

802.1Q VLAN User's Guide

NOTICE

Cabletron Systems reserves the right to make changes in specifications and other information contained in this document without prior notice. The reader should in all cases consult Cabletron Systems to determine whether any such changes have been made.

The hardware, firmware, or software described in this manual is subject to change without notice.

IN NO EVENT SHALL CABLETRON SYSTEMS BE LIABLE FOR ANY INCIDENTAL, INDIRECT, SPECIAL, OR CONSEQUENTIAL DAMAGES WHATSOEVER (INCLUDING BUT NOT LIMITED TO LOST PROFITS) ARISING OUT OF OR RELATED TO THIS MANUAL OR THE INFORMATION CONTAINED IN IT, EVEN IF CABLETRON SYSTEMS HAS BEEN ADVISED OF, KNOWN, OR SHOULD HAVE KNOWN, THE POSSIBILITY OF SUCH DAMAGES.

© Copyright 1998 by Cabletron Systems, Inc., P.O. Box 5005, Rochester, NH 03866-5005
All Rights Reserved
Printed in the United States of America

Order Number: 9032664 November 1998

Cabletron Systems is a registered trademark of Cabletron Systems, Inc.

All other product names mentioned in this manual may be trademarks or registered trademarks of their respective companies.

CONTENTS

FIGURES v
PREFACE..... vii

CHAPTER 1 VIRTUAL LOCAL AREA NETWORKS

1.1	Defining VLANs	1-1
1.2	Types of VLANs.....	1-3
1.2.1	802.1Q VLANs.....	1-3
1.2.2	Other VLAN Strategies	1-3
1.3	Benefits and Restrictions.....	1-3
1.4	VLAN Terms.....	1-4

CHAPTER 2 VLAN OPERATION

2.1	Description.....	2-1
2.2	VLAN Components.....	2-1
2.3	Configuration Process	2-2
2.3.1	Defining a VLAN	2-2
2.3.2	Assigning Ports to a VLAN	2-2
2.3.3	Customizing the VLAN Forwarding List	2-3
2.4	VLAN Switch Operation.....	2-3
2.4.1	Receiving Frames from VLAN Ports.....	2-4
2.4.2	Forwarding Decisions	2-5
	2.4.2.1 Broadcasts, Multicasts, and Unknown Unicasts.....	2-5
	2.4.2.2 Known Unicasts.....	2-5

CHAPTER 3 VLAN CONFIGURATION

3.1	Managing the Switch	3-1
3.1.1	Switch Without VLANs	3-1
3.1.2	Switch with VLANs.....	3-2
3.2	Summary of VLAN Local Management	3-4
3.2.1	Preparing for VLAN Configuration	3-4
3.3	802.1Q VLAN Configuration Menu Screen.....	3-5
3.4	Device/VLAN Configuration Screen	3-8
3.4.1	Defining a VLAN	3-10

3.4.2	Changing the VLAN to FID Association	3-11
3.4.3	Renaming a VLAN.....	3-11
3.4.4	Deleting a VLAN.....	3-12
3.4.5	Enabling VLANs	3-12
3.4.6	Disabling VLANs	3-13
3.4.7	Changing the Forwarding Mode.....	3-13
3.4.8	Paging Through the VLAN List.....	3-14
3.5	Port Assignment Configuration Screen.....	3-14
3.5.1	Changing the Port Mode	3-16
3.5.2	Assigning a VLAN ID.....	3-17
3.5.3	Paging Through the Port List.....	3-18
3.6	Port Filtering Configuration Screen.....	3-18
3.6.1	Displaying VLAN IDs Associated with a Port	3-20
3.6.2	Selecting the Type of Filtering for a Port.....	3-21
3.7	VLAN Forwarding Configuration Screen.....	3-21
3.7.1	Viewing Current VLAN Ports	3-23
3.7.2	Paging Through VLAN Forwarding List Entries.....	3-23
3.7.3	Adding Forwarding List Entries	3-24
3.7.4	Deleting Forwarding List Entries	3-24
3.7.5	Changing the Frame Format	3-25
3.8	Quick VLAN Walkthrough	3-25

CHAPTER 4 EXAMPLES

4.1	Example 1	4-1
4.1.1	Solving the Problem	4-2
4.1.2	Frame Handling.....	4-3
4.2	Example 2	4-4
4.2.1	Solving the Problem	4-5
4.2.2	Frame Handling.....	4-7
4.3	Example 3	4-11
4.3.1	Solving the Problem	4-12
4.3.2	Frame Handling.....	4-13

FIGURES

1-1	Example of a VLAN	1-2
2-1	Inside the Switch	2-4
3-1	Switch Management Without VLANs	3-1
3-2	Switch Management with VLANs	3-2
3-3	802.1Q VLAN Screen Hierarchy	3-4
3-4	802.1Q VLAN Configuration Menu Screen	3-6
3-5	Device/VLAN Configuration Screen	3-8
3-6	Port Assignment Configuration Screen	3-15
3-7	Port Filtering Configuration Screen	3-19
3-8	VLAN Forwarding Configuration Screen	3-22
3-9	Walkthrough Stage One	3-27
3-10	Walkthrough Stage Two	3-28
3-11	Walkthrough Stage Three	3-29
3-12	Walkthrough Stage Four	3-30
3-13	Final Walkthrough Stage	3-32
4-1	Example 1	4-1
4-2	Switch Configured for VLANs.....	4-3
4-3	Example 2	4-5
4-4	Bridge 1 Broadcasts Frames.....	4-8
4-5	Transmitting to Switch 4.....	4-9
4-6	Transmitting to Bridge 4	4-10
4-7	Example 3	4-11
4-8	Bridge 1 Broadcasts Frames.....	4-14
4-9	Switch 2 Forwards to 1Q Trunk.....	4-15
4-10	Switch 1 Forwards to 1D Trunk.....	4-15

PREFACE

Welcome to DIGITAL's *802.1Q VLAN User's Guide*. This guide introduces and describes DIGITAL's implementation of the IEEE 802.1Q draft standard for 802.1Q Virtual Local Area Network (VLAN) technology, and the VLAN Local Management screens used to configure DIGITAL's products used in 802.1Q VLAN environments.

USING THIS GUIDE

This guide serves as a supplement to the Local Management chapter of the DIGITAL's user's guides for devices that support 802.1Q VLANs. Read Chapter 1 and Chapter 2 first to gain an understanding of VLANs, the associated terminology, and the process for configuring VLANs on a switch. Look at the examples in Chapter 4 to see how VLANs can be created and changed using the existing network infrastructure in a building and how the switch handles the frames while they make their way through the networks shown in the examples. Chapter 3 describes the VLAN Local Management screens and provides a quick walkthrough on how to use them to configure VLANs in a switch.

STRUCTURE OF THIS GUIDE

This guide is organized as follows:

Chapter 1, **Virtual Local Area Networks**, presents the basic concepts of VLANs, including their benefits and uses. This chapter also provides information about how to obtain additional help if needed.

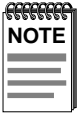
Chapter 2, **VLAN Operation**, describes the operation of an 802.1Q VLAN, the steps necessary to prepare an 802.1Q VLAN aware switch for VLAN operation, and examines the operation of an 802.1Q VLAN switch.

Chapter 3, **VLAN Configuration**, describes how to set up the switch for local and remote management, shows the Local Management screens used in 802.1Q VLAN configuration and explains their use.

Chapter 4, **Examples**, offers examples of 802.1Q VLANs and explains how network transmissions are treated by the components of each VLAN.

DOCUMENT CONVENTIONS

The following conventions are used throughout this document:



Note symbol. Calls the reader's attention to any item of information that may be of special importance.

In Local Management sections, **Bold type** indicates fields, field values, and commands that can be highlighted or selected by the user.

In Local Management sections, keystrokes are shown in UPPERCASE.

Italic type denotes complete book titles.

CORRESPONDENCE

Documentation Comments

If you have comments or suggestions about this manual, sent them to DIGITAL Network Products:

Attn.:	Documentation Project Manager
E-MAIL:	doc_quality@lkg.mts.dec.com

World Wide Web

To locate product-specific information, refer to the DIGITAL Network products Home Page on the World Wide Web at the following locations:

North America:	http://www.networks.digital.com
Europe:	http://www.networks.europe.digital.com
Asia Pacific:	http://www.networks.digital.com.au

GETTING HELP

Contact your DIGITAL representative for technical support. Before calling, have the following information ready:

- A description of the failure

- A description of any action(s) already taken to resolve the problem (e.g., changing mode switches, rebooting the unit, etc.)
- A description of your network environment (layout, cable type, etc.)
- Network load and frame size at the time of trouble (if known)
- The device history (i.e., have you returned the device before, is this a recurring problem, etc.)

CHAPTER 1

VIRTUAL LOCAL AREA NETWORKS

This chapter introduces the concepts of Virtual Local Area Networks (VLANs) and discusses the central concepts of IEEE 802.1Q VLANs. This chapter also contains information on how to contact DIGITAL for additional support related to VLANs.

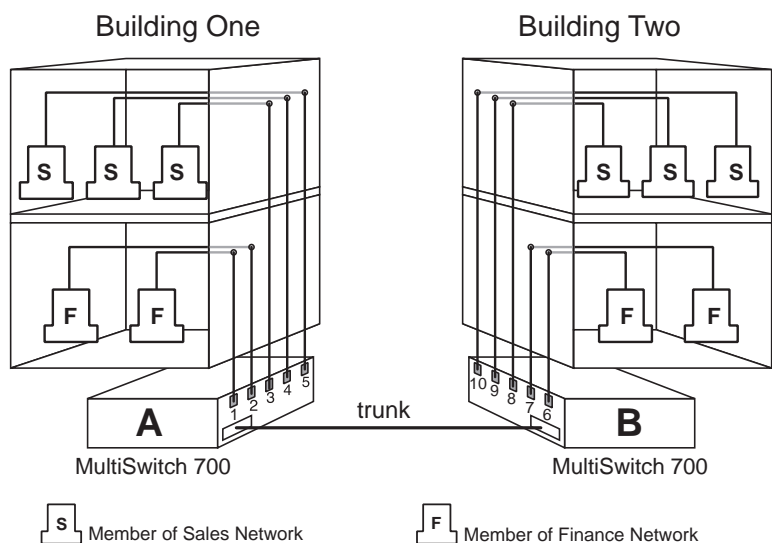
1.1 DEFINING VLANs

A Virtual Local Area Network is a group of devices that function as a single Local Area Network segment (broadcast domain). The devices that make up a particular VLAN may be widely separated, both by geography and location in the network.

The creation of VLANs allows users located in separate areas or connected to separate ports to belong to a single VLAN group. Users that are assigned to such a group will send and receive broadcast and multicast traffic as though they were all connected to a common network. VLAN aware switches isolate broadcast, multicast, and unknown traffic received from VLAN groups, so that traffic from stations in a VLAN are confined to that VLAN.

When stations are assigned to a VLAN, the performance of their network connection is not changed. Stations connected to switched ports do not sacrifice the performance of the dedicated switched link to participate in the VLAN. As a VLAN is not a physical location, but a membership, the network switches determine VLAN membership by associating a VLAN with a particular port.

Figure 1-1 shows a simple example of a port based VLAN. Two buildings house the Sales and Finance departments of a single company, and each building has its own internal network. The stations in each building connect to a MultiSwitch 700 in the basement. The two MultiSwitch 700s are connected to one another with a high speed link.



2664-01

Figure 1-1 Example of a VLAN

In this example, the Sales and Finance workstations have been placed on two separate VLANs. In a plain Ethernet environment, the entire network is a broadcast domain, and the MultiSwitch 700s follow the IEEE 802.1D bridging specification to send data between stations. A broadcast or multicast transmission from a Sales workstation in Building One would propagate to all the switch ports on MultiSwitch 700 A, cross the high speed link to MultiSwitch 700 B, and be propagated to all the switch ports on MultiSwitch 700 B. The MultiSwitch 700s treat each port as being equivalent to any other port, and have no understanding of the departmental memberships of each workstation.

In a VLAN environment, each MultiSwitch 700 understands that certain individual ports are members of separate workgroups. In this environment, a broadcast or multicast data transmission from one of the Sales stations in Building One would reach MultiSwitch 700 A, be sent to the ports connected to other local members of the Sales VLAN, cross the high speed link to MultiSwitch 700 B, and then be sent to any other ports and workstations on MultiSwitch 700 B that are members of the Sales VLAN.

1.2 TYPES OF VLANs

There are a number of different strategies for creating Virtual Local Area Networks, each with their own approaches to defining a station's membership in a particular VLAN.

