



# DG-IES-3512M

## Industrial Ethernet Switch

## Web Operation manual



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# 1 Production introduction

## 1.1 Overview

The switches offer multiple Ethernet ports and fiber ports. Stable system makes the network safer and more reliable, built-in web server manage the network easier.

### Firmware feature

- Network management: Web, Telnet, Console
- Switch attribute: VLAN, Qos
- Redundancy protocol: ERPS,MSTP/RSTP/STP
- Multicast: IGMP Snooping,static multicast,MLD Snooping
- Network security: ACL
- Network surveillance: SNMP v1/v2/v3,RMON
- Bandwidth management: link aggregation, port speed limit
- Diagnosis: mirroring, LLDP
- Synchronization protocol: NTP
- Alarm: port/power alarm.

## 2 Switch access

- 1) Web
- 2) Console port
- 3) Telnet

If equipment IP address is unknown, connect Console to PC to get it, the default IP is 192.168.0.2.

### 2.1 Web access

Enter the IP address in the browser's address bar, the login screen is displayed, then enter the user name "admin" and default password is nothing as shown in figure 2-1 below:

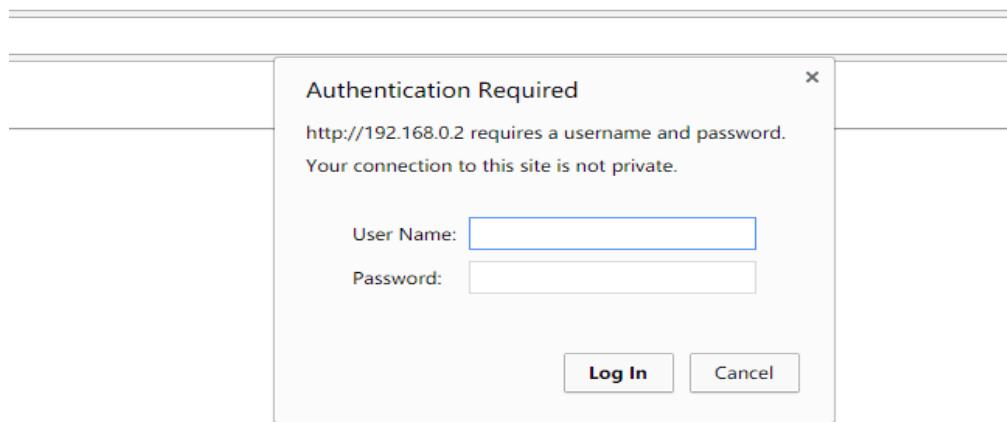


Figure 2-1 login screen

When you logged in to web interface, as shown in figure 2-2, it's navigation menu on the left and detailed interface on the right.

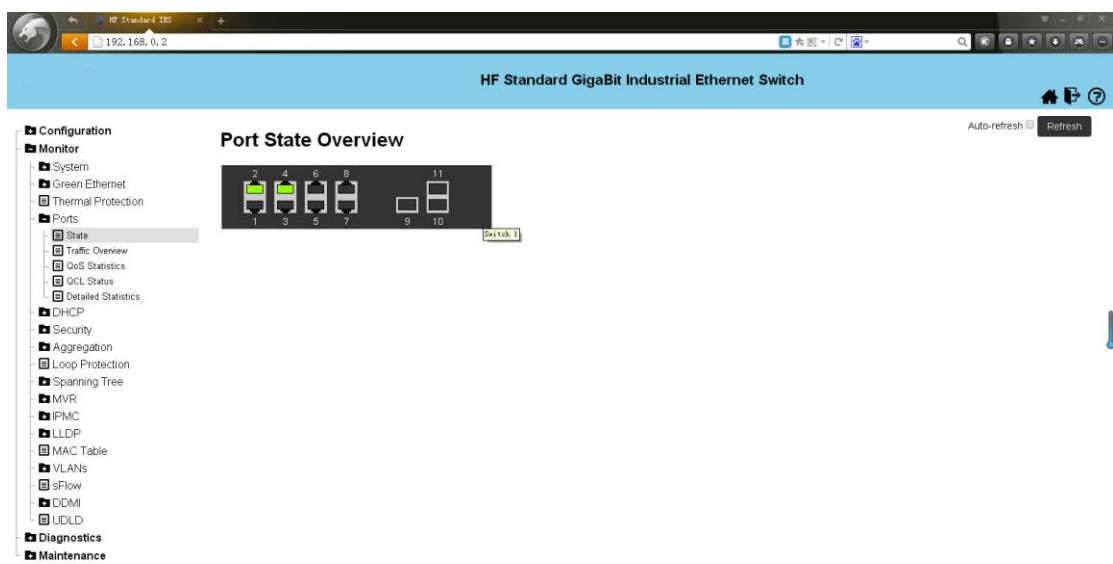


Figure 2-2 Web interface

## 2.2 Console port access

User can use hyper terminal of Windows or other softwares that support serial connection such as HTT3.3 to access swich via Console port. The following example shows how to use hyper terminal to access the switch via Console port:

- (1) Connect the PC serial port to switch Console port via Micro USB-DB9 cable we offered.
- (2) Run the hyper terminal from Windows, click Start → All programmes → Accessories → Communications → Hyper terminal, as shown in figure 2-3:



Figure 2-3 hyper terminal

(3) Create a new connection “DG\_SWITCH” as shown in figure 2-4.



Figure 2-4 new connection

(4) DG\_SWITCH" choose COM1 as shown in figure 2-5.

Notes: please check device manager to confirm the corresponding COM port.



Figure 2-5 COM port selection

- (5) COM1 setting as shown in figure2-6, Bit/s(baud rate: 115200; Data bits: 8; Parity: None; Stop bits: 1;  
Flow control: None

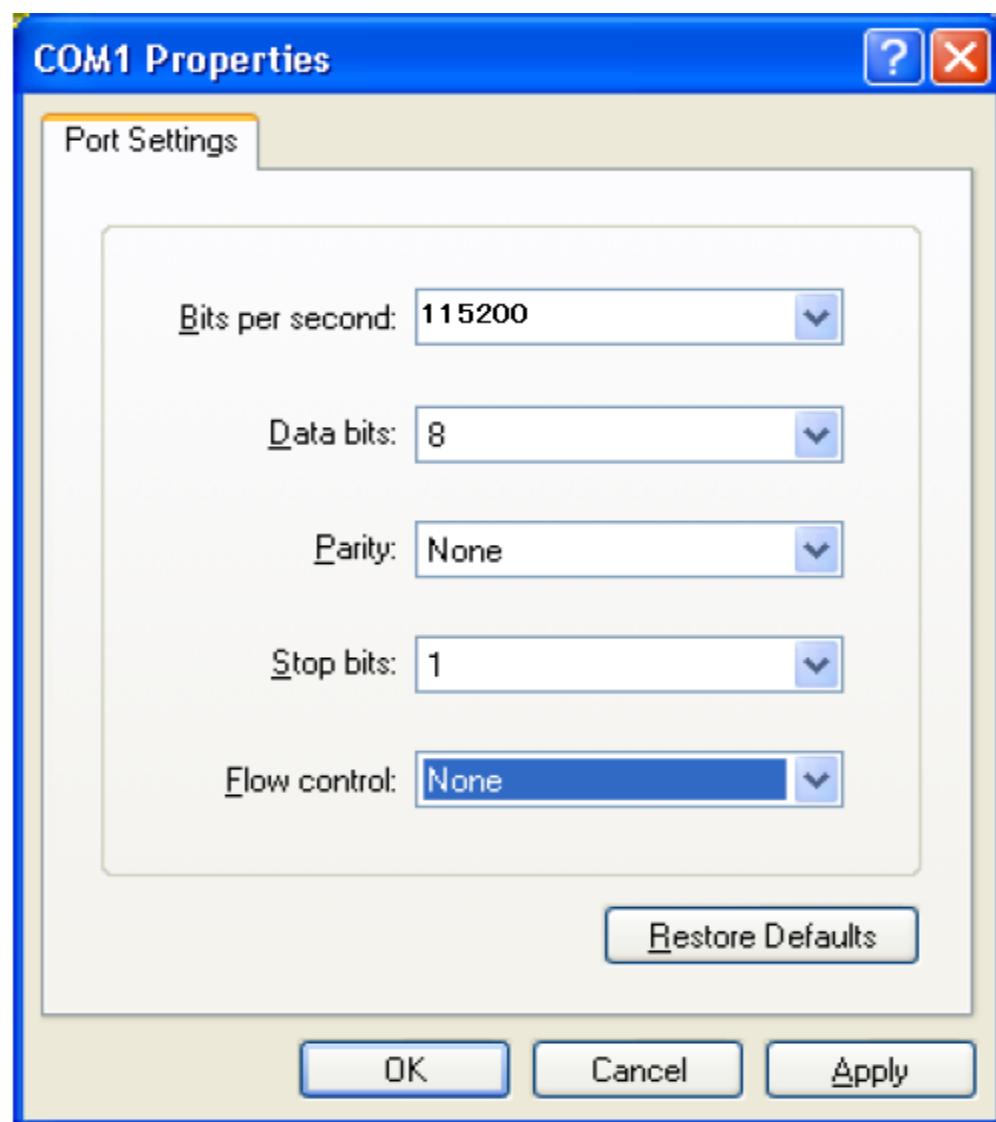


Figure 2-6 Serial port setting

- (6) Click "OK" to enter into CLI, the default user name of serial management is "admin", the default password is nothing . as shown in figure2-7.

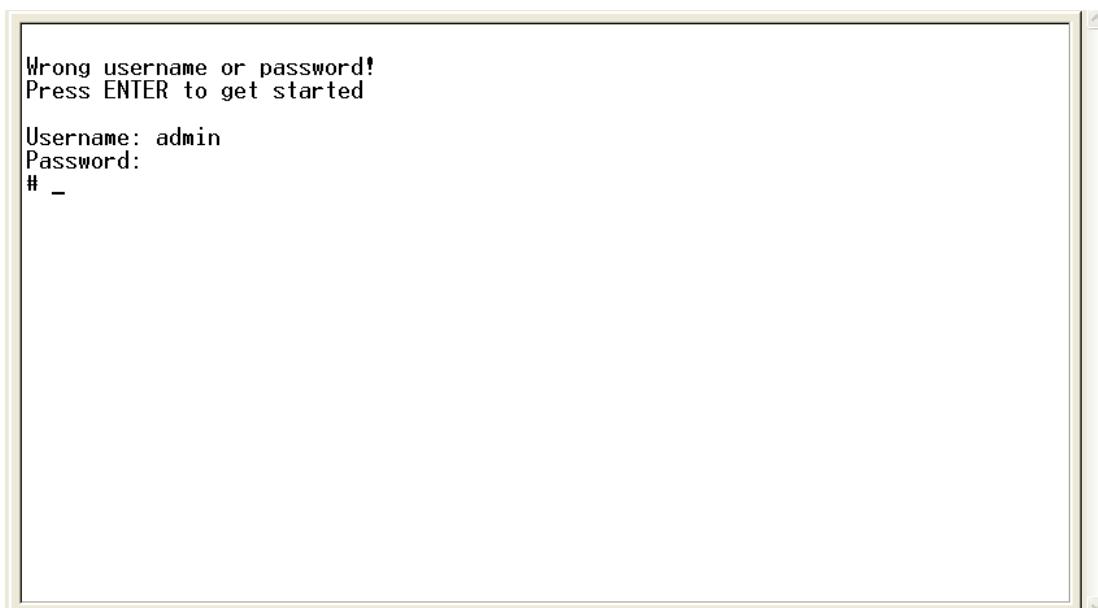


Figure 2-7 CLI

## 2.3 Telnet access

PC and switch IP address shall be in the same network when accessing the Telnet. Type “telnet IP address” in the run dialogue as shown in figure 2-8

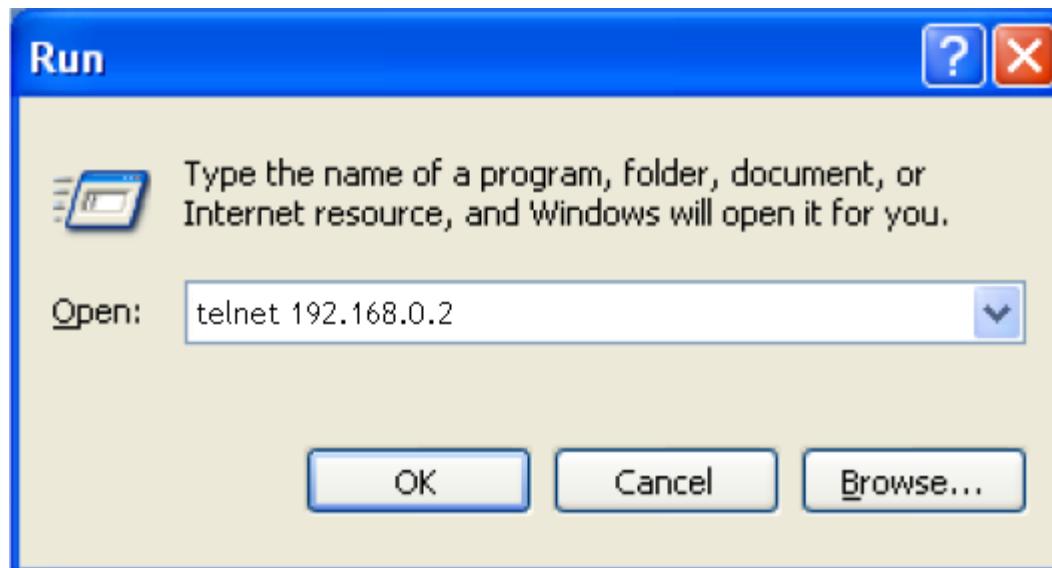


Figure 2-8 Telnet access

Type user name “admin” and password is empty in Telnet interface and press <Enter> to log in Telnet CLI as shown in figure 2-9.

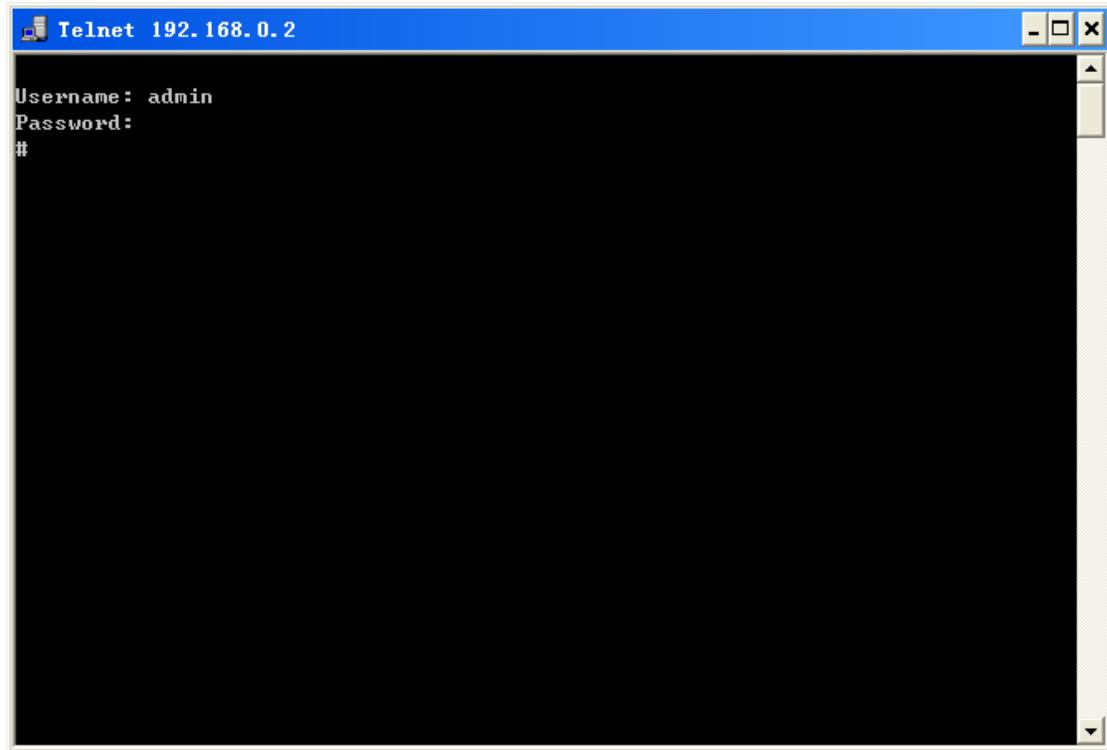


Figure 2-9 Telnet CLI

## 3 Equipment management

### 3.1 Basic information

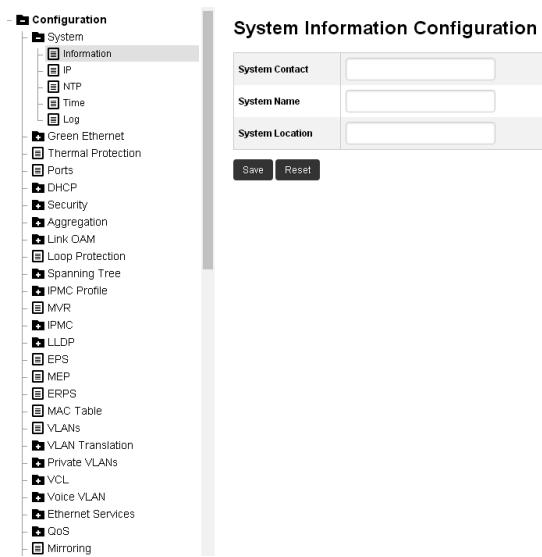


Figure 3-1 basic information

#### System Contact

##### 3.1.1 System Contact

The allowed string length is 0 to 255, and the allowed content is the ASCII characters from 32 to 126.

