![KEYMILE]

User Manual

COGE5, COGE5-F
co5ne_r2b, co5un_r2b

Control, 10 Gb Ethernet switch, uplinks, sync

XMC20

Content

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1 Preface

1.1 Precautions and Safety

Before you handle any equipment you must comply with the safety advices.

Adherence to the safety instructions ensures compliance with the safety requirements as defined in EN 60950 (Safety of Information Technology Equipment).

Please refer to the following document:

[202] Safety Instructions "Precautions and safety".

1.2 Symbols and Notations

This User Manual uses the following symbols:

CAUTION **Non-observance could result in minor or moderate injury.**
Failing to comply with this may result in the injury of the user or in physical damage.
→ Possible actions are given.

Risk of operating trouble!
Indicates that an action may lead to operating trouble or loss of data.
→ Possible actions are given.

Please note:
Shows significant information.
→ Possible actions are given.

1.3 Interfaces and Circuit Categories

Table 1: **Electrical interfaces and circuit categories**

COGE5 interface	Circuit category according to EN 60950-1	Max. rating	
		Voltage	Current
Local power supply	TNV2	< 72 V_{DC}	< 1.25 A
Electrical Gigabit or Fast Ethernet	SELV	< 3 V	< 10 mA
Synchronization	SELV	< 3 V	< 10 mA

Table 2: **Optical interfaces [a]**

COGE5 interface	Parameter	Max. rating	
			Remarks
Optical Gigabit and 10 Gigabit Ethernet	Laser class (according to EN 60825-1)	1 [b]	
	Optical transmitted power [c]	- 7 dBm	
	Transmitted wavelength	850 nm, 1310 nm, 1550 nm	non-visible radiation

a. The listed optical properties are related to the SFPs plugged in the COGE5 unit.
b. As the laser protection class 1 is complied, dangerous radiation cannot be emitted. Thus, special precautions for failures or laser warnings are not necessary.
c. Optical transmitted power, modulation and wavelengths are typical values for SFP/SFP+ modules, however these values may vary depending on SFP/SFP+ types and manufacturers.
Please refer to SFP/SFP+ manufacturers data sheets for more details.

1.4 Document History

Table 3: Document history

KEYMILE PEC		Date	XMC20 release	Changes since previous version
LZTBU 372 144/3	RA	November 2015	R6B	Support of rate limiters on Ethernet ports. RSTP and MSTP no longer supported.
LZTBU 372 144/2	RA	March 2015	R6A	New PTP feature. Support of MPLS-TP. Quality level mapping tables for synchronous Ethernet ports.
LZTBU 372 144/1	RA	February 2015	R4C	First revision for the XMC20 system release R4C

1.5 Target audience

This User Manual is targeted at persons who are entrusted with the installation, provisioning, operation and administration of the system.

The persons targeted are

- the installation personnel, and/or
- the provisioning personnel, and/or
- the operation and administration personnel

Please note:

Only trained and skilled personnel (maintenance staff as per EN 60950) may install and maintain the system.

1.6 Definition of Terms

Table 4: Specific terms

Term	Explanation
COGE5	The COGE5 is the one slot wide core and control unit of the XMC25, the XMC23 and the XMC22. It must be operated in an actively cooled XMC20 subrack. In this user guide, the term COGE5 is used to name the COGE5 and COGE5-F. Where certain features or characteristics apply to the COGE5-F only, the COGE5-F is named explicitly.
COGE5-F	The COGE5-F is the two slot wide core and control unit of the XMC25, the XMC23 and the XMC22. COGE5-F is functionally identical to the COGE5 unit, but can be operated in XMC20 subracks with passive cooling.

2 Introduction

2.1 General

This document describes the architecture and functions of the COGE5 and COGE5-F units and shows, how these units are commissioned and operated as part of the XMC20.

This document is restricted to the unit related aspects. Network element related functions are described in the following documents:

- [302] User Guide "XMC25/XMC23/XMC22":
  Generic network element related functions as e.g. time of day management or temperature supervision.
- [354] Quick Guide "ECST":
  XMC20 element manager (ECST) installation and connection functions.
- [355] User Manual "ECST":
  XMC20 element manager (ECST) description.
- [323] User Guide "Management Communication":
  XMC20 management access, routing and security related functions.
- [356] User Manual "Ethernet Switching":
  XMC20 Switch architecture, VLAN switching related functions and layer 2 protocols.
- [358] User Manual "MPLS-TP":
  XMC20 MPLS-TP Transport application, Label Edge Router and Label Switch Router functions.
- [314] User Guide "TDM Services and Cross Connections in XMC20".
  XMC20 TDM traffic architecture and functions for PDH and SDH.

The COGE5 is the 1 slot wide core and control unit for the multiservice access nodes XMC25, XMC23 and XMC22, that must be operated in actively cooled subracks. The COGE5-F is a 2 slot wide functional equivalent to the COGE5 unit that can be operated in passively cooled subracks.

The COGE5 and COGE5-F units combine the typical management functions of a core unit like embedded software distribution, system alarming, performance monitoring, etc., with an Ethernet switch including VLAN and MPLS-TP functionality.

The COGE5 and COGE5-F units provide several interface types in the front panel like SFP/SFP+ cages for backhaul connectivity, electrical GbE as for subtending XMC20 systems or co-located Ethernet equipment, electrical FE for management purposes and micro D-Sub 9 for synchronization.
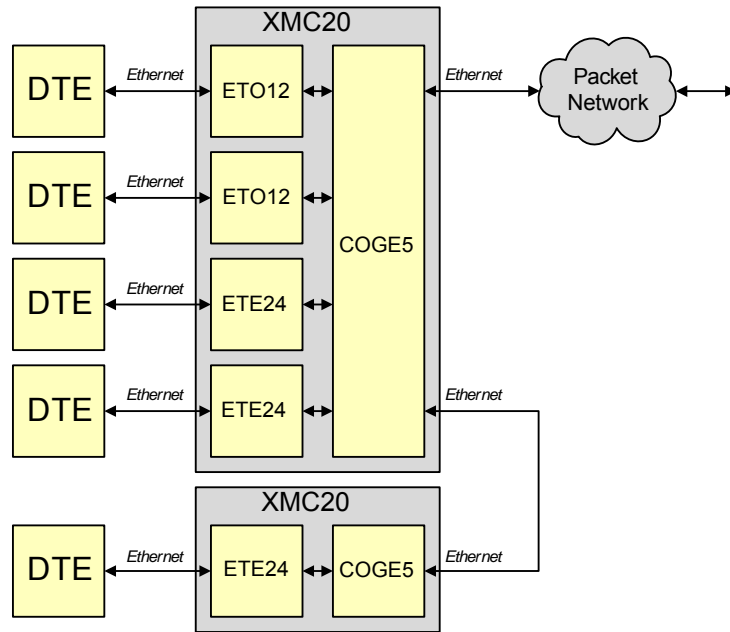
Figure 1: COGE5 unit application with a subtending XMC20

The network elements XMC25, XMC23 and XMC22 permit full redundancy of the control unit and its traffic interfaces when operated in slot 11 by inserting and configuring a second control unit in slot 13.

The details described in this document base on a specific COGE5 or COGE5-F embedded software (ESW) version. For more details about the ESW version required for the described functionality, please refer to [012] Release Note "XMC20 System Release R6B".

2.2 Unit View

Figure 2:   COGE5 (left) and COGE5-F (right) unit view

Figure 2 "COGE5 (left) and COGE5-F (right) unit view" shows the COGE5 and COGE5-F units with their front panels and interfaces. On the front plate are four LEDs for unit- and traffic status indication.

CAUTION **Non-observance could result in minor or moderate injury.**

The front of the COGE5-F can become hot.

→ Do not touch the front cover.

2.3 Block Diagram

The figure below shows the functional block diagram of the COGE5 unit. For more information regarding these functions, please refer to section 5 Functional Description (on page 31).
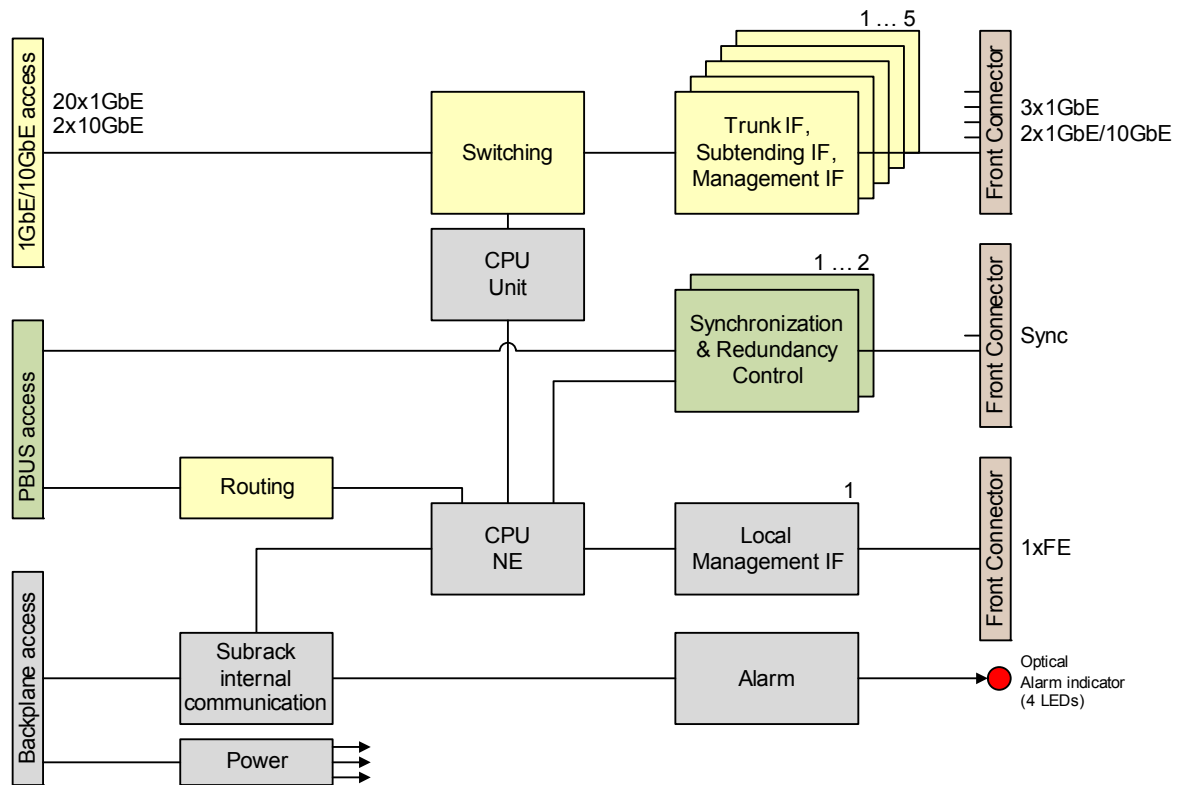
Figure 3: Block diagram of COGE5

3 Specification

The COGE5 unit uses the following feature licences, provides the functions listed below and conforms to the corresponding standards and recommendations (conformance to applicable parts of the standards).

3.1 Feature Licences

This unit is subject to one or several feature licences. The following licences are available for this unit.

Table 5: **Feature Licences relevant for this unit**

Licence ID	Short Description	Description
FL_SyncE	Lic COGE5 SyncE	Feature Licence for Synchronous Ethernet functionality for COGE5 - right to use per card
FL_1588v2	Lic COGE5 1588v2	Feature Licence for IEEE 1588v2 functionality for COGE5 - right to use per card
FL_MPLS	Lic for MPLS	System License for Multi-Protocol Label Switching (MPLS) - right to use per chassis with COGE5

For more information on feature licences please refer to [012] Release Note "XMC20 System Release R6B" and to [915] Technical Bulletin "Feature Licences for XMC20".

3.2 COGE5 Function Overview

The COGE5 unit provides the following functions and supports the following standards:

Table 6:   COGE5 Function Overview - system features

Feature	Rating or standard	Release
Central management point for the XMC25 network element		r1a
Central management point for the XMC23 network element		r1a
Central management point for the XMC22 network element		r1a
Embedded software download		r1a
Alarm collection and notification		r1a
Syslog, sources and destinations	RFC 5424	r1a
External alarm interfacing via backplane and management		r1a
Unit configuration delivery		r1a
Synchronization interface inputs - Frequency - Connector type - Impedance - Galvanic isolation	2 2.048 MHz Micro D-Sub 120 Ω according to ITU-T G.703 or high impedance (1.6 kΩ) yes, 1500 V_{RMS}	r1a
Synchronization interface outputs - Frequency - Connector type - Impedance - Galvanic isolation	2 2'048 kHz Micro D-Sub 120 Ω according to ITU-T G.703 (active) high impedance (squelched or inactive) yes, 1500 V_{RMS}	r1a
SFP modules	INF-8074 (12th May 2001), Specification for SFP (Small Form factor Pluggable) Transceiver	r1a
SFP+ modules	SFF-8431 (6th July 2009), Specifications for Enhanced Small Form Factor Pluggable Module SFP+	r1a
SFP DDM (Digital Diagnostic & Monitoring) SFP+ DDM (Digital Diagnostic & Monitoring)		r1a
COGE5 unit redundancy - Switchover time	Supported refer to [201] System Description "XMC20 R6B"	r1d
Synchronous Ethernet	ITU-T G.8262/Y.1362 (07/2010) Timing characteristics of a synchronous Ethernet equipment slave clock (option 1) ITU-T G.8264/Y.1364 (10/2008) Distribution of timing information through packet networks	r1e
Synchronous Ethernet ports	- 2 optical GbE ports - 3 electrical GbE ports	r1e

Table 6:   COGE5 Function Overview - system features (continued)

Feature	Rating or standard	Release
Precision Time Protocol (PTP)	IEEE Std 1588-2008 (07/2008) IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems	r2a
PTP ports	- 2 optical 10GbE ports - 3 GbE ports	r2a
PETS timing sources	- 2 optical Gigabit Ethernet ports - 2 (of the 3) electrical Gigabit Ethernet ports	r1e

Table 7:   COGE5 Function Overview - management interfaces

Feature	Rating or standard	Release
Electrical Gigabit Ethernet ports: - Number of ports - Connector type - Impedance	10BASE-T, 100BASE-TX, 1000BASE-T 3 RJ45 100 ± 15 Ω, frequency band 1 … 16 MHz	r1a
Optical Gigabit Ethernet ports: - Number of ports - Connector type (1000BASE-xx) - Connector type (10GBASE-xx)	1000BASE-xx [a] 10GBASE-xx [a] 2 SFP, complying with [INF-8074] specification SFP+, complying with [SFF-8431] specification	r1a
Local management port: - Number of ports - Connector type - Impedance	10BASE-T, 100BASE-TX 1 RJ-45 100 ± 15 Ω, frequency band 1 … 16 MHz	r1a
Remote authentication via RADIUS server		r1a
Routing	Static routing OSPF	r1a
- Number of bridge interfaces	1	r1a
- Number of TDM interfaces	16	r1a
- Capacity of the TDM interfaces	up to 2 Mbit/s per interface (P12 or P0_nc) up to 16 Mbit/s total	r1a
- Number of MPLS interfaces	10	r2a

a. The recommended SFP+ and SFP module types are listed in the KEYMILE Technical Bulletin "Supported SFP Transceivers". Please refer to section 4.4.2 SFP+ 10GbE optical Modules and Cables (on page 25) and section 4.4.3 SFP GbE optical Modules and Cables (on page 26).

Table 8:   COGE5 Function Overview - Ethernet switching

Feature	Rating or standard	Release
Gigabit Ethernet switching	IEEE 802.3-2008, CSMA/CD access method and physical specifications IEEE 802.3z-1998, Gigabit Ethernet	r1a
Electrical Gigabit Ethernet ports: - Number of ports - Connector type - Impedance	10BASE-T, 100BASE-TX, 1000BASE-T 3 RJ45 100 ± 15 Ω, frequency band 1 … 16 MHz	r1a

Table 8:   COGE5 Function Overview - Ethernet switching (continued)

Feature	Rating or standard	Release
Optical Gigabit Ethernet ports: - Number of ports - Connector type (1000BASE-xx) - Connector type (10GBASE-xx)	1000BASE-xx [a] 10GBASE-xx [a] 2 SFP, complying with [INF-8074] specification SFP+, complying with [SFF-8431] specification	r1a
VLAN support	IEEE 802.1Q-1998, Virtual bridged Local Area Networks Port VLAN	r1a
VLAN QoS with Class of Service	IEEE 802.1p, Traffic Class Expediting and Dynamic Multicast Filtering (in 802.1D-1998)	r1a
MPLS-TP support	IETF RFC 5921 (07/2010) A Framework for MPLS in Transport Networks	r2a
QoS Priority scheduler, - Strict priority - Shaped Deficit Weighted Round Robin		r1a

a. The recommended SFP+ and SFP module types are listed in the KEYMILE Technical Bulletin "Supported SFP Transceivers". Please refer to section 4.4.2 SFP+ 10GbE optical Modules and Cables (on page 25) and section 4.4.3 SFP GbE optical Modules and Cables (on page 26).

Table 9:   COGE5 Function Overview - fault management

Feature	Rating or standard	Release
Fault management	ITU-T X.733, Alarm Reporting	r1a

Table 10:   COGE5 Function Overview - equipment features

Feature	Rating or standard	Release

Power consumption [a]
- Power supply range V_{BAT}
- Current consumption (typical with max. traffic load)
  at V_{BAT} = -48V_{DC}
- Maximum total power requirements from battery,
  at V_{BAT} = nominal voltage
	refer to [201] System Description "XMC20 R6B"
	
	0.62 A
	
	30 W
		r1a

Mechanical parameters - Construction practice - Height of the unit (1 HU = 44.45mm) - Width of the unit (1 TE = 5.08mm) - Size of the PCB (H x D) - Weight of the COGE5 unit	19 inches 6 HU 4 TE (1 slot) 233 mm x 220 mm 434 g	r1a
Unit cooling	Operation with fan unit (active ventilation	r1a
Reliability - Calculated MTTF at 35 °C (MIL-HDBK-217F)	46 years	r1a

a. The given power consumption figures are without SFP/SFP+ modules. The power consumption of an SFP/SFP+ module is up to around 1.5 W. Please refer to the SFP/SFP+ modules data sheet for the exact power consumption value.

Table 11:   COGE5 Function Overview - other standards

Feature	Rating or standard	Release
Emission	refer to [201] System Description "XMC20 R6B"	r1a
Immunity	refer to [201] System Description "XMC20 R6B"	r1a

Table 11:   COGE5 Function Overview - other standards (continued)

Feature	Rating or standard	Release
Safety	refer to [201] System Description "XMC20 R6B" SFP/SFP+ modules: according to the manufacturer's data sheets (typically IEC 60825-1 Class 1 laser product)	r1a
Ambient conditions	refer to [201] System Description "XMC20 R6B" Error free operation up to 60°C ambient temperature is only guaranteed with SFP/SFP+ modules specified for the industrial temperature range (up to 85°C).	r1a

3.3 COGE5-F Function Overview

The COGE5-F unit provides the same functions and supports the same standards as the COGE5 unit, with the following exceptions:

Table 12:   COGE5-F Function Overview - equipment features

Feature	Rating or standard	Release
Mechanical parameters - Width of the unit (1 TE = 5.08mm) - Weight of the COGE5-F unit	 8 TE (2 slots) 1'700 g	r1a
Unit cooling	Operation without fan unit (passive ventilation). Vertical mounting of the units is mandatory.	r1a
Reliability - Calculated MTTF at 35 °C (MIL-HDBK-217F)	 23 years	r1a

Table 13:   COGE5-F Function Overview - other standards

Feature	Rating or standard	Release
Ambient conditions	refer to [201] System Description "XMC20 R6B" Error free operation up to 55°C ambient temperature is only guaranteed with SFP/SFP+ modules specified for the industrial temperature range (up to 85°C).	r1a

3.4 Versions

For detailed information about the released COGE5 hardware (HW) and embedded software (ESW) versions supporting all the previously mentioned features, please refer to [012] Release Note "XMC20 System Release R6B".

4 Installation

4.1 Prerequisites

Before installing a COGE5 unit take care to follow the safety advice as listed in [202] Safety Instructions "Precautions and safety".

For the installation of XMC20 HW,
  refer to [301] User Guide "XMC25 Installation", or
  refer to [310] User Guide "XMC23 Installation", or
  refer to [322] User Guide "XMC22 Installation".

The required local manager (ECST) version to commission and operate the XMC20 system must be according to [012] Release Note "XMC20 System Release R6B".

Along with this ECST version, two embedded softwares (ESW) according to [012] Release Note "XMC20 System Release R6B" must be installed in the COGE5 unit:

Table 14: ESW types for the COGE5 unit

ESW name	ESW application
co5un_rxxxx	Unit control and operation
co5ne_rxxxx	Network element control and operation

Valid combinations of hardware (HW) and embedded software (ESW) versions are given in [012] Release Note "XMC20 System Release R6B".

For a description of the first ESW download and assignment to the COGE5 unit please refer to [354] Quick Guide "ECST".

