DSLAM Configuration Guide

A Guide for configuring
DSLAM5008/5012/5016/5024

Contents

1 About this Guide

1.1 Structure of this guide

This guide describes how to use Command-Line Interface(CLI) to configure your DSLAM, including model 5008, 5012, 5016 and 5024.

Do not proceed until you have completed all the hardware connections.

1.2 Purpose and Audience

The intention of this DSLAM configuration guide is the following:

- To help the application engineer to evaluate the software features of the DSLAM.
- To use the Command-Line Interface(CLI) for application engineer to create a customized default configuration for his own product design.
- To let the ISP to modify the unit configuration in the field.

1.3 Organization

The remainder of this DSLAM Configuration Guide is organized as follows:

- **Chapter 2 System overview** describes the DSLAM software feature.
- **Chapter 3 Basic Configuration** describes the basic network setup and the methods to configure it.
- **Chapter 4 Configuring the IP Stack** describes how to setup your router by configuring the IP stack.
- **Chapter 5 Configuring the Bridge** describes how to configure the 802.1D and 802.1Q Bridge.
- **Chapter 6 Configuring ports** describes the ports available on your device.
- **Chapter 7 Configuring DSL** describes how to change your DSL configuration.
- **Chapter 8 Configuring System logging** describes how to configure system logging on.
- **Chapter 9 Configuring RFC1483** describes how to configure RFC 1483 bridged and routed networks.
- **Chapter 10 Configuring User Accounts** describes how to administer the user accounts on your network.
- **Chapter 11 Configuring SNMP agent** describes how to configure SNMP agent.

2 System Overview

Features of the ISOS software is summarized as follow:

2.1 System feature

2.1.1 ATM feature

- Provides ATM layer functionality (per I.361)
- Provides adaptation layer (AAL5, AAL0) functionality(per I.363.5)
- Supports UBR, CBR rt-VBR & nrt-VBR service classes in accordance with ATM forum TM 3.1. DSL-aware CAC
- Supports IP over ATM (IPoA, RFC 1483 & RFC 1577)
- Supports Ethernet over ATM (EoA, RFC 2684 - superseding RFC 1483)

2.1.2 DSL feature

- Supports fast and interleaved latency
- Supports the following types of line coding:- DMT: T1.413, G.992.1, G.992.2 with auto-detection, G.992.3 (G.dmt.bis / ADSL2) andG.992.5 (ADSL2plus)
- ADSL downstream data rates up to 12 Mbps,DSL2plus data rates up to 24 Mbps

2.1.3 Routing and IP features

The software supports the following protocols:

- IP layer stack supported.
- User Datagram Protocol (UDPv4)
- Transmission Control Protocol
- Address Resolution Protocol (ARP)
- Internet Control Message Protocol
- Routing Information Protocol (RIP) v1 and v2
- IP Fragmentation and Reassembly
- Virtual interfaces and secondary IP addresses
- IGMP, IGMP Proxy and Multicasting
- TCP Maximum Segment Size (MSS) Clamp changes the MSS in the TCP header of packets, so they do not require fragmentation when sent over a link with a smaller MTU

2.1.4 Bridging features

- Layer 2 MAC Transparent bridge as specified in IEEE802.1D and 802.1Q;
- VLAN and 802.1p priority support
- Bridged PDU encapsulation (per RFC2684)
- Bridge Source MAC Address forwarding. Forwarding IPpackets based on MAC address of the packet
- Spanning Tree bridge IEEE 802.1D

- IGMP Snooping support - allows multicast packets to be forwarded intelligently to ensure more efficient use of network bandwidth

2.1.5 Management features

Device/network management has following features:

- EmWeb Web-based Graphical User Interface (GUI) enabling end-user device configuration via HTTP.
- Support SNMP v1, v2
- SNMP MIB II, DSL MIB, ATM MIB
- Command Line Interface (CLI) via serial interface or Telnet over Ethernet or DSL
- Update of boot image or configuration data over HTTP/ TFTP including HTTP One-Click firmware upgrade.

2.2 CLI overview

2.2.1 CLI features

- Support local configuration by Console（RS-232）port.
- Support remote configuration by Telnet
- Provide a function similar to DosKey to display history commands.
- Enter “?” to get online help at any time
- Enter “tab” to match commands

2.2.1 CLI help

The Command Line interface provides online help to users:
A user can simply type “?” at the Command Line prompt
A list of all the commands and their descriptions will appear.

For example

?

Below is the corresponding output:

```
agent                           Get a file from a remote host
bridge                          Configure layer 2 bridge.
bridgevlan
console                         Console access
ethernet                        Commands to configure ethernet transports
help                            Top level CLI help
igmp
imdebug                         Directly access the information model
ip                              Configure IP router
port                            Physical port configuration commands
rfc1483                         Commands to configure RFC1483 transports
snmp
source                          Read a file of commands
```

```
system                          System administration commands
transports                      Transport configuration commands
user                            User commands
webserver                       Webserver configuration commands
```

Type in one command and "?" with space in between (**command ?**)
It will list all keyword and description about this command

For example(in this case, command is "ip")：

```
ip ?
```

Below is the corresponding output:

```
--> ip
add
attach
attachbridge
attachvirtual
clear
delete
detach
interface
list
ping
set
show
--> ip
```

Type in one parameter and "?" with space in between (**parameter ?**)
It will list all keyword and description about this parameter
If there is no corresponding parameter, the CLI will return the same command line, hit "Enter" to exit.

Type in one string and "?" with space in between (**string ?**)
It will list all the commands beginning with the string.
For example：

```
i?
```

Below is the corresponding output:

```
--> b
bridge                          bridgevlan
--> b
```

Type in the first few letters of the command and press <tab>. It will automatically display the complete command given this command name is unique.

2.2.2 CLI Edit

Command Line Interface provides basic command editor as:

key	Attribute
Normal key	Provide basic command input, and case insensitive

Backspace	Delete one character ahead
→	Move the cursor one character after
←	Move the cursor one character ahead
↑ ↓	Display history command
Del	Delete the character on the cursor

2.2.3 Configure DSLAM using CLI

Your DSLAM can be configured by using CLI via serial port as shown in 1.

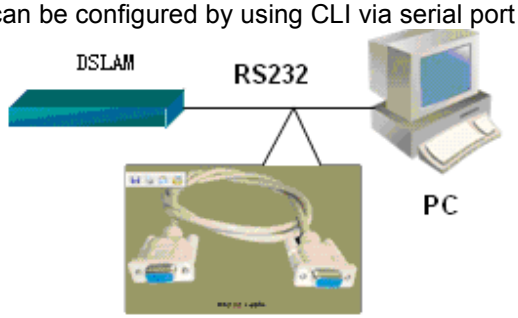


Figure 2-1 Connect DSLAM5024 to PC by Serial port

Then start the HyperTerminal in Microsoft Windows through the following path:
START → PROGRAMS → Accessories → Communications → HyperTerminal
If this is the first time to run it, the program will ask you to give a name for current connection and select an icon.

Figure 2-2 HyperTerminal Window

Continue by clicking OK and select the serial port being used.

Figure 2-3 Name the connection

Choose the serial port and configure the communication parameters including baud rate, data bits etc.

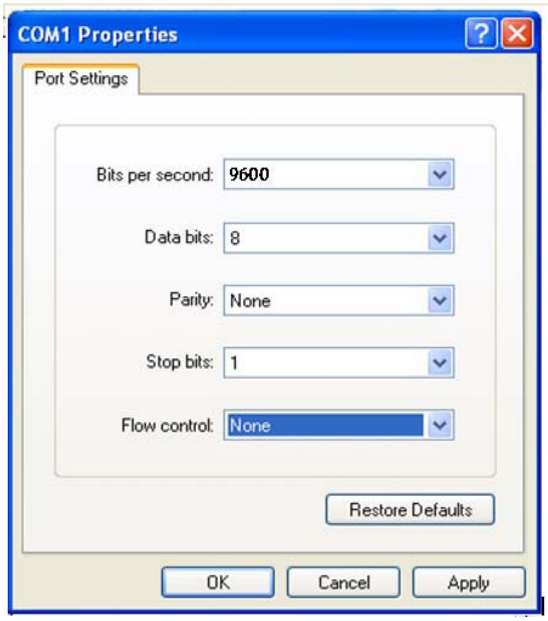


Figure 2-4 Choose the communication parameters

Default values are set as follows.

Baud Rate	9600
Data Bits	8
Stop Bits	1
Parity	None
Flow Control	None

You can also configure DSLAM using CLI by telnet, see figure 2-5,the default IP address is :192.168.1.32.

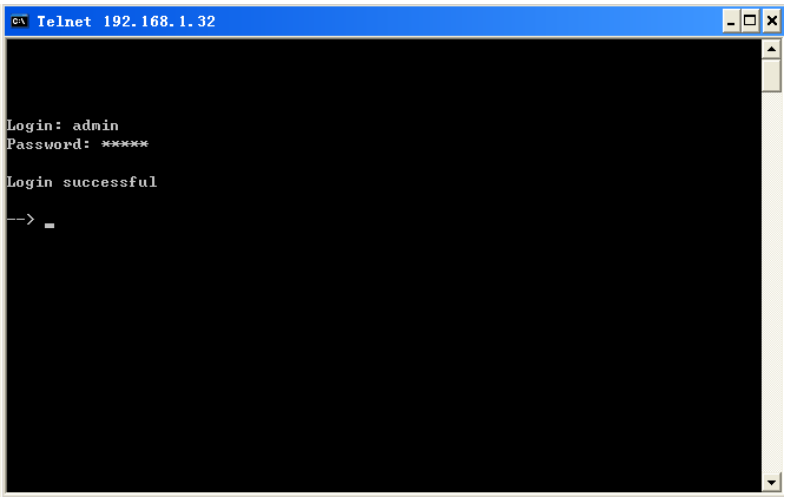


Figure 2-5 Telnet DSLAM

2.3 Basic Network For Configuration

Following describes the basic ADSL network and how to configure it. The majority of configurations described throughout this guide assume that you have setup your device to act as a DSLAM. Consider the network below:

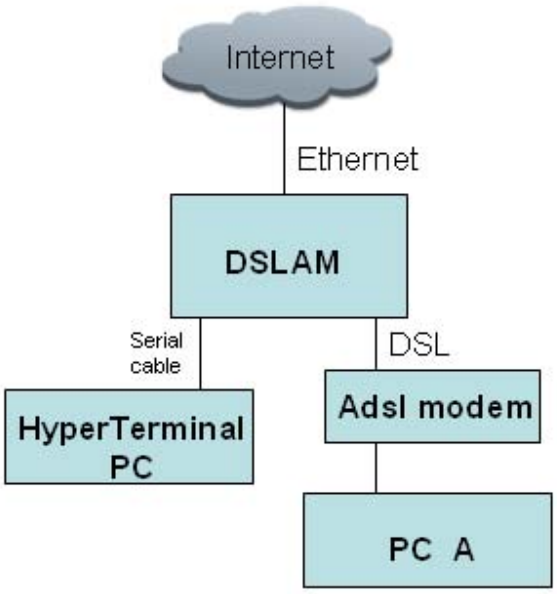


Figure 2-6: Basic Ethernet network

In this example, the hardware connections are as follows:

- the device is configured via the HyperTerminal PC attached to the serial port.
- the Internet is attached to the device's 10BaseT/100BaseTX Ethernet port.
- the PC A is attached to the device's DSL port via ADSL modem.

Once you have booted the device, its configuration can be changed interactively:

- Using the Command Line Interface (CLI). The CLI is supported by the Versatile Management Interface (VMI) and is the priority configuration method described throughout this guide.
- Using the ISOS Embedded Webserver (EmWeb).

3 Configuring the IP Stack

This chapter provides an introduction on how to setup IP stack.

The IP stack contains a suite of networking routing protocols for use in embedded networking. It allows you to configure basic connectivity for your network to provide IP routing between interfaces and support local applications such as Telnet, Webserver and alike.

3.1 Supported protocols and features

3.1.1 Creating IP interfaces

You must attach one or more interfaces to the IP stack and attach a transport to it. For IP interfaces, each interface must be configured with an IP address and a subnet mask. Together, these define the range of addresses which can be reached via the interface without passing through any other routers.

Each interface must have a unique subnet; the range of addresses on each interface must not overlap with any other interface.

To create an IP interface, enter:

```
ip add interface <name> [<ipaddress> [<subnetmask>]]
```

You do not have to specify the IP address and subnet mask of an interface on creation.

A transport is attached to an IP interface using the command:

```
ip attach <name> <transport>
```

For example, create an IP interface first:

```
ip add interface iplan 192.168.1.1 255.255.255.0
```

Then, create a transport. Details of how to create and configure transports are described elsewhere in this guide. In the example below, an Ethernet transport is created:

```
ethernet add transport ethernet0 ethernet0
```

Attach the transport to the interface:

```
ip attach iplan ethernet0
```

NOTE:

ethernet0 *is the default Ethernet port name on the DSLAM5008,DSLAM5012,DSLAM5016,DSLAM5024.*

3.1.2 Displaying information about interfaces

To list details about all existing IP interfaces, enter:

```
ip list interfaces
```

```
IP Interfaces:
 ID  |    Name      |    IP Address    |   DHCP   |   Transport
-----|--------------|------------------|----------|---------------
   2 | iplan        | 192.168.1.32     | disabled | ethernet0
-------------------------------------------------------------------
```

In this example, the *iplan* interface is your default LAN connection over Ethernet

To list details about a specific interface, enter:

```
ip show interface <name>
```

For example:

```
ip show interface iplan
```

```
IP Interface: iplan
                  Ipaddr :192.168.1.32
                    Mask : 255.255.255.0
                     MTU : 1492
                    Dhcp : false
           TCP MSS Clamp : false
  Source Addr Validation : false
              Accept V1 : false
                Send V1 : false
              Accept V2 : false
                Send V2 : false
          Send Multicast : false
```

3.1.3 Creating virtual interfaces

You can use a single port to transport data to multiple IP interfaces by creating a ‘virtual’ interface. Once an interface has been configured, you can create and attach a virtual interface to the ‘real’ interface. To create a virtual interface, use the ip add interface command, for example:

```
ip add interface my_virtual 172.15.1.1
```

Attach the virtual interface to the existing LAN interface using the command:

```
ip attachvirtual <virtual_interface> <real_interface>
```

For example:

```
ip attachvirtual my_virtual iplan
```

The virtual interface uses the transport and port configuration already attached to the 'real' interface. At the *ip list interfaces* table, the *Transport* name of the virtual interface is displayed as *[real_interface]*.

3.1.4 Deleting IP interfaces

To delete a single IP interface, enter:

```
ip delete interface <name>
```

To delete all existing interfaces, enter:

```
ip clear interfaces
```

3.1.5 Setting IP interface addresses

To manually set the IP address of an existing interface, use the command:

```
ip set interface <name> ipaddress <address> [<netmask>]
```

If a netmask is not specified, the natural subnet mask for the IP address is used.

For example, the following command sets the existing IP address for the existing *iplan* interface to *192.168.50.1*:

```
ip set interface iplan ipaddress 192.168.50.1
```

3.1.6 Attaching the bridge

You can attach the bridge to the router, allowing transports that are attached to the bridge to route through the IP stack. Enter:

```
ip attachbridge <name>
```

The <*name*> value is the name of the IP interface that you want to attach the bridge to, for example:

```
ip attachbridge iplan
```

To send/receive traffic for a particular VLAN on an IP interface, enter:

```
ip interface <ip interface> attachbridgevlan  <bridge vlan transport>
```

For example:

```
ip interface iplan attachbridgevlan vt1
```

3.1.7 Configuring routes

You can manually create a static route to ensure packets are forwarded to their correct destination. The route specifies a destination network (or single host), together with a mask to indicate what range of addresses the network covers, and a next-hop gateway address or interface. If there is a choice of routes for a destination, the route with the most specific mask is chosen.

