

Prepared (also subject responsible if other) EUS/DR/HH/F Bran Guernsey		No. 1553-CNZ 212 401 Uen		
Approved	Checked	Date 2008-10-02	Rev PB1	Reference

User Guide for GESB Configuration in Security Mode

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Abstract

This User's Guide provides information about the settings and configurations of ESS functionality for AXE platform.

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1 Description

ESS functionality allows the implementation of the following:

- Packet filtering (applicable to ARP, TCP, UDP, ICMP over IP)
- V-Lan (Virtual Lan) settings
- Port Set-up

These features are needed for connecting an external Ethernet network to the internal Ethernet backbone (and thus to the Central Processor) in an AXE node.

1.1 Purpose

Purpose of this document is to provide a description of the various commands available via CLI for ESS in order to implement the basic security/shield functionality for the Ethernet traffic that inflows from an external LAN.

1.2 Prerequisites

In order to configure the ESS functionality, the following prerequisite are mandatory:

1. The ESS functionality has been loaded on the GESB.
2. The board where the ESS software runs has an IP addresses assigned..
3. The user must have the common knowledge in TCP/IP networking.
4. The user must know the VLANs, subnets for the AXE-based node and connected routers.

2 Glossary

2.1.1 Concepts

- *V-Lan*
Virtual LAN, commonly known as a vLAN or as a VLAN, is a method of creating independent logical networks within a physical network. Several VLANs can co-exist within such a network. This helps in reducing the broadcast domain and aids in network administration by separating logical segments of a LAN (like company departments) that should not exchange data using a LAN (they still can exchange data by routing).
- *Port Based V-Lan – (handled by Switch PTABLE)*

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The Port based V-Lan should be used for handling the UnTagged traffic that flows in an *ingress* port.

There is one entry for each port in the switch.

They are used for telling the switch the following information - per port:

The interconnection among different ports across the switch.

The ports where to insert the Vlan tag (in the *egress* direction).

- *Tagged V-Lan - 802.1Q*

The 802.1Q V-Lan should be used for handling the Tagged traffic that flows in an *ingress* port.

There is one entry for each defined VLAN.

They are used for telling the switch the following information per VLAN:

The interconnection among different ports across the switch.

The ports where to remove the Vlan tag in the *egress* direction.

- *Ingress direction*

In this document the Ingress Direction is related to the GESB (from outside towards the switch).

- *Egress direction*

In this document the Egress Direction is related to the GESB (out from the switch).

- *Secure port / out port*

In this document the *Secure port* is the switch port that could be connected to the internal network after the filtering has been applied. It is unique for the switch.

- *Unsecure port*

In this document the *Unsecure ports* are the ones connected to the external network.

- *Filter Mask*

The filter mask specifies what portion of the Ethernet frame shall be inspected by the Filter process in the GESB switch. Filter mask is set per port and it can be set-up by means of CLI commands.

- *Filter Rule*

The Filter Rules specifies both the checks based on the filter mask to be performed and what action must be applied to Ethernet frame if the rule matches (allow or deny). Filter rule is set per port and it can be set-up by means of CLI commands.

- *Default Rule*

The default rule is the "drop all". If no rules are inserted by the user or if the rules do not match the Ethernet frame, the Ethernet frame shall be dropped. In this case the he so called "pin holing" it the way for select the wanted traffic only

- *GESB*

The GESB used in this document indicates the security features running on the GESB board.

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- **ESS**
Ethernet Switch and Shielding
Feature running on existing GESB Board (ROJ 208 410/2).
- **SB = Switch Board**
Is the board running the ESS functionality on GESB.

2.1.2 Abbreviations

CLI	Command Line Interface
CP	Central Processor
FRP	Firmware Replacement Package
GESB	Gigabit Ethernet Switching Board
LAN	Local Area Network
OS	Operating System
VLAN	Virtual LAN

3 Reference List

- [1] RFC 802.1Q, see <http://www.ietf.org/rfc.html>
- [2] User Guide for IP Stack on CP: 1/198 17-ANZ 225 01/5

4 Revision Information

Revision	Date	Prepared	Comments
PA1	2007-05-18	TEIRUPA	First Draft
PA2	2007-06-06	TEIRUPA	Internal inspection
PA3	2007-06-08	TEIRUPA	First complete document, distributed for inspection
PA4..PA8	2007-06-18	TEIRUPA – EANDBAD – TEIMCNT	Document updates
PA9	2007-07-12	TEIRUPA – EANDBAD – TEIMCNT	Inspected at PC-RPS
PA11	2007-07-18	TEIRUPA – EANDBAD – TEIMCNT	Reworked after PC-RPS
A	2007-07-23	TEIRUPA – EANDBAD – TEIMCNT	Final Revision
B	2008-10-01	EWUBRGU	Updated for ESS functionality

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5 How to Use

5.1 Remarks

In this document the 'port number' is referred to the front port numbering.

Several commands hereafter reported could be shortened (e.g. "switchdrv ethernet status" could be issued as "switchdrv et st").

The switches are normally duplicated in the system due to redundancy reasons.

It is recommended to configure one switch at the time. Every time a switch is configured, it must be verified no Ethernet errors are highlighted in the system, before changing the configuration of the other switch.

The maximum number of characters that it is possible to type on the CLI is 80; all the implemented commands, including parameters, fit the maximum line size.

In order to connect oneself to the target and set-up the switch, the telnet command shall be executed from one PC/workstation connected to the GESB.

The telnet must be applied using the /R option, i.e.

```
telnet /R xxx.yyy.zzz.kkk
```

Where the xxx.yyy.zzz.kkk is the IP address of the GESB

The username and password are:

UserName: *gesb*

Password: *gesb*

Telnet should be used only for connecting to the GESB running the ESS functionality for the execution of the CLI commands hereafter described.

Use of telnet towards other boards or for other purposes is not allowed.

5.2 Commands Overview

The figures below show command snapshots.

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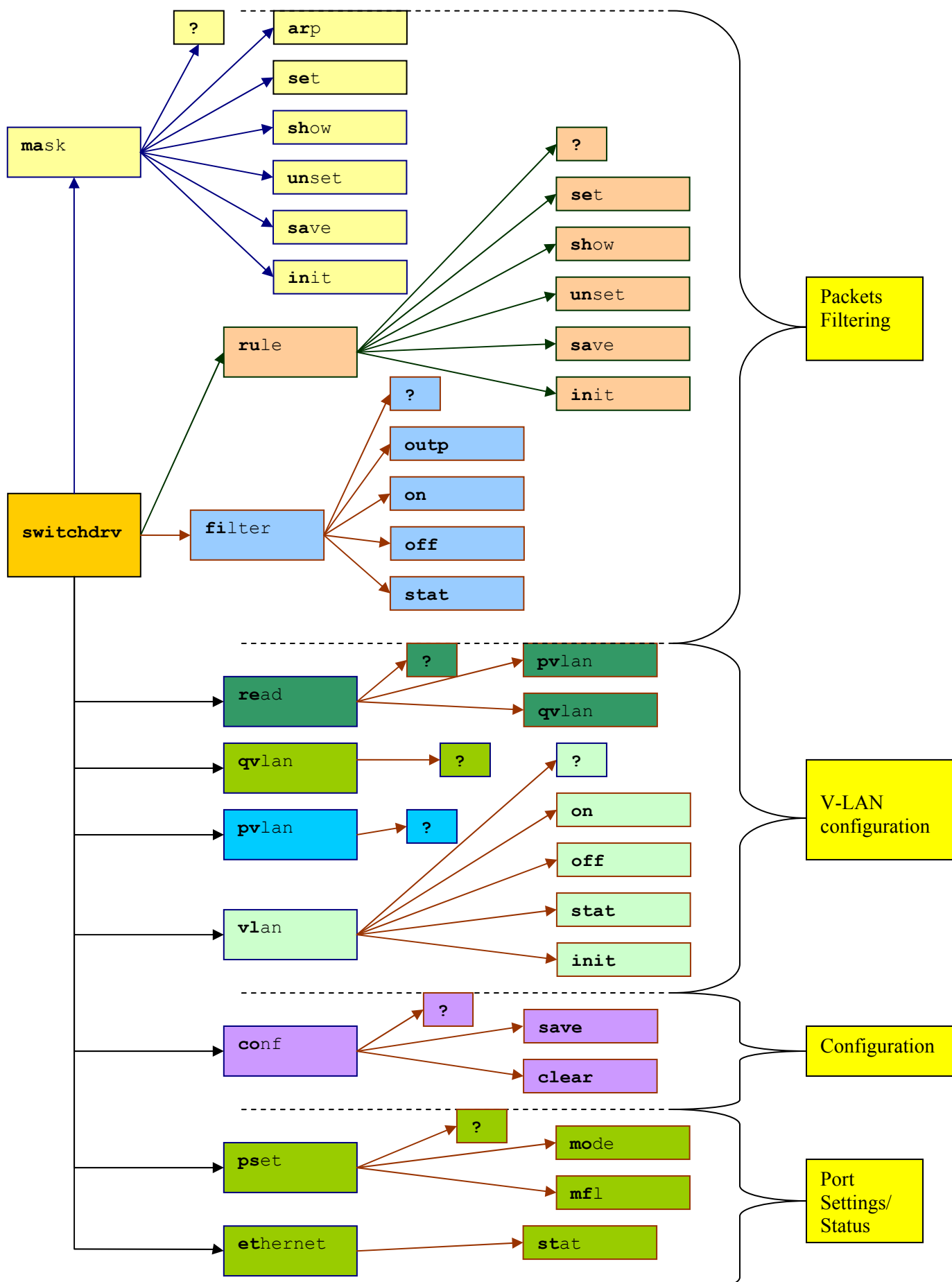


Figure 1: Commands Snapshot

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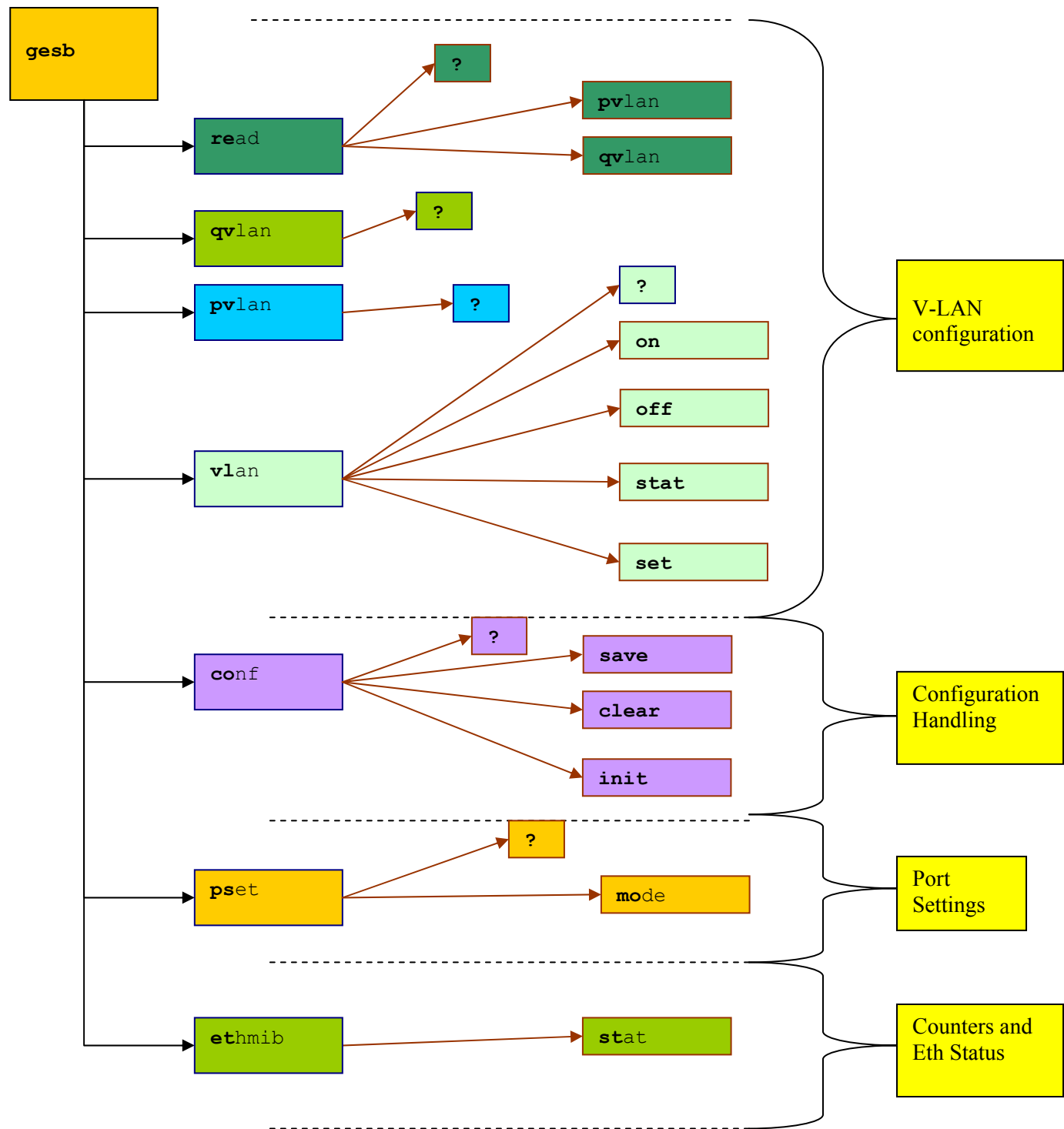