For a general description of the ESW download and assignment to a COGE5 unit which is already in service please refer to [302] User Guide "XMC25/XMC23/XMC22".

For a specific description of the ESW download and assignment to a COGE5 unit which is already in service or to a redundant COGE5 unit please refer to section 7.3 Unit and Network Element ESW Download (on page 60).

For a description of how to bring the unit ESW or the network element ESW of a COGE5 unit which is already in service into the bootloader state please refer to section 7.3 Unit and Network Element ESW Download (on page 60).

4.2 Slots

For XMC20 systems with only one COGE5 unit, this unit must be placed in slot 11, as shown in Figure 4 "XMC20 subracks with core unit COGE5 in slot 11". All other slots can be equipped with service units (SU).

Please note:

The COGE5-F unit occupies slot 11 and slot 12 in the XMC20 subrack.
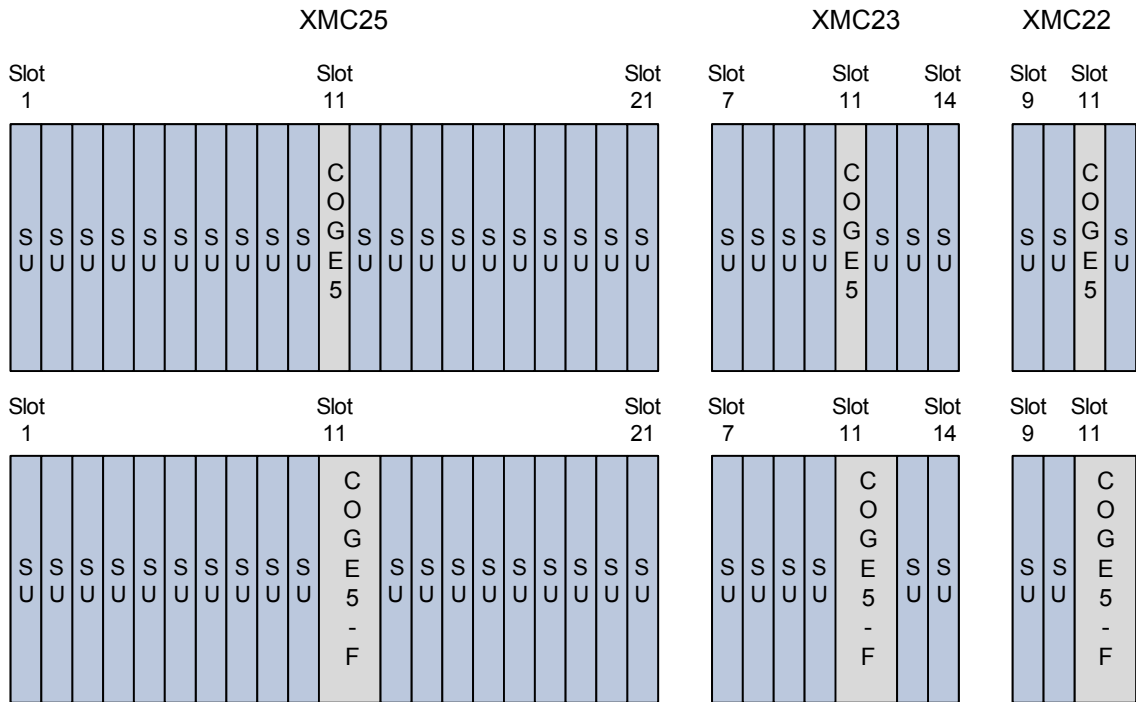
Figure 4:   XMC20 subracks with core unit COGE5 in slot 11

In systems with an additional, redundant core unit, the redundant COGE5 is placed in slot 13 as shown in Figure 5 "XMC20 subracks with core unit COGE5 in slot 11 & redundant core unit COGE5 in slot 13". All other slots can be equipped with service units (SU).

Please note:

The COGE5-F units occupy slot 11 to slot 14 in the XMC20 subrack.

Please note:

In an XMC22 subrack no redundant COGE5 unit can be plugged.
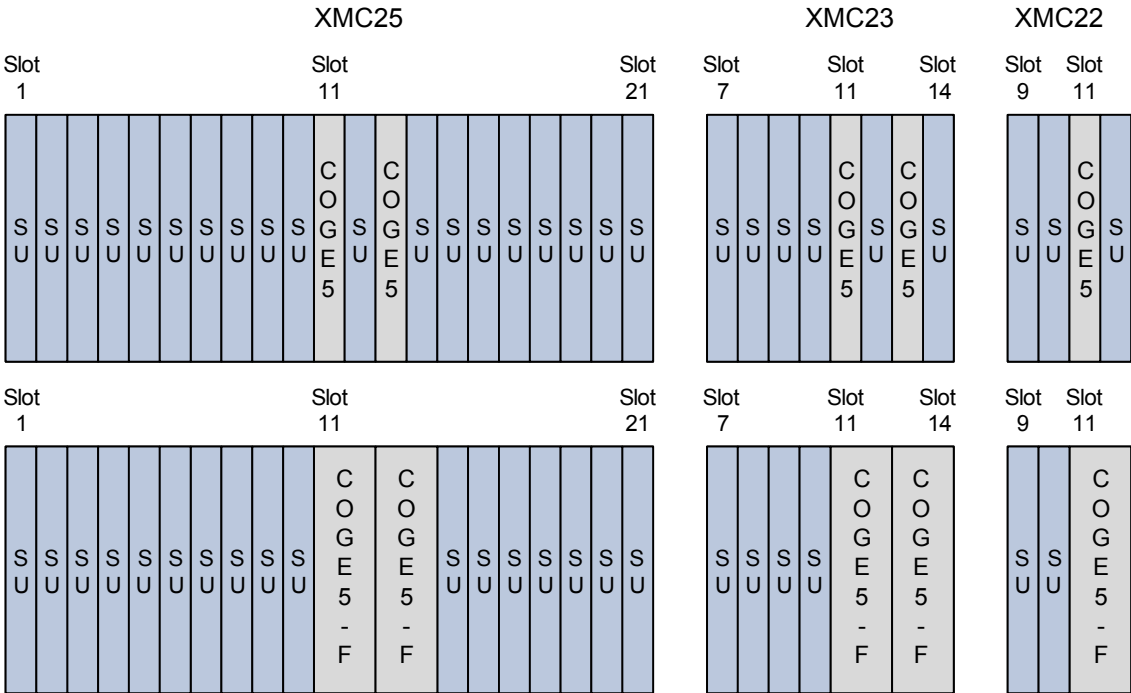
Figure 5: XMC20 subracks with core unit COGE5 in slot 11 & redundant core unit COGE5 in slot 13

4.3 Compatibility

4.3.1 XMC20 Units

COGE5 is compatible with any other XMC20 unit with an ESW release of the current XMC20 system release. Please refer to [012] Release Note "XMC20 System Release R6B".

4.3.2 Previous ESW Revisions

The COGE5 unit with ESW release co5xx_r2b is compatible to the previous XMC20 system release R6A. Please refer to [012] Release Note "XMC20 System Release R6B" for the compatible ESW releases of the core and other service units.

When upgrading to the ESW release co5xx_r2b all configuration parameters are inherited from an existing configuration. New parameters get their default values.

4.4 Connections and Cables

4.4.1 Front Connector of the COGE5 Unit

The COGE5 front panel connections are implemented as shown in Figure 6 "COGE5 (left) and COGE5-F (right) front panel and interface connectors".

Fixing screw

Pull-out handle with identification label

Optical status indications

micro-D-Sub 9-pin female connector: (synchronization interfaces)

pin 6   pin 1

pin 9   pin 5

Pin	External Synchronization		
1	Input	ESI-2	a
2	Input	ESI-1	a
3	GND		
4	Output	ESO-2	a
5	Output	ESO-1	a
6	Input	ESI-2	b
7	Input	ESI-1	b
8	Output	ESO-2	b
9	Output	ESO-1	b

RJ-45 8-contact female connector: Electrical 10/100BASE-TX interface (local management port)

port-5

RJ-45 8-contact female connectors: Electrical 10/100/1000BASE-T interfaces (traffic interfaces)

pin 1

pin 8

port-4

port-3

Pin	10BASE-T		100BASE-TX		1000BASE-T	
	MDI	MDI-X	MDI	MDI-X	MDI	MDI-X
1	TD+	RD+	Transmit +	Receive +	BI_DA+	BI_DB+
2	TD-	RD-	Transmit -	Receive -	BI_DA-	BI_DB-
3	RD+	TD+	Receive +	Transmit +	BI_DB+	BI_DA+
4					BI_DC+	BI_DD+
5					BI_DC-	BI_DD-
6	RD-	TD-	Receive -	Transmit -	BI_DB-	BI_DA-
7					BI_DD+	BI_DC+
8					BI_DD-	BI_DC-

port-2

SFP/SFP+ module cages: Optical GbE or 10GbE interfaces (traffic interfaces)

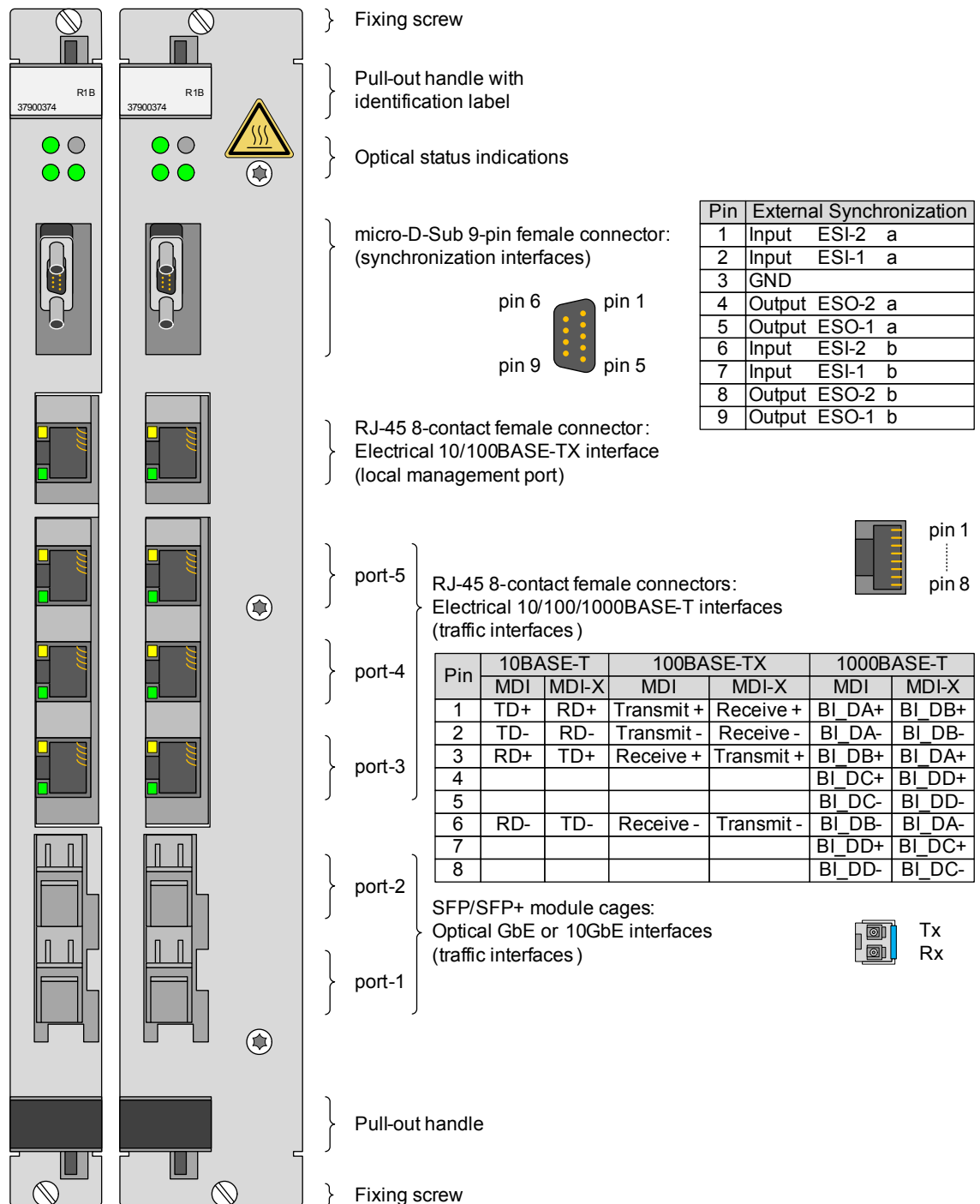Tx
Rx

port-1

Pull-out handle

Fixing screw

Figure 6:   COGE5 (left) and COGE5-F (right) front panel and interface connectors

The ⚠ symbol indicates the risk of the hot COGE5-F front cover.

The electrical Ethernet interfaces provide two LEDs indicating the link activity state and the link state:
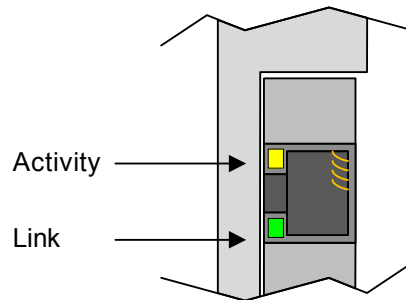

Figure 7:   Ethernet link LEDs on the electrical Ethernet interfaces

The activity LED has the following states:
- − Yellow blinking: Traffic activity.
- − Dark: No traffic.

The link LED has the following states:
- − Green: 10/100/1000 Mbit/s link up.
- − Dark: Link down.

4.4.2   SFP+ 10GbE optical Modules and Cables

The 10GbE optical interfaces on COGE5 consist of two SFP+ (Small Form factor Pluggable Plus) module cages.

The COGE5 unit only provides the mechanical infrastructure for SFP+ modules: This is a cage and a host board connector. COGE5 allows hot swapping of SFP+ modules.

Please note:

SFP+ modules must be fully MSA (Multi-Source Agreement) compliant [SFF-8431]. Please note that only KEYMILE's recommended SFP+ modules should be used in order to guarantee inter-working with the COGE5 unit.

→ In order to get the latest list of KEYMILE's recommended modules please refer to the KEYMILE Extranet
(via http://www.keymile.com) → Documentation & Software → XMC20 → Techn. Documentation → Bulletins.
Then go to Technical Bulletins, and open the "Supported SFP Transceivers" document once you have logged in.

The recommended SFP+ module types are listed in the above mentioned Technical Bulletin.

The selection of the transceiver and the media type will determine the maximum distance allowed according to the transmission media specifications. For details on connectors and pins for this interface, please refer to [SFF-8431].

SFP+ DDM (Digital Diagnostic & Monitoring) is supported on the SFP+ modules that are plugged in the SFP cages of the COGE5 unit provided that the module itself is supporting this feature.

The optical 10GbE interfaces (SFP+ modules) are equipped with industry standard duplex LC connectors. Connection to other types of connectors as e.g. SC or FC-PC is possible with converter cables (optical jumpers) or via an optical distribution frame.

The 10GBASE-LR modules perform as specified with optical single mode fibres conforming to IEC 60793-2-50 (Optical fibres - Part 2-50: Product specifications - Sectional specification for class B single-mode fibres), cable types B1.1 or B1.3.

4.4.3 SFP GbE optical Modules and Cables

The GbE optical interfaces on COGE5 consist of two SFP (Small Form factor Pluggable) module cages.

The COGE5 unit only provides the mechanical infrastructure for SFP modules: This is a cage and a host board connector. COGE5 allows hot swapping of SFP modules.

Please note:

SFP modules must be fully MSA (Multi-Source Agreement) compliant [INF-8074]. Please note that only KEYMILE's recommended SFP modules should be used in order to guarantee inter-working with the COGE5 unit.

→ In order to get the latest list of KEYMILE's recommended SFP modules please refer to the KEYMILE Extranet
(via http://www.keymile.com) → Documentation & Software → XMC20 → Techn. Documentation → Bulletins.
Then go to Technical Bulletins, and open the "Supported SFP Transceivers" document once you have logged in.

The recommended SFP module types are listed in the above mentioned Technical Bulletin.

The selection of the transceiver and the media type will determine the maximum distance allowed according to the transmission media specifications. For details on connectors and pins for this interface, please refer to [INF-8074].

SFP DDM (Digital Diagnostic & Monitoring) is supported on the SFP modules that are plugged in the SFP cages of the COGE5 unit provided that the module itself is supporting this feature.

The optical 1GbE interfaces (SFP modules) are equipped with industry standard duplex LC connectors. Connection to other types of connectors as e.g. SC or FC-PC is possible with converter cables (optical jumpers) or via an optical distribution frame.

The 1000BASE-SX modules perform as specified with optical multi mode fibres conforming to IEC 60793-2-10 (Optical fibres - Part 2-10: Product specifications - Sectional specification for category A1 multi mode fibres), cable type A1a.1 (OM2), A1a.2 (OM3) or A1a.3 (OM4).

The 1000BASE-LX and -EX modules perform as specified with optical single mode fibres conforming to IEC 60793-2-50 (Optical fibres - Part 2-50: Product specifications - Sectional specification for class B single-mode fibres), cable types B1.1, B1.3, B6_a1 or B6_a2.

The 1000BASE-ZX modules perform as specified with optical single mode fibres conforming to IEC 60793-2-50, cable type B1.2.

4.4.4 Electrical Ethernet Interface Cable

COGE5 provides three electrical Ethernet traffic interfaces according to IEEE 802.3, 802.3u and 802.3ab specifications, and they support:

- 10BASE-T
- 100BASE-TX
- 1000BASE-T

COGE5 provides one electrical Ethernet local management port according to IEEE 802.3 and 802.3u specifications, and it supports:

- 10BASE-T
- 100BASE-TX

All four interfaces are presented as RJ-45 connectors with automatic crossover functionality so they may be connected to both host and switch interfaces. Therefore both, crossover and straight cables can be used.

Please note:

For error free transmission, category 5e Ethernet cables are required at least. This assumes that the equipment on the remote end also supports transmission on category 5e cables. If this is not the case, we recommend the use of category 6 cables.

Electrical 10BASE-T/100BASE-TX/1000BASE-T ports on COGE5 support auto-negotiation with parallel detection.

Auto-Negotiation allows the highest performance mode to be automatically selected on a given link.

Please note:

COGE5 Ethernet electrical interfaces are configured in auto negotiation mode by default.

Please note:

With auto negotiation switched off, a crossed cable has to be used to connect to another COGE5 since the interface cannot automatically select the mode.

The following table shows the behaviour of COGE5 when connecting an external Ethernet device:

Table 15: COGE5 mode of operation

COGE5 mode	External Equipment mode	COGE5 election
Auto negotiation	Auto negotiation	1000 Mbit/s Full Duplex
Auto negotiation	1000 Mbit/s Full Duplex	1000 Mbit/s Full Duplex
Auto negotiation	1000 Mbit/s Half Duplex	1000 Mbit/s Half Duplex
Auto negotiation	100 Mbit/s Full Duplex	100 Mbit/s Full Duplex
Auto negotiation	100 Mbit/s Half Duplex	100 Mbit/s Half Duplex
Auto negotiation	10 Mbit/s Full Duplex	10 Mbit/s Full Duplex
Auto negotiation	10 Mbit/s Half Duplex	10 Mbit/s Half Duplex

➡ **Please note:**

When connecting Ethernet ports configured in manual mode (no auto-negoti-ation) to Ethernet ports in auto-negotiation mode, the link may be up but the duplex settings may be inconsistent. This can result in poor throughput per-formance on the link.

The previous note applies to any Ethernet device and is a consequence of the behaviour of Auto-Negotiation and Parallel Detection. When a port sup-porting auto-negotiation is connected to a port not supporting auto-negotia-tion, the port supporting auto-negotiation will revert to parallel detection: This can detect the link type (10BASE-T or 100BASE-TX) but will assume **half-duplex** operation (reference IEEE 802.3 clause 28.2.3.1 note 2). If the far side port is manually configured in full-duplex mode, then there is an incon-sistent configuration and the side operating in half-duplex may experience collisions while transmitting data.

➡ **Please note:**

Ethernet cables can be ordered from KEYMILE.

For details on available Ethernet cables, please refer to [506] User Manual "XMC20 cables".

4.4.5 Synchronization Interface Cable

The synchronization interface permits to connect the following signals according to ITU-T G.703:
- two symmetrical clock inputs (2048 kHz):
  - ESI-1,
  - ESI-2.
- two symmetrical clock outputs (2048 kHz):
  - ESO-1,
  - ESO-2.

The interface is implemented on COGE5 by means of a micro D-Sub con-nector.

➡ **Please note:**

This cable can be ordered from KEYMILE.

For details on available synchronization cables, please refer to [506] User Manual "XMC20 cables".