#### System Name

The allowed string length is 0 to 255.

#### System Location

The allowed string length is 0 to 255, and the allowed content is the ASCII characters from 32 to 126.

## 3.2 IP address change

Manage IP address can be changed as shown in figure 3-2.

The screenshot shows the DIGICOM web-based management interface. On the left is a navigation tree:

- Configuration
  - System
  - Information
  - IP
  - NTP
  - Time
  - Log
  - Green Ethernet
  - Thermal Protection
  - Ports
  - DHCP
  - Security
  - Aggregation
  - Link OAM
  - Loop Protection
  - Spanning Tree
  - IMC Profile
  - MVR
  - IPMC
  - LLDP
  - EPS
  - MEP
  - ERPS
  - MAC Table
  - VLANs
    - VLAN Translation
    - Private VLANs
    - VCL
    - Voice VLAN
  - Ethernet Services
  - QoS
  - Maintenance

**IP Configuration**

Mode	Host
DNS Server 0	No DNS server
DNS Server 1	No DNS server
DNS Server 2	No DNS server
DNS Server 3	No DNS server
DNS Proxy	<input type="checkbox"/>

**IP Interfaces**

Delete	VLAN	Enable	DHCPv4		IPv4		DHCPv6		IPv6	
			Fallback	Current Lease	Address	Mask Length	Enable	Rapid Commit	Current Lease	Address
<input type="checkbox"/>	1	<input type="checkbox"/>	0		192.168.0.2	24	<input type="checkbox"/>			

**Add Interface**

**IP Routes**

Delete	Network	Mask Length	Gateway	Next Hop VLAN
--------	---------	-------------	---------	---------------

**Add Route**

**Save** **Reset**

Figure 3-2 IP address change

### 3.3 Firmware update

It is very easy to update the software, showed as the followed picture. You should click the “Browse” to find the firmware, whose format is’ .dat’.

The screenshot shows the DIGICOM web-based management interface. On the left is a navigation tree:

- Green Ethernet
- Thermal Protection
- Ports
  - State
  - Traffic Overview
  - QoS Statistics
  - QCL Status
  - Detailed Statistics
- Link OAM
- DHCP
- Security
- Aggregation
- Loop Protection
- Spanning Tree
- MVR
- IPMC
- LLDP
- Ethernet Services
- MAC Table
- VLANs
- sFlow
- DDMI
- UDLD
- Diagnostics
- Maintenance
  - Restart Device
  - Factory Defaults
  - Software
    - Upload
    - Image Select
- Configuration

**Software Upload**

**Browse...** **Upload**

Figure 3-3 Software update

Click the upload,you will see t the followed figure 3-4.

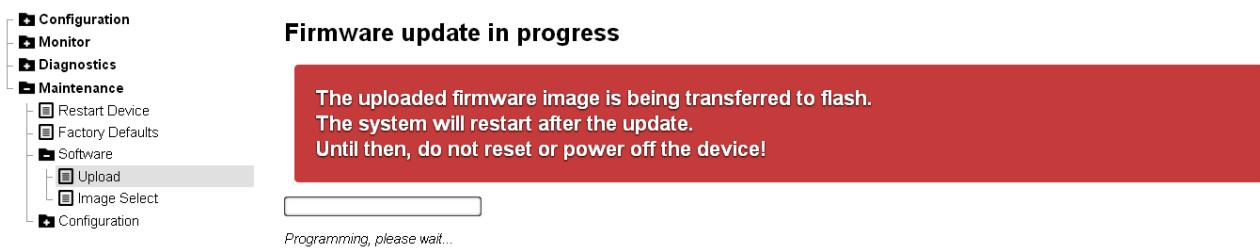


Figure 3-4 Firmware update in progress

## 4 Ports Configuration

Management speed, flow control,maximum frame size and so on can be configured here as shown in figure 4-1:

Port	Link	Current	Speed		Adv Duplex		Adv speed		Flow Control			Maximum Frame Size	Excessive Collision Mode	Frame Length Check	
			Configured	Fdx	Hdx	10M	100M	1G	Enable	Curr Rx	Curr Tx				
1	1 Gfdx	Auto	<>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9600	<>	<input type="checkbox"/>					
2	Down	Auto	<>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9600	Discard	<input type="checkbox"/>					
3	1 Gfdx	Auto	<>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9600	Discard	<input type="checkbox"/>					
4	Down	Auto	<>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9600	Discard	<input type="checkbox"/>					
5	Down	Auto	<>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9600	Discard	<input type="checkbox"/>					
6	Down	Auto	<>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9600	Discard	<input type="checkbox"/>					
7	Down	Auto	<>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9600	Discard	<input type="checkbox"/>					
8	Down	Auto	<>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9600	Discard	<input type="checkbox"/>					
9	Down	Auto	<>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9600		<input type="checkbox"/>					
10	Down	Auto	<>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9600		<input type="checkbox"/>					
11	Down	Auto	<>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9600		<input type="checkbox"/>					

Figure 4-1 Mode configuration

When you have any doubt,you can click the button like at the top right of the web to get the help.show in figure 4-2.

### Port Configuration Help

This page displays current port configurations. Ports can also be configured here.

#### Port

This is the logical port number for this row.

#### Link

The current link state is displayed graphically. Green indicates the link is up and red that it is down.

#### Current Link Speed

Provides the current link speed of the port.

#### Configured Link Speed

Selects any available link speed for the given switch port. Only speeds supported by the specific port is shown. Possible speeds are:

**Disabled** - Disables the switch port operation.

**Auto** - Port auto negotiating speed with the link partner and selects the highest speed that is compatible with the link partner.

**10Mbps HDX** - Forces the cu port in 10Mbps half duplex mode.

**10Mbps FDX** - Forces the cu port in 10Mbps full duplex mode.

**100Mbps HDX** - Forces the cu port in 100Mbps half duplex mode.

**100Mbps FDX** - Forces the cu port in 100Mbps full duplex mode.

**1Gbps FDX** - Forces the port in 1Gbps full duplex

**2.5Gbps FDX** - Forces the Serdes port in 2.5Gbps full duplex mode.

**SFP Auto AMS** - Automatically determines the speed of the SFP. Note: There is no standardized way to do SFP auto detect, so here it is done by reading the SFP rom. Due to the missing standardized way of doing SFP auto detect some SFPs might not be detectable. The port is set in **AMS** mode. Cu port is set in **Auto** mode.

**100-FX** - SFP port in 100-FX speed. Cu port disabled.

**1000-X** - SFP port in 1000-X speed. Cu port disabled.

Ports in AMS mode with 1000-X speed has Cu port preferred.

Ports in AMS mode with 1000-X speed has fiber port preferred.

Ports in AMS mode with 100-FX speed has fiber port preferred.

#### Advertise Duplex

Figure 4-2 Help

## 5 VLAN

### 5.1 Global VLAN Configuration

add VLAN 2,3

#### Global VLAN Configuration

Allowed Access VLANs	1-3
----------------------	-----

Figure 5-1 add VLAN

Delete VLAN 2

#### Global VLAN Configuration

Allowed Access VLANs	1,3
----------------------	-----

Figure 5-2 delete VLAN

#### Show Existing VLAN

VLAN Membership Status for Combined users

Start from VLAN 1 with 20 entries per page. [ << ] [ >> ]

VLAN ID	Port Members										
	1	2	3	4	5	6	7	8	9	10	11
1	✓			✓	✓	✓	✓	✓	✓	✓	✓
2		✓		✓	✓						
3			✓	✓	✓						

Figure 5-3 show existing VLAN

## 5.2 Port VLAN Configuration

### 5.2.1 Mode

The port mode (default is Access) determines the fundamental behavior of the port in question. A port can be in one of three modes as described below.

Access:

Access ports are normally used to connect to end stations. Dynamic features like Voice VLAN may add the port to more VLANs behind the scenes. Access ports have the following characteristics:

- Member of exactly one VLAN, the Port VLAN (a.k.a. Access VLAN), which by default is 1,
- accepts untagged frames and C-tagged frames,
- discards all frames that are not classified to the Access VLAN,
- on egress all frames are transmitted untagged.

Trunk:

Trunk ports can carry traffic on multiple VLANs simultaneously, and are normally used to connect to other switches. Trunk ports have the following characteristics:

- By default, a trunk port is member of all existing VLANs. This may be limited by the use of Allowed VLANs,
- by default, all frames but frames classified to the Port VLAN (a.k.a. Native VLAN) get tagged on egress. Frames classified to the Port VLAN do not get C-tagged on egress,
- egress tagging can be changed to tag all frames, in which case only tagged frames are accepted on ingress.

Hybrid:

Hybrid ports resemble trunk ports in many ways, but adds additional port configuration features. In addition to the characteristics described for trunk ports, hybrid ports have these abilities:

- Can be configured to be VLAN tag unaware, C-tag aware, S-tag aware, or S- custom-tag aware,
- ingress filtering can be controlled,
- ingress acceptance of frames and configuration of egress tagging can be configured independently.

### 5.2.2 Port VLAN

Determines the port's VLAN ID (a.k.a. PVID). Allowed VLANs are in the range 1 through 4095, default being 1.

On ingress, frames get classified to the Port VLAN if the port is configured as VLAN unaware, the frame is untagged, or VLAN awareness is enabled on the port, but the frame is priority tagged (VLAN ID = 0).

On egress, frames classified to the Port VLAN do not get tagged if Egress Tagging configuration is set to untag Port VLAN.

The Port VLAN is called an "Access VLAN" for ports in Access mode and Native VLAN for ports in Trunk or Hybrid mode.

### 5.2.3 Port Type

Ports in hybrid mode allow for changing the port type, that is, whether a frame's VLAN tag is used to classify the frame on ingress to a particular VLAN, and if so, which TPID it reacts on. Likewise, on egress, the Port Type determines the TPID of the tag, if a tag is required.

Unaware

On ingress, all frames, whether carrying a VLAN tag or not, get classified to the Port VLAN, and possible tags are not removed on egress.

C-port

On ingress, frames with a VLAN tag with TPID = 0x8100 get classified to the VLAN . embedded in the tag. If a frame is untagged or priority tagged, the frame gets classified to the Port VLAN. If frames must be tagged on egress, they will be tagged with a C-tag.

S-Port:

On ingress, frames with a VLAN tag with TPID = 0x8100 or 0x88A8 get classified to the VLAN ID embedded in the tag. If a frame is untagged or priority tagged, the frame gets classified to the Port VLAN. If frames must be tagged on egress, they will be tagged with an S-tag.

S-Custom-Port

On ingress, frames with a VLAN tag with a TPID = 0x8100 or equal to the Ethertype configured for Custom-S ports get classified to the VLAN ID embedded in the tag. If a frame is untagged or priority tagged, the frame gets classified to the Port VLAN. If frames must be tagged on egress, they will be tagged with the custom S-tag.

## 5.2.4 Ingress Filtering

Hybrid ports allow for changing ingress filtering. Access and Trunk ports always have ingress filtering enabled.

If ingress filtering is enabled (checkbox is checked), frames classified to a VLAN that the port is not a member of get discarded.

If ingress filtering is disabled, frames classified to a VLAN that the port is not a member of are accepted and forwarded to the switch engine. However, the port will never transmit frames classified to VLANs that it is not a member of.

## 5.2.5 Ingress Acceptance

Hybrid ports allow for changing the type of frames that are accepted on ingress.

### **Tagged and Untagged**

Both tagged and untagged frames are accepted.

### **Tagged Only**

Only tagged frames are accepted on ingress. Untagged frames are discarded.

### **Untagged Only**

Only untagged frames are accepted on ingress. Tagged frames are discarded.

## 5.2.6 Egress Tagging

Ports in Trunk and Hybrid mode may control the tagging of frames on egress.

### **Untag Port VLAN**

Frames classified to the Port VLAN are transmitted untagged. Other frames are transmitted with the relevant tag.

### **Tag All**

All frames, whether classified to the Port VLAN or not, are transmitted with a tag.

### **Untag All**

All frames, whether classified to the Port VLAN or not, are transmitted without a tag. This option is only available for ports in Hybrid mode.

## 5.2.7 Allowed VLANs

Ports in Trunk and Hybrid mode may control which VLANs they are allowed to become members of. Access ports can only be member of one VLAN, the Access VLAN.

The field's syntax is identical to the syntax used in the Existing VLANs field. By default, a port may become member of all possible VLANs, and is therefore set to 1-4095.

The field may be left empty, which means that the port will not be member of any of the existing VLANs.

## 5.2.8 Forbidden VLANs

A port may be configured to never be member of one or more VLANs. This is particularly useful when dynamic VLAN protocols like MVRP and GVRP must be prevented from dynamically adding ports to VLANs.

The trick is to mark such VLANs as forbidden on the port in question. The syntax is identical to the syntax used in the Existing VLANs field.

By default, the field is left blank, which means that the port may become a member of all possible VLANs.

## 5.2.9 Quick Configuration Example

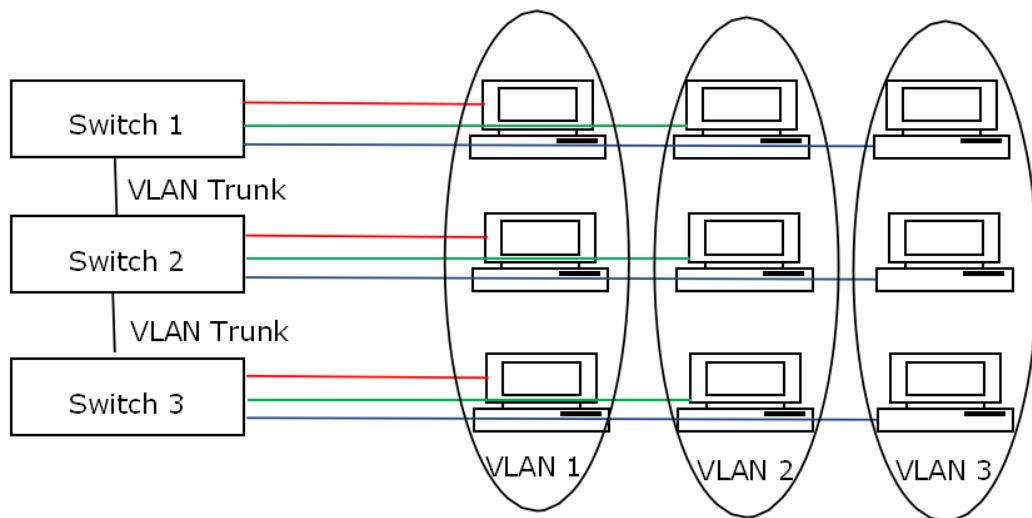


Figure 5-4 Quick Configuration Example

The screenshot shows the DIGICOM Industrial Ethernet configuration interface. On the left, a sidebar lists various configuration options: Thermal Protection, Ports, DHCP, Security, Aggregation, Loop Protection, Spanning Tree, IPMC Profile, MVR, PMC, LLDP, MAC Table, VLANs (which is selected), Private VLANs, VCL, Voice VLAN, QoS, Mirroring, UPnP, GVRP, sFlow, DDMI, UDLD, Monitor, Diagnostics, and Maintenance.

**Global VLAN Configuration**

Allowed Access VLANs	1-3
Ethertype for Custom S-ports	88AB

**Port VLAN Configuration**

Port	Mode	Port VLAN	Port Type	Ingress Filtering	Ingress Acceptance	Egress Tagging	Allowed VLANs
*	<>	1	<>	<input checked="" type="checkbox"/>	<>	<>	1
1	Access	1	C-Port	<input checked="" type="checkbox"/>	Tagged and Untagged	Untag All	1
2	Access	2	C-Port	<input checked="" type="checkbox"/>	Tagged and Untagged	Untag All	2
3	Access	3	C-Port	<input checked="" type="checkbox"/>	Tagged and Untagged	Untag All	3
4	Trunk	1	C-Port	<input checked="" type="checkbox"/>	Tagged and Untagged	Untag Port VLAN	1-3
5	Trunk	1	C-Port	<input checked="" type="checkbox"/>	Tagged and Untagged	Untag Port VLAN	1-3
6	Access	1	C-Port	<input checked="" type="checkbox"/>	Tagged and Untagged	Untag All	1
7	Access	1	C-Port	<input checked="" type="checkbox"/>	Tagged and Untagged	Untag All	1

Figure 5-5 Port VLAN Configuration

## 6 QoS configuration

### 6.1 Understanding QOS

All incoming frames are classified to a QoS class, which is used in the queue system when assigning resources, in the arbitration from ingress to egress queues and in the egress scheduler when selecting the next frame for transmission.

Bandwidth control in the queues can be done by using Policers or Shapers.

Apart from Shapers and Policers, different scheduling mechanisms can be configured on how the different priority queues in the QOS system are handled.

### 6.2 QOS Classification

There are two methods for classifying to a QoS class and for remarking priority information in the frame Basic and Advanced classification.

#### 6.2.1 Basic QOS Classification

Basic QoS classification enables predefined schemes for handling Priority Code Points (PCP), Drop Eligible Indicator (DEI), and Differentiated Service Code Points (DSCP):

- QoS classification based on PCP and DEI for tagged frames. The mapping table from PCP and DEI to QoS class is programmable per port.
- QoS classification based on DSCP values.
- DSCP Translation
- DSCP Remark based on QOS class.
- Per Port QOS class configuration for untagged and non IP Frames.

