

# Troubleshooting VLAN Trunk Protocol (VTP)

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## Introduction

This document provides information on how to troubleshoot VLAN Trunk Protocol (VTP).

## Prerequisites

### Requirements

There are no specific requirements for this document.

### Components Used

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

## Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

## Understand VTP

Refer to Understanding VLAN Trunk Protocol (VTP) for more information on VTP.

## Configure VTP

Refer to Configuring VLAN Trunk Protocol (VTP) for information to configure VTP.

## VTP Troubleshooting and Caveats

This section discusses some common troubleshooting situations for VTP.

### Unable to See VLAN Details in the show run Command Output

Configuration changes in CatOS are written to NVRAM immediately after a change is made. In contrast, Cisco IOS<sup>®</sup> Software does not save configuration changes to NVRAM unless you issue the **copy running-config startup-config** command. VTP client and server systems require VTP updates from other VTP servers to be immediately saved in NVRAM without user intervention. The VTP update requirements are met by the default CatOS operation, but the Cisco IOS update model requires an alternative update operation.

For this alteration, a VLAN database was introduced into Cisco IOS Software as a method to immediately save VTP updates for VTP clients and servers. In some versions of software, this VLAN database is in the form of a separate file in NVRAM, called the vlan.dat file. You can view VTP/VLAN information that is stored in the vlan.dat file for the VTP client or VTP server if you issue the **show vtp status** command.

VTP server/client mode switches do not save the entire VTP/VLAN configuration to the startup config file in the NVRAM when you issue the **copy running-config startup-config** command on these systems. It saves the configuration in the vlan.dat file. This does not apply to systems that run as VTP transparent. VTP transparent systems save the entire VTP/VLAN configuration to the startup config file in NVRAM when you issue the **copy running-config startup-config** command. For example, if you delete vlan.dat file after the configuration of the VTP in server or client mode and reload the switch, it resets the VTP configuration to default settings. However, if you configure VTP in transparent mode, delete the vlan.dat and reload the switch. This retains the VTP configuration.

This is an example of a default VTP configuration:

```
Switch#show vtp status
VTP Version                : 2
Configuration Revision     : 0
Maximum VLANs supported locally : 1005
Number of existing VLANs   : 5
VTP Operating Mode        : Client
VTP Domain Name           : CISCO
VTP Pruning Mode          : Disabled
VTP V2 Mode               : Disabled
VTP Traps Generation      : Disabled
MD5 digest                 : 0xD3 0x78 0x41 0xC8 0x35 0x56 0x89 0x97
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
```

You can configure normal-range VLANs (2 through 1000) when the switch is in either VTP server or transparent mode. However, you can only configure extended-range VLANs (1025 through 4094) in VTP transparent switches.

- In order to display all the VLAN configurations, the VLAN ID, name, and so forth, that are stored in the binary file, you must issue the **show vlan** command.
- You can display the VTP information, the mode, domain, and so forth, with use of the **show vtp status** command.
- The VLAN information and the VTP information are not displayed in the **show running-config** command output when the switch is in the VTP server/client mode. This is normal behavior of the switch.

```
Router#show run | include vlan
vlan internal allocation policy ascending
```

```
Router#show run | include vtp
```

- Switches that are in VTP transparent mode display the VLAN and VTP configurations in the **show running-config** command output because this information is also stored in the configuration text file.

```
Router#show run | include vlan
vlan internal allocation policy ascending
vlan 1
  tb-vlan1 1002
  tb-vlan2 1003
vlan 20-21,50-51
vlan 1002
  tb-vlan1 1
  tb-vlan2 1003
vlan 1003
  tb-vlan1 1
  tb-vlan2 1002
vlan 1004
vlan 1005
Router#show run | include vtp
vtp domain cisco
vtp mode transparent
```

**Note: Extended-range VLANs are not supported by 3500XL.** The 2900XL and 3500XL can use only VLANs in the range of 1 to 1001, and they do not support extended-range VLANs. If you upgrade the software of the switch, it does not bring an enhancement to support the configuration of extended-range VLANs.

## Catalyst Switches Do Not Exchange VTP Information

VTP allows switches to advertise VLAN information between other members of the same VTP domain. VTP allows a consistent view of the switched network across all switches. There are several reasons why the VLAN information can fail to be exchanged.

Verify these items if switches that run VTP fail to exchange VLAN information:

- VTP information only passes through a trunk port. Make sure that all ports that interconnect switches are configured as trunks and are actually trunking.

Make sure that if EtherChannels are created between two switches, only Layer 2 EtherChannels propagate VLAN information.

- Make sure that the VLANs are active in all the devices.
- One of the switches must be the VTP server in a VTP domain. All VLAN changes must be done on

this switch in order to have them propagated to the VTP clients.

- The VTP domain name must match and it is case sensitive. CISCO and cisco are two different domain names.
- Make sure that no password is set between the server and client. If any password is set, make sure that the password is the same on both sides.
- Every switch in the VTP domain must use the same VTP version. VTP V1 and VTP V2 are not compatible on switches in the same VTP domain. Do not enable VTP V2 unless every switch in the VTP domain supports V2.

**Note:** VTP V2 is disabled by default on VTP V2–capable switches. When you enable VTP V2 on a switch, every VTP V2–capable switch in the VTP domain enables V2. You can only configure the version on switches in VTP server or transparent mode.

- Switches that operate in transparent mode drop VTP advertisements if they are not in the same VTP domain.
- The extended–range VLANs are not propagated. Therefore, you must configure extended–range VLANs manually on each network device.

**Note:** In the future, the Catalyst 6500 Cisco IOS Software switches support VTP Version 3. This version is able to transmit extended–range VLANs. So far, VTP Version 3 is only supported on CatOS. Refer to the *Understanding How VTP Version 3 Works* section of *Configuring VTP* for more information on VTP Version 3.

