4.49 ISA- Ethernet switch (ES4-8FE)

The board ISA-ES4-8FE mainly works as a LAN switching and as gateway from the Ethernet traffic towards the SDH network.
In particular it provides the service of connecting two LANs and can be applied mainly in three scenario:

[1] Point to point application where a point to point connection is set-up between two routers or switches through an SDH network.

[2] Ring application where local interfaces add/drop Ethernet traffic on a ring of virtual concatenated paths in the SDH network.

[3] HUB application where several switches or routers convey traffic towards a single machine (for example POP router)

The connections to the Ethernet network are accomplished by means of 8 local 10/100 Base T ethernet interfaces located on the front of the board, and 16 ethernet over SDH interfaces through back-panel which has a 622 Mbit/s equivalent throughput.
The front panel hosts also one Small Form factor Pluggable module supporting a Gigabit Ethernet interface, the ninth local interface.

The SDH container used for Ethernet data transportation are VC-4, VC4XV (only when Gbit Ethernet interface will be managed) VC-3, VC-12, VC3XV and VC12XV.

The main functions implemented on the board are the following:

[1] Ethernet Physical interface

[2] Ethernet Switch module

[3] Ethernet Mapper (GFP/LAPS)

[4] SDH interfacing to Back Panel (TTF and LVC)

[5] Local Microprocessor

[6] RIBUS interface

[7] Power supply

[1] **Ethernet Physical interface**

This block supports the eight 10/100 Mbit/s ports. The 10/100 Mbit/s Ethernet MAC block is IEEE 802.3, 802.3x and 802.3ac compliant and supports Full Duplex only for 10/100 Mbit/s Ethernet MAC (MAC implements the IEEE 802.3 MAC Control layer and PAUSE operation for flow control) mode of operation; autonegotiation is also supported.

[2] **Ethernet Switch module**

In ISA ES4-8FE board, 25 ports are used, in which 8 of them for 100BASE-T line side interface, one for 1000Base SX, LX, ZX while other 16 for SDH mapper.

The basic functions supported are following listed:

- MAC based forwarding and autolearning
- VLAN based forwarding
- 802.1Q VLAN add/remove/swap
- Stacked VLAN (802.1Q format) add/remove/swap
- Multicast/Broadcast
- 802.3x flow control
- 802.1Q Priority bits management for queuing, WFQ scheduling
- Policing and bandwidth allocation

[3] **Ethernet Mapping over SDH (GFP/LAPS)**

Ethernet packets are encapsulated and mapped into SDH frames for transmission. Ethernet mapper supports 16 independent channels for EOS (Ethernet Over SDH) encapsulation.

Each channel can be mapped with multi SDH containers with appropriate bandwidth, such as VC12, VC12XV, VC3, VC3XV, VC4 or VC4XV (with local Gb Ethernet interface)

Both high order and low order concatenation are supported, moreover, virtual concatenation with LCAS (Link Capacity Adjustment Scheme) provides customer with powerful dynamic bandwidth adjustment scheme to fit various needs.

Basic feature list as follows:

- Multi encapsulation mode supported:
  - GFP Generic Framing Procedure (ITU-T G.7041)
  - LAPS Link Access Procedure SDH (ITU-T X.86/X.85)
  - BCP PPP Bridge Control Protocol (RFC 1662/2878)
- Low order/High order Contiguous and Virtual Concatenation supported
- XV Container supported:
  According to the port configuration two different operation mode are available for ISA ES-4-8FE as explained in the table below:

XV type	XV container supported	
	SMII operating mode	GMII operating mode
VC12-xv	(x = 1 to 50)	(x = 1 to 63)
VC3-xv	(x = 1 to 2)	(x = 1 to 12)
VC4-xv	(x = 1)	(x = 1 to 4)

  The choice between SMII or GMII operation is made via Craft Terminal.
- Differential delay compensation = 48 ms

[5] **SDH interfacing with Back Panel (TTF and LVC)**

The TTF block is connected to the two central boards (MATRIXN) through 1 +1 links @622 Mbit/s in LVDS.

TTF (Transport Terminal Function) block provides SDH termination for Regenerator Section and Multiplex Section.

The LVC block is connected both to the HPC matrices and to the LPC matrices on the MATRIXN card through couple of 1+1 links @ 622 MBit/s working in protection, LVDS format, STM-4 equivalent capacity.

LVC circuits perform the HOA function (Higher Order Assembler) and the Lower Order functions LTCM or LTCT sink, LPOM or LSUT sink, LSUT source and LTC source up to 4 STM1 equivalent.

[6] **Local Microprocessor**

It controls and supports the Ethernet functionalities (Ethernet Physical Interface, Ethernet Switch Module and Ethernet Mapper): configuration, alarms and states collections, performances monitoring, communications with the OS (SNMP).
The microprocessor is provided with relevant devices SDRAM (for data memory), Flash EPROM (for program memory) and Compact Flash.
External Shelf Controller (SC) controls SDH related circuits by ISPB bus.

[7] **RIBUS interface**

This block is used to read/write from/to the "RIBUS" serial stream (SPI: serial peripheral inventory), to control the LED on the unit, to release the Management-bus in case of power failure, and to use the remote inventory. RIBUS I/F is powered by the + 3.3 VS supplied by the rear access panel.

The following information/alarms coming from the boards are collected and sent to EQUICO:

– Card type and slot identification

– Alim alarm: it arises in case of card power failure

– ISPB control: it disables the card access to the ISPB bus in case of board power failure or incase of generic board failure.

– LED control: it commands the on/off status of the green/red INT LED present on each card.

Moreover the component permits to read/write the remote inventory.

[8] **Power supply**

This block converts the 48/60 V power supply, to obtain the voltages used to supply all the components in the board.

Ethernet card internally uses five different power voltages.

The following voltages are needed: +3.3V, +2.5V, +1.8V, +1.5V, +3.3VS.

The other functions implemented on the board are:

- **REMOTE INVENTORY**
  It is the memory containing the board information, for identification purposes (see para. 3.19 on page 347 for details).

- **M-BUS Driver**
  It drives the input-output gates of the Management-bus (ISPB: intra-shelf parallel bus). These drivers can be disabled (by the Bus-OFF signal) in case of power failure.

  DC/DC CONVERTERS

- **LEDS and Push-buttons**
  The board presents, on its front panel, one LED, the meaning of which is reported in Figure 39. on page 100.
  A push-button for the microprocessor restart is present on the front of the unit.

Figure 307. ISA ES4-8FE block diagram