#### 6.2.2 Advanced QOS Classification

Advanced QoS classification uses the QCLs, which provides a flexible classification:

- Higher layer protocol fields (Layer 2 through Layer 4) for rule matching.
- Actions include mapping to QOS class and translation of PCP, DEI and DSCP values

## 6.2.3 Policers

The Policers limit the bandwidth of received frames exceeding the configurable rates. Policers can be configured at queue level or at a port level. There is also a provision to add Policers at EVC level (Not discussed in this document).

## 6.2.4 Shapers

Egress traffic shaping can be achieved using bandwidth shapers. Shapers can be configured at queue level or at a port level.

## 6.2.5 Scheduling Algorithm

Two types of scheduling are possible on the switch at a port level.

1. Strict Priority
2. Deficit Weighted Round Robin (DWRR)

### Strict Priority

All queues follow strict priority

### DWRR

Scheduling can be done based on the weights configured for each queue. But of all the 8 queues present in the QOS system, Queue 6 and 7 are always schedule using strict priority. DWRR can be done on the Queues from 0 to 5.

## 6.3 QOS Classification

### 6.3.1 Basic QOS Classification

#### Port Classification

Basic QOS classification configuration can be done per port. Ingress traffic coming on each port can be assigned to a QOS Class (CoS), PCP, DPL and DEI.

Port	CoS	DPL	PCP	DEI	Tag Class.	DSCP Based	Address Mode
1	0 ▼	0 ▼	0 ▼	0 ▼	Disabled	<input type="checkbox"/>	Source ▼
2	3 ▼	1 ▼	2 ▼	1 ▼	Disabled	<input type="checkbox"/>	Source ▼
3	0 ▼	0 ▼	0 ▼	0 ▼	Disabled	<input type="checkbox"/>	Source ▼
4	0 ▼	0 ▼	0 ▼	0 ▼	Disabled	<input type="checkbox"/>	Source ▼
5	0 ▼	0 ▼	0 ▼	0 ▼	Disabled	<input type="checkbox"/>	Source ▼
6	0 ▼	0 ▼	0 ▼	0 ▼	Disabled	<input type="checkbox"/>	Source ▼
7	0 ▼	0 ▼	0 ▼	0 ▼	Disabled	<input type="checkbox"/>	Source ▼
8	0 ▼	0 ▼	0 ▼	0 ▼	Disabled	<input type="checkbox"/>	Source ▼
9	0 ▼	0 ▼	0 ▼	0 ▼	Disabled	<input type="checkbox"/>	Source ▼
10	0 ▼	0 ▼	0 ▼	0 ▼	Disabled	<input type="checkbox"/>	Source ▼
11	0 ▼	0 ▼	0 ▼	0 ▼	Disabled	<input type="checkbox"/>	Source ▼

**Save**   **Reset**

Figure 6-1 QoS Ingress Port Classification

### 6.3.2 Tagged Frames classification per port

Ingress port tag classification can be done based on the PCP,DEI values received on the incoming packets. This is done by enabling tag classification for that port.

**QoS Ingress Port Tag Classification Port 1**

**Tagged Frames Settings**

Tag Classification		Disabled	
<b>(PCP, DEI) to (QoS class, DP level) Mapping</b>			
PCP	DEI	QoS class	DP level
*	*	<: ▾	<: ▾
0	0	1 ▾	0 ▾
0	1	1 ▾	1 ▾
1	0	0 ▾	0 ▾
1	1	0 ▾	1 ▾
2	0	2 ▾	0 ▾
2	1	2 ▾	1 ▾
3	0	3 ▾	0 ▾
3	1	3 ▾	1 ▾
4	0	4 ▾	0 ▾
4	1	4 ▾	1 ▾

Figure 6-2 QoS Ingress Port tag Classification

### 6.3.3 Tag remarking per port

Tag remarking on the egress frames frame can be done in 3 ways:

1. Classified: PCP and DEI values on the egress frames are updated with the classified values at the ingress. By default the PCP and DEI values are set to classified values.
2. Default: PCP and DEI values on the egress frames are updated to default values defined per port.
3. Mapped: PCP and DEI values on the egress frames are updated based on the Tag remarking QoS/DPL to PCP/DEI Mapping per port.

PCP and DEI values sent on the egress frames can be mapped to QOS class and DPL value. This configuration can be done per port.

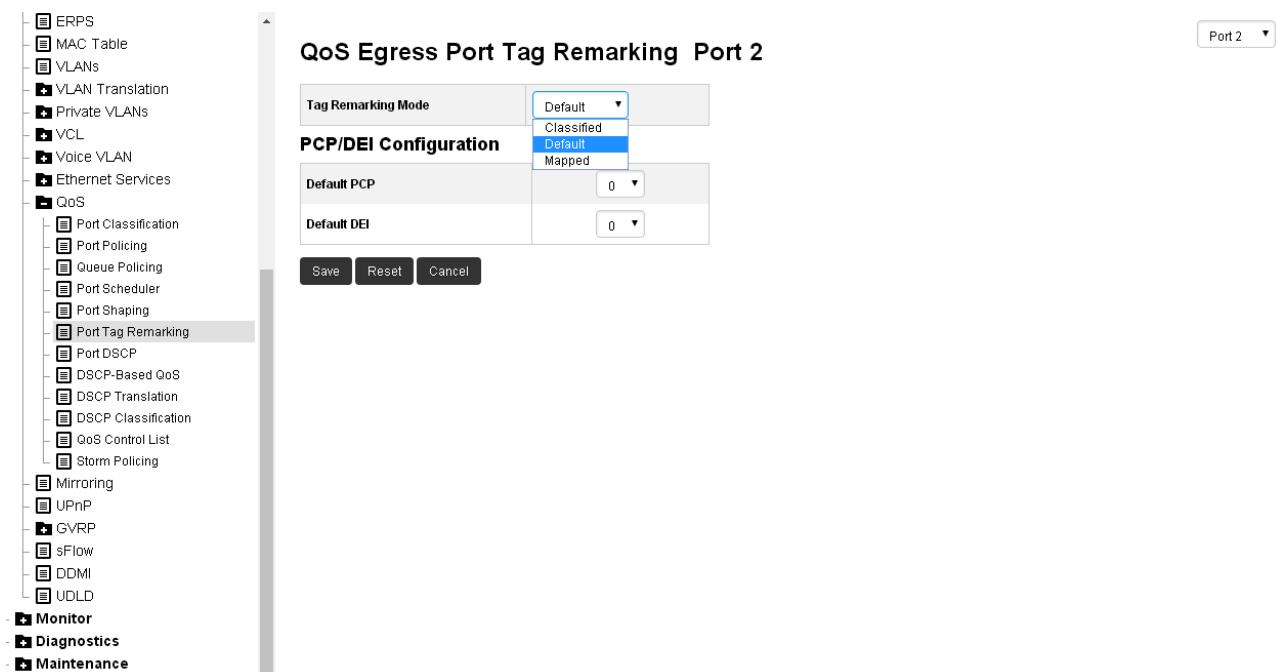


Figure 6-3 QoS Ingress Port Tag Remarking

#### Example 1:

Map QoS Class 2 and DPL 0 to PCP 3 and DEI 0, map Qos Class 3 and DPL 1 to PCP 4 and DEI 1.

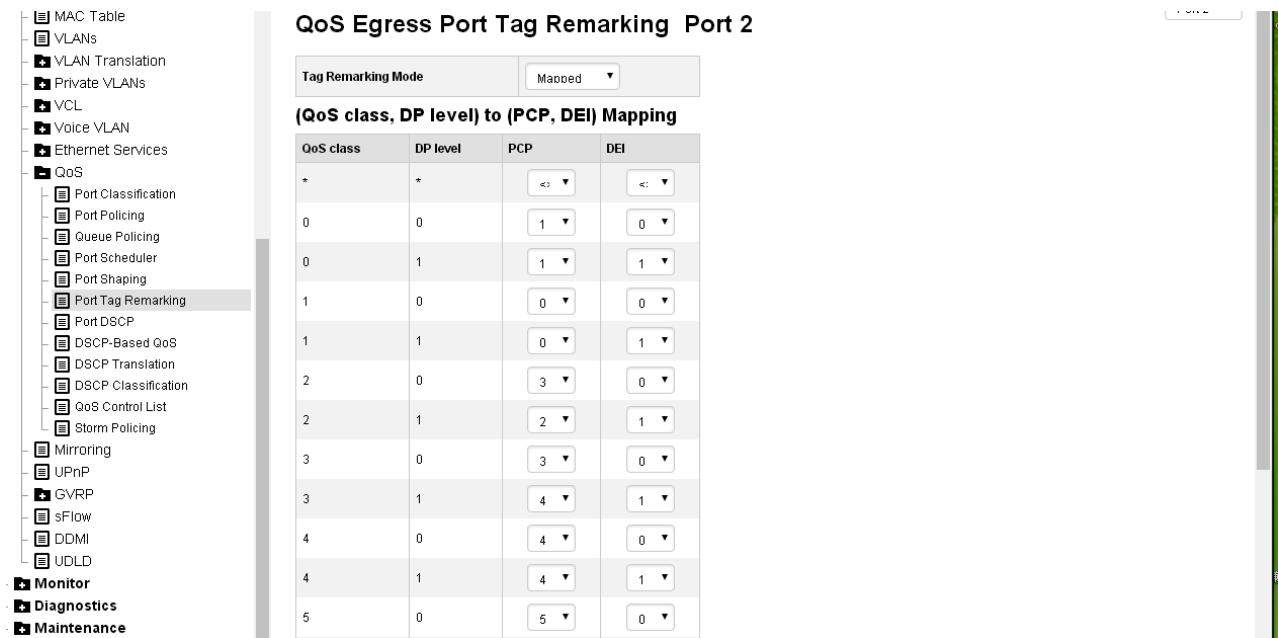


Figure 6-4 QoS Egress Port Tag Remarking

### 6.3.4 DSCP Configuration

DSCP Configuration per port is present both on ingress and egress.

1. DSCP based QoS classification
2. Selection of Trusted DSCP values used for QoS Classification.
3. DSCP Translation: DSCP translation is done based on the DSCP Translation table.
4. Classify (For rewriting if enabled):
  - No DSCP Classification.  
Classify only DSCP=0.
  - Classify only selected(trusted) DSCP values based on DSCP Classification table.  
Classify all DSCP.
5. Rewrite ( On Egress ) :
  - No Egress Rewrite
  - Rewrite enabled without remapping
  - Remap DSCP with DP unaware
  - Remap DSCP with DP aware.

#### **Example 2 :**

DSCP(Only Trusted) to QoS Class/ DPL classification at ingress on port 2.

Port	CoS	DPL	PCP	DEI	Tag Class.	DSCP Based	Address Mode
*	<>	<>	<>	<>		<input type="checkbox"/>	<>
1	0	0	0	0	Disabled	<input type="checkbox"/>	Source
2	0	0	0	0	Disabled	<input checked="" type="checkbox"/>	Source
3	0	0	0	0	Disabled	<input type="checkbox"/>	Source
4	0	0	0	0	Disabled	<input type="checkbox"/>	Source
5	0	0	0	0	Disabled	<input type="checkbox"/>	Source
6	0	0	0	0	Disabled	<input type="checkbox"/>	Source
7	0	0	0	0	Disabled	<input type="checkbox"/>	Source
8	0	0	0	0	Disabled	<input type="checkbox"/>	Source

Figure 6-5 DSCP(Only Trusted) to QoS Class/ DPL classification

DSCP	Trust	QoS Class	DPL
*	<input type="checkbox"/>	<>	<>
0 (BE)	<input type="checkbox"/>	0	0
1	<input type="checkbox"/>	0	0
2	<input checked="" type="checkbox"/>	4	0
3	<input type="checkbox"/>	0	0
4	<input type="checkbox"/>	0	0
5	<input type="checkbox"/>	0	0
6	<input type="checkbox"/>	0	0
7	<input type="checkbox"/>	0	0
8 (CS1)	<input type="checkbox"/>	0	0
9	<input type="checkbox"/>	0	0

Figure 6-6 DSCP-Based QoS Ingress Classification

### Example 3:

Translate DSCP at ingress on port 2 and rewrite enabled on port 3.

- MAC Table
- VLANs
- + VLAN Translation
- + Private VLANs
- + VCL
- + Voice VLAN
- + Ethernet Services
- QoS
  - Port Classification
  - Port Policing
  - Queue Policing
  - Port Scheduler
  - Port Shaping
  - Port Tag Remarking
  - Port DSCP
  - DSCP-Based QoS
  - DSCP Translation
  - DSCP Classification
  - QoS Control List

### QoS Ingress Port Classification

Port	CoS	DPL	PCP	DEI	Tag Class.	DSCH Based	Address Mode
*	<>	<>	<>	<>			<>
1	0	0	0	0	Disabled		Source
2	0	0	0	0	Disabled	<input checked="" type="checkbox"/>	Source
3	0	0	0	0	Disabled	<input checked="" type="checkbox"/>	Source
4	0	0	0	0	Disabled		Source
5	0	0	0	0	Disabled		Source
6	0	0	0	0	Disabled		Source
7	0	0	0	0	Disabled		Source

Figure 6-7 QoS based DSCP

- MAC Table
- VLANs
- + VLAN Translation
- + Private VLANs
- + VCL
- + Voice VLAN
- + Ethernet Services
- QoS
  - Port Classification
  - Port Policing
  - Queue Policing
  - Port Scheduler
  - Port Shaping
  - Port Tag Remarking
  - Port DSCP
  - DSCP-Based QoS
  - DSCP Translation
  - DSCP Classification
  - QoS Control List

### QoS Port DSCP Configuration

Port	Ingress		Egress
	Translate	Classify	Rewrite
*	<input type="checkbox"/>	<>	<>
1	<input type="checkbox"/>	Disable	Disable
2	<input checked="" type="checkbox"/>	Disable	Disable
3	<input type="checkbox"/>	Disable	Enable
4	<input type="checkbox"/>	Disable	Disable
5	<input type="checkbox"/>	Disable	Disable
6	<input type="checkbox"/>	Disable	Disable
7	<input type="checkbox"/>	Disable	Disable

Figure 6-8 Translate DSCP at ingress on port 2 and rewrite enabled on port 3

#### Example 4:

Classify only DSCP=0 at ingress on port 2 and rewrite enabled on port 3.

- MAC Table
- VLANs
- VLAN Translation
- Private VLANs
- VCL
- Voice VLAN
- Ethernet Services
- QoS
  - Port Classification
  - Port Policing
  - Queue Policing
  - Port Scheduler
  - Port Shaping
  - Port Tag Remarking
  - Port DSCP
  - DSCP-Based QoS
  - DSCP Translation
  - DSCP Classification
  - QoS Control List

## QoS Port DSCP Configuration

Port	Ingress		Egress
	Translate	Classify	Rewrite
*	<input type="checkbox"/>	<>	<>
1	<input checked="" type="checkbox"/>	Disable	Disable
2	<input type="checkbox"/>	DSCP=0	Disable
3	<input checked="" type="checkbox"/>	Disable	Enable
4	<input type="checkbox"/>	Disable	Disable
5	<input checked="" type="checkbox"/>	Disable	Disable
6	<input type="checkbox"/>	Disable	Disable
7	<input type="checkbox"/>	Disable	Disable

Figure 6-8 Classify only DSCP=0 at ingress on port 2 and rewrite enabled on port 3

## 6.4 Advanced QOS Classification

### 6.4.1 QCLs

Advanced QOS classification can be done by checking fields from Layer 2 to layer 4 and map them to PCP/DEI, QOS Class and DSCP values.

Example 5:

Match on a particular Source MAC on Port 2 and Map these to QoS Class 5

The screenshot shows the DIGICOM QCE Configuration interface. On the left is a sidebar with a tree view of configuration options:

- MAC Table
- VLANs
- VLAN Translation
- Private VLANs
- VCL
- Voice VLAN
- Ethernet Services
- QoS
  - Port Classification
  - Port Policing
  - Queue Policing
  - Port Scheduler
  - Port Shaping
  - Port Tag Remarking
  - Port DSCP
  - DSCP-Based QoS
  - DSCP Translation
  - DSCP Classification
  - QoS Control List
  - Storm Policing
  - Mirroring
  - UPnP
  - IGMP
  - sFlow

The main area is titled "QCE Configuration". It has three panels:

- Port Members:** A grid where Port 2 is checked.
- Key Parameters:** Fields for matching on source MAC (SMAC), tag, VID, PCP, DEI, and frame type.
- Action Parameters:** Fields for setting CoS, DPL, DSCP, PCP, DEI, and Policy (set to QoS Class 5).

Figure 6-9 Match on a particular Source MAC on Port 2 and Map these to QoS Class 5

## 6.4.2 Policers

### 6.4.2.1 Port Policers

Enable policing at port level on a particular port

Example 5:

Enable policer on Port 2 and set the policer rate to 2000Kbps. Optionally, we can enable Flow control as well if the policed traffic is TCP traffic for better performance.

Port	Enable	Rate	Unit	Flow Control
*	<input type="checkbox"/>	500	<> ▾	<input type="checkbox"/>
1	<input type="checkbox"/>	500	kbps ▾	<input type="checkbox"/>
2	<input checked="" type="checkbox"/>	2000	kbps ▾	<input checked="" type="checkbox"/>
3	<input type="checkbox"/>	500	kbps ▾	<input type="checkbox"/>
4	<input type="checkbox"/>	500	kbps ▾	<input type="checkbox"/>
5	<input type="checkbox"/>	500	kbps ▾	<input type="checkbox"/>

Figure 6-10 set the policer of the port 2 rate to 2000Kbps

#### 6.4.2.2 Queue Policers

Example 6:

Enable Policers on Queue 2 at Port 2. Set the Policing rate to 20 Mbps.