- The Security Association Identifier (SAID) values must be unique. SAID is a user–configurable, 4–byte VLAN identifier. The SAID identifies traffic that belongs to a particular VLAN. The SAID also determines to which VLAN each packet is switched. The SAID value is 100,000 plus the VLAN number. These are two examples:
  - ◆ The SAID for VLAN 8 is 100008.
  - ◆ The SAID for VLAN 4050 is 104050.
- The updates from a VTP server do not get updated on a client if the client already has a higher VTP revision number. Also, the client does not allow these updates to flow to its downstream VTP clients if the client has a higher revision number than that which the VTP server sends.

## Catalyst Switch Automatically Changes VTP Mode from Client to Transparent

Some Catalyst Layer 2 and Layer 3 fixed configuration switches change the VTP mode automatically from client to transparent with this error message:

```
%SW_VLAN-6-VTP_MODE_CHANGE: VLAN manager changing device mode from
CLIENT to TRANSPARENT.
```

Either of these two reasons can cause the automatic VTP mode change in these switches:

- **More VLANs run on the Spanning Tree Protocol (STP) than the switch can support.**

Catalyst Layer 2 and Layer 3 fixed configuration switches support a different maximum number of instances of STP with the use of per–VLAN spanning tree+ (PVST+). For example, the Catalyst 2940 supports four instances of STP in PVST+ mode, while the Catalyst 3750 supports 128 instances of STP in PVST+ mode. If more than the maximum number of VLANs is defined in the VTP, the VLANs that remain operate with STP disabled.

If the number of instances of STP that is already in use is greater than the maximum number, you can disable STP on one of the VLANs and enable it on the VLAN where you want STP to run. Issue the **no spanning–tree vlan *vlan–id*** global configuration command in order to disable STP on a specific

VLAN. Then, issue the **spanning-tree vlan** *vlan-id* global configuration command in order to enable STP on the desired VLAN.

**Note:** Switches that do not run STP still forward the bridge protocol data units (BPDUs) that they receive. In this way, the other switches on the VLAN that have a running STP instance can break loops. Therefore, STP must run on enough switches in order to break all the loops in the network. For example, at least one switch on each loop in the VLAN must run STP. You do not need to run STP on all switches in the VLAN. However, if you run STP only on a minimal set of switches, a change to the network can introduce a loop into the network and can result in a broadcast storm.

#### Workarounds:

- ◆ Reduce the number of VLANs that are configured to a number that the switch supports.
- ◆ Configure the IEEE 802.1s Multiple STP (MSTP) on the switch in order to map multiple VLANs to a single STP instance.
- ◆ Use switches and/or images (Enhanced Image [EI]) which support a greater number of VLANs.
- **The switch receives more VLANs from a connected switch than the switch can support.**

An automatic VTP mode change also can occur if the switch receives a VLAN configuration database message that contains more than a set number of VLANs. This normally happens in Catalyst Layer 2 and Layer 3 fixed configuration switches when they are connected to a VTP domain that has more VLANs than are supported locally.

#### Workarounds:

- ◆ Configure the allowed VLAN list on the trunk port of the connected switch in order to restrict the number of VLANs that are passed to the client switch.
- ◆ Enable pruning on the VTP server switch.
- ◆ Use switches and/or images (EI) which support a greater number of VLANs.

## Data Traffic Blocked between VTP Domains

Sometimes it is required to connect to switches that belong to two different VTP domains. For example, there are two switches called Switch1 and Switch2. Switch1 belongs to VTP domain cisco1 and Switch2 belongs to VTP domain cisco2. When you configure trunk between these two switches with the Dynamic Trunk Negotiation (DTP), the trunk negotiation fails and the trunk between the switches does not form, because the DTP sends the VTP domain name in a DTP packet. Because of this, the data traffic does not pass between the switches.

```
Switch1#show vtp status
VTP Version                : 2
Configuration Revision     : 0
Maximum VLANs supported locally : 1005
Number of existing VLANs   : 9
VTP Operating Mode         : Server
VTP Domain Name            : cisco1
VTP Pruning Mode           : Disabled
VTP V2 Mode                 : Disabled
VTP Traps Generation       : Disabled
```

```
Switch2#show vtp status
VTP Version                : 2
Configuration Revision     : 2
Maximum VLANs supported locally : 1005
Number of existing VLANs   : 42
VTP Operating Mode         : Server
```

```
VTP Domain Name           : cisco2
VTP Pruning Mode         : Disabled
VTP V2 Mode              : Disabled
VTP Traps Generation     : Disabled
```

```
Switch1#show interface fastethernet 1/0/23 trunk
```

```
Port      Mode      Encapsulation  Status      Native vlan
Fa1/0/23  auto     802.1q         not-trunking  1

Port      Vlans allowed on trunk
Fa1/0/23  1

Port      Vlans allowed and active in management domain
Fa1/0/23  1

Port      Vlans in spanning tree forwarding state and not pruned
Fa1/0/23  1
```

It is possible that you can also see this error message.

**Note:** Some of the switches do not show this error message.

```
4w2d: %DTP-SP-5-DOMAINMISMATCH: Unable to perform trunk negotiation on port Fa3/
3 because of VTP domain mismatch.
```

The solution for this issue is to manually force the trunking instead in order to rely on the DTP. Configure the trunk ports between the switches with the **switchport mode trunk** command.

```
Switch1(config)#interface fastethernet 1/0/23
switch1(config-if)#switchport mode trunk
```

```
Switch2(config)#interface fastethernet 3/3
switch2(config-if)#switchport mode trunk
```

```
switch1#show interface fastethernet 1/0/23 trunk
```

```
Port      Mode      Encapsulation  Status      Native vlan
Fa1/0/23  on       802.1q         trunking    1



Port      Vlans allowed on trunk
Fa1/0/23  1-4094

Port      Vlans allowed and active in management domain
Fa1/0/23  1-5

Port      Vlans in spanning tree forwarding state and not pruned
Fa1/0/23  1-5
```

## CatOS Switch Changes to VTP Transparent Mode, VTP-4-UNSUPPORTEDCFGRCVD:

A recent change in CatOS incorporated a protective feature that causes a CatOS switch to go into VTP transparent mode in order to prevent the possibility of a switch reset because of a watchdog timeout. This change is documented in these Cisco bug IDs:

- [CSCdu32627](#)  (registered customers only)
- [CSCdv77448](#)  (registered customers only)

## How Do I Determine If My Switch Might Be Affected?

The watchdog timeout can occur if these two conditions are met:

- The Token Ring VLAN (1003) is translated to VLAN 1.
- You make a change in VLAN 1.

