 with 802.1Q trunking !--- over
EtherChannel. For configuring interVLAN-routing on
Catalyst !--- 2948G-L3, refer to Catalyst 2948G-L3
Sample Configurations. Building configuration... Current
configuration: !! version 12.0 no service pad service
timestamps debug uptime service timestamps log datetime
no service password-encryption ! hostname 2948G-L3 !!
ip subnet-zero ! !--- Enable IRB when routing between
different !--- bridge groups is needed. bridge irb ! !--
- Configure a logical interface for the EtherChannel.
interface Port-channel1 no ip address no ip directed-
broadcast hold-queue 300 in ! !--- Create a subinterface
for each VLAN on the port channel. ! interface Port-
channel1.1 !--- Specify the encapsulation and VLAN
number. encapsulation dot1Q 1 no ip redirects no ip
directed-broadcast !--- Add the subinterface to the
appropriate bridge group. !--- All the interfaces (and
subinterfaces) that belong to the !--- same VLAN
(network or subnet) should be configured to fall !--- in
the same bridge group. bridge-group 1 ! !--- Configure a
subinterface for the second VLAN. !--- This procedure
must be repeated for every VLAN. ! interface Port-
channel1.2 encapsulation dot1Q 2 no ip redirects no ip
```

```

directed-broadcast bridge-group 2 ! !--- Configure a
subinterface for the native VLAN. ! interface Port-
channell1.99 encapsulation dot1Q 99 native no ip
redirects no ip directed-broadcast !--- Note in this
case you do not put any bridge group !--- statements
under this subinterface. A dummy VLAN has been chosen !-
-- as the native VLAN on which you do not put any
traffic, !--- so there is no need to have this routed. !
interface FastEthernet1 no ip address no ip directed-
broadcast !--- Configure the port to channel 1. channel-
group 1 ! interface FastEthernet2 no ip address no ip
directed-broadcast !--- Configure the port to channel 1.
channel-group 1 ! interface FastEthernet3 no ip address
no ip directed-broadcast !--- The device connected on
this interface belongs !--- to the same subnet (VLAN 1)
as subinterface 1 on !--- the port channel, so this
interface has to be added to !--- bridge-group 1.
bridge-group 1 ! !--- If there are any other interfaces
that belong to !--- the same VLAN (subnet), they all
have to be added to !--- the respective bridge group. (
.... Output is suppressed) ! ! ! a routed interface for
bridge-group 1 interface BVI1 ip address 1.1.1.1
255.255.255.0 no ip directed-broadcast no ip route-cache
cef ! ! a routed interface for bridge-group 2 interface
BVI2 ip address 2.2.2.1 255.255.255.0 no ip directed-
broadcast no ip route-cache cef ! ip classless ! !
bridge 1 protocol ieee command enables bridging using
the IEEE 802.1d spanning-tree bridge 1 protocol ieee !
The bridge 1 route ip command specifies that IP will be
routed bridge 1 route ip ! bridge 2 protocol ieee
command enables bridging using the IEEE 802.1d spanning-
tree bridge 2 protocol ieee ! bridge 2 route ip command
specifies that IP will be routed bridge 2 route ip !
line con 0 transport input none line aux 0 line vty 0 4
login ! end

```

## Catalyst 2950

```

5-2950-24##show run
Building configuration...

Current configuration : 1986 bytes
!
version 12.1
no service single-slot-reload-enable
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname 5-2950-24#
!
!
!
!--- VLAN 2 is created for this lab set up, !--- and
VLAN 1 is created by default. vlan 2 ip subnet-zero !---
For information on VTP, refer to !--- Understanding and
Configuring VLAN Trunk Protocol (VTP) vtp domain cisco
vtp mode transparent ! spanning-tree extend system-id !
!--- A logical port-channel interface is automatically
created !--- when ports are grouped into a channel
group. ! interface Port-channell1 !--- The switchport
trunk native vlan 99 command is !--- issued on the Fast

```

```

Ethernet interface.

switchport trunk native vlan 99
!--- The switchport mode trunk command is !--- issued on
the Fast Ethernet interface.