1.2.1 802.1Q VLANs

An 802.1Q VLAN switch determines the membership of a data frame by examining the configuration of the port that received the transmission or reading a portion of the data frame's tag header. A two-byte field in the header is used to identify the VLAN. This VLAN identification indicates what VLAN the frame belongs to. If the frame has no tag header, the switch checks the VLAN setting of the port that received the frame. If the switch has been configured for port based VLAN support, it assigns the port's VLAN identification to the new frame.

1.2.2 Other VLAN Strategies

VLANs may also be created by a variety of addressing schemes, including the recognition of groups of MAC addresses or types of traffic. One of the best-known VLAN-like schemes is the use of IP Subnets to divide networks into smaller subnetworks.

1.3 BENEFITS AND RESTRICTIONS

The primary benefit of the 802.1Q VLAN technology is that it provides localization of traffic. This function also offers improvements in security and performance to stations assigned to a VLAN.

While the localization of traffic to VLANs can improve security and performance, it imposes some restrictions on network devices that participate in the VLAN. Through the use of Filtering Database ID's

(FIDs) security can be implemented to enable or prevent users from one or more VLANs from communicating with each other.

One or more VLANs can be assigned to a FID so that all the users that are members of the VLANs of a FID can communicate with each other regardless of their VLAN affiliation. However, for the sake of security, the members of one FID cannot communicate with the members of another FID.

In order to set up a VLAN, all the network switch devices that are assigned to the VLAN must support the draft standard IEEE 802.1Q specification for VLANs. Before you attempt to implement a VLAN strategy, ensure that the switches under consideration support the IEEE 802.1Q specification.

1.4 VLAN TERMS

To fully understand the operation and configuration of port based VLANs, it is essential to understand the definitions of several key terms.

VLAN ID

A unique number (between 1 and 4094) that identifies a particular VLAN.

VLAN Name

A 32-character alphanumeric name associated with a VLAN ID. The VLAN Name is intended to make user-defined VLANs easier to identify and remember.

Filtering Database ID (FID)

Addressing information that the device learns about a VLAN is stored in the filtering database assigned to that VLAN. Several VLANs can be assigned to the same FID to allow those VLANs to share addressing information. This enables the devices in the different VLANs to communicate with each other when the individual ports have been configured to allow communication to occur. The configuration is accomplished using the Local Management VLAN Forwarding

Configuration screen. By default a VLAN is assigned to the FID that matches its VLAN ID.

Tag Header (VLAN Tag)

Four bytes of data inserted in a frame that identifies the VLAN/frame classification. The Tag Header is inserted into the frame directly after the Source MAC address field. Twelve bits of the Tag Header represent the VLAN ID. The remaining bits are other control information.

Tagged Frame

A data frame that contains a Tag Header. A VLAN aware device can add the Tag Header to any frame it transmits.

Untagged Frame

A data frame that does not have a Tag Header.

Port VLAN ID (PVID)

Identifies the VLAN into which untagged frames are classified according to a specific port. For example, an untagged frame received by a port that is a member of VLAN A would be classified as belonging to VLAN A.

Default VLAN

The VLAN to which all ports are assigned upon initialization. The Default VLAN has a VLAN ID of 1 and cannot be deleted or renamed.

Forwarding List

A list of the ports on a particular device that are eligible to transmit frames for a selected VLAN.

Port VLAN List

A per port list of all eligible VLANs whose frames can be forwarded out one specific port and the frame format (tagged or untagged) of transmissions for that port. The Port VLAN List specifies what VLANs are associated with a single port for frame transmission purposes.

Filtering Database

A database structure within the switch that keeps track of the associations between MAC addresses, VLANs, and interface (port) numbers. The Filtering Database is referred to when a VLAN aware switch makes a forwarding decision on a frame.

1Q Trunk

A connection between 802.1Q switches that passes only traffic with a VLAN Tag Header inserted in the frame. By default, a port designated as

a 1Q Trunk port has all VLANs in its Port VLAN List and is configured to transmit all frames as tagged frames. A 1Q Trunk drops all incoming frames that do not have a VLAN tag.

1D Trunk

A connection from a switch that passes only untagged traffic. By default, a port designated as a 1D Trunk port has all VLANs on its Port VLAN List and is configured to transmit all frames as untagged frames.

CHAPTER 2

VLAN OPERATION

This chapter describes the operation of a VLAN switch and discusses the operations that a VLAN switch performs in response to both normal and VLAN-originated network traffic.

2.1 DESCRIPTION

The 802.1Q VLAN operation is slightly different than the operation of traditional switched networking systems. These differences are due to the importance of keeping track of each frame and its VLAN association as it passes from switch to switch or from port to port within a switch.

2.2 VLAN COMPONENTS

Before describing the operation of an 802.1Q VLAN, it is important to understand the basic elements that are combined to make up an 802.1Q VLAN.

Stations

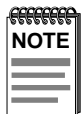
A station is any end unit that belongs to a network. In the vast majority of cases, stations are the computers through which the users access the network.

Switches

In order to configure a group of stations into a VLAN, the stations must be connected to VLAN aware switches. It is the job of the switch to classify received frames into VLAN memberships and transmit frames, according to VLAN membership, with or without a VLAN Tag Header.

2.3 CONFIGURATION PROCESS

A VLAN requires a series of configuration steps in order to begin operating. DIGITAL's VLAN aware MultiSwitch 700s default to operate in the 802.1Q VLAN mode. However, further configuration is necessary to establish multiple logical networks.



The actual steps involved in VLAN configuration using Local Management are presented in Chapter 3, **VLAN Configuration**. This brief section describes the actions that must be taken in very general terms, and is intended only to aid in the Administrator's understanding of VLAN switch operation.

2.3.1 Defining a VLAN

A VLAN must exist and have a unique identity before any ports or rules can be assigned to it. The Administrator defines a VLAN by assigning it a unique identification number (the VLAN ID), a filter database association, and an optional name. The VLAN ID is the number that will identify data frames originating from, and intended for, the ports that will belong to this new VLAN.

2.3.2 Assigning Ports to a VLAN

Now that a VLAN has been created, individual ports are given membership in the VLAN. This is accomplished through management by associating a VLAN ID with each port on the switch. This combination of the switch port's identification and the VLAN ID becomes the Port VLAN ID (PVID).

At the same time, the Administrator configures any needed trunk ports to consider themselves members of every VLAN. The configuration of trunk ports is very important in multiswitch VLAN configurations where a frame's VLAN membership needs to be maintained across several switches.

2.3.3 Customizing the VLAN Forwarding List

Once the ports that will participate in the VLAN have been associated with a VLAN ID (PVID), the VLAN Forwarding List can be customized. By assigning a PVID to a port, that port is automatically placed in the VLAN Forwarding List with a frame type of untagged. The information in the Forwarding List tells the VLAN aware switch what ports are eligible to forward traffic for that particular VLAN.

2.4 VLAN SWITCH OPERATION

IEEE 802.1Q VLAN switches act on the classification of frames into VLANs. Sometimes, VLAN classification is based on tags in the headers of data frames. These VLAN tags are added to data frames by the switch as the frames are transmitted out certain ports, and are later used to make forwarding decisions by the switch and other VLAN aware switches. In the absence of a VLAN tag header, the classification of a frame into a particular VLAN depends upon the configuration of the switch port that received the frame.

The operation of an 802.1Q VLAN switch is best understood from a point of view of the switch itself. To illustrate this concept, the examples that follow view the switch operations from *inside* the switch.

Figure 2-1 depicts the inside of a switch with six ports, numbered one through six. The switch has been configured to associate VLAN A and B with FID 2, VLAN C and D with FID 3, and VLAN E with FID 4. Port 6 has been classified as a 1Q Trunk Port. This classification establishes that all VLANs are members of the Port VLAN List for Port 6 and the frames transmitted for all VLANs will contain a tag header. Also the PVID for Port 6 is set to the default VLAN with its corresponding relationship to FID 1. Although untagged frames are not usually present on a 1Q Trunk Port, any untagged frames received would need to be classified if the port has not been configured to drop all untagged frames.

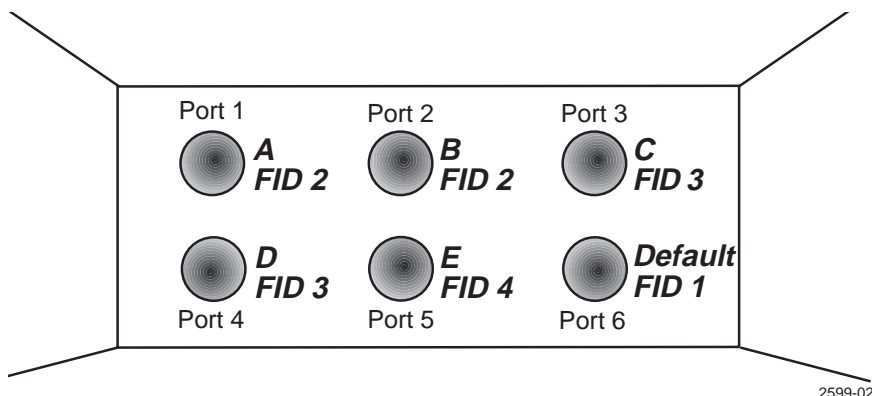


Figure 2-1 Inside the Switch

2.4.1 Receiving Frames from VLAN Ports

When a switch is placed in 802.1Q Operational Mode, every frame received by the switch must belong, or be assigned, to a VLAN.

Untagged Frames

The switch receives a frame from Port 1 and examines the frame. The switch notices that this frame does not currently have a VLAN tag. The switch recognizes that Port 1 is a member of VLAN A and classifies the frame as such. In this fashion, all untagged frames entering a VLAN switch assume membership in a VLAN.



A VLAN ID is always assigned to a port. By default, it is the Default VLAN (VLAN ID = 1).

The switch will now make a forwarding decision on the frame, as described in Section 2.4.2, **Forwarding Decisions**.

Tagged Frames

In this example, the switch receives a tagged frame from Port 4. The switch examines the frame and notices the frame is tagged for VLAN C. This frame may have already been through a VLAN aware switch, or originated from a station capable of specifying a VLAN membership. If a switch receives a frame containing a tag, the switch will classify the frame in regard to its tag rather than the PVID for its port.

The switch will now make a forwarding decision on the frame, as described in Section 2.4.2, **Forwarding Decisions**.

2.4.2 Forwarding Decisions

The type of frame under consideration and the filter setting of a VLAN switch determines how it forwards VLAN frames.

2.4.2.1 Broadcasts, Multicasts, and Unknown Unicasts

If a frame with a broadcast, multicast, or other unknown address is received by an 802.1Q VLAN aware switch, the switch checks the VLAN classification of the frame. The switch then forwards the frame out all ports that are identified in the Forwarding List for that VLAN. For example, if Port 3, shown in Figure 2-1, received the frame, the frame would then be sent to all ports that had VLAN C in their Port VLAN List.

2.4.2.2 Known Unicasts

When a VLAN switch receives a frame with a known MAC address as its destination address, the action taken by the switch to determine how the frame is transmitted depends on the VLAN, the VLAN associated FID, and if the port identified to send the frame is enabled to do so.

When a frame is received it is classified into a VLAN. The destination address is looked up in the FID associated with the VLAN. If a match is found, it is forwarded out the port identified in the lookup if, and only if, that port is allowed to transmit frames for that VLAN. If a match is not found, then the frame is flooded out all ports that are allowed to transmit frames belonging to that VLAN.

For example, assume that a frame is received by the switch depicted in Figure 2-1. This frame is a unicast untagged frame received on Port 3. The frame is then classified for VLAN C. The switch then makes its forwarding decision by comparing the destination MAC address to its filtering database. In this case, the MAC address is looked up in the filtering database FID 3, which is associated with VLAN C and VLAN D. The switch recognizes the destination MAC address of the frame as being located out Port 4.

Having made the forwarding decision, the switch now examines the Port VLAN List of Port 4 to determine if it may transmit a frame belonging to VLAN C. If so, the frame is transmitted out Port 4. If Port 4 has not been configured to transmit frames belonging to VLAN C, the frame is discarded.

CHAPTER 3

VLAN CONFIGURATION

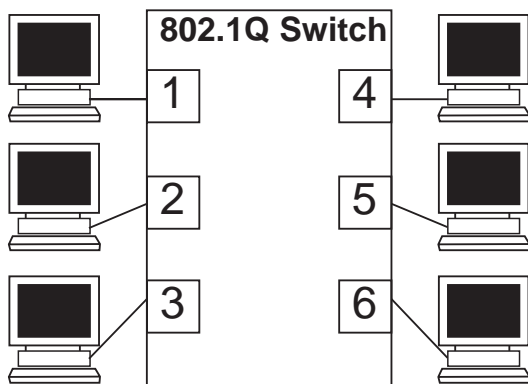
This chapter describes how to set up the switch for local or remote management, and the VLAN Local Management screens used to create and configure VLANs in a MultiSwitch 700.