Issue the **show vlan** command on the Catalyst in order to observe the Token Ring VLAN translation. This is an example of **show vlan** command output:

VLAN	Type	SAID	MTU	Parent	RingNo	BrdgNo	Stp	BrdgMode	Trans1	Trans2
1	enet	100001	1500	-	-	-	-	-	1003	

## How Does CatOS Version 6.3(3) Protect My Switch from a Watchdog Timeout?

There is a protective feature in order to prevent a watchdog timeout in this CatOS version. The Catalyst switch switches from VTP server or client to VTP transparent mode.

## How Do I Determine If My Switch Has Gone to VTP Transparent Mode in Order to Protect Against a Watchdog Timeout?

Your switch has gone to VTP transparent mode if the logging level for the VTP is raised to 4.

```
Console> (enable) set logging level vtp 4 default
```

You see this message when the switchover occurs:

```
VTP-4-UNSUPPORTEDCFGRCVD:Rcvd VTP advert with unsupported vlan config on trunk mod/port- VTP mode changed to transparent
```

## What Are the Negative Effects When the Switch Goes to VTP Transparent Mode?

- If pruning is enabled, the trunks go down.
- If the trunks go down and no other ports are in that VLAN, the VLAN interface in the installed Multilayer Switch Feature Card (MSFC) goes down.

If these effects occur, and this switch is in the core of your network, your network can be negatively affected.

## Where Does the Unsupported VTP Configuration Come From?

Any Cisco IOS Software-based switch, such as the switches in this list, can supply the unsupported VTP configuration:

- A Catalyst 2900/3500XL
- A Cisco IOS Software Catalyst 6500
- A Cisco IOS Software-based Catalyst 4000

These products translate the 1003 VLAN to VLAN 1 by default.

## What Is the Solution?

The solution in CatOS-based switches enables the switches to handle this translated information properly. The solution for the Cisco IOS Software-based switches is to remove this default translation and match the behavior of the CatOS-based switches. These are the integrated fixed versions that are currently available:

Catalyst Switch	Fixed Releases
CatOS switches	5.5(14) and later 6.3(6) and later 7.2(2) and later
Catalyst 4000 (Supervisor Engine III)	Not affected
Catalyst 6500 (Supervisor Engine Cisco IOS Software)	Cisco IOS Software Release 12.1(8a)EX and later
Catalyst 2900 and 3500XL	Cisco IOS Software Release 12.0(5)WC3 and later

If you cannot upgrade to images that have these fixes integrated, you can modify the configuration in the Cisco IOS Software–based switches. Use this procedure if the switch is a VTP server:

```

goss#vlan data

goss(vlan)#no vlan 1 tb-vlan1 tb-vlan2

Resetting translation bridge VLAN 1 to default
Resetting translation bridge VLAN 2 to default

goss(vlan)#no vlan 1003 tb-vlan1 tb-vlan2

Resetting translation bridge VLAN 1 to default
Resetting translation bridge VLAN 2 to default

goss(vlan)#apply

APPLY completed.

goss(vlan)#exit

APPLY completed.
Exiting...

```

The 1002 VLAN can be translated, but you can also remove it if you include this in your configuration:

```

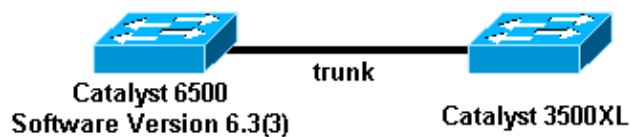
goss(vlan)#no vlan 1002 tb-vlan1 tb-vlan2

Resetting translation bridge VLAN 1 to default
Resetting translation bridge VLAN 2 to default

```

### When Exactly Does My Switch Change to VTP Transparent Mode?

Some confusion exists about when this switchover to VTP transparent mode occurs. The scenarios in this section provide examples of when the switchover can happen.



### • Example 1

These are the initial conditions:

- ◆ Both the Catalyst 6500 and the Catalyst 3500XL are VTP servers with the same VTP configuration revision number.
- ◆ Both servers have the same VTP domain name and the same VTP password, if the password is configured.
- ◆ The Catalyst 3500XL has the translated Token Ring VLAN.
- ◆ You start the servers while they are disconnected.

If you connect these two switches, the Catalyst 6500 goes to VTP transparent mode. Of course, this also happens if the Cisco 3500XL has a higher VTP configuration revision number than the Catalyst 6500 configuration revision number. Moreover, if the switch to VTP transparent mode occurs when you physically connect the two switches, you can reasonably assume that the change would also occur if you booted the Catalyst 6500 for the first time while the switch was already connected.

### • Example 2

These are the initial conditions:

- ◆ The Catalyst 6500 is a VTP server.
- ◆ The Catalyst 3500XL is a VTP client.
- ◆ The Catalyst 3500XL has a higher VTP configuration revision number than the Catalyst 6500 configuration revision number.
- ◆ Both switches have the same VTP domain and the same VTP password, if the password is configured.
- ◆ The Catalyst 3500XL has the translated Token Ring VLAN.
- ◆ You start the servers while they are disconnected.