4.4.6 Cable Fixing

In the XMC25, cables connecting to the COGE5 unit or other units in general should be guided and attached to the cable tray as indicated in Figure 8 "Side view of the subrack including cabling and cable tray". For more detailed information, please refer to [301] User Guide "XMC25 Installation".
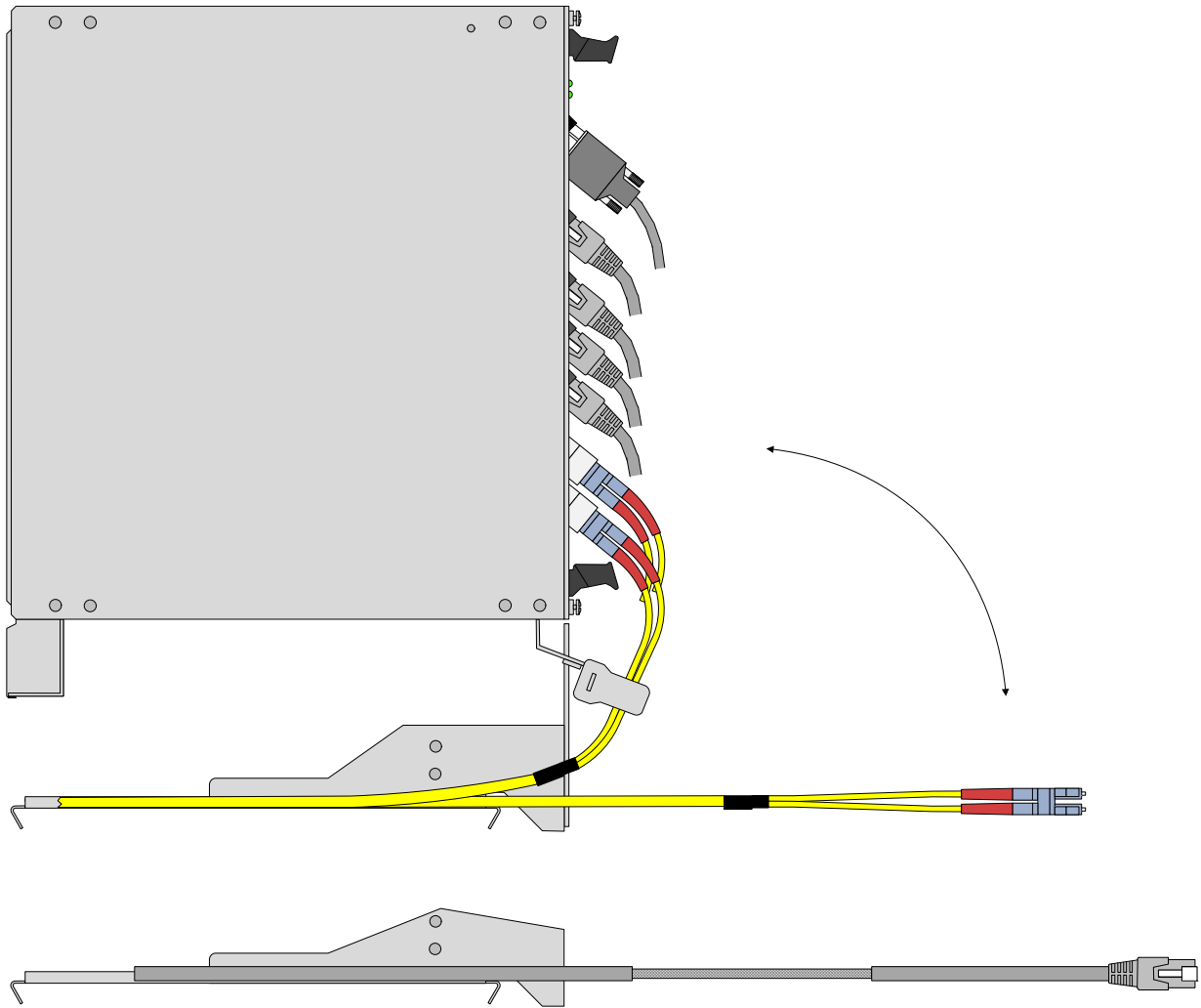
Figure 8:   Side view of the subrack including cabling and cable tray

In the XMC23 and XMC22, cables connecting to the COGE5 unit or other units should be guided and attached similarly to the way shown in Figure 8 "Side view of the subrack including cabling and cable tray" above. For more detailed information, please refer to [310] User Guide "XMC23 Installation" or refer to [322] User Guide "XMC22 Installation".

4.4.7   Cabling with COGE5 Redundancy

When using a redundant core unit in slot 13, cabling is different. Since the core unit HW is duplicated, some of the front connections have to be duplicated as well. The cables that have to be connected twice are the following:

- Ethernet cable to the local management port
  The Ethernet cables to the two COGE5 units can be connected e.g. via an Ethernet switch to the local manager. Note that the two management ports of the two COGE5 units have default IP addresses:
    − COGE5 unit in slot 11: 192.168.1.1.
    − Redundant COGE5 unit in slot 13: 192.168.1.2.
  The Ethernet local management port on the standby core unit is disabled.

The Ethernet local management port on a core unit running in the network element bootloader is enabled.

For the local management port configuration please refer to [323] User Guide "Management Communication".

- Synchronization input (ESI) interface cabling

  The ESI input is terminated with a 120 Ohm termination resistor. In case the two inputs on the working COGE5 unit and on the redundant COGE5 unit are connected in parallel, one of the two inputs should have high impedance. Refer also to section 5.2.4 Synchronization Interface (on page 38).

  The ESI inputs are supervised on the active and on the standby COGE5 unit. An alarm is raised if an ESI input is only connected to one of the two units.

- Synchronization output (ESO) interface cabling

  The ESO outputs on the active COGE5 can be active or squelched.

  The ESO outputs on the standby COGE5 are squelched.

  The impedance of an active ESO output is 120 Ohm. A squelched ESO output has high impedance. The ESO outputs of the active and standby COGE5 units can be connected in parallel.

- Ethernet cables to the traffic interfaces

  For maximum protection against failures, also electrical and optical cables from a switching or routing device to ports 1 to 5 of the COGE5 unit need to be connected to both units, the working and the standby COGE5. In this case, split horizon might be required.

5 Functional Description

This section provides a functional description of the COGE5 core unit and its interfaces. For the description of a configuration example refer to section 6 Commissioning (on page 50).

5.1 Applications

The COGE5 core unit controls the configuration and operation of the XMC20 system, maintains an updated database with relevant information for each configured unit.

The unit performs Ethernet switching between every Ethernet service unit supporting the VLAN Bridge function of the XMC20 Switch. The COGE5 front ports can alternatively be used as MPLS-TP access or uplink ports for the MPLS-TP Transport application.

The COGE5 front ports are usable as PETS timing sources, based on Synchronous Ethernet or the PTP approach.

The COGE5 core unit also provides redundancy through 1:1 equipment protection when two core units are plugged and configured. The following sections cover these aspects in more detail.

5.1.1 Hardware Control

One of the main functions of the COGE5 unit is to control the service units at hardware level. This comprises the following functions:
- Check the presence of service units
- Supervise the core unit redundancy status
- Activate/deactivate the units
- Reset the units
- Read the unit alarm status
- Read the unit inventory data
- Provide clock information
- Control signals to the redundant COGE5

5.1.2 System Management

System management is an important function that affects all units in a running system. Each unit of the NE contributes to the management functions:
- Inventory management
- Configuration management
- Status
- Fault management

• Performance management

The COGE5 core unit has some particular functions for the management of the system:

• Loading an NE system configuration and making it effective (configuration management)
• Monitoring all the unit functions, collection and classification of the failures and creation of triggers for consequent actions (fault management)
• Management communication with the outside world to allow local and remote operation and maintenance of the NE, i.e. support of all the provided management functions

NE management is a system level function and is described in [323] User Guide "Management Communication".

5.1.3 Management Traffic and Routing

The COGE5 unit provides a management router with one VLAN interface, 16 TDM interfaces and 10 MPLS interfaces. The router supports the OSPF protocol.

The management connections and the management routing functions of the XMC20 are described in [323] User Guide "Management Communication".

5.1.4 Switching

The COGE5 unit provides five external Ethernet interfaces acting as XMC20 Switch ports:

• three electrical GbE for electrical GbE, and
• two SFP/SFP+ modules for optical or electrical GbE or optical 10GbE.

Moreover, it has 20 internal ports in the backplane of 1 Gbit/s each granting access to every other unit in the subrack, connecting the Ethernet switch devices being part of the XMC20 Switch or connecting Ethernet switch devices not being part of the XMC20 Switch.

The COGE5 unit has also two internal ports of 10 Gbit/s connecting a redundant COGE5 unit.

COGE5 permits switching traffic at wire speed between all its ports.

Risk of operating trouble!

Under heavy load situations from the tributary side and when using the same VLAN priority (CoS) for all or many traffic streams, congestion might occur in upstream direction due to the limited packet buffer resources in the switching circuit.

Please note:

Management traffic coming from the COGE5 management router and entering the XMC20 Switch is per default tagged with a VLAN priority CoS4.

→ To avoid collisions of tagged management traffic with user traffic it is recommended to use other VLAN priorities for the user traffic.

The following table summarises the main features of the COGE5 switch circuit.

Table 16:   COGE5 switch features

Feature		Details
Generic	Main feature	L2 switching
	No. of ports	28
	Internal packet buffer	1.5 MB
	MAC addresses	up to 16'000 [a]
VLAN	VLAN support (802.1Q)	Yes
	VLAN no.	4089 (1-4089)
	VLAN tag stacking support (802.1Q, Q-in-Q))	Yes
	VLAN tag stacking support (802.1ad)	No [b]
	IVL (Independent VLAN Learning) [c]	Yes
MPLS-TP	Virtual Private Wire Service (VPWS)	yes
	VPWS Attachment Circuit (AC)	AC port based, AC VLAN based, AC untagged
	VPWS Pseudo Wire VLAN handling	No change, Add VLAN, Change VLAN
	Virtual Private LAN Service (VPLS)	yes
	VPLS Attachment Circuit (AC) (= Switch Virtual Interface (SVI) attached to the XMC20 Switch)	AC VLAN based
	VPLS Pseudo Wire VLAN handling	No change, Change VLAN
	MPLS tunnel roles	Transit, Initiator, Terminator
	MPLS label range	16 … 1'048'575
QoS	CoS (802.1p)	Yes
	Output queues	8
	Weighted scheduling	Yes
	Shaping support	Yes (future release)
Link functions	Split horizon	Yes

a. 16'000 is the maximum value reachable with random MAC addresses (real traffic in the field). Note that with sequential MAC addresses as they are used in stress or acceptance test scenarios the maximum value can be reduced.
b. Will be available in a future release.
c. MAC learning on a per VLAN basis.

The XMC20 Switch supporting the **VLAN Bridge** function is a VLAN aware switch. The COGE5 external Ethernet interfaces are used as bridge ports of the XMC20 Switch and support all available bridge port modes as described in the [356] User Manual "Ethernet Switching".

The XMC20 Switch supporting the **MPLS-TP Transport** function. MPLS-TP supports two services:

- Virtual Private Wire Service (**VPWS**):
  A VPWS connects the Pseudo Wire Access Circuit (PWAC) ports to the MPLS-TP uplink ports. The PWAC ports are located on Ethernet service units or on the COGE5 unit, the MPLS-TP uplink ports are the external Ethernet interfaces of the COGE5 unit.
- Virtual Private LAN Service (**VPLS**).
  A VPLS connects the Switch Virtual Interface (SVI), which is attached to the XMC20 Switch, to the MPLS-TP uplink ports. The local user ports are the Customer VLAN Ports (CVP), located on Ethernet service units or on the COGE5 unit, which are member of the SVI VLAN. The MPLS-TP uplink ports are the external Ethernet interfaces of the COGE5 unit.

The MPLS-TP Transport application is described in the [358] User Manual "MPLS-TP".

The COGE5 internal ports, connecting Ethernet switch devices being part of the XMC20 Switch, all transport VLAN tagged frames.

The COGE5 internal ports, connecting Ethernet switch devices not being part of the XMC20 Switch, are handled as an external Bridge ports or PWAC ports, i.e. they transport VLAN tagged or untagged frames.

The management functions of the COGE5 Ethernet ports are described at three different places:
- The [356] User Manual "Ethernet Switching" describes all VLAN Bridge port parameters of the Ethernet interfaces which are used as external ports of the XMC20 Switch:
  − port type,
  − port mode,
  − port VLAN ID,
  − acceptable frame types (for the general port mode only),
  − default priority,
  − ingress filtering,
  − VLAN membership,
  − trust mode.
- The [358] User Manual "MPLS-TP" describes all MPLS-TP Transport application related port parameters of the PWAC and MPLS-TP ports:
  − port type,
  − MPLS label ranges,
  − LSP labels,
  − Pseudo Wire labels,
  − VPWS service type,
  − VPLS service type,
  − SVI VLAN,
  − AC VLAN,
  − PW VLAN,
  − QoS handling.
- This User Manual describes the physical port parameters of the external and internal Ethernet interfaces:
  − MTU size,
  − flow control,
  − queue scheduling.

5.1.5 Link Protection Functions

The link protection function "MPLS-TP tunnel protection" is a feature of the MPLS-TP Transport function of the XMC20 Switch. Please refer to [358] User Manual "MPLS-TP".

5.1.6 Security Features

Security features as e.g. ingress storm control are features of the XMC20 Switch. Please refer to [201] System Description "XMC20 R6B".

5.2 Interfaces

The interfaces in the COGE5 unit can be classified as follows:
- Traffic ports (for trunking or subtending purposes)
- Management
- Synchronization
- Backplane
- External alarms

5.2.1 Traffic Ports

Traffic ports are the five Ethernet front ports of the COGE5. Traffic ports are part of the XMC20 Switch.

For the **VLAN Bridge** application the port type of traffic ports must be configured to "CVP", i.e. Customer VLAN Port. With this the ports can be configured to be
- Access ports, or
- Trunk ports, or
- Trunk with native VLAN ports, or
- General ports.

The port VLAN handling is depending of the configured port mode. Please refer to [356] User Manual "Ethernet Switching" and to [012] Release Note "XMC20 System Release R6B" for further information.

For the **MPLS-TP Transport VPWS** service the port type of traffic ports must be configured to "PWAC", i.e. Pseudo Wire Access Circuit, or to "MPLS-TP", i.e. MPLS-TP uplink port. No further port configuration is required.

Please note:

It is not possible to change the port type of a PWAC port while the port is used for a pseudo wire (VPWS).

→ Before changing the port type (e.g. to CVP) delete the pseudo wires (VPWS) that are using that port as PWAC port.

The port and pseudo wire VLAN handling is depending of the configured VPWS service type. Please refer to [358] User Manual "MPLS-TP" for further information.

For the **MPLS-TP Transport VPLS** service the port type of traffic ports must be configured to "CVP", i.e. Customer VLAN Port, or to "MPLS-TP", i.e. MPLS-TP uplink port. The CVP ports have to be configured in the ECST "Switching" view as a VLAN Bridge port. The "MPLS-TP" ports require no further configuration.

Risk of operating trouble!

CVP ports which are member of a VPLS do not support the storm control feature of the XMC20 Switch.

→ Apply a rate limiter on a CVP port which is prone to broadcast storms.

The user port (CVP) VLAN handling is depending of the configured port mode. Please refer to [356] User Manual "Ethernet Switching" for further information.

Please note:

It is not possible to change the port type of a MPLS-TP port while the port is used for a tunnel.

→ Before changing the port type (e.g. to CVP) delete the tunnels that are using that port as MPLS-TP port.

Please note:

A COGE5 unit cannot be unassigned while at least one port is configured as PWAC port and used for a pseudo wire (VPWS), or configured as MPLS-TP port and used for a tunnel.

→ Before unassigning the unit delete all pseudo wires (VPWS) and tunnels that are using any port of the unit as PWAC or MPLS-TP port.

COGE5 provides two SFP cages (port-1 and port-2) where different SFP/SFP+ modules can be inserted to satisfy network needs. Because of the wide range of available distances that can be covered with optical interfaces, the SFP/SFP+ interfaces (ports 1 and 2) are considered as network interfaces.

These interfaces support SFP+ modules with 10GBASE-xx according to their respective standards, or support SFP modules with 1000BASE-xx according to their respective standards.

For details about SFP+ modules, refer to section 4.4.2 SFP+ 10GbE optical Modules and Cables (on page 25). For details about SFP modules, refer to section 4.4.3 SFP GbE optical Modules and Cables (on page 26).

The selection of the transceiver and the media type (single mode or multi mode fibre) will determine the maximum distance allowed according to the SFP/SFP+ provider specifications.

For details on connectors and pins for this interface please refer to "SFF-8431" and to "INF-8074".

The SFP/SFP+ modules provide duplex LC connectors.

Please note:

SFP/SFP+ modules are hot swappable. This means that you can plug or remove the modules during operation of the unit.

→ KEYMILE strongly recommends however to remove the fibre before plugging or unplugging an SFP/SFP+ module.

In principle, any of the electrical or optical Ethernet front ports can be used as subtending interface, i.e. a further XMC20 network element can be connected to this port. However, electrical interfaces have a limited reach compared with the optical interfaces and are therefore normally used in subtending configurations.

The three electrical Ethernet interfaces (port-3, port-4 and port-5) support 10/100/1000BASE-T/TX according to IEEE 802.3 specifications. The interfaces are implemented by means of an RJ-45 connector with auto-negotiation. Fixed operation modes (speed, half/full duplex modes) are also available. These interfaces support automatic cross over functionality allowing straight or cross over cables to be connected.

The traffic ports support Ethernet frames bigger than 1522 bytes called jumbo frames. The maximum frame length supported is 9'216 octets (refer also to section 8.3 AP: / unit-x / port-a (on page 76)).

Any of the five traffic ports can be used for inband management communications or as a dedicated (untagged) management port by configuring the port VLAN-ID to the management VLAN-ID.

The internal ports (GbE star) connecting the service units are used in two applications:
- Connection of an Ethernet service unit participating in the XMC20 Switch. In this case the port has a fixed configuration, except the queue handling (MTU sizes and queue scheduling).
- Connection of a service unit not participating in the XMC20 Switch. In this case the internal port offers the same amount of configuration parameters as an external port, except the link speed and duplex mode.
  A service unit not participating in the XMC20 Switch can e.g. provide access to the Ethernet over PDH (EoP) or Ethernet over SDH (EoS) transport facilities.

Please note:

The switch device on the redundant COGE5 unit participates in the XMC20 Switch.

5.2.2 Management Ports

Please refer to section 5.1.3 Management Traffic and Routing (on page 32).

5.2.3 Mirror Ports

Any of the five Ethernet front ports of the COGE5 unit, and any other Ethernet port of the XMC20 Switch, can be configured to be a mirror port. In this case, frames from any other front port can be copied to this port.

For the port to be mirrored, you can select the direction, i.e. ingress frames, egress frames, or both.

For more information please refer to [302] User Guide "XMC25/XMC23/XMC22".

5.2.4 Synchronization Interface

This interface is implemented by means of a micro D-Sub connector. It provides two symmetrical clock signal inputs of 2.048 MHz with an impedance of 120 Ohms according to ITU-T G.703 (esi-1 and esi-2) or high impedance, and two symmetrical clock signal outputs of 2.048 MHz with an impedance of 120 Ohms (eso-1 and eso-2) or high impedance.

The impedance of the input interface, 120 Ohms or high impedance, can be determined by a jumper on the board. High impedance is necessary when a redundant COGE5 is placed in slot 13. In this case, you can connect a synchronization source to two COGE5 synchronization input interfaces in parallel (e.g. to both esi-1 on unit-11 and esi-1 on unit-13). When using an exter-

nal line termination, you have to set the synchronization inputs on both COGE5 boards to high impedance.

The jumper for the impedance selection is situated just behind the synchronization interface connector on the COGE5 board. The upper jumper is for esi-2 whereas the lower jumper is for esi-1. Plugging the jumper on the two lower pins sets the interface impedance to 120 Ohms. Plugging the jumper on the two upper pins sets the interface impedance to "high".
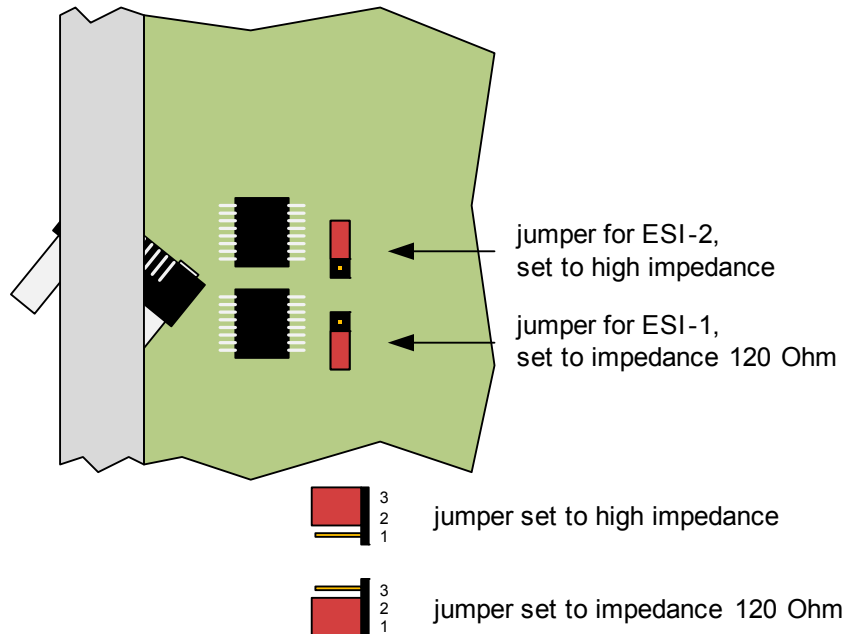

Figure 9:   Jumper position and setting for esi-1 and esi-2

The eso-1 and/or eso-2 output are only active on the active COGE5 unit and if the eso-1 and/or eso-2 output is not squelched.

