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Configuring InterVLAN Routing and ISL/802.1Q Trunking on Catalyst 2900XL/3500XL/2940/2950/2970 Series Switches Using an External Router

Introduction

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- Prerequisites
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- Catalyst 3500XL Switch
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Introduction

This document provides sample configurations on InterSwitch Link (ISL) and 802.1Q trunking between a Catalyst 3512–XL switch and a Cisco 2600 router; the results of each command are displayed as they are executed. Cisco 3600 and 4500/4700 series routers, or other members of the Cisco 2600 series routers, with FastEthernet interfaces, and any Catalyst 2900XL, 3500XL, 2940, 2950 or 2970 can be used in the scenarios presented in this document to obtain the same results.

Trunking is a way to carry traffic from several VLANs over a point-to-point link between the two devices. Two ways in which Ethernet trunking can be implemented are:

- ISL (Cisco proprietary protocol, and not supported by the 2940 or 2950 series switches)
- 802.1Q (Institute of Electrical and Electronics Engineers (IEEE) standard)

We will create a trunk that will carry traffic from two VLANs (VLAN1 and VLAN2) across a single link between a Catalyst 3500 and a Cisco 2600 router.

We are using the Cisco 2600 router to do the Inter-VLAN routing between VLAN1 and VLAN2. Catalyst 2900XL/3500XL/2940/2950/2970 series switches are Layer 2 (L2) switches, and are not capable of routing or communicating between the VLANs. For further details on Inter-VLAN routing, refer to the Routing Between Virtual LANs Overview chapter of the Cisco IOS® Switching Services Configuration Guide, Release 12.1.

To create the examples in this document, we used the following switches in a lab environment with cleared configurations:

- Catalyst 3512XL switch running Cisco IOS 12.0(5.x)XU
- Cisco 2621 router running Cisco IOS 12.1(3)T

- Cisco 2621 router running Cisco IOS 12.1(1)T

The configurations in this document were implemented in an isolated lab environment. Ensure that you understand the potential impact of any configuration or command on your network before using it. The configurations on all devices were cleared with the write erase command to ensure that they have a default configuration.

Before You Begin

Conventions

For more information on document conventions, see the Cisco Technical Tips Conventions.

Prerequisites

There are no specific prerequisites for this document.

Components Used

This document is not restricted to specific software and hardware versions.

Important Notes

For Catalyst 2900XL/3500XL/2940/2950/2970 Switches:

Catalyst 2940 and 2950 series switches only support 802.1q trunking, and do not support ISL trunking.

On a 4 MB DRAM Catalyst 2900XL switch, trunking is only supported with the following trunking-capable modules:

- WS-X2914-XL-V: 4-port 10/100 ISL/802.1Q switch module
- WS-X2922-XL-V: 2-port 100BaseFX ISL/802.1Q switch module
- WS-X2924-XL-V: 4-port 100BaseFX ISL/802.1Q switch module
- WS-X2931-XL: 1000BaseX uplink for Catalyst 2900 XL
- WS-X2932-XL: 1000BaseT uplink for Catalyst 2900 XL

Refer to Table 1 below for a current list of switch models that support trunking:

Table 1

Switch Models	Minimum Release Required for ISL Trunking	Minimum Release Required for IEEE 802.1Q Trunking	Current Release Required for Trunking
WS-C2916M-XL (4-Meg Switch)	11.2(8)SA4 (Enterprise Edition)	11.2(8)SA5 (Enterprise Edition)	11.2(8.6)SA6 (Original Edition)
C2912-XL	11.2(8)SA4	11.2(8)SA5	12.0(5)WC(1)

	(Enterprise Edition)	(Enterprise Edition)	or later
C2924-XL	11.2(8)SA4 (Enterprise Edition)	11.2(8)SA5 (Enterprise Edition)	12.0(5)WC(1) or later
WS-C2924C-XL	11.2(8)SA4 (Enterprise Edition)	11.2(8)SA5 (Enterprise Edition)	12.0(5)WC(1) or later
WS-C2924M-XL	11.2(8)SA4 (Enterprise Edition)	11.2(8)SA5 (Enterprise Edition)	12.0(5)WC(1) or later
WS-C2912MF-XL	11.2(8)SA4 (Enterprise Edition)	11.2(8)SA5 (Enterprise Edition)	12.0(5)WC(1) or later
WS-C2924M-XL-DC	12.0(5)XU	12.0(5)XU	12.0(5)WC(1) or later
WS-C3508G-XL	11.2(8)SA4 (Enterprise Edition)	11.2(8)SA5 (Enterprise Edition)	12.0(5)WC(1) or later
WS-C3512-XL	11.2(8)SA4 (Enterprise Edition)	11.2(8)SA5 (Original Edition)	12.0(5)WC(1) or later
WS-C3524-XL	11.2(8)SA4 (Enterprise Edition)	11.2(8)SA5 (Enterprise Edition)	12.0(5)WC(1) or later
WS-C3548-XL	12.0(5)XP (Enterprise Edition)	12.0(5)XP (Enterprise Edition)	12.0(5)WC(1) or later
WS-C3524-PWR-XL	12.0(5)XU	12.0(5)XU	12.0(5)WC(1) or later
WS-C2940-8TF	ISL Not Supported	12.1(13)AY	12.1(13)AY or later for 802.1Q. ISL is not supported.
WS-C2940-8TT	ISL Not Supported	12.1(13)AY	12.1(13)AY or later for 802.1Q. ISL is not supported.
WS-C2950-12	ISL Not Supported	12.0(5)WC(1)	12.0(5)WC(1) or later for 802.1Q. ISL is not supported.