If you connect these two switches, the Catalyst 6500 goes to VTP transparent mode. In this scenario, if the Catalyst 3500XL has a lower configuration revision number than the Catalyst 6500 configuration revision number, the Catalyst 6500 does not switch to VTP transparent mode. If the Catalyst 3500XL has the same configuration revision number, the Catalyst 6500 does not go to VTP transparent mode. However, the translation is still present in the Catalyst 3500XL.

## What Is the Quickest Way to Recover After I Notice the Translation in My Network?

Even if you correct the Token Ring VLAN information in one switch, such as the switch that malfunctioned, the information can propagate throughout your network. You can use the **show vlan** command in order to determine if this occurred. Therefore, the quickest way to recover is to perform these steps:

1. Take a Cisco IOS Software–based switch, such as a Catalyst XL that is connected to the network, and change the switch to a VTP server.
2. Remove the translated VLANs.
3. After you apply the change in the switch, reconnect the switch to the network.

The change should be propagated to all the other VTP servers and clients.

You can use the **show vlan** command in order to verify that the translation is gone in the network. At this point, you should be able to change the affected CatOS 6.3(3) switch back to a VTP server.

**Note:** The Catalyst XL switches do not support as many VLANs as the Catalyst 6500s support. Ensure that all the VLANs in the Catalyst 6500 exist in the Catalyst XL switch before you reconnect them. For example, you do not want to connect a Catalyst 3548XL with 254 VLANs and a higher VTP configuration revision number to a Catalyst 6500 that has 500 VLANs configured.

# How a Recently Inserted Switch Can Cause Network Problems

**Note:** Refer to the *Flash Animation: VTP* section of Understanding VLAN Trunk Protocol (VTP) in order to see a Flash demonstration of this problem.

This problem occurs when you have a large switched domain that is all in the same VTP domain, and you want to add one switch in the network.

This switch was previously used in the lab, and a good VTP domain name was entered. The switch was configured as a VTP client and was connected to the rest of the network. Then, you brought the ISL link up to the rest of the network. In just a few seconds, the whole network was down. How did this happen?

The configuration revision number of the switch that you inserted was higher than the configuration revision number of the VTP domain. Therefore, your recently introduced switch, with almost no configured VLANs, erased all VLANs through the VTP domain.

This occurs whether the switch is a VTP client or a VTP server. A VTP client can erase VLAN information on a VTP server. You can tell that this has occurred when many of the ports in your network go into inactive state but continue to be assigned to a nonexistent VLAN.

## Solution

Quickly reconfigure all of the VLANs on one of the VTP servers.

## What to Remember

Always make sure that the configuration revision number of all switches that you insert into the VTP domain is lower than the configuration revision number of the switches that are already in the VTP domain.

If you have the output of a **show tech-support** command from your Cisco device, you can use the Output Interpreter [🔗](#) (registered customers only) in order to display potential issues and fixes.

## Example

Complete these steps in order to see an example of this problem:

1. Issue these commands in order to see that clic has 7 VLANs (1, 2, 3, and the defaults), clic is the VTP server in the domain named test, and port 2/3 is in VLAN 3:

```
clic (enable) show vlan
```

```
1993 May 25 05:09:50 %PAGP-5-PORTTOSTP:Port 2/1 joined bridge port 2/1 lan
VLAN Name                               Status    IfIndex Mod/Ports, Vlans
-----
1    default                               active    65      2/2,2/4-50
2    VLAN0002                               active    70
3    VLAN0003                               active    71      2/3
1002 fddi-default                           active    66
1003 token-ring-default                   active    69
1004 fddinet-default                       active    67
1005 trnet-default                         active    68      68
```

```
clic (enable) show vtp domain
```

```
Domain Name                               Domain Index VTP Version Local Mode Password
-----
test                                       1             2             server      -
```

```

Vlan-count Max-vlan-storage Config Revision Notifications
-----
7          1023             0             disabled

```

```

Last Updater    V2 Mode  Pruning  PruneEligible on Vlans
-----
0.0.0.0         disabled disabled 2-1000

```

clic (enable) **show port 2/3**

```

Port  Name                Status    Vlan      Level  Duplex Speed Type
-----
2/3  connected 3             normal   10    half 10/100BaseTX

```

2. Connect bing, which is a lab switch on which VLANs 4, 5, and 6 were created.

**Note:** The configuration revision number is 3 in this switch.

bing (enable) **show vlan**

```

VLAN Name                Status    IfIndex Mod/Ports, Vlans
-----
1    default                active    4        2/1-48
                                     3/1-6
4    VLAN0004                active    63
5    VLAN0005                active    64
6    VLAN0006                active    65
1002 fddi-default            active    5
1003 token-ring-default    active    8
1004 fddinet-default       active    6
1005 trnet-default         active    7

```

3. Place bing in the same VTP domain (test).

bing (enable) **show vtp domain**

```

Domain Name                Domain Index VTP Version Local Mode Password
-----
test                        1            2            server    -

```

```

Vlan-count Max-vlan-storage Config Revision Notifications
-----
8          1023             3             disabled

```

```

Last Updater    V2 Mode  Pruning  PruneEligible on Vlans
-----
10.200.8.38     disabled disabled 2-1000

```

4. Configure the trunk between the two switches in order to integrate bing in the network.

Bing erased the clic VLAN, and now clic has VLANs 4, 5, and 6. However, clic no longer has VLANs 2 and 3, and port 2/3 is inactive.

clic (enable) **show vtp domain**

```

Domain Name                Domain Index VTP Version Local Mode Password
-----
test                        1            2            server    -

```

```

Vlan-count Max-vlan-storage Config Revision Notifications
-----
8          1023             3             disabled

```

```

Last Updater    V2 Mode  Pruning  PruneEligible on Vlans
-----
10.200.8.38     disabled disabled 2-1000

```

```
clic (enable)
```

```
clic (enable) show vlan
```

VLAN	Name	Status	IfIndex	Mod/Ports, Vlans
1	default	active	65	2/2,2/4-50
4	VLAN0004	active	72	
5	VLAN0005	active	73	
6	VLAN0006	active	74	
1002	fddi-default	active	66	
1003	token-ring-default	active	69	
1004	fdnet-default	active	67	
1005	trnet-default	active	68	68

```
clic (enable) show port 2/3
```

Port	Name	Status	Vlan	Level	Duplex	Speed	Type
2/3		inactive	3	normal	auto	auto	10/100BaseTX

## Recently Added Switch Does Not Get the VLANs From the VTP Server

Make sure that the newly added switch has a configuration revision number that is less than the current revision number of the domain. See the [How a Recently Inserted Switch Can Cause Network Problems and Reset the Configuration Revision Number](#) sections for more information.