Routes can be created by using the command:

```
ip add route <name> <dest_ip> <netmask> {gateway <gateway_ip> | interface <interface>}
```

To route to a destination which is not on any local network, a route may be added via a gateway (i.e., another router). The gateway IP address must be on the same subnet as one of the router's interfaces. For example, to ensure packets destined for the *10.0.0.0* subnet are routed via local gateway address *192.168.3.2*, enter:

```
ip add route route_gateway 10.0.0.0 255.0.0.0 gateway 192.168.3.2
```

The interface name can be specified instead of a gateway IP address. This can be useful if the gateway IP address or interface IP address is unknown at the time the route is added. For example, to forward packets via local interface *ip_interface*, enter:

```
ip add route route_interface 10.0.0.0 255.0.0.0 interface ip_interface
```

When a system has one LAN interface and one WAN interface, it is very common for only one route to be needed - a *default* route. This default route would forward all packets whose destination was unknown to a gateway router reached via the WAN interface. You can only create one default route. To create a default route, use the command:

```
ip add defaultroute {gateway <gateway_ip> | interface <interface>}
```

For example, to create a default route via the gateway used in the earlier example, enter:

```
ip add defaultroute gateway 192.168.3.2
```

To create a default route via the interface used in the earlier example, enter:

```
ip add defaultroute interface ip_interface
```

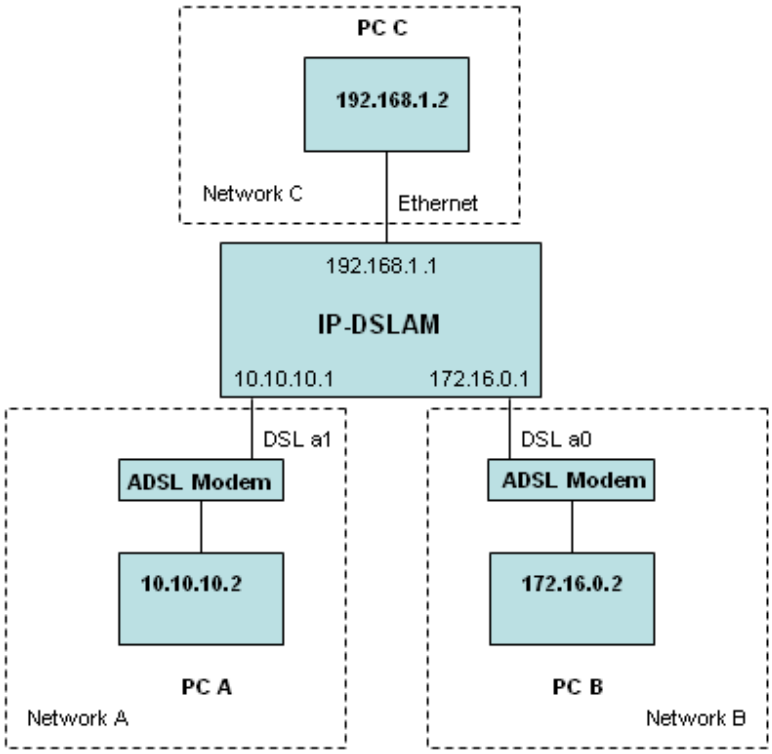


Figure 3-1: Basic router network configuration

The IP interfaces are connected as follows:

- the PC C is connected to the Network C subnet via the *ethenet* port using an Ethernet transport
- the PC B is connected to the Network B subnet via DSL port *a0* using a RFC1483 transport
- the PC A is connected to the Network B subnet via DSL port *a1* using a RFC1483 transport

Clear your current default configuration:

```
system config clear
```

```
system config save
```

```
system restart
```

Create a Network A interface:

```
ip add interface iplanA 10.10.10.1 255.255.255.0
```

Create Network B interface:

```
ip add interface iplanB 172.16.0.1 255.255.255.255
```

Create a Network C interface:

```
ip add interface iplanC 192.168.1.1 255.255.255.0
```

Create transports for each of the IP interfaces:

```
ethernet add transport eth0 ethernet0
```

```
rfc1483 add wb0 a0 0 35
```

```
rfc1483 add wb1 a1 0 35
```

Attach the transports to their respective IP interfaces:

```
ip attach iplanA wb1
```

```
ip attach iplanB wb0
```

```
ip attach iplanC eth0
```

Check your interface configuration using the *ip list interfaces* command.
Add router:

```
ip add route lanC 192.168.1.0 255.255.255.0 interface iplanC
```

```
ip add route lanB 172.16.0.0 255.255.255.0 interface iplanB
```

```
ip add route lanA 10.10.10.0 255.255.255.0 interface iplanA
```

4 Configuring the Bridge

This chapter describes how to configure the D-bridge (802.1D Bridge) and the Q-bridge (802.1Q Bridge).

4.1 Introduction

The DSLAM bridge operates in either the D-bridge mode or the Q-bridge mode. The Q-bridge (802.1Q bridge) is an extension to the 802.1D bridge (D-bridge). As specified in IEEE Standard 802.1Q-1998 and IEEE Standard 802.1D-1998, the principle elements of Bridge operation are:

- reception, filtering and transmission of frames between the separate MACs of the Bridged interfaces connected to a device's ports.
- maintenance of the information needed to make filtering and relaying decisions.
- management of the above

DSLAM bridge elements are managed via the CLI and EmWeb. Along with the basic 802.1D functionality that allows you to bridge network traffic between different network ports, Q-bridge can also be configured to separate traffic into Virtual LANs (VLANs) and to prioritize incoming traffic using frame header tags.

In addition, the bridge can be configured to support IGMP snooping functionality. IGMP snoop enables forwarding of multicast traffic intelligently instead of flooding all ports with multicast packets. This leads to efficient use of network bandwidth. IGMP Snoop is available in both Q-bridge and D-bridge mode. For details of IGMP Snoop and its configuration, refer to **IGMP Snoop Support** chapter.

This chapter contains the following sections:

- **Overview** of Q-bridge suppor; describes the functionality supported including frame header tags, 802.1P and VLAN learning mechanisms.
- **Basic D bridge configuration**; provides basic D-bridge configuration information.
- **Q-bridge CLI commands;** describes the main bridge commands that you will use to configure VLANs.
- **Example Q-bridge configurations;** describes typical VLAN network configurations.
- **IGMP Snoop Support ;** provides an overview of IGMP Snoop, its benefits and an example configuration.

4.2 Overview of Q-bridge support

The Q-bridge supports the following functionality:

- Can support more than 72 Bridge ports
- Performs source address learning based on source MAC address and VID
- Maintains a static filtering database based on destination MAC address and VID
- Maintains a static filtering database based on source MAC address and VID
- Performs filtering and forwarding of frames based on the filtering database
- Maintains static VLAN registration entries and forwarding frames based on those entries
- Supports a hybrid VLAN learning mechanism for unicast packets, thus enabling both Independent VLAN Learning (IVL) and Shared VLAN Learning (SVL)
- Supports both independent and hybrid VLAN learning mechanisms for multicast frames
- Provides support for tagged as well as untagged frames, and making tagging decisions for outgoing frames based on port properties
- Performs packet prioritization
- Supports 802.1P which provides a method for specifying how prioritization should occur within a MAC-layer bridge
- Performs age-out of dynamic entries in the filtering database
- Provides both command-based and graphical interfaces for management and configuration of the bridge

4.2.1 Frame header tags

Forwarding, filtering and prioritizing decisions are based on VLAN tags specified in incoming frames. Frames can fall into one of the following categories:

- *vlan-tagged*; a tag header is attached to the frame after the source MAC address field or the Routing Information field. The tag header contains a VLAN ID and a prioritization field.
- *priority-tagged*; a tag header is attached to the frame after the source MAC address field or the Routing Information field. The tag header contains prioritization information and a null VLAN ID.
- *untagged*; there is no tag header attached to the frame

4.2.2 802.1P support

802.1P defines the prioritization field of the VLAN tag, which adds a 32-bit tag header after a frame's normal destination and source address header information.
The DSLAM schedules packets based on the traffic class value set in each frame. The user priority in the incoming frame header is mapped to a regenerated priority value in the outgoing frame header. The regenerated priority value is mapped to a traffic class value .

Eight levels (values 0-7) of priority are defined. Value 7 is the highest priority and 0 is the lowest. Incoming packets are buffered in multiple queues based on their priority.

The Priority Queuing service discipline is used to provide better treatment to higher priority frames compared with lower priority frames. A lower priority queue is only served if the queues of higher priority levels are not backlogged. This scheme may cause starvation to low priority frames if there is a continuous flow of high priority frames.

Incoming frames are buffered in the default priority-enabled interface of the bridge process.

4.2.3 VLAN Learning Mechanisms

You can configure the bridge to support the following VLAN learning mechanisms:

- *Independent VLAN Learning* (IVL)- Using IVL, the Learning Process and Filtering Database can be configured so that if an individual MAC address is learned in one VLAN, that learned information **is not** used in forwarding decisions taken for that address relative to any other VLAN in the system. This is achieved by including information from each VLAN in distinct Filtering Databases.
- *Independent VLAN Learning (IVL)/ Shared VLAN Learning* (SVL) - Two learning mechanisms are supported. Using SVL, the Learning Process and Filtering Database can be configured so that if an individual MAC address is learned in one VLAN, that learned information **is** used in forwarding decisions taken for that address relative to all other VLAN in the given set. This is achieved by including learned info from a number of VLANs in the same Filtering Database.

Unicast learning supports SVL/IVL (referred to as the *Hybrid VLAN Mechanism* in ISOS) - which supports multiple Filtering Databases and allows you to define the grouping of VLANs to Filtering Databases. For IVL learning, multiple Filtering Databases are supported and you can define the each VLAN using an independent Filtering Database. For SVL learning, a single Filtering Database is supported and you can define all VLANs to use the same Filtering Database.

Multicast learning supports the same mechanisms supported by unicast learning, but you can also configure the bridge module file to support only IVL (without SVL) so that learning for each VLAN takes place in an independent Filtering Database.

4.3 Basic bridge configuration

This section describes how to create bridge interfaces, attach transports to them and then attach the bridge to the IP stack.

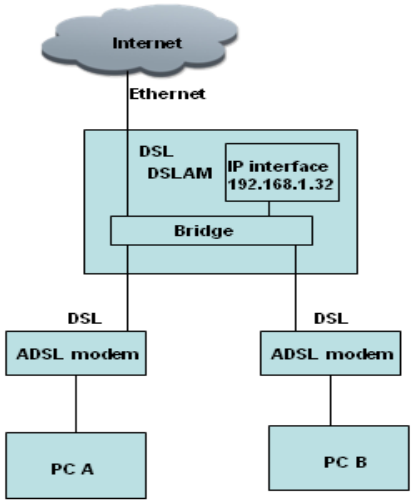


Figure 4-1: Basic bridge/router network configuration

The bridge is configured as follows:

- a bridge interface is attached to a bridge interface via ADSL port a0 using a rfc1483 transport

- a bridge interface is attached to a bridge interface via ADSL port a1 using a rfc1483 transport
- a bridge interface is connected to the Internet via Ethernet port *ethernet0* using an Ethernet transport
- the bridge is attached to the IP stack via the IP LAN interface so that the dslam can be management by ip address

Clear your current default configuration:

```
system config clear
```

```
system config save
```

```
system restart
```

Create a IP interface:

```
ip add interface iplan 192.168.1.32 255.255.255.0
```

.

Bridge interfaces are created using the command:

```
bridge add interface <name>
```

Create a bridge interface

```
bridge add interface uplink
```

Ethernet transport are created using the command:

```
ethernet add transport <name> ethernet0
```

Create a ethernet transport

```
ethernet add transport eth0 ethernet0
```

Transports are attached to the bridge using the command:

```
bridge attach <interface> <transport>
```

Attach the Ethernet transport to the *uplink* bridge interface:

```
bridge attach uplink eth0
```

Create a bridge interface and an Rfc1483 transport, then attach them:

Create bridge interfaces:

```
bridge add interface wan0
```

```
bridge add interface wan1
```

Rfc1483 transport are created using the command:

```
Rfc1483 add transport <name> <adsl port> <vpi> <vci> <llc/vcum> <bridged/routed>
```

Create rfc1483 transports

```
rfc1483 add transport wb0 a0 0 35 llc bridged
```

```
rfc1483 add transport wb1 a0 0 35 llc bridged
```

Attache the rfc1483 transport to bridge

```
bridge attach wan0 wb0
```

```
bridge attach wan0 wb0
```

The bridge is attached to the router using the command:

```
ip attachbridge <ip_interface>
```

Attach the bridge to the LAN IP interface:

```
ip attachbridge iplan
```

Check the bridge by entering:

```
bridge list interfaces
```

```
ID:      1
Name: wan0

Filter| PVID   | Accept     | Ingress    | User   | Transport
Type  |        | FrameType  | Filtering  | Prio   |
------|--------|------------|------------|--------|----------------------------
All   | 1      | ALL        | disabled   | 0      | wb0

ID:      2
Name: wan1

Filter| PVID   | Accept     | Ingress    | User   | Transport
Type  |        | FrameType  | Filtering  | Prio   |
------|--------|------------|------------|--------|----------------------------
All   | 1      | ALL        | disabled   | 0      | wb1

-------------------------------------------------------------------------------
```

For detailed information about a single bridge interface, use the command:

```
bridge show interface <name>
```

For example:

```
bridge show interface ethernet0
```

```
bridge interface: ethernet0
```

```
Name:                  ethernet0
Filter Type:           All
Port Filter:           All
PVID:                  1
Acceptable Frame Type: ALL
Ingress Filtering:     ENABLED
user Priority:         0
Transport:             ethernet0
```

Note that the *bridge list interfaces* and *bridge show interface* example outputs displayed above are for an image which has the Q-bridge option included. If you have not included the Q-bridge option, a subset of this information is displayed.

4.4 Q-bridge CLI commands

This section describes the basic Q-bridge CLI commands required to create and configure VLANs. They allow you to:

1. Create a Virtual LAN; s
2. Create a VLAN port and set it to forward either tagged or untagged frames;
3. Set ingress filter rules for vlan-tagged frames;
4. Configure the Bridge interface to accept or reject untagged incoming frames;
5. Create forwarding rules and filters for unicast or multicast frames;
6. Map the user priorities of incoming frames to regenerated priorities, then map regenerated priorities to traffic classes;
7. Create bridge VLAN transports, each for a particular VLAN, and associates IP interfaces to the bridge VLAN transports;

4.4.1 Creating VLANs

bridge add vlan <name> <vlanid> <fdb>

Note that the VLAN ID is always unique to each specific VLAN. You can create a single default VLAN and/or one or more user-defined VLANs. A default VLAN allows forwarding of untagged frames. To create a default VLAN, you **MUST** enter:

bridge add vlan DefaultVlan 1 DefaultFdb

Note that you cannot create a user-defined VLAN by entering the same VLAN ID of the default VLAN (of value 1), because it is reserved for the default VLAN. However, user-defined VLANs may use the same filtering database - *DefaultFdb*. A User-defined VLAN allows you to specify the name, ID and Filtering Database (FDB) name. Specifying a Filtering Database for the first time, automatically creates the database and adds it to the list displayed by the *bridge list fdbs* command. For example:

bridge add vlan vlan2 2 Qbridge

To check the Filtering Databases, enter:

```
bridge list fdbs
```

```
Filtering Databases Statistics:
ID|FDB Name  |FID|Num VLANs|Num Entries|Num O/F Discard|Type
-------------------------------------------------------------
 1|DefaultFdb| 0 |1        |0          |0              |static
 2|Qbridge   | 1 |1        |0          |0              |static
-------------------------------------------------------------
```

4.4.2 Creating VLAN ports

Once you have created a VLAN, you must add VLAN interfaces to it and specify whether the interfaces should forward untagged or tagged frames on those interfaces. VLAN interfaces are created using the command:

```
bridge add vlaninterface <name> {tagged|untagged} <interfacename>
```

The <*name*> is the name of the VLAN created using the *bridge add vlan* command. The <*interfacename*> is the name of the bridge interface that has a valid transport/port attached to it. The interface must be defined as one of the following:

- a *tagged* interface; will always transmit tagged packets for the VLAN
- an *untagged* interface; will always transmit untagged packets for the VLAN

For example, if you want to add the *ethernet0* and *a1* ports to *vlan2*'s list of tagged egress interfaces, enter:

```
bridge add vlaninterface vlan2 tagged uplink
```

```
bridge add vlaninterface vlan2 tagged wan1
```

To list VLANs and check which interfaces are tagged and untagged for each one, enter:

```
bridge list vlans
```

```
VLANs:
 ID | VLAN ID | VLAN Name   | FDB Name    | Type
-------------------------------------------------
 1  | 2       | vlan2       | Qbridge     | static
Tagged Interfaces :  uplink  wan1
Untagged Interfaces:
```

You are not allow to add VLAN interfaces to a default VLAN. For the *DefaultVlan*, all existing interfaces attached to the bridge via transports are already automatically configured as *untagged* interfaces. The bridge interfaces subsequently created are also added as untagged interfaces to the default VLAN.

4.4.3 Ingress filtering vlan-tagged frames

You can set an *ingress* rule on bridge interfaces in order to filter vlan-tagged frames based on their VLAN ID. The VLAN ID of every vlan-tagged frame received by an interface is checked. If the ID specified in the frame matches a VLAN, and if the interface that received the frame is listed in that VLAN's egress interface list, the frame is accepted. If the ID does not match or the interface is not in the egress interface list, the frame is discarded. This rule is disabled by default to allow incoming frames regardless of their VLAN ID.