The impedance of an active output interface is 120 Ohm, the impedance of a squelched or disabled output on the standby COGE5 unit is "high".

5.2.5   Backplane Interfaces

5.2.5.1   1GbE double Star

Slot 11 and 13 of the XMC20 subrack have point-to-point connections of 1 Gbit/s each to every other slot in the subrack via the backplane, allowing the interconnection of the switch devices on the Ethernet service units to the XMC20 Switch.

Switch devices on service units not participating in the XMC20 Switch are also connected via the 1 Gbit/s link. In this case the backplane Ethernet port is handled the same as an external (front) port.

5.2.5.2   10GbE Links

Slot 11 and 13 have two point-to-point connections of 10 Gbit/s to interconnect the working COGE5 unit with the redundant COGE5 unit.

5.2.5.3   CBUS

The CBUS (Control BUS) contains signals used for the interworking of the units in a subrack like slot select control signals, alarms, power supply, and inventory information.

5.2.5.4   PBUS

The PBUS contains signals for synchronization, distribution of PDH signals, and internal communication.

COGE5 and all service units have access to the PBUS in order to exchange information using the KEYMILE proprietary protocol ICN (Internal Communication Network).

The ICN is used for the management communication between the core unit and service units within the subrack.

The main functions of the ICN bus are:

- Service unit configuration and fault management
  Configuration, monitoring, alarm collection, and software installation with the service units.
- Broadcasting of operational parameters
  Time and date, synchronization signals, etc.
- Exchange of data between working and redundant control unit
  Update or exchange of information between control units including status and alarm information.
- Service unit to service unit communication

The communication of the ICN uses a proprietary protocol stack. The lower layers of the stack rely on an HDLC synchronous bus with a speed of 5 Mbit/ s. The communication of the ICN is based on a multi master principle.

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5.3 Equipment Protection EQP (Core Unit Redundancy)

The XMC25 and XMC23 network elements support 1:1 equipment protection for the core unit by installing a redundant core unit in slot 13 of the XMC25 or XMC23 subrack.

For the redundant core unit installation procedure please refer to section 7.3.4 ESW Download on a redundant COGE5 Unit plugged in the first Time (on page 64).

Please note:

For details on the core unit redundancy prerequisites and operation please refer to [302] User Guide "XMC25/XMC23/XMC22".

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5.4 Synchronization

5.4.1 2048 kHz Synchronization Interfaces

The synchronization interface on a micro D-Sub connector provides symmetrical clock signals of 2.048 MHz (two inputs, two outputs) on the COGE5 as described in the section 4.4.5 Synchronization Interface Cable (on page 28) and section 5.2.4 Synchronization Interface (on page 38). The synchronization interfaces can be used to synchronize the PETS function of the XMC20.
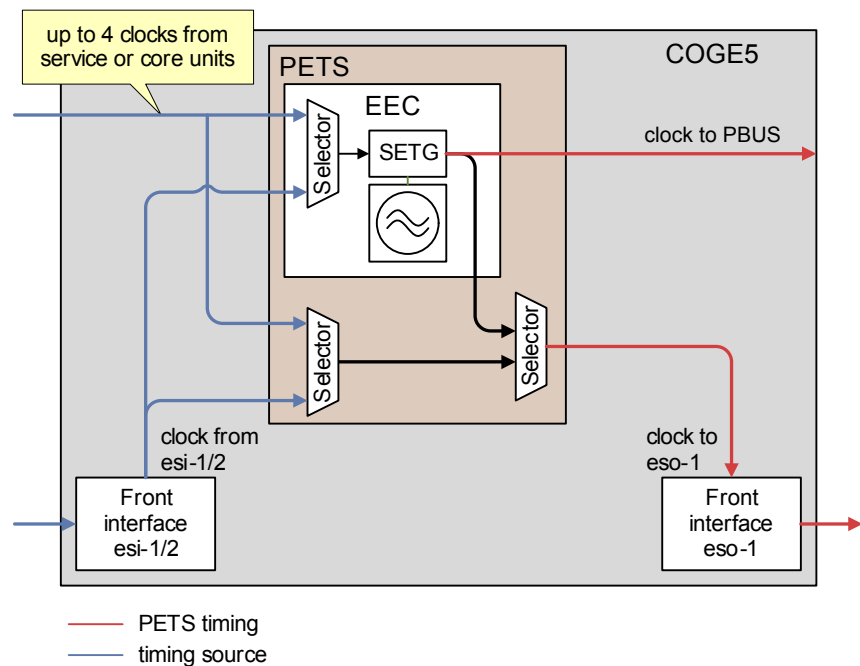

Figure 10:   PETS synchronization with esi-1 and esi-2

The eso-2 output provides the SETS timing of an SDH service unit.

The synchronization parameters concerning the XMC20 system are configured with ECST at the AP: /ne, Configuration. For more details, refer to [314] User Guide "TDM Services and Cross Connections in XMC20".

At COGE5 level, you can define the esi-1, esi-2 labels (Label 1, Label 2, and Description). In addition, in case of loss of signal, this port will generate an alarm from this access point.

Please note:

For details on the synchronization aspects and configuration details at system level, please refer to [314] User Guide "TDM Services and Cross Connections in XMC20".

5.4.2 Synchronous Ethernet

The COGE5 front ports port-1 to port-5 support the synchronous Ethernet.

Please note:

Only two of the three electrical Ethernet interfaces port-3 to port-5 on the COGE5 unit can be selected as synchronous Ethernet source at the same time.

Risk of operating trouble!

An electrical SFP based Ethernet port does not support synchronous Ethernet.

The receive timing of the Ethernet signal can be used to synchronize the PETS. The transmit timing of the Ethernet signal is synchronized to the PETS timing.
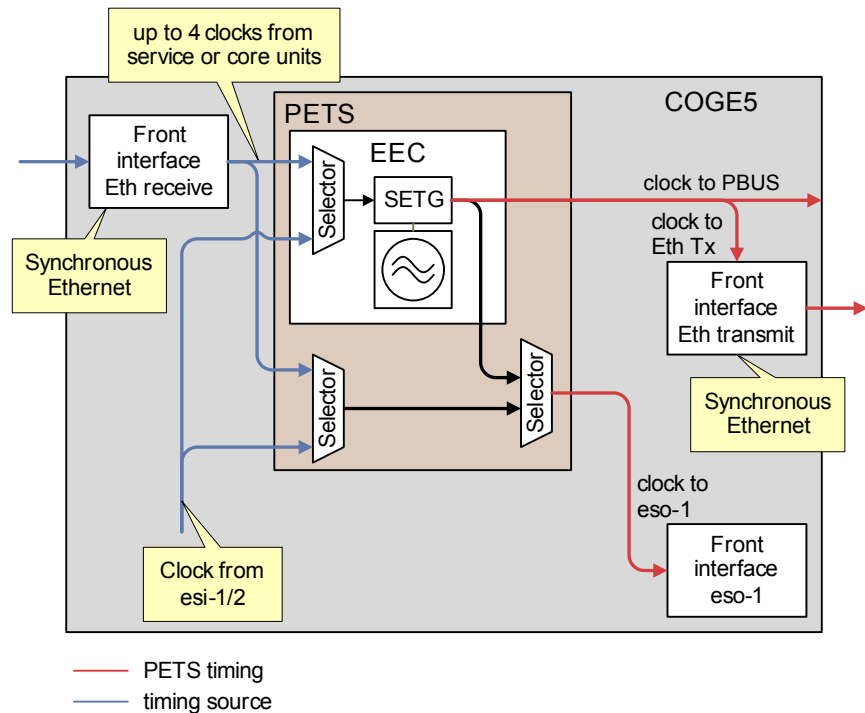

Figure 11:   PETS synchronization with synchronous Ethernet

The quality level (QL) is transported in the Ethernet Synchronization Messaging Channel (ESMC). The usage of ESMC is configurable with a configuration parameter at the AP: /unit-x/port-a, Configuration - SyncE. The received and transmitted QL values can be adapted using the Input Mapping Table and Output Mapping Table.

The status of the transmitted and received QL is available at the AP: /unit-x/port-a, Status - SyncE.

Please note:

For details on the synchronization aspects and configuration details at system level, please refer to [314] User Guide "TDM Services and Cross Connections in XMC20".

Synchronous Ethernet is supported for the following Ethernet port speeds:
- 100BASE-x,
- 1000BASE-x,
- 10GBASE-x.

Timing transfer over most Ethernet interfaces operates without restrictions. Timing transfer over 1000BASE-T operates only in unidirectional direction, from the clock master to the clock slave. Two 1000BASE-T ports autonomously negotiate which port will be the clock master and which port will be the clock slave. The procedure is as follows:

- At start up both ports of an Ethernet point-to-point link have the preferred clock mode "master". The negotiation process arbitrarily selects one of the ports as "slave".
- If one of the Ethernet ports is used as synchronization source for the PETS, it gets the preferred clock mode "slave". If necessary the master/slave roles are re-negotiated and the link is restarted.

Risk of operating trouble!

The selection of a synchronous Ethernet port as PETS clock source can lead to a short traffic interruption.

- If both ports of an Ethernet point-to-point link are configured as synchronization source for the PETS, both get the preferred clock mode "slave". The negotiation process arbitrarily selects one of the ports as "master".
    − The alarm CLKMIS (Clock Mismatch) is activated on the "master" port.
    − Timing transfer is only possible in one direction.

5.4.3   Precision Time Protocol

The COGE5 front ports port-1 to port-5 support the Precision Time Protocol (PTP) according to IEEE 1588v2.

Synchronization via PTP is supported for the following Ethernet port speeds:
- 100BASE-x,
- 1000BASE-x,
- 10GBASE-x.

Risk of operating trouble!

The SFP-based 1 GbE interfaces port-1 and port-2 on the COGE5 unit are not operable as PTP timing sources.

    → The port-1 and port-2 must use the 10 GbE mode to be usable as PTP timing source.

In a PTP Boundary Clock the received PTP packets in an Ethernet signal can be used to synchronize the PETS. The forwarded PTP packets are synchronized to the PETS timing. See section 5.4.3.1 Boundary Clock Application (on page 46).

In a PTP Ordinary Clock the received PTP packets in an Ethernet signal can be used to synchronize the PETS. There are no forwarding PTP packets. See section 5.4.3.2 Ordinary Clock Application (on page 47).

Please note:

A PTP port must be in the administrative status "up" to be selectable as PTP source at the AP: /ne, Configuration - PTP.

In a PTP Transparent Clock the received PTP packets in an Ethernet signal are forwarded, with a transit delay correction, as transmit PTP packets.

There is no synchronization of the PETS timing to the received PTP packets. See section 5.4.3.3 Transparent Clock Application (on page 48).

up to 4 clocks from service or core units
and
up to 4 PTP clocks from the core units

PTP clock type: Boundary Clock

PETS

COGE5

Front interface Eth receive

EEC

SETG

clock to PBUS

clock to Eth Tx

PTP port role: Slave

Selector

Front interface Eth transmit

Selector

Selector

PTP port role: Master

Clock from esi-1/2

clock to eso-1

Front interface eso-1
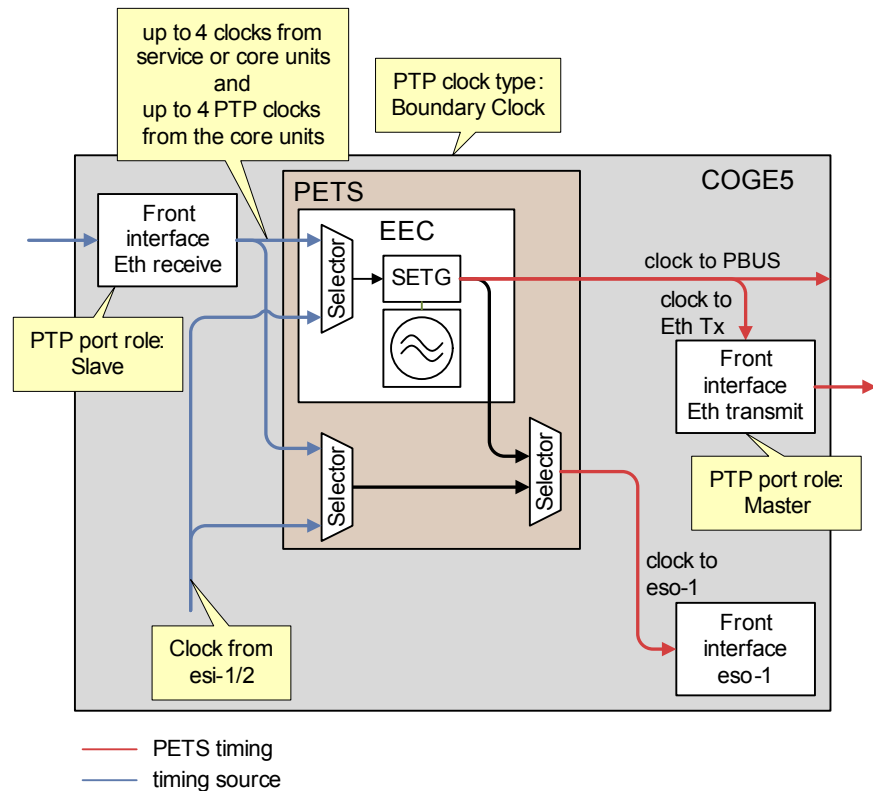
PETS timing
timing source

Figure 12:   PETS synchronization with PTP, Boundary Clock

The quality level (QL) is transported in the PTP packets using the Clock Class parameter. The usage of the PTP QL is limited to the display of the received and transmitted QL values, i.e. the PTP QL cannot be used for the QL based clock source selection.

The status of the transmitted and received QL is available at the AP: /unit-x/ port-a, Status - PTP.

Risk of operating trouble!

With PTP only one synchronization path direction is active. This is the forward path (Master to Slave).

→   The PTP quality level information in reverse direction (Slave to Master) is not applicable.

Risk of operating trouble!

When using the "Hybrid" or "Pure Hybrid" PTP mode the QL used for the clock selection algorithm is taken from the synchronous Ethernet port.

Please note:

The PTP can be used as external time source (AP: /ne, Configuration - Date And Time - Time Sources) if the PTP is enabled and at least one PTP source is selected as PETS clock source. The PTP mode must be configured to "Frequency And Phase", to "Hybrid" or to "Pure Hybrid".

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➡ **Please note:**

For details on the synchronization aspects and configuration details at system level, please refer to [314] User Guide "TDM Services and Cross Connections in XMC20".

5.4.3.1 Boundary Clock Application

A Boundary Clock network element has several PTP ports, one configured as Slave port and all others acting as Master ports.

The PETS can be synchronized to the timing information received at the PTP slave port.
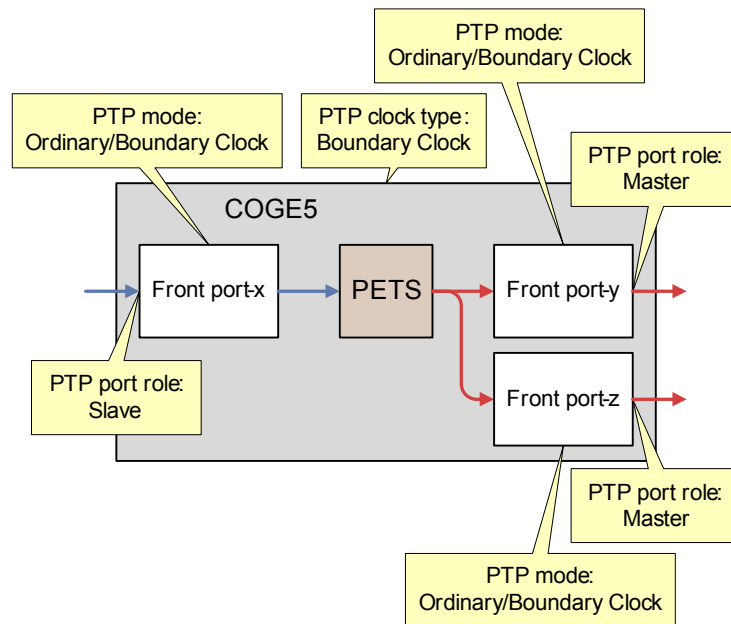

Figure 13:   PTP Boundary Clock

For a Boundary Clock network element the XMC20 and the COGE5 have to be configured as follows:
- COGE5, AP: /unit-x, Configuration - PTP - Clock Type:
  − Boundary Clock.
- COGE5, AP: /unit-x/port-y, Configuration - PTP - PTP Mode:
  − Ordinary/Boundary Clock.
- COGE5, AP: /unit-x/port-y, Configuration - PTP - Role:
  − Slave (for ports with a fixed Slave role).
  − Master (for ports with a fixed Master role).
  − Master Or Slave (for ports for which the role can change when the synchronization path direction changes).
- XMC20, AP: /ne, Configuration - PTP - PTP Mode:
  − Frequency (only the PTP frequency information is evaluated).
  − Frequency And Phase (the PTP frequency and phase information is evaluated).
  − Hybrid (the synchronous Ethernet frequency and the PTP phase information are evaluated).
  − Pure Hybrid (the synchronous Ethernet frequency and the PTP phase information of the same clock source are evaluated).

- XMC20, AP: /ne, Configuration - PTP - PTP Sources - PTP-x:
  − /unit-x/port-y (select the "Ordinary/Boundary Clock" port which can be a Slave).
- XMC20, AP: /ne, Configuration - PETS - PETS Clock Selection:
  − PTP-x Priority = <n> (give the PTP source a high priority, e.g. 1).

5.4.3.2 Ordinary Clock Application

An Ordinary Clock network element has a single PTP port. With XMC20 this is always a Slave port.

The PETS can be synchronized to the timing information received at the PTP slave port.
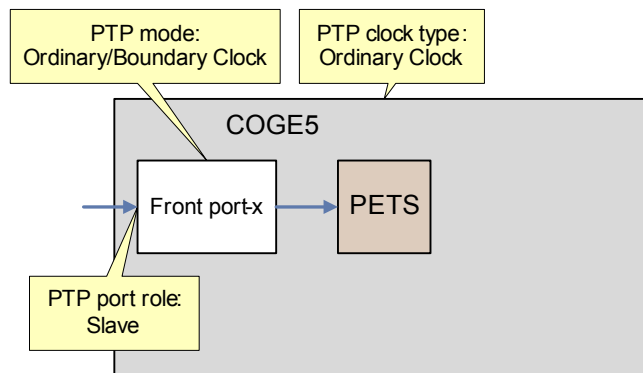

Figure 14:   PTP Ordinary Clock

For an Ordinary Clock network element the XMC20 and the COGE5 have to be configured as follows:

- COGE5, AP: /unit-x, Configuration - PTP - Clock Type:
  − Boundary Clock.
  − Ordinary Clock (preferred).
- COGE5, AP: /unit-x/port-y, Configuration - PTP - PTP Mode:
  − Ordinary/Boundary Clock.
- COGE5, AP: /unit-x/port-y, Configuration - PTP - Role:
  − Slave (preferred).
  − Master Or Slave.
- XMC20, AP: /ne, Configuration - PTP - PTP Mode:
  − Frequency (only the PTP frequency information is evaluated).
  − Frequency And Phase (the PTP frequency and phase information is evaluated).
  − Hybrid (the synchronous Ethernet frequency and the PTP phase information are evaluated).
  − Pure Hybrid (the synchronous Ethernet frequency and the PTP phase information of the same clock source are evaluated).
- XMC20, AP: /ne, Configuration - PTP - PTP Sources - PTP-x:
  − /unit-x/port-y (select the "Ordinary/Boundary Clock" port which can be a Slave).
- XMC20, AP: /ne, Configuration - PETS - PETS Clock Selection:
  − PTP-x Priority = <n> (give the PTP source a high priority, e.g. 1).

5.4.3.3   Transparent Clock Application

A Transparent Clock network element has several PTP ports, one acting as Slave port and all others acting as Master ports.

Risk of operating trouble!

Transparent ports are not operable with the port types "MPLS-TP" and "PWAC".

→ A transparent PTP port must be configured to the Customer VLAN Port (CVP) port type. The bridge parameters must assure the packet forwarding between all transparent ports.

Please note:

A Transparent Clock cannot be used as PTP source for the PETS synchronization.