WS-C2950-24	ISL Not Supported	12.0(5)WC(1)	12.0(5)WC(1) or later for 802.1Q. ISL is not supported.
WS-C2950C-24	ISL Not Supported	12.0(5)WC(1)	12.0(5)WC(1) or later for 802.1Q. ISL is not supported.
WS-C2950T-24	ISL Not Supported	12.0(5)WC(1)	12.0(5)WC(1) or later for 802.1Q. ISL is not supported.
WS-C2950G-12-EI	ISL Not Supported	12.0(5)WC(1)	12.0(5)WC(1) or later for 802.1Q. ISL is not supported.
WS-C2950G-24-EI	ISL Not Supported	12.0(5)WC(1)	12.0(5)WC(1) or later for 802.1Q. ISL is not supported.
WS-C2950G-48-EI	ISL Not Supported	12.0(5)WC(1)	12.0(5)WC(1) or later for 802.1Q. ISL is not supported.
WS-C2950SX-24	ISL Not Supported	12.0(5)WC(1)	12.0(5)WC(1) or later for 802.1Q. ISL is not supported.
WS-C2950-24-EI-DC	ISL Not Supported	12.0(5)WC(1)	12.0(5)WC(1) or later for 802.1Q. ISL is not supported.
WS-C2955T-12	ISL Not Supported	12.1(13)EA1	12.1(13)EA1 or later for 802.1Q. ISL is not supported.
WS-C2955S-12	ISL Not Supported	12.1(13)EA1	12.1(13)EA1 or later for 802.1Q. ISL

			is not supported.
WS-C2955C-12	ISL Not Supported	12.1(13)EA1	12.1(13)EA1 or later for 802.1Q. ISL is not supported.
WS-C2970G-24T	12.1(11)AX	12.1(11)AX	12.1(11)AX or later
WS-C2970G-24TS	12.1(14)EA1	12.1(14)EA1	12.1(14)EA1 or later

Note: In the above table, only WS-C2916M-XL is a 4 MB DRAM switch. All the other switches listed are 8 MB DRAM switches. To determine whether your switch has 4 MB or 8 MB of DRAM, enter the user-level show version command. For more information, see the How to Determine the Amount of Switch Memory Using the Command Line Interface section of Upgrading Software in Catalyst 2900-XL/3500-XL Switches Using the Command Line Interface.

Note: In Catalyst 2900XL/3500XL/2940/2950/2970 switches, a VLAN interface, for example, int vlan 1, int vlan 2, int vlan x, can be created for each and every VLAN that is configured on the switch. However, only one VLAN can be used at a time as a management VLAN. The IP address is assigned to the VLAN interface of the management VLAN only. If the IP address is assigned to another VLAN interface whose VLAN is not used as management VLAN, that interface will not come up. It is preferred to create the VLAN interface only for the management VLAN.

For Cisco 2600 Routers:

For 802.1Q trunking, one VLAN is not tagged. This VLAN is called native VLAN. The native VLAN is used for untagged traffic when the port is in 802.1Q trunking mode. While configuring 802.1Q trunking, it is very important to keep in mind that the native VLAN must be configured the same on each side of the trunk link. It is a common mistake not to match the native VLANs while configuring 802.1Q trunking between the router and the switch. For details on native VLANs, refer to the IEEE 802.1Q section of Bridging Between IEEE 802.1Q VLANs, in New Features in Release 12.1(3)T.

In this sample configuration, the native VLAN is VLAN1, by default, on both the Cisco 2621 router and the Catalyst 3512XL switch. Depending on your network needs, you may have to use a native VLAN other than the default VLAN, VLAN1. Commands have been mentioned in the Configurations section of this document on how to change the native VLAN on the Cisco 2600 router and Catalyst 3500XL switch.

Sample configurations presented in this document can be used on Cisco 2600/3600/4500/4700 series routers with Fast Ethernet interfaces or Fast Ethernet network modules. Also, make sure that you are using the Cisco IOS version that supports ISL/802.1Q VLAN trunking. For a complete list of Cisco 2600/3600/4500/4700 routers that support ISL/802.1Q VLAN trunking and the supported Cisco IOS versions, refer to Table 2 below.