switchport mode trunk
!-- The switchport nonegotiate command is !--- issued on
the Fast Ethernet interface.

switchport nonegotiate
no ip address
flowcontrol send off
!
interface FastEthernet0/1
!--- Configure the port to be in trunking mode.
switchport mode trunk !--- Configure a dummy VLAN as the
native VLAN. !--- For this example, VLAN 99 is used.
switchport trunk native vlan 99 !--- Disable the DTP
negotiation on this interface !--- (the Catalyst 2948G-
L3 switch does not support these frames). switchport
nonegotiate no ip address !--- Configure the port to
channel without PAgP. channel-group 1 mode on !
interface FastEthernet0/2 !--- Configure the port to be
in trunking mode. switchport mode trunk !--- Configure a
dummy VLAN as the native VLAN. !--- For this example,
VLAN 99 is used. switchport trunk native vlan 99 !---
Disable the DTP negotiation on this interface !--- (the
Catalyst 2948G-L3 switch does not support these frames).
switchport nonegotiate no ip address !--- Configure the
port to channel without PAgP. channel-group 1 mode on !
interface FastEthernet0/3 !--- The PC2 on this interface
belongs to VLAN 2. switchport access vlan 2 switchport
mode access no ip address !--- On the userports, enable
portfast to increase !--- the STP convergence time.
spanning-tree portfast ! ( .... Output is suppressed) !
interface Vlan1 ip address 1.1.1.2 255.255.255.0 no ip
route-cache ! ip http server !! line con 0 line vty 5
15 ! end

```

## Verificar

Esta seção fornece informações que você pode usar para confirmar se suas configurações estão funcionando corretamente.

A [Output Interpreter Tool \(somente clientes registrados\)](#) oferece suporte a determinados comandos show, o que permite exibir uma análise da saída do comando show.

## Comandos show para o Catalyst 2950

Os seguintes comandos **show** verificam a configuração para o switch Catalyst 2950, como mostrado na saída abaixo.

```
5-2950-24##show vlan
```

| VLAN Name | Status | Ports                      |
|-----------|--------|----------------------------|
| 1 default | active | Fa0/4, Fa0/5, Fa0/6, Fa0/7 |

Fa0/8, Fa0/9, Fa0/10, Fa0/11  
 Fa0/12, Fa0/13, Fa0/14, Fa0/15  
 Fa0/16, Fa0/17, Fa0/18, Fa0/19  
 Fa0/20, Fa0/21, Fa0/22, Fa0/23  
 Fa0/24, Gi0/1, Gi0/2  
 Fa0/3

2 VLAN0002 active  
 1002 fddi-default active  
 1003 token-ring-default active  
 1004 fddinet-default active  
 1005 trnet-default active

| VLAN | Type  | SAID   | MTU  | Parent | RingNo | BridgeNo | Stp  | BrdgMode | Trans1 | Trans2 |
|------|-------|--------|------|--------|--------|----------|------|----------|--------|--------|
| 1    | enet  | 100001 | 1500 | -      | -      | -        | -    | -        | 0      | 0      |
| 2    | enet  | 100002 | 1500 | -      | -      | -        | -    | -        | 0      | 0      |
| 1002 | fddi  | 101002 | 1500 | -      | -      | -        | -    | -        | 0      | 0      |
| 1003 | tr    | 101003 | 1500 | -      | -      | -        | -    | -        | 0      | 0      |
| 1004 | fdnet | 101004 | 1500 | -      | -      | -        | ieee | -        | 0      | 0      |
| 1005 | trnet | 101005 | 1500 | -      | -      | -        | ibm  | -        | 0      | 0      |

Remote SPAN VLANs

Primary Secondary Type Ports

5-2950-24##show interfaces port-channel 1 trunk

Port Mode Encapsulation Status Native vlan  
 Po1 on 802.1q trunking 99

Port Vlans allowed on trunk  
 Po1 1-4094

Port Vlans allowed and active in management domain  
 Po1 1-2

Port Vlans in spanning tree forwarding state and not pruned  
 Po1 1-2

5-2950-24##show interface port-channel 1

Port-channell is up, line protocol is up  
 Hardware is EtherChannel, address is 0005.7428.0e02 (bia 0005.7428.0e02)  
 MTU 1500 bytes, BW 200000 Kbit, DLY 1000 usec,  
 reliability 255/255, txload 1/255, rxload 1/255  
 Encapsulation ARPA, loopback not set  
 Full-duplex, 100Mb/s  
 input flow-control is off, output flow-control is off  
 Members in this channel: Fa0/1 Fa0/2  
 ARP type: ARPA, ARP Timeout 04:00:00  
 Last input 00:00:01, output 00:00:00, output hang never  
 Last clearing of "show interface" counters never  
 Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0  
 Queueing strategy: fifo  
 Output queue :0/40 (size/max)  
 5 minute input rate 25000 bits/sec, 39 packets/sec  
 5 minute output rate 39000 bits/sec, 59 packets/sec  
 11609 packets input, 955786 bytes, 0 no buffer  
 Received 11590 broadcasts, 0 runts, 0 giants, 0 throttles  
 0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored  
 0 watchdog, 11583 multicast, 0 pause input