Configure ingress filtering using the command:

```
bridge set interface <name> ingressfiltering {disable|enable}
```

For example, the following commands ensure that only vlan-tagged frames with a VLAN ID of 2 are accepted by the lan interface:

```
bridge set interface lan ingressfiltering enable
```

4.4.4 Accepting/rejecting incoming frames

Configure the bridge interfaces to determine whether they can accept only vlan-tagged frames or accept all incoming frames (vlan-tagged, priority-tagged and untagged) using the following command:

```
bridge set interface <name> acceptframetype {acceptall|accepttaggedonly}
```

In order for a bridge interface to accept all frames, each frame must have a valid VLAN ID. Priority-tagged and untagged frames do not have VLAN IDs, so they are assigned a Port VLAN ID (PVID) instead. By default, bridge interfaces accept all frames and the default PVID assigned to frames is *1*.

There is no need to change the default PVID if you want to send the untagged traffic as untagged on all ports in the Default VLAN. If you want to send all untagged traffic to a particular VLAN, change the PVID so that it corresponds with the VLAN ID by entering:

```
bridge set interface {name|number} pvid <pvid>
```

For example, use the following default setting:

```
bridge set interface lan acceptframetype acceptall
```

```
bridge set interface wan acceptframetype acceptall
```

then set the correct PVID as follows:

```
bridge set interface lan pvid 2
```

```
bridge set interface wan pvid 2
```

If you want a bridge interface to accept only vlan-tagged frames, all priority-tagged and untagged

frames that do not carry a VLAN ID (i.e., untagged and priority-tagged frames) are discarded. The following commands set the *lan* and *wan* interfaces to accept tagged frames only:

```
bridge set interface lan acceptframetype accepttaggedonly
```

```
bridge set interface wan acceptframetype accepttaggedonly
```

4.4.5 Forwarding and filtering frames

The forwarding process determines which frames should be forwarded between interfaces on the bridge. Different filters can be applied to unicast and multicast frames respectively.

4.4.5.1 *Forwarding unicast frames*

Create a filter for the destination MAC address of unicast frames. If the destination MAC address of an incoming unicast frame matches the address set in this entry, the frame is forwarded to the egress interface for this entry. To create a filter, enter:

```
bridge add ucastentry dest <name> <fdbname> <macaddress>
```

Create a similar filter for the source MAC address and source interface. If the source MAC address of an incoming unicast frame and the source interface that receives it match the address/interface set in this entry, the frame is forwarded to the egress interfaces in the entry. To create a filter, enter:

```
bridge add ucastentry src <name> <fdbname> <macaddress> <recvinterface>
```

Add an interface to the source or destination MAC filtering entry that you created using the previous two example commands. Enter:

```
bridge add ucastinterface <entryname> <fdbname> egress <interfacename>
```

4.4.5.2 *Forwarding multicast* frames

You can create a *Forward All Group* for an existing Filtering Database. The interfaces added to this group are the interfaces that all multicast frames will be forwarded to, in addition to the interfaces added using the *bridge add mcastentry* command (described later in this section).

```
bridge add fwdallinterface independent <vlanname> <interfacename>
```

```
bridge add fwdallinterface shared <fdbname> <interfacename>
```

If you specify the independent option, learning for each VLAN is separate, therefore you only need to specify one VLAN name. If you specify the shared option, learning is based on the VLANs that are grouped into a Filtering Database. For example, if you set the multicast learning mechanism to IVM in the *bridge.module* file, enter:

```
bridge add fwdallinterface independent vlan2
```

You can also create a *Forward Unregistered Group* for an existing VLAN. The interfaces added to this group are the interfaces that multicast frames will be forwarded to if their destination MAC address is not present in the Filtering Database entry. You can specify whether the interface uses

the independent or shared VLAN learning mechanism, depending on the learning mechanism set in the *bridge.module* file. To add an interface to this group, enter one of the following:

```
bridge add fwdunreginterface independent <vlanname> <interfacename>
```

```
bridge add fwdunreginterface shared <fdbname> <interfacename>
```

Create a filter for the MAC address of multicast frames. If the MAC address of an incoming frame matches the address set in this filter, the frame is forwarded to all interfaces added to the specified multicast entry's egress interface list (see the *bridge add mcastport* command). You can specify whether the interface uses the independent or shared VLAN learning mechanism. To create a filter, enter one of the following:

```
bridge add mcastentry independent <name> <vlanname> <mac>
```

```
bridge add mcastentry shared <name> <fdbname> <mac>
```

For example:

```
bridge add mcastentry independent filter1 vlan2 01:00:00:00:00:0
```

Add an interface to the egress interface list of the multicast entry. This list is used by the filter entries previously created. You can specify whether the interface uses the independent or shared VLAN learning mechanism. To add an interface to the egress list, enter:

```
bridge add mcastinterface independent <entryname> <vlanname> egress
<interfacename>
```

```
bridge add mcastinterface shared <entryname> <fdbname> egress <interfacename>
```

For example:

```
bridge add mcastinterface independent filter1 vlan2 egress lan
```

4.4.5 Prioritizing frames

You must map the priority levels of incoming frames to regenerated priority levels. Once the priority level of an incoming frame is detected on the specified bridge interface, the Q-bridge will replace it with the regenerated priority level mapped to that particular user priority. The regenerated level is set in the VLAN tag of outgoing frames.

Regenerated priority levels can be set to any value between 0-7, where 7 is the highest priority and 0 is the lowest. To set the regenerated priority mappings, use the following command:

```
bridge set interface <name> regenpriority <pri0> <pri1> <pri2> <pri3> <pri4>
<pri5> <pri6> <pri7>
```

For example:

```
bridge set interface lan regenpriority 0 0 0 0 5 6 7 7
```

According to the mapping set in this command, any incoming frame with a user priority of 0-3 will be replaced by regenerated priority 0, and priorities 4, 5, 6 and 7 will be replaced by regenerated priorities 5, 6, 7 and 7 respectively.

If your interface is configured to accept untagged frames, you must also configure the user priority that should be assigned to those frames, using the following command:

```
bridge set interface <name> defaultuserpriority <defaultpriority>
```

The regenerated levels are then mapped to traffic class values in the outgoing frame. Traffic class values can be set to any value between 0-7, where 7 is the highest class and 0 is the lowest. This value is used by the Scheduler device to prioritize frames for transmission. Traffic class mapping is disabled by default. To enable it, enter:

```
bridge set trafficclassstatus enable
```

Now map the regenerated priority levels to their traffic class values, using the following command:

```
bridge set interface <name> trafficclassmap <pri0> <pri1> <pri2> <pri3> <pri4>
<pri5> <pri6> <pri7>
```

For example:

```
bridge set interface wan trafficclassmap 0 0 0 0 1 1 1 1
```

According to this mapping, any outgoing frame with a regeneration priority between *0-3* will be assigned a traffic class of *0*, and any outgoing frame with a regeneration priority between *4-7* will be assigned traffic class *1*. Traffic class *1* will be given higher priority over traffic class *0*.

4.4.6 Bridge VLAN transport

Bridge VLAN transport which allows the user to create bridge VLAN transports, each for a particular VLAN, and associates IP interfaces to the bridge VLAN transports. Each bridge VLAN transport shall be associated with a unique VLAN Id and a single IP interface. All the packets sent by IP through a bridge VLAN transport will be tagged with the VLAN Id associated with it. Similarly, the tagged IP traffic received by the bridge will be sent to IP on the bridge VLAN transport associated with the VLAN Id in the packet.

NOTE:

The IP stack still sends/receives untagged packets to/from the bridge. It is the bridge that tags the packet appropriately and forwards on the VLAN interfaces.

To associate an IP interface to a VLAN, first create a bridge VLAN transport using the following command:

NOTE:

A VLAN with the same VLAN Id should be added to the system before running the add command.

```
bridgevlan add transport <name> <vlanID>
```

For example:

```
bridgevlan add transport vt1 7
```

According to this command, a new bridge VLAN transport is created with VLAN Id 7.

To associate an IP interface with a VLAN, attach the interface with a bridge VLAN transport. Use the following command:

```
ip interface <ip interface> attachbridgevlan <vlan transport>
```

For example:

```
ip interface iplan attachbridgevlan vt1
```

According to this command, the IP interface ip1 will send/receive packets with the VLAN Id corresponding to the transport vt1, which is 7.

NOTE:

Only one bridge VLAN transport can be associated with an IP interface, i.e. one IP interface cannot send/receive traffic for multiple VLANs.

4.5 Example Q-bridge configurations

The configurations described in this section allow you to:

- Achieve LAN isolation;
- Create VLANs across multiple switches;
- Enable user mobility;

4.5.1 LAN isolation using VLANs

You can achieve traffic isolation and security by isolating different networks for broadcast and multicast traffic. For example, in the figure below, broadcast and multicast traffic is blocked between VLANs (e.g., between station X and station Y), even though every station is connected to the same switch.

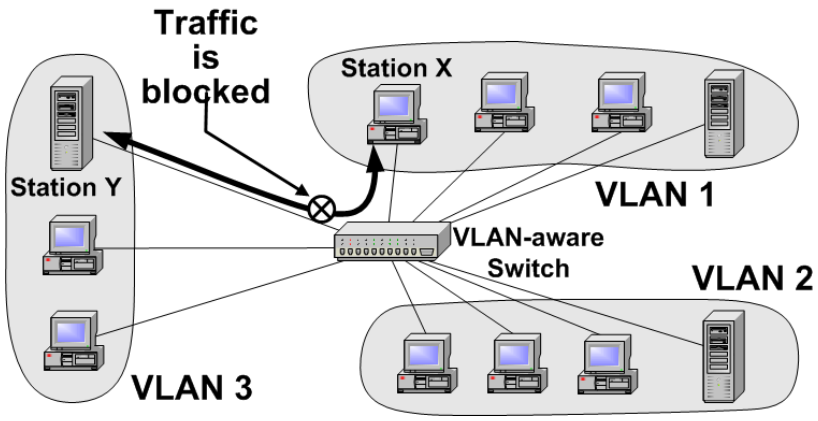


Figure 4-2: LAN Isolation using VLANs

Clear your current configuration:

```
system config clear
```

```
system config save
```

```
system restart
```

Create an Ethernet transport (using port *ethernet0*) and attach it to the bridge:

```
bridge add interface uplink
```

```
ethernet add transport ethernet0 ethernet0
```

```
bridge attach uplink ethernet0
```

Create an RFC1483 transport (using port *a0*) set to use Logical Link Control (LLC) encapsulation and attach it to the bridge:

```
bridge add interface wan0
```

```
rfc1483 add transport wb0 a0 0 35 llc bridged
```

```
bridge attach wan0 wb0
```

Create second RFC1483 transport (using port *a1*) set to use Logical Link Control (LLC) encapsulation and attach it to the bridge:

```
bridge add interface wan1
```

```
rfc1483 add transport wan1 wb1 0 35 llc bridged
```

```
bridge attach wan1 wb1
```

Create two VLANs called *vlan2* and *vlan3* both using the same Filtering Database:

```
bridge add vlan vlan2 2 Qbridge
```

```
bridge add vlan vlan3 3 Qbridge
```

Add two VLAN interfaces to *vlan2*. The bridge interfaces *wan0* and *wan1* (attached to ports *a0* and *a1*) are configured to forward tagged packets:

```
bridge add vlaninterface vlan2 tagged wan0
```

```
bridge add vlaninterface vlan2 tagged uplink
```

Add two VLAN interfaces to *vlan3*. The bridge interfaces*uplink* (attached to ports *ethernet1* and *wan* respectively) are configured to forward tagged packets :

```
bridge add vlaninterface vlan3 tagged uplink
```

```
bridge add vlaninterface vlan3 tagged wan1
```

Traffic isolation now exists between *wan0* and *wan1* interfaces:

- VLAN2 tagged traffic flows between *wan0* and *uplink* interfaces
- VLAN3 tagged traffic flows between *wan1* and *uplink* interfaces

4.5.2 VLANs Spanning Multiple Switches

You can assign VLANs such that various users behave as if they are on the same LAN even though they physically reside on separate LANs. For example, the figure below shows three physical LANs, and three VLANs. The hosts in each VLAN are belongs to different physical LANs, and may even reside in different locations (i.e., in different buildings).

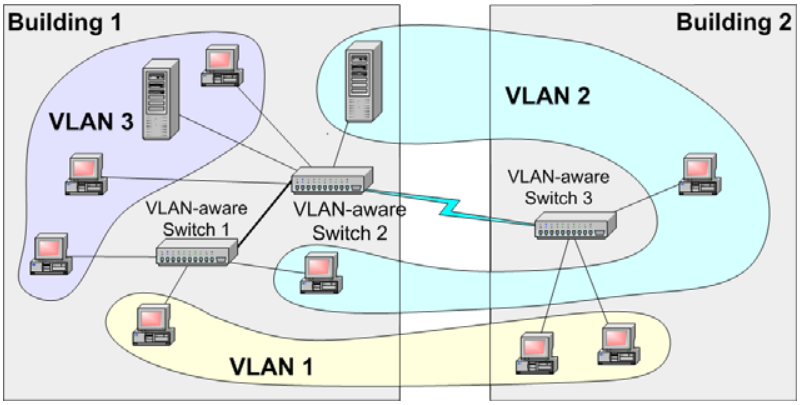


Figure 4-3: VLANs Spanning Multiple Switches

You need to configure two devices for this configuration; they are connected to each other via ATM.

4.5.2.1 *Configuring DSLAM system A*

Clear your current configuration:

```
system config clear
```

```
system config save
```

```
system restart
```

Create an Ethernet transport (using port *ethernet0*) and attach it to the bridge:

```
bridge add interface uplink
```

```
ethernet add transport ethernet0 ethernet0
```

```
bridge attach uplink ethernet0
```

Create an RFC1483 transport (using port *a1*) set to use Logical Link Control (LLC) encapsulation and attach it to the bridge:

```
bridge add interface wan1
```

```
rfc1483 add transport wb1 a1 0 35 llc bridged
```

```
bridge attach wan1 wb1
```

Create a VLAN called *vlan2*:

```
bridge add vlan vlan2 2 Qbridge
```

Add two VLAN interfaces to *vlan2*. The bridge interfaces *uplink* and *wan1* (*ethernet0* and *a0* respectively) are configured to forward tagged packets:

```
bridge add vlaninterface vlan2 tagged uplink
```

```
bridge add vlaninterface vlan2 tagged uplink
```

4.5.2.2 *Configuring DSLAM system B*

This configuration is identical to the configuration for DSLAM System B:

```
system config clear
```

```
system config save
```

```
system restart
```

```
bridge add interface uplink
```

```
ethernet add transport ethernet0 ethernet0
```

```
bridge attach uplink ethernet0
```

```
bridge add interface wan0
```

```
rfc1483 add transport wan0 a0 0 35 llc bridged
```

```
bridge attach wan1 wan0
```

```
bridge add vlan vlan2 2 Qbridge
```

```
bridge add vlaninterface vlan2 tagged uplink
```

```
bridge add vlaninterface vlan2 tagged wan0
```

vlan2 now spans DSLAM systems A and B.

4.5.3 Traffic prioritization

This configuration allows you to generate different kinds of traffic generated from three different sources; Office A, Office B and Office C:

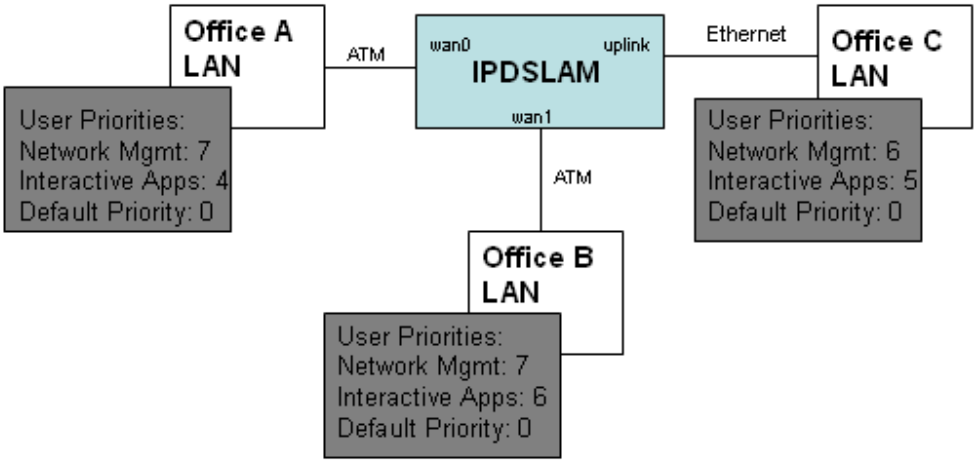


Figure 4-4: Traffic prioritization network

Each Office is attached to the device via a separate bridge interface. Frames originating from the Offices that contain VLAN user priorities will be detected by the Q-bridge and replaced with the corresponding regenerated priority. In this configuration example, the regenerated priority mappings differ depending on which Office the traffic originates from. These mapping are configured as follows:

User Priorities	Regenerated Priorities		
	Office A (wan0)	Office B (wan1)	Office C (uplink)
7	7	7	7
6	6	6	7
5	6	6	6
4	6	6	6
3	0	0	0
2	0	0	0
1	0	0	0
0	0	0	0

Table 4-1: User and regenerated priority mappings

The bridge normalizes packet priorities and ensures that all Network Management traffic is

transmitted with priority *7*, and Interactive traffic is transmitted with priority *6*.