Table 2

Router Models	Minimum Release Required	Minimum Release Required	Current Release Required for	Minimum Required Feature Set
---------------	--------------------------	--------------------------	------------------------------	------------------------------

	for ISL Trunking	for IEEE 802.1Q Trunking	Trunking (ISL/802.1Q)	(ISL/802.1Q)
Cisco 2620	11.3(3a)T	12.0(1)T	12.1(5)T,	IP PLUS / IP
Cisco 2621	11.3(3a)T	12.0(1)T	12.1(5)	PLUS
Cisco 2620	12.1(3a)T	12.1(3a)T	12.1(5)T,	IP PLUS / IP
Cisco 2650	12.1(3a)T	12.1(3a)T	12.1(5)	PLUS
Cisco 3620	11.3(1)T	12.0(1)T	12.1(5)T,	IP PLUS / IP
Cisco 3640	11.3(1)T	12.0(1)T	12.1(5)	PLUS
Cisco 3661	12.0(5)T	12.0(5)T	12.1(5a)	PLUS
Cisco 3662	12.0(5)T	12.0(5)T	12.1(5)T,	IP PLUS / IP
Cisco 4500–M	11.3(1)T	12.0(1)T	12.1(5)	PLUS
Cisco 4700–M	11.3(1)T	12.0(1)T	12.1(5)T,	IP PLUS / IP
			12.1(5a)	PLUS

Note: Table 2 only lists the minimum or current maintenance/main releases that support this sample configuration. Router models with certain network modules may have different minimum Cisco IOS versions. For a complete list of minimum supported software for any router family, use the Software Advisor (registered customers only) .

Note: The minimum supported release may not necessarily be the recommended release. To determine the best maintenance release for your Cisco product, search for bugs listed by product component in the Bug Toolkit (registered customers only) .

Note: Table 2 lists the minimum feature set required to do IP Inter–VLAN routing and trunking to support this sample configuration. For a complete list of other feature sets supported in different Cisco IOS versions and on different platforms, use the Cisco IOS Upgrade Planner (registered customers only) .