Figure 2: ESS Commands Snapshot

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5.3 Commands description

5.3.1 Filtering Commands

5.3.1.1 Filtering principles

When filter is activated, every incoming Ethernet frame is checked against its content, using the following scheme:

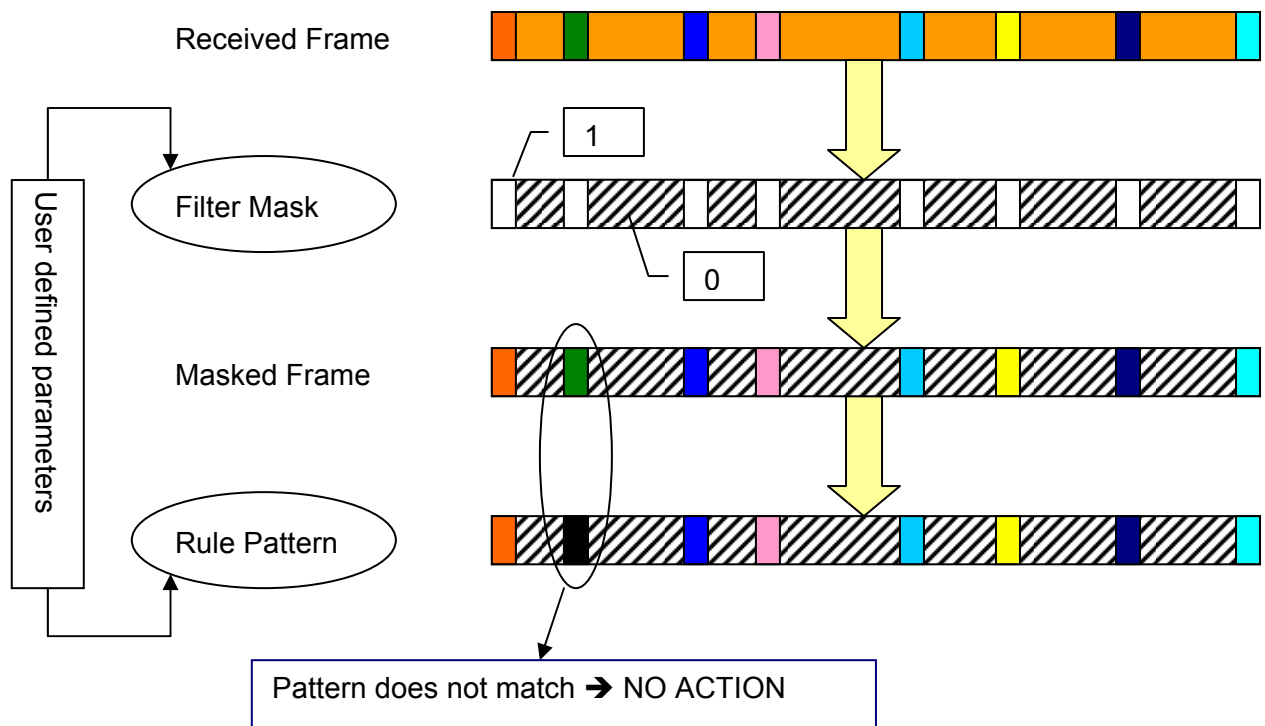


Figure 2: Filtering Principle

In order to filter incoming Ethernet frames the following sequence must be implemented:

Step 0: define the secure port (the one that provides the filtered traffic);

Step 1: define filter masks per port → define what portion of the Ethernet frame must be inspected;

Step 2: define filter rules per port → define a search pattern and the action to perform if the pattern matches;

Step 3: enable filtering per port;

The following figure shows the IP header; bits are numbered in “network order” being bit0 the MSb and bit31 the LSb:

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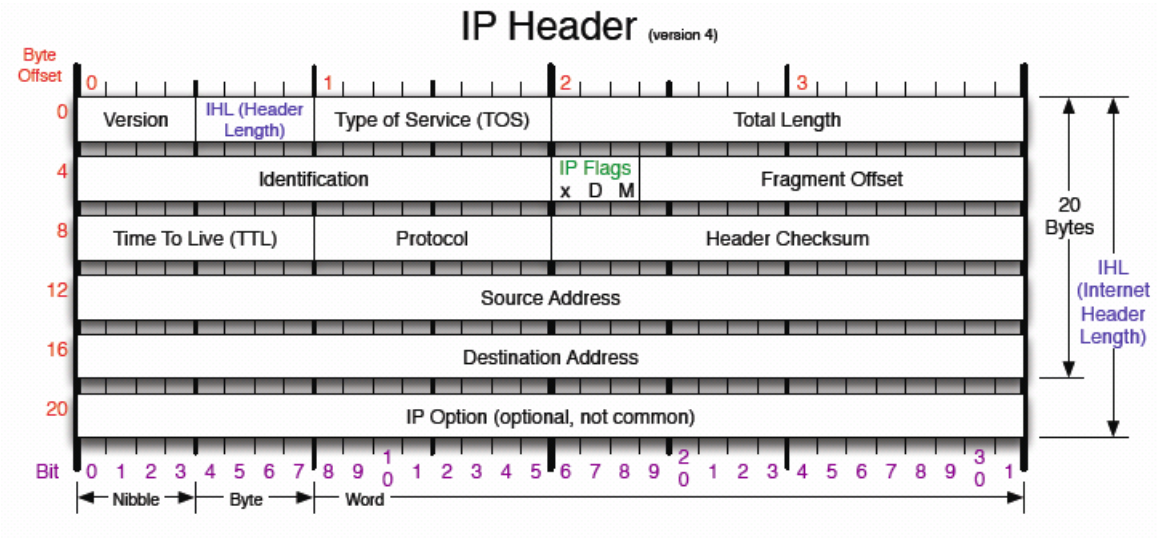


Figure 3: IP Header

The following figures show respectively the TCP and UDP headers:

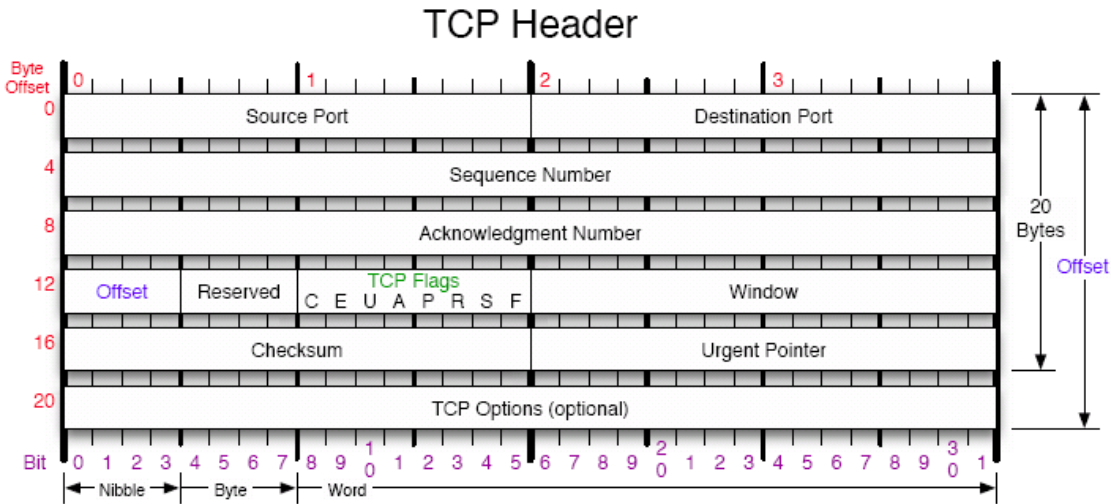


Figure 4: TCP Header

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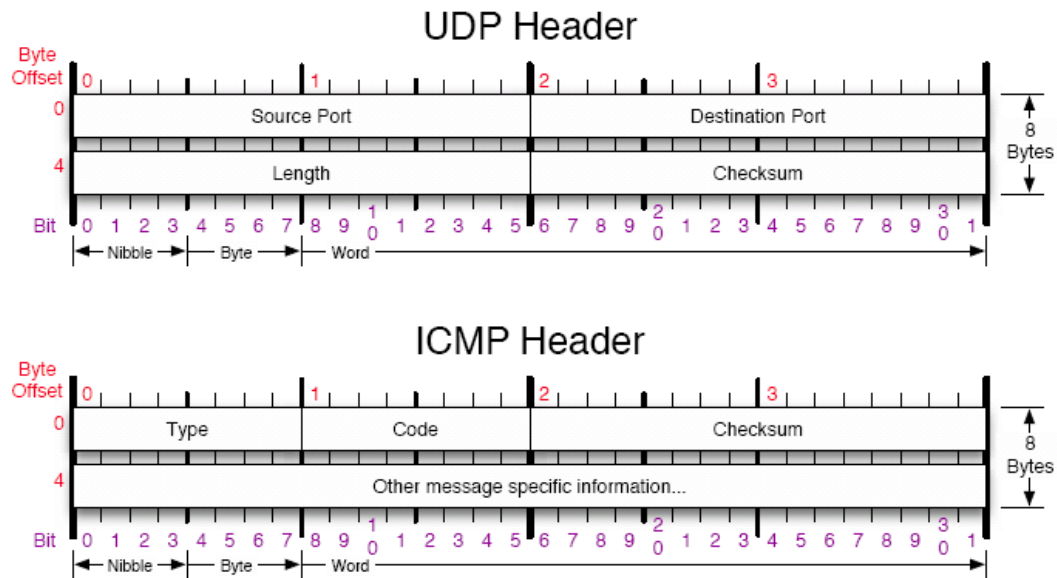
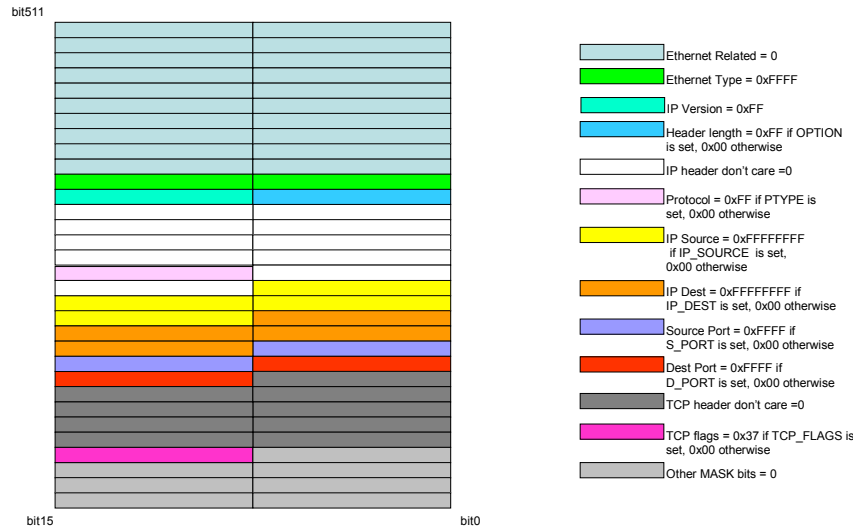


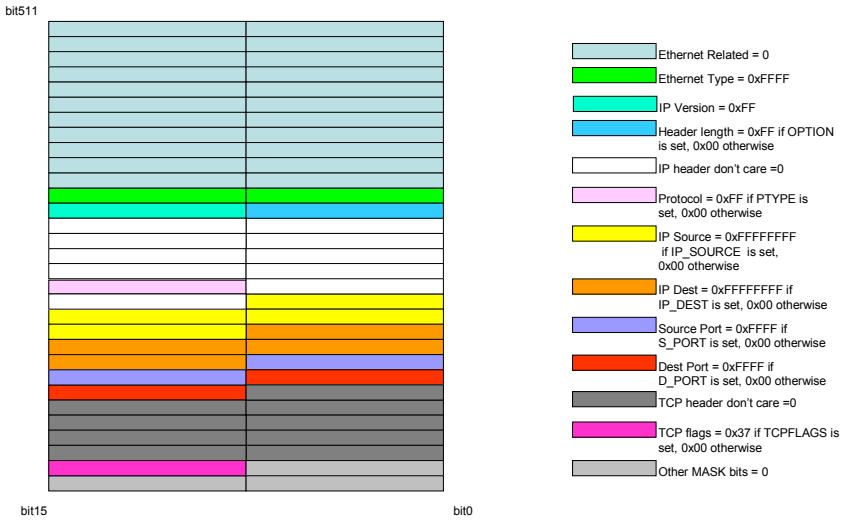
Figure 5: UDP/ICMP Header

The following figure shows the mask (each row represents a 16 bits Word) for an untagged packet, considering no IP Options and TCP:



In case the packet is tagged the Ethernet header is increased by 4 bytes placed between the Source MAC and the Type, so the figure above becomes:

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5.3.1.2 Filtering sequence

The following steps must be executed in order to set-up the switch for packet filtering purposes.