→ In order to synchronize the PETS to a Transparent Clock, connect a Transparent Clock (Master) to an (additional) COGE5 front port configured as Ordinary/Boundary Clock (Slave).
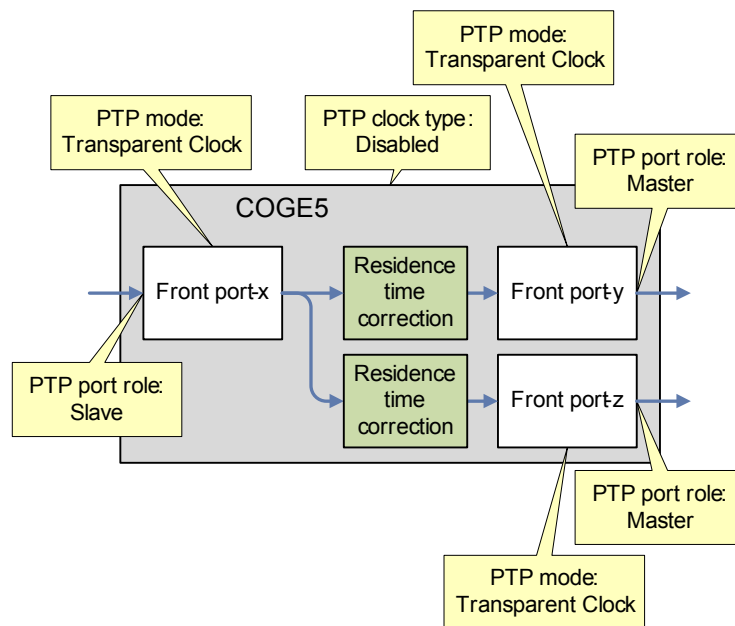

Figure 15:   PTP Transparent Clock

For a Transparent Clock network element the XMC20 and the COGE5 have to be configured as follows:

- COGE5, AP: /unit-x, Configuration - PTP - Clock Type:
  - Disabled (preferred).
  - Boundary Clock.
  - Ordinary Clock.
- COGE5, AP: /unit-x/port-y, Configuration - PTP - PTP Mode:
  - Transparent Clock.
- COGE5, AP: /unit-x/port-y, Configuration - PTP - Role:
  - Slave (for ports with a fixed Slave role).
  - Master (for ports with a fixed Master role).

- − Master Or Slave (for ports for which the role can change when the synchronization path direction changes).
- COGE5, AP: /unit-x/port-y, Overview - Port Type - Usage:
  - − CVP.
- ECST "Switching" view, Switching - Bridging - bridge-1 - Ports:
  - − Mode = e.g. Access (the PTP messages are forwarded untagged).
  - − PVID = e.g. 1 (port VLAN ID for all transparent ports).

KEYMILE

6 Commissioning

This section presents how to configure and bring into operation the COGE5 unit and its main functions. For operation, i.e. status and maintenance functions refer to section 7 Operation and Maintenance (on page 57).

6.1 Commissioning Prerequisites for COGE5

The following prerequisites must be fulfilled for the commissioning of a COGE5 unit:

6.1.1 COGE5 Unit

A COGE5 must be physically plugged in slot 11 of the XMC20 subrack. Please make sure the HW fulfils the requirements stated in [012] Release Note "XMC20 System Release R6B".

→ **Please note:**

When you power up the COGE5 unit for the first time (from factory default settings), all LEDs will be "ON". This state means that the network element bootloader is active but there is no application software (ESW) to launch. You will need to install an appropriate ESW.

→ For the installation procedures and the detailed initial connection procedure please refer to [354] Quick Guide "ECST".

A redundant COGE5 unit (if required) must be physically plugged in slot 13 of the XMC20 subrack. This is mandatory if you want to implement core unit redundancy. It is not required if you do not want core unit redundancy.

6.1.2 ECST

ECST needs to be installed on a PC, and a management connection from the ECST to the XMC20 needs to be up and running. For details about the installation and operation of the ECST, please refer to [354] Quick Guide "ECST" and [355] User Manual "ECST".

The amount and accessibility of operations depend on the user profile with which you are logged in. For more information, please refer to [323] User Guide "Management Communication".

→ **Please note:**

Ethernet cabling should be connected to both the master and the redundant COGE5 if redundancy is implemented.

→ In this case, care must be taken to correctly configure split horizon settings in order to avoid broadcast storms.

For all ECST related topics please refer to [355] User Manual "ECST".

For all management connection related topics please refer to [323] User Guide "Management Communication".

For a specific description of the ESW download and assignment to a COGE5 unit which is already in service or to a redundant COGE5 unit please refer to section 7.3 Unit and Network Element ESW Download (on page 60).

6.2   First ESW Download to a COGE5 Unit

🚫

Risk of operating trouble!

An ESW installation may perform also a firmware upgrade which will take about 30 s. During the firmware upgrade the TRAFFIC LED blinks with 5 Hz.

→ Do NOT disrupt power during this upgrade procedure!

When inserting a COGE5 unit the first time into a XMC20 subrack the unit is running in the network element bootloader, no ESW is installed.

You need to install valid ESW on the COGE5 unit in slot 11. If you implement core unit redundancy, you need to install the identical ESW on the COGE5 units in both slot 11 and slot 13.

Note that you have to install two ESW, one for the unit management and one for the network element management:

•   The unit ESW (co5un_r2bxx) is installed at the AP: /unit-x.

•   The NE ESW (co5ne_r2bxx) is installed at the AP: /unit-x/neController.

Please make sure the ESW version fulfils the requirements stated in [012] Release Note "XMC20 System Release R6B".

For the first ESW installation procedure please refer to [354] Quick Guide "ECST".

6.3   Configuring an Ethernet Front Port

In order to configure one of the Ethernet front ports in COGE5, the following steps have to be performed. If you are using a redundant COGE5, the steps must be performed on both COGE5, the active core unit (unit-11) and the standby core unit (unit-13).

The "unit-x" stands for either "unit-11", or "unit-13", or for both in a sequential order.

Port configuration   This action list shows step by step how to configure an external Ethernet port. The given example uses mostly the default values.

The following assumptions and identifiers are used:
– The COGE5 unit is assigned.
– The port to be configured has the identifier port-5.
– The bridge port is a trunk port and forwards the VLANs with VLAN ID 100 and 101.

Configure the scheduling pro-   **Proceed as follows:**
file

1. Select the "Tree View" of the ECST.

2. Navigate to the scheduling profile parameters:
    -   AP:/ne, Configuration - QoS, Scheduling Profiles.

3. Configure the scheduling profile 2:
    -   Select Profile = 2.

4. Set the scheduling algorithm of the traffic classes 0 to 6:
    -   Select Scheduling Algorithm = Weighted Round Robin.

5. Execute "Apply".

Result: The scheduling profile is configured.

Configure the port type   **Proceed as follows:**

1. Select the "Tree View" of the ECST.

2. Navigate to the port parameters:
    -   AP:/unit-x/port-5, Overview - Port Type.

3. Configure the port to be a Customer VLAN Port (CVP):
    -   Usage = CVP.

4. Execute "Apply".

Result: The Ethernet port type is configured.

Configure the physical port   **Proceed as follows:**
parameters

1. Navigate to the port parameters:
    -   AP:/unit-x/port-5, Main - Physical.

2. Configure the MTU size:
    -   MTU = 1578 Octets.

3. Disable the flow control:
    -   Flow Control, Admin = false.

4. Navigate to the port QoS parameters:
    -   AP:/unit-x/port-5, QoS - QoS Scheduling.

5. Select the queue scheduling profile as it is defined at the AP: /ne, Con-
    figuration - QoS, Scheduling Profiles:
    -   Profile Index = 2.

6. Execute "Apply".

Result: The Ethernet physical port is completely configured.

Configure the bridge parame-
ters

Proceed as follows:

1. Select the "Switching" view of the ECST.

2. Navigate to the bridge-1 parameters:
    -   AP:/Switching/Bridges.

3. Click on the bridge-1 row of the bridge table:
    -   The bridge-1 configuration dialogue opens.

4. Navigate to the General parameters:
    -   AP:/Switching/Bridges, bridge-1/General.

5. Configure the aging time of the MAC learning:
    -   Aging Time = 300 s.

6. Execute "Apply".

Result: The bridge is completely configured.

Configure the bridge port
parameters

Proceed as follows:

1. Select the "Switching" view of the ECST.

2. Navigate to the port parameters of bridge-1:
    -   AP:/Switching/Bridges/bridge-1, Ports.

3. Select the port mode of /unit-x/port-5:
    -   Mode = Trunk.

4. Click on the port-5 row of the port table:
    -   The port-5 configuration dialogue opens.

5. Navigate to the QoS parameters:
    -   AP:/unit-x/port-5/QoS.

6. Configure the trust mode:
    -   Trust L2 = false.
    -   Trust L3 = true.

7. Execute "Apply".

Result: The bridge port is completely configured.

Configure the bridge VLAN
parameters

Proceed as follows:

1. Select the "Switching" view of the ECST.

2. Navigate to the VLAN parameters of bridge-1:
    -   AP:/Switching/Bridges/bridge-1, VLANs.

3. Add the VLAN 100:
    -   Click the "Create" button.
    -   The "Create a new VLAN" dialogue opens.

4. Enter the VLAN parameters:
    -   VLAN ID = 100.
    -   Name = VLAN_100.
    -   Click the "OK" button.

5. Add the VLAN 101:
    - Click the "Create" button.
    - The "Create a new VLAN" dialogue opens.

6. Enter the VLAN parameters:
    - VLAN ID = 101.
    - Name = VLAN_101.
    - Click the "OK" button.

7. Execute "Apply".

Result: The VLANs for the bridge-1 are completely configured.

Activation **Proceed as follows:**

1. Select the "Tree View" of the ECST.

2. Navigate to the port parameters:
    - AP:/unit-x/port-5, Main - General:

3. Set the administrative state of the port-5 to up
    - Interface Status, Admin Status = Up.

4. Execute "Apply".
    - The "Operational Status" changes to "Up".

Result: The port is activated.

Save the configuration **Proceed as follows:**

1. Save the configuration to the NE flash memory:
    - Execute "Save to NE".

Result: The configuration is saved.

End of instruction

6.4　Commissioning MPLS-TP

The management functions for the commissioning of the MPLS-TP application are located in the ECST tab "MPLS-TP".

For a description of this functionality please refer to [358] User Manual "MPLS-TP".

6.5　Commissioning the PTP synchronization

The management functions for the commissioning of the PTP synchronization are located in the ECST tab "Tree View", at the following access points:

- AP: /ne, Configuration - PTP.
- AP: /unit-11 or /unit-13, Configuration - PTP.
- AP: /unit-11/port-y or /unit-13/port-y, Configuration - PTP.

An example for the "Hybrid" network element synchronization, using PTP and synchronous Ethernet, is described in [314] User Guide "TDM Services and Cross Connections in XMC20".

7 Operation and Maintenance

This section presents how to operate the COGE5 unit once it has been commissioned. For a description on how to configure and bring into operation the COGE5 unit and its main functions, refer to section 6 Commissioning (on page 50).

7.1 Unit Optical Indicators

The COGE5 unit has four LED optical indicators showing information about the unit, traffic, status and lock state.
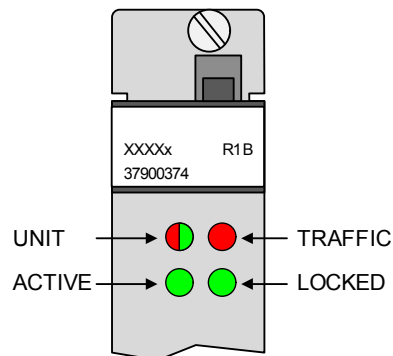
The following figure shows the LED layout on the unit.

Figure 16:   Fault and status indication LEDs on the COGE5 unit

The operating state of the COGE5 unit can be known by reading the LED optical indicators from the COGE5 unit front.

The following table shows the signalling of the COGE5 LEDs and their meaning.

Table 17:   LED signalling on COGE5

LED Name	Colour	State	Meaning
UNIT	Red	Failure	The unit is not in service. The unit is not able to provide the requested function due to - equipment failure (total breakdown) - mismatch of HW and/or SW Recovery from this error situation is done usually by replacement of unit HW or ESW.
	Green / Red (blinking 1 Hz [a])	Booting / waiting	The unit has not been taken into service yet or the unit has not been provisioned. - During the booting process the initial software installation is progressing on the control unit. The COGE5 will not respond to management communications as long as it is in the booting state. - In the waiting state the control unit is waiting for configuration. The waiting state lasts as long as the COGE5 has no configuration. In this state, the COGE5 can only provide the "point to point" type of management communication. This means that only the Ethernet local management port will allow a direct connection for initial commissioning. Recovery from this situation is done by taking the unit into service with ECST.
	Green	Running	The unit is up and running, it is ready to provide the required service. - The internal resources are available and the COGE5 controls the NE. - All management functions, e.g. configuration management, fault management and software management are available.
	Off	Failure	The system is not powered or there is an outage of power supply on the unit or an outage of the LED.
TRAFFIC	Red	Failure	One or more active failures on the unit, independent of the severity. More detailed information is provided by ECST. Note: This definition is valid for both, active and standby unit.
	Off	Normal	Normal (error free) operation. This is the default state.
ACTIVE	Green	Active	The unit is active, i.e. controls the other units in the subrack.
	Off	Standby	The unit is standby. If the UNIT LED is green, the unit is ready to take over the operation in case the active unit will fail. The standby operation state is only possible for the redundant unit in an NE with 1+1 equipment protection for the control unit.
LOCKED	Green	Locked	The NE is locked to a synchronization source.
	Off	Not locked	The NE is not locked to a synchronization source.

a. The blinking frequency can be erratic

Please note:

When COGE5 is started up for the first time (from factory default settings), all LEDs will be "ON". This state means that the network element bootloader (bco5n_rxxxx) is active but there is no application software (ESW) to launch.

For the installation of application software (ESW), please refer to [302] User Guide "XMC25/XMC23/XMC22".

7.2 Maintenance

7.2.1 Inventory Data

It is possible to read inventory data from the COGE5 unit via the ECST at the following access points:

- AP: /unit-x, Main - Inventory,
  for unit related information, and

- AP: /unit-x/neController, Main - Inventory,
  for NE control processor related information.

The detailed HW information is described in section 8.2.2 AP: / unit-x, Main (on page 73) and in section 8.5.2 AP: / unit-x / neController, Main (on page 96).

7.3 Unit and Network Element ESW Download

Risk of operating trouble!

The assignment of new unit ESW or network element ESW to COGE5 requires a restart of the unit.

→ Thus, the installation of new ESW on the COGE5 unit affects all traffic functions.

Risk of operating trouble!

An ESW upgrade may perform also a firmware upgrade which will take about 30 s. During the firmware upgrade the TRAFFIC LED blinks with 5 Hz.

→ Do NOT disrupt power during this upgrade procedure!

7.3.1 Unit ESW and Network Element ESW Download on a running COGE5 Unit

The unit ESW (UN ESW) and the network element ESW (NE ESW) can be downloaded and started on a running COGE5 unit using the ECST menu "NE/Software Download…" or via the ECST at the access points AP: /unit-x, Main - Software and AP: /unit-x/neController, Main - Software.

ESW download for the unit and the network element

The instructions below assume

- the ECST accesses the above mentioned access points.
- the COGE5 unit is plugged in slot 11.

The following actions must be performed to download and start the

- network element ESW, and the
- unit ESW.

Download procedure **Proceed as follows:**

1. Set up a management connection to the XMC20 network element.
   - Select the user class "manager". This is necessary to receive the access rights for downloading ESWs to the units of the NE.

2. Select the AP: /unit-11, i.e. the COGE5 unit.
   - The AP: /unit-11 is running with the unit ESW (co5un_rxxxx).

3. Open the management function (MF) "Main" and select the tab "Software".
   - Select the new COGE5 UN ESW (co5un_r2bxx) in the list of "Software On Element Manager" and click "Download".
   - Wait until the download is terminated and the ESW appears in the list "Software On Unit".

4. In "Configuration" select the downloaded ESW under "Software".
   - Check that "Software Installation" is set to "Manual Start".

5. Execute "Apply".

6. Select the AP: /unit-11/neController.
   - The AP: /unit-11/neController is running with the network element ESW (co5ne_rxxxx).

7. Open the MF "Main" and select the tab "Software".
   - Select the new COGE5 NE ESW (co5ne_r2bxx) in the list of "Software On Element Manager" and click "Download".
   - Wait until the download is terminated and the ESW appears in the list "Software On Unit".

8. In "Configuration" select the downloaded ESW under "Software".
   - Check that "Software Installation" is set to "Manual Start".

9. Execute "Apply".

10. Save the configuration to the NE flash memory:
    - Execute "Save to NE".

11. Start the new unit software.
    - In the MF "Main" of the AP: /unit-11, i.e. the COGE5 unit, click the command button "Start Software".
    - This reboots the unit ESW of the control unit.

12. Start the new network element software.
    - In the MF "Main" of the AP: /unit-11/neController, i.e. the network element, click the command button "Start Software".
    - This reboots the network element ESW of the control unit.

Please note:

Rebooting the active COGE5 unit while there is a redundant COGE5 available, the redundant COGE5 will take over the active role.

13. Wait until the unit has booted and reconnect.

Result: The new UN (unit) ESW (co5un_r2bxx) is installed and running at the AP: /unit-11.

Result: The new NE (network element) ESW (co5ne_r2bxx) is installed and running at the AP: /unit-11/neController.

End of instruction

KEYMILE

7.3.2 Unit ESW Download on a running COGE5 Unit

The unit ESW (UN ESW) can be downloaded and started on a running COGE5 unit using the ECST menu "NE/Software Download…" or via the ECST at the access point AP: /unit-x, Main - Software.

ESW download for the unit The instructions below assume

- the ECST accesses the above mentioned access point.
- the COGE5 unit is plugged in slot 11.

The following actions must be performed to download and start the unit ESW.

Download procedure **Proceed as follows:**

1. Set up a management connection to the XMC20 network element.
   - Select the user class "manager". This is necessary to receive the access rights for downloading ESWs to the units of the NE.

2. Select the AP: /unit-11, i.e. the COGE5 unit.
   - The AP: /unit-11 is running with the unit ESW (co5un_rxxxx).

3. Open the MF "Main" and select the tab "Software".
   - Select the new COGE5 UN ESW (co5un_r2bxx) in the list of "Software On Element Manager" and click "Download".
   - Wait until the download is terminated and the ESW appears in the list "Software On Unit".

4. In "Configuration" select the downloaded ESW under "Software".
   - Check that "Software Installation" is set to "Manual Start".

Configuration		
Software	co5un_r1g22.esw	⚡ Start Software
Software Installation	Manual Start	
Schedule Date and Time	17 ⌄ 2 ⌄ 2015 ⌄ 15 ⌄ 15 ⌄ 41 ⌄	

5. Execute "Apply".

6. Save the configuration to the NE flash memory:
   - Execute "Save to NE".

7. Start the new software.
   - In the MF "Main" of the AP: /unit-11, i.e. the COGE5 unit, click the command button "Start Software".
   - This reboots the unit ESW of the control unit.

➡️ **Please note:**

Rebooting the active COGE5 unit while there is a redundant COGE5 available, the redundant COGE5 will take over the active role.

8. Wait until the unit has booted.

Result: The new UN (unit) ESW (co5un_r2bxx) is installed and running at the AP: /unit-11.

End of instruction

KEYMILE

7.3.3 Network Element ESW Download on a running COGE5 Unit

The network element ESW (NE ESW) can be downloaded and started on a running COGE5 unit using the ECST menu "NE/Software Download…" or via the ECST at the access point AP: /unit-x/neController, Main - Software.

ESW download for the network element

The instructions below assume

- the ECST accesses the above mentioned access point.
- the COGE5 unit is plugged in slot 11.

The following actions must be performed to download and start the network element ESW.

Download procedure

Proceed as follows:

1. Set up a management connection to the XMC20 network element.
   - Select the user class "manager". This is necessary to receive the access rights for downloading ESWs to the units of the NE.

2. Select the AP: /unit-11/neController.
   - The AP: /unit-11/neController is running with the network element ESW (co5ne_rxxxx).

3. Open the MF "Main" and select the tab "Software".
   - Select the new COGE5 NE ESW (co5ne_r2bxx) in the list of "Software On Element Manager" and click "Download".
   - Wait until the download is terminated and the ESW appears in the list "Software On Unit".

4. In "Configuration" select the downloaded ESW under "Software".
   - Check that "Software Installation" is set to "Manual Start".

5. Execute "Apply".

6. Save the configuration to the NE flash memory:
   - Execute "Save to NE".

7. Start the new software.
   - In the MF "Main" of the AP: /unit-11/neController click the command button "Start Software".
   - This reboots the network element ESW of the control unit.

Please note:

Rebooting the active COGE5 unit while there is a redundant COGE5 available, the redundant COGE5 will take over the active role.

8. Wait until the unit has booted and reconnect.

Result: The new NE (network element) ESW (co5ne_r2bxx) is installed and running at the AP: /unit-11/neController.

End of instruction

7.3.4 ESW Download on a redundant COGE5 Unit plugged in the first Time

The unit ESW (UN ESW) and the network element ESW (NE ESW) can be downloaded and started on a redundant COGE5 unit using the ECST tools menu "Software Download …" or via the ECST at the access points AP: / unit-x, Main - Software and AP: /unit-x/neController, Main - Software.