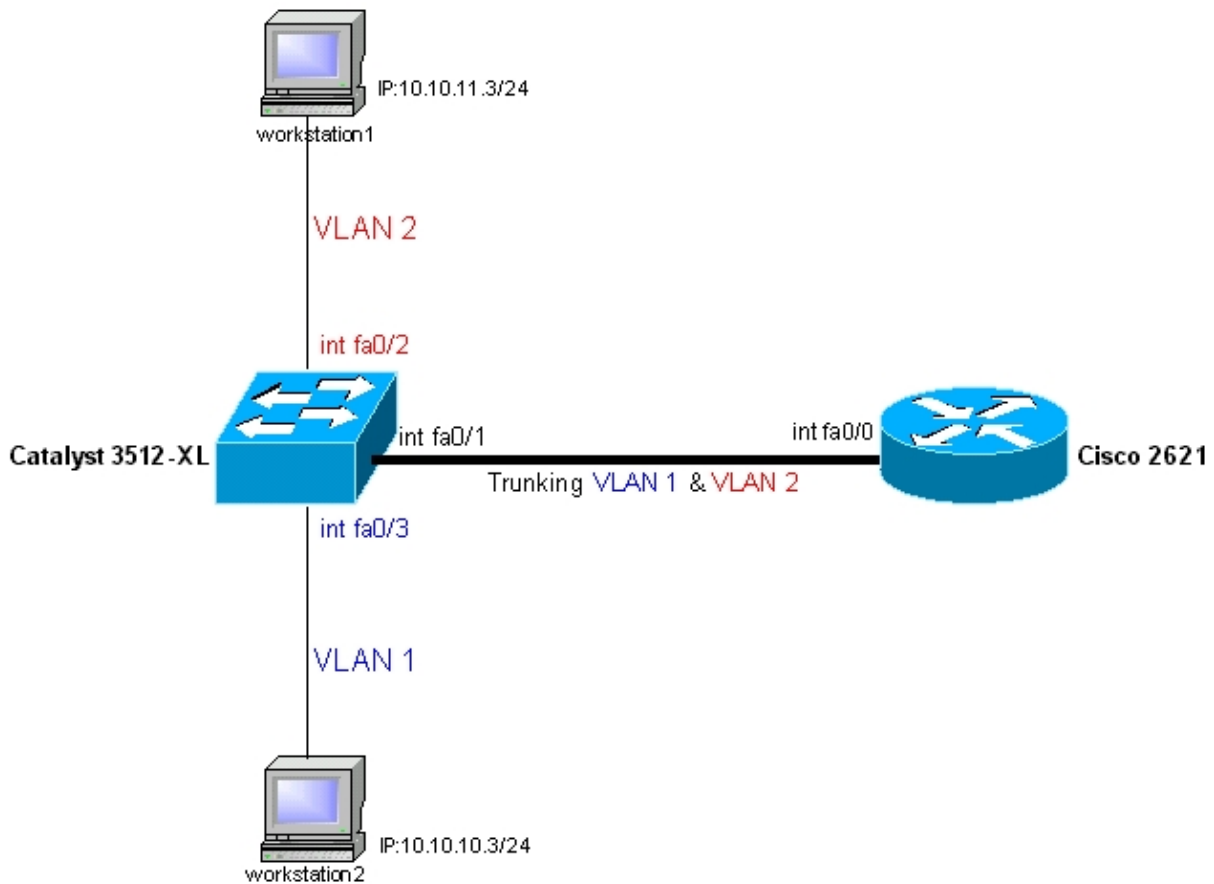
Configure

In this section, you are presented with the information to configure the features described in this document.

Note: To find additional information on the commands used in this document, use the Command Lookup Tool (registered customers only) .

Network Diagram

This document uses the network setup shown in the diagram below.



Configurations

This document uses the configurations shown below.

Note: Router models with certain network modules may have different minimum Cisco IOS versions that support ISL trunking.

- Catalyst 3512–XL
- Cisco 2600 Router
- 802.1Q Configuration on the Router for Cisco IOS Versions Earlier than 12.1(3)T

Catalyst 3512–XL

Note: The following screen captures show the commands that were entered on the 3512XL switch. Comments between the commands are added in blue italics to explain certain commands and steps.

```
!-- Set the privileged mode

!-- and Telnet password on the switch.

switch#configure terminal
```


Enter configuration commands, one per line. End with CNTL/Z.

```
switch(config)#hostname 3512xl
3512xl(config)#enable password mysecret
3512xl(config)#line vty 0 4
3512xl(config-line)#login
3512xl(config-line)#password mysecret
3512xl(config-line)#exit
3512xl(config)#no logging console
3512xl(config)#^Z
```

!-- Set the IP address and default gateway for VLAN1 for management purposes.

```
3512xl#configure terminal
```

Enter configuration commands, one per line. End with CNTL/Z.

```
3512xl(config)#int vlan 1
3512xl(config-if)#ip address 10.10.10.2 255.255.255.0
3512xl(config-if)#exit
3512xl(config)#ip default-gateway 10.10.10.1
3512xl(config)#end
```

!-- Set the VTP Mode.

!-- In our example, we have set the mode to be transparent.

!-- Depending on your network, set the VTP Mode accordingly.

!-- For details on VTP,

!-- refer to

!-- Creating and Maintaining VLANs on Catalyst 2900XL and 3500XL Switches.

```
3512xl#vlan database
```

```
3512xl(vlan)#vtp transparent
```

Setting device to VTP TRANSPARENT mode.

!-- Adding VLAN2. VLAN1 already exists by default.

```
3512xl(vlan)#vlan 2
```

VLAN 2 added:

Name: VLAN0002

```
3512xl(vlan)#exit
```

APPLY completed.

Exiting....

!-- Enable trunking on the interface fastEthernet 0/1.

```
3512xl#configure terminal
```

Enter configuration commands, one per line. End with CNTL/Z.

```
3512xl(config)#int fastEthernet 0/1
3512xl(config-if)#switchport mode trunk
```

!-- Enter the trunking encapsulation as either isl

```
3512xl(config-if)#switchport trunk encapsulation isl
```

!-- or as dot1q:

```
3512xl(config-if)#switchport trunk encapsulation dot1q
```

!-- In case of 2940/2950 series switches, none of the above two commands are used,

!-- 2940/2950 series switches only support 802.1q encapsulation which is configured automatically,

!-- when trunking is enabled on the interface by using switchport mode trunk command.

```

!-- In case of dot1q, you need to make sure that
!-- the native VLAN matches across the link.
!-- On 3512XL, by default, the native VLAN is 1.
!-- Depending on your network needs, you may change
!-- the native VLAN to be other than VLAN1,
!-- but it is very important that you change the native VLAN
!-- on the router accordingly.
!-- You may change the native VLAN, if needed, by using the following command:
!-- 3512xl(config-if)#switchport trunk native vlan <vlan ID>

!-- Allow all VLANs on the trunk.

3512xl(config-if)#switchport trunk allowed vlan all
3512xl(config-if)#exit

!-- The following set of commands will place FastEthernet 0/2
!-- into VLAN2 and enable portfast on the interface.

3512xl(config)#int fastEthernet 0/2
3512xl(config-if)#switchport access vlan 2
3512xl(config-if)#spanning-tree portfast
3512xl(config-if)#exit

!-- FastEthernet 0/3 is already in VLAN1 by default.
!-- Enable portfast on the interface.

3512xl(config)#int fastEthernet 0/3
3512xl(config-if)#spanning-tree portfast
3512xl(config-if)#^Z

!-- For details on why to enable portfast,
!-- refer to:
!-- Using PortFast and Other Commands to Fix Workstation Startup Connectivity Delays.
!-- Remember to save the configuration.

3512xl#write memory
Building configuration...

3512xl#

-----

3512xl#show running-config
Building configuration...

Current configuration:

!
version 12.0
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname 3512xl
!
no logging console
enable password mysecret
!
!
!
!