In turn, regenerated priorities are mapped to traffic class values in the outgoing frames. The mappings used in this configuration are as follows:

Regenerated Priority	Traffic class
7	2
6	1
5	0
4	0
3	0
2	0
1	0
0	0

Table 4-2: Regenerated priorities mapped to traffic classes

In this way, all tagged frames are prioritized into one of the following:

- traffic class *2* (higher priority)
- traffic class *1* (medium priority)
- traffic class *0* (lower priority)

To configure this network:

Create a VLAN called *vlan2*:

```
bridge add vlan vlan2 2 Qbridge
```

Add VLAN ports to *vlan2*. The ports attached to the bridge interfaces *lan1*, *lan2* and *wan* are configured to forward tagged packets:

```
bridge add vlaninterface vlan2 tagged wan0
```

```
bridge add vlaninterface vlan2 tagged wan1
```

```
bridge add vlaninterface vlan2 tagged uplink
```

Enable traffic class mapping so that regenerated levels can be mapped to corresponding traffic classes:

```
bridge set trafficclassstatus enable
```

```
bridge set interface wan0 regenpriority 0 0 0 0 6 6 6 7
```

```
bridge set interface wan1 regenpriority 0 0 0 0 6 6 6 7
```

```
bridge set interface uplink regenpriority 0 0 0 0 6 6 7 7
```

```
bridge set interface lan1 trafficclassmap 0 0 0 0 0 0 1 2
```

```
bridge set interface lan2 trafficclassmap 0 0 0 0 0 0 1 2
```

```
bridge set interface wan trafficclassmap 0 0 0 0 0 0 1 2
```

You can now generate packets from each Office and check that user priorities are mapped to traffic classes as follows:

- Default priority traffic maps to traffic class 0
- Interactive traffic maps to traffic class 1
- Network Management traffic maps to traffic class 2

4.6 IGMP Snoop Support

4.6.1 Overview

An IGMP Snoop switch provides the benefit of conserving bandwidth on those segments of the network where no node has expressed interest in receiving packets addressed to the multicast group address. This is in contrast to the normal switch behavior where multicast traffic is typically forwarded on all interfaces.

The IGMP Snooping switch listens to IGMP reports, queries and leave messages sent between hosts and a multicast router, to identify the interfaces that are members of multicast groups. Based on this information it adds/deletes multicast entries from its filtering database, ensuring that multicast traffic is only forwarded to interfaces identified as members of the specific multicast group.

In ISOS, *IGMP Snoop* is implemented in two modes - **Proxy** and **Snoop-only**, with '*Snoop-only*' being the default mode. The '*Proxy mode*' is supported by means of IGMP proxy-reporting, where the reports received from the downstream hosts are summarized and then the switch reports its own state in response to the upstream queries from multicast routers. The switch also acts as a Querier, generating queries periodically on the downstream interfaces. The '*Snoop only*' mode is implemented by snooping through the IGMP packets and forwarding the IGMP packets received on the upstream interfaces to all other interfaces. As the queries received from the upstream interfaces are forwarded to the downstream interfaces, periodic queries are not generated, unlike the proxy mode. The IGMP packets received on a downstream interface are also forwarded to all the upstream interfaces.

IGMP Snoop also supports two leave processing modes for each bridge interface - **Fast** and **Normal**, with '*Normal*' being the default mode. In the '*Fast*' mode of leave processing, on receiving a leave message on a downstream interface, IGMP Snoop shall simply delete the interface from the group membership information and the 'Leave' message is forwarded to the upstream interfaces. '*Fast*' Mode for an interface shall be configured when it is known that there is only one host behind the interface. Fast leave processing helps to reduce the latency involved in removing an interface from the group membership information. In the '*Normal*' mode of leave processing, on receiving a leave message on a downstream interface, IGMP snoop shall repeatedly generate group specific queries on the interface. Failure to receive any membership report in response shall result in deletion of the interface from the group membership information.

4.6.2 Benefits of IGMP Snoop in D-bridge mode

In D-bridge, all multicast packets are treated like broadcast packets which are forwarded on all ports in the forwarding state. This results in less efficient utilization of network bandwidth as multicast traffic is forwarded on interfaces where no node has any interest in receiving the packet.

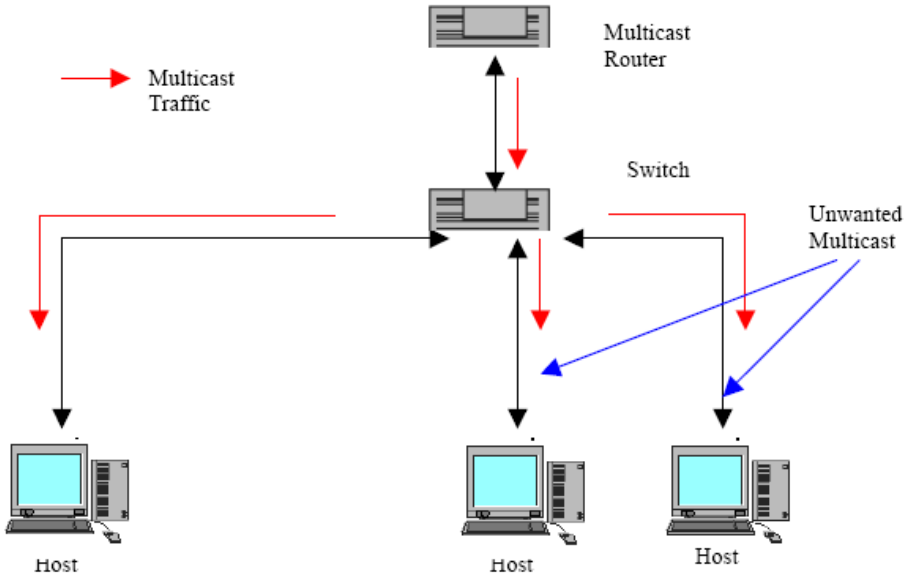


Figure 4-5: Multicast packets flooding without IGMP Snoop in D-bridge

IGMP snooping enables forwarding of multicast traffic intelligently, instead of flooding to all ports. Multicast packets that belong to a layer 2 multicast group are only forwarded to an interface if a host on that interface has expressed interest in the same group. This significantly reduces flooding of multicast data resulting in better utilization of network bandwidth and improved bridge performance.

4.6.3 Benefits of IGMP Snoop in Q-bridge mode

In Q-bridge without IGMP Snoop, multicast packets are not forwarded unless the bridge is statically configured to forward multicast packets.In other words, multicast entries and their egress interface list need to be created through the CLI. Using the fwdall configuration to forward multicast packets on interfaces leads to multicast traffic for all multicast groups to be forwarded on these interfaces, which may not be desirable.

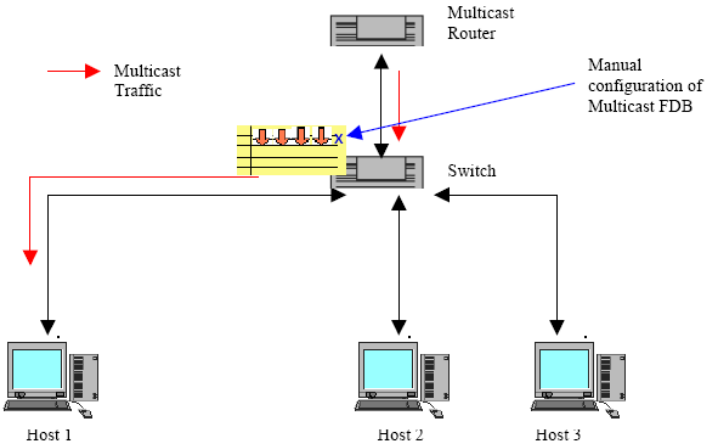


Figure 4-6: Reduced flooding with static configuration of Multicast Filtering Database in Q-bridge

With IGMP Snoop, creation of static multicast filtering entries is not required as it allows dynamic addition/deletion of multicast entries in the multicast filtering database. Hosts interested in multicast data send IGMP membership reports specifying the IP multicast group. IGMP Snoop captures this information and adds dynamic entries in the multicast Filtering Database for the group and the interface in its egress list. Similarly when a host leaves a multicast group, it sends an IGMP leave message which is used by IGMP Snoop to delete the interface from the multicast group entry. Therefore, multicast data is forwarded on only those interfaces that are a part of the filtering database entry for the group. This results in better utilization of the network bandwidth.

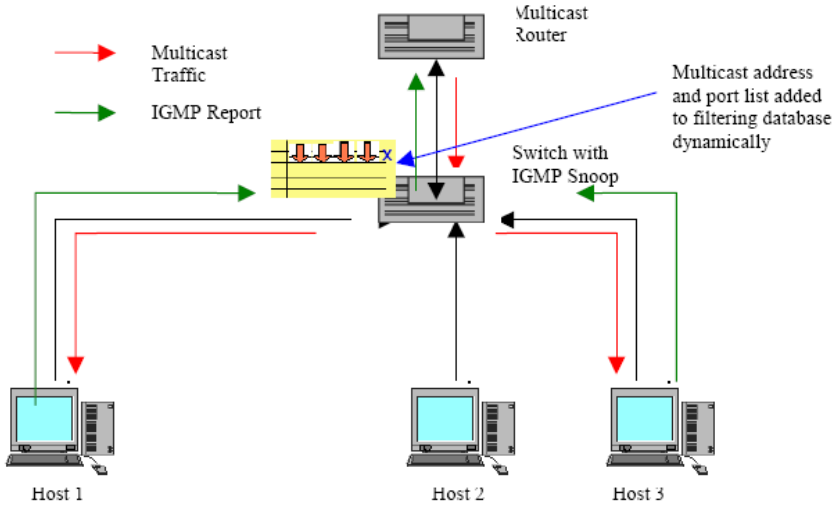


Figure 4-7: Reduced flooding and dynamic configuration of Multicast Filtering Database with IGMP Snoop

4.6.4 Example IGMP Snoop Configuration

The configuration described in this section allows you to achieve dynamic addition/deletion of multicast filtering entries and interfaces in this Multicast Filtering Database. Hence, this reduces flooding of Multicast packets.

Configure the interface P1 on which a multicast router is connected as static multicast router interface. To add a static multicast router interface, enter:

```
bridge add igmpsnoop mcastrouterintf P1
```

You may choose not to configure P1 as a static multicast router in which case it will become a dynamic multicast router interface on receiving an IGMP query with non zero source IP address. This will provide flexibility to dynamically change the multicast router interface, depending on the querier in the network. In case of dynamic multicast router configuration, the user must configure the multicast router's query interval to be less than the *multicastroutertimeout* value on the switch, using the command:

```
bridge set igmpsnoop mcastroutertimeout
```

Enable IGMP Snoop using the CLI command:

```
bridge set igmpsnoop enabled
```

If there is only one host connected to a downstream interface B1, to set the 'fast' mode of leave processing, enter:

```
bridge set interface B1 igmpsnoop leavemode fast
```

Hosts on the downstream interfaces will respond with their group membership reports in response to general queries generated by the switch. The dynamic multicast group membership information can be listed using the command:

```
bridge list igmpsnoop groupinfo
```

To list the multicast entries and interfaces created dynamically in the Filtering Database (only available in Q-bridge mode), enter:

```
bridge list mcastentries {shared|independent} <fdb_name>
```

5 Configuring ports

This chapter describes the ports available on your DSLAM device.

5.1 Configuring ports using the CLI

5.1.1 Displaying available ports

Each port belongs to a port class. You can list port classes by entering:

```
port list ?
```

```
adsl                                Port class
all                                 Port class
atm                                 Port class
ethernet                            Port class
```

The *port list all* CLI command lists the available ports (from every port class) on your DSLAM.

To display all ports, enter:

```
port list all
```

The port listed depends on the DSLAM type that you are using. The following output is for a DSLAM5024 device:

```
Valid port names in class 'all':
    ciao
    a0
    a1
    a2
    a3
    a4
    a5
    a6
    a7
    a8
    a9
    a10
    a11
    a12
    a13
    a14
    a15
    a16
    a17
    a18
    a19
    a20
    a21
```

```
a22
a23
ethernet0
```

5.1.2 Displaying specific port information

To view your Ethernet port settings, type the following CLI command:

```
port ethernet0 show
```

Below is some example output:

```
Version                                 = 1.00
PortClassEthernet                       = true
FullDuplexEnable                        = true
HashHigh                                = 0
HashLow                                 = 0
Loopback                                = false
MAC                                     = 00:30:50:11:03:90
MaxMulticastListsize                    = 64
PadShortData                            = true
PauseFrameEnable                        = true
PhysicalPort                            = 0
PromiscuousEnable                       = true
RxBroadcastEnable                       = true
RxBufferOverflows                       = 0
RxDescBase                              = 0x21907160
RxDescCount                             = 10
RxMissedFrames                          = 0
RxMulticastAllEnable                    = true
RxMulticastEnable                       = true
RxNoBufAvailable                        = 0
RxNoPacketsDone                         = 0
RxPacketTooBig                          = 0
RxWatchdogTimeout                       = 0
RxNumFrmsAllCntr                        = 529
RxNumFrmsOkCntr                         = 529
RxCntrlFrmsCntr                         = 0
RxUnsupCntrlCntr                        = 0
RxNumBytsAllCntr                        = 55404
RxNumBytsOkCntr                         = 55404
RxUnicastCntr                           = 1
RxMulticastCntr                         = 528
RxBroadcastCntr                         = 36
RxFifoOvrFloCntr                        = 0
RxMinLenCntr                            = 0
RxMaxLenCntr                            = 0
RxCrcErrorCntr                          = 0
RxAlignErrorCntr                        = 0
RxLengthErrCntr                         = 0
RxEthrTypFrmCntr                        = 528
TxDescBase                              = 0x21907790
TxDescCount                             = 64
TxNoPacketsDone                         = 1
TxPacketTooBig                          = 0
TxNumFrmsAllCntr                        = 0
TxCntrlFrmsCntr                         = 0
TxNumBytsAllCntr                        = 0
TxNumBytsOkCntr                         = 0
TxUnicastCntr                           = 0
TxMulticastCntr                         = 0
TxBroadcastCntr                         = 0
```

```
        TxFifoUndFloCntr                                = 0
        TxNumBadFrmsCntr                                = 0
        TxSingleColCntr                                 = 0
        TxMultiColCntr                                  = 0
        TxNumDeffredCntr                                = 0
        TxLateColCntr                                   = 0
        TxAbortedFrmCntr                                = 0
        TxNoCrsCntr                                     = 0
        TxXsDefferalCntr                                = 0
        SnmpIfIndex                                     = 26
        SnmpIfDescr                                     = GlobespanVirata cf_ethernet
device Port 0 Version 100

        SnmpIfType                                      = 6
        SnmpIfMtu                                       = 1500
        SnmpIfSpeed                                     = 100000000
        SnmpIfPhysAddress                               = 00:30:50:11:03:90
        SnmpIfOperStatus                                = 1
        SnmpIfAdminStatus                               = 1
        SnmpIfLastChange                                = 2143
        SnmpIfLinkUpDownTrapEnable                      = 2
        SnmpIfPromiscuousMode                           = 1
        SnmpIfAlias                                     =
        IntPhyDisable                                   = false
        100Base                                         = true
        PauseFrameAdvert                                = true
        100BaseFullAdvert                               = true
        100BaseHalfAdvert                               = true
        10BaseFullAdvert                                = true
        10BaseHalfAdvert                                = true
        AutoNegAckOk                                    = false
        AutoNegDone                                     = true
        AutoNegotiateRestart                            = false
        AutoNegotiation                                 = true
        Connected                                       = true
        DisReconnectCount                               = 2
        EnableDuplexCheck                               = true
        FullDuplex                                      = true
        IsMysti                                         = true
        Jabber                                          = false
        JabberCount                                     = 0
        LinkSpeed                                       = 1000000
        NoNeg100BaseMode                                = true
        NoNegFullDuplexMode                             = false
        RemotePauseFrame                                = true
        Remote100BTFD                                   = true
        Remote100BTHD                                   = true
        Remote10BTFD                                    = true
        Remote10BTHD                                    = true
        PowerDown                                       = false
        RemoteFault                                     = false
        RemoteFaultCount                                = 0
        Reset                                           = false
        RiseTimeAdj                                     = 2
        TxLevelAdj                                      = 8
        PhyAddress                                      = 1
```

5.1.3 Configuring a specific port

Some of the attributes displayed by the *port ethernet show* command can be configured from the CLI. To identify which attributes can be configured, enter:

```
port ethernet set ?
```

```
MAC
resetDefaults
```

To display the value options available for a specific attribute, enter the following:

```
port ethernet set <attribute> ?
```

For example:

```
port ethernet set resetDefaults ?
```

```
false
true
```

Enter the command with the required value, for example:

```
port ethernet0 set Reset true
```

6 Configuring DSL

This chapter provides information on using and configuring your DSL connection.