3.1 MANAGING THE SWITCH

The switch may be managed locally via a terminal connected to the COM port, or remotely (SNMP or Telnet sessions) from a management station connected to a switch port that is a member of the same VLAN as the switch's Host Data Port. (By default, this is the default VLAN.) When the switch is configured with VLANs, special precautions must be taken to use remote management.

3.1.1 Switch Without VLANs

When the switch is powered up, the switch uses its default settings to switch frames like an 802.1D switch. In this default configuration any switch port can be used to remotely manage the device as shown in Figure 3-1.



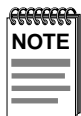
Any station may be used as the management station.

2599_14

Figure 3-1 Switch Management Without VLANs

3.1.2 Switch with VLANs

If the switch is to be configured for multiple VLANs, it may be desirable to configure a management-only VLAN. This allows a management station connected to the management VLAN to manage all ports on the switch and make management secure by preventing management via ports assigned to other VLANs.



The switch's virtual Host Data Port, like any other port, has configurable VLAN membership. For manageability of the device to be maintained, this port must be a member of the same VLAN as the port to which the management station is connected.

Figure 3-2 shows an example of a switch configured with port 1 on the Management VLAN port and the other users belonging to VLANs A, B, and C.

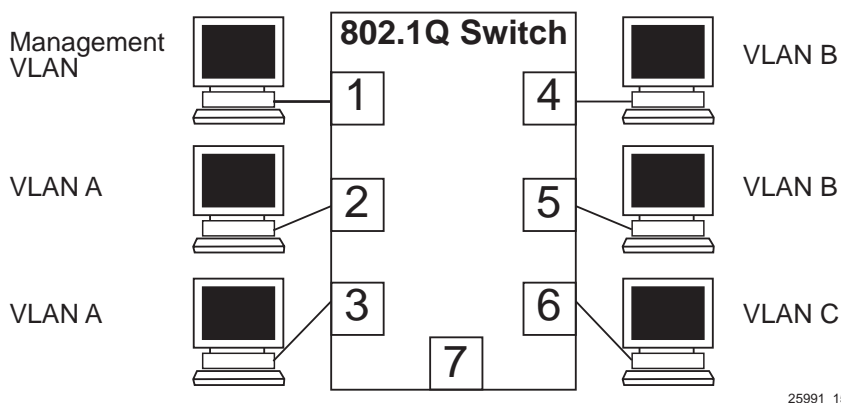


Figure 3-2 Switch Management with VLANs

To set up the switch shown in Figure 3-2 to establish a management VLAN on port 1, use the process described below:

1. Use the Device/VLAN Configuration screen for the following:
 - a. Define a new VLAN named “Management VLAN” (or other suitable name) and its VLAN ID. In this example, the VLAN ID is set to 2.

- b.** Set the FID so the Management VLAN has its own number to make the VLAN secure. In this example, the FID is 3 and no other VLAN should be assigned to this FID. This keeps the new VLAN from sharing its filtering database with other VLANs in the switch. For details on defining a VLAN, refer to Section 3.4.1.
- 2.** Use the Port Assignment Configuration screen for the following:
 - a.** Assign the VLAN ID, 2, of the new Management VLAN to a port. In this example, it is port 1. Leave the Port Mode setting in the default value of HYBRID.



It is not necessary to configure a physical port for management on each switch. Only those switches that will have a management station attached to it need a physical port assigned to the Management VLAN.

- b.** Assign the VLAN ID, 2, of the new Management VLAN to the Host Data Port. The port number will depend on the device. This port is not a physical port and will usually be one number above the maximum number physical ports on the device, including the ports on any optional interfaces installed. In this example, it will be port 8. Leave the Port Mode setting in the default value of HYBRID. For details on assigning a VLAN ID, refer to Section 3.4.2.

This process would be repeated on every switch that is connected in the network to ensure that each switch has a secure Management VLAN for switch management.

If the switch was connected to another switch via port 7, which was set as a 1Q Trunk port, then the management station connected to the Management VLAN port of either switch could manage both switches.



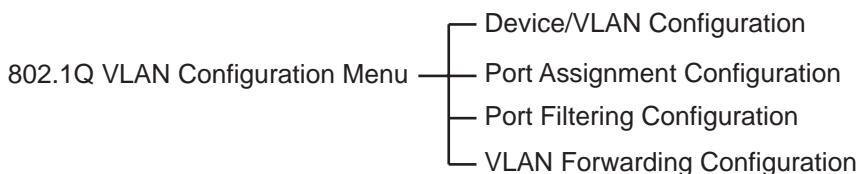
The management stations at each switch must be on the same Management VLAN.

No matter how many switches are connected, a management station connected to any port on the same Management VLAN can be used to remotely manage any DIGITAL's 802.1Q switch in the network as long as the Host Data Port of all the switches are members of the same Management VLAN.

3.2 SUMMARY OF VLAN LOCAL MANAGEMENT

The VLAN configuration process is an extension of normal Local Management operations. A series of Local Management screens provide access to the functions and commands necessary to add, change, or delete VLANs and to assign ports to those VLANs.

A switch supporting 802.1Q VLANs provides the VLAN Configuration screens as a standard part of its Local Management hierarchy when the switch is configured to operate in 802.1Q Mode. The hierarchy of the Local Management screens pertaining to 802.1Q VLAN configuration is shown in Figure 3-3.



2599_03

Figure 3-3 802.1Q VLAN Screen Hierarchy

3.2.1 Preparing for VLAN Configuration

A little forethought and planning is essential to a good VLAN implementation. Before attempting to configure a single switch for VLAN operation, consider the following:

- How many VLANs will be required
- What stations will belong to them
- What ports are connected to those stations

It may also be helpful to sketch out a diagram of your VLAN strategy. The examples provided in Chapter 4 may be useful for a depiction of the planning process.

Access Local Management as described in your device user's guide. Perform all required initial setup operations. Navigate to the 802.1Q VLAN Configuration Menu screen to begin the VLAN configuration process for the device.

3.3 802.1Q VLAN CONFIGURATION MENU SCREEN

The 802.1Q VLAN Configuration Menu screen enables the user to select screens to assign switched network ports to VLANs, define new VLANs, and configure port filtering according to a VLAN list or untagged frames. Network users can be logically grouped into VLANs even if they span long physical distances over a vast, intricate physical network. The VLAN Local Management menu items listed on the 802.1Q VLAN Configuration Menu allow such VLANs to be configured on a network at the switched port of the device or MultiSwitch 700 chassis.

Before attempting the VLAN configuration, ensure that the device to be configured has been set for 802.1Q SWITCHING mode. The mode selection is a Local Management operation that is accessible through the General Configuration screen of the device.



The device resets when changing operational modes.

To access the 802.1Q VLAN Configuration Menu screen from the module, device, or chassis specific Configuration Menu screen, use the arrow keys to highlight the **802.1Q VLAN CONFIGURATION MENU** item and press ENTER. The 802.1Q VLAN Configuration Menu screen, Figure 3-4, displays.

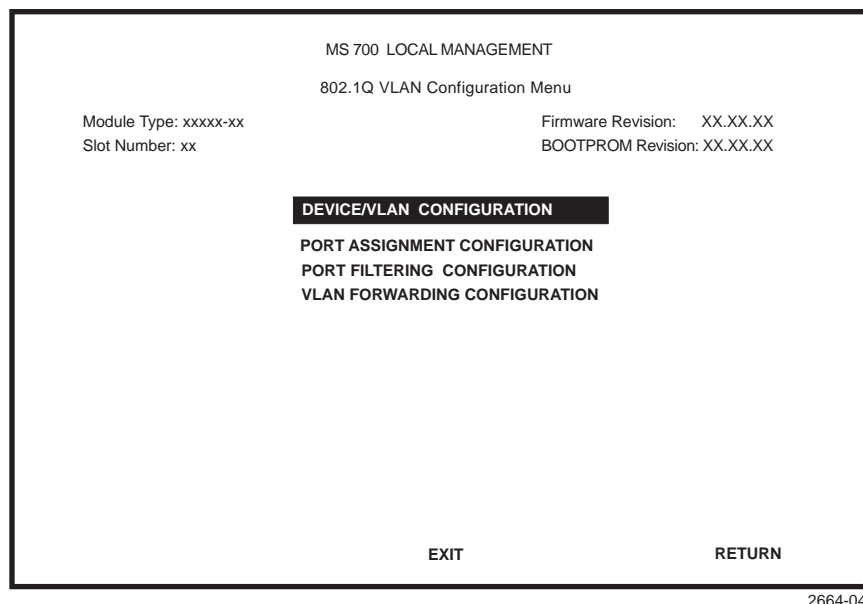


Figure 3-4 802.1Q VLAN Configuration Menu Screen

The following describes each menu item on the 802.1Q VLAN Configuration Menu screen:

DEVICE/VLAN CONFIGURATION

The Device/VLAN Configuration screen enables the user to view, add, name, enable, or disable VLANs within the device, and also associate the VLANs to a Filter Database ID (FID). It also enables the user to configure attributes that apply to the entire switch and/or VLANs. Refer to Section 3.4 for additional information.

PORT ASSIGNMENT CONFIGURATION

The Port Assignment Configuration screen displays a list of ports and enables the user to assign a Port VLAN ID (PVID) to each port. The screen also allows the user to change the operational mode of a port. Refer to Section 3.5 for additional information.

PORT FILTERING CONFIGURATION

The Port Filtering Configuration screen enables the filtering out of inbound frames to prevent them from being forwarded by the switch out a particular port. This screen also lists the VLANs whose frames are eligible to be transmitted out that port. Refer to Section 3.6 for additional information.

VLAN FORWARDING CONFIGURATION

The VLAN Forwarding Configuration screen enables the user to view which ports are included in the VLAN's Forwarding List and whether to include a Tag Header in a frame being transmitted. Refer to Section 3.7 for additional information.

3.4 DEVICE/VLAN CONFIGURATION SCREEN

The Device/VLAN Configuration screen enables the user to define operating characteristics for the switch and enables the user to add, name, delete, enable, and disable VLANs, and assign VLANs to FIDs. The screen will display up to eight VLANs simultaneously.

To access the Device/VLAN Configuration screen from the 802.1Q VLAN Configuration Menu screen, use the arrow keys to highlight the **DEVICE/VLAN CONFIGURATION** menu item and press ENTER. The Device/VLAN Configuration screen, Figure 3-5, displays.

MS 700 LOCAL MANAGEMENT

Device/VLAN Configuration

Module Type: xxxx-xx
Slot Number: xx

Firmware Revision: XX.XX.XX
BOOTPROM Revision: XX.XX.XX

Forward Default VLAN Out All Ports: [NO]

VLAN ID	FID	VLAN Name	Admin Status
1	1	DEFAULT VLAN	[Enabled]

VLAN ID: 1 FID: 1 VLAN Name: DEFAULT VLAN [ADD]

SAVE EXIT RETURN

2664-05

Figure 3-5 Device/VLAN Configuration Screen

The following defines each field of the Device/VLAN Configuration screen:

Forward Default VLAN Out All Ports (Toggle)

Allows the Administrator to assign or remove the default VLAN from the Port VLAN List for all ports. When set to YES, the default VLAN is added to the Port VLAN List of all ports that do not already include it. When set to NO, the default VLAN is removed from the Port VLAN List of any port that does not have the default VLAN as its PVID. The default is NO.

VLAN ID - upper part of screen (Read-Only)

Provides a list of the assigned VLAN IDs that are configured in the module. Initially, only the Default VLAN (VLAN ID: 1) is listed.

FID - upper part of screen (Read-Only)

Lists the Filtering Database ID (FID) associated with each VLAN. VLANs associated with the same FID may enable the users in those VLANs to communicate with each other.

VLAN Name - upper part of screen (Read-Only)

Lists the names assigned to the corresponding VLAN IDs. If a name has not been assigned to a VLAN, the VLAN Name field displays, "Not Defined".

Admin Status (Toggle)

The current state of the associated VLAN. This field toggles between Enabled and Disabled. An enabled VLAN is operational and a disabled VLAN is not operational. If a VLAN is disabled, all ports assigned to that VLAN will assume a PVID of the default VLAN.