ESW download on a redundant COGE5

The instructions below assume
- the ECST accesses the above mentioned access points.
- the active COGE5 unit is plugged in slot 11, the redundant COGE5 unit is plugged in slot 13.

The following actions must be performed to download and start the
– network element ESW, and the
– unit ESW.

Download and start the NE ESW

Proceed as follows:

1. Set up a management connection to the XMC20 network element.
   - Select the user class "manager". This is necessary to receive the access rights for downloading ESWs to the units of the NE.

2. Select the AP: /unit-13/neController, i.e. the redundant COGE5 unit.
   - The AP: /unit-13/neController is running in the network element boot-loader (bco5n_rxx).

3. Open the MF "Main" of the AP: /unit-13/neController and select the tab "Software".
   - Select the desired COGE5 NE ESW (co5ne_r2bxx) in the list of "Software On Element Manager" and click "Download".
   - Wait until the download is terminated and the ESW appears in the list "Software On Unit".

4. In "Configuration" select the downloaded ESW under "Software".
   - Check that "Software Installation" is set to "Manual Start".

   - Execute "Apply".
   - Save the configuration to the NE flash memory: Execute "Save to NE".

5. Start the new software.
   - Click the command button "Start Software". This reboots the redundant control unit.

6. Wait until the unit has booted.
   - The AP: /unit-13/neController is running the NE ESW (co5ne_r2bxx).
   - The AP: /unit-13 is still running in the unit bootloader (bco5u_rxxxx).

Result: The neController of the redundant COGE5 unit is running the configured ESW.

Download and start the UN ESW

Proceed as follows:

1. Select the AP: /unit-13, i.e. the redundant COGE5 unit.
   - The AP: /unit-13 is running in the unit bootloader (bco5u_rxx).

2. Open the MF "Main" and select the tab "Software".
   - Select the desired COGE5 UN ESW (co5un_r2bxx) in the list of "Software On Element Manager" and click "Download".
   - Wait until the download is terminated and the ESW appears in the list "Software On Unit".

3. In "Configuration" select the downloaded ESW under "Software".
   - Check that "Software Installation" is set to "Manual Start".
   - Execute "Apply".

   - Execute "Apply".
   - Save the configuration to the NE flash memory: Execute "Save to NE".

4. Start the new software.
   - In the MF "Main" of the AP: /unit-11 click the command button "Start Software". This reboots the redundant control unit.

5. Wait until the unit has booted.
   - The AP: /unit-13 is running the unit ESW (co5un_r2bxx).

6. Assign the redundant core unit to make it available for commissioning.
   - The redundant COGE5 is now ready for configuration.
   - The working COGE5 unit in slot 11 is the active unit.
   - The redundant COGE5 unit in slot 13 is the standby unit.

7. Save the configuration to the NE flash memory.
   - Execute "Save to NE".

Result: The redundant COGE5 unit is running the configured ESW.

End of instruction

7.3.5 Set the COGE5 Unit into the Network Element Bootloader

Please note:

Setting the active COGE5 unit into the bootloader while there is a standby COGE5 available, the standby COGE5 will take over the active role.

Risk of operating trouble!

Please be aware of the fact, that a core unit in the bootloader can only be accessed locally via the Ethernet local management port.

The bootloader state can be used to e.g. delete all ESW from a unit or for debug purposes.

The COGE5 unit is assumed to be plugged in slot 11.

Set to the network element bootloader The following actions must be performed to bring a running COGE5 unit into the network element (NE) bootloader.

Bootloader procedure	**Proceed as follows:**

1. Set up a management connection to the XMC20 network element.
   - Select the user class "manager".

2. Select the AP: /unit-11, i.e. the COGE5 unit.
   - The AP: /unit-11 is running with the unit ESW (co5un_r2bxx).

3. Open the MF "Main" and select the tab "Equipment".
   - Execute the command "Stop In Boot".
   - Confirm the warning message by clicking the "OK" button.
   - The COGE5 unit reboots.

4. Wait until the unit has booted and reconnect as "manager".
   - The AP: /unit-11 is the only AP available in the AP tree.
   - The AP: /unit-11 is now running in the network element bootloader (bco5n_rxxxx).

End of instruction

Please note:

To exit from the NE bootloader an NE ESW must be configured and applied at the AP: /unit-x, Main - Software before restarting the unit.

7.3.6 Set the COGE5 Unit into the Unit Bootloader

Please note:

Setting the active COGE5 unit into the bootloader while there is a standby COGE5 available, the standby COGE5 will take over the active role.

Risk of operating trouble!

Please be aware of the fact, that a core unit in the bootloader can only be accessed locally via the Ethernet local management port.

The bootloader state can be used to e.g. delete all ESW from a unit or for debug purposes.

The COGE5 unit is assumed to be plugged in slot 11.

Set to the unit bootloader	The following actions must be performed to bring a running COGE5 unit into the unit (UN) bootloader.

Bootloader procedure	**Proceed as follows:**

1. Set up a management connection to the XMC20 network element.
   - Select the user class "manager".

2. Select the AP: /unit-11, i.e. the COGE5 unit.
   - The AP: /unit-11 is running with the unit ESW (co5un_r2bxx).

3. Open the MF "Main" and select the tab "Equipment".
   - Execute the command "Stop In Boot".
   - Confirm the warning message by clicking the "OK" button.
   - The COGE5 unit reboots.

4. Wait until the unit has booted and reconnect as "manager".
   - The AP: /unit-11 is the only AP available in the AP tree.
   - The AP: /unit-11 is now running in the network element bootloader (bco5n_rxxxx).

5. Open the MF "Main" and select the tab "Software".
   - If the desired NE ESW is not available on the unit select the COGE5 NE ESW (co5ne_r2bxx) in the list of "Software On Element Manager" and click "Download".
   - Wait until the download is terminated and the ESW appears in the list "Software On Unit".

6. In "Configuration" select the downloaded ESW under "Software".
   - Check that "Software Installation" is set to "Manual Start".

7. Execute "Apply".

Please note:

When the COGE5 unit is running in the network element bootloader the "Save to NE" command is executed automatically when the configuration is modified.

→ The operator is not allowed to execute a manual "Save to NE" command.

8. Start the new software.
   - In the MF "Main" of the AP: /unit-11 click the command button "Start Software". This reboots the control unit.

9. Wait until the unit has booted, disconnect and reconnect as "manager".

Result: The AP: /unit-11 is now running in the unit bootloader (bco5u_rxxxx).

Result: The AP: /unit-11/neController is running the NE ESW (co5ne_r2bxx).

End of instruction

Please note:

To exit from the UN bootloader a UN ESW must be configured and applied at the AP: /unit-x, Main - Software before restarting the unit.

7.4 Setting up Mirror Ports

In certain situations, you may need to monitor frames from any of the XMC20 Switch ports on one of the COGE5 front ports. For this purpose, any of the five Ethernet front ports can be configured to be a mirror port.

Assuming the case where you want to mirror all frames that are sent by the port-1 of a service unit in slot 20 to the COGE5 unit, and you have one front port of the COGE5 yet unused (e.g. port-5), you may proceed as follows to get the frames to a monitoring equipment connected to that spare front port.

Configure a mirror port Activate mirroring of the unit-20, port-1 outgoing Ethernet traffic on the COGE5 port-5.

Configure the port type **Proceed as follows:**

1. Select the "Tree View" of the ECST.

2. Navigate to the COGE5 port parameters:
   - AP:/unit-11/port-5, Overview - Port Type.

3. Set the port type for the mirror port:
   - Usage = Analyzer

4. Execute "Apply".

Result: The port type is configured.

Configure the mirrored port **Proceed as follows:**

1. Navigate to the COGE5 port parameters:
   - AP:/unit-11/port-5, Overview - Mirroring.

2. Add a mirrored port table entry:
   - Click "Add …".
   - The "Add Mirroring Entry" dialogue opens.

3. Enter the parameter values:
   - In the "Source" row click "…".
   - The "Select the Source Port" dialogue opens.
   - Tick the box of port-1 of the unit-20.
   - Click "OK".
   - The "Destination" port is already preselected: /unit-11/port-5.
   - Set the Copy Direction = Copy TX only

4. Click "OK" in the "Add Mirroring Entry" dialogue.

5. Execute "Apply".

Result: The mirror port is completely configured.

Activation **Proceed as follows:**

1. Navigate to the COGE5 port parameters:
   - AP:/unit-11/port-5, Main - General:

2. Set the administrative state of the port-5 to up:
   - Interface Status, Admin Status = Up.

3. Execute "Apply".
   - The "Operational Status" changes to "Up".

Result: The port is activated.

End of instruction

Now you connect your monitoring equipment to port-5 of the COGE5 unit and start monitoring.

7.5 MPLS-TP Status

The management functions for the operation of MPLS-TP are located in the ECST tab "MPLS-TP".

For a description of this functionality please refer to [358] User Manual "MPLS-TP".

7.6 PTP Status

The management functions for the operation of the PTP synchronization functions are located in the ECST tab "Tree View", at the following access points:

- AP: /ne, Status - PTP.
- AP: /ne, Status - PETS.
- AP: /unit-11/port-y or /unit-13/port-y, Status - PTP.

For a description of this functionality see section 8.3.5.2 AP: / unit-x / port-a, Status – PTP (on page 88) and refer to [314] User Guide "TDM Services and Cross Connections in XMC20".

8 User Interface Reference

This section gives a complete reference of the managed objects, properties, and commands of the COGE5 core unit as far as these are not covered in the generic descriptions in [302] User Guide "XMC25/XMC23/XMC22".

8.1 Introduction

Below, you find a detailed description of all the configuration parameters and operations belonging to the managed objects model (MOM) for the COGE5 core unit operated in a XMC20.

Figure 17 "MOM for COGE5" shows the access point (AP) tree for the COGE5 unit with its managed objects.
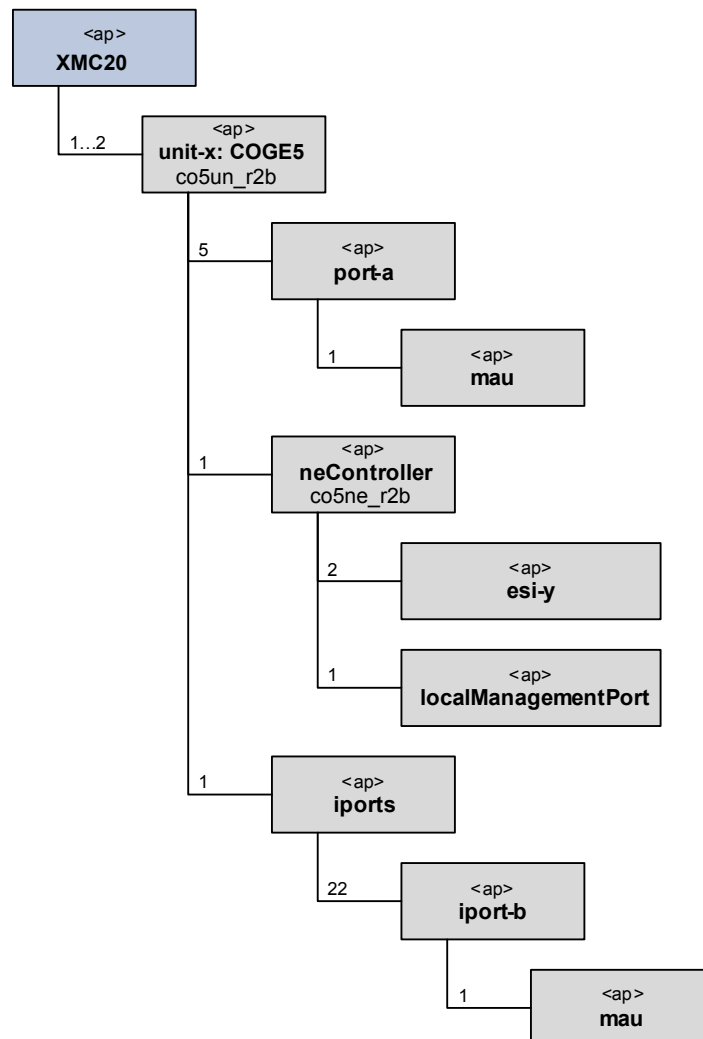
Figure 17:   MOM for COGE5

With these managed objects (MOs) the following functions are covered:

Table 18: Managed objects (MOs) for COGE5

MO	Description of the management functions
unit-x: COGE5 Rxx (co5un_r2b)	Restart of the unit, management of the unit ESW, labelling, indication of equipment status, read of inventory data, access to logbooks. Configuration of unit parameters and equipment protection parameters, creating or deleting of data conferences. The detailed properties are described in section 8.2 AP: / unit-x: COGE5 (on page 73).
port-a	Management of the Ethernet front ports. The AP "port-a" includes both, 1000BASE-X/10000BASE-R SFP Ethernet ports (port-1 and port-2), and electrical 10/100/1000BASE-T Ethernet ports (port-3 to port-5). The detailed properties are described in section 8.3 AP: / unit-x / port-a (on page 76).
mau	The mau provides the fault management functions of the SFPs. The detailed properties are described in section 8.4 AP: / unit-x / port-a / mau (on page 95) and in section 8.10 AP: / unit-x / iports / iport-b / mau (on page 108).
neController (co5ne_r2b)	Management of the NE ESW, labelling, indication of equipment status, read of inventory data, access to logbooks. The detailed properties are described in section 8.5 AP: / unit-x / neController (on page 96).
esi-y	Management of the external synchronization inputs, fault management. The detailed properties are described in section 8.6 AP: / unit-x / neController / esi-y (on page 98).
localManagement-Port	Configuration and fault management of the local management port. The detailed properties are described in [323] User Guide "Management Communication".
iports	The iports AP contains all internal Ethernet ports.
iport-b	Management of the Ethernet internal ports. The internal ports connect all service units with the core unit COGE5 and connect the working and redundant core units when using equipment protection. The detailed properties are described in section 8.9 AP: / unit-x / iports / iport-b (on page 101).

Please note that Ethernet switching related operations like VLAN tagging, filtering, etc. are part of the managed object "bridges" on NE level, which is described in [356] User Manual "Ethernet Switching".

Please note that MPLS-TP Transport related operations like Tunnel creation, etc. are part of the managed object "MPLS-TP" on NE level, which is described in [358] User Manual "MPLS-TP".

For each of the managed objects, properties and commands, the GUI "Tree Views" are given.

This reference section comprises the management functions:
- Overview,
- Main,
- QoS,
- Statistics,
- Configuration,

- Fault Management, and
- Status.

Most of the APs only offer a part of the management functions listed above.

The order of appearance of the management function descriptions is in accordance with the APs in the ECST AP tree and the availability of the management functions of each AP.

In the tables of the sections below, the parameter default values for properties are <u>underlined</u>.

Please note:

For better legibility of numbers in this user guide, inverted commas are used when the number's size exceeds three digits (e.g. 40'000). In parameter entry fields of the ECST, these inverted commas must not be entered. Instead, the numbers are entered without these inverted commas (e.g. 40000).

Please note:

Screenshots presented in this reference are examples and show configurations or data that may not correspond to the view you see when managing your XMC20 equipment.

8.2 AP: / unit-x: COGE5

The name "unit-x" stands for:
- the "unit-11" if only one COGE5 is operated in the XMC20, or
- the "unit-13" if, in addition to unit-11 a redundant COGE5 is operated in the XMC20.

8.2.1 AP: / unit-x, Overview

For a description of the
- − "Overview - Alarms",
- − "Overview - Mirroring",
- − "Overview - Port Type, and
- − "Overview - Statistics"

management functions, please refer to [302] User Guide "XMC25/XMC23/XMC22".

8.2.2 AP: / unit-x, Main

For a description of the
- − "Main - General",
- − "Main - Equipment",
- − "Main - Inventory",
- − "Main - Logbooks", and
- − "Main - Software"

management functions, please refer to [302] User Guide "XMC25/XMC23/XMC22".

8.2.3 AP: / unit-x, Configuration
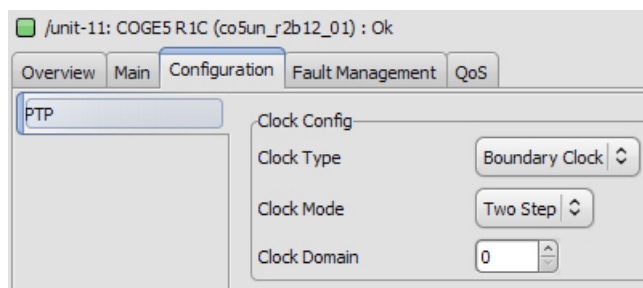
8.2.3.1 AP: / unit-x, Configuration - PTP

Table 19: AP: / unit-x, Configuration - PTP

Operation Name	Parameter Name	Range	Descriptions / Details
Clock Config	Clock Type	Disabled	The COGE5 unit is not used as a PTP ordinary or boundary clock. It can be used as a PTP transparent clock. No PTP port can be used as PETS timing source. See section 5.4.3 Precision Time Protocol (on page 44).
		Ordinary Clock	The COGE5 unit is used as a PTP ordinary clock and/or transparent clock.
		Boundary Clock	The COGE5 unit is used as a PTP boundary clock and/or ordinary clock and/or transparent clock.
	Clock Mode	One Step	Time information uses a single event message.
		Two Step	Time information uses the combination of an event message and a subsequent general message.
	Clock Domain	0 … 255	A domain consists of one or more PTP devices communicating with each other. 0 is the default domain.

8.2.4 AP: / unit-x, Fault Management

For the a description of the general aspects of the
- − "Fault Management - Status", and
- − "Fault Management - Configuration"

management functions, please refer to [302] User Guide "XMC25/XMC23/XMC22". The following table lists the fault causes of the current AP.

Table 20: AP: / unit-x, Fault Management

ID	Fault Cause	Event Type	Traffic Affecting	Default Severity	Description
CCE	Configuration or Customization Error	Processing Error Alarm	☑	Major	An invalid configuration has been accepted by the unit by mistake. To get rid of the alarm redo the complete configuration or reboot the unit. If the alarm persists please contact KEYMILE.
GSW	General Software Alarm	Equipment Alarm	☐	Major	The XMC20 has detected an unspecific problem with the ESW running on this unit.
MFA	Maintenance Function Active	Communication Alarm	☑	Warning	An operator initiated maintenance function is active on this unit.
SWM	Software Mismatch	Equipment Alarm	☐	Minor	The running ESW does not match the assigned ESW.
SSWNA	Scheduled Software Not Available	Equipment Alarm	☐	Minor	The ESW that is scheduled for installation is not available on the unit. Make sure that the ESW is downloaded to the unit.
HWIC	Hardware Incompatible With Configuration	Equipment Alarm	☑	Major	The plugged HW is not compatible with the unit configuration HW stored in the database. You may need to change the HW or re-create the configuration for the unit.

Table 20: AP: / unit-x, Fault Management (continued)

ID	Fault Cause	Event Type	Traffic Affecting	Default Severity	Description
SWIC	Software Incompatible With Configuration	Equipment Alarm	☑	Major	The ESW running on the unit is not compatible with the unit configuration stored in the database. You may need to upgrade, or downgrade the ESW, or re-create the configuration with the currently running ESW.
SWIN	Software Incompatible With Network Element	Equipment Alarm	☑	Major	The running ESW is not compatible with the version required by the NE type or version.
NSW	No Application Software	Equipment Alarm	☑	Major	There is no application ESW installed on the unit, or the application ESW has not yet finished its boot process.
UIC	Unit Incompatible	Equipment Alarm	☑	Major	The inserted unit is not compatible with the assigned unit.
UNAS	Unit Not Assigned	Equipment Alarm	☐	Warning	The unit is not assigned and cannot be configured. To assign the unit, execute the "Assign" command in the "Main" function of the unit.
UNAV	Unit Not Available	Equipment Alarm	☑	Critical	The unit that is configured is either not plugged or not recognized due to a failure.
PWRSVE	Battery Power Saving	Equipment Alarm	☑	Critical	Power saving is active on the unit, i.e. it is kept in the "reset" state during battery power backup. Power saving is not supported on the COGE5 unit.

8.2.5 AP: / unit-x, QoS

8.2.5.1 AP: / unit-x, QoS – Rate Limiting

For a description of the
- "QoS - Rate Limiting"

management function, please refer to [302] User Guide "XMC25/XMC23/XMC22".

8.3 AP: / unit-x / port-a

The COGE5 front Ethernet ports (port-a) are used for the connection of external equipment.

➡ **Please note:**

The local management port on the COGE5 unit is part of the management interfaces and is described in [323] User Guide "Management Communication".

The COGE5 implements two different types of Ethernet front ports:
- 2 SFP/SFP+ based ports (port-1 and port-2), and
- 3 electrical ports (port-3, port-4 and port-5).

The SFP/SFP+ based ports provide SFP cages for the implementation of SFP/SFP+ modules. The supported speeds are 1000 Mbit/s (1 Gbit/s) and 10'000 Mbit/s (10 Gbit/s) according to the deployed SFP or SFP+ module.