```
0 input packets with dribble condition detected
17396 packets output, 1442093 bytes, 0 underruns
0 output errors, 0 collisions, 1 interface resets
0 babbles, 0 late collision, 0 deferred
0 lost carrier, 0 no carrier, 0 PAUSE output
0 output buffer failures, 0 output buffers swapped out
```

5-2950-24##**show interface 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: Off
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 99 (Inactive)
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Operational private-vlan: none
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001
```

Protected: false

Voice VLAN: none (Inactive)

Appliance trust: none

5-2950-24##**show cdp neighbors**

```
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater
```

| Device ID  | Local Intrfce | Holdtme | Capability | Platform | Port ID      |
|------------|---------------|---------|------------|----------|--------------|
| 5-2948G-L3 | Fas 0/1       | 144     | R T        | Cat2948G | Port-channel |
| 5-2948G-L3 | Fas 0/2       | 178     | R T        | Cat2948G | Fas 2        |
| 5-2948G-L3 | Fas 0/1       | 178     | R T        | Cat2948G | Fas 1        |

PC2#**ping 1.1.1.3**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 1.1.1.3, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/4 ms

## [Comandos show para o Catalyst 2948G-L3](#)

Os seguintes comandos **show** verificam a configuração para o switch Catalyst 2948-L3, como mostrado na saída abaixo.

5-2948G-L3#**show interfaces port-channel 1**

```
Port-channel1 is up, line protocol is up
  Hardware is FEChannel, address is 0001.43ff.1407 (bia 0000.0000.0000)
  MTU 1500 bytes, BW 200000 Kbit, DLY 100 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive set (10 sec)
  Half-duplex, Unknown Speed, Media type unknown
  ARP type: ARPA, ARP Timeout 04:00:00
```



No. of active members in this channel: 2  
Member 0 : FastEthernet1  
Member 1 : FastEthernet2  
Last input 00:00:00, output 00:00:00, output hang never  
Last clearing of "show interface" counters never  
Queueing strategy: fifo  
Output queue 0/40, 0 drops; input queue 0/300, 0 drops  
5 minute input rate 2000 bits/sec, 4 packets/sec  
5 minute output rate 1000 bits/sec, 1 packets/sec  
27033 packets input, 2083710 bytes, 0 no buffer  
Received 6194 broadcasts, 0 runts, 0 giants, 0 throttles  
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort  
0 watchdog, 0 multicast  
0 input packets with dribble condition detected  
12808 packets output, 1945983 bytes, 0 underruns  
0 output errors, 0 collisions, 0 interface resets  
0 babbles, 0 late collision, 0 deferred  
0 lost carrier, 0 no carrier  
0 output buffer failures, 0 output buffers swapped out

5-2948G-L3#**show vlan**

Virtual LAN ID: 1 (IEEE 802.1Q Encapsulation)

vLAN Trunk Interfaces: GigabitEthernet49  
GigabitEthernet50.1  
Port-channell1.1