Port	Queue 0	Queue 1	Queue 2		Queue 3	Queue 4	Queue 5	Queue 6	Queue 7
	Enable	Enable	E	Rate	Unit	Enable	Enable	Enable	Enable
*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	500	<>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	500	kbps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	20	Mbps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	500	kbps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	500	kbps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	500	kbps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	500	kbps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	500	kbps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				500	kbps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 6-11 Enable Policers on Queue 2 at Port 2

## 6.5 Shapers

### 6.5.1 Port Shapers

Enable Shaper on Port 3 and set the shaper rate to 4000 Kbps, Enable shaping on Queue 2 and Queue 4 at different rates on Port 3, showed as the figure 6-12.

Queue Shaper				Port Shaper		
Enable	Rate	Unit	Excess	Enable	Rate	Unit
<input type="checkbox"/>	2000	kbps	<input type="checkbox"/>	<input type="checkbox"/>	4000	kbps
<input type="checkbox"/>	500	kbps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	500	kbps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	2000	kbps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	500	kbps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	500	kbps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	500	kbps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	500	kbps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 6-12 shapers port 3

## 6.6 Schedulers

### 6.6.1 DWRR

#### Example7:

Set the scheduling mode to DWRR on Port 3 with the below weights Queue0- 40, Queue1-40, Queue2-20, Queue3-20, Queue4-20 and Queue5-20, showed as the figure 6-13.

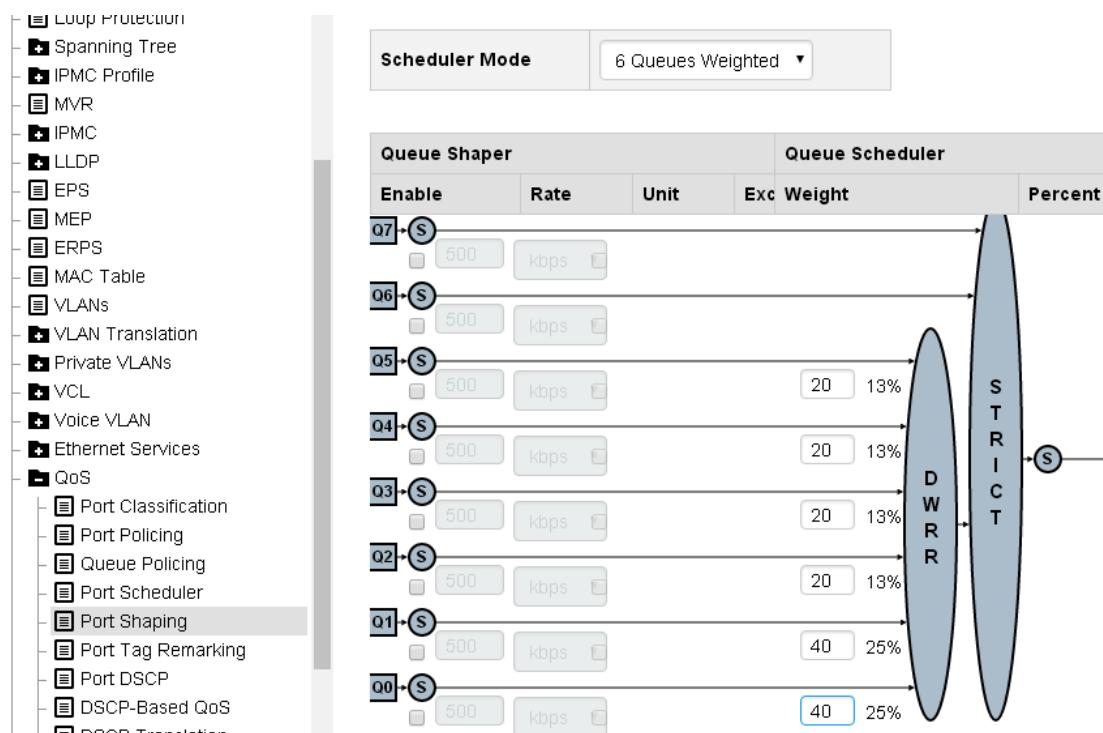


figure 6-13 DWRR on port 3

## 7 LACP

LACP is an IEEE 802.3ad standard protocol. The Link Aggregation Control Protocol, allows bundling several physical ports together to form a single logical port.

### 7.1 Port based Configuration

Enable/Disable LACP

Control whether LACP is enabled on this switch port. LACP will form an aggregation when 2 or more ports are connected to the same partner with LACP enabled. Default value is disabled.

#### LACP Enabled Configuration

Port	LACP Enabled	Key	Role	Timeout	Prio
*	<input type="checkbox"/>	<>	<>	<>	32768
1	<input type="checkbox"/>	Auto	Active	Fast	32768
2	<input checked="" type="checkbox"/>	Auto	Active	Fast	32768
3	<input type="checkbox"/>	Auto	Active	Fast	32768
4	<input type="checkbox"/>	Auto	Active	Fast	32768
5	<input type="checkbox"/>	Auto	Active	Fast	32768
6	<input type="checkbox"/>	Auto	Active	Fast	32768
7	<input type="checkbox"/>	Auto	Active	Fast	32768

Figure 7-1 LACP enable on port 2

#### 7.1.1 Configuring LACP Key

The Key value incurred by the port, range 1-65535 . The Auto setting will set the key as appropriate by the physical link speed, 10Mb = 1, 100Mb = 2, 1Gb = 3. Using the Specific setting, a user-defined value can be entered. Ports with the same Key value can participate in the same aggregation group, while ports with different keys cannot. Default value is auto.

**Example 8: Set LACP key to 4 on the port 2**

Port	LACP Enabled	Key	Role	Timeout	Prio
*	<input type="checkbox"/>	<>	<>	<>	32768
1	<input type="checkbox"/>	Auto	Active	Fast	32768
2	<input type="checkbox"/>	Specific	4	Active	32768
3	<input type="checkbox"/>	Auto	Active	Fast	32768
4	<input type="checkbox"/>	Auto	Active	Fast	32768
5	<input type="checkbox"/>	Auto	Active	Fast	32768

Figure 7-2 Set LACP key to 4 on the port 2

### 7.1.2 Configuring LACP Role

The Role shows the LACP activity status. The Active will transmit LACP packets each second, while Passive will wait for a LACP packet from a partner (speak if spoken to). Default value is active.

### 7.1.3 Configuring LACP Timeout

The Timeout controls the period between BPDU transmissions. Fast will transmit LACP packets each second, while Slow will wait for 30 seconds before sending a LACP packet. Default value is fast.

### 7.1.4 Configuring LACP Priority

The Priority controls the priority of the port. If the LACP partner wants to form a larger group than is supported by this device then this parameter will control which ports will be active and which ports will be in a backup role. Lower number means greater priority. Default value is 32768.

## 8 MAC address table

Switching of frames is based upon the DMAC address contained in the frame. The switch builds up a table that maps MAC addresses to switch ports for knowing which ports the frames should go to (based upon the DMAC address in the frame). This table contains both static and dynamic entries. The static entries are configured by the network administrator if the administrator wants to do a fixed mapping between the DMAC address and switch ports.

The frames also contain a MAC address (SMAC address), which shows the MAC address of the equipment sending the frame. The SMAC address is used by the switch to automatically update the MAC table with these dynamic MAC addresses. Dynamic entries are removed from the MAC table if no frame with the corresponding SMAC address has been seen after a configurable age time.

### 8.1 Set MAC address table aging time

By default, dynamic entries are removed from the MAC table after 300 seconds. This removal is called aging.

Example 9: change aging time to 200 seconds.

- Configuration**
- System
- Green Ethernet
- Thermal Protection
- Ports
- DHCP
- Security
- Aggregation
- Link OAM
- Loop Protection
- Spanning Tree
- IPMC Profile
- MVR
- IPMC
- LLDP
- EPS
- MEP
- ERPS
- MAC Table
- VLANs
- VLAN Translation
- Private VLANs
- VCL
- Voice VLAN
- Ethernet Services
- QoS

### MAC Address Table Configuration

#### Aging Configuration

Disable Automatic Aging	<input type="checkbox"/>
Aging Time	200 seconds

#### MAC Table Learning

	Port Members										
	1	2	3	4	5	6	7	8	9	10	11
Auto	<input checked="" type="radio"/>										
Disable	<input checked="" type="radio"/>										
Secure	<input checked="" type="radio"/>										

#### Static MAC Table Configuration

Delete	VLAN ID	MAC Address	Port Members								
			1	2	3	4	5	6	7	8	9
<input type="button" value="Delete"/>	<input type="text" value="1234567891011"/>										

37

[www.dgssys.ru](http://www.dgssys.ru)

Figure 8-1 Change aging time to 200 seconds

## 8.2 Add static MAC address entry into MAC address table

**Example10:** Add static MAC address: 00:00:00:00:00:0F in VLAN 2 on port 3.

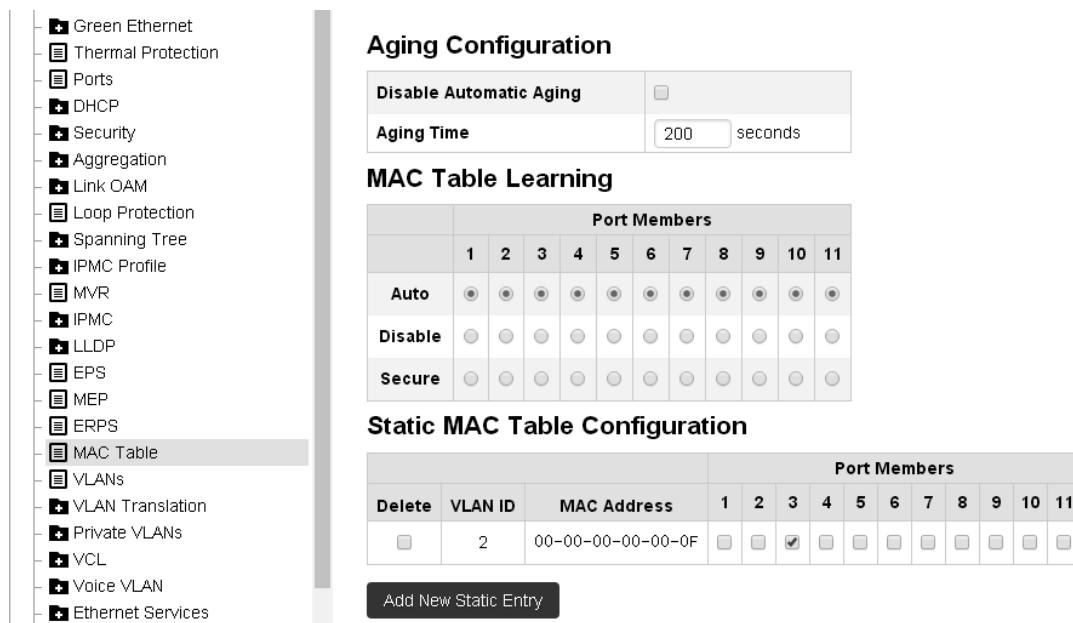


Figure 8-2 Add static MAC address in VLAN 2 on port 3

## 8.3 Show MAC address table

MAC Address Table			Port Members											
Type	VLAN	MAC Address	CPU	1	2	3	4	5	6	7	8	9	10	11
Static	1	00-01-C1-00-00-00	✓											
Static	1	33-33-00-00-00-01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Static	1	33-33-00-00-00-02	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Static	1	33-33-FF-00-00-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dynamic	1	4C-72-B9-FD-92-D7			✓									
Static	2	00-00-00-00-00-0F				✓								

Figure 8-3 Show MAC address table

## 9 Mirroring & Remote Mirroring

### 9.1 Mirroring (Local)

For debugging network problems or monitoring network traffic, the switch system can be configured to mirror frames from multiple ports to a mirror port.

#### 9.1.1 Type

##### Mirror

Configure the switch to local mirror mode. The source port(s) and destination port are located on the same switch.

##### Source

Configure the switch as a source node for monitor flow. The source port(s), reflector port and intermediate port(s) are located on this switch.

##### Intermediate

Configure the switch as a forwarding node for monitor flow and the switch is an option node. The object is to forward traffic from source switch to destination switch. The intermediate ports are located on this switch.

##### Destination

Configure the switch as an end node for monitor flow. The destination port(s) and intermediate port(s) are located on this switch.

#### 9.1.2 VLAN ID

The VLAN ID points out where the monitor packet will copy to. It's recommend to be separated from the VLAN of normal data traffic.

### 9.1.3 Reflector Port

The reflector port is a method to redirect the traffic to Remote Mirroring VLAN. The reflector port will stop working as a normal port if it's configured as a reflector port.

Note: The reflector port needs to select only on Source switch type. Note2: The reflector port needs to disable MAC Table learning and STP. Note3: The reflector port only supports on pure copper ports.

### 9.1.4 Source VLAN(s) Configuration

The switch can support VLAN-based Mirroring.

**Note:** The Mirroring session shall have either ports or VLANs as sources, but not both.

### 9.1.5 Remote Mirroring Port Configuration

**Source**

**Disabled**

Neither frames transmitted nor frames received are mirrored.

**Both**

Frames received and frames transmitted are mirrored on the Intermediate/Destination port.

**Rx only**

Frames received on this port are mirrored on the Intermediate/Destination port. Frames transmitted are not mirrored.

**Tx only**

Frames transmitted on this port are mirrored on the Intermediate/Destination port. Frames received are not mirrored.

**Intermediate**

For Remote Mirroring only, the intermediate port is a switched port to connect to other switch.

**Note: The intermediate port needs to disable MAC Table learning. Destination**

The destination port is a switched port that you receive a copy of traffic from the source port.

**Note1: On mirror mode, the device only supports one destination port.**

**Note2: The destination port needs to disable MAC Table learning.**

## 9.1.6 Configuration Guideline for All Features

When the switch is running on Remote Mirroring mode, the administrator needs to check whether or not other features are enabled or disabled. For example, the administrator cannot enable the MSTP on reflector port. All monitor traffic is blocked on reflector port

All recommended settings are described in the below table.

	Impact	source port	reflector port	intermediate port	destination port	Remote Mirroring VLAN
arp_inspection	High		* disabled	* disabled		
acl	Critical		* disabled	* disabled	* disabled	
dhcp_relay	High		* disabled	* disabled		
dhcp_snooping	High		* disabled	* disabled		
ip_source_guard	Critical		* disabled	* disabled	* disabled	
ipmc/igmpsnp	Critical					un-conflict
ipmc/mldsnp	Critical					un-conflict
lacp	Low				o disabled	

lldp	Low				o disabled	
mac learning	Critical		*	*	*	
mstp	Critical		* disabled		o disabled	
mvr	Critical					un-conflict
nas	Critical		*	*	*	
psec	Critical		*	*	*	
qos	Critical		*	*	*	
upnp	Low				o disabled	
mac-based vlan	Critical		*	*		
protocol-based vlan	Critical		*	*		
vlan_translation	Critical		*	*	*	
voice_vlan	Critical		*	*		

Note:

\* -- must

o -- optional

Impact: Critical/High/Low Critical 5 packets->0 packets

High 5 packets -> 4 packets

Low 5 packets -> 6 packets

### 9.1.7 Mirror the traffic of Port X to Port Y

#### Example11: Mirror Traffic of Port 1 to Port 6

Port	Source	Intermediate	Destination
1	Both	<input type="checkbox"/>	<input type="checkbox"/>
2	Disabled	<input type="checkbox"/>	<input type="checkbox"/>
3	Disabled	<input type="checkbox"/>	<input type="checkbox"/>
4	Disabled	<input type="checkbox"/>	<input type="checkbox"/>
5	Disabled	<input type="checkbox"/>	<input type="checkbox"/>
6	Disabled	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	Disabled	<input type="checkbox"/>	<input type="checkbox"/>

Figure 9-1 Mirror Traffic of Port 1 to Port 6

### 9.1.8 Mirror the traffic of VLAN N to Port Y

#### Example 12 : Mirror Traffic of VLAN 123 to Port 6

- Security
- Aggregation
- Link OAM
- Loop Protection
- Spanning Tree
- IPMC Profile
- MVR
- IPMC
- LLDP
- EPS
- MEP
- ERPS
- MAC Table
- VLANs
- VLAN Translation
- Private VLANs
- VCL
- Voice VLAN
- Ethernet Services
- QoS
- Mirroring
- UPnP
- GVRP

## Mirroring & Remote Mirroring Configuration

<b>Mode</b>	Enabled
<b>Type</b>	Mirror
<b>VLAN ID</b>	200
<b>Reflector Port</b>	Port 1

### Source VLAN(s) Configuration

<b>Source VLANs</b>	123
---------------------	-----

### Port Configuration

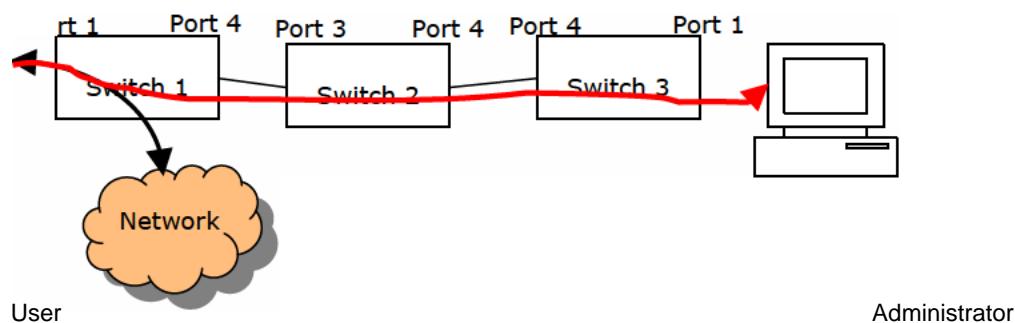
Port	Source	Intermediate	Destination
1	Disabled	<input type="checkbox"/>	<input type="checkbox"/>
2	Disabled	<input type="checkbox"/>	<input type="checkbox"/>
3	Disabled	<input type="checkbox"/>	<input type="checkbox"/>

Figure 9-2 Mirror Traffic of VLAN 123 to Port 6

## 9.2 Remote Mirroring

Remote Mirroring is an extend function of Mirroring. It can extend the destination port in other switch. So the administrator can analyze the network traffic on the other switches.