STEP	COMMAND	USED FOR	REFERENCE
1	switchdrv filter outp	Set up the secure port: the secure port is unique for the switch. It is the port to be connected towards CP.	5.3.1.3
2	switchdrv mask set	Set up the filter mask for a port. It must be defined for every port the filtering is applied.	5.3.1.4
	switchdrv mask xxx	Step 2 must be iterated for all the possible masks, for all the ports the user wants to protect. Other commands could be used for display/delete/init the mask table.	5.3.1.4 5.3.1.5 5.3.1.8
3	switchdrv rule set	Set up the filter rule according to the already inserted filter mask. It must be defined for every port the filtering is applied.	5.3.1.9
	switchdrv rule xxx	Step 3 must be iterated for all the possible rules, for all the ports the user wants to protect. Other commands could be used for display/delete/init the rule table.	5.3.1.10 5.3.1.11 5.3.1.13
4	switchdrv filter on	Start the packet filtering, it must be stated for all the ports.	5.3.1.14
	ack	The 'ack' must be applied in order to confirm the command.	5.3.1.15 5.3.1.16
5		Checks for Ethernet alarms in the systems. Checks the updated switch configuration does not disturb the Ethernet traffic in the node.	
6	switchdrv conf save	Save the current configuration.	5.3.3.4

5.3.1.3 Define the out (egress) port for filtering

The port where the traffic is filtered out has to be defined by means of the following command:

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```
switchdrv filter outp <port>
```

The following parameter has to be applied:

Parameter	Meaning	Range	Note
port	GESB port number	0..7	according to GESB front ports numbering

The current value for the out port is defined in the 'switchdrv filter stat' command, see later in this document.

Note that changing of the out port results in stopping all filter activities

Example:

```
switchdrv filter outp 0
```

Results in the following printout

```
OUT port set to: 0
```

5.3.1.4 Set a Filter mask

Set up a filter mask means telling the switch manager what fields of the Ethernet frame have to be inspected in the filtering process. It is possible to define up to 7 different masks per port. Masks with entry '0' are reserved for the "drop all" i.e. they are as default set to zero (no checks at all on the packet). It is also possible to define multiple assignments, for all the ports and/or all entries.

A specific command exists in order to define a mask for ARP protocol.

In order to set-up a mask, the following command exists:

```
switchdrv mask set (?) (<port/all> <fsel/all> <vl_tag> <ip_s> <ip_d>
                        <ptype> <ip_opt> <src_p> <des_p> <tcp_f>)

switchdrv mask arp (?) (<port> <fsel>)
```

The following parameters could be applied:

Parameter	Meaning	Range	Note
port	GESB port number	0..7 'all'	According to GESB front ports numbering
fsel	Table entry number	1..7 'all'	According to mask show printout it is the index in the mask table.
vl_tag	VLAN Tag	0,1	0:don't check, 1:check value

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ip_s	IP source address	0..32	Number of bits to be checked in the ip source address, according to the notation xxx.yyy.zzz.kkk:ip_s
ip_d	IP dest address	0..32	Number of bits to be checked in the ip destination address, according to the notation xxx.yyy.zzz.kkk:ip_d
ptype	IP protocol type	0,1	0:don't check, 1:check value
ip_opt	IP options	0,1	0:don't check, 1:check value
src_p	protocol src port	0,1	0:don't check, 1:check value check is possible only if ip_opt is not present and ptype=TCP or UDP
dst_p	Protocol dst port	0,1	0:don't check, 1:check value check is possible only if ip_opt is not present and ptype=TCP or UDP
tcp_f	TCP Flags	0,1	0:don't check, 1:check value check is possible only if ip_opt is not present and ptype=TCP

As example, create a mask for **all** ports and entry 7 to check on:

IP source address value

IP protocol type value

IP options presence

protocol source port

switchdrv mask set all 7 0 **32** 0 **1** **1** **1** 0 0

This results in the following printout

```
IMASK SET

PORT : all ports
FSEL : 7

WRITE ENTRY OK
```

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5.3.1.5 Show a Filter mask

In order to show the mask table, the following command exists:

```
switchdrv mask show (?) (<port/all>)
```

The following parameters could be applied:

Parameter	Meaning	Range	Note
port	GESB port number	0..7 'all'	according to GESB front ports numbering

Example (considering the previous mask set command)

```
switchdrv mask show 3
```

Results in the following printout

IMASK TABLE PORT 3									
FSEL	TAG	IP SOURCE	IP DEST	P TYPE	IP OP	SRC P	DES P	TCP FL	
0		00.00.00.00	00.00.00.00						RESERVED FOR DROP ALL
1		00.00.00.00	00.00.00.00						
2		00.00.00.00	00.00.00.00						
3		00.00.00.00	00.00.00.00						
4		00.00.00.00	00.00.00.00						
5		00.00.00.00	00.00.00.00						
6		00.00.00.00	00.00.00.00						
7		FF.FF.FF.FF	00.00.00.00	X	X	X			

5.3.1.6 Unset a Filter mask

In order to remove from the table (i.e. set to default) one or all mask entry – for one or all ports, the following command exists:

```
switchdrv mask unset (?)<port/all> <entry/all>
```

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The following parameters have to be applied:

Parameter	Meaning	Range	Note
port	GESB port number	0..7 'all'	according to GESB front ports numbering
Entry	The entry to delete	1..7 'all'	Entry #0 can not be deleted

Example:

```
switchdrv mask unset all all
```

Results in the following printout

```
IMASK UNSET  
  
PORT : all ports  
FSEL : all fsel  
  
DELETE ENTRY OK
```

5.3.1.7 Save the current Filter masks

In order to save the current filter masks for all ports, the following command exists:

```
switchdrv mask save
```

Results in the following printout

```
IMASK configuration saving .....  
  
Saving completed
```

The configuration is saved in a file stored into secondary file system, it's not possible to store different files with different configurations.

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5.3.1.8 Load the Filter masks

In order to load the last saved filter masks for all ports, the following command exists:

```
switchdrv mask init
```

Results in the following printout

```
IMASK  initialization
Reading IMASK.DAT file .....
Initialization completed
```

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5.3.1.9 Set a Filter rule

Set up a filter rule means telling the switch manager the exact content of the different fields in the Ethernet frame to inspect by the filtering process. It is possible to define up to 127 different rules per port, based on the 7 user-defined filter masks. Rules with entry '0' are reserved for the "drop all" i.e. they are as default set to zero. It is also possible to define multiple assignments, for all the ports and/or all entries.

In order to set-up a mask, the following command exists:

```
switchdrv rule set
```

You will be asked to insert the following fields:

```
PORT      [DEF 0] =
FSEL      [DEF 0] =
ETHPRO    [DEF IPV4] =
VL TAG    [DEF 0] =
IP PRO    [DEF np] =
IP SRC    [DEF 0.0.0.0] =
IP DST    [DEF 0.0.0.0] =
IP OPT    [DEF nochk]=
SRC PO    [DEF 0] =
DST PO    [DEF 0] =
TCPFLG    [DEF 0] =
ACTION    [DEF deny] =
```

The following parameters are requested to be inserted:

Parameter	Meaning	Range	Default	Note
port	GESB port number	0..7 'all'	0	according to GESB front ports numbering
fsel	Table entry number	1..7 'all'	1	According to mask show printout it is the index in the mask table.
ethpro	Ethernet protocol type	'ipv4' 'arp'	'ipv4'	Further protocol fields will be asked only if 'ipv4' has been selected
vl_tag	VLAN Tag	0..4095	0	
ip_s	IP source address	xxx.yyy.zzz.kkk	0.0.0.0	
ip_d	IP dest address	xxx.yyy.zzz.kkk	0.0.0.0	
ptype	IP protocol type	'tcp', 'udp' 'icmp', 'nopr'	'nopr'	'nopr' must be used if the user does not want to check the protocol type (and set '0' in the ptype field for the related mask)
ip_opt	IP options	'nochk', 'forbid'	'nochk'	"nochk" to match packets with and without ip options "forbid" to match only packets

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				without ip options
src_p	protocol src port	[0-65535]	0	allowed only in case of TCP/UDP without ip option
dst_p	Protocol dst port	[0-65535]	0	allowed only in case of TCP/UDP without ip option
tcp_f	TCP Flags	1-128	0	only in case of TCP without ip option
ACTION	What to do if the rule matches	'allow' - 'deny'	'deny'	"allow" to forward the packet in case of matching "deny" to drop the packet in case of matching

These parameters are entered in interactive way (one after the other)

Example:

Set a filter on the port number 3 with mask addressed by FSEL 1 to allow only traffic with following characteristics:

- IPv4
- TCP
- Coming from IP address 192.168.200.10
- Directed to the subnet 192.200.160.0/24
- Without IP option field
- Coming from the protocol port 2000
- Directed to the protocol port 3000

```
switchdrv rule set
```

```
PORT      [DEF 0] = 3
FSEL      [DEF 0] = 1
ETHPRO    [DEF IPV4] = ipv4
VL TAG    [DEF 0] =
IP PRO    [DEF np] = tcp
IP SRC    [DEF 0.0.0.0] = 192.168.200.10
IP DST    [DEF 0.0.0.0] = 192.200.160.0
IP OPT    [DEF nochk]= forbid
SRC PO    [DEF 0] = 2000
DST PO    [DEF 0] = 3000
TCPFLG    [DEF 0] =
ACTION    [DEF deny] = allow
```

Results in the following printout

```
WRITE ENTRY OK
```

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5.3.1.10 Show a Filter Rule

In order to show the rule table, the following command exists:

```
switchdrv rule show (?) (<port/all>)
```

The following parameters could be applied:

Parameter	Meaning	Range	Note
port	GESB port number	0..7 'all'	according to GESB front ports numbering

Example:

```
switchdrv rule show 3
```

Results in the following printout

```

+-----+
|IRULE TABLE PORT 3 |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|ENTRY| FSEL | TAG | IP SOURCE | IP DEST | PTYPE | IP OP | SRC PORT | DES PORT | TCP FL | ACTION |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| 1 | 0 | 0 | 0.0.0.0 | 0.0.0.0 | NOPR | NOCHK | 0 | 0 | 0 | DROP ALL |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| 2 | 1 | 0 | 192.168.200.10 | 192.200.160.0 | TCP | FORB | 2000 | 3000 | 0 | Allow |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+

```

Note that the “TAG” column means VLAN TAG (is the vl_tag parameter mentioned before)

5.3.1.11 Unset a Filter rule

In order to remove from the table (i.e. set to default) the mask table, the following command exists:

```
switchdrv rule unset (?)<port/all> <entry/all>
```

The following parameters have to be applied:

Parameter	Meaning	Range	Note
port	GESB port number	0..7 'all'	according to GESB front ports numbering
Entry	The entry to delete	2..127 'all'	Entries #0 and #1 can not be deleted

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When the rule is removed from the table, the table is ordered and presented to the user again.

Example:

```
switchdrv rule unset 3 all
```

Results in the following printout

```
IRULE UNSET      PORT : 3      ENTRY: all entries
```

```
+-----+
|IRULE TABLE PORT 3 |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|ENTRY| FSEL | TAG | IP SOURCE | IP DEST | PTYPE | IP OP | SRC PORT | DES PORT | TCP FL | ACTION |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| 1 | 0 | 0 | 0.0.0.0 | 0.0.0.0 | NOPR | NOCHK | 0 | 0 | 0 | DROP ALL |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
```

```
UNSET ENTRY OK
```

5.3.1.12 Save the current Filter rules

In order to save the current filter rules for all ports, and the filter status the following command exists (without parameters):

```
switchdrv rule save
```

Results in the following printout:

```
IRULE configuration saving.....
```

```
Saving completed
```

```
FILTER status saving
```

```
Saving completed
```

The configuration is saved in a file stored into secondary file system, it's not possible to store different files with different configurations.

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5.3.1.13 Load the Filter rules

In order to load the last saved filter rules for all ports, the following command exists (without parameters):

```
switchdrv rule init
```

Results in the following printout:

```
IRULE  initialization
Reading IRULE.DAT file .....
Initialization completed
FILTER status initialization
Reading FILTER.DAT file
Initialization completed
```

5.3.1.14 Start filtering process

As soon as the mask table and rules table have been populated and the egress port for filtering is defined, it is possible to start filtering activities

This is done by means of the following command:

```
switchdrv filter <port> <on>
```

It is possible to specify a single port or all ports, the default is all ports.

The following parameters have to be applied:

Parameter	Meaning	Range	Note
Port	GESB port number	0..7 'all'	according to GESB front ports numbering

Define the out port is mandatory before to enable the filtering.

Example:

```
switchdrv filter 7 on
```

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Results in the following printout

FILTER Port 7 : ENABLED

A confirmation of the enable command (on) is requested: this is done in order to prevent the filtering process drops the not malicious Ethernet traffic (including the telnet traffic).

WARNING:

Type "ACK" to confirm connection presence
if acknowledge is not entered in 30 sec
filter will be disabled.

ENTER ACK: ack

ACK CONFIRMED

5.3.1.15 Stop filtering process

The filtering process is stopped by means of the following command:

```
switchdrv filter off <port>
```

The following parameters have to be applied:

Parameter	Meaning	Range	Note
Port	GESB port number	0..7 'all'	according to GESB front ports numbering It is an optional parameter, 'all' is applied as default

Example:

```
switchdrv filter 7 off
```

Results in the following printout:

FILTER Port 7 : DISABLED

Note that changing of the out port results in stopping all filter activities.

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5.3.1.16 Show the filter status

In order to understand if the filter is activated or not, it is possible to get the status of the filter:

```
switchdrv filter stat
```

The following parameters have to be applied:

Parameter	Meaning	Range	Note
port	GESB port number	0..7 'all'	according to GESB front ports numbering It is an optional parameter, 'all' is applied as default

Example:

```
switchdrv filter all stat
```

Results in the following printout

```
OUT port : 1
```

```
FILTER Port 7 : ENABLED  
FILTER Port 6 : DISABLED  
FILTER Port 5 : DISABLED  
FILTER Port 4 : DISABLED  
FILTER Port 3 : DISABLED  
FILTER Port 2 : DISABLED  
FILTER Port 1 : OUT PORT  
FILTER Port 0 : DISABLED
```

5.3.2 VLAN Commands

In order to handle VLANs inside the GESB switch, several commands exist. VLANs could be used for isolating different type of traffic (e.g. isolate the traffic coming from an external network from the internal traffic)

The default configuration for the GESB switch is:

- no tag will be added to a received MAC frame without a tag;
- an ingress MAC frame with a tag will be forwarded with the same tagging;
- no filtering depending on the VLAN tag will be done in the switches.

The management of VLANs is based on setting of two tables:

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PTABLE

VTABLE

which are then the features to support the IEEE 820.1Q standard.

PTABLE, the port based VLAN table, identifies the VLAN IDs associated with an untagged frame (frame without a tag header) or priority tagged frame (frame with a tag header of VLAN ID = 0) and, also, the membership of all the ports which are members of this VLAN. For simplicity, we define them "pvlan".

VTABLE, the 802.1Q or tag based VLAN table, gets the VLAN port membership from the VLAN ID by extracting it from the tag header of the frame. For simplicity, we define them "qvlan".

An 802.1Q Tagged VLAN Table (VTABLE) is used to get all the member ports associated with a VLAN.

Remember that:

- If the ingress frame is untagged, the VID for the egress frame is picked up from the PTABLE.
 - If the ingress Ethernet frame is tagged, it is used the VID of the incoming Ethernet frame to index into the VTABLE.
- As general rule, for untagged Ethernet frames, the VID is picked up from the PTABLE and for tagged Ethernet frames the VID is present in the VLAN tag.
- The L2 switching is based on the combination of the destination MAC address plus the VLAN tag.
- PTABLE is only used for incoming untagged traffic and VTABLE is only used for incoming Tagged traffic.
- QVLAN is the name within the standard; VTABLE is the table in the chipset switch. They are the same thing.

In case of Destination Lookup Failure (DLF) the VLAN Port Bitmap in PTABLE or VTABLE identifies the egress ports..

5.3.2.1 VLAN set-up sequence

The following steps must be executed in order to set-up the VLANs when complex mode is used:

STEP	COMMAND	USED FOR	REFERENCE
1	switchdrv vlan on	Enable the VLAN handling. The switch stops working	5.3.2.2

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		in “transparent” mode and starts using the port based and 802.1Q VLANs tables. The default configuration is: All the “untagged” traffic pass through the switch, all ports are connected among them. All the “VLAN tagged” traffic, with a VLAN id not belonging to any qvlan entry, is stopped.	
2	switchdrv qvlan	The tagged 802.1Q VLANs are handled by means of this command. This command must be issued if the switch has to handle tagged Ethernet packets.	5.3.2.4
	switchdrv qvlan xxx	Step 2 must be iterated for all the possible VLANs are handled by the switch. If a tagged Ethernet frame enter in the switch and there is no entry for it in the table, the Ethernet frame is refused. Other commands could be used for display/delete the VLAN table.	5.3.2.5 5.3.2.7
4	switchdrv pvlan	The port based VLANs are handled by means of this command. This command tells the switch what to do with the untagged Ethernet packets, e.g. where to switch them and if add a VLAN tag.	Error! Reference source not found.
	switchdrv pvlan xxx	Step 2 must be iterated for all the switch ports (0..7). Other commands could be used for display the table. Removing a port based VLAN is performed by means of overwriting the existing one.	5.3.2.7
5		Checks for Ethernet alarms in the systems. Checks the updated switch configuration does not disturb the Ethernet traffic in the node.	
6	switchdrv conf save	Save the configuration.	5.3.3.4

5.3.2.2 V-LAN State Machine for command handling

When dealing with V-LAN, the user could be in one of the following states:

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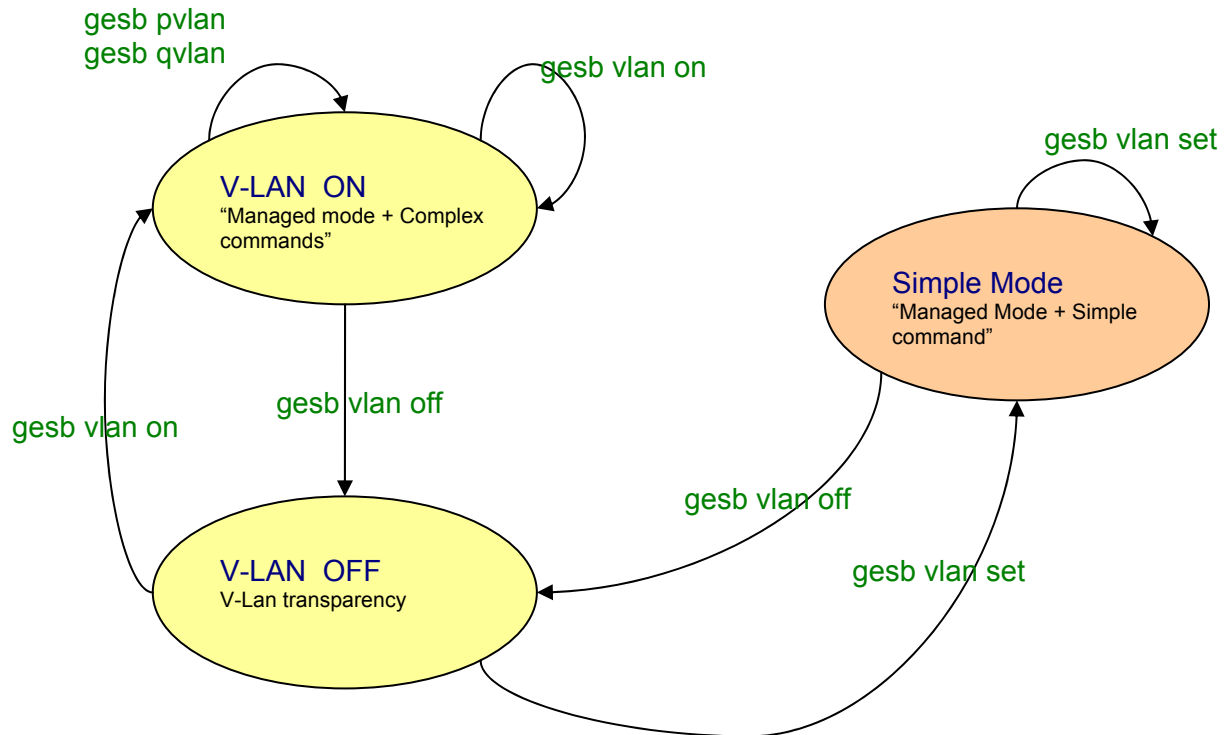


Figure 6: V-Lan State Machine

When the V-LAN state is "Simple Mode", the "gesb pvlan" and "gesb qvlan" commands are refused.

When the V-LAN state is "V-LAN ON", the "gesb vlan set" command is refused and the "gesb vlan on" command has no effect

When the V-LAN state is "V-LAN OFF", the "gesb pvlan" and "gesb qvlan" commands are refused.

The "gesb vlan on", "gesb vlan off" and "gesb vlan set" commands are used for changing the v-lan state (as reported above).

It is important highlighting that in the beginning, before passing from the unmanaged to the managed mode, it is no possible to set VLAN configurations.

All the other commands are accepted in whatever state.

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5.3.2.3 Handling the VLAN Transparency

The VLAN transparency is a feature that allows packets traffic to be transmitted as they are; they pass through the switch both tagged and untagged without changing their own nature. GESB working in transparent mode is called working in “unmanaged” mode; GESB working in non transparent mode is called working in “managed” mode. By default, at board start-up, GESB is set to work in unmanaged mode just to guarantee the VLAN transparency. To set the board in “managed” mode, the following command must be run:

```
switchdrv vlan on
```

This command will take effect only if the GESB is in “unmanaged” mode. This command sets the Port based VLAN table with entries having this format:

```
PORT           : i (i is in the range 0..7)
VLAN_TAG       : 1
Port Members   : 0 1 2 3 4 5 6 7
Out Untag Ports : 0 1 2 3 4 5 6 7
RJ flag unset
```

while the 802.1Q VLAN table remains as it is.

To set the board in “unmanaged” mode, the following command must be run:

```
switchdrv vlan off
```

In this case, the Port based VLAN table assumes this configuration:

```
PORT           : i (i is in the range 0..7)
VLAN_TAG       : 1
Port Members   : 0 1 2 3 4 5 6 7
Out Untag Ports : -
RJ flag unset
```

which is its default configuration, while the 802.1Q VLAN table is set according to the its default values:

```
VLAN_TAG       : 4095
Port Members   : -
Out Untag Ports : -
```

In order to know in which mode the board is working, the following command must be run:

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```
switchdrv vlan stat
```

This command will provide the GESB status information: either ON (GESB in “managed” mode) or OFF (GESB in “unmanaged” mode). In this case, the possible printouts are:

“The VLAN status is OFF” or “The VLAN status is ON” or SIMPLE MODE: in this case, the following additional information is reported:

```
The VLAN status is SIMPLE MODE
```

```
The configuration set is:
```

```
Port_IN = p_in, Tag_IN = t_in, Port_EXT = p_ext, Tag_EXT = t_ext
```

At run time, to restore a configuration previously saved, the following command must be run:

```
switchdrv vlan init
```

The effect of this command is losing the present configuration and restoring the previous one.. If the configuration is not available an error message will be issued.

It is important highlighting that in the beginning, before passing from the unmanaged to the managed mode, no port based VLAN configurations must be done. In fact, passing to the managed mode will reconfigure the Port based VLAN table as seen in the description of command “switchdrv vlan on”.

Note: as already seen, since disabling the VLAN transparency by means the command “switchdrv vlan on” implies a complete reconfiguration of the Port based VLAN table, it is mandatory configuring the Port based VLAN table when GESB is in status ON, that is in “managed” mode.

5.3.2.4 Define a 802.1Q Based Vlan

In order to set a Tag-based VLAN configuration, the following command must to be run:

```
switchdrv qvlan
```

and the following information will be requested in interactive way:

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Parameter	Meaning	Range	Note
VLAN_TAG	The VLAN ID to handle	0..4095	Numbers 0, 1 and 4095 are reserved for special use. VLAN value 1 is used internally in the switches as default VLAN. It is possible to use all other 4093 VLAN values as VLAN identifiers.
PORT NUMBERS	The TAGGED ports belonging to the VLAN (where the switch expects to receive TAGGED packets)	0..7	It is possible to insert up to 8 numbers (each number is separated by a blank) according to GESB front ports numbering.
UNTAGGED PORT NUMBERS	The UNTAGGED ports belonging to the VLAN representing the ports on which the egress traffic is untagged (the egress ports where the switch is removing the VLAN tag)	0..7	It is possible to insert up to 8 numbers (each number is separated by a blank) according to GESB front ports numbering.

Despite the fact there are 64 entries in the table, the actual entries of the 802.1Q VLAN table available are 62 because the first one is reserved by the switch while the last one is used by the software in order to guarantee the order of the entries within the 802.1Q VLAN table. If the 802.1Q VLAN table is completely full and one attempts to insert a further entry, the following warning message will be issued:

```
"QVLAN table is full and no more available.  
To go on removing an entry".
```

So, to continue it is necessary to remove an entry and insert the new one.