6.1 Introduction

Your device complies with the following standards (depending on the firmware):

- ANSI T1.413 i2
- ITU G.992.1 (ADSL G.dmt), All Annexes
- ITU G.992.2 (ADSL G.lite), All Annexes
- ITU G.992.3 (ADSL2), Annexes A, B, L,and M
- ITU G.992.5 (ADSL2plus), Annexes A,B, and M

6.2 Displaying DSL port attributes

To view your DSL port settings, type the following CLI command:

port a<x> show

The attributes and values displayed as the output of this command depend on the configuration of the DSLAM that your device is attached to. Below is some example output:

```
Version                                  = 2.15
ActivateLine                             = None
Action                                   = Startup
Connected                                = true
Whip                                     = Inactive
ShowtimeLed                              = 0
AutoStart                                = true
PhysicalPort                             = 0
MonitorStatus                            = true
SnmpIfIndex                              = 100
SnmpIfDescr                              = adsl
SnmpIfType                               = 94
SnmpIfMtu                                = 0
SnmpIfSpeed                              = 0
SnmpIfPhysAddress                        = 00:00:00:00:00:00
SnmpIfOperStatus                         = 1
SnmpIfAdminStatus                        = ┐
SnmpIfLastChange                         = 1762
LineCoding                               = DMT
LineType                                 = Interleaved
LineDMTTrellis                           = On
AtucInvSerialNumber                      = co-0123456
AtucInvVendorID                          = FFB54753504E0000
AtucInvVersionNumber                     = E.66.1.69
AtucCurrSnrMgn                           = 80
AtucCurrAtn                              = 0
AtucCurrStatus                           = No Defects
```

```
AtucCurrOutputPwr                          = 163
AtucCurrAttainableRate                     = 0
AtucGsOpState                              = Showtime
AtucGsActualStandard                       = G.Dmt.BisPlus
AtucGsTxAtmCellCounter                     = 2136
AtucGsRxAtmCellCounter                     = 0
AtucDefectReason                           = 0
AtucDeltLastTxState                        = 0
AtucGsPilotTone                            = 64
AtucDeltHLINSCus                           = 0
AtucDeltHLOGMTus                           = 0
AtucDeltQLNMTus                            = 0
AtucDeltSNRMTus                            = 0
AturInvVendorID                            = B5004244434D0000
AturCurrSnrMgn                             = 64
AturCurrAtn                                = 30
AturCurrAttainableRate                     = 0
AturDeltLastTxState                        = 0
AturDeltHLINSCds                           = 0
AturDeltHLOGMTds                           = 0
AturDeltQLNMTds                            = 0
AturDeltSNRMTds                            = 0
AtucChanCurrTxRate                         = 22407900
AtucIntlvChanCurrTxRate                    = 22407900
AtucFastChanCurrTxRate                     = 0
AtucIntlvChanPrevTxRate                    = 0
AtucFastChanPrevTxRate                     = 0
AturChanCurrTxRate                         = 961000
AturIntlvChanCurrTxRate                    = 961000
AturFastChanCurrTxRate                     = 0
AturIntlvChanPrevTxRate                    = 0
AturFastChanPrevTxRate                     = 0
AtucConfTargetSnrMgn                       = 60
AtucConfMaxSnrMgn                          = 310
AtucChanConfFastMinTxRate                  = 32000
AtucChanConfInterleaveMinTxRate            = 32000
AtucChanConfFastMaxTxRate                  = 24544000
AtucChanConfInterleaveMaxTxRate            = 32736000
AtucChanConfMaxInterleaveDelay             = 4
AturConfTargetSnrMgn                       = 60
AturChanConfFastMinTxRate                  = 32000
AturChanConfInterleaveMinTxRate            = 32000
AturChanConfFastMaxTxRate                  = 3072000
AturChanConfInterleaveMaxTxRate            = 3072000
AturChanConfMaxInterleaveDelay             = 16
LineDMTConfMode                            = FreqDivMux
LineDMTConfTrellis                         = On
AtucConfGsStandard                         = G.Dmt.BisPlus.Auto
AtucConfGsMaxBitsPerBin                    = 15
AtucConfGsTxStartBin                       = 64
AtucConfGsTxEndBin                         = 511
AtucConfGsRxStartBin                       = 6
AtucConfGsRxEndBin                         = 63
AtucConfGsBitSwap                          = Disable
AtucConfGsUsBitSwap                        = Disable
AtucConfGsAnnexType                        = AnnexM
AtucConfGsFullRetrainEnable                = Enable
AtucConfGsAdvertisedCapability             = Unknown (52481)
AtucConfGsHwPwrReduction                   = Enable
AtucConfGsUseCustomBin                     = Disable
AtucConfGsEscapeFastRetrainEnable          = Disable
AtucConfGsFastRetrainEnable                = Enable
AtucIntlvChanPerfGsHec                     = 0
AtucFastChanPerfGsHec                      = 0
```

```
AtucIntlvChanPerfCrc                          = 1
AtucFastChanPerfCrc                           = 0
AtucIntlvChanPerfFec                          = 2
AtucFastChanPerfFec                           = 0
AturIntlvChanPerfGsHec                        = 0
AturFastChanPerfGsHec                         = 0
AturIntlvChanPerfCrc                          = 1
AturFastChanPerfCrc                           = 0
AturIntlvChanPerfFec                          = 0
AturFastChanPerfFec                           = 0
ConfProfileLineType                           = Interleaved
AtucGsStartProgress                           = 0
AturInvSerialNumber                           =
AturInvVersionNumber                          =
AturCurrOutputPwr                             = 4
AtucConfRateMode                              = AdaptAtStartup
AtucConfGsInitiate                            = Default
AtucConfGsRsFastOvrhdDown                     = Disable
AtucConfGsRsIntCorrectionDown                 = 1msec
AtucConfGsRsFastOvrhdUp                       = Disable
AtucConfGsRsIntCorrectionUp                   = 125usec
AtucConfDownshiftSnrMgn                       = 0
AtucConfUpshiftSnrMgn                         = 120
AtucConfMinUpshiftTime                        = 0
AtucConfMinDownshiftTime                      = 0
AtucPerfLofs                                  = 0
AtucPerfLoss                                  = 0
AtucPerfLols                                  = 0
AtucPerfLprs                                  = 0
AtucPerfESs                                   = 1
AturPerfLofs                                  = 0
AturPerfLoss                                  = 0
AturPerfLprs                                  = 0
AturPerfESs                                   = 2
AturConfDownshiftSnrMgn                       = 30
AturConfUpshiftSnrMgn                         = 90
AturConfMinUpshiftTime                        = 30
AturConfMinDownshiftTime                      = 30
Defaults                                      = Unknown (255)
PortClassADSL                                 = true
PMStateEnable                                 = None
PMStateForced                                 = None
AtucConfPML0Time                              = 0
AtucConfPML2Time                              = 255
AtucConfPML2ATPR                              = 3
AtucConfPML2MinRate                           = 1024000
AtucConfGsPML2EntryThresholdRate              = 256000
AtucConfGsPML2ExitThresholdRate               = 512000

AtucConfGsPML2EntryRateMinTime                = 60
PowerState                                    = Invalid
AtucTransmitPower                             = 160
PortClassATM                                  = true
PortSpeed                                     = 66037
TxBurstSize                                   = 10
CACMode                                       = None
CACFunction                                   = 0x00000000

UPSAddr                                       = 0x01326b34
cbr_CPS                                       = 0
rvbrPCR_CPS                                   = 0
rvbrSCR_CPS                                   = 0
vbrPCR_CPS                                    = 0
vbrSCR_CPS                                    = 0
```

```
ubr_CPS                                  = 2000
ubrMCR_CPS                               = 0
RingLength                               = 1000
VPIRange                                 = 12
VCIRange                                 = 16
DefaultPCR                               = 2000
DefaultMaxQueue                          = 64
TrafficShaping                           = false
NiType                                   = nni
HighSpeedRxPort                          = false
HighSpeedTxPort                          = false
HwVPBreakout                             = false
.
```

6.3 Configuring DSL port attributes

You may want to modify various DSL parameters to ensure the correct operation of the device with your test equipment, or to prepare your devices for operation in a particular environment in which they will be deployed.

Some of the attributes displayed by the *port a1 show* command can be configured from the CLI. To identify which attributes can be configured, enter:

```
port a1 set ?
```

The attributes displayed as the output of this command depend on the configuration of the DSLAM and the capability of the Central Office (CO) that your device is attached to. Below is some example output:

```
Action
ActivateLine
AtucChanConfFasMaxTxRate
AtucChanConfFastMinTxRate
AtucChanConfInterleaveMaxTxRate
AtucChanConfInterleaveMinTxRate
AtucChanConfMaxInterleaveDelay
AtucConfDownshiftSnrMgn
AtucConfGsAnnexType
AtucConfGsBitSwap
AtucConfGsEscapeFastRetrainEnable
AtucConfGsFastRetrainEnable
AtucConfGsFullRetrainEnable
AtucConfGsInitiate
AtucConfGsMaxBitsPerBin
AtucConfGsPML2EntryRateMinTime
AtucConfGsPML2EntryThresholdRate
AtucConfGsPML2ExitThresholdRate
AtucConfGsRsFastOvrhdDown
AtucConfGsRsFastOvrhdUp
AtucConfGsRsIntCorrectionDown
AtucConfGsRsIntCorrectionUp
AtucConfGsRxEndBin
AtucConfGsRxStartBin
AtucConfGsStandard
AtucConfGsTxEndBin
AtucConfGsTxStartBin
AtucConfGsUsBitSwap
AtucConfGsUseCustomBin
AtucConfMaxSnrMgn
AtucConfMinDownshiftTime
```

```
AtucConfMinUpshiftTime
AtucConfPML0Time
AtucConfPML2ATPR
AtucConfPML2MinRate
AtucConfPML2Time
AtucConfRateMode
AtucConfTargetSnrMgn
AtucConfUpshiftSnrMgn
AturChanConfFastMaxTxRate
AturChanConfFastMinTxRate
AturChanConfInterleaveMaxTxRae
AturChanConfInterleaveMinTxRate
AturChanConfMaxInterleaveDelay
AturConfDownshiftSnrMgn
AturConfMinDownshiftTime
AturConfMinUpshiftTime
AturConfTargetSnrMgn
AturConfUpshiftSnrMgn
AutoStart
ConfProfileLineType
Defaults
LineDMTConfMode
LineDMTConfTrellis
MonitorStatus
PMStateEnable
PMStateForced
Whip
```

To display the value options available for a specific attribute, enter the following:

```
port a1 set <attribute> ?
```

For example:

```
port a1 set ActivateLine ?
```

```
Abort
None
Start
```

Enter the command with the required value, for example:

```
port a1 set ActivateLine Start
```

6.4 Configuring the DSL standard

To change your preferred standard compliance, enter the command:

```
port <adsl port name> set AtucConfGsStandard <value>
```

with the <value> set to one of the following:

```
T1.413
G.Lite
G.DMT
```

```
G.Dmt.Bis
G.Dmt.BisPlus
G.Dmt.BisPlus.Auto
G.ReAdsl2
Multimode
```

Once you have set this value, enter:

port <adsl port name> show

to display attributes and to check that your preferred standard compliance has been set.

6.5 Configuring the DSL annex type

To change your preferred Annex compliance, enter the command:

port <adsl port name> set AnnexType <value>

with the <*value*> set to one of the following:

```
None
G.Dmt.Bis
AnnexM
AnnexA
```

Once you have set this value, enter:

port <adsl port name> show

to display attributes and to check that your preferred Annex compliance has been set.

7 Configuring System logging

This chapter provides information about how to configure the system logging on the device.

7.1 Displaying system information

Global information about your system configuration is displayed by entering:

```
system info
```

```
Global System Configuration:

        Vendor: Vendor
           URL: N/A

    MAC address: 00:30:51:11:03:90

  Hardware ver: He500/G24 v1.2.0.5 / He5x0/He400 CSP v1.0 (ISOS 9.0)
  Software ver: DSLAM5024-V2.010-AnnexM
    Build type: RELEASE
      Compiler: gcc 2.94.4 20010315 (release)
```

7.2 Clearing, saving and restoring configurations

7.2.1 Clearing the current configuration

Before you start configuring your device, you may want to clear the current settings in order to start your own configuration with a *clean* system. To reset all attributes (including BUN ports) to their defaults and delete existing interfaces and transports, enter:

```
system config clear
```

```
Restoring backup configuration //isfs/im.conf.minimal
To finish clearing, please save configuration and restart
*Note that subsequent changes this session will NOT be saved*
```

Save the cleared configuration:

```
system config save
```

7.2.2 Saving configuration changes

Whenever you change the device configuration and then enter the CLI command:

```
system config save
```

the changes are saved to the *im.conf* file in FlashFS. Enter the following:

```
system restart
```

7.2.3 Restoring a configuration

To restore the factory defaults configuration stored in the *//isfs/im.conf.factory file*, enter:

```
system config restore factory
```

To reset attributes to their defaults and delete all existing interfaces and transports, enter:

```
system config restore minimal
```

7.3 Updating system firmware

To update Flash memory (FlashFS) with the files contained in ISFS that are not yet present in FlashFS, enter the following commands:

```
console enable
```

```
Switching from CLI to console mode - type 'exit' to return
```

```
flashfs update
```

FlashFS effectively provides a backup of all the information contained in ISFS.

8 Configuring RFC1483

This chapter provides information about the RFC 1483.

The RFC 1483 transport provides the simplest method of connecting end stations over an ATM network. RFC 1483 can either be used in bridged mode, where Ethernet packets are encapsulated in AAL-5 (ATM Adaptation Layer-5) PDUs (Protocol Data Units), or routed mode, where IP packets are encapsulated in AAL-5 PDUs.

It is most often used in bridged mode, which allows MAC-level Ethernet to be bridged directly to RFC 1483.

8.1 Ethernet - RFC1483 bridged

In this configuration, the DSLAM device uses the *Bridge* module to bridge between Ethernet and RFC 1483 at Layer 2. The systems do **not** need to be configured with any IP address information because both LAN PCs are on the same subnet. The RFC 1483 encapsulated frames run over a PVC .

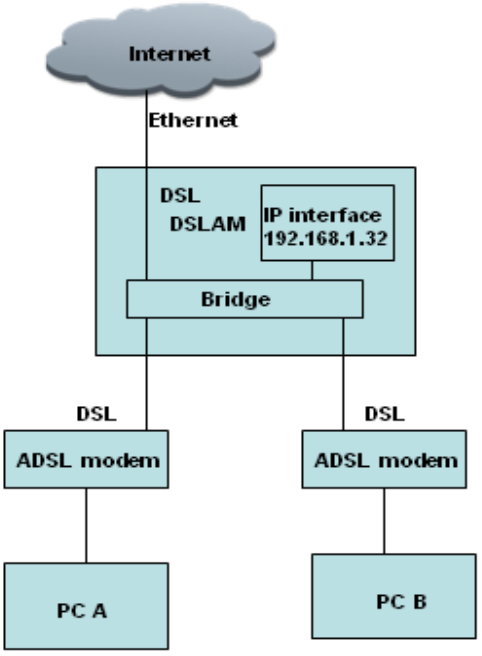


Figure 8-1: Ethernet-RFC1483 bridged configuration

The outline configuration procedure is as follows:

1. Configure the PCs;
3. Configure the DSLAM;

8.1.1 Configure PC A and PC B

The PCs will have IP addresses on the same subnet as the router's LAN IP address (192.168.1.1 255.255.255.0). For example:

- PC A
  IP address: 192.168.1.2
  Subnet mask: 255.255.255.0
- PC B (Wireless)
  IP address: 192.168.1.3
  Subnet mask: 255.255.255.0

8.1.2 Configure the DSLAM

Clear your current configuration:

```
system config clear
```

```
system config save
```

```
system restart
```

Create an Ethernet transport and attach it to the bridge:

```
bridge add interface uplink
```

```
ethernet add transport ethernet0 ethernet0
```

```
bridge attach uplink ethernet0
```

Create an RFC1483 transport set to use Logical Link Control (LLC) encapsulation and attach it to the bridge:

```
rfc1483 add transport wb0  a0 0 101 llc bridged
```

```
rfc1483 add transport wb1 a1 0 101 llc bridged
```

```
bridge add interface wan0
```

```
bridge add interface wan1
```

```
bridge attach wan0 wb0
```

```
bridge attach wan1 wb1
```

9 Configuring User Accounts

This chapter provides information about how to manage the user accounts on your network.

9.1 Administering user accounts

By default, an administrator account exists with access privileges set to allow the administrator to create new accounts, save backup configurations, restore factory defaults and configure the device via the CLI, console and EmWeb. When the device first boots, you login to it using the default login name and password *admin*:

```
Login: admin
Password: *****

Login successful
```

Once logged in, the administrator can create and configure new accounts for additional users.