### Example 13:



## Switch 1

Configure Switch 1 as Source Switch with the following parameters

- source port: 1
- Mirror mode: both, frames received and frames transmitted are mirrored.
- Intermediate port: 4

Note: The intermediate port needs to disable MAC Table learning.

- Reflector port: 2
- Note1: The reflector port needs to select only on Source switch type.
- Note2: The reflector port needs to disable MAC Table learning and STP.
- Note3: The reflector port only supports on pure copper ports.
- VLAN for mirrored traffic: 200

- Aggregation
- Link OAM
- Loop Protection
- Spanning Tree
- IPMC Profile
- MVR
- IPMC
- LLDP
- EPS
- MEP
- ERPS
- MAC Table
- VLANs
- VLAN Translation
- Private VLANs
- VCL
- Voice VLAN
- Ethernet Services
- QoS
- Mirroring
- UPnP
- GVRP
- sFlow
- DDMI

### Mirroring & Remote Mirroring Configuration

<b>Mode</b>	Enabled
<b>Type</b>	Source(RMirror)
<b>VLAN ID</b>	200
<b>Reflector Port</b>	Port 2

### Source VLAN(s) Configuration

<b>Source VLANs</b>	
---------------------	--

### Port Configuration

Port	Source	Intermediate	Destination
1	Both	<input type="checkbox"/>	<input type="checkbox"/>
2	Disabled	<input type="checkbox"/>	<input type="checkbox"/>
3	Disabled	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	Disabled	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Figure 9-3 Remote Mirroring - Source Switch

## Switch 2

Configure Switch 2 as Intermediate Switch with the following parameters

Intermediate port: 3 and 4

42

**Note: The intermediate port needs to disable MAC Table learning.**

- VLAN for mirrored traffic: 200
  - Security
  - Aggregation
  - Link OAM
  - Loop Protection
  - Spanning Tree
  - IPMC Profile
  - MVR
  - IPMC
  - LLDP
  - EPS
  - MEP
  - ERPS
  - MAC Table
  - VLANs
  - VLAN Translation
  - Private VLANs
  - VCL
  - Voice VLAN
  - Ethernet Services
  - QoS
  - Mirroring
  - UPnP
  - GVRP
  - sFlow
  - DDMI
  - UDLD

## Mirroring & Remote Mirroring Configuration

Mode	Enabled
Type	Intermediate(RMirror)
VLAN ID	200
Reflector Port	Port 2

### Source VLAN(s) Configuration

Source VLANs	
--------------	--

### Port Configuration

Port	Source	Intermediate	Destination
1	Disabled	<input type="checkbox"/>	<input type="checkbox"/>
2	Disabled	<input type="checkbox"/>	<input type="checkbox"/>
3	Disabled	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	Disabled	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Disabled	<input type="checkbox"/>	<input type="checkbox"/>

Figure 9-4 remote mirroring intermediate switch configuration Switch 3

Configure Switch 3 as Destination Switch with the following parameters.

- Intermediate port: 4

**Note: The intermediate port needs to disable MAC Table learning.**

- Destination port: 1

**O Note1: The device only supports one destination port.**

**O Note2: The destination port needs to disable MAC Table learning.**

- VLAN for mirrored traffic: 200

- [+] Aggregation
- [+] Link OAM
- [+] Loop Protection
- [+] Spanning Tree
- [+] IPMC Profile
- [+] MVR
- [+] IPMC
- [+] LLDP
- [+] EPS
- [+] MEP
- [+] ERPS
- [+] MAC Table
- [+] VLANs
- [+] VLAN Translation
- [+] Private VLANs
- [+] VCL
- [+] Voice VLAN
- [+] Ethernet Services
- [+] QoS
- [+] Mirroring
- [+] UPnP
- [+] GVRP
- [+] sFlow

## Mirroring & Remote Mirroring Configuration

<b>Mode</b>	Enabled
<b>Type</b>	Destination(RMirror)
<b>VLAN ID</b>	200
<b>Reflector Port</b>	Port 2

### Source VLAN(s) Configuration

<b>Source VLANs</b>	
---------------------	--

### Port Configuration

Port	Source	Intermediate	Destination
1	Disabled	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Disabled	<input type="checkbox"/>	<input type="checkbox"/>
3	Disabled	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	Disabled	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Figure 9-4 remote mirroring destination switch

# 10 GVRP

Generic VLAN registration protocol, or GVRP for short is specified in IEEE 802.1Q-2005, clause 11 and IEEE 802.1D.2004, clause 12.

## 10.1 GVRP Port Configuration

GVRP is turned on, showed as below.

The screenshot shows the configuration interface for the DIGICOM Industrial Ethernet device. On the left, there is a navigation tree with the following items:

- LINK OAM
- Loop Protection
- Spanning Tree
- IPMC Profile
- MVR
- IPMC
- LLDP
- EPS
- MEP
- ERPS
- MAC Table
- VLANs
- VLAN Translation
- Private VLANs
- VCL
- Voice VLAN
- Ethernet Services
- QoS
- Mirroring
- UPnP
- GVRP
  - Global config
  - Port config**
- sFlow

The "Port config" item under GVRP is highlighted with a gray background.

On the right, the title "GVRP Port Configuration" is displayed above a table. The table has two columns: "Port" and "Mode". The "Port" column lists ports 1 through 10, and the "Mode" column shows the configuration for each port. The configuration for port 1 is highlighted with a blue border, indicating it is active.

Port	Mode
*	<>
1	<b>GVRP enabled</b>
2	Disabled
3	Disabled
4	Disabled
5	Disabled
6	Disabled
7	Disabled
8	Disabled
9	Disabled
10	Disabled

Figure 10-1 GVRP enable

## 10.2 GVRP Global configuration

A small number of parameters can be configured for GVRP. These parameters are in the web config shown below.

The screenshot shows the left sidebar navigation menu and the main configuration page. The sidebar includes options like Link OAM, Loop Protection, Spanning Tree, IPMC Profile, MVR, IPMC, LLDP, EPS, MEP, ERPS, MAC Table, VLANs, VLAN Translation, Private VLANs, VCL, Voice VLAN, Ethernet Services, QoS, Mirroring, UPnP, and GVRP. Under GVRP, there are two sub-options: Global config (which is selected and highlighted in grey) and Port config. The main page title is "GVRP Configuration". It has a checked checkbox for "Enable GVRP". Below it is a table with four rows, each containing a parameter name and its corresponding value input field. A "Save" button is located at the bottom of the table.

Parameter	Value
Join-time:	20
Leave-time:	60
LeaveAll-time:	1000
Max VLANs:	20

Figure 10-1 GVRP configuration

# 11 Multiple Spanning Tree Protocol(MSTP)

## 11.1 Bridge settings

- **Configuration**
  - System
  - Green Ethernet
  - Thermal Protection
  - Ports
  - DHCP
  - Security
  - Aggregation
  - Link OAM
  - Loop Protection
  - Spanning Tree**
    - Bridge Settings**
    - MSTI Mapping
    - MSTI Priorities
    - CIST Ports
    - MSTI Ports
  - IPMC Profile
  - MVR
  - IPMC
  - LLDP
  - EPS
  - MEP
  - ERPS
  - MAC Table
  - VLANs
  - VI LAN Translation

## STP Bridge Configuration

### Basic Settings

<b>Protocol Version</b>	MSTP
<b>Bridge Priority</b>	32768
<b>Hello Time</b>	2
<b>Forward Delay</b>	15
<b>Max Age</b>	20
<b>Maximum Hop Count</b>	20
<b>Transmit Hold Count</b>	6

### Advanced Settings

<b>Edge Port BPDU Filtering</b>	<input type="checkbox"/>
<b>Edge Port BPDU Guard</b>	<input type="checkbox"/>
<b>Port Error Recovery</b>	<input checked="" type="checkbox"/>
<b>Port Error Recovery Timeout</b>	

**Save**   **Reset**

Figure 11-1 STP Bridge Configuration

## 11.2 MSTI Configuration

By default, all VLAN IDs are mapped to the CIST<sup>2</sup>. If the protocol version is set to MSTP, then a VLAN ID can be mapped to one out of 8 spanning trees, where of CIST is one. The 7 others are called MSTI1,..., MSTI7 as shown in Figure . A MSTI configuration does also have a name and a revision as the figure shows.

All these values have to be configured identical on the switches in the network. Otherwise the configuration will not take effect.

**Configuration**

- System
- Green Ethernet
- Thermal Protection
- Ports
- DHCP
- Security
- Aggregation
- Link OAM
- Loop Protection
- Spanning Tree
  - Bridge Settings
  - MSTI Mapping
  - MSTI Priorities
  - CIST Ports
  - MSTI Ports
- IPMC Profile
- MVR
- IPMC
- LLDP
- EPS
- MEP
- ERPS
- MAC Table
- VLANs
- VLAN Translation
- Private VLANs

Add VLANs separated by spaces or comma.

**Unmapped VLANs are mapped to the CIST.** (The default bridge instance).

Configuration Identification

<b>Configuration Name</b>	00-01-c1-00-00-00
<b>Configuration Revision</b>	0

MSTI Mapping

MSTI	VLANs Mapped
MSTI1	10,15
MSTI2	16-20
MSTI3	
MSTI4	
MSTI5	
MSTI6	
MSTI7	

Figure 11-2 MSTI Configuration

### 11.3 MSTI Priorities

Each MSTI and CIST can be given a priority as show below.

**Configuration**

- System
- Green Ethernet
- Thermal Protection
- Ports
- DHCP
- Security
- Aggregation
- Link OAM
- Loop Protection
- Spanning Tree
  - Bridge Settings
  - MSTI Mapping
  - MSTI Priorities
  - CIST Ports
  - MSTI Ports
- IPMC Profile
- MVR
- IPMC
- LLDP
- EPS
- KMRP

## MSTI Configuration

MSTI Priority Configuration

MSTI	Priority
*	<> ▼
CIST	40960 ▼
MSTI1	32768 ▼
MSTI2	32768 ▼
MSTI3	32768 ▼
MSTI4	32768 ▼
MSTI5	32768 ▼
MSTI6	32768 ▼
MSTI7	32768 ▼

Figure 11-3 MSTI priorities

A low priority number means higher priority.

A *Bridge Identifier* is constructed per CIST, MSTI1,...,MSTI7, which is the Bridge Priority, see Figure 3, plus the number in the figure above. This is concatenated with the MAC address of the switch. In this way the Bridge Identifier should be unique.

A low Bridge Identifier means higher priority. A high priority means that the switch tends to be the root of the spanning tree in favor of switches with lower priority. So if two switches has the same Bridge Priority, then by e.g. selecting MSTI1 priority higher on the one switch than the other, and vice versa with MSTI2, the one switch tends to be root of the one MSTI and the other switch for the other MSTI.

## 11.4 STP CIST port configuration

Configurations concerning STP on a port basis is configured in the web , as shown in Figure 6.

Port	STP Enabled	Path Cost		Priority	Admin Edge	Auto Edge	Restricted		BPDU Guard	Point-to-point
-	<input checked="" type="checkbox"/>	Auto		128	Non-Edge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Forced True

Port	STP Enabled	Path Cost		Priority	Admin Edge	Auto Edge	Restricted		BPDU Guard	Point-to-point
*	<input checked="" type="checkbox"/>	<>		<>	<>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<>
1	<input checked="" type="checkbox"/>	Specific	12345	128	Non-Edge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Auto
2	<input checked="" type="checkbox"/>	Auto		128	Non-Edge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Auto
3	<input type="checkbox"/>	Auto		128	Non-Edge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Auto
4	<input checked="" type="checkbox"/>	Auto		128	Non-Edge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Auto
5	<input checked="" type="checkbox"/>	Auto		128	Non-Edge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Auto
6	<input checked="" type="checkbox"/>	Auto		128	Non-Edge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Auto
7	<input checked="" type="checkbox"/>	Auto		128	Non-Edge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Auto

Figure 11-4 CIST port configuration

Let's start with pointing out, that all parameters above, except Path Cost and Priority, are specific for the port and not for CIST. But all the other parameters cannot, because they apply to the port. e.g. spanning tree is disabled (as it is for port 3), then this goes for the CIST and all the MSTIs.

Also there is a CIST Aggregation Port Configuration and a CIST Normal Port Configuration. All the configurations done in the second case is done in the Config Interface mode

### 11.4.1 Admin Edge and Auto Edge

These two values control how a port is declared to be an edge port or not. An edge port, is a port which is not connected to a bridge.

If auto edge is enabled, then the port determine whether a port is an edge port by registering if BPDUs are received on that port. The admin edge determines what the port should start as being – edge or not, until auto edge – if enabled, change it.

The decision can be seen by selecting Monitor>Spanning Tree>Bridge Status, then clicking on CIST. Then the field Edge shows the decision.

### 11.4.2 Restricted Role and Restricted TCN

If restricted role is enabled, it causes the port not to be selected as Root Port for the CIST or any MSTI, even if it has the best spanning tree priority vector. Such a port will be selected as an Alternate Port after the Root Port has been selected. If set, it can cause lack of spanning tree connectivity. It can be set by a network administrator to prevent bridges external to a core region of the network influence the spanning tree active topology, possibly because those bridges are not under the full control of the administrator. This feature is also known as Root Guard.

If restricted TCN is enabled, it causes the port not to propagate received topology change notifications and topology changes to other ports. If set it can cause temporary loss of connectivity after changes in a spanning tree's active topology as a result of persistently incorrect learned station location information. It is set by a network administrator to prevent bridges external to a core region of the network, causing address flushing in that region, possibly because those bridges are not under the full control of the administrator or the physical link state of the attached LANs transits frequently.

### 11.4.3 BPDU Guard

If enabled, causes the port to disable itself upon receiving valid BPDU's. Contrary to the similar bridge setting, the port Edge status does not affect this setting.

### 11.4.4 Point-to-point

Where the no form is equivalent to setting it to auto.

Setting the link to point-to-point, shows up in the web gui as Forced True. Setting it to shared, is shown as Force False. Setting it to auto shows as Auto.

## 11.5 MSTI Ports

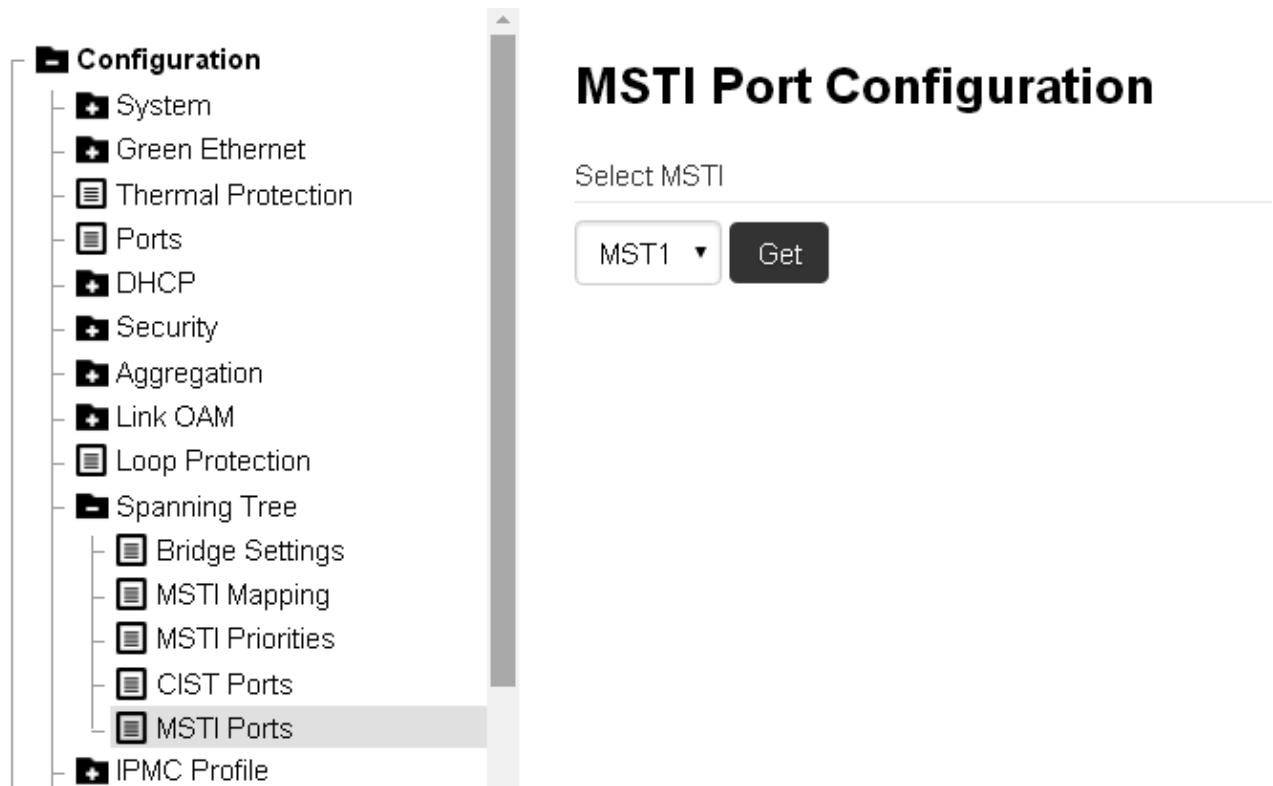


Figure 11-4 MSTI Port configuration

Then select the MSTI wanted, and press get.