VLAN ID - lower part of screen (Modifiable)

Accepts input from the user to select or define a new VLAN ID.

FID - lower part of screen (Modifiable)

Displays the FID currently associated with the VLAN typed in the VLAN ID field. A new number can be typed into the FID field to reassign the VLAN to a different filtering database. Each VLAN will default to a FID that matches its VLAN ID and can be changed to a FID from 1 to 1094.

VLAN Name - lower part of screen (Modifiable)

Used to assign or change names of VLANs. The VLAN Name (with up to 32 characters) is an optional attribute of a VLAN, and is not required for VLAN operation.

ADD/DEL (Toggle)

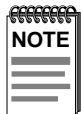
Toggles the action taken between adding the entered VLAN to the switch or deleting the selected VLAN from the switch.

3.4.1 Defining a VLAN

To define a VLAN, proceed as follows:

1. Use the arrow keys to highlight the **VLAN ID** field.
2. Enter the VLAN ID using a unique number between 2 and 4094. The VLAN IDs of 0, 1, and 4095 may not be used for user-defined VLANs.

If an illegal number is entered, the Event Message Line will display: "PERMISSIBLE RANGE FOR VLAN IDS: 2 to 4094" and the field will refresh with the previous value.



Each VLAN ID must be unique. If a duplicate VLAN ID is entered, the switch assumes that the Administrator intends to modify the existing VLAN.

3. If the VLAN is to be assigned to a different filtering database, use the arrow keys to highlight the **FID** field. If the VLAN is not going to be assigned to a different FID, go to step 5.
4. Type in the ID number of the FID.
5. Use the arrow keys to highlight the **VLAN Name** field.
6. Type a name of up to 32 ASCII characters in the VLAN Name field (optional).
7. Use the arrow keys to highlight the **ADD/DEL** field.

8. Press the **SPACE** bar to select **ADD** for a defined VLAN. Press **ENTER**. The new VLAN will be added to the VLAN list. The message “VLAN ADDED” displays in the Event Message Line in the upper left-hand corner of the screen.

The VLAN will not be saved to the switch until the configuration is saved.

9. Use the arrow keys to highlight the **SAVE** command at the bottom of the screen. Press **ENTER**. The message “SAVED OK” displays.

3.4.2 Changing the VLAN to FID Association

To change the association of a VLAN to a FID, proceed as follows:

1. Use the arrow keys to highlight the **VLAN ID** field.
2. Enter the VLAN ID of the VLAN whose FID association is to be changed.

If an illegal number is entered, the Event Message Line will display: “PERMISSIBLE RANGE FOR VLAN IDS: 2 to 4094” and the field will refresh with the previous value.

3. Use the arrow keys to highlight the **FID** field.
4. Type in the ID number of the FID. If the ID number is valid, the Event Message Line in the upper left hand corner of the screen displays “VLAN # UPDATED”, where # represents the entered ID number.
5. Use the arrow keys to highlight the **SAVE** command at the bottom of the screen. Press **ENTER**. The message “SAVED OK” displays.

3.4.3 Renaming a VLAN

To change the name of an existing VLAN, proceed as follows:

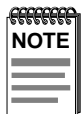
1. Enter the VLAN ID. The **VLAN Name** field will automatically update to display the VLAN’s current name.
2. Use the arrow keys to highlight the **VLAN Name** field.

3. Type a name of up to 32 ASCII characters in the VLAN Name field. Press ENTER. If the name is valid, the Event Message Line in the upper left hand corner of the screen displays “VLAN # UPDATED”, where # represents the entered VLAN name.
4. Use the arrow keys to highlight the **SAVE** command at the bottom of the screen. Press ENTER. The message “SAVED OK” displays.

3.4.4 Deleting a VLAN

To delete a VLAN from the current VLAN list, proceed as follows:

1. Enter the VLAN ID. The **VLAN Name** field will automatically update to display the VLAN’s name if that VLAN has been previously configured.
2. Use the arrow keys to highlight the **ADD/DEL** field.
3. Press the SPACE bar to select **DEL**. Press ENTER. The VLAN is removed from the list. The message “VLAN DELETED” displays in the Event Message Line in the upper left-hand corner of the screen.
4. Use the arrow keys to highlight the **SAVE** command at the bottom of the screen. Press ENTER. The message “SAVED OK” displays.



The default VLAN cannot be deleted from the list.

3.4.5 Enabling VLANs

To enable a VLAN, proceed as follows:

1. Use the arrow keys to highlight the **Admin Status** field of the selected VLAN.
2. Press the SPACE bar to toggle the field to display **Enabled**.
3. Use the arrow keys to highlight the **SAVE** command at the bottom of the screen.
4. Press ENTER. The message “SAVED OK” displays.

3.4.6 Disabling VLANs

To disable a VLAN, proceed as follows:

1. Use the arrow keys to highlight the **Admin Status** field of the selected VLAN.
2. Press the SPACE bar to toggle the field to display **Disabled**.
3. Use the arrow keys to highlight the **SAVE** command at the bottom of the screen.
4. Press ENTER. The message “SAVED OK” displays.



The default VLAN cannot be disabled.

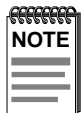
3.4.7 Changing the Forwarding Mode

To change the forwarding mode of the switch, proceed as follows:

1. Use the arrow keys to highlight the **Forward Default VLAN Out All Ports** field.
2. Press the SPACE bar or BACKSPACE to toggle between **YES** and **NO**. The YES selection places the default VLAN (VLAN ID=1) in the Egress Lists of all ports on the switch. The NO selection removes the default VLAN from the Egress Lists of all ports, unless those ports have a PVID of 1 (those belonging to only the Default VLAN).
3. Use the arrow keys to highlight the **SAVE** command at the bottom of the screen.
4. Press ENTER. The message “SAVED OK” displays.

3.4.8 Paging Through the VLAN List

To display additional VLANs that do not display in the current VLAN List as shown on the screen, use the **NEXT** or **PREVIOUS** commands located at the bottom of the screen, as follows:



The **NEXT** and **PREVIOUS** fields will only display if there are further VLAN List entries to page through.

1. To display the next screen, use the arrow keys to highlight **NEXT**. Press **ENTER** to view the entries on the next screen.
2. To display the previous screen, use the arrow keys to highlight **PREVIOUS**. Press **ENTER** to view the entries on the previous screen.

3.5 PORT ASSIGNMENT CONFIGURATION SCREEN

The Port Assignment Configuration screen enables the user to select a mode of operation for each port and to assign a Port VLAN Identification (PVID) to each port.

To access the Port Assignment Configuration screen from the 802.1Q VLAN Configuration Menu screen, use the arrow keys to highlight the **PORT ASSIGNMENT CONFIGURATION** menu item and press **ENTER**. The Port Assignment Configuration screen, Figure 3-6, displays.

MS 700 LOCAL MANAGEMENT

Port Assignment Configuration

Module Type: xxxxx-xx
Slot Number: xx

Firmware Revision: XX.XX.XX
BOOTPROM Revision: XX.XX.XX

Port	Port Mode	VLAN ID	FID	VLAN Name
1	[1D TRUNK]	[0001]	0001	Default VLAN
2	[1Q TRUNK]	[0001]	0001	Default VLAN
3	[HYBRID]	[0001]	0001	Default VLAN
4	[HYBRID]	[0001]	0001	Default VLAN
5	[HYBRID]	[0001]	0001	Default VLAN
6	[HYBRID]	[0001]	0001	Default VLAN
7	[HYBRID]	[0001]	0001	Default VLAN
8	[HYBRID]	[0001]	0001	Default VLAN
9	[HYBRID]	[0001]	0001	Default VLAN
10	[HYBRID]	[0001]	0001	Default VLAN
11	[HYBRID]	[0001]	0001	Default VLAN
12	[HYBRID]	[0001]	0001	Default VLAN

SAVE
PREVIOUS
NEXT
EXIT
RETURN

2664-06

Figure 3-6 Port Assignment Configuration Screen

The following defines each field of the Port Assignment screen:

Port (Read-Only)

Lists the port numbers of the interfaces of the current module.

Port Mode (Selectable)

Displays the current operational mode for the corresponding port and enables the selection of one of three modes: HYBRID, 1Q TRUNK, or ID TRUNK. The default is HYBRID.

VLAN ID (Selectable)

The ID number of the VLAN that is associated with the current port (Port VLAN ID). This is the VLAN ID that any untagged frame will be classified into. The default PVID is 0001.

FID (Read-Only)

Displays the FID associated with the VLAN ID. This field updates as the associated VLAN ID field is changed.

VLAN Name (Read-Only)

The name that is associated with the current VLAN ID. If a name was not assigned to a VLAN, “NOT DEFINED” displays as the VLAN name.

3.5.1 Changing the Port Mode

To change the operational mode of a port, proceed as follows.

1. Use the arrow keys to highlight the **PORT MODE** field for the module and port combination you wish to change.
2. Use the SPACE bar or BACKSPACE key to step through the available selections. A port may be configured for any of the following modes:
 - a. **HYBRID**: This is the default mode for all ports on the switch. The initial Port VLAN List includes the PVID with a frame format of untagged. Any other VLANs desired for the Port VLAN List needs to be manually configured. By changing the default mode to 1Q Trunk or 1D Trunk, the Port VLAN List and the associated frame type is automatically configured.
 - b. **1Q TRUNK**: This mode sets the port for transmitting to another 802.1Q aware device. In this mode, all frames are transmitted with a tag header included in the frame (excluding BPDUs). The switch will drop all untagged frames it receives on the 1Q Trunk port. The Port VLAN List for the port includes all VLANs.
 - c. **1D TRUNK**: This mode sets the port for transmitting to a legacy 802.1D switch fabric. In this mode, all incoming frames are classified into the default VLAN and all frames are transmitted untagged. The switch expects to receive only untagged frames through the 1D Trunk port. This mode also updates the Port VLAN List and makes the port eligible to transmit frames for all VLANs. The 1D Trunk mode can be used in conjunction with the “Forward Default VLAN Out All Ports” parameter and the Default VLAN to allow all stations on a legacy portion of the network to access all stations or servers in the 802.1Q portion of the network.

3. When the desired operational mode for the port is displayed, use the arrow keys to highlight the **SAVE** command at the bottom of the screen.
4. Press ENTER. The message “SAVED OK” displays.

3.5.2 Assigning a VLAN ID

The Port Assignment Configuration screen also enables the user to set each port’s VLAN ID (PVID) by stepping through a list of all configured VLANs. To assign a VLAN ID to a port in this manner, perform the following steps:



It may be necessary to use the **NEXT** and **PREVIOUS** commands to page through the available ports. For instructions, refer to Section 3.5.3, **Paging Through the Port List**.

1. Use the arrow keys to highlight the **VLAN ID** field for the port combination you wish to change.
2. Use the **SPACE** bar or **BACKSPACE** key to step sequentially through the previously configured VLAN ID numbers. Only existing VLAN IDs will be displayed.

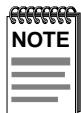


New VLAN IDs must be created with the functions available on the Device/VLAN Configuration screen, discussed in Section 3.4.

3. When the desired VLAN ID is displayed, use the arrow keys to highlight the **SAVE** command at the bottom of the screen.
4. Press ENTER. The message “SAVED OK” displays.

3.5.3 Paging Through the Port List

To display additional ports that do not display in the current screen, use the **NEXT** or **PREVIOUS** commands at the bottom of the screen, as follows:



The **NEXT** and **PREVIOUS** fields will only display if there are further Port List entries to page through.

1. To display the next screen, use the arrow keys to highlight **NEXT**. Press **ENTER** to view the entries on the next screen.
2. To display the previous screen, use the arrow keys to highlight **PREVIOUS**. Press **ENTER** to view the entries on the previous screen.

3.6 PORT FILTERING CONFIGURATION SCREEN

The Port Filtering Configuration screen has three functions:

- Enables the user to select a port and view a list of VLANs that are configured to have their frames transmitted out that port.
- Enables the filtering out of certain incoming frames according to the VLAN List and prevent them from being switched and transmitted out another port.
- Enables the filtering out of all incoming untagged frames so they will not be transmitted out another port.

To access the Port Filtering Configuration screen from the 802.1Q VLAN Configuration Menu screen, use the arrow keys to highlight the **PORT FILTERING CONFIGURATION** menu item and press **ENTER**. The Port Filtering Configuration screen, Figure 3-7, displays.