```

```

!
ip subnet-zero
!
!
!
interface FastEthernet0/1
    switchport mode trunk
!

!-- If 802.1Q is configured,
!-- you will instead see the following output
!-- under interface FastEthernet0/1:
!-- interface FastEthernet0/1
!-- switchport trunk encapsulation dot1q
!-- switchport mode trunk

!
interface FastEthernet0/2
    switchport access vlan 2
    spanning-tree portfast
!
interface FastEthernet0/3
    spanning-tree portfast
!
interface FastEthernet0/4
!
interface FastEthernet0/5
!
interface FastEthernet0/6
!
interface FastEthernet0/7
!
interface FastEthernet0/8
!
interface FastEthernet0/9
!
interface FastEthernet0/10
!
interface FastEthernet0/11
!
interface FastEthernet0/12
!
interface GigabitEthernet0/1
!
interface GigabitEthernet0/2
!
interface VLAN1
    ip address 10.10.10.2 255.255.255.0
    no ip directed-broadcast
    no ip route-cache
!
ip default-gateway 10.10.10.1
!
line con 0
    transport input none
    stopbits 1
line vty 0 4
    password mysecret
    login
line vty 5 15
    login
!
end

```

2600 Router

Note: The following screen captures show the commands that were entered on the Cisco 2600 router. Comments between the commands are added in blue italics to explain certain commands and steps.

```
!-- Set the privileged mode
!-- and Telnet password on the router.

Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname c2600

c2600(config)#enable password mysecret
c2600(config)#line vty 0 4
c2600(config-line)#login
c2600(config-line)#password mysecret
c2600(config-line)#exit
c2600(config)#no logging console
c2600(config)#^Z

c2600#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.

!-- Select FastEthernet 0/0 for the trunk configuration.
!-- No L2 or Layer 3 (L3) configuration is done here.

c2600(config)#int fastEthernet 0/0
c2600(config-if)#no shut
c2600(config-if)#exit

!-- Enable trunking on the sub-interface FastEthernet 0/0.1.
!-- Note that actual trunks are configured on the sub-interfaces.

c2600(config)#int fastEthernet 0/0.1

!-- Enter the trunking encapsulation as either isl

c2600(config-subif)#encapsulation isl 1

!-- or as dot1q:
!-- In case of dot1q, you need to make sure that
!-- the native VLAN matches across the link.
!-- On 3512XL, by default, the native VLAN is 1.
!-- On the router, configure VLAN1 as the native VLAN.

c2600(config-subif)#encapsulation dot1Q 1 ?
    native Make this is native vlan
    <cr>
c2600(config-subif)#encapsulation dot1Q 1 native

!-- On the switch, if you have a native VLAN other than VLAN1,
!-- on the router, configure the same VLAN to be the native VLAN,
!-- by using the above command.
```

Note: The **encapsulation dot1Q 1 native** command was added in Cisco IOS version 12.1(3)T. If

you are using an earlier version of Cisco IOS, refer to the 802.1Q configuration for Cisco IOS Versions Earlier than 12.1(3)T section of this document to configure 802.1Q trunking on the router.

```
!-- Configure L3 information on the sub-interface 0/0.1.

c2600(config-subif)#ip address 10.10.10.1 255.255.255.0
c2600(config-subif)#exit

!-- Enable trunking on the sub-interface FastEthernet 0/0.2.
!-- Note that actual trunks are configured on the sub-interfaces.

c2600(config)#int fastEthernet 0/0.2

!-- Enter the trunking encapsulation as either isl

c2600(config-subif)#encapsulation isl 2

!-- or as dot1q:

c2600(config-subif)#encapsulation dot1Q 2

!-- Configure L3 information on the sub-interface 0/0.2.

c2600(config-subif)#ip address 10.10.11.1 255.255.255.0
c2600(config-subif)#exit
c2600(config)#^Z

!-- Remember to save the configuration.

c2600#write memory
Building configuration...
[OK]
c2600#
```

Note: In order to make this setup work, and to successfully ping between workstation1 and workstation2, you need to make sure that the default gateways on the workstations are setup properly. For workstation1, the default gateway should be 10.10.11.1 and for workstation2, the default gateway should be 10.10.10.1. For details on how to set the default gateways on the workstations, refer to their respective sections in this document.

Note: The following paragraph is only applicable, if you have configured 802.1Q trunking between the router and the switch.