Example:

Let's see some example on how handling this command. When you type the command "switchdrv qvlan", an interactive session will open and the application will ask to fill the following fields:

VLAN_TAG =

PORT NUMBERS =

UNTAGGED PORT NUMBERS =

It is mandatory typing one and only one blank between two consecutive port numbers. For instance:

wrong string: 75 (no blanks);

correct string: 7 5 (one blank).

Note 1: the string "7 5" (two blanks or more) formally is not correct but nevertheless is automatically handled by the software.

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Note 2: the string "03" (no blanks) will be interpreted as "3".

If we write the configuration:

```
VLAN_TAG = 64
PORT NUMBERS = 5 6 7
UNTAGGED PORT NUMBERS = 5 7
```

We will get the printout:

```
VTABLE_entry      : 1
VLAN_TAG          : 64
Port members      : 5 6 7
Out untag ports   : 5 7
```

Note: the term "VTABLE_entry" specifies the entry value of the 802.1Q VLAN table where the configuration is stored. This table is automatically sorted according to the VLAN_TAG values: the lowest VLAN_TAG is kept in the entry 1, and so on.

5.3.2.5 Remove a Tag Based Vlan

In case you need to remove an old Tag-based VLAN configuration just run:

```
switchdrv qvlan -r Qtab
```

and the following information must be inserted:

Parameter	Meaning	Range	Note
Qtab	represent the entry in the 802.1Q VLAN table (the so-called VTABLE) to remove	1..62	Entry 0 and 63 are reserved and can not be removed

Example:

according to the example above, to remove the configuration associated with the VLAN_TAG = 64, you must run:

```
switchdrv qvlan -r 1
```

Of course, every time a wrong value is edited on the command line an appropriate error message will be issued.

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5.3.2.6 Define a Port Based Vlan

In order to set a Port based VLAN configuration, the following command must to be run:

```
switchdrv pvlan -p Port -t TAG_value -m M_port,M_port,...,M_port <-u  
U_port,U_port,...,U_port> <-f rj>
```

and the following information must be inserted:

Parameter	Meaning	Range	Note
PORT	The SB front port to configure	0..7	
TAG_value	The VLAN ID to handle	2..4094	Numbers 0, 1 and 4095 are reserved for special use. VLAN value 1 is used internally in the switches as default VLAN. It is possible to use all other 4093 VLAN values as VLAN identifiers.
M_port	It identifies all the members of the port-based VLAN, that is, it is the list of ports to which frames received on PORT can be forwarded. (One-directional)	0..7	It is possible to insert up to 8 numbers (each number is separated by a comma) according to SB front ports numbering. It is possible to include PORT in member list, but it's not mandatory. In this User Guide PORT is always included in member list. And this is also recommended because it makes scripting of configuration less error prone. Shall contain list of ALL members
Uport	The UNTAGGED ports belonging to the VLAN representing the ports on which the egress traffic is untagged (the egress ports where the switch is not adding the VLAN tag)	0..7	It is possible to insert up to 8 numbers (each number is separated by a comma) according to SB front ports numbering. Shall be a subset of -m member list. Only indicating those ports which shall stay untagged. It's possible to define additional ports, not yet included in m member list, meaning is not clear (to be sorted out by tests) Proper wording will be adapted to test results.
RJ Flag	If present, input untagged frames and input frames with VID = 0 are discarded		This flag obsoletes definition of PTABLE for this PORT. As -m must be specified anyway following definition is recommended: switchdrv pvlan -p PORT -t 5 -m PORT -f rj

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			switchdrv pvlan -p 0 -t 5 -m 0,1,2 -u 1 -> internally result: VLAN=1; externally on port 2: VLAN=5
--	--	--	--

5.3.2.7 Reading the VLAN Configuration tables

It can be useful to read back the current settings of 802.1Q VLAN table and Port based VLAN table and it will be possible to read back either a single entry or the whole table. For these actions two commands are supplied, respectively both for 802.1Q VLAN table and for Port based VLAN table:

```
switchdrv read qvlan -a
```

This command is used to read back the whole 802.1Q VLAN table.

```
switchdrv read qvlan -v VTABLE_entry
```

This command is used to read back only the entry correspondent to the VLAN identified by VTABLE_entry. VTABLE_entry is a number in the range 0 – 63 and specifies the VTABLE entry which you are interested in; if one entry has not been filled, you will see the default values.

```
switchdrv read pvlan -a
```

This command is used to read back all the 8 Port based VLAN table entries.

In the following example, only port 2 has a non-default configuration:

```
switchdrv read pvlan -a
```

```

PORT           : 0
VLAN_TAG       : 1
Port Members   : 0 1 2 3 4 5 6 7
Out Untag Ports : -
RJ flag unset

```

```

PORT           : 1
VLAN_TAG       : 1
Port Members   : 0 1 2 3 4 5 6 7
Out Untag Ports : -

```

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RJ flag unset

PORT : 2
VLAN_TAG : 34
Port Members : 0 1 2
Out Untag Ports : 1
RJ flag unset

PORT : 3
VLAN_TAG : 1
Port Members : 0 1 2 3 4 5 6 7
Out Untag Ports : -
RJ flag unset

PORT : 4
VLAN_TAG : 1
Port Members : 0 1 2 3 4 5 6 7
Out Untag Ports : -
RJ flag unset

PORT : 5
VLAN_TAG : 1
Port Members : 0 1 2 3 4 5 6 7
Out Untag Ports : -
RJ flag unset

PORT : 6
VLAN_TAG : 1
Port Members : 0 1 2 3 4 5 6 7
Out Untag Ports : -
RJ flag unset

PORT : 7
VLAN_TAG : 1
Port Members : 0 1 2 3 4 5 6 7
Out Untag Ports : -
RJ flag unset

`switchdrv read pvlan -v PVLAN_ID`

This command is used to read back only the entry correspondent to the port identified by PVLAN_id. PVLAN_id is a number in the range 0 – 7 and specifies the port which you are interested in reading of; if one port has not been configured, you will see the default values

Example:

`switchdrv read pvlan -v 2`

PORT : 2
VLAN_TAG : 34
Port Members : 0 1 2
Out Untag Ports : 1

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RJ flag unset

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5.3.2.8 Simplified Command

In case of easy vlan configuration, - i.e. only two ports involved in the Vlan and only one Vlan defined – a simplified command could be used.

It is applicable only when the topology is as reported in the picture below, i.e.:

- The “External Port” could communicate only with the “Internal Port” (and eventually the V-Lan tag is inserted or removed)
- The “Internal Port” could communicate with all ports (and eventually the V-Lan tag is inserted or removed towards the “external port”)
- All other ports cannot communicate with the “External Port” but are allowed to communicate one each other (handling untagged traffic)

This is equivalent to define 8 port based V-Lan, a tagged V-Lan after the V-lan activation command (“switchdrv vlan on” command), that are 10 commands.

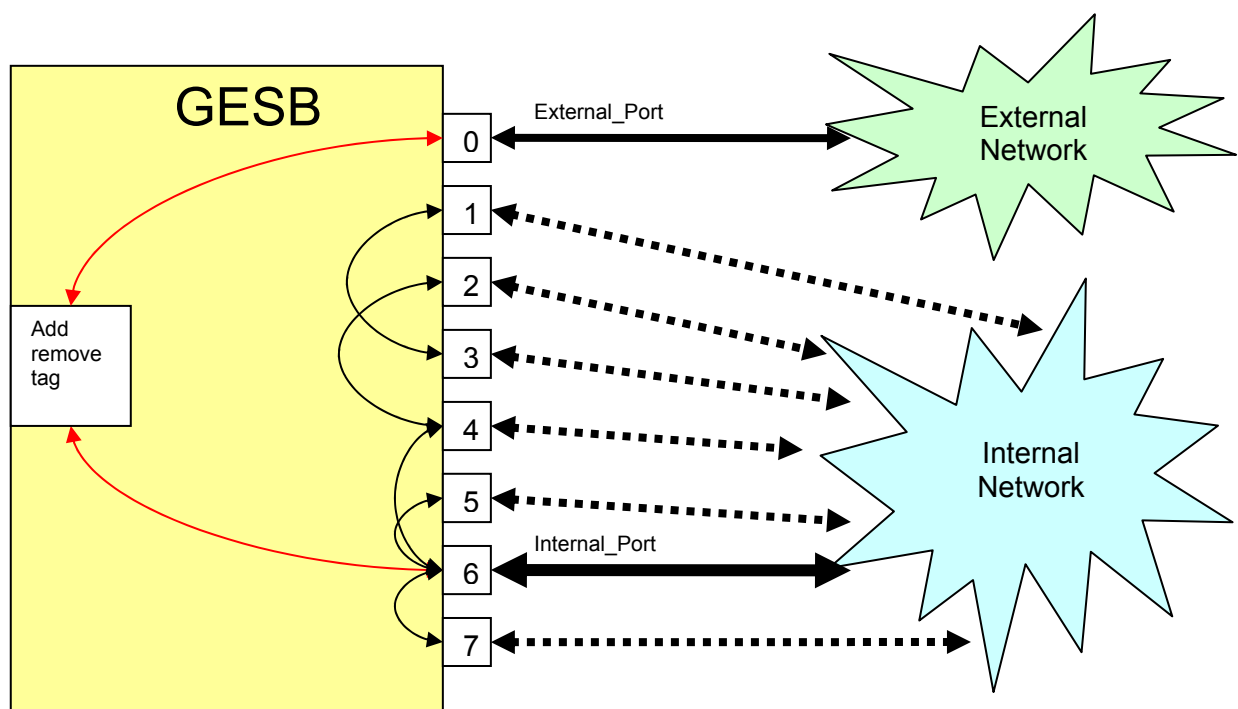


Figure 7: Simple V-Lan Configuration example

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This commands could be shortened in only command

```
switchdrv vlan set <Port_int> <Tag_int> <Port_ext> <Tag_ext>
```

Where:

Parameter	Meaning	Range	Note
Port_int	The SB front port connected to the internal network (where the external traffic is supposed to be switched)	0..7	
Port_ext	The SB front port connected to the external network	0..7	
TAG_int	The VLAN ID for the ingress / egress traffic of the external port (applicable only for the frames coming from / to the external port)	2..4094 or NO_TAG	If different from NO_TAG it must have the same value of the TAG_ext (see below table).
TAG_ext	The VLAN ID for the ingress / egress traffic of the external port	2..4094 or NO_TAG	If different from NO_TAG it must have the same value of the TAG_int (see below table).

The following tag alternatives are applicable to the new command:

TAG INT	TAG EXT	Result
NO_TAG	NO_TAG	This means a port based V-Lan is created and the traffic from the "External" port could flows only towards the "Internal" one
2..4094	NO_TAG	The Tagged Packets that enter in the Port_Int (with the specified TAG_IN) are forwarded to the Port_Ext - and the Tag is removed - Packets that enter in the Port_Ext are supposed to be not tagged (tagged packets will be refused). Tag will be added and the packet is forwarded to the Port_IN.
NO_TAG	2..4094	Packets that enter in the Port_Ext are supposed to be tagged

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		(un tagged packets will be refused). Tag will be removed and the packet is forwarded to the Port_IN. The Packets that enter in the Port_Int are supposed to be not tagged. To those ones directed towards the Port_Ext, the Tag_Ext is added
2..4094	2..4094	Packets that enter in the Port_Ext are supposed to be tagged (un tagged packets will be refused). Tag will be maintained and the packet is forwarded to the Port_IN. The Tagged Packets that enter in the Port_Int (with the specified tag) are forwarded to the Port_Ext - and the Tag is maintained - Notice: Tags for both internal and external port must be the same (tag could not be changed).