MS 700 LOCAL MANAGEMENT

Port Filtering Configuration

Module Type: xxxxx-xx
Slot Number: xx

Firmware Revision: XX.XX.XX
BOOTPROM Revision: XX.XX.XX

Port VLAN List

VLAN ID	VLAN Name
0001	Default VLAN
0003	Not Defined
0004	Not Defined
0012	Not Defined
0014	Not Defined
0020	Not Defined

Port: [002]

Filter Using VLAN Lists: [NO]
Filter All Untagged Frames: [NO]

SAVEPREVIOUSNEXTEXITRETURN

2664-07

Figure 3-7 Port Filtering Configuration Screen

The following defines each field of the Port Filtering Configuration screen:

VLAN ID (Read-Only)

Displays the VLAN ID of the VLANs that are configured to have their frames transmitted out the port selected in the Port # field.

VLAN Name (Read-Only)

Lists the names of the VLANs associated with the VLAN ID. If a VLAN does not have a name, “Not Defined” is displayed.

Port # (Selectable)

Used to step to the port number of the interface being configured including the selection of ALL ports.

Filter Using VLAN Lists (Toggle)

Used to filter out (drop) frames that are classified, via their VLAN tag, as belonging to a VLAN that is not on the Port VLAN List and prevent them from being forwarded by the switch. This field toggles between YES and NO. YES enables filtering according to the Port VLAN List. NO allows the switch to forward the frames. The default is NO.

Filter All Untagged Frames (Toggle)

Used to filter out all incoming untagged frames so they will not be forwarded by the switch. This field toggles between YES and NO. YES enables the filtering of untagged frames. NO allows the switch to forward untagged frames. The default is NO.

3.6.1 Displaying VLAN IDs Associated with a Port

To display the VLAN IDs and VLAN Names of the VLANs associated with a particular port, proceed as follows:

1. Use the arrow keys to highlight the **Port** field.
2. Use the SPACE bar or BACKSPACE key to step through the available port selections. The screen displays the Port VLAN List of the selected Port. If ALL is selected, no VLAN ID or VLAN Name information is displayed under Port VLAN List.
3. To display additional VLANs that do not display in the current screen display, use the **NEXT** or **PREVIOUS** commands located at the bottom of the screen, as follows:



The NEXT and PREVIOUS fields will only display if there are further VLANs in the list to page through.

4. To display the next screen, use the arrow keys to highlight **NEXT**. Press ENTER to view the entries on the next screen.
5. To display the previous screen, use the arrow keys to highlight **PREVIOUS**. Press ENTER to view the entries on the previous screen.

3.6.2 Selecting the Type of Filtering for a Port

A port can be set to filter out received frames according to its Port VLAN List. This keeps them from being transmitted and drops all untagged frames from being transmitted. To set this type of filtering, proceed as follows:

1. Use the arrow keys to highlight the **Port #** field.
2. Use the SPACE bar or BACKSPACE key to step through the available port selections.
3. Use the arrow keys to highlight the **Filter Using VLAN List** field.
4. Use the SPACE bar or BACKSPACE key to toggle between **YES** and **NO**. When set to YES, the switch will drop all incoming frames that are classified with a VLAN tag of a VLAN that does not appear on the Port VLAN List. The default is NO.
5. Use the arrow keys to highlight the **Filter All Untagged Frames** field.
6. Use the SPACE bar or BACKSPACE key to toggle between **YES** or **NO**. When set to YES, the switch will drop all incoming frames that do not have a VLAN tag header. The default is NO.
7. To save the settings, Use the arrow keys to highlight the **SAVE** command at the bottom of the screen.
8. Press ENTER. The message "SAVED OK" displays. The settings are saved.

3.7 VLAN FORWARDING CONFIGURATION SCREEN

The VLAN Forwarding Configuration screen enables the user to view the ports included in a VLAN's Forwarding List. The user can also define which ports to include in the VLAN's Forwarding List. The formats of the frames (Tagged or Untagged) that a VLAN port will forward can also be specified with this screen.

To access the VLAN Forwarding Configuration screen from the 802.1Q VLAN Configuration Menu screen, use the arrow keys to highlight the **VLAN FORWARDING CONFIGURATION** menu item and press ENTER. The VLAN Forwarding Configuration screen, Figure 3-8, displays.

MS 700 LOCAL MANAGEMENT

VLAN Forwarding Configuration

Module Type: xxxx-xx

Slot Number: xx

Firmware Revision: XX.XX.XX

BOOTPROM Revision: XX.XX.XX

Current VLAN Ports	Port Type	Frame Format
Port 15	Etherent Frontpanel	Untagged
Port 25	Etherent Frontpanel	Untagged
Port 35	ATM ELAN Finance	Tagged
Port 30	ATM PVC VCI-1 VPI-23	Untagged
Port 15	Etherent Frontpanel	Untagged
Port 25	Etherent Frontpanel	Untagged
Port 35	ATM ELAN Finance	Tagged
Port 30	ATM PVC VCI-1 VPI-23	Untagged

VLAN ID: [4094]

VLAN Name: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

[DELETE]

Port: [30]

ATM PVC VCI-1 VPI-23

Frame Type: [Untagged]

SAVE

PREVIOUS

NEXT

EXIT

RETURN

2664-08

Figure 3-8 VLAN Forwarding Configuration Screen

The following defines each field of the VLAN Forwarding Configuration screen:

Current VLAN Ports (Read-Only)

Lists the ports that are currently configured to transmit frames classified to the selected VLAN.

Port Type (Read-Only)

The MIB2 interface description for the selected switch port.

Frame Format - upper part of screen (Read-Only)

The frame format (Tagged or Untagged) for the frames of the selected VLAN that the port will transmit.

VLAN ID (Selectable)

The identification of the VLAN under examination. This screen displays the list of ports currently configured to transmit frames for the VLAN ID in this field.

VLAN Name (Read-Only)

The name associated with the VLAN ID.

ADD/DELETE (Toggle)

Swaps the action taken to add or delete a port from the VLAN Forwarding List.

Port (Selectable)

The port number of the interface being configured.

Frame Type- *lower part of screen* (Toggle)

Selects the format of frames (Tagged or Untagged) that will be transmitted by the selected port for this VLAN. The default is Untagged.

3.7.1 Viewing Current VLAN Ports

To display the VLAN Forwarding List for a particular VLAN, proceed as follows:

1. Use the arrow keys to highlight the **VLAN ID** field. Use the SPACE bar or BACKSPACE to step to the desired VLAN ID and VLAN Name.
2. Press ENTER. The screen updates to display the VLAN Forwarding List for the selected VLAN.

3.7.2 Paging Through VLAN Forwarding List Entries

To display additional entries in the VLAN Forwarding List that do not appear on the screen, use the **NEXT** or **PREVIOUS** commands located at the bottom of the screen, as follows:

1. To display the next screen, use the arrow keys to highlight **NEXT**. Press ENTER to view the entries on the next screen.
2. To display the previous screen, use the arrow keys to highlight **PREVIOUS**. Press ENTER to view the entries on the previous screen.

3.7.3 Adding Forwarding List Entries

To add a port to the VLAN Forwarding List, proceed as follows:

1. Use the arrow keys to highlight the **VLAN ID** field. Use the SPACE bar or BACKSPACE to step to the desired VLAN ID and VLAN Name. Press ENTER.
2. Use the arrow keys to highlight the **Port** field. Step through the available ports on the module with the SPACE bar or BACKSPACE.
3. Use the arrow keys to highlight the **ADD/DELETE** field. Press the SPACE bar to select **ADD**. Press ENTER.

The Forwarding List entry will be added to the list of current VLANs once the configuration is saved.

4. Use the arrow keys to highlight the **SAVE** command at the bottom of the screen.
5. Press ENTER. The message “SAVED OK” displays.

The port is added to the VLAN Forwarding List of the selected VLAN.

3.7.4 Deleting Forwarding List Entries

To remove a port from the currently displayed VLAN Forwarding List, proceed as follows:

1. Use the arrow keys to highlight the **VLAN ID** field. Use the SPACE bar or BACKSPACE to step to the desired VLAN ID and VLAN Name. Press ENTER.
2. Use the arrow keys to highlight the **Port** field. Step through the available ports on the module with the SPACE bar or BACKSPACE.
3. Use the arrow keys to highlight the **ADD/DELETE** field. Press the SPACE bar to select **DEL**. Press ENTER.

The Forwarding List entry will be deleted from the list of current VLANs once the configuration is saved.

4. Use the arrow keys to highlight the **SAVE** command at the bottom of the screen.

5. Press ENTER. The message “SAVED OK” displays.

The port is deleted from the VLAN Forwarding List of the selected VLAN.

3.7.5 Changing the Frame Format

To change the frame format for a port, proceed as follows:

1. Use the arrow keys to highlight the **Port** field. Step through the available ports by pressing the SPACE bar or BACKSPACE.
2. Using the arrow keys, select the **Frame Type** field. Use the SPACE bar or BACKSPACE to toggle between **Tagged** or **Untagged**.
3. Use the arrow keys to highlight the **SAVE** command at the bottom of the screen.
4. Press ENTER. The message “SAVED OK” displays.

3.8 QUICK VLAN WALKTHROUGH

The procedures below provide a short tutorial walkthrough that presents each of the steps necessary to configure a new VLAN, assign a port to it, and check the Port VLAN List of the port. You may wish to follow this walkthrough from start to finish before attempting to configure your own VLANs.

This walkthrough begins at the 802.1Q VLAN Configuration Menu screen for a DLM6C-AA chassis. Follow the instructions in your device user’s guide to navigate to this Local Management screen.



The screens displayed by your devices may be marginally different from those shown in the illustrations for this walkthrough.

1. On the 802.1Q VLAN Configuration Menu screen, use the arrow keys to highlight the **DEVICE/VLAN CONFIGURATION** menu item. Press ENTER. The Device/VLAN Configuration screen displays.
2. In this walkthrough, we will not change the setting of the Forward Default VLAN Out All Ports fields from their default setting of NO.

3. Use the arrow keys to highlight the **VLAN ID** field. Assign a number to a new VLAN by typing the number “2” in the **VLAN ID** field.
4. Use the arrow keys to highlight the **FID** field. In this example we will assign the new VLAN to FID 2 by typing the number “2” in the FID field.
5. Use the arrow keys to highlight the **VLAN Name** field. Type “**TEST VLAN**” in the VLAN Name field. Press ENTER.
6. Use the arrow keys to highlight the **ADD/DEL** field.
7. Press the SPACE bar to toggle the field to **ADD**. Press ENTER. The VLAN is added to the list.
8. Use the arrow keys to highlight the **SAVE** command at the bottom of the screen. Press ENTER. The message “SAVED OK” displays. The screen refreshes and VLAN 2, the **TEST VLAN** has been added to the Device/VLAN Configuration screen and all learning of MAC addresses will be updated in FID 2. The screen should now look like Figure 3-9.



This new VLAN is currently disabled, as the DISABLED field to the far right shows. When all the rules and settings for the VLAN are in place, it will be necessary to return to this screen and enable the VLAN.

MS 700 LOCAL MANAGEMENT

Device/VLAN Configuration

Module Type: xxxxx-xx
Slot Number: xx

Firmware Revision: XX.XX.XX
BOOTPROM Revision: XX.XX.XX

Forward Default VLAN Out All Ports: [NO]

VLAN ID	FID	VLAN Name	Admin Status
1	1	DEFAULT VLAN	[Enabled]
2	2	TEST VLAN	[Disabled]

VLAN ID: 1

FID: 2

VLAN Name: TEST VLAN

[ADD]

SAVE

EXIT

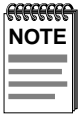
RETURN

2664-09

Figure 3-9 Walkthrough Stage One

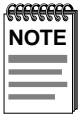
It is now time to assign a port to this new VLAN.

9. Use the arrow keys to highlight the **RETURN** command at the bottom of the screen. Press ENTER. The 802.1Q VLAN Configuration Menu screen displays. Use the arrow keys to select the **PORT ASSIGNMENT CONFIGURATION** menu item and press ENTER. The Port Assignment Configuration screen displays.



For the purposes of this walkthrough, port 3 will be configured.

10. Use the arrow keys to highlight the **VLAN ID** field for the module and port combination you wish to change.



As this port will connect to a single workstation, and is not to be used for switch-to-switch communications, it is not necessary to change the PORT MODE from the default setting of HYBRID.

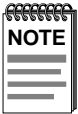
11. Use the SPACE bar to step sequentially through the previously configured VLAN ID numbers. When the number **0002** (the new VLAN ID) is displayed, the FID field updates to **0002**, and the **VLAN Name** field updates showing the name assigned to this VLAN, **TEST VLAN**.
12. Use the arrow keys to highlight the **SAVE** command at the bottom of the screen. Press ENTER. The PVID for Port 3 is now configured to the TEST VLAN. The TEST VLAN is also added to the Port VLAN List for Port 3 with a frame format of Untagged. The screen should now look like Figure 3-10.