Note: If you have followed the configuration steps listed in the above sections, and are still not able to ping across the VLANs (between workstation1 and workstation2), then there is a possibility that you have come across Caveat CSCds42715, in which the 802.1Q native VLAN keyword does not function properly when fast switching is enabled. The bug fix was integrated in the following code versions: 12.2(0.5), 12.2(0.5)T, 12.1(5)DC, 12.1(5)YB, 12.2(0.18)S, 12.1(5)YD02, 12.2(2)B, 12.2(15)ZN. You can check the status and a brief description of the bug by using the Bug Toolkit (registered customers only) and entering the bug ID CSCds42715.

```

-----
c2600#show running-config
Building configuration...

Current configuration:
!
version 12.1
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname c2600
!
no logging console
enable password mysecret
!
!
!
!
!
!
ip subnet-zero
!
!
!
!
!
!
!
!
!
interface FastEthernet0/0
  no ip address
  duplex auto
  speed auto
!
interface FastEthernet0/0.1
  encapsulation isl 1
  ip address 10.10.10.1 255.255.255.0
  no ip redirects
!

!-- If 802.1Q is configured,
!-- you will instead see the following output
!-- under interface FastEthernet0/0.1:
!-- interface FastEthernet0/0.1
!-- encapsulation dot1Q 1 native
!-- ip address 10.10.10.1 255.255.255.0

!
!
interface FastEthernet0/0.2
  encapsulation isl 2
  ip address 10.10.11.1 255.255.255.0
  no ip redirects
!

!-- If 802.1Q is configured,
!-- you will instead see the following output
!-- under interface FastEthernet0/0.2:
!-- interface FastEthernet0/0.2
!-- encapsulation dot1Q 2
!-- ip address 10.10.11.1 255.255.255.0

```

```

!
interface FastEthernet0/1
  no ip address
  shutdown
  duplex auto
  speed auto
!
ip classless
no ip http server
!
!
!
line con 0
  transport input none
line aux 0
line vty 0 4
  password mysecret
  login
!
no scheduler allocate
end

```

802.1Q Configuration on the Router for Cisco IOS Versions Earlier than 12.1(3)T

As described earlier in this document, while configuring 802.1Q trunking it is very important to match the native VLAN across the link. In the Cisco IOS software versions earlier than 12.1(3)T, you cannot define the native VLAN explicitly, as the encapsulation dot1q 1 native command under the sub-interface is not available. In the earlier Cisco IOS versions, it is important to configure the native VLAN-Interface not as a sub-interface, which is in our example VLAN1. If configured wrong, the router would expect a tag dot1q frame on VLAN1 and the switch is not expecting a tag on VLAN1. As a result, no traffic will pass between VLAN1 on the switch and the router.

In the current lab setup, use the following steps to configure the Cisco 2600 router:

```

!-- Set the privileged mode
!-- and Telnet password on the router.

Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname c2600
c2600(config)#enable password mysecret
c2600(config)#line vty 0 4
c2600(config-line)#login;
c2600(config-line)#password mysecret
c2600(config-line)#exit
c2600(config)#no logging console
c2600(config)#^Z

c2600#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.

!-- Select FastEthernet 0/0 for the trunk configuration.

c2600(config)#int fastEthernet 0/0
c2600(config-if)#no shut

```

```
!-- Note that the IP address for VLAN1 is configured on the main interface,  
!-- and no encapsulation for VLAN1 will be done under the sub-interface.
```

```
c2600(config-if)#ip address 10.10.10.1 255.255.255.0  
c2600(config-if)#exit
```

```
!-- Configure dot1q encapsulation for VLAN 2  
!-- on sub-interface fastEthernet 0/0.2.
```

```
c2600(config)#int fastEthernet 0/0.2  
c2600(config-subif)#encapsulation dot1Q 2  
c2600(config-subif)#
```

```
!-- Configuring L3 information on the sub-interface 0/0.2.
```

```
c2600(config-subif)#ip address 10.10.11.1 255.255.255.0  
c2600(config-subif)#exit  
c2600(config)#^Z
```

```
!-- Remember to save the configuration.
```

```
c2600#write memory  
Building configuration...  
[OK]  
c2600#
```