The new switch might not immediately receive the list of configured VLANs from the VTP server. In order to overcome this, make any of these modifications to the VLAN database:

- Create any VLAN.
- Delete any VLAN.
- Modify the properties of any current VLAN.

Make modifications to the VLAN database at any VTP server of the same domain.

```
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 50

Switch(config-vlan)#name 50thVLAN

Switch(config-vlan)#end
Switch#
```

Once the modification is completed, the newly added switch receives the VLAN information from the VTP server.

## Reset the Configuration Revision Number

You can easily reset the configuration revision number by either of the two procedures provided in this section.

### Reset the Configuration Revision using Domain Name

Complete these steps in order to reset the configuration revision number with the change of the domain name:

1. Issue this command in order to see that the configuration is empty:

```
clic (enable) show vtp domain
```

```
Domain Name                Domain Index VTP Version Local Mode Password
-----
                            1             2             server      -

Vlan-count Max-vlan-storage Config Revision Notifications
-----
5           1023             0             disabled

Last Updater   V2 Mode   Pruning   PruneEligible on Vlans
-----
0.0.0.0       disabled disabled 2-1000
clic (enable)
```

2. Configure the domain name, which is **test** in this example, and create two VLANs.

The configuration revision number goes up to 2:

```
clic (enable) set vtp domain test
```

```
VTP domain test modified
```

```
clic (enable) set vlan 2
```

```
Vlan 2 configuration successful
```

```
clic (enable) set vlan 3
```

```
Vlan 3 configuration successful
```

```
clic (enable) show vtp domain
```

```
Domain Name                Domain Index VTP Version Local Mode Password
-----
test                        1             2             server      -

Vlan-count Max-vlan-storage Config Revision Notifications
-----
7           1023             2             disabled

Last Updater   V2 Mode   Pruning   PruneEligible on Vlans
-----
0.0.0.0       disabled disabled 2-1000
clic (enable)
```

3. Change the domain name from test to cisco.

The configuration revision number is back to 0, and all the VLANs are still present:

```
clic (enable) set vtp domain cisco
```

```
VTP domain cisco modified
```

```
clic (enable) show vtp domain
```

```
Domain Name                Domain Index VTP Version Local Mode Password
-----
cisco                      1             2             server      -

Vlan-count Max-vlan-storage Config Revision Notifications
-----
7           1023             0             disabled

Last Updater   V2 Mode   Pruning   PruneEligible on Vlans
-----
0.0.0.0       disabled disabled 2-1000
```

4. Change the VTP domain name from cisco back to test.

The configuration revision is 0. There is no risk that anything can be erased, and all the previously configured VLANs remain:

```
clic (enable) set vtp domain test

VTP domain test modified

clic (enable) show vtp domain

Domain Name                Domain Index VTP Version Local Mode Password
-----
test                        1            2            server      -

Vlan-count Max-vlan-storage Config Revision Notifications
-----
7           1023            0            disabled

Last Updater   V2 Mode   Pruning   PruneEligible on Vlans
-----
0.0.0.0        disabled disabled 2-1000
clic (enable)
```

## Reset the Configuration Revision using VTP Mode

Complete these steps in order to reset the configuration revision number with the change of the VTP mode:

1. Issue this command in order to see that the configuration is empty:

```
clic (enable) show vtp domain

Domain Name                Domain Index VTP Version Local Mode Password
-----
                                1            2            server      -

Vlan-count Max-vlan-storage Config Revision Notifications
-----
5           1023            0            disabled

Last Updater   V2 Mode   Pruning   PruneEligible on Vlans
-----
0.0.0.0        disabled disabled 2-1000
clic (enable)
```

2. Configure the domain name, which is **test** in this example, and create two VLANs.

The configuration revision number goes up to 2:

```
clic (enable) set vtp domain test

VTP domain test modified

clic (enable) set vlan 2

Vlan 2 configuration successful

clic (enable) set vlan 3

Vlan 3 configuration successful

clic (enable) show vtp domain

Domain Name                Domain Index VTP Version Local Mode Password
```

```

-----
test                1                2                server          -

Vlan-count Max-vlan-storage Config Revision Notifications
-----
7           1023           2                disabled

Last Updater    V2 Mode  Pruning  PruneEligible on Vlans
-----
0.0.0.0        disabled disabled 2-1000
clic (enable)

```

### 3. Change the VTP mode from server to transparent.

The configuration revision number is back to 0, and all the VLANs are still present:

```

clic (enable) set vtp mode transparent

VTP domain test modified

clic (enable) show vtp domain

Domain Name                Domain Index VTP Version Local Mode Password
-----
test                        1                2                transparent -

Vlan-count Max-vlan-storage Config Revision Notifications
-----
7           1023           0                disabled

Last Updater    V2 Mode  Pruning  PruneEligible on Vlans
-----
0.0.0.0        disabled disabled 2-1000

```

### 4. Change the VTP mode from transparent to server or client.

The configuration revision is 0. There is no risk that anything can be erased, and all the previously configured VLANs remain:

```

clic (enable) set vtp mode server

VTP domain test modified

clic (enable) show vtp domain

Domain Name                Domain Index VTP Version Local Mode Password
-----
test                        1                2                server          -

Vlan-count Max-vlan-storage Config Revision Notifications
-----
7           1023           0                disabled

Last Updater    V2 Mode  Pruning  PruneEligible on Vlans
-----
0.0.0.0        disabled disabled 2-1000
clic (enable)

```

## All Ports Inactive After Power Cycle

Switch ports move to the inactive state when they are members of VLANs that do not exist in the VLAN database. A common issue is that all the ports move to this inactive state after a power cycle. Generally, you see this when the switch is configured as a VTP client with the uplink trunk port on a VLAN other than VLAN 1. Because the switch is in VTP client mode, when the switch resets, it loses its VLAN database and

causes the uplink port and any other ports that were not members of VLAN 1 to go into inactive mode.