9.1.1 Adding new user accounts

There are two types of account that you can add to the system:

- a *dialin* account that allows the user to access the system via a dialin connection, for example, using PPP, but cannot login to the system directly.
- a *login* account that allows the user to login to the system directly, but cannot access the system via a dialin connection.

To add a *dialin* user, use the command:

```
system add user <name> [“comment”]
```

For example:

```
system add user fred “user with dialin access”
```

To add a *login* user, use the command:

```
system add login <name> [“comment”]
```

For example:

```
system add login joe “user with login access”
```

The default attributes for each dialin and login user account are as follows:

Table 9-1: Default user attributes

Default attributes	Dialin user	Login user

User can dialin to the system via the CLI	Yes	No
User can login to the system via the CLI	No	Yes
User can access the web pages	No	Yes
Default access permission set	default user	default user

.

NOTE:
The term user *is used throughout this chapter to refer to both login and dialin users, unless otherwise specified.*

9.1.2 Configuring existing user accounts

By default, new users are given a *default* access level. There are three access level options for CLI users:

- *default user* - can configure the device using CLI commands; cannot enter usable console commands or blacklisted console commands
- *engineer* - can configure the device using CLI commands and usable console commands; cannot use blacklisted console commands
- *super user* - can configure the device using CLI commands, usable console commands and blacklisted console commands. Can also set up user login accounts, save backup configuration and restore factory settings.

s

To change the access level for an existing user, enter:

```
system set {login|user} <name> access {default|engineer|superuser}
```

To configure the dialin setting for an existing user, enter:

```
system set {login|user} <name> maydialin {enabled|disabled}
```

To allow/prevent access to the device via the CLI for an existing user, enter:

```
system set {login|user} <name> mayconfigure {enabled|disabled}
```

To allow/prevent access to the device via EmWeb for an existing user, enter:

```
system set {login|user} <name> mayconfigureweb {enabled|disabled}
```

To display information about users, enter one of the following commands:

```
system list users
```

```
system list logins
```

The output displayed for each command is identical:

```
Users:
```

```
                 May      May conf.    May         Access
ID | Name |   Conf.   |     web    | Dialin    |    Level    |  Comment
---|------|----------|------------|-----------|-------------|-------------------------
 1 | joe  | ENABLED  | ENABLED    |disabled   | default     | user with login access
 2 | fred | disabled | ENABLED    | ENABLED   | default     | user with dialin access
 3 | admin| ENABLED  | ENABLED    | disabled  | superuser   | Default admin user
-------------------------------------------------------------------------------
```

To delete an existing dialin account, enter:

```
system delete user <name>
```

To delete an existing login account, enter:

```
system delete login <name>
```

9.1.3 Configuring user logins and passwords

As an administrator, you may want to login to the device using another user's login, for example, to check the configuration changes that a user has made or to change their password access for security reasons.

To login to the device as another user, by entering:

```
user change <name>
```

The <*name*> is the other user's account login name. Whilst logged in as a different user, you inherit that user's access permissions. For example, if the user account has default or engineer access permissions set, you will inherit these and lose your super user status. For more information about access permissions.

Once you have entered the *user change* command, you can set a new password on the account without having to enter the existing password. Enter:

```
user password
```

Enter the new password twice as prompted:

```
Enter new password: ******
   Again to verify: ******
```

Alternatively, you can change a user's password without having to enter the *user change* command by entering:

```
system set user <name> password <password>
```

10 Configuring Snmp agent

This chapter provides information about how to setup snmp agent in system.

10.1 Snmp agent config

10.1.1 Display snmp config

To view snmp agent config,type the following command:

```
snmp show config
```

Below is the example output :

```
    sysdescr: IP-DSLAM
 sysobjectid:
 syslocation: Shang_China
  syscontact:
     sysname: DSLAM5024
 authentraps: disabled
snmpAutoSave: false
```

10.1.2 Configure snmp

To configure snmp ,enter

```
snmp set config <attribute> <value>
```

10.2 Snmp communitynames

10.2.1 Display snmp commnuitynames

To view snmp communitynames ,type the following command:

```
snmp list communitynames
```

Bellow is the example output:

```
-------------------------------------------------------------------------
 ID  | Name     | Community Name          | Access| Manager          |Temp|Perm
-----|----------|-------------------------|-------|------------------|----|----
```

```
  1 | public    | public                  | write | 0.0.0.0         | En | En
```

10.2.2 Create snmp commnuitynames

To create snmp communityname,type the following command:

```
snmp add communityname <name> <community> <read/write> <ip address>
<enable/disable>
```

ip address and enable/disable is option parameters.

For exmaple:

To add a public community for snmp read .

```
snmp add communityname public public read
```

11 Configuring with EmWeb

This chapter describes how to configure the DSLAM using EmWeb,. EmWeb can be used as an alternative method for managing and administering your DSLAM.

11.1 References to CLI commands

Configuring your device using the Engineer web pages has the same effect as configuring it using the Command Line Interface (CLI). Throughout this chapter, you will see references to other chapters in this guide and CLI commands that provide functionality equivalent to EmWeb configurations.

11.2 Accessing EmWeb

At the console of one of your LAN PCs, type the following CLI command:

```
ip list interfaces
```

```
IP Interfaces:
 ID  |    Name      |    IP Address    |   DHCP   |   Transport
-----|--------------|------------------|----------|---------------
   1 | iplan        | 192.168.1.32     | disabled | <BRIDGE>
-------------------------------------------------------------------
```

This command lists the interfaces available, including the LAN interface that is attached to your PC. The default LAN IP address is `192.168.1.32`.

At your web browser, enter the LAN IP address as the URL ***192.168.1.32*** by default). The *Status* homepage for the Engineer web pages is displayed:

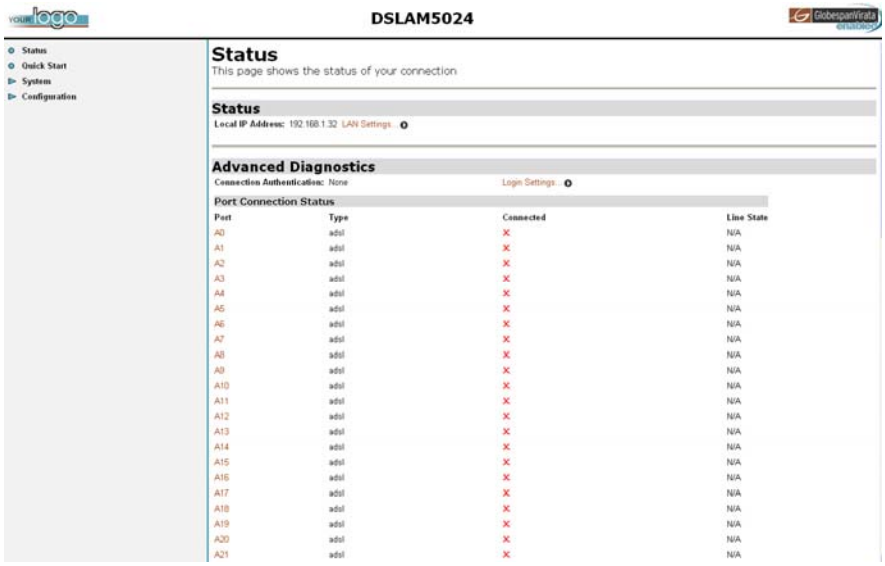


Figure 11-1: EmWeb Status homepage

The first time that the Engineer pages are launched during a session, a *Welcome* message is displayed at the top of the *Status* homepage. This message is replaced by the *Status* heading once the page is automatically or manually refreshed.

11.2.1 Logging in to EmWeb

The first time that you click on an entry from the left-hand menu, a login box is displayed. You must enter your username and password to access the pages. The default network login is the same as the login used at the CLI console. Type the following:

```
User Name: admin
Password: admin
```

Click on *OK*. You are now ready to configure your device using EmWeb.

11.2.2 About the Engineer web page menus

This chapter focuses on the options available from the *Configuration* menu. F

NOTE:

Most of the features contain sensible default settings. You are unlikely to have to reconfigure every feature included in the Configuration menu.

From the left-hand menu, click on *Configuration*. The following sub-headings are displayed:

- *Save config*; allows you to save your current configuration to Flash memory.
- *Authentication*; allows you to create, edit and delete user accounts.
- *LAN connections*; allows you to edit your LAN port IP address, create and edit a secondary IP address and create new LAN services.
  - *WAN connections*; allows you to create, edit and delete WAN services.
- *IP routes*; allows you to create, edit and delete IP routes.
- *Bridge*; allows you to configure the D-bridge and the Q-bridge. The Q-bridge is not included in

your image by default. For details of how to include and configure it,

- *Ports*; allows you to configure the ports available on your device.

The following sections describe the features provided in each of the above menu entries.

11.3 Save configuration

This option enables you to save your current configuration to Flash memory. For more information including corresponding CLI commands.

1. From the *Configuration* menu, click *Save config*. The following page is displayed:

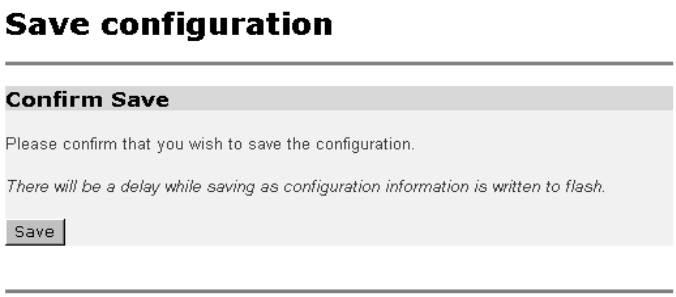


Figure 11-2 Save configuration page

2. Click *Save* to save your current configuration in the *im.conf* file from ISFS and in to FlashFS. This has the same effect as entering the *system config save* CLI command.

   After a short time the configuration is saved and the following confirmation message is displayed:

   ```
   Saved information model to file //flashfs/im.conf
   ```

11.4 Authentication

This option allows you to administer accounts for users accessing the device. For more information including corresponding CLI commands

From the *Configuration* menu, click on *Authentication*. The following page is displayed:

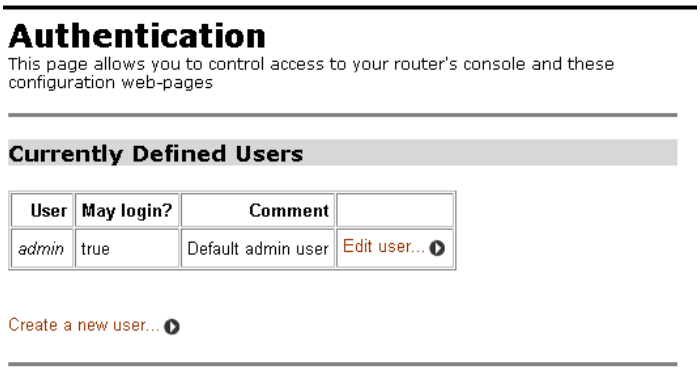


Figure 11-3: Authentication page

11.3.1 Creating a new login account

1. Click *Create a new user*. The following page is displayed:

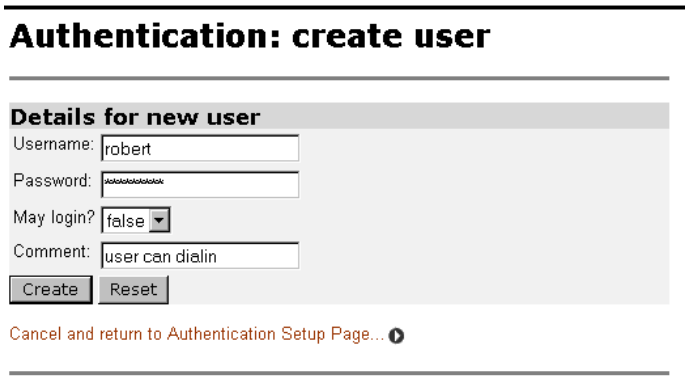


Figure 11-4: Authentication create user page

2. Type details for the new user into the username, password and comment text boxes, and select a *May login?* option:
   - true means that the user can login but not dialin
   - false means that the user can dialin but not login
3. Click *Create*. The *Authentication* page is displayed. The table now contains details for the user that you have just created.

11.4.2 Editing/deleting a login account

1. The *Authentication* page table contains an *Edit user* hyperlink for each user account entry.

   Click on an *Edit user* link. The following page is displayed:

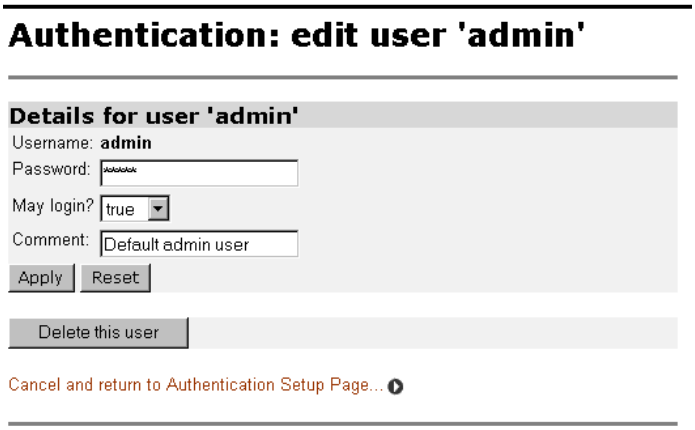


Figure 11-5: Edit user page

   This page allows you to:
   - update details for a specific user account. Modify the necessary text boxes then click *Apply*.

- delete a user account. Click *Delete* this user.

2. Once you have edited or deleted a user account, the *Authentication* page is displayed and the table reflects any changes that you have made on the *edit user* page.

11.5 LAN connections

This option allows you to:

- create/delete LAN connections
- configure the primary and secondary LAN connections on DSLAM
- create virtual interfaces; multiple virtual interfaces can be associated with the existing primary LAN interface

From the *Configuration* menu, click *LAN connections*. The following page is displayed:

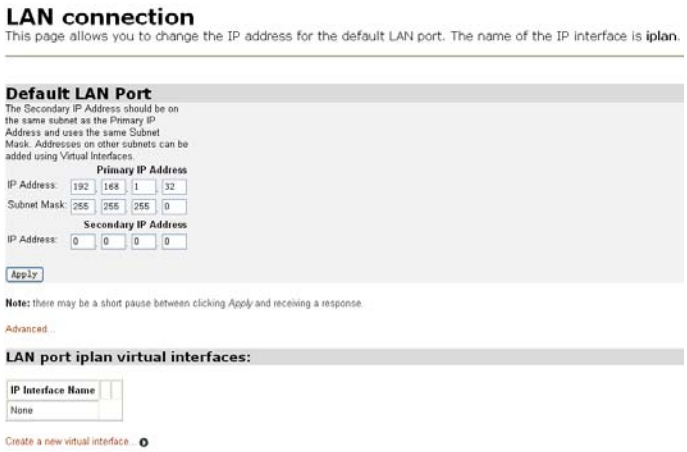


Figure 11-6: LAN connections page

This page displays the wireless and USB LAN connections that exist on your device. In the example above, the Ethernet transports together with the primary Ethernet LAN connection, are bridged and attached to the router.

11.5.1 Creating new LAN connections

1. Click *Create a new service*. The *LAN connection: create service* page is displayed. You have two options:
   - Click *Ethernet routed* then *Configure* if you want to attach the service directly to the router. At the *Ethernet routed* page, enter a description and select the port that you want the service to use. Click *DHCP* if you want DHCP to assign an IP address, or *LAN IP address* and type an address in the relevant text box if you want to manually select an address.
   - Click *Ethernet bridged* then *Configure* if you want to attach the service to the bridge. At the *Ethernet bridged* page, enter a description and select the port that you want the service to use.
2. Once you have configured your Ethernet routed or bridged service, click *Apply*. The *LAN connections* page is displayed, and the new service appears in the *LAN services currently defined* table.

11.5.2 Deleting LAN connections

The table displayed on the *LAN connections* page contains a *Description* column. Click on the corresponding *Description* entry for a specific LAN service to display detailed information about it. To delete the service, click on the *Delete this connection* button. The *LAN connections* page is displayed and the deleted service has been removed from the table.