The electrical ports provide speeds of 10, 100 or 1000 Mbit/s.

8.3.1 AP: / unit-x / port-a, Overview

For a description of the
  − "Overview - Alarms",
  − "Overview - Mirroring", and
  − "Overview - Port Type"

management functions, please refer to [302] User Guide "XMC25/XMC23/XMC22".

8.3.2 AP: / unit-x / port-a, Main

8.3.2.1 AP: / unit-x / port-a, Main – General

For a description of the "Labels" and "Alarm Status" parameters in the
  − "Main - General"

management function, please refer to [302] User Guide "XMC25/XMC23/XMC22".

Table 21:   AP: / unit-x / port-a, Main – General

Operation Name	Parameter Name	Range	Descriptions / Details
Interface Status	Admin Status	Up	Select "Up" to bring the port into service
		Down	Select "Down" to take the port out of service.
	Oper Status	Up	Shows the operational state is up. The state can only be up if the administrative state is up and there are currently no failures. If the port is SFP based the type must also be configured.
		Down	Shows the operational state is down.
		Testing	Shows the port is in a testing state.

8.3.2.2   AP: / unit-x / port-a, Main – SFP

The Main - SFP management function is only available for the SFP based ports:

- port-1, and
- port-2.

Table 22: AP: / unit-x / port-a, Main – SFP

Operation Name	Parameter Name	Range	Descriptions / Details
Type	Type Configuration	None	No SFP module is plugged
		<List of SFP module types>	Select the type of the plugged SFP module. This should correspond to the Type Status parameter.
	Type Status	None	No SFP module is plugged
		<Detected SFP module types>	Shows the type of the plugged SFP module.
Equipment Inventory	Equipment State	Ok	Equipment state of the plugged SFP module.
		Unknown	
		Empty	
		Plugged	
		Mismatch	
		Failed	
	Manufacturer Serial Number	0 … 16 characters	These description fields provide information about the vendor, part number, revision and production date.
	Manufacturing Date	0 … 10 characters	
	Manufacturer ID	0 … 16 characters	
	Manufacturer Part Number	0 … 16 characters	

Table 22:   AP: / unit-x / port-a, Main – SFP (continued)

Operation Name	Parameter Name	Range	Descriptions / Details
Status	Module Temperature	°C	SFP module temperature, displayed in °C.
	Supply Voltage	mV	SFP supply voltage, displayed in mV.
	TX Bias Current	uA	SFP bias current, displayed in µA.
	TX Output Power	dBm	Optical power at the transmit interface, displayed in dBm.
	RX Input Power	dBm	Optical power at the receive interface, displayed in dBm.

8.3.2.3   AP: / unit-x / port-a, Main – Physical

Table 23:   AP: / unit-x / port-a, Main – Physical

Operation Name	Parameter Name	Range	Descriptions / Details
	MAC Address	00:00:00:00:00:00 … ff:ff:ff:ff:ff:ff	Shows the physical (MAC) address of this port. This parameter is read-only.
	Port Speed	10 Mbit/s	Shows the port speed. This parameter is read-only.
		100 Mbit/s	
		1000 Mbit/s	
		10 Gbit/s	
	MTU	64 … 1'578 … 9'194 Octets, step 2 Octets	Maximum Transmission Unit, i.e. maximum IP packet size. The MTU size is calculated including the IP headers.
Speed And Duplex	Admin	Auto	Autonegotiation
		10BaseT HD	10 Mbit/s, half duplex
		10BaseT FD	10 Mbit/s, full duplex
		100BaseTX HD	100 Mbit/s, half duplex
		100BaseTX FD	100 Mbit/s, full duplex
		1000BaseT FD	1 Gbit/s, full duplex
		1000Base<xx> FD	1 Gbit/s, full duplex (for SFP modules only). The <xx> string designates the SFP type, e.g. SX.
		10GigBase<xx>	10 Gbit/s, full duplex (for SFP+ modules only). The <xx> string designates the SFP type, e.g. LR.

Table 23:   AP: / unit-x / port-a, Main – Physical (continued)

Operation Name	Parameter Name	Range	Descriptions / Details
	Operational	10BaseT HD	10 Mbit/s, half duplex
		10BaseT FD	10 Mbit/s, full duplex
		100BaseTX HD	100 Mbit/s, half duplex
		100BaseTX FD	100 Mbit/s, full duplex
		1000BaseT FD	1 Gbit/s, full duplex
		1000Base<xx> FD	1 Gbit/s, full duplex (for SFP modules only). The <xx> string designates the SFP type, e.g. SX.
		10GigBase<xx>	10 Gbit/s, full duplex (for SFP+ modules only). The <xx> string designates the SFP type, e.g. LR.
		Other	The speed and duplex setting cannot be determined or the port state is down.
Flow Control	Admin	☑	Port Ethernet flow control according to IEEE 802.3x.
		☐	Flow control is a mechanism which allows the receiving party of a connection to control the rate of the sending party.
	Operational	☑	
		☐	

Please note:

For an overview on the specific characteristics of XMC20 Switch ports, please refer to [356] User Manual "Ethernet Switching" and refer to [358] User Manual "MPLS-TP".

8.3.3 AP: / unit-x / port-a, Configuration

8.3.3.1 AP: / unit-x / port-a, Configuration – Synchronization

Table 24: AP: / unit-x / port-a, Configuration – SyncE

Operation Name	Parameter Name	Range	Descriptions / Details
Synchronization	Method	None	Do not use a synchronization method
		ESMC	Use the Ethernet Synchronization Message Channel (ESMC) for the transport of the synchronization status message (SSM). The PETS QL value is only transmitted if the COGE5 unit configuration parameter "Synchronized To NE Clock Enabled" is set to true. Otherwise the transmit timing is free running and the transmitted QL is "Do Not Use".

Table 24:   AP: / unit-x / port-a, Configuration – SyncE (continued)

Operation Name	Parameter Name	Range	Descriptions / Details
QL Transmission	Source	ESI-1	Synchronization sources are all the PDH clock sources as they are configured at the AP: /ne, Configuration - PETS. The PTP-x sources are only available if the PTP mode is not disabled at the AP: /ne, Configuration - PTP. These values are read-only.
		ESI-2	
		<PDH Clock Source 1>	
		<PDH Clock Source 2>	
		<PDH Clock Source 3>	
		<PDH Clock Source 4>	
		PTP-1	
		PTP-2	
		PTP-3	
		PTP-4	
		Internal	
	Usage	<u>NA</u>	No synchronization method has been selected.
		CanBeUsed	Transmit the QL value of the selected synchronization source
		DoNotUse	Transmit the QL value 15, i.e. indicating that the traffic signal cannot be used as a synchronization source.
Input Mapping Table	Received QL	1 … 14	A received quality level in the range 1 to 14 can be adapted to any other QL which will then be used in the PETS and ESO selection process. The default is a 1:1 mapping. Note that a lower QL means a higher clock quality.
	Adapted QL	Unknown	
		1 … 14	
		Do Not Use	
Output Mapping Table	Transmitted QL	1 … 14	A PETS internally used quality level in the range 1 to 14 can be adapted to any other QL which will then be used in the SSM of the corresponding transmit signal. The default is a 1:1 mapping. Note that a lower QL means a higher clock quality. Please refer to [314] User Guide "TDM Services and Cross Connections in XMC20" for a description of the quality level handling.
	Adapted QL	Unknown	
		1 … 14	
		Do Not Use	

Risk of operating trouble!

An electrical SFP based Ethernet port does not support synchronous Ethernet.

Risk of operating trouble!

An Ethernet port operating in 1000BASE-T mode supports only unidirectional synchronous Ethernet.

→ A 1000BASE-T Ethernet port transports timing information only from the clock master to the clock slave.

Risk of operating trouble!

An Ethernet port operating in 10BASE-T mode cannot be used for the synchronous Ethernet.

Please note:

An Ethernet port operating in 100BASE-TX half duplex mode can be used for synchronous Ethernet.

→ The half duplex mode applies only for the layer 2 and above, the physical layer operates in full duplex mode.

Please note:

For more information regarding quality level handling please refer to [314] User Guide "TDM Services and Cross Connections in XMC20".

8.3.3.2   AP: / unit-x / port-a, Configuration – PTP

Table 25:   AP: / unit-x / port-a, Configuration – PTP

Operation Name	Parameter Name	Range	Descriptions / Details
Port Config	PTP Mode	Disabled	The port is not used as a PTP port. The PTP port cannot be used as PETS synchronization source.
		Ordinary/Boundary Clock	Use the port as PTP port of an ordinary or boundary clock.
		Transparent Clock	Use the port as PTP port of a transparent clock. Note that the PTP clock type is typically configured to "Disabled", but can also be configured to "Ordinary Clock" or "Boundary Clock".
		Ordinary/Boundary and Transparent Clock	This mode will be supported in a future release.
	Role	Slave	The PTP port is a slave port. The PTP port can be used as PETS synchronization source.
		Master	The PTP port is a master port. The PTP port cannot be used as PETS synchronization source. The master role is not supported if the PTP clock type is configured to "Ordinary Clock".
		Master Or Slave	The PTP port is a slave or a master port, depending of the forwarding direction of the timing information. The PTP port can be used as PETS synchronization source.
	Encapsulation	Ethernet	PTP packets are encapsulated in Ethernet MAC frames.
		Ethernet + VLAN	PTP packets are encapsulated in Ethernet MAC frames with a VLAN tag.
	Addressing	Unicast	Use unicast PTP messaging.
		Multicast	Use multicast PTP messaging.
Ethernet Configuration	VLAN ID	1 … 4089	VLAN ID to be used with Ethernet + VLAN encapsulation.
	Priority	CoS 0 … CoS 3 … CoS 7	VLAN Class of Service to be used with Ethernet + VLAN encapsulation.
	Unicast Destination MAC	<MAC address>	Enter the MAC address of the remote Ethernet port (Master) when using the unicast addressing scheme. Default: A0:00:00:00:00:01
	Forward Multicast Messages	☑	Forwarding of multicast messages is required if the grand master clock generates multicast frames.
		☐	

Table 25: AP: / unit-x / port-a, Configuration – PTP

Operation Name	Parameter Name	Range	Descriptions / Details
Message Intervals	Announce	1 Message every 2 Seconds	Number of messages per interval for the Announce message type. This type of messages is only applicable for PTP ports in the master role.
		1 Message Per Second	
		2 Messages Per Second	
		4 Messages Per Second	
		8 Messages Per Second	
		16 Messages Per Second	
		32 Messages Per Second	
		64 Messages Per Second	
	Sync	1 Message every 2 Seconds	Number of messages per interval for the Sync message type and the follow up messages. The message interval should match the PTP message intervals configured at the AP: /ne, Configuration - PTP.
		1 Message Per Second	
		2 Messages Per Second	
		4 Messages Per Second	
		8 Messages Per Second	
		16 Messages Per Second	
		32 Messages Per Second	
		64 Messages Per Second	
	Delay	1 Message every 2 Seconds	Number of messages per interval for the Delay Request message type and the response messages. The message interval should match the PTP message intervals configured at the AP: /ne, Configuration - PTP.
		1 Message Per Second	
		2 Messages Per Second	
		4 Messages Per Second	
		8 Messages Per Second	
		16 Messages Per Second	
		32 Messages Per Second	
		64 Messages Per Second	
QL Transmission	Source	PTP-1	Synchronization sources are all the PTP clock sources as they are configured at the AP: /ne, Configuration - PTP. These values are read-only.
		PTP-2	
		PTP-3	
		PTP-4	
	Usage	CanBeUsed	Transmit the QL value of the selected synchronization source
		DoNotUse	Transmit the QL value 15, i.e. indicating that the traffic signal cannot be used as a synchronization source.

Risk of operating trouble!

The SFP-based 1 GbE interfaces port-1 and port-2 on the COGE5 unit are not operable as PTP timing sources.

→ The port-1 and port-2 must use the 10 GbE mode to be usable as PTP timing source.

KEYMILE

> **Please note:**
>
> *A COGE5 port is only selectable as PTP source if the COGE5 is configured correspondingly:*
> - → AP: /unit-x, Configuration - PTP:
>   Clock Type = Ordinary Clock, or Boundary Clock.
> - → AP: /unit-x/port-y, Configuration - PTP:
>   PTP Mode = Ordinary/Boundary Clock.
>   Role = Slave, or Master Or Slave
> - → The port must be in the administrative state = up.

> **Please note:**
>
> *For more information regarding quality level handling please refer to [314] User Guide "TDM Services and Cross Connections in XMC20".*

8.3.4 AP: / unit-x / port-a, Fault Management

For the a description of the general aspects of the
- − "Fault Management - Status", and
- − "Fault Management - Configuration"

management functions, please refer to [302] User Guide "XMC25/XMC23/XMC22". The following table lists the fault causes of the current AP.

Table 26: AP: / unit-x / port-a, Fault Management

ID	Fault Cause	Event Type	Traffic Affecting	Default Severity	Description
LOS	Loss Of Signal	Communication Alarm	☑	Major	The signal has been lost on the front port. Make sure the connector is plugged on the front port and the remote equipment is transmitting a signal.
CLKMIS	Clock Mismatch	Equipment Alarm	☐	Minor	The port has been configured as PDH clock source, but the Ethernet port does not support synchronous Ethernet, i.e. the 1000BASE-T port is configured as clock master. Please refer to section 5.4.2 Synchronous Ethernet (on page 42).

8.3.5 AP: / unit-x / port-a, Status

8.3.5.1 AP: / unit-x / port-a, Status – SyncE

Table 27: AP: / unit-x / port-a, Status – SyncE

Operation Name	Parameter Name	Range	Descriptions / Details
Clock Quality	Received QL	Unknown	The synchronization method "None" has been configured, or no ESMC messages are received.
		Do Not Use	The received SSM value is = 15, or the port operational state is down.
		1 … 14	The received SSM value is < 15.
	Transmitted QL	Unknown	The synchronization method "None" has been configured. The port transmits no ESMC messages.
		Do Not Use	The "Do Not Use" quality level is transmitted as SSM value = 15 in the following cases: - The ports "QL Transmission Usage" parameter is "DoNotUse. - The port is operating in 1000BASE-T mode as clock slave.
		1 … 14	Display of the transmitted SSM value < 15.
	Master Role	☑	Master role of a 1000BASE-T Ethernet port. If enabled the port can transmit the QL. 100BASE-TX and optical port types have the Master Role always enabled.
		☐	
	Slave Role	☑	Slave role of a 1000BASE-T Ethernet port. If enabled the port can receive the QL. 100BASE-TX and optical port types have the Slave Role always enabled.
		☐	

Please note:

For more information regarding quality level handling please refer to [314] User Guide "TDM Services and Cross Connections in XMC20".

8.3.5.2 AP: / unit-x / port-a, Status – PTP

Table 28: AP: / unit-x / port-a, Status – PTP

Operation Name	Parameter Name	Range	Descriptions / Details
Clock Quality	Received QL	Do Not Use	The received QL value is = 15, or the port operational state is down, or the port is a transparent port.
		Unknown	The received PTP QL is 0 (Clock Class = 82).
		1 … 14	The received QL value is < 15.
	Transmitted QL	Do Not Use	The "Do Not Use" quality level is transmitted as QL value = 15 (Clock Class = 110).
		Unknown	The "Unknown" QL is sent as long as the PETS is not phase locked. This inhibits the phase locking of the downstream PTP slave clock. The "Unknown" QL is sent if the port is a transparent port.
		1 … 14	Display of the transmitted QL value < 15.

Table 28:   AP: / unit-x / port-a, Status – PTP (continued)

Operation Name	Parameter Name	Range	Descriptions / Details
Parent Data Set	Stats Valid	☑	The PTP clock has a port in the SLAVE state, and the PTP clock has computed statistically valid estimates of the "Observed Parent Offset Scaled Log Variance" and the "Observed Parent Clock Phase Change Rate" parameters.
		☐	The above conditions for the PTP clock are not fulfilled.
	Observed Parent Offset Scaled Log Variance	$0 \ldots 2^{16}$	An estimate of the parent clock's PTP variance.
	Observed Clock Phase Change Rate	$-2^{31} \ldots 2^{31}$	An estimate of the parent clock's phase change rate.
	Grandmaster Identity	16 hex characters	Clock identity attribute of the grandmaster clock.
	Clock Class	0 … 255	Attribute of an ordinary or boundary clock that denotes the traceability of the time or frequency distributed by the grandmaster clock. See table 5 of IEEE1588-2008. In the XMC20 the Clock Class parameter carries the Quality Level information in the Announce messages (table 1 of ITU-T G.8265.1). Refer to [314] User Guide "TDM Services and Cross Connections in XMC20".
	Clock Accuracy	Unknown	Characterizes a clock for the purpose of the best master clock (BMC) algorithm. See table 6 of IEEE 1588-2008.
		25 ns … 10 s	
		Worse than 10 s	
	Offset Scaled Log Variance	$0 \ldots 2^{16}$	A static constant determined by the manufacturer, or based on measured or modelled behaviour of the components of the local clock and its environment.
	Grandmaster Priority 1	0 … 255	The attribute is used in the execution of the best master clock algorithm. Lower values take precedence.
	Grandmaster Priority 2	0 … 255	The attribute is used in the execution of the best master clock algorithm. Lower values take precedence.
Time Properties	Current UTC Offset	$-2^{15} \ldots 2^{15}$ s	Offset between International Atomic Time (TAI) and Universal Coordinated Time (UTC).
	Current UTC Offset Valid	☑	The parameter is true if the "Current UTC Offset" is known to be correct.
		☐	
	Leap 59	☑	The parameter is true if the last minute of the current UTC day contains 59 seconds.
		☐	
	Leap 61	☑	The parameter is true if the last minute of the current UTC day contains 61 seconds.
		☐	
	Time Traceable	☑	The parameter is true if the timescale and the value of "Current UTC Offset" are traceable to a primary reference.
		☐	

Table 28:   AP: / unit-x / port-a, Status – PTP (continued)

Operation Name	Parameter Name	Range	Descriptions / Details
	Frequency Traceable	☑	The parameter is true i if the frequency determining the timescale is traceable to a primary reference.
		☐	
	PTP Timescale	☑	The parameter is true if the clock timescale of the grandmaster clock is PTP.
		☐	
	Time Source	Atomic Clock	Source of time used by the grandmaster clock. See table 7 of IEEE 1588-2008.
		GPS	
		Terrestrial Radio	
		PTP	
		NTP	
		Hand Set	
		Internal Oscillator	
		Other	
Clock Quality	Operational State	Unknown	Operating state is currently unknown.
		Disabled	The stream has been disabled.
		Grandmaster	Operating on a clock with a clock class ≤ 127 and is currently grandmaster in the network.
		Master	Operating as a master on a clock with a clock class ≥ 128 because it is currently the best clock available.
		Repeater	Operating as a master on a clock that is synchronized to a better server via another stream. This stream is repeating the timing information from the grandmaster.
		Passive Master	Operating on a clock with a clock class ≤ 127 but is currently not the grandmaster in the network and therefore is in the passive state.
		Slave	Operating as a slave due to the BMC algorithm determining that it is connected to the grandmaster in the network.
		Listening	Listening to ANNOUNCE messages from a server but is not collecting any timing data.
		Monitoring	Receiving ANNOUNCE messages and timing data (SYNC, etc.) from a server that is not the best server in the network.

Please note:

The transmitted QL value displayed is only meaningful in the forward direction of synchronization (master to slave), i.e. on a Master port.

Please note:

The received QL value displayed is only meaningful in the forward direction of synchronization (master to slave), i.e. on a Slave port.

8.3.6 AP: / unit-x / port-a, Statistics

8.3.6.1 AP: / unit-x / port-a, Statistics – General

Table 29: AP: / unit-x / port-a, Statistics – General

Operation Name	Parameter Name	Range	Descriptions / Details
RX Counters	RX Octets	$0 \dots 2^{64}-1$	Number of ingress octets
	RX Unicast Packets	$0 \dots 2^{64}-1$	Number of ingress unicast packets
	RX Multicast Packets	$0 \dots 2^{64}-1$	Number of ingress multicast packets
	RX Broadcast Packets	$0 \dots 2^{64}-1$	Number of ingress broadcast packets
	RX Errors	$0 \dots 2^{32}-1$	Number of ingress errored packets
TX Counters	TX Octets	$0 \dots 2^{64}-1$	Number of egress octets
	TX Unicast Packets	$0 \dots 2^{64}-1$	Number of egress unicast packets
	TX Multicast Packets	$0 \dots 2^{64}-1$	Number of egress multicast packets
	TX Broadcast Packets	$0 \dots 2^{64}-1$	Number of egress broadcast packets
	TX Errors	$0 \dots 2^{32}-1$	Number of egress errored packets

Please note:

The statistics counters restart with 0 when they reach their upper range limit.