Complete these steps in order to solve this problem:

1. Temporarily change the VTP mode to transparent.

```
switch (enable) set vtp mode transparent
```

```
VTP domain austinlab modified  
switch (enable)
```

2. Add the VLAN to which the uplink port is assigned to the VLAN database.

**Note:** This example assumes that VLAN 3 is the VLAN that is assigned to the uplink port.

```
switch (enable) set vlan 3
```

```
VTP advertisements transmitting temporarily stopped,  
and will resume after the command finishes.  
Vlan 3 configuration successful  
switch (enable)
```

3. Change the VTP mode back to client after the uplink port begins forwarding.

```
switch (enable) set vtp mode client
```

```
VTP domain austinlab modified
```

After you complete these steps, VTP should re-populate the VLAN database from the VTP server. The re-population moves all ports that were members of VLANs that the VTP server advertised back into the active state.

## Trunk Down, which Causes VTP Problems

Remember that VTP packets are carried on VLAN 1, but only on trunks (ISL, dot1q, or LAN emulation [LANE]).

If you make VLAN changes during a time when you have a trunk down or when LANE connectivity is down between two parts of your network, you can lose your VLAN configuration. When the trunk connectivity is restored, the two sides of the network resynchronize. Therefore, the switch with the highest configuration revision number erases the VLAN configuration of the lowest configuration revision switch.

## VTP and STP (Logical Spanning Tree Port)

When you have a large VTP domain, you also have a large STP domain. VLAN 1 must span through the whole VTP domain. Therefore, one unique STP is run for that VLAN in the whole domain.

When VTP is used and a new VLAN is created, the VLAN is propagated through the entire VTP domain. The VLAN is then created in all switches in the VTP domain. All Cisco switches use PVST, which means that the switches run a separate STP for each VLAN. This adds to the CPU load of the switch. You must refer to the maximum number of logical ports (for the STP) that are supported on the switch in order to have an idea of the number of STPs that you can have on each switch. The number of logical ports is roughly the number of ports that run STP.

**Note:** A trunk port runs one instance of STP for each active VLAN on the trunk.

You can perform a rapid evaluation of this value for your switch with this formula:

(Number of active VLANs x Number of trunks) + Number of access ports

This number, which is the maximum number of logical ports for STP, varies from switch to switch and is documented in the release notes for each product. For example, on a Catalyst 5000 with Supervisor Engine 2, you can have a maximum of 1500 STP instances. Each time you create a new VLAN with VTP, the VLAN is propagated by default to all switches and is subsequently active on all ports. You might need to prune unnecessary VLANs from the trunk in order to avoid inflation of the number of logical ports.

**Note:** Pruning unnecessary VLANs from the trunk can be performed with one of two methods:

- **Manual pruning of the unnecessary VLAN on the trunk** This is the best method, and it avoids the use of the spanning tree. Instead, the method runs the pruned VLAN on trunks. The VTP Pruning section of this document describes manual pruning further.
- **VTP pruning** Avoid this method if the goal is to reduce the number of STP instances. VTP–pruned VLANs on a trunk are still part of the spanning tree. Therefore, VTP–pruned VLANs do not reduce the number of spanning tree port instances.

## VTP Pruning

VTP pruning increases the available bandwidth. VTP pruning restricts flooded traffic to those trunk links that the traffic must use in order to access the appropriate network devices. By default, VTP pruning is disabled. The enablement of VTP pruning on a VTP server enables pruning for the entire management domain. The **set vtp pruning enable** command prunes VLANs automatically and stops the inefficient flooding of frames where the frames are not needed. By default, VLANs 2 through 1000 are pruning eligible. VTP pruning does not prune traffic from pruning–ineligible VLANs. VLAN 1 is always pruning ineligible; traffic from VLAN 1 cannot be pruned.

**Note:** Unlike manual VLAN pruning, automatic pruning does not limit the spanning tree diameter.

All devices in the management domain must support VTP pruning in order for VTP pruning to be effective. On devices that do not support VTP pruning, you must manually configure the VLANs that are allowed on trunks. You can perform manual pruning of the VLAN from the trunk with the **clear trunk mod/port** command and the **clear trunk vlan\_list** command. For example, you can choose to only allow, on each trunk, a core switch to the VLANs that are actually needed. This helps to reduce the load on the CPUs of all switches (core switches and access switches) and avoids the use of STP for those VLANs that extend through the entire network. This pruning limits STP problems in the VLAN.

This is an example:

- **Topology** The topology is two core switches that are connected to each other, each with 80 trunk connections to 80 different access switches. With this design, each core switch has 81 trunks, and each access switch has two uplink trunks. This assumes that access switches have, in addition to the two uplinks, two or three trunks that go to a Catalyst 1900. This is a total of four to five trunks per access switch.
- **Platform** Core switches are Catalyst 6500s with Supervisor Engine 1A and Policy Feature Card 1 (PFC1) that run software release 5.5(7). According to the Release Notes for Catalyst 6000/6500 Software Release 5.x, this platform cannot have more than 4000 STP logical ports.
- **Access switches** Access switches are either:
  - ◆ Catalyst 5000 switches with Supervisor Engine 2, which do not support more than 1500 STP logical ports
  - ◆ Catalyst 5000 switches with Supervisor Engine 1 and 20 MB of DRAM, which do not support more than 400 STP logical ports
- **Number of VLANs** Remember to use VTP. A VLAN on the VTP server is created on all switches in

the network. If you have 100 VLANs, the core must handle roughly 100 VLANs x 81 trunks = 8100 logical ports, which is above the limit. The access switch must handle 100 VLANs x 5 trunks = 500 logical ports. In this case, Catalysts in the core exceed the supported number of logical ports, and access switches with Supervisor Engine 1 are also above the limit.