This is configured as native Vlan for the following interface(s) :  
GigabitEthernet49  
GigabitEthernet50

| Protocols Configured: | Address:       | Received: | Transmitted: |
|-----------------------|----------------|-----------|--------------|
| IP                    | 10.10.10.1     | 0         | 0            |
| Bridging              | Bridge Group 1 | 3418      | 5            |

Virtual LAN ID: 2 (IEEE 802.1Q Encapsulation)

vLAN Trunk Interfaces: GigabitEthernet50.2  
Port-channell1.2

| Protocols Configured: | Address:       | Received: | Transmitted: |
|-----------------------|----------------|-----------|--------------|
| IP                    | 20.20.20.1     | 0         | 0            |
| Bridging              | Bridge Group 2 | 3952      | 9            |

Virtual LAN ID: 21 (IEEE 802.1Q Encapsulation)

vLAN Trunk Interface: GigabitEthernet49.1

| Protocols Configured: | Address: | Received: | Transmitted: |
|-----------------------|----------|-----------|--------------|
|-----------------------|----------|-----------|--------------|

Virtual LAN ID: 99 (IEEE 802.1Q Encapsulation)

vLAN Trunk Interface: Port-channell1.99

This is configured as native Vlan for the following interface(s) :  
Port-channell1

| Protocols Configured: | Address: | Received: | Transmitted: |
|-----------------------|----------|-----------|--------------|
|-----------------------|----------|-----------|--------------|

5-2948G-L3#**show spanning-tree**

```
Bridge group 1 is executing the IEEE compatible Spanning Tree protocol
Bridge Identifier has priority 32768, address 0001.43ff.1409
Configured hello time 2, max age 20, forward delay 15
We are the root of the spanning tree
Topology change flag not set, detected flag not set
Times: hold 1, topology change 35, notification 2
        hello 2, max age 20, forward delay 15
Timers: hello 0, topology change 0, notification 0
bridge aging time 300
```

```
Port 6 (FastEthernet3) of Bridge group 1 is forwarding
Port path cost 19, Port priority 128
Designated root has priority 32768, address 0001.43ff.1409
Designated bridge has priority 32768, address 0001.43ff.1409
Designated port is 6, path cost 0
Timers: message age 0, forward delay 0, hold 0
BPDU: sent 4107, received 2
```

```
Port 58 (Port-channell.1 DOT1Q) of Bridge group 1 is forwarding
Port path cost 12, Port priority 128
Designated root has priority 32768, address 0001.43ff.1409
Designated bridge has priority 32768, address 0001.43ff.1409
Designated port is 58, path cost 0
Timers: message age 0, forward delay 0, hold 0
BPDU: sent 5240, received 502
```

```
Bridge group 2 is executing the IEEE compatible Spanning Tree protocol
Bridge Identifier has priority 32768, address 0000.0c00.d08c
Configured hello time 2, max age 20, forward delay 15
Current root has priority 0, address 0010.0db1.804f
Root port is 59 (Port-channell.2), cost of root path is 50
Topology change flag not set, detected flag not set
Times: hold 1, topology change 35, notification 2
        hello 2, max age 20, forward delay 15
Timers: hello 0, topology change 0, notification 0
bridge aging time 300
```

```
Port 59 (Port-channell.2 DOT1Q) of Bridge group 2 is forwarding
Port path cost 12, Port priority 128
Designated root has priority 0, address 0010.0db1.804f
Designated bridge has priority 32770, address 0005.7428.0e00
Designated port is 65, path cost 38
Timers: message age 3, forward delay 0, hold 0
BPDU: sent 1790, received 3964
```

PC1#**ping 2.2.2.2**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/4 ms

## [Troubleshoot](#)

Atualmente, não existem informações disponíveis específicas sobre Troubleshooting para esta configuração.

## [Informações Relacionadas](#)

- [Entendendo e configurando o protocolo VLAN Trunk \(VTP\)](#)
- [Exemplo de Configurações de Catalyst 2948G-L3](#)
- [Suporte ao Produto - Switches](#)
- [Suporte de tecnologia de switching de LAN](#)
- [Suporte Técnico e Documentação - Cisco Systems](#)