The effect of this command is that:

The switch enter in “managed mode”

The “ptable” is updated according to the command (starting from scratch),

The “vtable” is updated according to the command (starting from scratch),

Hereafter an example of simplified command is reported:

```
OSmon> switchdrv vlan set 7 45 5 45
The VLAN has been set in SIMPLE MODE status
```

```
OSmon> switchdrv vlan stat
```

```
The VLAN status is SIMPLE MODE
The configuration set is:
```

```
Port_IN = 7, Tag_IN = 45, Port_EXT = 5, Tag_EXT = 45
```

```
OSmon> switchdrv read qvlan -a
```

```
VTABLE_entry      : 0
VLAN_TAG          : 0
Port Members      : -
Out Untag Ports   : -
```

```
VTABLE_entry      : 1
VLAN_TAG          : 45
Port Members      : 5 7
Out Untag Ports   : -
```

```
VTABLE_entry      : 2
VLAN_TAG          : 4095
Port Members      : -
```

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Out Untag Ports : -

VTABLE_entry : 3
VLAN_TAG : 4095
Port Members : -
Out Untag Ports : -

VTABLE_entry : 62
VLAN_TAG : 4095
Port Members : -
Out Untag Ports : -

VTABLE_entry : 63
VLAN_TAG : 4095
Port Members : -
Out Untag Ports : -

```
OSmon> switchdrv read pvlan -a
PORT : 0
VLAN_TAG : 4095
Port Members : 0 1 2 3 4 6 7
Out Untag Ports : 0 1 2 3 4 6 7
RJ flag unset
```

```
PORT : 1
VLAN_TAG : 4095
Port Members : 0 1 2 3 4 6 7
Out Untag Ports : 0 1 2 3 4 6 7
RJ flag unset
```

```
PORT : 2
VLAN_TAG : 4095
Port Members : 0 1 2 3 4 6 7
Out Untag Ports : 0 1 2 3 4 6 7
RJ flag unset
```

```
PORT : 3
VLAN_TAG : 4095
Port Members : 0 1 2 3 4 6 7
Out Untag Ports : 0 1 2 3 4 6 7
RJ flag unset
```

```
PORT : 4
VLAN_TAG : 4095
Port Members : 0 1 2 3 4 6 7
Out Untag Ports : 0 1 2 3 4 6 7
RJ flag unset
```

```
PORT : 5
VLAN_TAG : 4095
Port Members : 0 1 2 3 4 5 6 7
Out Untag Ports : -
RJ flag set
```

```
PORT : 6
VLAN_TAG : 4095
Port Members : 0 1 2 3 4 6 7
Out Untag Ports : 0 1 2 3 4 6 7
RJ flag unset
```

```
PORT : 7
VLAN_TAG : 4095
Port Members : 0 1 2 3 4 6 7
```

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Out Untag Ports : 0 1 2 3 4 6 7
RJ flag unset

OSmon> switchdrv vlan set 6 **43** 5 NO_TAG

A new VLAN configuration has been set in SIMPLE MODE status

OSmon> switchdrv read qvlan -a

VTABLE_entry : 0
VLAN_TAG : 0
Port Members : -
Out Untag Ports : -

VTABLE_entry : 1
VLAN_TAG : **43**
Port Members : 6
Out Untag Ports : 5

VTABLE_entry : 2
VLAN_TAG : 4095
Port Members : -
Out Untag Ports : -

VTABLE_entry : 61
VLAN_TAG : 4095
Port Members : -
Out Untag Ports : -

VTABLE_entry : 62
VLAN_TAG : 4095
Port Members : -
Out Untag Ports : -

VTABLE_entry : 63
VLAN_TAG : 4095
Port Members : -
Out Untag Ports : -

OSmon> switchdrv read pvlan -a

PORT : 0
VLAN_TAG : 4095
Port Members : 0 1 2 3 4 6 7
Out Untag Ports : 0 1 2 3 4 6 7
RJ flag unset

PORT : 1
VLAN_TAG : 4095
Port Members : 0 1 2 3 4 6 7
Out Untag Ports : 0 1 2 3 4 6 7
RJ flag unset

PORT : 2
VLAN_TAG : 4095
Port Members : 0 1 2 3 4 6 7
Out Untag Ports : 0 1 2 3 4 6 7
RJ flag unset

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```

PORT          : 3
VLAN_TAG      : 4095
Port_Members  : 0 1 2 3 4 6 7
Out Untag Ports : 0 1 2 3 4 6 7
RJ flag unset

```

```

PORT          : 4
VLAN_TAG      : 4095
Port_Members  : 0 1 2 3 4 6 7
Out Untag Ports : 0 1 2 3 4 6 7
RJ flag unset

```

```

PORT          : 5
VLAN_TAG      : 43
Port_Members  : 6
Out Untag Ports : -
RJ flag unset

```

```

PORT          : 6
VLAN_TAG      : 4095
Port_Members  : 0 1 2 3 4 6 7
Out Untag Ports : 0 1 2 3 4 6 7
RJ flag unset

```

```

PORT          : 7
VLAN_TAG      : 4095
Port_Members  : 0 1 2 3 4 6 7
Out Untag Ports : 0 1 2 3 4 6 7
RJ flag unset

```

```
OSmon> switchdrv vlan set 6 NO_TAG 5 NO_TAG
```

A new VLAN configuration has been set in SIMPLE MODE status

```
OSmon> switchdrv read pvlan -a
```

```

PORT          : 0
VLAN_TAG      : 4095
Port_Members  : 0 1 2 3 4 6 7
Out Untag Ports : 0 1 2 3 4 6 7
RJ flag unset

```

```

PORT          : 1
VLAN_TAG      : 4095
Port_Members  : 0 1 2 3 4 6 7
Out Untag Ports : 0 1 2 3 4 6 7
RJ flag unset

```

```

PORT          : 2
VLAN_TAG      : 4095
Port_Members  : 0 1 2 3 4 6 7
Out Untag Ports : 0 1 2 3 4 6 7
RJ flag unset

```

```

PORT          : 3
VLAN_TAG      : 4095
Port_Members  : 0 1 2 3 4 6 7
Out Untag Ports : 0 1 2 3 4 6 7
RJ flag unset

```

```

PORT          : 4
VLAN_TAG      : 4095

```

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```
Port Members      : 0 1 2 3 4 6 7
Out Untag Ports   : 0 1 2 3 4 6 7
RJ flag unset
```

```
PORT              : 5
VLAN_TAG          : 4095
Port Members      : 6
Out Untag Ports   : 6
RJ flag unset
```

```
PORT              : 6
VLAN_TAG          : 4095
Port Members      : 0 1 2 3 4 5 6 7
Out Untag Ports   : 0 1 2 3 4 5 6 7
RJ flag unset
```

```
PORT              : 7
VLAN_TAG          : 4095
Port Members      : 0 1 2 3 4 6 7
Out Untag Ports   : 0 1 2 3 4 6 7
RJ flag unset
```

```
OSmon> switchdrv read qvlan -a
```

```
VTABLE_entry      : 0
VLAN_TAG          : 0
Port Members      : -
Out Untag Ports   : -
```

```
VTABLE_entry      : 1
VLAN_TAG          : 4095
Port Members      : -
Out Untag Ports   : -
```

```
VTABLE_entry      : 2
VLAN_TAG          : 4095
Port Members      : -
Out Untag Ports   : -
```

```
VTABLE_entry      : 62
VLAN_TAG          : 4095
Port Members      : -
Out Untag Ports   : -
```

```
VTABLE_entry      : 63
VLAN_TAG          : 4095
Port Members      : -
Out Untag Ports   : -
```

5.3.3 Port Setting Commands

In order to handle the SB board frontal ports, the following command has been provided. It's possible to force the port speed, duplex mode, pause capability for full duplex communication. The pause capability is also called flow control.

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The default configuration for all ports of the SB is:

- auto-negotiation;
- max frame length equal to 1528 byte

To force the link to work with a fixed operating state, the SB will be configured in order to be capable of negotiating only the selected state and the auto negotiation procedure will be started again for that link.

So the approach for the link state configuration is not to disable the auto negotiation.

To force the state on the link only the SB must be configured, the other link peer has to be kept in auto negotiation mode.

If the SB link peer is not auto negotiation capable, when a change of the operating state is requested, the two devices try to use the physical layer to get the optimal speed but they cannot agree on the duplex mode that will be always set to the default value: Half Duplex.

The Ericsson recommendation is to keep the SB link peer always in auto negotiation mode.

5.3.3.1 Change the operating state of the ports

The port speed, duplex mode and pause capability can be forced on each port of the SB.

Flow control is active only if both sides are able to handle pause frame control.

To configure the operating state of SB ports the following command can be used :

```
switchdrv pset <port/all> mode <AUTO/10H/10F/100H/100F/1GH/1GF> [<PC/NPC>]
```

The following parameters have to be applied:

Parameter	Meaning	Range	Note
port	SB port number	0..7	according to SB front ports numbering
AUTO	autonegotiation	-	The best common configuration is automatically set.
10H	10Mbit Half Duplex	-	The port can operate only at 10MBit Half Duplex
10F	10Mbit Full Duplex	-	The port can operate only at 10MBit Full Duplex
100H	100Mbit Half Duplex	-	The port can operate only at 100MBit Half Duplex
100F	100Mbit Full Duplex	-	The port can operate only at 100MBit Full Duplex
1GH	1Gigabit Half Duplex	-	The port can operate only at 1 Gigabit Half Duplex

Prepared (also subject responsible if other) EUS/DR/HH/F Bran Guernsey		No. 1553-CNZ 212 401 Uen		
Approved	Checked	Date 2008-10-02	Rev PB1	Reference

1GF	1Gigabit Full Duplex	-	The port can operate only at 1 Gigabit Full Duplex
PC	Pause Capable	-	The port is able to generate flow control pause frame
NPC	Not Pause Capable	-	The port is not able to generate flow control pause frame

Example:

Force the port 7 to operate only at 100Mbit speed, full duplex, pause capable

```
switchdrv pset 7 mode 100F PC
```

Results in the following printout:

```
MODE SET
```

5.3.3.2 Shutting down a front port

In order to shut down or reactivate a port, the following command could be used:

```
switchdrv pset <port/all> <up/down>
```

Where:

Parameter	Meaning	Range	Note
port	SB port number	0..7	according to SB front ports numbering

5.3.3.3 Show current status of ports

In order to show the current ports status the following command exists.

```
switchdrv ethmib stat
```

No parameter has to be applied.

Example:

Prepared (also subject responsible if other) EUS/DR/HH/F Bran Guernsey		No. 1553-CNZ 212 401 Uen		
Approved	Checked	Date 2008-10-02	Rev PB1	Reference

No connection to ports: 0, 1, 2, 3, 4

```
switchdrv ethmib stat
```

Results in the following printout:

```
PORT 0 : 0x1000 0x1000 port 0 : Down
PORT 1 : 0x1000 0x1000 port 1 : Down
PORT 2 : 0x1000 0x1000 port 2 : Down
PORT 3 : 0x1000 0x1000 port 3 : Down
PORT 4 : 0x1000 0x1000 port 4 : Down
PORT 5 : 0x871c 0x871c PORT 5 : Up - 1000, Full, FlowCtrl: disabled, MFL: 1528 bytes
PORT 6 : 0x871c 0x871c PORT 6 : Up - 1000, Full, FlowCtrl: disabled, MFL: 1528 bytes
PORT 7 : 0x851c 0x851c PORT 7 : Up - 100, Full, FlowCtrl: disabled, MFL: 1514 bytes
```

Prepared (also subject responsible if other) EUS/DR/HH/F Bran Guernsey		No. 1553-CNZ 212 401 Uen		
Approved	Checked	Date 2008-10-02	Rev PB1	Reference

5.3.3.4 Saving a Configuration

In order to be able to recover the previous configuration after a board restart you need to save the relevant information into a non volatile memory structure so that it can be retrieved in case of restarts.

Each time a configuration needs to be saved, the command:

```
switchdrv conf save
```

is issued and the current configuration is saved in non volatile memory area.

This configuration is restored as soon as a restart (cold, warm, power on) occurs.

5.3.3.5 Remove the Configuration parameters

In order to remove the stored configuration, the following command exists:

```
switchdrv conf clear
```

After this command has been run, if the board is restarted the default configuration is applied, see Default Configuration chapter 6.

5.3.3.6 Restore the Configuration parameters

In order to restore the saved configuration, the following command exists:

```
switchdrv conf init
```

If no configuration exists, then the default configuration is applied, see Default Configuration chapter 6.