- **Solution** If you assume that only four or five VLANs are actually needed in each access switch, you can prune all the other VLANs from the trunk on the core layer. For example, if only VLANs 1, 10, 11, and 13 are needed on trunk 3/1 that goes to that access switch, the configuration on the core is:

```
Praha> (enable) set trunk 1/1 des

Port(s) 1/1 trunk mode set to desirable.

Praha> (enable) clear trunk 1/1 2-9,12,14-1005

Removing Vlan(s) 2-9,12,14-1005 from allowed list.
Port 1/1 allowed vlans modified to 1,10,11,13.

Praha> (enable) clear trunk 1/1 2-9,12,14-1005
```

**Note:** Even if you do not exceed the number of allowed logical ports, prune VLANs from a trunk. The reason is that an STP loop in one VLAN only extends where the VLAN is allowed and does not go through the entire campus. The broadcast in one VLAN does not reach the switch that does not need the broadcast. In releases that are earlier than software release 5.4, you cannot clear VLAN 1 from trunks. In later releases, you can clear VLAN 1 with this command:

```
Praha> (enable) clear trunk 1/1 1

Default vlan 1 cannot be cleared from module 1.
```

The Case of VLAN 1 section of this document discusses techniques on how to keep VLAN 1 from spanning the whole campus.

## VLANs are not pruned

If two switches, A and B, are connected with one port of Switch A, which is configured as trunk, and is connected to an IP phone, then the VTP joins the messages that pass from Switch A to Switch B. Therefore, Switch B is not able to prune the unused VLANs.

This issue can be resolved if you configure the port connected to IP Phone as an access port voice VLAN .

```
Switch#interface FastEthernet0/1
switchport access vlan <vlan number>
switchport voice vlan <vlan number>
```

## The Case of VLAN 1

You cannot apply VTP pruning to VLANs that need to exist everywhere and that need to be allowed on all switches in the campus, in order to be able to carry VTP, Cisco Discovery Protocol [CDP] traffic, and other control traffic. However, there is a way to limit the extent of VLAN 1. The feature is called VLAN 1 disable on trunk. The feature is available on Catalyst 4500/4000, 5500/5000, and 6500/6000 series switches in CatOS software release 5.4(x) and later. The feature allows you to prune VLAN 1 from a trunk, as you do for any other VLAN. This pruning does not include all the control protocol traffic that is still allowed on the trunk (DTP, PAGP, CDP, VTP, and others). However, the pruning does block all user traffic on that trunk. With this feature, you can keep the VLAN from spanning the entire campus. STP loops are limited in extent, even in VLAN 1. Configure VLAN 1 to be disabled, as you would configure other VLANs to be cleared from the trunk:

```

Console> (enable) set trunk 2/1 desirable

Port(s) 2/1 trunk mode set to desirable.

Console> (enable) clear trunk 2/1 1

Removing Vlan(s) 1 from allowed list.
Port 2/1 allowed vlans modified to 2-1005.

```

UDLD uses native VLAN in order to talk to the neighbor. So, in a trunk port, the native VLAN must not be pruned in order for UDLD to work properly.

## Troubleshoot VTP Configuration Revision Number Errors That Are Seen in the show vtp statistics Command Output

VTP is designed for an administrative environment in which the VLAN database for the domain is changed at only one switch at any one time. It assumes that the new revision propagates throughout the domain before another revision is made. If you change the database simultaneously on two different devices in the administrative domain, you can cause two different databases to be generated with the same revision number. These databases propagate and overwrite the existing information until they meet at an intermediate Catalyst switch on the network. This switch cannot accept either advertisement because the packets have the same revision number but a different MD5 value. When the switch detects this condition, the switch increments the No of config revision errors counter.

**Note:** The **show vtp statistics** command output in this section provides an example.

If you find that the VLAN information is not updated on a certain switch, or if you encounter other, similar problems, issue the **show vtp statistics** command. Determine if the count of VTP packets with configuration revision number errors is increasing:

```

Console> (enable) show vtp statistics

VTP statistics:
summary advts received      4690
subset  advts received      7
request advts received      0
summary advts transmitted   4397
subset  advts transmitted    8
request advts transmitted    0
No of config revision errors 5
No of config digest errors   0
VTP pruning statistics:
Trunk      Join Transmitted  Join Received  Summary advts received from
-----  -----  -----  -----
non-pruning-capable device
1/1      0          0          0
1/2      0          0          0
Console> (enable)

```

If you observe a configuration revision error, you can resolve this problem if you change the VLAN database in some way so that a VTP database with a higher revision number than the revision number of the competing databases is created. For example, on the switch that acts as the primary VTP server, add or delete a false VLAN in the administrative domain. This updated revision is propagated throughout the domain and overwrites the database at all devices. When all the devices in the domain advertise an identical database, the error no longer appears.

## Troubleshoot VTP Configuration Digest Errors That Are Seen in the show vtp statistics Command Output

This section addresses how to troubleshoot VTP configuration digest errors that you see when you issue the `show vtp statistics` command. This is an example:

```
Console> (enable) show vtp statistics

VTP statistics:
summary advts received      3240
subset advts received       4
request advts received      0
summary advts transmitted   3190
subset advts transmitted    5
request advts transmitted   0
No of config revision errors 0
No of config digest errors 2
VTP pruning statistics:
Trunk      Join Transmitted  Join Received  Summary advts received from
-----  -
1/1        0                0              0
1/2        0                0              0
Console> (enable)
```

The general purpose of an MD5 value is to verify the integrity of a received packet and to detect any changes to the packet or corruption of the packet during transit. When a switch detects a new revision number that is different from the currently stored value, the switch sends a request message to the VTP server and requests the VTP subsets. A subset advertisement contains a list of VLAN information. The switch calculates the MD5 value for the subset advertisements and compares the value to the MD5 value of the VTP summary advertisement. If the two values are different, the switch increases the `No of config digest errors` counter.