11.5.3 Configuring primary and secondary LAN connections

1. Click *Change default LAN port IP address*. The following page is displayed:

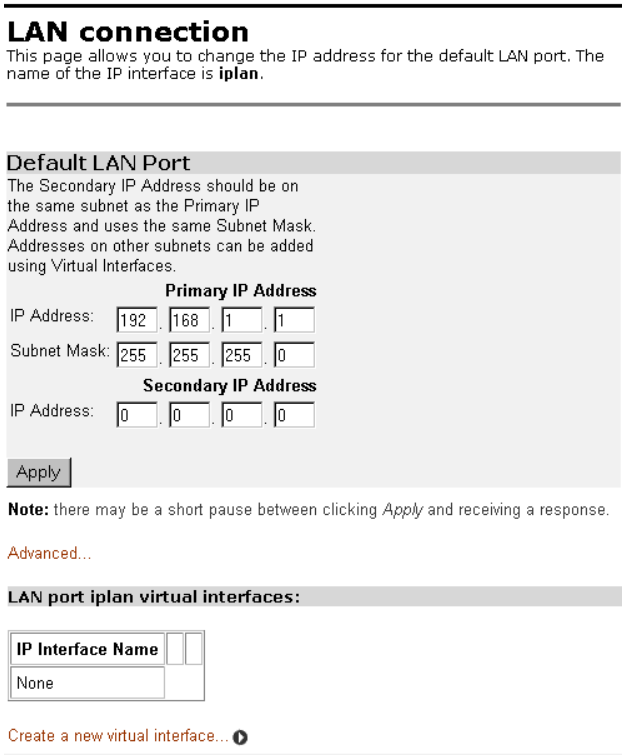


Figure 11-7: LAN connections page

2. The *Default LAN Port* section contains two subsections:
   - IP address and subnet mask details of your primary LAN connection. To edit these details, click in the address boxes and type new primary address details. For details of the CLI commands that correspond with the web page activities described here,.
   - Secondary IP address details. To create/configure a secondary IP address, click in the *Secondary IP Address text box* and type new address details. This has the same effect as entering the following CLI command (with the correct values added):

```
ip interface add secondaryipaddress
```

3. Once you have configured the IP address(es), click *Apply*. A message confirms that your address information is being updated. If you have changed the primary IP address, you may need to enter the new address in your web browser address box.

4. To carry out further configuration of your LAN interface, click *Advanced*. The page displayed features tabs across the top. Clicking on a tab displays advanced information about the interface. You can modify the values displayed on each page, then click *Change* to save changes. The tabs and their values are as follows:

Table 11-1: Advanced LAN configuration features

Tab heading	Configuration options	Corresponding CLI commands
Edit 'Ip Interface'	Change the IP address and netmask	`ip set interface ipaddress` `ip set interface netmask`
	Set the Maximum Transmission Unit	`ip set interface mtu`
	Attach the LAN interface to a real interface, making it a virtual interface.	`ip attachvirtual`
Edit Tcp Mss Clamp	Sets the TCP Maximum Segment Size Clamp functionality (true or false).	`ip set interface tcpmssclamp`

Edit Rip Versions	Set which RIP versions can be accepted by or sent from the interface, and whether multicast packets can be sent.	`ip set interface rip accept`
		`ip set interface rip send`
		`ip set interface rip multicast`

Edit NAT	Enable/disable NAT between the LAN interface and the external (WAN) interface.	`nat enable`

11.5.4 Creating virtual interfaces

1. From the *Configuration* menu, click *LAN connections*. Click *Change Default LAN port IP address*. At the bottom of the page, click *Create a new virtual interface*.
2. At the *Create virtual interface* page, type the IP address and netmask of the virtual interface, then click *Apply*.
3. The LAN connections page is displayed. The virtual interfaces section contains a table listing the names of the virtual interface(s). Each virtual interface is called *item#* by default.
4. Each virtual interface name has an *Edit* and a *Delete* link associated with it. To edit a service:
   - Click *Edit*. Change the options for the existing virtual interface, then click *Change*. The page is reset and the new values are displayed.

   To delete a service:
   - Click *Delete*. Check the details displayed, then click *Delete this connection*.

For further information including details of the CLI commands that correspond with the web page activities described here.

11.6 WAN connections

This option allows you to create and configure WAN connections for your device. You can also create virtual interfaces on routed services. From the *Configuration* menu, click on *WAN connections*. The *WAN connections* page is displayed:

WAN services currently defined:

Service Name	IP/Bridge Interface Name	Description	Creator		
wb0	wan0	wb0	CLI	Edit...	Delete...
wb1	wan1	wb1	CLI	Edit...	Delete...
wb2	wan2	wb2	CLI	Edit...	Delete...
wb3	wan3	wb3	CLI	Edit...	Delete...
wb4	wan4	wb4	CLI	Edit...	Delete...
wb5	wan5	wb5	CLI	Edit...	Delete...
wb6	wan6	wb6	CLI	Edit...	Delete...
wb7	wan7	wb7	CLI	Edit...	Delete...
wb8	wan8	wb8	CLI	Edit...	Delete...
wb9	wan9	wb9	CLI	Edit...	Delete...
wb10	wan10	wb10	CLI	Edit...	Delete...
wb11	wan11	wb11	CLI	Edit...	Delete...
wb12	wan12	wb12	CLI	Edit...	Delete...
wb13	wan13	wb13	CLI	Edit...	Delete...
wb14	wan14	wb14	CLI	Edit...	Delete...
wb15	wan15	wb15	CLI	Edit...	Delete...
wb16	wan16	wb16	CLI	Edit...	Delete...
wb17	wan17	wb17	CLI	Edit...	Delete...
wb18	wan18	wb18	CLI	Edit...	Delete...
wb19	wan19	wb19	CLI	Edit...	Delete...
wb20	wan20	wb20	CLI	Edit...	Delete...

Figure 11-8: WAN connections page

This page displays the WAN connections on your device. In this instance, a rfc1483 transport is connected to the *bridge* interface.

11.6.1 Creating a WAN service

1. Click *Create a new service.* A list of WAN service options is displayed. The options available on this page are:

Table 12-2: WAN service configuration options

WAN service option	Further information:
RFC 1483 routed RFC 1483 bridged	*Configuring RFC1483*
Ethernet routed	*Configuring the Router*
Ethernet bridged	*Configuring the Bridge*

2. Click an option, then click *Configure*. Add configuration information about the WAN service that you are creating.
3. Click *Apply*. The *WAN connections* page is displayed. The table now contains details of the service that you have just created.

11.6.2 Editing a WAN service

1. At the table displayed on the *WAN connections* page, click on the *Edit* link for a specific service. The *Edit connection* page is displayed.
2. Change the values for the existing service. If you want to carry out advanced editing, click on the links at the top of the *Edit connection* page. The links that appear depend on the type of service that you are configuring, for example, for an Ethernet routed service, you can choose from the

   following advanced editing links:

   - Edit 'Service'
   - Edit 'rfc1483'
   - Edit 'atm Channel'
   - Edit 'bridge Interface'
3. Click *Change*. The *Edit Service* page is displayed and changes are applied to the service.

11.6.3 Deleting a WAN service

1. At the table displayed on the *WAN connections* page, click on the *Delete* link for a specific service. The *WAN connection: delete* page is displayed.
2. Check the details displayed, then click *Delete this connection*.

11.6.4 Creating a virtual interface (routed services only)

1. At the table displayed on the *WAN connections* page, click on the *Virtual I/f* link for a specific routed service. The *Virtual interface* page is displayed.
2. Click on the *Create a new virtual interface...* hyperlink. On the page displayed, type the IP address and netmask of the virtual interface, then click *Apply*.
3. The WAN connections page is displayed. If you click on the *Virtual I/f* link, the *Virtual interface* page displays a table listing the names of existing virtual interfaces. Each virtual interface is called *item#* by default.

For details of configuring virtual interfaces.

11.6.5 Creating an IP V4 Route

1. Click on the *Create new Ip V4Route* hyperlink. The following page is displayed:

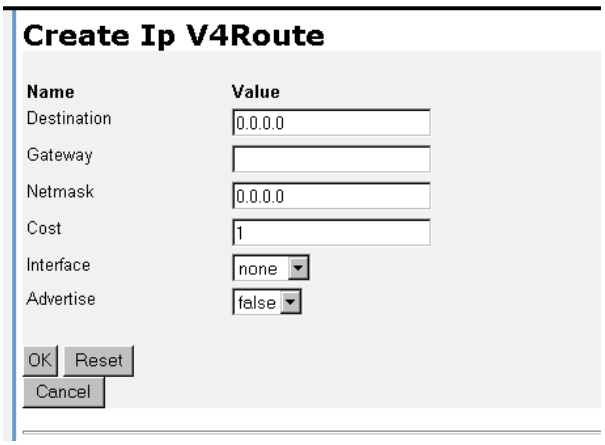


Figure 11-9:Create IP V4 Route page

2. Complete the *Create IP v4 Route* form:
   - Specify a *Destination* network (or single host), together with a *Netmask* to indicate what range of addresses the network covers
   - Specify a next-hop *Gateway* address or interface
   - Specify the number of hops counted as the *Cost* of the route
   - Set the *Interface* used by the route (select none if you want it to route to any address via the gateway)
   - Enable/disable the advertising of the route via RIP by selecting true/false. If there is a choice of routes for a destination, the route with the most specific mask is chosen.

   Adding a route has the same effect as entering the ip add route CLI command.. The other attributes can be set using the CLI commands listed below.

```
ip set route destination

ip set route cost

ip set route gateway

ip set route interface

ip set route advertise
```

3. Click *OK*. The *Edit Routes* page is displayed:

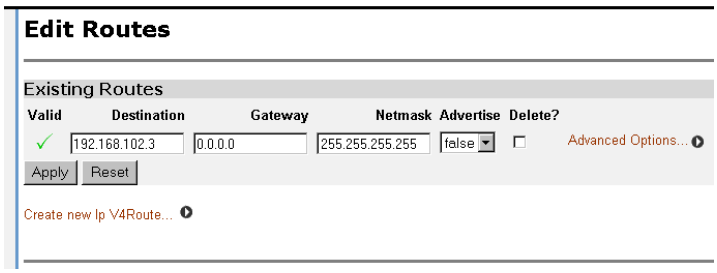


Figure 11-10:Edit Routes page

The table contains details of the route that you have just created, including whether the route is valid ✓ or invalid ✗.

11.6.6 Editing a route

At the *Edit Routes* page:

1. Change the destination, gateway, netmask or RIP advertise status of a route by clicking in the relevant text box, updating the information then click *Apply*.

2. To edit every attribute of the route including the interface and cost setting, click on the *Advanced Options* hyperlink for a specific route and update the relevant information. Click *OK*.

11.6.7 Deleting a route

At the *Edit Routes* page:

1. To delete an existing route, check the *Delete?* box associated with a specific route.
2. Click *Apply*.

11.7 Bridge

For more information on D-bridge and Q-bridge including details of the CLI commands that correspond with the web page activities described here.
This option allows you to configure the D-bridge (802.1D) and the Q-bridge (802.1Q). The configuration described in this section assumes that you have included the Q-bridge option in your system file. If you are using the D-bridge without the Q-bridge, you can still access the *Bridge Main Page*, the *Interface Configuration* page and the *Interface Statistics/Flushing* page, but these pages will display a subset of the features/parameters shown as examples in this section.

The Bridge option allows you to:

- Modify or delete a bridge interface
- Create, modify, or delete a VLAN
- Set the following features of a VLAN:
  - Tagged and untagged port list
  - Source and destination MAC-based unicast filtering
  - Multicast filtering
  - Forward all ports and unregistered ports.
- Display and clear statistical information

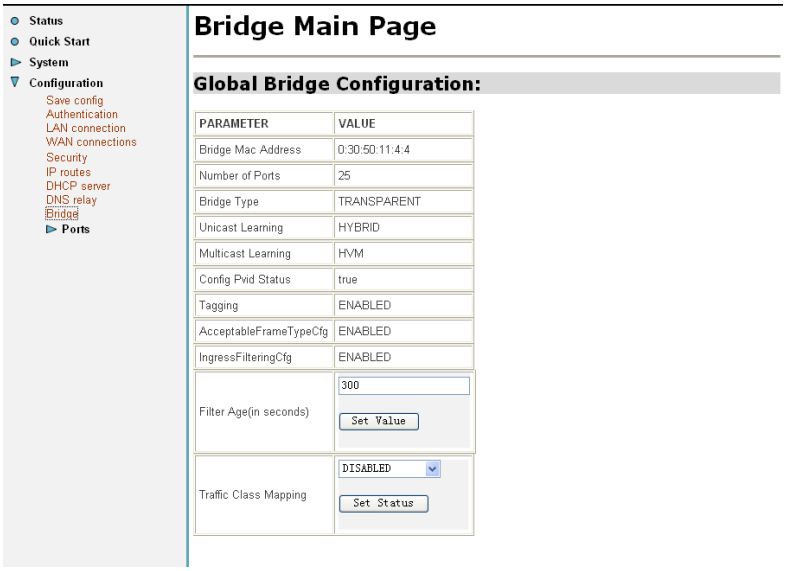


Figure 11-11:Bridge (Q-bridge mode) main page

11.7.1 Interface configuration

This option displays the *Bridge Interfaces* page:

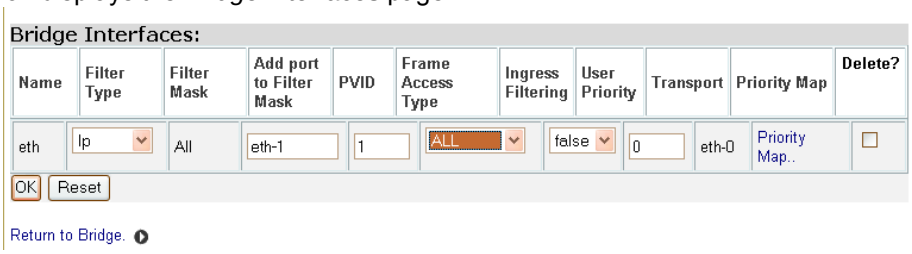


Figure 11-12:Bridge interface configuration

This page allows you to:

- Modify the following parameters for an interface:
  - *Filter type*; click the drop down list and select the new filter type.
  - *Add port to Filter Mask*; type the port name in the text box.
  - *PVID*; type the new Port VID in the text box.
  - *Frame Access Type*; click the drop down list and select the type.
  - *Ingress Filtering*; click the drop down list and select *true* or *false*.
  - *User Priority*; type the priority number in the text box.

  To accept the modified parameter(s), click *OK*.
- Delete an interface; click the *Delete?* box associated with a specific interface, then click *OK*.

To return to the *Bridge Main* page, click *Return to Bridge*.

11.7.2 VLAN Configuration

Selecting this option displays the following page:

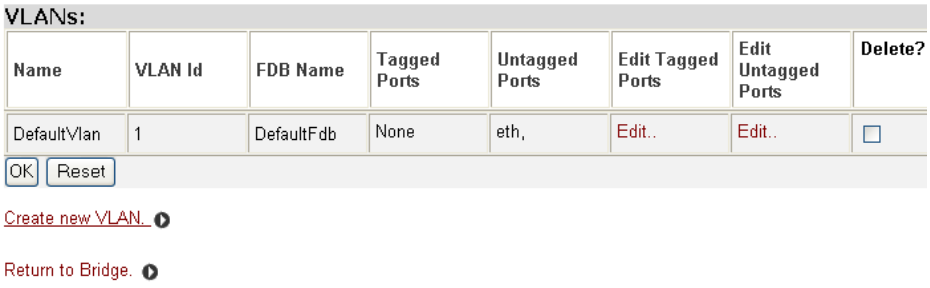


Figure 11-13:VLAN configuration

This page displays all configured VLANs and their settings. You can perform the following functions using this page.

- Create a VLAN; click *Create new VLAN*, and the *Create a new VLAN* page is displayed. In the appropriate boxes, enter the VLAN name, VLAN Id, and Fdb name, then click *OK*.
- Delete a VLAN; click the *Delete?* box for the VLAN to be deleted, then click *OK*.
- Edit the tagged port list for a VLAN:

1. Under *Edit Tagged Ports* in the VLAN's row of the display, click *Edit*.
2. To add a port to the tagged port list, type the port name in the *Name* box, click the drop down list to select the port type, then click *OK*.
3. To delete a port from the tagged port list, click the port's *Delete?* box and click *OK*.

- Edit the untagged port list for a VLAN:
  1. Under *Edit Untagged Ports* in the VLAN's row of the display, click *Edit*.
  2. To add a port to the untagged port list, type the port name in the *Name* box, click the drop down list to select the port type, then click *OK*.
  3. To delete a port from the untagged port list, click the port's *Delete?* box and click *OK*.

To return to the Bridge main page, click *Return to Bridge*.

11.7.3 Source MAC Based Unicast Filtering Entry Configuration

Selecting this option displays the following page:

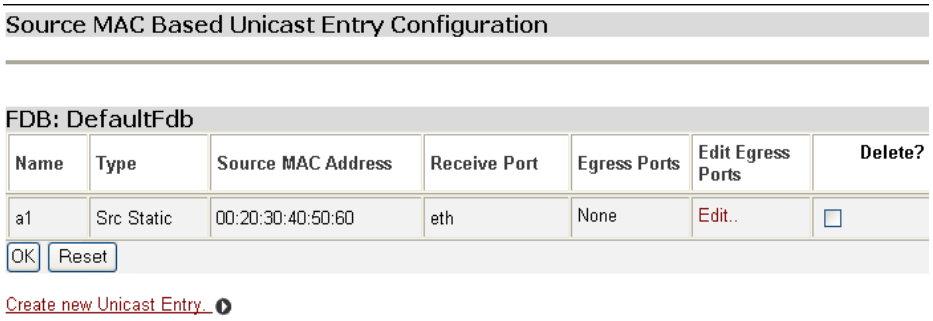


Figure 11-14:Source MAC based unicast entry configuration

This page displays all source MAC-based unicast filtering entries for all filtering databases. You can perform the following functions using this page.