Note: In order to make this setup work and to successfully ping between workstation1 and workstation2, you need to make sure that the default gateways on the workstations are setup properly. For workstation1, the default gateway should be 10.10.11.1, and for workstation2, the default gateway should be 10.10.10.1. For details on how to set the default gateways on the workstations, refer to their respective sections in this document.

```
c2600#show running-config  
Building configuration...  
  
Current configuration:  
!  
version 12.1  
service timestamps debug uptime  
service timestamps log uptime  
no service password-encryption  
!  
hostname c2600  
!  
no logging console  
enable password mysecret  
!  
!  
!  
!  
memory-size iomem 7  
ip subnet-zero  
!  
!  
!  
!
```



```
!  
!  
interface FastEthernet0/0  
  ip address 10.10.10.1 255.255.255.0  
  duplex auto  
  speed auto  
!  
interface FastEthernet0/0.2  
  encapsulation dot1Q 2  
  ip address 10.10.11.1 255.255.255.0  
!  
interface FastEthernet0/1  
  no ip address  
  shutdown  
  duplex auto  
  speed auto  
!  
ip classless  
no ip http server  
!  
!  
line con 0  
  transport input none  
line aux 0  
line vty 0 4  
  password mysecret  
  login  
!  
no scheduler allocate  
end  
  
c2600#
```

debug and show Commands

This section provides information you can use to confirm your configuration is working properly.

Certain **show** commands are supported by the Output Interpreter Tool (registered customers only) , which allows you to view an analysis of **show** command output.

On the Catalyst 2900XL/3500XL/2940/2950/2970 switch, use the following commands:

- **show int {FastEthernet | GigabitEthernet} <module/port> switchport**
- **show vlan**
- **show vtp status**

On the Cisco 2600 router, use the following commands:

- **show vlan**
- **show interface**

Sample show Command Output

Catalyst 3500XL Switch

show int {FastEthernet | GigabitEthernet} <module/port> switchport

This command is used to check the administrative and operational status of the port. It is also used to make sure that the native VLAN matches on both sides of the trunk. The native VLAN is used for untagged traffic when the port is in 802.1Q trunking mode. Refer to Creating and Maintaining VLANs on Catalyst 2900XL and 3500XL Switches for details on native VLANs.

```
3512xl#show int fastEthernet 0/1 switchport
Name: Fa0/1
Switchport: Enabled
Administrative mode: trunk
Operational Mode: trunk
Administrative Trunking Encapsulation: isl
Operational Trunking Encapsulation: isl
Negotiation of Trunking: Disabled
Access Mode VLAN: 0 ((Inactive))
Trunking Native Mode VLAN: 1 (default)
Trunking VLANs Enabled: ALL
Trunking VLANs Active: 1,2
Pruning VLANs Enabled: 2-1001

Priority for untagged frames: 0
Override vlan tag priority: FALSE
Voice VLAN: none
Appliance trust: none
```

Note: For 802.1Q trunking, the output of the above command changes as follows:

```
3512xl#show int fastEthernet 0/1 switchport
Name: Fa0/1
Switchport: Enabled
Administrative mode: trunk
Operational Mode: trunk
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: dot1q
Negotiation of Trunking: Disabled
Access Mode VLAN: 0 ((Inactive))
Trunking Native Mode VLAN: 1 (default)
Trunking VLANs Enabled: ALL
Trunking VLANs Active: 1,2
Pruning VLANs Enabled: 2-1001

Priority for untagged frames: 0
Override vlan tag priority: FALSE
Voice VLAN: none
```

show vlan

This command is used to verify that the interfaces (ports) belong to the correct VLAN. In our example, only interface Fa0/2 belongs to VLAN2. The rest are members of VLAN1.

```
3512xl#show vlan
VLAN Name                Status    Ports
-----
1    default                active    Fa0/3, Fa0/4, Fa0/5, Fa0/6,
                                   Fa0/7, Fa0/8, Fa0/9, Fa0/10,
                                   Fa0/11, Fa0/12, Gi0/1, Gi0/2
2    VLAN0002              active    Fa0/2
```

```

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

```

...(output suppressed)

show vtp status

This command is used to check the VLAN trunking protocol (VTP) configuration on the switch. In our example, we have used transparent mode. The correct VTP mode depends on the topology of your network. For details on VTP, refer to Creating and Maintaining VLANs on Catalyst 2900XL and 3500XL Switches.

```

3512xl#show vtp status
VTP Version                : 2
Configuration Revision      : 0
Maximum VLANs supported locally : 254
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                  : 0xC3 0x71 0xF9 0x77 0x2B 0xAC 0x5C 0x97
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00

```

Cisco 2600 Router

show vlan

This command tells you what L2 or L3 information is configured for each VLAN.

```

c2600#show vlan

Virtual LAN ID: 1 (Inter Switch Link Encapsulation)

VLAN Trunk Interface: FastEthernet0/0.1

Protocols Configured: Address: Received: Transmitted:
IP                  10.10.10.1         40             38

Virtual LAN ID: 2 (Inter Switch Link Encapsulation)

VLAN Trunk Interface: FastEthernet0/0.2

Protocols Configured: Address: Received: Transmitted:
IP                  10.10.11.1         9              9

```

Note: For 802.1Q trunking, the output of the above command changes as follows:

```

c2600#show vlan

Virtual LAN ID: 1 (IEEE 802.1Q Encapsulation)

VLAN Trunk Interface: FastEthernet0/0.1

This is configured as native Vlan for the following interface(s): FastEthernet0/0

Protocols Configured: Address: Received: Transmitted:
IP                  10.10.10.1         0              2