MS 700 LOCAL MANAGEMENT				
Port Assignment Configuration				
Module Type: xxxxx-xx		Firmware Revision: XX.XX.XX		
Slot Number: xx		BOOTPROM Revision: XX.XX.XX		
Port	Port Mode	VLAN ID	FID	VLAN Name
1	[1D TRUNK]	[0001]	0001	Default VLAN
2	[1Q TRUNK]	[0001]	0001	Default VLAN
3	[HYBRID]	[0002]	0002	TEST VLAN
4	[HYBRID]	[0001]	0001	Default VLAN
5	[HYBRID]	[0001]	0001	Default VLAN
6	[HYBRID]	[0001]	0001	Default VLAN
7	[HYBRID]	[0001]	0001	Default VLAN
8	[HYBRID]	[0001]	0001	Default VLAN
9	[HYBRID]	[0001]	0001	Default VLAN
10	[HYBRID]	[0001]	0001	Default VLAN
11	[HYBRID]	[0001]	0001	Default VLAN
12	[HYBRID]	[0001]	0001	Default VLAN
SAVE		PREVIOUS	NEXT	EXIT RETURN

2664-10

Figure 3-10 Walkthrough Stage Two

Now that port 3 belongs to the TEST VLAN, we will designate one port as a 1Q Trunk port for a connection to another VLAN aware switch. This 1Q Trunk port will carry traffic from all VLANs, allowing VLAN frames to maintain their VLAN ID across multiple switches.



For the purposes of this walkthrough, port 10 will be configured as the trunk port.

- 13. Use the arrow keys to highlight the **Port Mode** field for port 10. Use the SPACE bar or BACKSPACE key to step sequentially through the possible settings of the port until **1Q TRUNK** is displayed.
- 14. Use the arrow keys to highlight the **SAVE** command at the bottom of the screen. Press ENTER. Port 10 is now acting as a 1Q Trunk port and every VLAN is in its Port VLAN List. The frame format for every VLAN is also set to tagged. The screen should now look like Figure 3-11.

MS 700 LOCAL MANAGEMENT

Port Assignment Configuration

Module Type: xxxxx-xx Firmware Revision: XX.XX.XX

Slot Number: xx BOOTPROM Revision: XX.XX.XX

Port	Port Mode	VLAN ID	VLAN Name
1	[HYBRID]	[0001]	DEFAULT VLAN
2	[HYBRID]	[0001]	DEFAULT VLAN
3	[HYBRID]	[0002]	TEST VLAN
4	[HYBRID]	[0001]	DEFAULT VLAN
5	[HYBRID]	[0001]	DEFAULT VLAN
6	[HYBRID]	[0001]	DEFAULT VLAN
7	[HYBRID]	[0001]	DEFAULT VLAN
8	[HYBRID]	[0001]	DEFAULT VLAN
9	[HYBRID]	[0001]	DEFAULT VLAN
10	[1Q TRUNK]	[0001]	DEFAULT VLAN
11	[HYBRID]	[0001]	DEFAULT VLAN
12	[HYBRID]	[0001]	DEFAULT VLAN

SAVE PREVIOUS NEXT EXIT RETURN

2664-11

Figure 3-11 Walkthrough Stage Three

Now that the TEST VLAN and the 1Q Trunk connection are set up, we can proceed to activate the TEST VLAN.

- 15. On the 802.1Q VLAN Main Menu screen, use the arrow keys to highlight the **DEVICE/VLAN CONFIGURATION** menu item.

Press ENTER. The Device/VLAN Configuration screen, Figure 3-12, displays.

[illegible]

2664-12

Figure 3-12 Walkthrough Stage Four

16. Use the arrow keys to highlight the **Admin Status** field of VLAN ID 2, the TEST VLAN.
17. Press the SPACE bar to toggle the field to display Enabled.
18. Use the arrow keys to highlight the **SAVE** command at the bottom of the screen.
19. Press ENTER. The message “SAVED OK” displays. The switch activates the new VLAN.

This effectively completes the configuration of a single VLAN, assigning it to a port, and configuring the switch to forward the frames received on that port to be forwarded with the VLAN information included in the frame.

The Port VLAN List of any port on the device can also be checked at any time using the Port Filtering Configuration screen. A list of all ports eligible to transmit frames for a given VLAN will also be listed on the VLAN Forwarding Configuration screen. Each port can also be set to filter out (drop) incoming frames that have VLAN tags that do not match with any of those in its Port VLAN List, and also filter out all untagged frames received by the port. As a default neither function is activated.

In this walkthrough, we will show how to display the Port VLAN List of port 10 and set the port to filter out all untagged frames that it receives.

20. On the 802.1Q VLAN Main Menu screen, use the arrow keys to highlight the **PORT FILTERING CONFIGURATION** menu item. Press ENTER. The Port Filtering Configuration screen displays.
21. Use the arrow keys to highlight the **Port** field.
22. Press the SPACE bar to step the field to display 2.
23. Use the arrow keys to highlight the **Filter All Untagged Frames** field.
24. Press the SPACE bar to toggle the field to display YES.
25. Use the arrow keys to highlight the **SAVE** command at the bottom of the screen.
26. Press ENTER. The message "SAVED OK" displays. The Port Filtering Configuration screen displays the Port VLAN List for port 2 and the Filtering All Untagged Names field is set to YES as shown in Figure 3-13.

MS 700 LOCAL MANAGEMENT

Port Filtering Configuration

Module Type: xxxx-xx
Slot Number: xx

Firmware Revision: XX.XX.XX
BOOTPROM Revision: XX.XX.XX

Port VLAN List

VLAN ID	VLAN Name
0001	DEFAULT VLAN
0001	1Q TRUNK

Port : [10]

Filter Using VLAN Lists: [NO]
Filter All Untagged Frames: [YES]

SAVE

PREVIOUS

NEXT

EXIT

RETURN

2664-20

Figure 3-13 Final Walkthrough Stage

This effectively completes the displaying of the Port VLAN List and the setting of the port filtering of all untagged frames.

CHAPTER 4

EXAMPLES

This chapter provides examples of how VLAN aware MultiSwitch 700s can be configured to group users at the port level to create VLANs in existing networks. Each example presents a problem and shows how it is solved by configuring the switches using the VLAN Local Management screens. The actual procedures and screens used to configure a VLAN aware switch are covered in Chapter 3, **VLAN Configuration**. Also provided in the discussion of each example is a description of how the frames transmitted from one user would traverse the network to its target device.

4.1 EXAMPLE 1

This first example looks at the configuration of a single Ethernet switch for VLAN operation. In this example, two groups of three users are to be assigned to two VLANs to isolate them from one another. The blue users (B1, B2, B3) are to be kept completely separate from the red users (R1, R2, R3). Figure 4-1 shows the initial state of the switch.

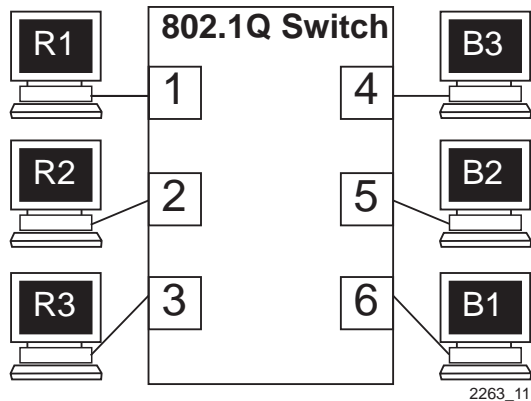


Figure 4-1 Example 1

4.1.1 Solving the Problem

To set up this switch, users will be assigned to two new VLANs, red stations to the Red VLAN, and blue stations to the Blue VLAN. The information below describes how the switch is configured to create these two VLANs and how users are assigned to them.

1. First, the switch is set for 802.1Q operation. Since traffic isolation is to be based on VLAN membership alone, the switch is set so Red VLAN is a member of FID 2 and Blue VLAN is a member of FID 3 from the Device/VLAN Configuration screen.
2. The Administrator uses the Device/VLAN Configuration screen to define the two VLANs for this switch; the Red VLAN, with a VLAN ID of 002, and the Blue VLAN, with a VLAN ID of 003.
3. The Administrator brings up the Port Assignment Configuration screen and assigns the ports to the VLANs.
 - Ports 1, 2, and 3: VLAN ID 002 (Red VLAN)
 - Ports 4, 5, and 6: VLAN ID 003 (Blue VLAN)

4. Now that the ports have been assigned, the VLANs are enabled from the Device/VLAN Configuration screen.

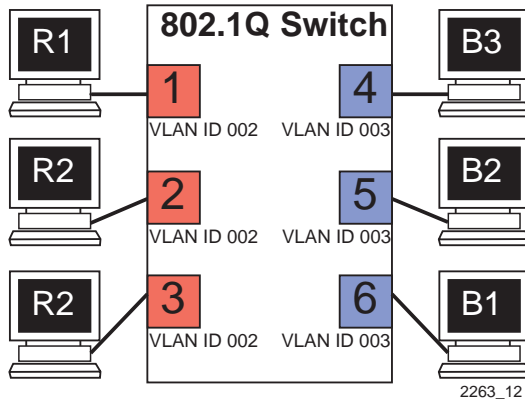


Figure 4-2 Switch Configured for VLANs

The switch will now classify each frame received as belonging to either the Red or Blue VLANs. Traffic from one VLAN will not be forwarded to the members of the other VLAN, and all frames transmitted by the switch will be normal, untagged Ethernet frames.

4.1.2 Frame Handling

This section describes the operations of the switch when two frames are received. The first frame is a broadcast sent by station R1.

1. Station R1 transmits the broadcast frame. The switch receives this frame on Port 1. As the frame is received, the switch classifies it. The frame is untagged, so the switch classifies it as belonging to the VLAN that Port 1 is assigned to, the Red VLAN.
2. At the same time, the switch adds the source MAC address of the frame and VLAN the associated port to its Source Address Table in FID 2. In this fashion it learns that station R1 is located out Port 1.

3. Once the frame is classified, its destination MAC address is examined. The switch discovers that the frame is a broadcast, and treats it as it would any other unknown destination MAC address. The switch forwards the frame out all ports in the Red VLAN's Forwarding List except for the one that received the frame. In this case, the frame is sent to Ports 2 and 3.

The second frame is a unicast, where station R2 responds to station R1's broadcast.

4. Station R2, having received and recognized the broadcast from R1, transmits a unicast frame as a response. The switch receives this frame on Port 2. The switch classifies this new untagged frame as belonging to the Red VLAN.
5. The switch adds the source MAC address and VLAN for station R2 to its Source Address Table in FID 2, and checks the Source Address Table for the destination MAC address given in the frame. The switch finds the MAC address and VLAN in this table, and recognizes that the MAC address and VLAN match for R1 is located out Port 1.
6. The switch examines its VLAN configuration information and determines that the frame for Red VLAN is allowed to be forwarded out Port 1 and that it must be sent in an untagged format.
7. The switch forwards the frame out Port 1. Any other unicast transmissions between stations R1 and R2 will be handled identically.

4.2 EXAMPLE 2

This second example investigates the steps that must be taken to set up VLANs across multiple 802.1Q VLAN switches. This includes the configuration and operation of 1Q Trunks between 802.1Q VLAN switches.

As shown in Figure 4-3, two companies, "Redco" and "Blue Industries", share floors 2 and 4 in a building where the network infrastructure is supplied by the building owner. The objective is to completely isolate the network traffic of the two companies by limiting the user's traffic through the ports of two switches, thus maintaining security and shielding the network traffic from each company. This example will show the use and configuration of a 1Q Trunk connection and the creation of VLANs across multiple switches.