- Create a new source MAC-based unicast entry for a filtering database:
  1. Click *Create new Unicast Entry* below the filtering database to which the entry is to be added. The *Create Qbridge Ucast Entry* page is displayed.
  2. In the appropriate boxes, enter the entry name, receive port, and source MAC address, then click the drop down list to select the entry type. To accept the values, click *OK*.
- Delete a source MAC-based unicast entry from a filtering database; click the *Delete?* box for the entry, then click *OK*.
- Edit the egress port list of a displayed filtering database:
  1. Under *Edit Egress Ports* in the entry's row of the display, click *Edit*.
  2. To add a port to the egress port list, type the port name in the *Name* box, then click *OK*.
  3. To delete a port from the egress port list, click the port's *Delete?* box and click *OK*.

11.7.4 Destination MAC Based Unicast Filtering Entry Configuration

Selecting this option displays the following page:

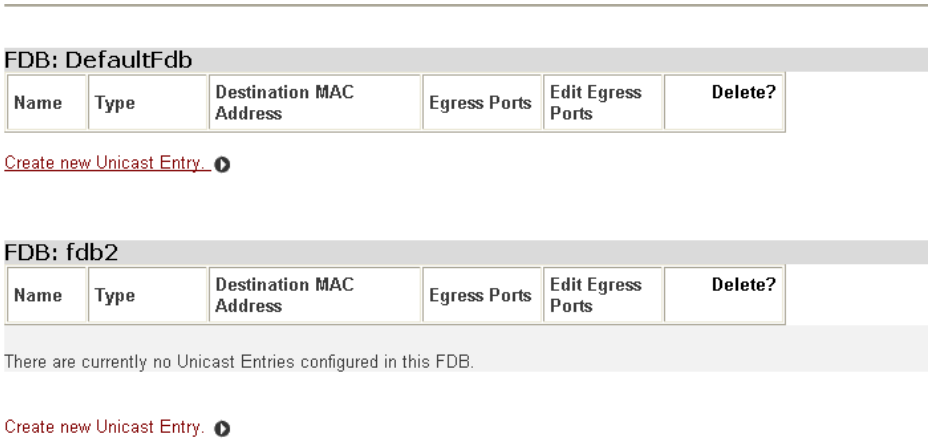


Figure 11-15:Destination MAC based unicast entry configuration

This page displays all destination MAC-based unicast filtering entries for all filtering databases. You can perform the following functions using this page.

- Create a new destination MAC-based unicast entry for a filtering database:
  1. Click *Create new Unicast Entry* below the filtering database to which the entry is to be added. The *Create Destination MAC based unicast Entry* page is displayed.
  2. In the appropriate boxes, enter the entry name and destination MAC address, then click the drop down list to select the entry type. To accept the values, click *OK*.
- Delete a destination MAC-based unicast entry from a filtering database; click the *Delete?* box for the entry, then click *OK*.
- Edit the egress port list of a displayed filtering database:
  1. Under *Edit Egress Ports* in the entry's row of the display, click *Edit*.
  2. To add a port to the egress port list, type the port name in the *Name* box, then click *OK*.
  3. To delete a port from the egress port list, click the port's *Delete?* box and click *OK*.

11.7.5 Multicast Filtering Entry Configuration

Selecting this option displays the following page:

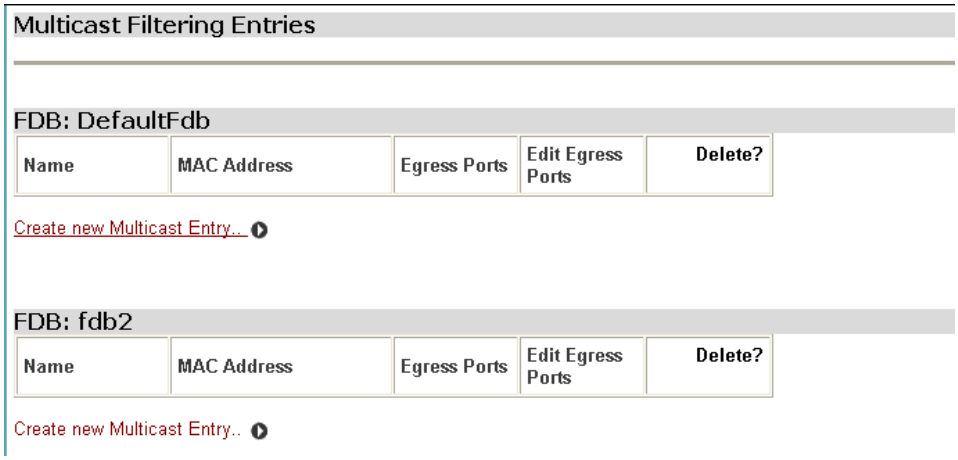


Figure 11-16:Multicast filtering entry configuration

This page displays all multicast filtering entries for all filtering databases. You can perform the

following functions using this page.

- Create a new multicast entry for a filtering database:
  1. Click *Create new Multicast Entry* below the filtering database to which the entry is to be added. The *Create Multicast Filtering Entry* page is displayed.
  2. Enter the entry name, then click the drop down list to select the multicast learning type, then enter the MAC address in the box. To accept the values, click *OK*.
- Delete a multicast entry from a filtering database; click the *Delete?* box for the entry, then click *OK*.
- Edit the egress port list of a displayed filtering database:
  1. Under *Edit Egress Ports* in the entry's row of the display, click *Edit*.
  2. To add a new egress port, type the port name in the *Name* box, then click *OK*.
  3. To delete an egress port, click the port's *Delete?* box and click *OK*.

11.7.6 Forward All and Forward Unregistered Entry Configuration

Selecting this option displays the following page:

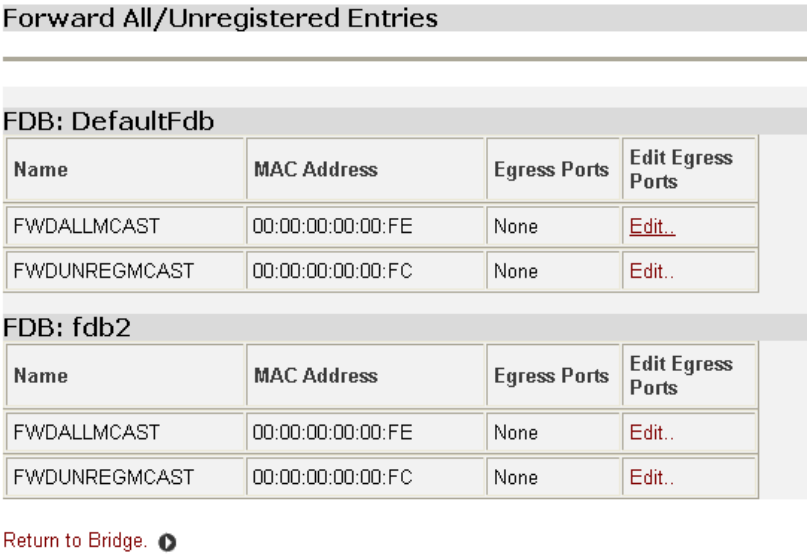


Figure 11-17:Forward all/unregistered entry configuration

This page displays the forward all and forward unregistered filtering entries for all filtering databases. Using this page, you can edit the egress port list of a displayed filtering database:

To edit forward all ports:

1. Click *Edit* under *Edit Egress Ports* in the FWDALLMCAST row of the display.
2. To add a new forward all port to the egress list, type the port name in the *Name* box, then click *OK*.
3. To delete an egress port, click the port's *Delete?* box and click *OK*.

To edit forward unregistered ports:

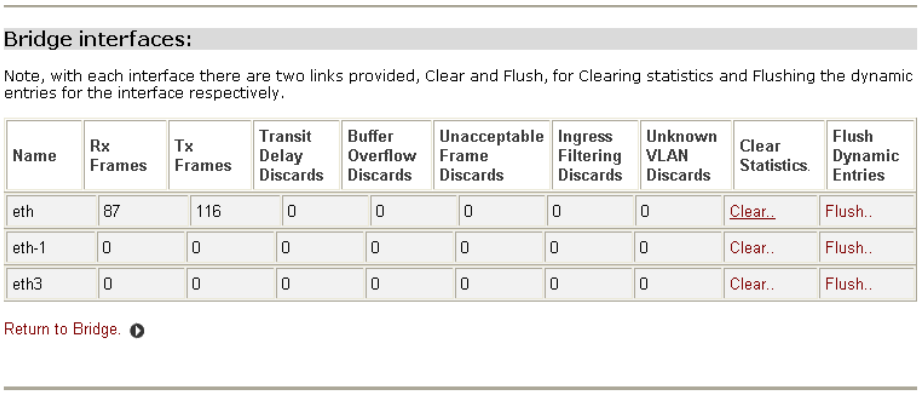
1. Click *Edit* under *Edit Egress Ports* in the FWDUNREGMCAST row of the display.
2. To add a new forward all port to the egress list, type the port name in the *Name* box, then click *OK*.

3. To delete an egress port, click the port's *Delete?* box and click *OK*.

To return to the Bridge main page, click *Return to Bridge*.

11.7.7 Interface Statistics/Flushing

Selecting this option displays the following page:



Bridge interfaces:

Note, with each interface there are two links provided, Clear and Flush, for Clearing statistics and Flushing the dynamic entries for the interface respectively.

Name	Rx Frames	Tx Frames	Transit Delay Discards	Buffer Overflow Discards	Unacceptable Frame Discards	Ingress Filtering Discards	Unknown VLAN Discards	Clear Statistics	Flush Dynamic Entries
eth	87	116	0	0	0	0	0	Clear..	Flush..
eth-1	0	0	0	0	0	0	0	Clear..	Flush..
eth3	0	0	0	0	0	0	0	Clear..	Flush..

Return to Bridge.

Figure 11-18:Bridge interface statistics/flushing page

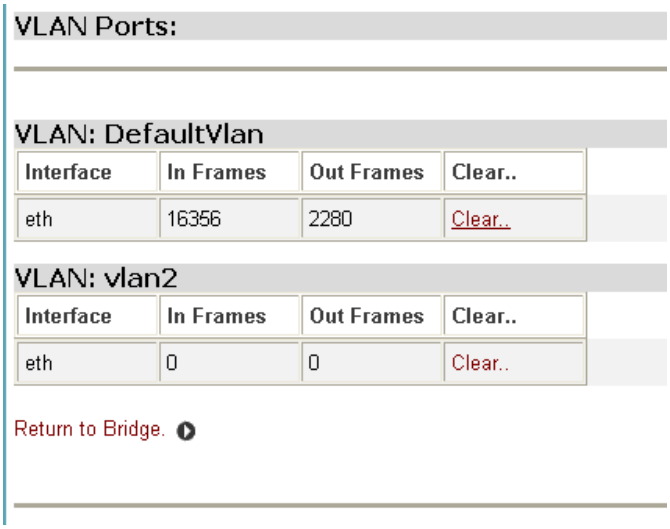
This page displays statistics for all bridge interfaces.Using this page, you can do the following:

- To clear statistics for an interface, click *Clear* under *Clear Statistics* in the interface's row of the display. When the process is complete, a message is displayed. Click *Back* to continue.
- To flush dynamic entries for an interface, click *Flush* under *Flush Dynamic Entries* in the interface's row of the display. When the process is complete, a message is displayed. Click *Back* to continue.

To return to the Bridge main page, click *Return to Bridge*.

11.7.8 VLAN port statistics

Selecting this option displays the following page:



VLAN Ports:

VLAN: DefaultVlan

Interface	In Frames	Out Frames	Clear..
eth	16356	2280	Clear..

VLAN: vlan2

Interface	In Frames	Out Frames	Clear..
eth	0	0	Clear..

Return to Bridge.

Figure 11-19:VLAN port statistics page

This page displays statistics for all VLAN ports.Using this page, you can clear statistics for a VLAN port:

1. Click *Clear* in the interface's row of the display. When the process is complete, a message is displayed.
2. Click *Back* to continue.

To return to the Bridge main page, click *Return to Bridge*.

11.8 Ports

For more information about ports including CLI commands that correspond with the web activities described here,.

This option allows you to configure the ports available on your device.

11.8.1 Configuring ports

1.From the Configuration menu, click Ports. A sub-list of ports available on your DSLAM is displayed.

2.From the Ports menu, click on Ethernet0. The Ethernet0 Configuration page is displayed:

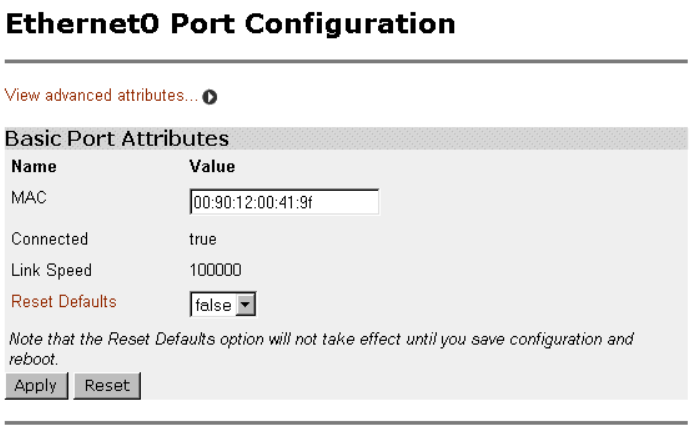


Figure 11-20:Ethernet0 Port Configuration page

The page displays basic port attributes for the Ethernet0 port on your DSLAM.

3. Update the port attributes that are available for editing, then click *Apply* to update the configuration, or *Reset* to revert back to the default configuration settings.
4. To carry out advanced editing and/or to view the advanced port attributes, click on *View*

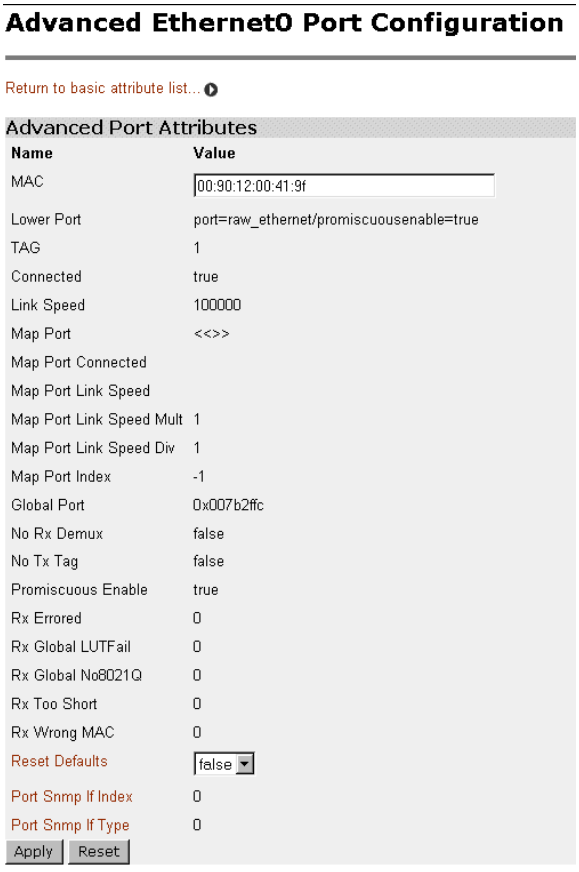


Figure 11-21:Advanced Ethernet0 Port Configuration page

5. Update the port attributes that are available for editing, then click *Apply* to update the configuration, or *Reset* to revert back to the default configuration settings.

Appendix A: DSLAM Cable Pin Assignment

On the back of DSLAM5024/DSLAM5016, there are two standard RJ21 female connectors marked as PSTN/LINE.

Two standard DSLAM cables with RJ21 male connectors are used to connect PSTN interface to PSTN system and LINE interface to the terminal subscribers. the dslam cable pin assignment as follows:

DSLAM cable pin assignment					
Port ID	Wire Color		Port ID	Wire Color	
1	White	Blue	13	Black	Green
2	White	Orange	14	Black	Brown
3	White	Green	15	Black	Gray
4	White	Brown	16	Yellow	Blue
5	White	Gray	17	Yellow	Orange
6	Red	Blue	18	Yellow	Green
7	Red	Orange	19	Yellow	Brown
8	Red	Green	20	Yellow	Gray
9	Red	Brown	21	Purple	Blue
10	Red	Gray	22	Purple	Orange
11	Black	Blue	23	Purple	Green
12	Black	Orange	24	Purple	Brown
			N/A	Purple	Gray