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Approved	Checked	Date 2008-10-02	Rev PB1	Reference

5.3.4 Counters

In order to retrieve the information on the counters for the ports, the following command could be used:

```
switchdrv ethmib <port>
```

Parameter	Meaning	Range	Note
port	SB port number	0..7	according to SB front ports numbering (OPTIONAL parameter)

and it will report the counters for the port (or for all the port if not specified)

```
OSmon> switchdrv ethmib 0
```

```
PORT 0 : 0x1000 0x1000 port 0 : Down
0 :TR64(w24) - Tx/Rx 64 Byte Packet Counter at 0x0700020
0 :TR127(w24) - Tx/Rx 65-127 Byte Packet Counter at 0x0700021
0 :TR255(w24) - Tx/Rx 128-511 Byte Packet Counter at 0x0700022
0 :TR511(w24) - Tx/Rx 512-1023 Byte Packet Counter at 0x0700023
0 :TR1023(w20) - Tx/Rx 512-1023 Byte Packet Counter at 0x0700024
0 :TRMAX(w24) - Tx/Rx 1024-MaxPktLen Byte Packet Counter at 0x0700025
0 :TRMGV(w24) - Tx/Rx 1519-1522 Byte Good VLAN Frame Counter at 0x0700026
0 :RBYT(w32) - Receive Byte Counter at 0x0700027
0 :RPKT(w20) - Receive Frame Counter at 0x0700028
0 :RFCS(w16) - Receive FCS Error Frame Counter at 0x0700029
0 :RMCA(w24) - Receive Multicast Frame Counter at 0x070002a
0 :RBCA(w24) - Receive Broadcast Frame Counter at 0x070002b
0 :RXCF(w16) - Receive Control Frame Counter at 0x070002c
0 :RXPF(w16) - Receive Pause Frame Counter at 0x070002d
0 :RXUO(w16) - Receive Unknown Opcode Counter at 0x070002e
0 :RALN(w16) - Receive Alignment Error Counter at 0x070002f
0 :RFLR(w16) - Receive Packet Length Out of Range Counter at 0x0700030
0 :RCDE(w16) - Receive Symbol Error Frame Counter at 0x0700031
0 :RFCR(w16) - Receive False Carrier Counter at 0x0700032
0 :RUND(w16) - Receive Undersize Packet Counter at 0x0700033
0 :ROVR(w16) - Receive Oversize Packet Counter at 0x0700034
0 :RFRG(w16) - Receive Fragment Counter at 0x0700035
0 :RJBR(w16) - Receive Jabber Counter at 0x0700036
0 :TBYT(w32) - Transmit byte Counter at 0x0700038
0 :TPKT(w24) - Transmit Packet Counter at 0x0700039
0 :TMCA(w24) - Transmit Multicast Packet Counter at 0x070003a
0 :TBCA(w24) - Transmit Broadcast Packet Counter at 0x070003b
0 :TXPF(w16) - Transmit Pause Control Frame Counter at 0x070003c
0 :TJBR(w16) - Transmit Jabber Counter at 0x0700046
0 :TFCS(w16) - Transmit FCS Error Counter at 0x0700047
0 :TXCF(w16) - Transmit Control Frame Counter at 0x0700048
0 :TOVR(w16) - Transmit Oversize Packet Counter at 0x0700049
0 :RIPC(w24) - L3 Recieve Unicast Packet Counter at 0x0700050
0 :RIPD(w16) - L3 Receive Discarded Packet Counter at 0x0700051
0 :RIPCHK(w16) - L3 Received with IP HeaderError Packet Counter at 0x0700052
0 :TIP(w24) - L3 Transmit Unicast Packet Counter at 0x0700057
0 :TIPD(w16) - L3 Transmit Discarded Packet Counter at 0x0700058
0 :RDISC(w16) - Receive Packet Discard Counter at 0x0700055
0 :TAGE(w16) - Aged Packet Counter at 0x0700056
0 :TVLAN(w24) - Transmit Tagged Packet Counter at 0x0700059
0 :TABRT(w16) - Total Aborted Tx Packet Counter at 0x070005b
Counters are read
```

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In order to reset the counters for the ports, the following command could be used:

```
switchdrv ethmib <port> -r
```

Parameter	Meaning	Range	Note
port	SB port number	0..7	according to SB front ports numbering (OPTIONAL parameter)

It will result in the following printout:

```
OSmon> switchdrv ethmib 1 -r  
  
PORT 1 : 0x1000 0x1000  
  
Counters are reset
```

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6 Default Configurations

As already mentioned, the user has the possibility to change the configuration and, when is suitable for the system, save it in order to be available every time the application is restarted (restart cold, warm power off-on).

There could be 2 default configuration the user could face when the applications are restarted:

1. "VLAN transparency" mode: when the SB is installed the very first time (either by means of hardware replacement or firmware upgrade), it starts in "VLAN transparency" mode, i.e. both the vlan tagged packets and vlan untagged are switched and threaded in the same way
2. "User Defined mode": when the user changes the configuration and saves it by means of the "conf save" command (see Saving a Configuration), soon after the application restarts this configuration is retrieved and loaded on the switch.

The V-LAN status in the "VLAN transparency mode" is:

```
switchdrv read pvlan -a
```

```
PORT          : 0
VLAN_TAG      : 1
Port Members  : 0 1 2 3 4 5 6 7
Out Untag Ports : -
RJ flag unset
```

```
PORT          : 1
VLAN_TAG      : 1
Port Members  : 0 1 2 3 4 5 6 7
Out Untag Ports : -
RJ flag unset
```

```
PORT          : 2
VLAN_TAG      : 1
Port Members  : 0 1 2 3 4 5 6 7
Out Untag Ports : -
RJ flag unset
```

```
PORT          : 3
VLAN_TAG      : 1
Port Members  : 0 1 2 3 4 5 6 7
Out Untag Ports : -
RJ flag unset
```

```
PORT          : 4
VLAN_TAG      : 1
Port Members  : 0 1 2 3 4 5 6 7
Out Untag Ports : -
RJ flag unset
```

```
PORT          : 5
VLAN_TAG      : 1
Port Members  : 0 1 2 3 4 5 6 7
Out Untag Ports : -
RJ flag unset
```

```
PORT          : 6
VLAN_TAG      : 1
Port Members  : 0 1 2 3 4 5 6 7
Out Untag Ports : -
```

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RJ flag unset

PORT : 7
VLAN_TAG : 1
Port Members : 0 1 2 3 4 5 6 7
Out Untag Ports : -
RJ flag unset

switchdrv read qvlan -a

VTABLE_entry : 0
VLAN_TAG : 0
Port Members : -
Out Untag Ports : -

VTABLE_entry : 1
VLAN_TAG : 4095
Port Members : -
Out Untag Ports : -

VTABLE_entry : 2
VLAN_TAG : 4095
Port Members : -
Out Untag Ports : -

..... The same for all the other entries in the V-LAN table

VTABLE_entry : 61
VLAN_TAG : 4095
Port Members : -
Out Untag Ports : -

VTABLE_entry : 62
VLAN_TAG : 4095
Port Members : -
Out Untag Ports : -

VTABLE_entry : 63
VLAN_TAG : 4095
Port Members : -
Out Untag Ports : -

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7 Configuration Example

Here are reported some relevant configuration for the SB.

7.1 APZ 212 50 – Configuration example

Currently in the APZ 212 50, there could be two GESBs (for each side), the so called “External” and “Internal” GESB.

They are used for connecting the External network and APG one (the External) and the CP and SCB-RP (the internal).

In this case the GESB – I works as a First Level Switch.

Both GESBs are supposed to be loaded with ESS software (or replaced by the GESB)

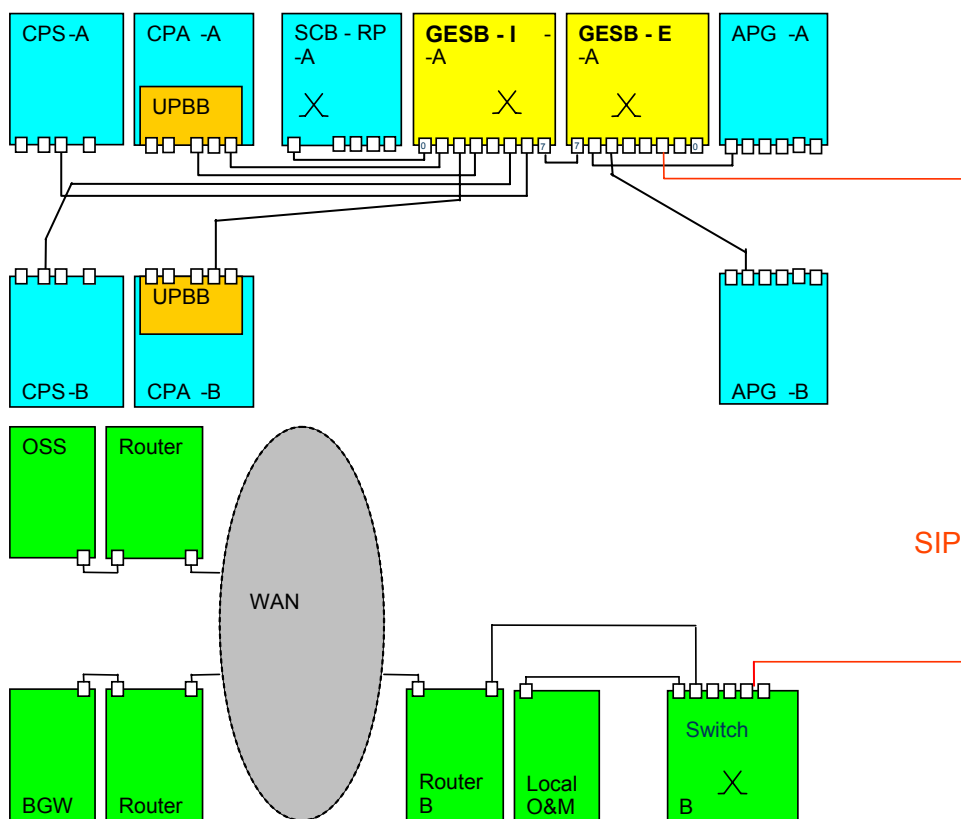


Figure 8

The two SBs must be configured according to the following schemes:

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7.1.1 GESB – E

In the SB-E for the mentioned example, only 4 ports are used

Untagged Traffic from/to ports 5,6 and 7 is switched

Traffic from port 2 to port 7 is Tagged by the switch

Tag is removed from ingress port 7 Ethernet frames (and the so untagged Ethernet frames are sent to port 2 only)

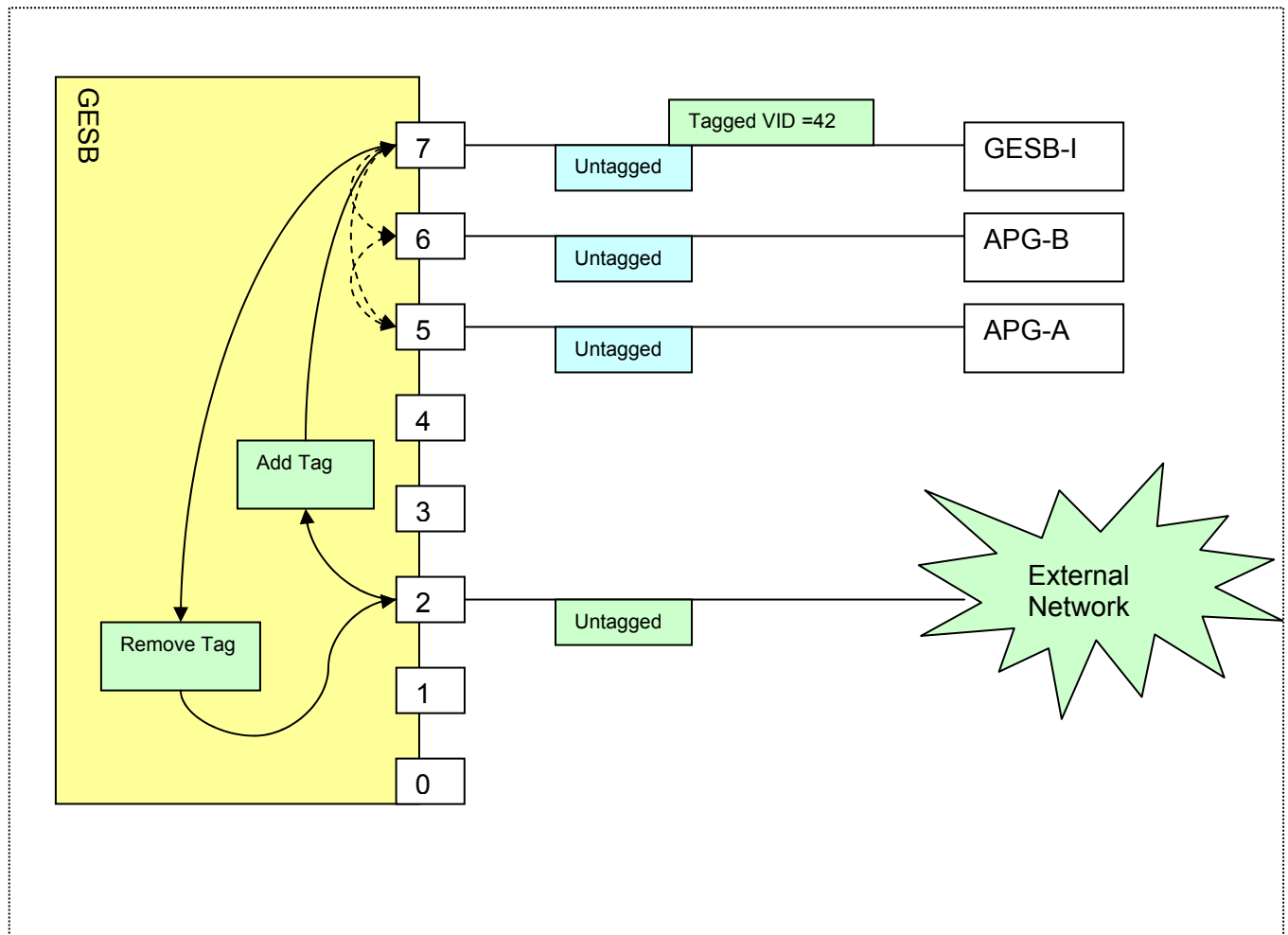


Figure 9

Please note that ports 0,1,3,4 are not connected in this example.