-	<b>Configuration</b>
-	System
-	Green Ethernet
-	Thermal Protection
-	Ports
-	DHCP
-	Security
-	Aggregation
-	Link OAM
-	Loop Protection
-	Spanning Tree
-	Bridge Settings
-	MSTI Mapping
-	MSTI Priorities
-	CIST Ports
-	MSTI Ports
-	IPMC Profile
-	MVR
-	IPMC
-	LLDP
-	EPS
-	MEP
-	ERPS
-	MAC Table
-	VLANs
-	VLAN Translation
-	Private VLANs
-	VLAN

## MST1 MSTI Port Configuration

MSTI Aggregated Ports Configuration

Port	Path Cost	Priority
-	Auto	128

MSTI Normal Ports Configuration

Port	Path Cost	Priority
*	<>	<>
1	Auto	128
2	Auto	128
3	Auto	128
4	Auto	128
5	Auto	128
6	Auto	128
7	Auto	128
8	Auto	128
9	Auto	128

Figure 11-5 MSTI port configuration

As for the other parameters, they are the same as in the CIST case, but we repeat them here anyway:

The <Cost> is a number in the range 1,...,200000000 or it may be auto. If set to auto, then the path cost will be set to some value appropriate for the physical link speed, using IEEE 802.1D recommended values.

The <Priority> is a number in the range 0,...,240 and a multiple of 16. Note that if it is not a multiple of 16 then it will be set to 0.

The path cost is used by STP when selecting ports. Low cost is chosen in favor of high cost. And if two ports have the same cost, then priority is used as a tie breaker.

## 12 Ethernet Ring Protection Switching(ERPS)

### **ERPS ID**

The ID of the created Protection group, It must be an integer value between 1 and 64. The maximum number of ERPS Protection Groups that can be created are 64. Click on the ID of an Protection group to enter the configuration page.

### **Port 0**

This will create a Port 0 of the switch in the ring.

### **Port 1**

This will create "Port 1" of the switch in the Ring. As interconnected sub-ring will have only one ring port, "Port 1" is configured as "0" for interconnected sub-ring. "0" in this field indicates that no "Port 1" is associated with this instance.

### **Port 0 SF MEP**

The Port 0 Signal Fail reporting MEP.

### **Port 1 SF MEP**

The Port 1 Signal Fail reporting MEP. As only one SF MEP is associated with interconnected sub-ring without virtual channel, it is configured as "0" for such ring instances. "0" in this field indicates that no Port 1 SF MEP is associated with this instance.

### **Port 0 APS MEP**

The Port 0 APS PDU handling MEP.

### **Port 1 APS MEP**

The Port 1 APS PDU handling MEP. As only one APS MEP is associated with interconnected sub-ring without virtual channel, it is configured as "0" for such ring instances. "0" in this field indicates that no Port 1 APS MEP is associated with this instance.

### **Ring Type**

Type of Protecting ring. It can be either major ring or sub-ring.

### **Interconnected Node**

Interconnected Node indicates that the ring instance is interconnected. Click on the checkbox to configure this. "Yes" indicates it is an interconnected node for this instance. "No" indicates that the configured instance is not interconnected.

## Virtual Channel

Sub-rings can either have virtual channel or not on the interconnected node. This is configured using "Virtual Channel" checkbox. "Yes" indicates it is a sub-ring with virtual channel. "No" indicates, sub-ring doesn't have virtual channel.

## Major Ring ID

Major ring group ID for the interconnected sub-rings. It is used to send topology change updates on major ring. If ring |

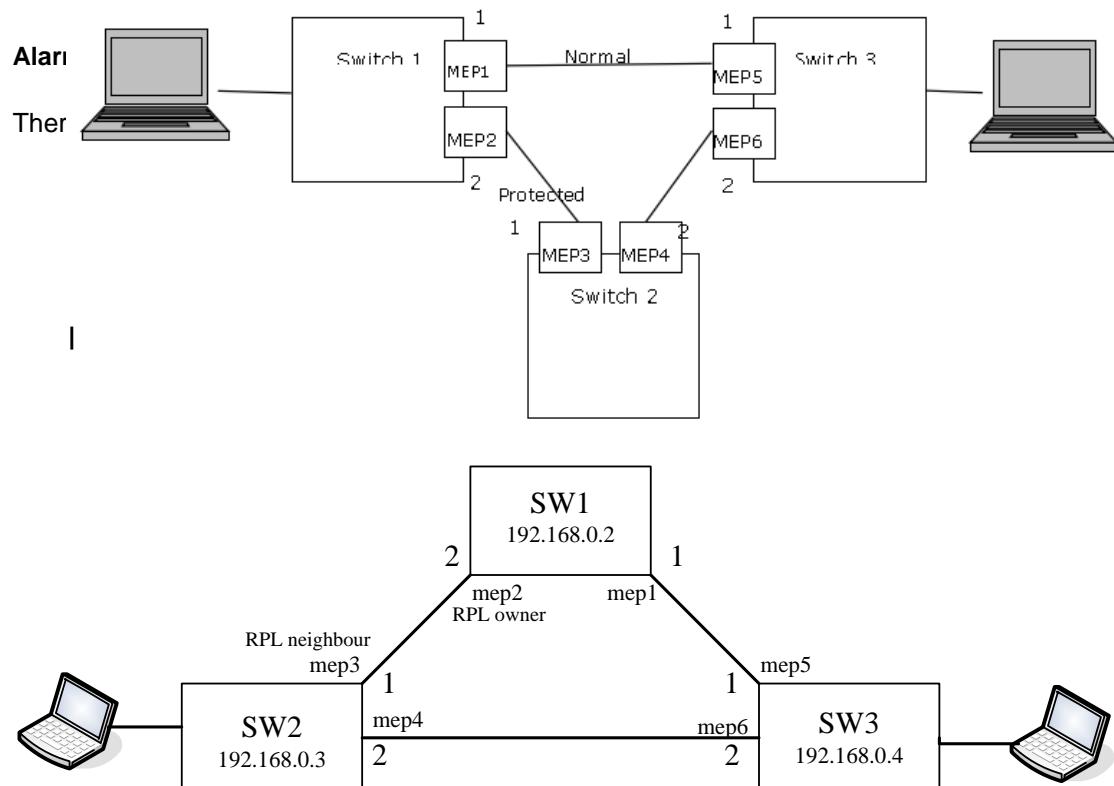


Figure 12-1 network topology model

## Configure by Web

1. Connect Switch 1 and Switch 2, Switch 1 and Switch 3. Don't connect Switch 2 and Switch 3 to avoid loop first. Web client is connected to Switch 1.
2. Restore default on Switch 1/2/3. Disable DHCP client, set proper static IP for Switch 1/2/3.  
In this example, switch 1 is 192.168.0.2, switch 2 is 192.168.0.3, switch 3 is 192.168.0.4
3. On Switch 1/2/3, disable Spanning Tree (It's enabled in default setting) to avoid confliction with ERPS.
4. Enable Vlan tag aware on Switch 1/2/3. (Set Port Type to C-Port on Port 1 and Port 2 of three switches).

**Global VLAN Configuration**

Allowed Access VLANs	1
Ethertype for Custom S-ports	88A8

**Port VLAN Configuration**

Port	Mode	Port VLAN	Port Type	Ingress Filtering	Ingress Acceptance	Egress Tagging	Allowed VLANs	Forbidden VLANs
1	Hybrid	1	C-Port	<input checked="" type="checkbox"/>	Tagged and Untagged	Untag Port VLAN	1-2	
2	Hybrid	1	C-Port	<input checked="" type="checkbox"/>	Tagged and Untagged	Untag Port VLAN	1-2	
3	Access	1	C-Port	<input checked="" type="checkbox"/>	Taooed and Untaooed	Untao All	1	
4	Access	1	C-Port	<input checked="" type="checkbox"/>	Taooed and Untaooed	Untao All	1	
5	Access	1	C-Port	<input checked="" type="checkbox"/>	Tagged and Untagged	Untag All	1	
6	Access	1	C-Port	<input checked="" type="checkbox"/>	Tagged and Untagged	Untag All	1	
7	Access	1	C-Port	<input checked="" type="checkbox"/>	Tagged and Untagged	Untag All	1	
8	Access	1	C-Port	<input checked="" type="checkbox"/>	Tagged and Untagged	Untag All	1	
9	Access	1	C-Port	<input checked="" type="checkbox"/>	Tagged and Untagged	Untag All	1	
10	Access	1	C-Port	<input checked="" type="checkbox"/>	Taooed and Untaooed	Untao All	1	
11	Access	1	C-Port	<input checked="" type="checkbox"/>	Taooed and Untaooed	Untao All	1	

Save Reset

## 5. Create MEP

### 5.1 Switch 1

Add new MEP on Port 1

**Maintenance Entity Point**

Delete	Instance	Domain	Mode	Direction	Residence Port	Level	Flow Instance	Tagged VID	This MAC	Alarm
Delete	1	Port	Med	Down	1	0	1	2		

Add New MEP Save Reset

Add new MEP on Port 2

**Maintenance Entity Point**

Delete	Instance	Domain	Mode	Direction	Residence Port	Level	Flow Instance	Tagged VID	This MAC	Alarm
<input type="checkbox"/>	1	Port	Mep	Down	1	0		2	BC-9C-C5-00-1F-D0	
<input type="checkbox"/>	2	Port	Mep	Down	2	0		2	BC-9C-C5-00-1F-D1	

**Add New MEP** **Save** **Reset**

- Configuration
  - System
  - Green Ethernet
  - Thermal Protection
  - Ports
  - DHCP
  - Security
  - Aggregation
  - Link OAM
  - Loop Protection
  - Spanning Tree
  - IPMC Profile
  - MVR
  - IPMC
  - LLDP
  - EPS
  - **MEP**
  - ERPS
  - MAC Table
  - VLANs
  - VLAN Translation
  - Private VLANs
  - VCL
  - Voice VLAN
  - Ethernet Services
  - QoS
  - Mirroring
  - UPnP
  - sFlow
  - DDMI

Edit MEP1 (by clicking 1 under Instance of MEP table)

**MEP Configuration**

**Instance Data**

Instance	Domain	Mode	Direction	Residence Port	Flow Instance	Tagged VID	EPS Instance	This MAC
1	Port	Mep	Down	1		2	1	BC-9C-C5-00-1F-D0

**Instance Configuration**

Level	Format	Domain Name	MEG id	MEP id	Tagged VID	Syslog	cLevel	cMEG	cAIS	cLCK	cLoop	cConfig	cDEG	cSSF	aBLK	aTSD	aTSF
0	ITU ICC		ICCC00MEG0000	1	2	<input type="checkbox"/>											

**Peer MEP Configuration**

Delete	Peer MEP ID	Unicast Peer MAC	cLOC	cRDI	cPeriod	cPriority
<input type="checkbox"/>	5	BC-9C-C5-00-1F-F4				

**Add New Peer MEP**

**Functional Configuration**

Continuity Check				APS Protocol				
Enable	Priority	Frame rate	TLV	Enable	Priority	Cast	Type	Last Octet
<input checked="" type="checkbox"/>	0	1 msec	<input type="checkbox"/>	<input checked="" type="checkbox"/>	0	Multi	R-APS	1

**Fault Management** **Performance Monitoring**

- Configuration
  - System
  - Green Ethernet
  - Thermal Protection
  - Ports
  - DHCP
  - Security
  - Aggregation
  - Link OAM
  - Loop Protection
  - Spanning Tree
  - IPMC Profile
  - MVR
  - IPMC
  - LLDP
  - EPS
  - **MEP**
  - ERPS
  - MAC Table
  - VLANs
  - VLAN Translation
  - Private VLANs
  - VCL
  - Voice VLAN
  - Ethernet Services
  - QoS
  - Mirroring
  - UPnP
  - sFlow
  - DDMI

\*Unicast Peer MAC can keep empty; it will be learned by receiving the CCM from peer side.

Edit MEP2 (by clicking 2 under Instance of MEP table)

**MEP Configuration**

**Instance Data**

Instance	Domain	Mode	Direction	Residence Port	Flow Instance	Tagged VID	EPS Instance	This MAC
2	Port	Mep	Down	2		2	1	BC-9C-C5-00-1F-D1

**Instance Configuration**

Level	Format	Domain Name	MEG id	MEP id	Tagged VID	Syslog	cLevel	cMEG	cAIS	cLCK	cLoop	cConfig	cDEG	cSSF	aBLK	aTSD	aTSF
0	ITU ICC		ICCC00MEG0000	2	2	<input type="checkbox"/>											

**Peer MEP Configuration**

Delete	Peer MEP ID	Unicast Peer MAC	cLOC	cRDI	cPeriod	cPriority
<input type="checkbox"/>	3	BC-9C-C5-00-1F-DC				

**Add New Peer MEP**

**Functional Configuration**

Continuity Check				APS Protocol				
Enable	Priority	Frame rate	TLV	Enable	Priority	Cast	Type	Last Octet
<input checked="" type="checkbox"/>	0	1 msec	<input type="checkbox"/>	<input checked="" type="checkbox"/>	0	Multi	R-APS	1

**Fault Management** **Performance Monitoring**

- Configuration
  - System
  - Green Ethernet
  - Thermal Protection
  - Ports
  - DHCP
  - Security
  - Aggregation
  - Link OAM
  - Loop Protection
  - Spanning Tree
  - IPMC Profile
  - MVR
  - IPMC
  - LLDP
  - EPS
  - **MEP**
  - ERPS
  - MAC Table
  - VLANs
  - VLAN Translation
  - Private VLANs
  - VCL
  - Voice VLAN
  - Ethernet Services
  - QoS
  - Mirroring
  - UPnP
  - sFlow
  - DDMI

## 5.2 Switch 2

Add new MEP on Port 1

The screenshot shows the 'Maintenance Entity Point' configuration screen. On the left is a navigation tree with 'MEP' selected. The main area has a table titled 'Maintenance Entity Point' with the following columns: Delete, Instance, Domain, Mode, Direction, Residence Port, Level, Flow Instance, Tagged VID, This MAC, and Alarm. A row is being edited with values: Instance 1, Port, Mode Mep, Direction Down, Residence Port 1, Level 0, Flow Instance 1, Tagged VID 2, This MAC (empty), and Alarm (empty). Buttons at the bottom include 'Add New MEP', 'Save', and 'Reset'.

Delete	Instance	Domain	Mode	Direction	Residence Port	Level	Flow Instance	Tagged VID	This MAC	Alarm
<input type="button" value="Delete"/>	1	Port	Mep	Down	1	0	1	2		

Add new MEP on Port 2

The screenshot shows the 'Maintenance Entity Point' configuration screen for Port 2. The navigation tree on the left has 'MEP' selected. The main area displays a table with two entries:

Delete	Instance	Domain	Mode	Direction	Residence Port	Level	Flow Instance	Tagged VID	This MAC	Alarm
<input type="checkbox"/>	1	Port	Mep	Down	1	0		2	BC-9C-C5-00-1F-DC	<span style="color: green;">●</span>
<input type="checkbox"/>	2	Port	Mep	Down	2	0		2	BC-9C-C5-00-1F-DD	<span style="color: green;">●</span>

Buttons at the bottom include 'Add New MEP', 'Save', and 'Reset'.

Edit MEP1 (by clicking 1 under Instance of MEP table)

The screenshot shows the 'MEP Configuration' section of the DIGICOM configuration tool. On the left is a tree view of configuration categories. The main area displays 'Instance Data' and 'Peer MEP Configuration' tables.

**Instance Data:**

Instance	Domain	Mode	Direction	Residence Port	Flow Instance	Tagged VID	EPS Instance	This MAC
1	Port	Mep	Down	1		2	1	BC-9C-C5-00-1F-DC

**Peer MEP Configuration:**

Delete	Peer MEP ID	Unicast Peer MAC	cLOC	cRDI	cPeriod	cPriority
<input type="checkbox"/>	2	BC-9C-C5-00-1F-D1	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>

**Functional Configuration:**

Continuity Check				APS Protocol			
Enable	Priority	Frame rate	TLV	Enable	Priority	Cast	Type
<input checked="" type="checkbox"/>	0	1 msec	<input type="radio"/>	<input checked="" type="checkbox"/>	0	Multi	R-APS
				Last Octet			

Fault Management and Performance Monitoring buttons are also present.

Edit MEP2 (by clicking 2 under Instance of MEP table)

The screenshot shows the 'MEP Configuration' section after editing the MEP instance. The 'Instance Data' table now shows Instance 2.

**Instance Data:**

Instance	Domain	Mode	Direction	Residence Port	Flow Instance	Tagged VID	EPS Instance	This MAC
2	Port	Mep	Down	2		2	1	BC-9C-C5-00-1F-DD

**Peer MEP Configuration:**

Delete	Peer MEP ID	Unicast Peer MAC	cLOC	cRDI	cPeriod	cPriority
<input type="checkbox"/>	6	BC-9C-C5-00-1F-F5	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>

**Functional Configuration:**

Continuity Check				APS Protocol			
Enable	Priority	Frame rate	TLV	Enable	Priority	Cast	Type
<input checked="" type="checkbox"/>	0	1 msec	<input type="radio"/>	<input checked="" type="checkbox"/>	0	Multi	R-APS
				Last Octet			

Fault Management and Performance Monitoring buttons are also present.