```

Virtual LAN ID: 2 (IEEE 802.1Q Encapsulation)

vLAN Trunk Interface: FastEthernet0/0.2

Protocols Configured:	Address:	Received:	Transmitted:
IP	10.10.11.1	42	19

Note: For 802.1Q trunking, with Cisco IOS versions earlier than 12.1(3)T, the output of the command changes as follows:

```
c2600#show vlan
```

Virtual LAN ID: 2 (IEEE 802.1Q Encapsulation)

vLAN Trunk Interface: FastEthernet0/0.2

Protocols Configured:	Address:	Received:	Transmitted:
IP	10.10.11.1	6	4

Note: No IEEE 802.1Q encapsulation is displayed for VLAN1 on any of the sub-interfaces.

show interface

This command is used to check the administrative and operational status of the interface.

```
c2600#show interfaces fastEthernet 0/0
```

FastEthernet0/0 is up, line protocol is up

Hardware is AmdFE, address is 0003.e36f.41e0 (bia 0003.e36f.41e0)

MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,

reliability 255/255, txload 1/255, rxload 1/255

Encapsulation ARPA, loopback not set

Keepalive set (10 sec)

Full-duplex, 100Mb/s, 100BaseTX/FX

ARP type: ARPA, ARP Timeout 04:00:00

Last input 00:00:00, output 00:00:07, output hang never

Last clearing of "show interface" counters never

Queueing strategy: fifo

Output queue 0/40, 0 drops; input queue 0/75, 0 drops

5 minute input rate 0 bits/sec, 1 packets/sec

5 minute output rate 0 bits/sec, 0 packets/sec

217 packets input, 12884 bytes

Received 217 broadcasts, 0 runts, 0 giants, 0 throttles

0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored

0 watchdog

0 input packets with dribble condition detected

45 packets output, 6211 bytes, 0 underruns(0/0/0)

0 output errors, 0 collisions, 4 interface resets

0 babbles, 0 late collision, 0 deferred

0 lost carrier, 0 no carrier

0 output buffer failures, 0 output buffers swapped out

```
c2600#show interfaces fastEthernet 0/0.1
```

FastEthernet0/0.1 is up, line protocol is up

Hardware is AmdFE, address is 0003.e36f.41e0 (bia 0003.e36f.41e0)

Internet address is 10.10.10.1/24

MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,

reliability 255/255, txload 1/255, rxload 1/255

Encapsulation ISL Virtual LAN, Color 1.

ARP type: ARPA, ARP Timeout 04:00:00

```
c2600#show interfaces fastEthernet 0/0.2
```

```
FastEthernet0/0.2 is up, line protocol is up
  Hardware is AmdFE, address is 0003.e36f.41e0 (bia 0003.e36f.41e0)
  Internet address is 10.10.11.1/24
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ISL Virtual LAN, Color 2.
  ARP type: ARPA, ARP Timeout 04:00:00
```

Note: For 802.1Q trunking, the output of the above command changes as follows:

```
c2600#show interfaces fastEthernet 0/0.1
FastEthernet0/0.1 is up, line protocol is up
  Hardware is AmdFE, address is 0003.e36f.41e0 (bia 0003.e36f.41e0)
  Internet address is 10.10.10.1/24
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation 802.1Q Virtual LAN, Vlan ID 1.
  ARP type: ARPA, ARP Timeout 04:00:00

c2600#show interfaces fastEthernet 0/0.2
FastEthernet0/0.2 is up, line protocol is up
  Hardware is AmdFE, address is 0003.e36f.41e0 (bia 0003.e36f.41e0)
  Internet address is 10.10.11.1/24
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation 802.1Q Virtual LAN, Vlan ID 2.
  ARP type: ARPA, ARP Timeout 04:00:00
```

Related Information

- [Configuring 802.1q Trunking Between a Catalyst 3550/3750 and Catalyst Switches](#)
 - [Creating and Maintaining VLANs on Catalyst 2900XL and 3500XL Switches](#)
 - [Creating and Maintaining VLANs on Catalyst 2950 Switches](#)
 - [Using PortFast and Other Commands to Fix Workstation Startup Connectivity Delays](#)
 - [Catalyst 2900XL/3500XL, Cisco IOS Desktop Switching Command Reference](#)
 - [Catalyst 2940 Switch Command Reference](#)
 - [Catalyst 2950 and Catalyst 2955 Switch Command Reference](#)
 - [Catalyst 2970 Switch Command Reference](#)
 - [XC: Cisco IOS Switching Services Configuration Guide](#)
 - [XR: Cisco IOS Switching Services Command Reference](#)
 - [Technical Support – Cisco Systems](#)
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