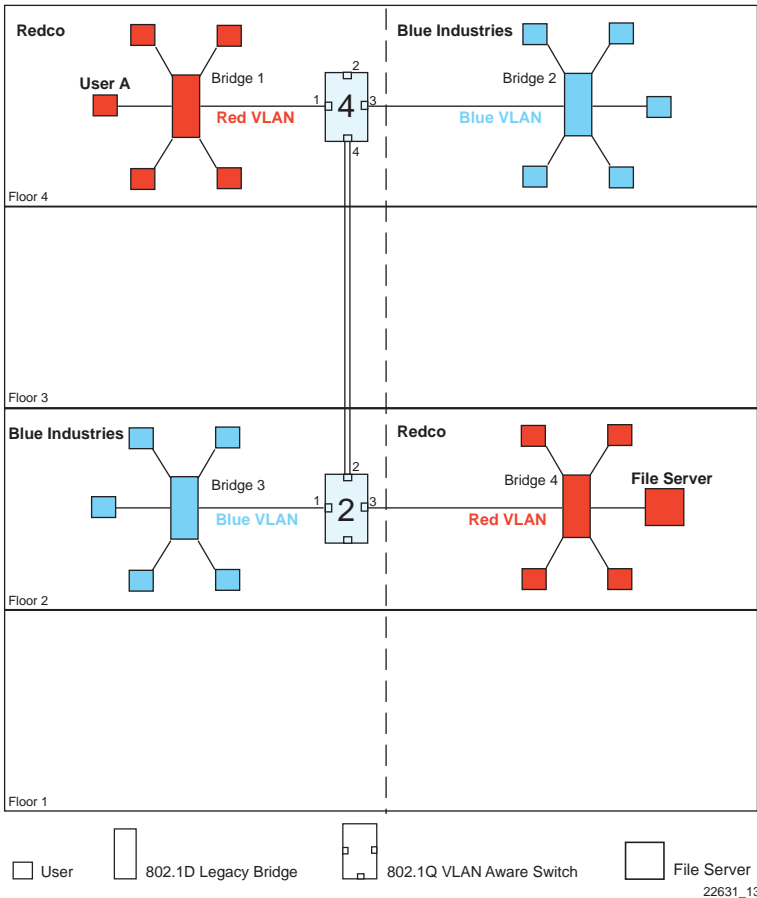


Figure 4-3 Example 2

4.2.1 Solving the Problem

To solve the problem in this example, the users are assigned to VLANs using Switch 4 and Switch 2 as shown in Figure 4-3. Redco users are assigned to the Red VLAN and Blue Industries users to the Blue VLAN. The following information shows how Switch 4 and Switch 2 are configured to create the two VLANs to isolate the users of the two companies from one another on the network using the existing infrastructure.

Switch 4

Switch 4 is set as follows:

1. On the Port Filtering Configuration screen, the Filter Using Port VLAN Lists is set to YES for ALL ports. This prevents tagged frames from being forwarded according to each Port VLAN List, preventing users on the Red VLAN from communicating with users on the Blue VLAN. If a frame is received that is not on a port's Port VLAN List, the frame is dropped.
2. Two VLANs are added to the list of VLANs in the Device/VLAN Configuration screen and assigned to a FID. In this example they are as follows:
 - VLAN ID 222, FID 2, with a VLAN Name of Red
 - VLAN ID 223, FID 3, with a VLAN Name of Blue
3. A Port VLAN ID (PVID) is assigned to each port (1, 3, and 4) as follows using the Port Assignment Configuration screen:
 - Port 1, VLAN ID: 222 for the Red VLAN
 - Port 3, VLAN ID: 223 for the Blue VLAN
 - Port 4, Port Mode: 1Q Trunk

This causes the switch to classify all untagged frames received as belonging to the VLAN specified by each port PVID and to replace the previous PVID information in the port VLAN List with the new PVID information, so that Port 1 is part of the Red VLAN, Port 3 is part of the Blue VLAN, and both are set as VLAN frame format of untagged. Port 4 is set as an 802.1Q Trunk port, which makes the port eligible to transmit to all VLANs, and all frames forwarded out this port are forwarded as tagged frames. With the original classification information inserted in the frame Tag Header the receiving switch will maintain the original frame classification.

Switch 2

Switch 2 is set as follows:

1. On the Port Filtering Configuration screen, the Filter Using Port VLAN Lists is set to YES for ALL ports.
2. Two VLANs are added to the list of VLANs in the Device/VLAN Configuration screen and assigned to a FID. In this example they are as follows:
 - VLAN ID 222, FID 3, with a VLAN Name of Red
 - VLAN ID 223, FID 3, with a VLAN Name of Blue
3. A Port VLAN ID is assigned to each port (1, 2, and 3) as follows using the Port Assignment screen:
 - Port 1, VLAN ID: 223 for the Blue VLAN
 - Port 2, Port Mode: 1Q Trunk
 - Port 3, VLAN ID: 222 for the Red VLAN

These settings change the configuration of the switch, so that Port 1 is part of Blue VLAN, Port 3 is part of Red VLAN, and both are set as frame type of untagged. Port 2 is set as an 802.1Q Trunk port, which makes the Port VLAN List contain all VLANs and sets all frames forwarded out this port to be tagged frames.

4.2.2 Frame Handling

The following describes how, when User A attempts to log on to the File Server on Bridge 4, the frames from User A are classified on Switch 4 and traverse the network. In this example, the MAC address of User A is “Y” and the MAC address for the File Server is “Z”. The following description includes illustrations to help understand how the frames flow through the network.

1. User A sends a frame with a Broadcast Destination Address in an attempt to locate the File Server. The frame is received on User A’s port of Bridge 1 and, because the frame is a broadcast frame, it is transmitted out all ports of Bridge 1 as shown in Figure 4-4.

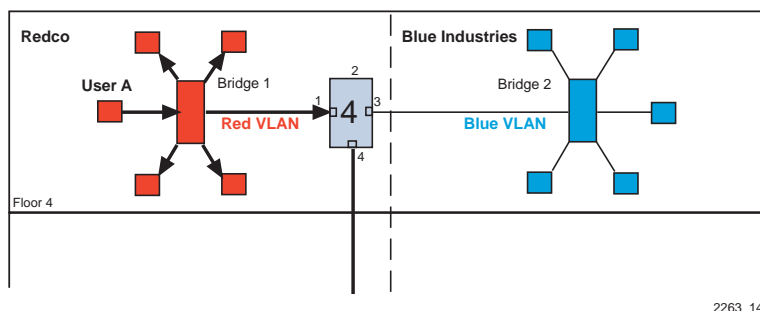


Figure 4-4 Bridge 1 Broadcasts Frames

2. Switch 4 receives the frame from Bridge 1 and immediately classifies it as belonging to the Red VLAN. After the frame is classified, Switch 4 checks the Destination Address and, upon discovering that it is a Broadcast Destination Address, forwards the frame out all ports in the Red VLAN Forwarding List excluding Port 1, which received the frame. In this example, it is only Port 4.

Switch 4 updates its Source Address Table in FID 2 if it didn't already have a dynamic entry for MAC address "Y" in FID 2. Because Switch 4 received the frame on Port 1, it does not forward the frame out that port, but does forward the frame to Port 4.

The frame is transmitted to Switch 2 with a VLAN Tag Header inserted in the frame. The VLAN Tag Header indicates that the frame is classified as belonging to the Red VLAN. Figure 4-5 shows the path taken to this point to reach Switch 2.

The VLAN Tag Header is inserted because Switch 4, Port 4 is designated as an 802.1Q Trunk port. In this case, the Port Mode setting for Port 4 is 802.1Q Trunk and the VLAN Frame format for that VLAN is tagged.

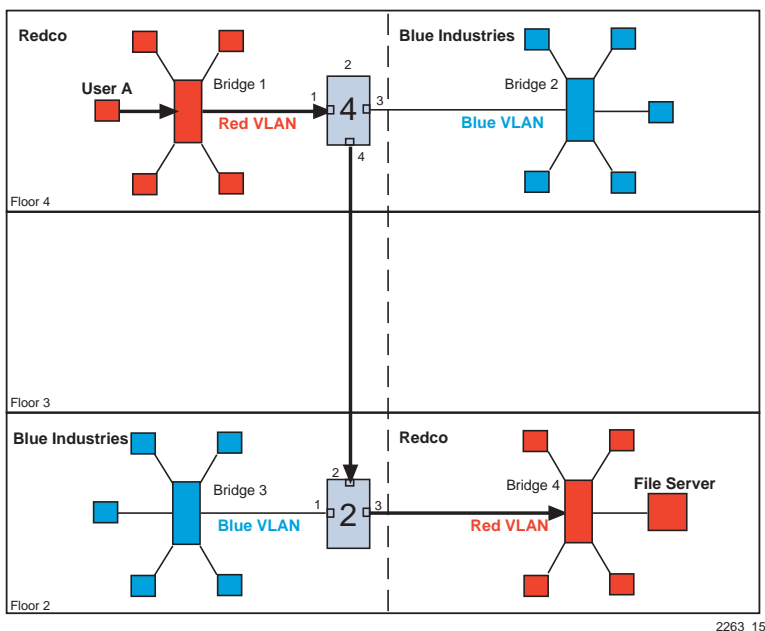


Figure 4-5 Transmitting to Switch 4

- When Switch 2 receives the tagged frame on its Port 2, it checks the frame's VLAN Tag Header and determines that the frame is classified as belonging to the Red VLAN, and that the frame is a broadcast frame. Switch 2 forwards the frame to all ports in the Red VLAN Forwarding List excluding Port 2, which received the frame. In this example, the only eligible port is Port 3, which connects to Bridge 4. Switch 2 checks its Forwarding List, which specifies that the VLAN frame type for that port is untagged. Switch 2 then updates its Source Address Table in FID 3 for MAC address "Y" if necessary. The untagged frame is then transmitted out Port 3 to Bridge 4. Bridge 4 forwards the frame out all its ports because it is a broadcast frame, and the server receives it as shown in Figure 4-6.

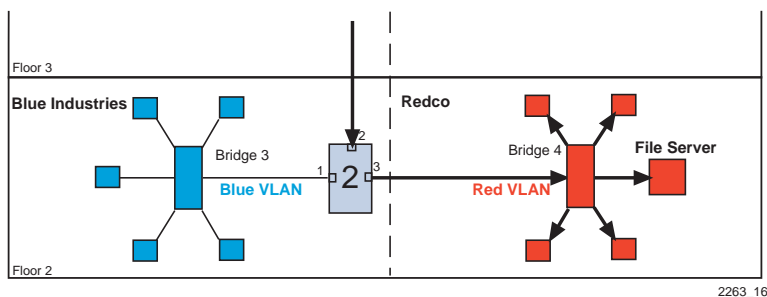


Figure 4-6 Transmitting to Bridge 4

4. The File Server responds with a unicast frame to User A. All switches between the File Server and User A have an entry in their respective Source Address Tables identifying which port to use for forwarding the frame to User A, MAC address “Y” in FID 3. All switches update their Source Address Tables for the File Server’s MAC address “Z” as the frame is forwarded through the switch fabric to User A. The 802.1D switches update their Source Address Tables based on the source MAC address and receive port and the 802.1Q switches update their databases based on the source MAC address, VLAN, and receive port.
5. The frame from the File Server is received on Switch 2, and forwarded to Switch 1 as a tagged frame classified as belonging to the Red VLAN. Switch 1 removes the tag and forwards the frame to Bridge 1, which in turn forwards the frame out of the port attached to User A. All subsequent frames between User A and the File Server are forwarded through the switch fabric in the same manner.

4.3 EXAMPLE 3

This final example illustrates the use of a 1D Trunk to connect a device to a network of 802.1Q VLAN switches.

In this example, illustrated in Figure 4-7, a merger has taken place between Redco and Blue Industries, the companies in the previous example. The two companies have become divisions within a single corporation, Green, Inc. A third group of stations, the Green, Inc. staff, is added to the facility. Also, the Green, Inc. Network Administrators add a Mail Server to the network on the first floor.

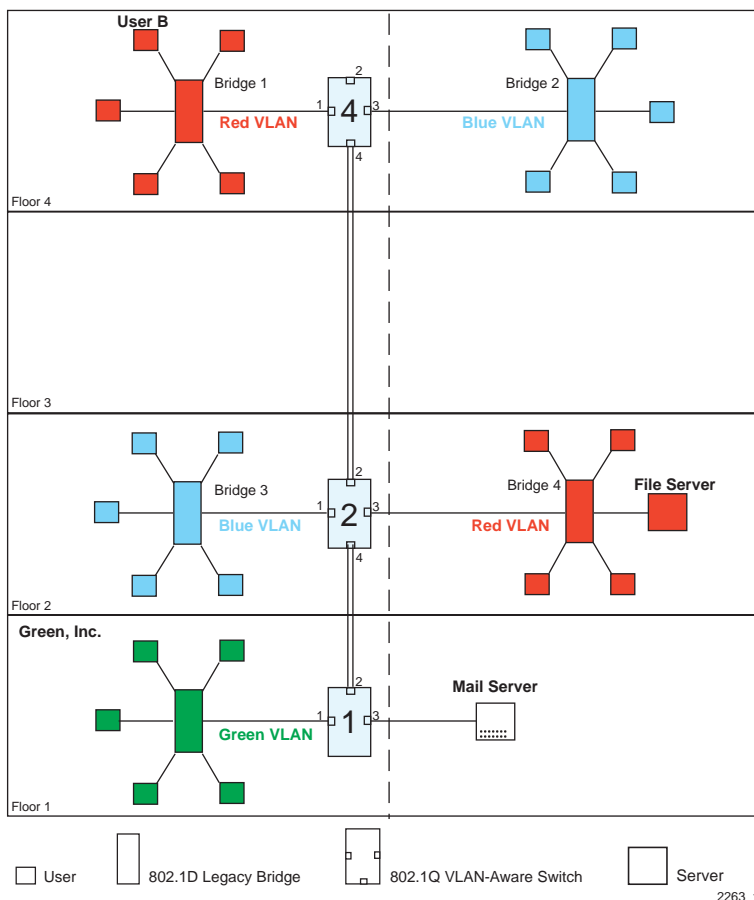


Figure 4-7 Example 3

The Green, Inc. Network Administrators want to continue to separate normal network traffic between the Blue and Red VLANs, and create a new isolated VLAN for Green, Inc. users. All divisions in the facility are to have equal access to the Mail Server on the first floor.