### 5.3 Switch 3

Add new MEP on Port 1

Delete	Instance	Domain	Mode	Direction	Residence Port	Level	Flow Instance	Tagged VID	This MAC	Alarm
<input type="button" value="Delete"/>	1	Port	Mep	Down	1	0	2	BC-9C-C5-00-1F-F4		

Add New MEP    Save    Reset

Add new MEP on Port 2

Delete	Instance	Domain	Mode	Direction	Residence Port	Level	Flow Instance	Tagged VID	This MAC	Alarm
<input type="checkbox"/>	1	Port	Mep	Down	1	0	2	BC-9C-C5-00-1F-F4		
<input type="checkbox"/>	2	Port	Mep	Down	2	0	2	BC-9C-C5-00-1F-F5		

Add New MEP    Save    Reset

Edit MEP1 (by clicking 1 under Instance of MEP table)

Edit MEP2 (by clicking 2 under Instance of MEP table)

## 6. ERPS

### 6.1 Switch 1, the RPL owner

**Ethernet Ring Protection Switching**

Delete	ERPS ID	Port 0	Port 1	Port 0 APS MEP	Port 1 APS MEP	Port 0 SF MEP	Port 1 SF MEP	Ring Type	Interconnected Node	Virtual Channel	Major Ring ID	Alarm
<input type="button" value="Delete"/>	1	1	2	1	2	1	2	Major	<input type="checkbox"/>	<input type="checkbox"/>	0	<input checked="" type="radio"/>

Add New Protection Group    Save    Reset

- Configuration
- System
- Green Ethernet
- Thermal Protection
- Ports
- DHCP
- Security
- Aggregation
- Link OAM
- Loop Protection
- Spanning Tree
- IPMC Profile
- MVR
- IPMC
- LLDP
- EPS
- MEP
- ERPS
- MAC Table
- VLANs
- VLAN Translation
- Private VLANs
- VCL
- Voice VLAN
- Ethernet Services
- QoS
- Mirroring
- UPnP
- GVRP
- sFlow
- DDMI
- UDLD

Edit ERPS1 (by clicking 1 under ERPS ID of ERPS table)

**Instance Configuration**

ERPS ID	Port 0	Port 1	Port 0 SF MEP	Port 1 SF MEP	Port 0 APS MEP	Port 1 APS MEP	Ring Type
1	1	2	1	2	1	2	Major Ring

**RPL Configuration**

RPL Role	RPL Port	Clear
RPL Owner	Port1	<input type="checkbox"/>

**Instance Command**

Command	Port
None	None

**Instance State**

Protection State	Port 0	Port 1	Transmit APS	Port 0 Receive APS	Port 1 Receive APS	WTR Remaining	RPL Un-blocked	No APS Received	Port 0 Block Status	Port 1 Block Status	FOP Alarm
Idle	OK	OK	NR RB BPR1			0	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Unblocked	Blocked	<input checked="" type="radio"/>

- Configuration
- System
- Green Ethernet
- Thermal Protection
- Ports
- DHCP
- Security
- Aggregation
- Link OAM
- Loop Protection
- Spanning Tree
- IPMC Profile
- MVR
- IPMC
- LLDP
- EPS
- MEP
- ERPS
- MAC Table
- VLANs
- VLAN Translation
- Private VLANs
- VCL
- Voice VLAN
- Ethernet Services
- QoS
- Mirroring
- UPnP
- GVRP
- sFlow

Edit Protected VLAN

Delete	VLAN ID
<input type="button" value="Delete"/>	1

Add New Entry    Back  
Save    Reset

\*After Save, remember to connect Switch 2 and Switch 3. Because RPL will be disconnected, so you won't be able to access switch 2 from Switch 1 (Web Client is connected to Switch 1)

Check MEP table on Switch 1/2/3. Alarm should keep green.

Delete	Instance	Domain	Mode	Direction	Residence Port	Level	Flow Instance	Tagged VID	This MAC	Alarm
<input type="checkbox"/>	1	Port	Mep	Down	1	0		2	BC-9C-C5-00-1F-D0	
<input type="checkbox"/>	2	Port	Mep	Down	2	0		2	BC-9C-C5-00-1F-D1	

Add New MEP    Save    Reset

- Configuration
  - System
  - Green Ethernet
  - Thermal Protection
  - Ports
  - DHCP
  - Security
  - Aggregation
  - Link OAM
  - Loop Protection
  - Spanning Tree
  - IPMC Profile
  - MVR
  - IPMC
  - LLDP
  - EPS
  - MEP**
  - ERPS
  - MAC Table
  - VLANs
  - VLAN Translation
  - Private VLANs
  - VCL
  - Voice VLAN
  - Ethernet Services
  - QoS
  - Mirroring
  - UPnP

### Maintenance Entity Point

Delete	Instance	Domain	Mode	Direction	Residence Port	Level	Flow Instance	Tagged VID	This MAC	Alarm
<input type="checkbox"/>	1	Port	Mep	Down	1	0		2	BC-9C-C5-00-1F-DC	<span style="color: green;">●</span>
<input type="checkbox"/>	2	Port	Mep	Down	2	0		2	BC-9C-C5-00-1F-DD	<span style="color: green;">●</span>

**Add New MEP** **Save** **Reset**

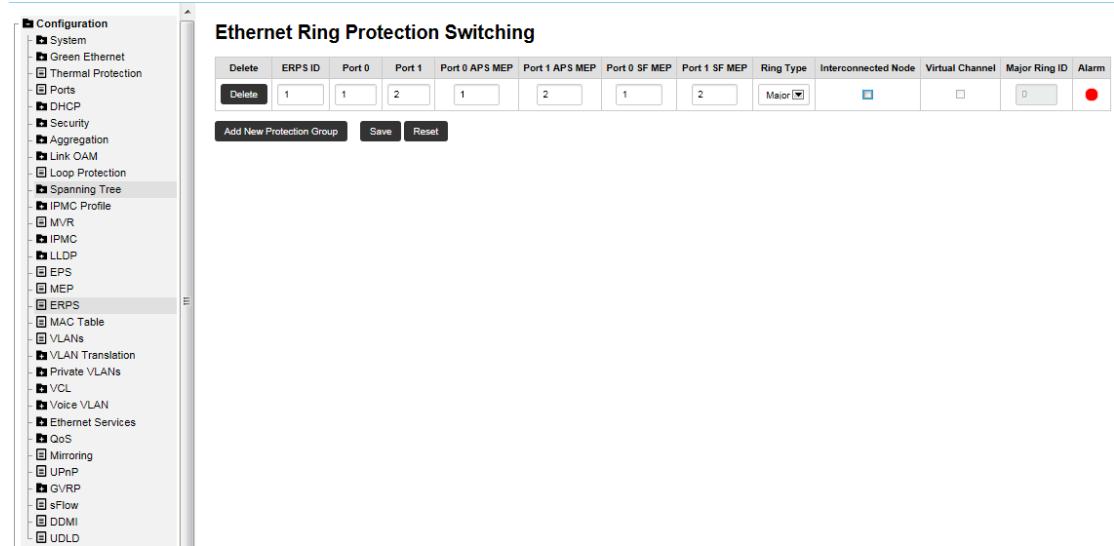
  

### Maintenance Entity Point

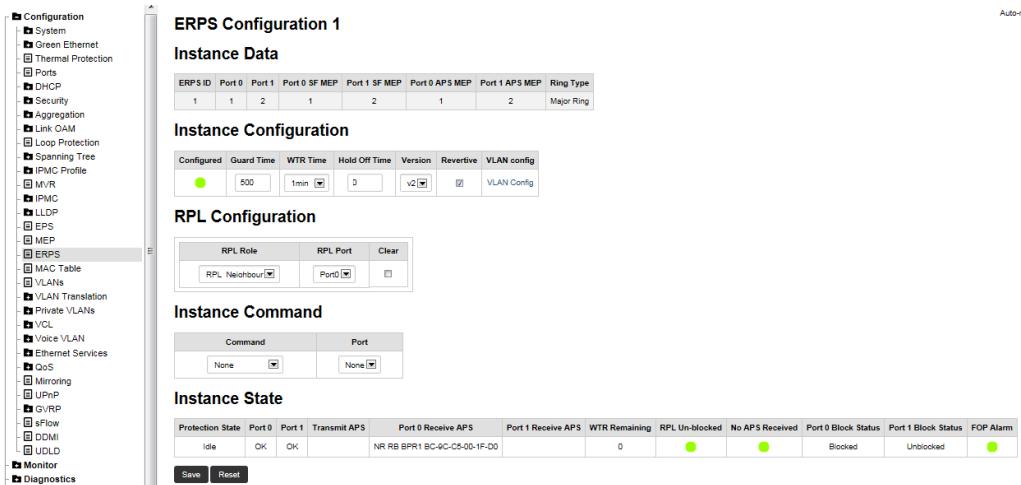
Delete	Instance	Domain	Mode	Direction	Residence Port	Level	Flow Instance	Tagged VID	This MAC	Alarm
<input type="checkbox"/>	1	Port	Mep	Down	1	0		2	BC-9C-C5-00-1F-F4	<span style="color: green;">●</span>
<input type="checkbox"/>	2	Port	Mep	Down	2	0		2	BC-9C-C5-00-1F-F5	<span style="color: green;">●</span>

**Add New MEP** **Save** **Reset**

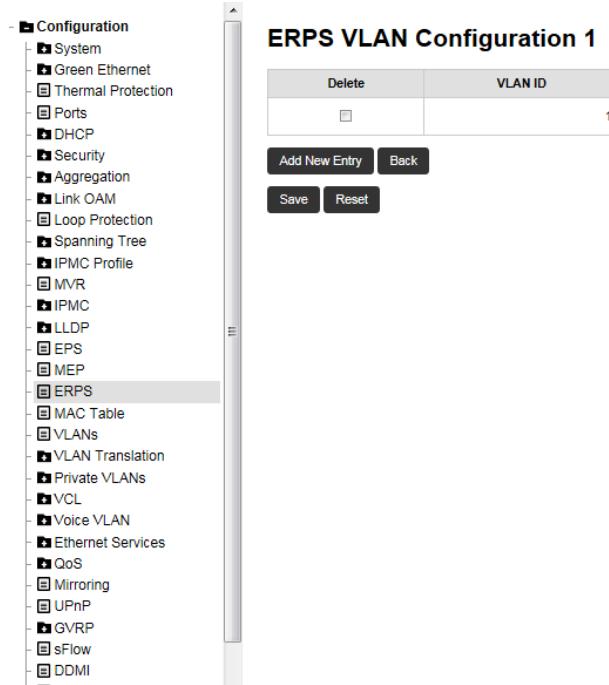
## 6.2 Switch 2, the RPL neighbor



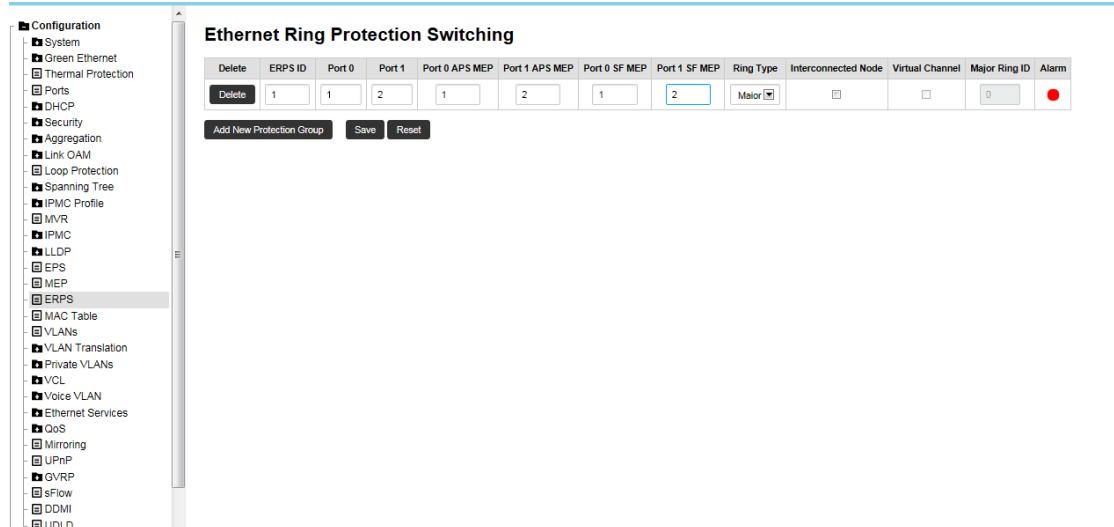
Edit ERPS1 (by clicking 1 under ERPS ID of ERPS table)



Edit Protected VLAN



### 6.3 Switch 3



Edit ERPS1 (by clicking 1 under ERPS ID of ERPS table)

No action is required on Switch 3. Keep the RPL owner to none.

Edit Protected VLAN

**ERPS VLAN Configuration 1**

Delete	VLAN ID
<input type="checkbox"/>	1

**Configuration**

- System
- Green Ethernet
- Thermal Protection
- Ports
- DHCP
- Security
- Aggregation
- Link OAM
- Loop Protection
- Spanning Tree
- IPMC Profile
- MVR
- IPMC
- LLDP
- EPS
- MEP
- ERPS
- MAC Table
- VLANs
- VLAN Translation
- Private VLANs
- VCL
- Voice VLAN
- Ethernet Services
- QoS
- Mirroring
- UPnP
- GVRP
- sFlow
- DDMI

## 13 PTP(1588)

### 13.1 PTP Clock Configuration

#### Clock Instance

Indicates the Instance of a particular Clock Instance [0..3]. Click on the Clock Instance number to edit the Clock details.

#### Device Type

Indicates the Type of the Clock Instance. There are 6 Device Types.

1. Ord-Bound - clock's Device Type is Ordinary-Boundary Clock.
2. P2p Transp - clock's Device Type is Peer to Peer Transparent Clock.
3. E2e Transp - clock's Device Type is End to End Transparent Clock.
4. Master Only - clock's Device Type is Master Only.
5. Slave Only - clock's Device Type is Slave Only.
6. BC-frontend - Boundary Clock frontend clock instance, only 1-step, 1-way is supported, i.e. these config parameters are ignored

#### Profile

Indicates the Profile of the Clock Instance.

1. 1588 – IEEE 1588 Standard
2. G8265.1 – PTP telecom profile for frequency synchronization

**PTP Clock Configuration**

Delete	Clock Instance	Device Type	Profile
<b>Delete</b>	0	Ord-Bound	1588
<b>Add New PTP Clock</b> <b>Save</b> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 5px;"> <b>Ord-Bound</b>                      Inactive                      Ord-Bound                      P2pTransp                      E2eTransp                      Mastronly                      Slaveonly                      BC-frontend                 </div>			

**System**

- Ports Configuration
- State
- Traffic Overview
- QoS Statistics
- QCL Status
- Detailed Statistics

Aggregation

Redundancy

Security

Green Ethernet

IPMC

MVR

LLDP

PoE

MAC Table

VLANs

GVRP

PTP(1588) & SyncE

- PTP Configuration
- PTP Status
- SyncE

Ethernet Services

QoS

Link OAM

Diagnostics

Maintenance

## 13.2 PTP Clock's Configuration and Status

### 13.2.1 Clock Type and Profile

Show clock Type and Profile, apply profile defaults.

### 13.2.2 Port Enable and Configuration

Click on “Ports Configuration” to set ptptp clock’s port data set..

### 13.2.3 Local Clock Current time

Show/update local clock data

#### PTP Time

Shows the actual PTP time with nanosecond resolution.

#### Clock Adjustment Method

Shows the actual clock adjustment method. The method depends on the available hardware.

#### Synchronize to System Clock

Activate this button to synchronize the System Clock to PTP Time.

#### Ports Configuration

Click to edit the port data set for the ports assigned to this clock instance.

### 13.2.4 Clock current Data Set

The clock current data set is defined in the IEEE 1588 Standard. The current data set is dynamic

#### **stpRm**

**Steps Removed** : It is the number of PTP clocks traversed from the grandmaster to the local slave clock.

#### **Offset from master**

Time difference between the master clock and the local slave clock, measured in ns.

#### **mean Path Delay**

The mean propagation time for the link between the master and the local slave.

### 13.2.5 Clock Parent Data Set

The clock parent data set is defined in the IEEE 1588 standard. The parent data set is dynamic.

#### **Parent Port Identity**

Clock identity for the parent clock, if the local clock is not a slave, the value is the clocks own id.

#### **Port**

Port Id for the parent master port

#### **PStat**

Parents Stats (always false).

#### **Var**

It is observed parent offset scaled log variance

#### **Change Rate**

Observed Parent Clock Phase Change Rate. i.e. the slave clocks rate offset compared to the master. (unit = ns per s).

#### **Grand Master Identity**

Clock identity for the grand master clock, if the local clock is not a slave, the value is the clocks own id.

#### **Grand Master Clock Quality**

The clock quality announced by the grand master (See description of Clock Default DataSet:Clock Quality)

**Pri1**

Clock priority 1 announced by the grand master

**Pri2**

Clock priority 2 announced by the grand master.

### 13.2.6 Clock Default Dataset

The clock default data set is defined in the IEEE 1588 Standard. It holds three groups of data: the static members defined at clock creation time, the Dynamic members defined by the system, and the configurable members which can be set here.

**ClockId**

An internal instance id (0..3)

**Device Type**

Indicates the Type of the Clock Instance. There are five Device Types.