A common reason for these digest errors is that the VTP password is not configured consistently on all VTP servers in the VTP domain. Troubleshoot these errors as a misconfiguration or data corruption issue.

When you troubleshoot this problem, ensure that the error counter is not historical. The statistics menu counts errors since the most recent device reset or the VTP statistics reset.

## Unable to Change the VTP Mode of a Switch from Server / Transparent

If the switch is a standalone (that is, not connected to the network), and you want to configure the VTP mode as the client, after reboot, the switch comes up either as a VTP server or VTP transparent, dependent upon the VTP mode of the switch before it was configured as the VTP client. The switch does not allow itself to be configured as a VTP client when there is no VTP server nearby.

## OSPF Hellos Blocked in a VTP Domain

Open Shortest Path First (OSPF) Hellos can get blocked and the adjacency can be dropped if a switch in the VTP domain is changed from the server or client mode to transparent mode. This issue can occur if VTP pruning is enabled in the domain.

Use any of these options in order to resolve the issue:

- Hard code the OSPF neighbors.
- Disable VTP pruning in the domain.

- Revert the VTP mode of the switch to server or client.

## SW\_VLAN-4-VTP\_USER\_NOTIFICATION

This section talks about the commonly occurring variants of this error message:

```
%SW_VLAN-4-VTP_USER_NOTIFICATION : VTP protocol user notification: [chars]
```

### **%SW\_VLAN-4-VTP\_USER\_NOTIFICATION: VTP protocol user notification: Version 1 device detected on [int] after grace period has ended**

By default, the VLAN Trunking Protocol (VTP) Version on Cisco switches is Version 2 and is compatible with Version 1. This message is just a notification that indicates that there is a switch connected on port Gig0/10 that runs VTP Version 1. Everything continues to work fine, unless you run IPX, and there is nothing harmful for the switch.

In order to resolve this issue, change the VTP version with these commands.

For Cisco IOS switches, use these commands:

```
Switch#vlan database
Switch(vlan)#vtp v2-mode
```

For CatOS switches, use this command:

```
Console> (enable) set vtp version 2 enable
```

### **%SW\_VLAN-SP-4-VTP\_USER\_NOTIFICATION: VTP protocol user notification: MD5 digest checksum mismatch on receipt of equal revision summary on trunk: [int]**

In order to know more the cause and to resolve the issue, see the Troubleshoot VTP Configuration Digest Errors That Are Seen in the show vtp statistics Command Output section.

### **%SW\_VLAN-4-VTP\_USER\_NOTIFICATION: VTP protocol user notification: Error detected in VTP Revision Number for VTP Domain Index [dec]**

In order to know more the cause and to resolve the issue, see the Troubleshoot VTP Configuration Revision Number Errors That Are Seen in the show vtp statistics Command Output section.

## Single Switchport Trunk That Allowed the vlan command Appears as Multiple Commands in the show running-config command Output

When the number of allowed VLANs extends past a certain number of characters, which is the default terminal width, the **show running-config** command wraps the line and adds the **switchport trunk allowed vlan add** command to the line. This is the way Cisco IOS handles long lists in the **switchport trunk allowed vlan** command.

```
Switch#configure terminal
Switch(config)#int fa3/30
Switch(config-if)#switchport trunk allowed vlan 14, 105, 110, 115, 120, 125, 130-132,
140, 150, 155, 200, 210, 220, 222, 230, 232, 240, 301-309, 840, 860-862, 870, 880,
881, 884-886, 889, 896, 898, 411, 412, 413, 421
```

```
!--- The previous command should be in a single line.
It has been wrapped into three lines for proper formatting.
```

The output of **show running-config** looks similar to this:

```
Switch#show running-config | begin 3/30
interface FastEthernet3/30
  switchport
  switchport trunk allowed vlan 14,105,110,115,120,125,130-132,140,150,155,200
  switchport trunk allowed vlan add 210,220,222,230,232,240,301-309,411-413,421
  switchport trunk allowed vlan add 840,860-862,870,880,881,884-886,889,896,898
!

!--- rest of output elided
```

You can also notice that the VLAN list has been order in ascending order and displayed in the output.

Remove VLAN 1 from the allowed list so you can disable VLAN 1 on any individual VLAN trunk port in order to reduce the risk of spanning-tree loops or storms. When you remove VLAN 1 from a trunk port, the interface continues to send and receive management traffic, for example, Cisco Discovery Protocol (CDP), Port Aggregation Protocol (PAgP), Link Aggregation Control Protocol (LACP), Dynamic Trunking Protocol (DTP), and VLAN Trunking Protocol (VTP) in VLAN 1.

The **no** form of the **allowed vlan** command resets the list to the default list, which allows all VLANs.

## Internal VLAN Usage

All packets sent to the EARL must be prefixed by a VLAN ID, because that is the packet format the EARL expects. Routed ports do not have a visible VLAN ID since one is not explicitly configured, so the switch borrows a VLAN from the pool of 4096 that it has. You can instruct the Catalyst 6500 series switch to start to borrow VLANs from the top, and descend from 4096, or from bottom, and ascend from 1006, with the use the global config mode **vlan allocation policy** command.

```
Switch(config)#vlan internal allocation policy {ascending | descending}
```

Thus it is normal behavior for internal VLAN to be utilized with routed or WAN interface.

---

## Related Information

- [LAN Product Support](#)
- [LAN Switching Technology Support](#)
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