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In order to achieve this configuration, the following steps are needed (in red is reported the input from the user)

Step	ESS Command
Enable the VLans on the SB	OSmon> switchdrv vlan on
Define a port based V-Lan for tagging (with tag 42) the traffic from port 2	OSmon> switchdrv pvlan -p 2 -t 42 -m 2,7 -u 2
Define a port based V-Lan for port 0 in order not to send untagged traffic to the port 2	OSmon> switchdrv pvlan -p 0 -t 2 -m 0,1,3,4,5,6,7 -u 0,1,3,4,5,6,7
Define a port based V-Lan for port 1 in order not to send untagged traffic to the port 2	OSmon> switchdrv pvlan -p 1 -t 2 -m 0,1,3,4,5,6,7 -u 0,1,3,4,5,6,7
Define a port based V-Lan for port 3 in order not to send untagged traffic to the port 2	OSmon> switchdrv pvlan -p 3 -t 2 -m 0,1,3,4,5,6,7 -u 0,1,3,4,5,6,7
Define a port based V-Lan for port 4 in order not to send untagged traffic to the port 2	OSmon> switchdrv pvlan -p 4 -t 2 -m 0,1,3,4,5,6,7 -u 0,1,3,4,5,6,7
Define a port based V-Lan for port 5 in order not to send untagged traffic to the port 2	OSmon> switchdrv pvlan -p 5 -t 2 -m 0,1,3,4,5,6,7 -u 0,1,3,4,5,6,7
Define a port based V-Lan for port 6 in order not to send untagged traffic to the port 2	OSmon> switchdrv pvlan -p 6 -t 2 -m 0,1,3,4,5,6,7 -u 0,1,3,4,5,6,7
Define a port based V-Lan for port 7 in order not to send untagged traffic to the port 2	OSmon> switchdrv pvlan -p 7 -t 2 -m 0,1,3,4,5,6,7 -u 0,1,3,4,5,6,7
Define a tagged V-Lan in order to handle the tagged traffic – Tag 42 - (involving port 7 and port 2 only) and remove the tag out from port 2	OSmon> switchdrv qvlan -t 42 -m 2,7 -u 2
When the user is confident about the configuration, the V-LAN and port configuration could be saved	OSmon> switchdrv conf save

All the above mentioned steps – for this particular configuration – could be shortened by means of the following commands:

Step	ESS Command
Set-up the switch	OSmon> switchdrv vlan set 7 42 2 NO_TAG
When the user is confident about the configuration, the V-LAN and port	OSmon> switchdrv conf save

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configuration could be saved	
------------------------------	--

7.1.2 GESB – I

GESB-I needs only to be configured in order to allow tagged traffic to pass through (the so called ‘V-Lan transparency’)

The ‘V-Lan transparency’ is enabled by default when the board is upgraded to “SB”, so special settings are not needed.

8 Printout

8.1 Help

8.1.1 General

OSmon> ?

The following commands are available to the current user:

? Prints syntax and a short explanation for each command
switchdrv

For further information on a command type:
<command> ?

OSmon> switchdrv ?

NAME

gesb - Ethernet Switch & Shielding Board

SUBCOMMANDS

switchdrv vlan
switchdrv pvlan
switchdrv qvlan
switchdrv read
switchdrv conf
switchdrv ethmib
switchdrv pset

see "<subcommand> ?" for more information

OSmon>

8.1.2 V-Lan help printout

OSmon> switchdrv vlan ?

NAME

gesb - Ethernet Switch & Shielding Board

vlan - It is used to set a VLAN status in either unmanaged or managed or simple mode status

sub commands:

switchdrv vlan (?) : To get this help
SYNOPSIS
switchdrv vlan ?

Prepared (also subject responsible if other) EUS/DR/HH/F Bran Guernsey		No. 1553-CN2 212 401 Uen		
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switchdrv vlan on : It sets a VLAN in managed mode.
It takes effect only if the VLAN is in unmanaged mode.

SYNOPSIS
switchdrv vlan on

switchdrv vlan off : It sets a VLAN in unmanaged mode.

SYNOPSIS
switchdrv vlan off

switchdrv vlan stat : It provides the VLAN status information.

SYNOPSIS
switchdrv vlan stat

switchdrv vlan set Port_IN Tag_IN Port_EXT Tag_EXT : It sets the VLAN status in simple mode.
It takes effect only if the VLAN is in unmanaged or simple mode status.

SYNOPSIS
switchdrv vlan set Port_IN Tag_IN Port_EXT Tag_EXT

PARAMETERS

? : this help
Port_IN : GESB front port connected to the internal network - range[0-7]
Tag_IN : It is either a VLAN ID in the range[2-4094] or no_tag
Port_EXT : GESB front port connected to the external network - range[0-7]
Tag_EXT : It is either a VLAN ID in the range[2-4094] or no_tag

EXAMPLES

```
switchdrv vlan set 3 no_tag 0 no_tag
switchdrv vlan set 3 no_tag 0 40
switchdrv vlan set 3 40 0 no_tag
switchdrv vlan set 3 40 0 40
```

OSmon> switchdrv pvlan ?

NAME

gesb - Ethernet Switch & Shielding Board
pvlan - It is used to configure Port Based VLANs

sub commands:

switchdrv pvlan (?) : To get this help
SYNOPSIS
switchdrv pvlan ?

switchdrv pvlan -p PNum -t TAG -m ports1 [<-u ports2> <-f rj>]: It configures a Port based VLAN
SYNOPSIS
switchdrv pvlan -p PNum -t TAG -m ports1 [<-u ports2> <-f rj>

PARAMETERS

? : this help
PNum : GESB port number according to GESB front ports numbering - range[0-7]
TAG : VLAN ID used by Port Based VLAN - range[2-4094]
ports1 : set of GESB front ports - range[0-7]
ports2 : set of GESB front ports which egress traffic must be untagged - range[0-7]
rj : if set, input untagged frames and input frames with VID = 0 are discarded

NOTE: parameters between < > are optional.
ports1 & ports2 represent strings of numbers separated by comma in the range[0-7].
All values must be typed in decimal format.

EXAMPLES

```
switchdrv pvlan -p 3 -t 64 -m 1
switchdrv pvlan -p 3 -t 64 -m 0,1,7
switchdrv pvlan -p 3 -t 64 -m 0,1,7 -u 0,5
switchdrv pvlan -p 3 -t 64 -m 0,1,7 -u 0,5 -f rj
switchdrv pvlan -p 3 -t 64 -m 0,1,2,3,4,5,6,7 -u 0,1,2,5,6 -f rj
```

Prepared (also subject responsible if other) EUS/DR/HH/F Bran Guernsey		No. 1553-CNZ 212 401 Uen		
Approved	Checked	Date 2008-10-02	Rev PB1	Reference

OSmon> switchdrv qvlan ?

NAME

gesb - Ethernet Switch & Shielding Board
 qvlan - It is used to configure an IEEE 802.1Q VLAN

sub commands:

switchdrv qvlan (?) : To get this help
 SYNOPSIS
 switchdrv qvlan ?

switchdrv qvlan -t TAG -m ports1 <-u ports2>: It configures an IEEE 802.1Q VLAN
 SYNOPSIS
 switchdrv qvlan -t TAG -m ports1 <-u ports2>

switchdrv qvlan -r Qtab : remove a QVLAN configuration
 SYNOPSIS
 switchdrv qvlan -r Qtab

PARAMETERS

? : this help
 TAG : VLAN ID for IEEE 802.1Q VLANs - range[2-4094]
 ports1 : set of GESB front ports - range[0-7]
 ports2 : set of GESB front ports which egress traffic must be untagged - range[0-7]
 Qtab : QVLAN table entry to remove - range[1-62]

NOTE: parameters between < > are optional.
 ports1 & ports2 represent strings of numbers separated by comma in the range[0-7].
 All values must be typed in decimal format.

EXAMPLES

```
switchdrv qvlan -t 64 -m 1
switchdrv qvlan -t 64 -m 1,5
switchdrv qvlan -t 64 -m 1,5 -u 4
switchdrv qvlan -t 64 -m 0,1,2,3,4,5,6,7 -u 4,6
```

```
switchdrv qvlan -r 3
```

OSmon> switchdrv read ?

NAME

gesb - Ethernet Switch & Shielding Board
 read - It is used to visualize a VLAN configuration

sub commands:

switchdrv read (?) : To get this help
 SYNOPSIS
 switchdrv read ?

switchdrv read pvlan -a : It prints all 8 Port Based VLAN configurations
 SYNOPSIS
 switchdrv read pvlan -a

switchdrv read pvlan -v Ptab : It prints a specific Port Based VLAN configuration
 SYNOPSIS
 switchdrv read pvlan -v Ptab

switchdrv read qvlan -a : It prints all 64 802.1Q VLAN configurations
 SYNOPSIS
 switchdrv read qvlan -a

switchdrv read qvlan -v Qtab : It prints a specific 802.1Q VLAN configuration

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Approved	Checked	Date 2008-10-02	Rev PB1	Reference

SYNOPSIS
switchdrv read qvlan -v Qtab

PARAMETERS

? : this help
Ptab : Port ID of configuration to show - range[0-7]
Qtab : QVLAN table entry to show - range[0-63]

EXAMPLES

switchdrv read pvlan -v 3
switchdrv read qvlan -v 31

8.1.3 Configuration Help Printout

OSmon> switchdrv conf ?

NAME

gesb - Ethernet Switch & Shielding Board
conf - It is used either to save the present configuration or to clear the saved configuration or to restore a configuration saved in the non-volatile memory area.

sub commands:

switchdrv conf (?) : To get this help
SYNOPSIS
switchdrv conf ?

switchdrv conf save : It saves the current configuration into non volatile memory
SYNOPSIS
switchdrv conf save

switchdrv conf clear : It deletes the configuration saved into non volatile memory
SYNOPSIS
switchdrv conf clear

switchdrv conf init : It restores the configuration saved into non volatile memory
If configuration parameters are not found the default configuration will be restored.

SYNOPSIS
switchdrv conf init

PARAMETERS

? : this help

8.1.4 Counters and Statistic Help Printout

OSmon> switchdrv ethmib ?

NAME

gesb - Ethernet Switch & Shielding Board

SYNOPSIS

switchdrv ethmib (?) ([<port>] [-r]) (status)

PARAMETERS

ethmib - Display statistics counters for ethernet ports.
If <port> is not specified, all ports statistics are listed.

? - Display this help menu for port statistics CLI.

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Approved	Checked	Date 2008-10-02	Rev PB1	Reference

<port> - A port number within 0..7.

-r - reset a <port> or all ports if <port> is not specified.

status - Display status for all ports

EXAMPLES

All statistics counters for 8 ports are printed.

```
switchdrv ethmib
```

Display help menu

```
switchdrv ethmib ?
```

Reset all statistics counters for 8 ports.

```
switchdrv ethmib -r
```

Display all statistics counters for port 5.

```
switchdrv ethmib 5
```

Reset all statistics counters for port 3.

```
switchdrv ethmib 3 -r      or
switchdrv ethmib -r 3
```

A command is given with syntax error.

```
switchdrv ethmib 17
```

8.1.5 Port Setting Help Printout

OSmon> switchdrv pset ?

NAME

gesb - Ethernet Switch & Shielding Board

SYNOPSIS

```
switchdrv pset <port/all> mode <AUTO/10H/10F/100H/100F/1GH/1GF> [<PC/NPC>]
switchdrv pset <port/all> <up/down>
```

PARAMETERS

port: SWITCHDRV port number - range[0-7] according to GESB front ports numbering
mode: specify speed and duplex mode for selected port/s

AUTO: Enable Autonegotiation
10H : Force 10 Mbps Half Duplex mode
10F : Force 10 Mbps Full Duplex mode
100H: Force 100 Mbps Half Duplex mode
100F: Force 100 Mbps Full Duplex mode
1GH : Force 1000 Mbps Half Duplex mode
1GF : Force 1000 Mbps Full Duplex mode
NPC : Not Pause Frame capable(Flow Control disabled)
PC : Pause Frame capable(Flow Control enabled), only for Full Duplex mode
up : Set Ethernet link up
down: Set Ethernet link down

EXAMPLES

Set port number 3 as 100 Mbps Full Duplex Pause Frame capable.

```
switchdrv pset 3 mode 100F PC
```

Set all ports in autonegotiation mode.

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```
switchdrv pset all mode auto
```

```
Set Ethernet link for port numer 6 down.
```

```
switchdrv pset 6 down
```

8.2 Error Messages

8.2.1 Command Unknown

```
OSmon> reset
```

```
Command not found
```

```
OSmon>
```

8.2.2 Sub-Command Unknown

```
OSmon> switchdrv reset
```

```
Syntax error
```

```
OSmon> switchdrv vlan reset
```

```
Syntax Error in sub-command vlan
```

8.2.3 Wrong Number of Parameters

```
OSmon> switchdrv vlan on 34
```

```
Syntax error
```

```
OSmon>
```

8.2.4 Wrong Parameters

```
OSmon> switchdrv vlan of
```

```
Syntax Error in sub-command vlan
```

```
OSmon> switchdrv pvlan -w 3
```

```
Syntax Error: the flag -p is missing
```

```
OSmon> switchdrv pvlan -p 3 -r 5
```

```
Syntax Error
```

8.2.5