1. Ord-Bound - Clock's Device Type is Ordinary-Boundary Clock.
2. P2p Transp - Clock's Device Type is Peer to Peer Transparent Clock.
3. E2e Transp - Clock's Device Type is End to End Transparent Clock.
4. Master Only - Clock's Device Type is Master Only.
5. Slave Only - Clock's Device Type is Slave Only.

**2 Step Flag**

True if two-step Sync events and Pdelay\_Resp events are used

**Ports**

The total number of physical ports in the node

**Clock Identity**

It shows unique clock identifier

**Dom**

Clock domain [0..127].

**Clock Quality**

The clock quality is determined by the system, and holds 3 parts: Clock Class, Clock Accuracy and OffsetScaledLog Variance as defined in IEEE1588.

The Clock Accuracy values are defined in IEEE1588 table 6 (Currently the clock Accuracy is set to 'Unknown' as default).

**Pri1**

Clock priority 1 [0..255] used by the BMC master select algorithm.

**Pri2**

Clock priority 2 [0..255] used by the BMC master select algorithm.

**Protocol**

Transport protocol used by the PTP protocol engine

Ethernet PTP over Ethernet multicast

EthernetMixed PTP using a combination of Ethernet multicast and unicast

IPv4Multi PTP over IPv4 multicast

IPv4Mixed PTP using a combination of IPv4 multicast and unicast

IPv4Uni PTP over IPv4 unicast

**One-Way**

If true, one way measurements are used. This parameter applies only to a slave. In one-way mode no delay measurements are performed, i.e. this is applicable only if frequency synchronization is needed. The master always responds to delay requests.

**VLAN Tag Enable**

The VLAN Tag Enable parameter is ignored, because the tagging is controlled by the VLAN configuration.

**VID**

VLAN Identifier used for tagging the VLAN packets.

**PCP**

Priority Code Point value used for PTP frames.

### 13.2.7 Clock Time Properties Data Set

The clock time properties data set is defined in the IEEE 1588 Standard. The data set is both configurable and dynamic, i.e. the parameters can be configured for a grandmaster. In a slave clock the parameters are overwritten by the grandmasters timing properties. The parameters are not used in the current PTP implementation.

The valid values for the Time Source parameter are:

16 (0x10) ATOMIC\_CLOCK

- 32 (0x20) GPS
- 48 (0x30) TERRESTRIAL\_RADIO
- 64 (0x40) PTP
- 80 (0x50) NTP
- 96 (0x60) HAND\_SET
- 144 (0x90) OTHER
- 160 (0xA0) INTERNAL\_OSCILLATOR

### 13.2.8 Filter Parameters

The default delay filter is a low pass filter, with a time constant of  $2^{**}$  **DelayFilter**\***DelayRequestRate**.

If the DelayFilter parameter is set to 0, the delay filter uses the same algorithm as the offset filter.

The default offset filter uses a minimum offset or a mean filter method

i.e. The minimum measured offset during **Period** samples is used in the calculation.

The distance between two calculations is **Dist** periods.

Note: In configurations with Timestamp enabled PHYs, the period is automatically increased, if  $(\text{period} * \text{dist} < \text{SyncPackets pr sec}/4)$ , i.e. max 4 adjustments are made pr sec.

If **Dist** is 1 the offset is averaged over the **Period**,

If **Dist** is >1 the offset is calculated using 'min' offset.

#### **DelayFilter**

See above

#### **Filter Type**

Shows the filter type used which can be either the basic filter or an advanced filter that can be configured to use only a fraction of the packets received (i.e. the packets that have experienced the least latency).

#### **Period**

See above

#### **dist**

See above

#### **Height**

The height of the sample window measured in microseconds (only applicable to advanced

offset filter).

#### **Percentage**

The percentage of sync packets (with smallest delay) used by the offset filter (only applicable to advanced offset filter).

#### **Reset Threshold**

The threshold in micro seconds at which the offset filter will be reset and the slave clock synchronized to the master.

### **13.2.9 Servo Parameters**

The default clock servo uses a PID regulator to calculate the current clock rate. i.e.

```
clockAdjustment =  
    OffsetFromMaster/ P constant +  
    Integral(OffsetFromMaster)/ I constant +  
    Differential OffsetFromMaster)/ D constant
```

#### **Display**

If true then Offset From Master, MeanPathDelay and clockAdjustment are logged on the debug terminal.

#### **P-enable**

If true the P part of the algorithm is included

#### **I-Enable**

If true the I part of the algorithm is included

#### **D-enable**

If true the D part of the algorithm is included

#### **'P' constant**

[1..1000] see above

#### **'I' constant**

[1..10000] see above

#### **'D' constant**

[1..10000] see above

### 13.2.10 Unicast Slave Configuration

When operating in IPv4 Unicast mode, the slave is configured up to 5 master IP addresses. The slave then requests Announce messages from all the configured masters. The slave uses the BMC algorithm to select one as master clock, the slave then request Sync messages from the selected master.

**Duration**

The number of seconds a master is requested to send Announce/Sync messages. The request is repeated from the slave each Duration/4 seconds.

**ip\_address**

IPv4 Address of the Master clock

**grant**

The granted repetition period for the sync message

**CommState**

The state of the communication with the master, possible values are:

IDLE : The entry is not in use.

INIT : Announce is sent to the master (Waiting for a response).

CONN : The master has responded.

SELL : The assigned master is selected as current master.

SYNC : The master is sending Sync messages.

## PTP Clock's Configuration and Status

### Clock Type and Profile

Clock Instance	Device Type	Profile	Apply Profile Defaults
0	Ord-Bound	1588	<b>Apply</b>

### Port Enable and Configuration

Port Enable										Configuration
1	2	3	4	5	6	7	8	9	10	Ports Configuration
<input type="checkbox"/>										

### Local Clock Current Time

PTP Time	Clock Adjustment method	Synchronize to System Clock
1970-01-01T01:08:54+00:00 528,599,040	Internal Timer	<b>Synchronize to System Clock</b>

### Clock Current DataSet

stpRm	Offset From Master	Mean Path Delay
0	0.000,000,000	0.000,000,000

### Clock Parent DataSet

Parent Port ID	Port	PStat	Var	Rate	GrandMaster ID	GrandMaster Clock Quality	Pri1	Pri2
bc:9c:c5:ff:fe:10:20:a0	0	False	0	0	bc:9c:c5:ff:fe:10:20:a0	Ci:251 Ac:Unknwn Va:65535	128	128

### Clock Default DataSet

ClockId	Device Type	2 Step Flag	Ports	Clock Identity	Dom	Clock Quality		
0	Ord-Bound	False ▾	10	bc:9c:c5:ff:fe:10:20:a0	0	Ci:251	Ac:Unknwn	Va:65535
Pri1	Pri2	Protocol		One-Way	VLAN Tag Enable	VID	PCP	DSCP
128	128	Ethernet	▼	False ▾	False ▾	1	0 ▾	0

### Clock Time Properties DataSet

UtcOffset	Valid	leap59	leap61	Time Trac	Freq Trac	ptp Time Scale	Time Source
0	False ▾	False ▾	False ▾	False ▾	False ▾	True ▾	160

### Filter Parameters

Filter Type	Delay Filter	Period	Dist
Basic ▾	6	1	2

### Servo Parameters

Display	P-enable	I-enable	D-enable	'P' constant	'I' constant	'D' constant
False ▾	True ▾	True ▾	True ▾	3	80	40

### Unicast Slave Configuration

Index	Duration	ip_address	grant	CommState
0	100	0.0.0.0	0	IDLE
1	100	0.0.0.0	0	IDLE
2	100	0.0.0.0	0	IDLE
3	100	0.0.0.0	0	IDLE
4	100	0.0.0.0	0	IDLE

**Save** **Reset**

## 13.3 PTP Clock's Port Configuration

The port data set is defined in the IEEE 1588 Standard. It holds three groups of data: the static members, the dynamic members, and configurable members which can be set here.

### Port

Static member port Identity : Port number [1..max port no]

### Stat

Dynamic member portState: Current state of the port.

### MDR

Dynamic member log Min Delay Req Interval: The delay request interval announced by the master.

### Peer Mean Path Del

The path delay measured by the port in P2P mode. In E2E mode this value is 0.

**Anv**

The interval for issuing announce messages in master state. Range is -3 to 4.

**ATo**

The timeout for receiving announce messages on the port. Range is 1 to 10.

**Syv**

The interval for issuing sync messages in master. Range is -7 to 4.

**Dlm**

Configurable member delayMechanism: The delay mechanism used for the port:

e2e End to end delay measurement

p2p Peer to peer delay measurement.

Can be defined per port in an Ordinary/Boundary clock.

In a transparent clock all ports use the same delay mechanism, determined by the clock type.

**MPR**

The interval for issuing Delay\_Req messages for the port in E2e mode. This value is announced from the master to the slave in an announce message. The value is reflected in the MDR field in the Slave

The interval for issuing Pdelay\_Req messages for the port in P2P mode

Note: The interpretation of this parameter has changed from release 2.40. In earlier versions the value was interpreted relative to the Sync interval, this was a violation of the standard, so now the value is interpreted as an interval. I.e. MPR=0 => 1 Delay\_Req pr sec, independent of the Sync rate.

Range is -7 to 5.

**Delay Asymmetry**

If the transmission delay for a link in not symmetric, the asymmetry can be configured here, see IEEE 1588 Section 7.4.2 Communication path asymmetry

Range is -100000 to 100000.

**Version**

The current implementation only supports PTP version 2

**Ingress latency**

Ingress latency measured in ns, as defined in IEEE 1588 Section 7.3.4.2.

Range is -100000 to 100000.

### Egress Latency

Egress latency measured in ns, as defined in IEEE 1588 Section 7.3.4.2.

Range is -100000 to 100000.

#### PTP Clock's Port Data Set Configuration

Port	Stat	MDR	PeerMeanPathDel	Anv	ATo	Syv	Dim	MPR	Delay Asymmetry	Ingress Latency	Egress Latency	Version
4	dsbl	3	0.000,000,000	0	3	0	e2e ▾	0	0	0	0	2
5	dsbl	3	0.000,000,000	0	3	0	e2e ▾	0	0	0	0	2

**Save** **Reset**

## 14 SyncE

### 14.1 SyncE Configuration

#### 14.1.1 Clock Source Nomination and State

For each possible clock source the following can be configured.

##### Clock Source

This is the instance number of the clock source. This has to be referenced when selecting 'Manual' Mode

##### Nominated

When a clock source is nominated, the clock output from the related PHY (Port) is enabled against the clock controller. This makes it available as a possible source in the clock selection process. If it is supported by the actual HW configuration, The Station clock input can be nominated as a Clock Source.

##### Port

In this drop down box, the ports that are possible to select for this clock source, is presented. The PCB104 Sync module supports 10MHz station clock input. The station clock input is indicated by a port name = 'S-CLK'. The serval1 has a limitation that chip port 1 cannot be nominated as source 1. On the Vitesse boards this is port 7 (interface gi 1/7).

Serval2 NID board limitations: Port 5-12 can be configured for 100M, 1G or 2.5G speed. In 2.5G speed mode the SyncE hardware is not able to lock, because the recovered clock output frequency does not match the SyncE hardware's frequency options.

##### Priority

The priority for this clock source. Lowest number (0) is the highest priority. If two clock sources has the same priority, the lowest clock source number gets the highest priority in the clock selection process.

##### SSM Overwrite

A selectable clock source Quality Level (QL) to overwrite any QL received in a SSM. If QL is not Received in a SSM (SSM is not enabled on this port), the SSM Overwrite QL is used as if received. The SSM Overwrite can be set to QL\_NONE, indicating that the clock source is without any know quality (Lowest compared to clock source with known quality)

##### Hold Off

The Hold Off timer value. Active loss of clock Source will be delayed the selected amount of time. The clock selector will not change clock source if the loss of clock condition is cleared within this time

### **ANEG Mode**

This is relevant for 1000BaseT ports only. In order to recover clock from port it must be negotiated to 'Slave' mode. In order to distribute clock the port must be negotiated to 'Master' mode.

This different ANEG modes can be activated on a Clock Source port:

**Prefer Slave:** The Port will be negotiated to 'Slave' mode if possible.

**Prefer Master:** The Port will be negotiated to 'Master' mode if possible.

**Forced Slave:** The Port will be forced to 'Slave' mode.

The selected port in 'Locked' state will always be negotiated to 'Slave' if possible.

### **LOCS**

Signal is lost on this clock source.

### **SSM**

If SSM is enabled and not received properly. Type of SSM fail will be indicated in the 'Rx SSM' field.

### **WTR**

Wait To Restore timer is active.

### **Clear WTR**

Clears the WTR timer and makes this clock source available to the clock selection process.

## **14.1.2 Clock Selection Mode and State**

The Clock Selector is only in one instance - the one who selects between the nominated clock sources.

### **Mode**

The definition of the 'best' clock source is firstly the one with the highest (QL) and secondly (the ones with equal QL) the highest priority.

Clock Selector can be in different modes:

**Manual:** Clock selector will select the clock source stated in Source (see below). If this manually selected clock source is failing, the clock selector will go into holdover state.

**Manual To Selected:** Same as Manual mode where the pt. selected clock source will become Source.

**Auto NonRevertive:** Clock Selection of the best clock source is only done when the selected clock fails.

**Auto Revertive:** Clock Selection of the best clock source is constantly done.

**Force Hold Over:** Clock Selector is forced to Hold Over State.

**Force Free Run:** Clock Selector is forced to Free Run State.

### **Source**

Only relevant if Manual mode is selected (see above).

### **WTR Time**

WTR is the Wait To Restore timer value in minutes. The WTR time is activated on the falling edge of a clock source failure (in Revertive mode). This means that the clock source is first available for clock selection after WTR Time (can be cleared).

### **SSM Hold Over**

This is the transmitted SSM QL value when clock selector is in Hold Over State.

### **SSM Free Run**

This is the transmitted SSM QL value when clock selector is in Free Run State.

### **EEC Option**

The ZL30xxx based Sync modules support both EEC1 and EEC2 option. The difference is:  
EEC1=> DPLL bandwidth=3,5 Hz, EEC2=> DPLL bandwidth = 0,1 Hz.

### **State**

This is indicating the state of the clock selector. Possible states are:.

**Free Run:** There is no external clock sources to lock to (unlocked state). The Clock Selector has never been locked to a clock source long enough to calculate the hold over frequency offset to local oscillator. The frequency of this node is the frequency of the local oscillator.

**Hold Over:** There is no external clock sources to lock to (unlocked state). The Clock Selector has calculate the holdover frequency offset to local oscillator. The frequency of this node is hold to the frequency of the clock source previous locked to.

**Locked:** Clock selector is locked to the clock source indicated (See next).

**Top:** Clock selector is locked to Time over packets, e.g. PTP (See next).

### **Clock Source**

The clock source locked to when clock selector is in locked state.

### **LOL**

Clock selector has raised the Los Of Lock alarm.

**DHOLD**

Clock selector has not yet calculated the holdover frequency offset to local oscillator. This becomes active for about 10 s. when a new clock source is selected

### 14.1.3 Station Clock Configuration

The Sync module may have a Station clock input and/or a Station clock output.

**Clock input frequency**

If supported by the Sync HW, the station clock input frequency can be configured, the possible frequencies are:

1,544 MHz, 2,048 MHz or 10 MHz

**Clock Output frequency**

If supported by the Sync HW, the station clock output frequency can be configured, the possible frequencies are:

1,544 MHz, 2,048 MHz or 10 MHz

### 14.1.4 SyncE Ports

For each possible port on switch.

**Port**

The port number to configure.

**SSM Enable**

Enable and disable of SSM functionality on this port.

**Tx SSM**

Monitoring of the transmitted SSM QL on this port. Transmitted QL should be the Quality Level of the clock generated by this node. This means the QL of the clock source this node is locked to

**Rx SSM**

Monitoring of the received SSM QL on this port. If link is down on port, QL\_LINK is indicated. If no SSM is received, QL\_FAIL is indicated

**1000BaseT Mode**

If PHY is in 1000BaseT Mode then this is monitoring the master/slave mode. In order to receive clock on a port, it has to be in slave mode. In order to transmit clock on a port, it has to be in master mode.

## SyncE Ports

Port	SSM Enable	Tx SSM	Rx SSM	1000BaseT Mode
1	<input type="checkbox"/>			Master
2	<input type="checkbox"/>			Master
3	<input type="checkbox"/>			Master
4	<input type="checkbox"/>			Master
5	<input type="checkbox"/>			Master
6	<input type="checkbox"/>			Master
7	<input type="checkbox"/>			Master
8	<input type="checkbox"/>			Master
9	<input type="checkbox"/>			Master
10	<input type="checkbox"/>			Master

## PTP Ports (8265.1)

Instance	Rx SSM	PTSF
0	QL FAIL	LossAnn
1	QL FAIL	LossAnn
2	QL FAIL	LossAnn
3	QL FAIL	LossAnn

### SyncE Configuration

#### Clock Source Nomination and State

Clock Source	Nominated	Port	Priority	SSM Overwrite	Hold Off	ANEG mode	LOCS	SSM	WTR	Clear WTR
1	<input type="checkbox"/>	1	0	QL NONE	Disabled	None				none
2	<input type="checkbox"/>	1	0	QL NONE	Disabled	None				none

#### Clock Selection Mode and State

Mode	Source	WTR Time	SSM Hold Over	SSM Free Run	EEC Option	State	Clock Source	LOL	DHOLD
Auto Revertive	1	5M	QL NONE	QL NONE	None	Free Run			

#### Station Clock Configuration

Clock input frequency	Clock output frequency
Disabled	Disabled

**Save**

**Reset**