4.3.1 Solving the Problem

Much of the existing network configuration can remain as it was for Example 2. While a new 1Q Trunk port must be activated and configured on Switch 2, and the operational modes of the switches must be changed, there are no other real changes to the network above the first floor.

Switch 4

Switch 4 is set as follows:

1. On the Port Filtering Configuration screen, the Filter Using Port VLAN Lists is set to YES for ALL ports to keep the VLANs isolated.
2. The Forward Default VLAN Out All Ports is set to YES using the Device/VLAN Configuration screen. This adds the Default VLAN to the Port VLAN List of every switch port.

Switch 2

Switch 2 is set as follows:

1. On the Port Filtering Configuration screen, the Filter Using Port VLAN Lists is set to YES for ALL ports to keep the VLANs isolated.
2. The Forward Default VLAN Out All Ports is set to YES using the Device/VLAN Configuration screen. This adds the Default VLAN to the Port VLAN List of every switch port and all VLANs are members of FID 1.
3. The port mode of Port 4 is set using the Port Assignment screen:
 - Port 4, Port Mode: 1Q Trunk

This causes Port 4 to be set as an additional 802.1Q Trunk port, which makes its Port VLAN List contain all VLANs, and all frames forwarded out this port are forwarded as tagged frames.

Switch 1

Switch 1 is set as follows:

1. On the Port Filtering Configuration screen, the Filter Using Port VLAN Lists is set to YES for ALL ports.
2. The Forward Default VLAN Out All Ports is set to YES using the Device/VLAN Configuration screen. This adds the Default VLAN to the Port VLAN List of every switch port.
3. One VLAN is added to the list of VLANs in the Device/VLAN Configuration screen. In this example, it is set as follows:
 - VLAN ID 224, FID 1, with a VLAN Name of Green
4. A Port VLAN ID is assigned to the switch ports as follows using the Port Assignment screen:
 - Port 1, VLAN ID: 224 for the Green VLAN
 - Port 2, Port Mode: 1Q Trunk
 - Port 3, Port Mode: 1D Trunk

These settings change the configuration of the switch, so that Port 1 is part of the Green VLAN and is set to transmit a frame type of untagged. Port 2 is set as an 802.1Q Trunk port, which makes the port eligible to transmit frames of all VLANs, and sets all frames forwarded out this port to be tagged frames. Port 3 is set as a 1D Trunk port, where frames classified as belonging to any VLAN are forwarded untagged, and received frames are classified as belonging to the Default VLAN.

4.3.2 Frame Handling

The following describes how, when User B attempts to contact the Mail Server on Switch 1, the frames are classified on Switch 4 and traverse the network.

1. User B sends a broadcast frame in an attempt to contact the Mail Server. The frame enters Bridge 1 and, being a broadcast, is forwarded to all ports. Bridge 1 learns User B's MAC address from the Source Address field of the frame and adds it to its Source Address Table in FID 1.

- Switch 4 receives the frame and classifies this new untagged frame as belonging to the Red VLAN. Since the frame is a broadcast, it is forwarded to any ports that are classified as eligible to receive Red VLAN frames. Switch 4 also updates its Source Address Table for FID 1, identifying User B as being located out Port 1.

On Switch 4, the only port eligible to receive Red VLAN frames is Port 4, the 1Q Trunk. The frame is forwarded out Port 4 with the Red VLAN Tag header being added, as shown in Figure 4-8.

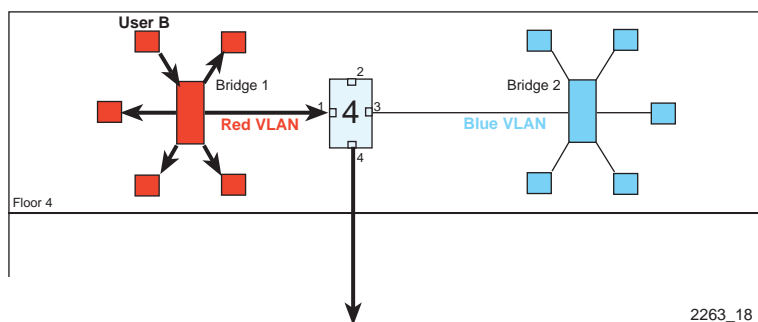


Figure 4-8 Bridge 1 Broadcasts Frames

- Switch 2 receives the tagged Red VLAN frame on Port 2, as shown in Figure 4-9. The VLAN Tag in the frame is maintained, classifying the frame as belonging to the Red VLAN. The switch forwards the broadcast frame out all the eligible ports, Ports 3 and 4. Switch 2 simultaneously updates its Source Address Table for FID 1 to reflect the location of User B (Port 2).

The frame forwarded out Port 3 has its VLAN Tag stripped before transmission, and it is passed to Bridge 4 as a normal broadcast frame. The frame that is transmitted out Port 4, the 1Q Trunk, retains its VLAN tag.

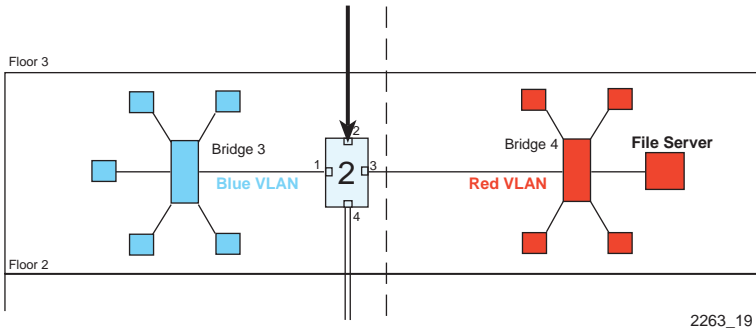


Figure 4-9 Switch 2 Forwards to 1Q Trunk

4. When Switch 1 receives the tagged broadcast frame, it also examines the tag and classifies the frame as belonging to the Red VLAN. This broadcast frame is then sent to all ports eligible to receive Red VLAN frames. In this case only the 1D trunk, Port 3, is eligible, as it is considered a member of all VLANs for forwarding purposes. The VLAN Tag is stripped from the frame and the frame is transmitted out Port 3 as shown in Figure 4-10. The Source Address Table, FID 1 for Switch 1 is updated to contain User B.

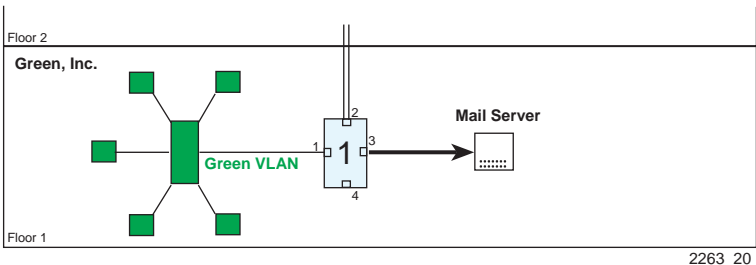


Figure 4-10 Switch 1 Forwards to 1D Trunk

5. The Mail Server receives the broadcast frame and recognizes it. The Mail Server responds with a unicast frame to User B. This frame crosses the 1D Trunk and is received by Switch 1. Switch 1 classifies the unicast frame as belonging to the Default VLAN (the only membership for the 1D Trunk port).

Switch 1 checks the Filtering Database for the MAC address of User B. User B's MAC address is located, and Port 2 is identified as User B's location. The frame is then checked for eligibility and frame format for Port 2. Since Port 2 is a 1Q Trunk port, it is eligible to transmit frames for all VLANs. The frame is tagged and transmitted out Port 2.

The switch also recognizes the MAC address of User B in its Source Address Table, FID 1, and updates that table to contain the MAC address and port combination of the Mail Server.

6. This tagged unicast frame is received by Switch 2. The frame is already tagged as belonging to the Default VLAN, so no classification needs to be done. The switch recognizes User B's MAC address in its Source Address Table, FID 1, and updates that table to contain the Mail Server's MAC address and port combination.

The switch checks the Filtering Database for the MAC address of User B. User B's MAC address is located, and Port 2 is identified as the location of User B. The frame is checked for eligibility and frame format for Port 2. Since Port 2 is a 1Q Trunk port, it is eligible to transmit frames for all VLANs. The frame is tagged and transmitted out port 2.

7. Switch 4 receives the frame on its 1Q port, Port 4, and examines the frame's Tag. The frame maintains its Default VLAN classification. The switch also refers to its Source Address Table, FID 1, to see if it can locate an entry for User B. User B is found to be located on Port 1. The switch also updates its Source Address Table, FID 1, with the port and MAC address combination for the Mail Server.

The switch examines the Filtering Database and locates the MAC address entry for User B and Port 1. The frame is then checked for eligibility and frame format for Port 1. As Port 1 is considered eligible to transmit to the Default VLAN, the frame is transmitted out Port 1 without a VLAN Tag.

8. Bridge 1 receives the frame and recognizes User B's MAC address. The frame is forwarded to the correct port and the bridge's Source Address Table is updated with an entry for the Mail Server's MAC address. User B receives the Mail Server's response. Any further unicast traffic between the Mail Server and User B will be handled in the same fashion by the switches in the network.

INDEX

Numerics

- 1D Trunk 1-6, 3-16, 4-11
- 1Q Trunk 1-5, 3-16, 4-4
- 802.1Q VLAN Configuration Menu
 - screen 3-5

C

- Chapters
 - organization vii
- Configuration 2-2
- Conventions viii

D

- Default VLAN 1-5
- Device/VLAN Configuration
 - screen 3-8

E

- Examples 4-1

F

- FID. See Filtering Database ID
- Filtering Database 1-5
- Filtering Database ID 1-4
- Forwarding list 1-5
 - adding entries 3-24
 - customizing 2-3
 - deleting entries 3-24
 - viewing 3-23
- Forwarding mode
 - changing 3-13
- Frame format
 - changing 3-25
- Frames
 - tagged 1-5, 2-5
 - untagged 1-5, 2-4

H

- Host data port 3-2, 3-3
- Hybrid 3-16

L

- Lists
 - Forwarding 1-5
 - Port VLAN 1-5
- Local management. See managing the switch

M

- Managing the switch 3-1
 - when configured with VLANs 3-2
 - when not configured with VLANs 3-1

O

- Organization of chapters vii

P

- Port Assignment Configuration
 - screen 3-14
- Port Filtering Configuration
 - screen 3-18
- Port mode
 - 1D Trunk 3-16
 - 1Q Trunk 3-16
 - changing 3-16
 - Hybrid 3-16
- Port VLAN ID 1-5
- Port VLAN list 1-5
- PVID. See Port VLAN ID

R

- Remote management. See managing the switch

S

Screens

- 802.1Q VLAN Configuration
 - Menu 3-5
- Device/VLAN Configuration 3-8
- Port Assignment
 - Configuration 3-14
- Port Filtering Configuration 3-18
- VLAN Forwarding
 - Configuration 3-21

Station 2-1

Switch 2-1

T

Tag 1-5

Tag Header 1-5

Tagged frame 1-5, 2-5

U

Untagged frame 1-5, 2-4

V

VLAN

- assigning ports 2-2
- components 2-1
- configuration 2-2
- default VLAN 1-5
- defining 2-2
- definition 1-1 to 1-4
- operation 2-3
- terms 1-4
- types 1-3

VLAN Configuration

- deleting 3-12
- disabling 3-13
- enabling 3-12

VLAN Forwarding Configuration

- screen 3-21

VLAN ID 1-4

- assigning 3-17

VLAN Local Management 3-4

VLAN name 1-4