8.3.6.2 AP: / unit-x / port-a, Statistics – Ethernet

/unit-11 (COGE5 R 1C)/port-5: Ethernet

| Overview | Main | Configuration | Fault Management | Status | Statistics | QoS |

General

Ethernet

Error Counters

FCS Errors	52113	Frames
Mac Transmit Errors	0	Frames
Mac Receive Errors	0	Frames
Frames Too Long	0	Frames
Drop Events	0	
CRC Align Errors	52113	Packets
Undersize Packets	0	Packets
Fragment Packets	11736	Packets
Jabber Packets	0	Packets

Collision Counters

Deferred Transmissions	10	Frames
Collisions	3	Collisions
Late Collisions	7	Collisions
Excessive Collisions	0	Frames

Pause Frame Counters

| RX Pause Frames | 0 | Frames |
| TX Pause Frames | 0 | Frames |

Receive Statistics

Received Packets	215833598	Packets
Received Octets	35997014817	Octets
64 Octets	7100347	Packets
65 to 127 Octets	1841095	Packets
128 to 255 Octets	25932	Packets
256 to 511 Octets	206854488	Packets
512 to 1023 Octets	0	Packets
> 1023 Octets	0	Packets

Table 30: AP: / unit-x / port-a, Statistics – Ethernet

Operation Name	Parameter Name	Range	Descriptions / Details
Error Counters	FCS Errors	$0 \ldots 2^{64}-1$	Number of ingress frames with FCS errors
	Mac Transmit Errors	$0 \ldots 2^{64}-1$	Number of egress frames with a MAC sublayer transmit error
	Mac Receive Errors	$0 \ldots 2^{64}-1$	Number of ingress frames with a MAC sublayer receive error
	Frames Too Long	$0 \ldots 2^{64}-1$	Number of ingress frames that exceed the maximum permitted frame size.
	Drop Events	$0 \ldots 2^{32}-1$	Number of ingress drop events
	CRC Align Errors	$0 \ldots 2^{32}-1$	Number of ingress packets with CRC alignment errors
	Undersize Packets	$0 \ldots 2^{32}-1$	Number of ingress undersized packets (< 64 bytes)
	Fragment Packets	$0 \ldots 2^{32}-1$	Number of ingress fragment packets
	Jabber Packets	$0 \ldots 2^{32}-1$	Number of ingress jabber packets
Collision Counters [a]	Deferred Transmissions	$0 \ldots 2^{32}-1$	Number of egress frames for which the first transmission attempt is delayed because the medium is busy
	Collisions	$0 \ldots 2^{32}-1$	Number of estimated collisions
	Late Collisions	$0 \ldots 2^{32}-1$	Number of times that a collision is detected later than one slot time into the transmission of a packet.
	Excessive Collisions	$0 \ldots 2^{32}-1$	Number of frames for which transmission fails due to excessive collisions
Pause Frame Counters	RX Pause Frames	$0 \ldots 2^{64}-1$	Number of ingress pause MAC control frames
	TX Pause Frames	$0 \ldots 2^{64}-1$	Number of egress pause MAC control frames
Receive Statistics	Received Packets	$0 \ldots 2^{64}-1$	Number of ingress packets
	Received Octets	$0 \ldots 2^{64}-1$	Number of ingress octets
	64 Octets	$0 \ldots 2^{64}-1$	Number of ingress packets with a size of 64 octets
	65 to 127 Octets	$0 \ldots 2^{64}-1$	Number of ingress packets with a size of 65 to 127 octets
	128 to 255 Octets	$0 \ldots 2^{64}-1$	Number of ingress packets with a size of 128 to 255 octets
	256 to 511 Octets	$0 \ldots 2^{64}-1$	Number of ingress packets with a size of 256 to 511 octets
	512 to 1023 Octets	$0 \ldots 2^{64}-1$	Number of ingress packets with a size of 512 to 1023 octets
	> 1023 Octets	$0 \ldots 2^{64}-1$	Number of ingress packets with a size of more than 1023 octets

a. These counters are not available for 10 GbE interfaces. They are always 0.

Please note:

The statistics counters restart with 0 when they reach their upper range limit.

8.3.7 AP: / unit-x / port-a, QoS

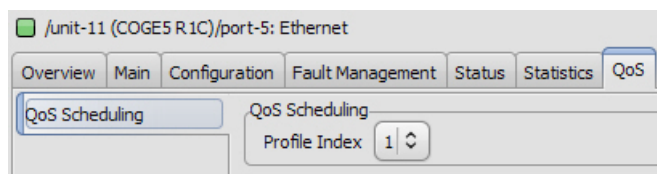### 8.3.7.1 AP: / unit-x / port-a, QoS – QoS Scheduling

/unit-11 (COGE5 R1C)/port-5: Ethernet

Overview | Main | Configuration | Fault Management | Status | Statistics | QoS

QoS Scheduling

QoS Scheduling
Profile Index 1

Table 31:   AP: / unit-x / port-a, QoS – QoS Scheduling

Operation Name	Parameter Name	Range	Descriptions / Details
QoS Scheduling	Profile	1 … 5	Select the QoS scheduling profile number. QoS scheduling profiles are configured with ECST at the AP: /ne, Configuration - QoS - Scheduling Profiles.

8.3.7.2 AP: / unit-x / port-a, QoS – Rate Limiting

Please note:

The Rate Limiting tab is only available if the port type of the Ethernet port is configured to PWAC or to CVP.

→ First configure the port type to PWAC or to CVP.

For a description of the

− "QoS - Rate Limiting"

management function, please refer to [302] User Guide "XMC25/XMC23/XMC22".

8.4 AP: / unit-x / port-a / mau

8.4.1 AP: / unit-x / port-a / mau, Overview

For a description of the
- "Overview - Alarms"

management function, please refer to [302] User Guide "XMC25/XMC23/ XMC22".

8.4.2 AP: / unit-x / port-a / mau, Main

For a description of the
- "Main - General"

management function, please refer to [302] User Guide "XMC25/XMC23/ XMC22".

8.4.3 AP: / unit-x / port-a / mau, Fault Management

Please note:

The mau fault management applies only to the SFP based Ethernet ports.

For the a description of the general aspects of the
- "Fault Management - Status", and
- "Fault Management - Configuration"

management functions, please refer to [302] User Guide "XMC25/XMC23/ XMC22". The following table lists the fault causes of the current AP.

Table 32: AP: / unit-x / port-a / mau, Fault Management

ID	Fault Cause	Event Type	Traffic Affecting	Default Severity	Description
ENA	Equipment Not Available	Equipment Alarm	☑	Major	There is no SFP/SFP+ module plugged, or the SFP/SFP+ module cannot be recognized. Make sure you are using a compatible SFP/SFP+ module on this port.
TRF	Transmitter Failure	Equipment Alarm	☑	Major	The transmitter part of the SFP/SFP+ module reports a failure. This may be due to a HW failure. You may need to replace the SFP/SFP+ module.
HWIC	Hardware Incompatible With Configuration	Equipment Alarm	☑	Major	The plugged SFP/SFP+ module is not compatible with the unit configuration HW stored in the database. You may need to change the HW or re-create the configuration for the unit.

8.5   AP: / unit-x / neController

8.5.1   AP: / unit-x / neController, Overview

For a description of the
- − "Overview - Alarms"

management function, please refer to [302] User Guide "XMC25/XMC23/ XMC22".

8.5.2   AP: / unit-x / neController, Main

For a description of the
- − "Main - General",
- − "Main - Equipment",
- − "Main - Inventory",
- − "Main - Logbooks", and
- − "Main - Software"

management functions, please refer to [302] User Guide "XMC25/XMC23/ XMC22".

Please note:

In the "Main - Equipment" management function only the "Equipment Status" properties are available. The "Assignment Status" properties and the equipment commands are not applicable.

8.5.3   AP: / unit-x / neController, Fault Management

For the a description of the general aspects of the
- − "Fault Management - Status", and
- − "Fault Management - Configuration"

management functions, please refer to [302] User Guide "XMC25/XMC23/ XMC22". The following table lists the fault causes of the current AP.

Table 33:   AP: / unit-x / neController, Fault Management

ID	Fault Cause	Event Type	Traffic Affecting	Default Severity	Description
GSW	General Software Alarm	Equipment Alarm	☐	Major	The XMC20 has detected an unspecific problem with the ESW running on this unit.
MFA	Maintenance Function Active	Communication Alarm	☑	Warning	An operator initiated maintenance function is active on this unit.
SWM	Software Mismatch	Equipment Alarm	☐	Minor	The running ESW does not match the assigned ESW.
SSWNA	Scheduled Software Not Available	Equipment Alarm	☐	Minor	The ESW that is scheduled for installation is not available on the unit. Make sure that the ESW is downloaded to the unit.

Table 33: **AP: / unit-x / neController, Fault Management (continued)**

ID	Fault Cause	Event Type	Traffic Affecting	Default Severity	Description
HWIC	Hardware Incompatible With Configuration	Equipment Alarm	☑	Major	The plugged HW is not compatible with the unit configuration HW stored in the database. You may need to change the HW or re-create the configuration for the unit.
SWIC	Software Incompatible With Configuration	Equipment Alarm	☑	Major	The ESW running on the unit is not compatible with the unit configuration stored in the database. You may need to upgrade, or downgrade the ESW, or re-create the configuration with the currently running ESW.
SWIN	Software Incompatible With Network Element	Equipment Alarm	☑	Major	The running ESW is not compatible with the version required by the NE type or version.
NSW	No Application Software	Equipment Alarm	☑	Major	There is no application ESW installed on the unit, or the application ESW has not yet finished its boot process.

KEYMILE

8.6 AP: / unit-x / neController / esi-y

8.6.1 AP: / unit-x / neController / esi-y, Overview

For a description of the
- "Overview - Alarms"

management function, please refer to [302] User Guide "XMC25/XMC23/ XMC22".

8.6.2 AP: / unit-x / neController / esi-y, Main

8.6.2.1 AP: / unit-x / neController / esi-y, Main - General

For a description of the
- "Main - General"

management function, please refer to [302] User Guide "XMC25/XMC23/ XMC22".

Please note:

The administrative state of the ESI-1 and ESI-2 ports on the active and standby COGE5 unit is controlled by the PETS configuration. The administrative state is set to up as soon as the ESI port is given a PETS clock priority other than "Disabled".

→ For more information please refer to [314] User Guide "TDM Services and Cross Connections in XMC20"

8.6.3 AP: / unit-x / neController / esi-y, Fault Management

For the a description of the general aspects of the
- "Fault Management - Status", and
- "Fault Management - Configuration"

management functions, please refer to [302] User Guide "XMC25/XMC23/ XMC22". The following table lists the fault causes of the current AP.

Table 34: AP: / unit-x / neController / esi-y, Fault Management

ID	Fault Cause	Event Type	Traffic Affecting	Default Severity	Description
LOS	Loss Of Signal	Communica-tion Alarm	☑	Major	There is no signal applied on the ESI interface.

Please note:

The alarm state of the ESI-1 and ESI-2 ports on the active and standby COGE5 unit can only be active if the corresponding ESI port is selected as PETS clock source, i.e. given a PETS clock priority other than "Disabled".

KEYMILE

8.7 AP: / unit-x / neController / localManagementPort

For a description of the management functions of the local management port please refer to [323] User Guide "Management Communication".

8.8 AP: / unit-x / iports

8.8.1 AP: / unit-x / iports, Overview

For a description of the
- "Overview - Alarms",
- "Overview - Port Type", and
- "Overview - Statistics"

management functions, please refer to [302] User Guide "XMC25/XMC23/XMC22".

Please note:

The Port Type tab is only available if any of the internal ports is connected to an Ethernet stand-alone service unit.

→ For a list of Ethernet stand-alone service units please refer to [358] User Manual "MPLS-TP".

8.8.2 AP: / unit-x / iports, Main

For a description of the
- "Main - General"

management function, please refer to [302] User Guide "XMC25/XMC23/XMC22".

8.9 AP: / unit-x / iports / iport-b

The COGE5 internal backplane Ethernet ports (iport-b) connect every service unit plugged in the same network element via the GbE star. The backplane ports are 1GbE electrical ports. The speed of the ports is fixed.

The characteristics are identical for all internal ports iport-b:
- b = 1 … 10, 12 … 21 in a XMC25,
- b = 7 … 10, 12 … 14 in a XMC23.
- b = 9… 10, 12 in a XMC22.

The internal port
- iport-13
  can be used for the connection of a service unit or redundant core unit plugged in slot 13. The iport-13 connecting the redundant core unit is only used if the redundant core unit is running in the bootloader. Otherwise the internal ports iport-51 and iport-53 are used, see below.

Please note:

Slot 13 can also hold a service unit.

- iport-11
  is only available on the redundant core unit. The backplane port is a 1GbE electrical port. The speed of the port is fixed.
  The iport-11 connecting the working core unit is only used if the working core unit is running in the bootloader. Otherwise the internal ports iport-51 and iport-53 are used, see below.

The internal ports
- iport-51, iport-53,
  are available on the working and redundant core units. The backplane ports are 10GbE electrical ports. The speed of the ports is fixed.
  The iport-51 and iport-53 connecting the working and redundant core units are used if the core units are running the unit application ESW. Otherwise the internal port iport-11 or iport-13 is used, see above.

8.9.1 AP: / unit-x / iports / iport-b, Overview

For a description of the
- − "Overview - Alarms", and
- − "Overview - Port Type"

management functions, please refer to [302] User Guide "XMC25/XMC23/XMC22".

Please note:

The Port Type tab is only available if the port is connected to an Ethernet stand-alone service unit.

→ For a list of Ethernet stand-alone service units please refer to [358] User Manual "MPLS-TP".

8.9.2 AP: / unit-x / iports / iport-b, Main

8.9.2.1 AP: / unit-x / iports / iport-b, Main – General

For a description of the "Labels" and "Alarm Status" parameters in the
- "Main - General"

management function, please refer to [302] User Guide "XMC25/XMC23/ XMC22".

Table 35: AP: / unit-x / iports / iport-b, Main – General

Operation Name	Parameter Name	Range	Descriptions / Details
Interface Status	Admin Status	Up	Select "Up" to bring the internal port into service
		Down	The internal port cannot be set to the Down state.
	Oper Status	Up	Shows the operational state is up. The state can only be up if the administrative state is up and there are currently no failures.
		Down	Shows the operational state is down.
		Unknown	The port status is unknown.
		Testing	Shows the port is in a testing state.

8.9.2.2 AP: / unit-x / iports / iport-b, Main – Physical

Table 36:   AP: / unit-x / iports / iport-b, Main – Physical

Operation Name	Parameter Name	Range	Descriptions / Details
	MAC Address	00:00:00:00:00:00 … ff:ff:ff:ff:ff:ff	Shows the physical (MAC) address of this port. This parameter is read-only.
	Port Speed	1'000 Mbit/s	Shows the port speed. This parameter is read-only.
		10'000 Mbit/s	
		---	The internal Ethernet port is not operational.
	MTU	1978 … 9'194 Octets	Maximum Transmission Unit, i.e. maximum IP packet size. The MTU size is calculated including the IP headers.
Speed And Duplex	Admin	1000BaseX FD	1'000 Mbit/s, full duplex. Applicable for iport-1 to iport-21.
		10GBaseX FD	10'000 Mbit/s, full duplex. Applicable for iport-51 and iport-53.
		Auto	Not applicable
	Operational	1000BaseT FD	1'000 Mbit/s, full duplex. Applicable for iport-1 to iport-21.
		10GBaseX FD	10'000 Mbit/s, full duplex. Applicable for iport-51 and iport-53.
		---	The internal Ethernet port is not operational.
Flow Control	Admin	☑	Port Ethernet flow control according to IEEE 802.3x. Flow control is a mechanism which allows the receiving party of a connection to control the rate of the sending party.
		☐	
	Operational	☑	
		☐	

Please note:

For an overview on the specific characteristics of XMC20 Switch ports, please refer to [356] User Manual "Ethernet Switching" and refer to [358] User Manual "MPLS-TP".

8.9.3 AP: / unit-x / iports / iport-b, Statistics

8.9.3.1 AP: / unit-x / iports / iport-b, Statistics – General

Table 37: AP: / unit-x / iports / iport-b, Statistics – General

Operation Name	Parameter Name	Range	Descriptions / Details
RX Counters	RX Octets	$0 \dots 2^{64}-1$	Number of ingress octets
	RX Unicast Packets	$0 \dots 2^{64}-1$	Number of ingress unicast packets
	RX Multicast Packets	$0 \dots 2^{64}-1$	Number of ingress multicast packets
	RX Broadcast Packets	$0 \dots 2^{64}-1$	Number of ingress broadcast packets
	RX Errors	$0 \dots 2^{32}-1$	Number of ingress errored packets
TX Counters	TX Octets	$0 \dots 2^{64}-1$	Number of egress octets
	TX Unicast Packets	$0 \dots 2^{64}-1$	Number of egress unicast packets
	TX Multicast Packets	$0 \dots 2^{64}-1$	Number of egress multicast packets
	TX Broadcast Packets	$0 \dots 2^{64}-1$	Number of egress broadcast packets
	TX Errors	$0 \dots 2^{32}-1$	Number of egress errored packets

Please note:

The statistics counter restart with 0 when they reach their upper range limit.

8.9.3.2 AP: / unit-x / iports / iport-b, Statistics – Ethernet

/unit-11 (COGE5 R 1C)/iports/iport-14: Ethernet

| Overview | Main | Statistics | QoS |

| General |
| Ethernet |

Error Counters

FCS Errors	0	Frames
Mac Transmit Errors	0	Frames
Mac Receive Errors	0	Frames
Frames Too Long	0	Frames
Drop Events	0	
CRC Align Errors	0	Packets
Undersize Packets	0	Packets
Fragment Packets	0	Packets
Jabber Packets	0	Packets

Collision Counters

Deferred Transmissions	0	Frames
Collisions	0	Collisions
Late Collisions	0	Collisions
Excessive Collisions	0	Frames

Pause Frame Counters

| RX Pause Frames | 0 | Frames |
| TX Pause Frames | 0 | Frames |

Receive Statistics

Received Packets	208041452	Packets
Received Octets	33510016582	Octets
64 Octets	191	Packets
65 to 127 Octets	0	Packets
128 to 255 Octets	0	Packets
256 to 511 Octets	208041261	Packets
512 to 1023 Octets	0	Packets
> 1023 Octets	0	Packets

Table 38: AP: / unit-x / iports / iport-b, Statistics – Ethernet

Operation Name	Parameter Name	Range	Descriptions / Details
Error Counters	FCS Errors	$0 \ldots 2^{64}-1$	Number of ingress frames with FCS errors
	Mac Transmit Errors	$0 \ldots 2^{64}-1$	Number of egress frames with a MAC sublayer transmit error
	Mac Receive Errors	$0 \ldots 2^{64}-1$	Number of ingress frames with a MAC sublayer receive error
	Frames Too Long	$0 \ldots 2^{64}-1$	Number of ingress frames that exceed the maximum permitted frame size.
	Drop Events	$0 \ldots 2^{32}-1$	Number of ingress drop events
	CRC Align Errors	$0 \ldots 2^{32}-1$	Number of ingress packets with CRC alignment errors
	Undersize Packets	$0 \ldots 2^{32}-1$	Number of ingress undersized packets (< 64 bytes)
	Fragment Packets	$0 \ldots 2^{32}-1$	Number of ingress fragment packets
	Jabber Packets	$0 \ldots 2^{32}-1$	Number of ingress jabber packets
Collision Counters [a]	Deferred Transmissions	$0 \ldots 2^{32}-1$	Number of egress frames for which the first transmission attempt is delayed because the medium is busy
	Collisions	$0 \ldots 2^{32}-1$	Number of estimated collisions
	Late Collisions	$0 \ldots 2^{32}-1$	Number of times that a collision is detected later than one slot time into the transmission of a packet.
	Excessive Collisions	$0 \ldots 2^{32}-1$	Number of frames for which transmission fails due to excessive collisions
Pause Frame Counters	RX Pause Frames	$0 \ldots 2^{64}-1$	Number of ingress pause MAC control frames
	TX Pause Frames	$0 \ldots 2^{64}-1$	Number of egress pause MAC control frames
Receive Statistics	Received Packets	$0 \ldots 2^{64}-1$	Number of ingress packets
	Received Octets	$0 \ldots 2^{64}-1$	Number of ingress octets
	64 Octets	$0 \ldots 2^{64}-1$	Number of ingress packets with a size of 64 octets
	65 to 127 Octets	$0 \ldots 2^{64}-1$	Number of ingress packets with a size of 65 to 127 octets
	128 to 255 Octets	$0 \ldots 2^{64}-1$	Number of ingress packets with a size of 128 to 255 octets
	256 to 511 Octets	$0 \ldots 2^{64}-1$	Number of ingress packets with a size of 256 to 511 octets
	512 to 1023 Octets	$0 \ldots 2^{64}-1$	Number of ingress packets with a size of 512 to 1023 octets
	> 1023 Octets	$0 \ldots 2^{64}-1$	Number of ingress packets with a size of more than 1023 octets

a. These counters are not available for 10 GbE interfaces. They are always 0.

Please note:

The statistics counter restart with 0 when they reach their upper range limit.

8.9.4　AP: / unit-x / iports / iport-b, QoS

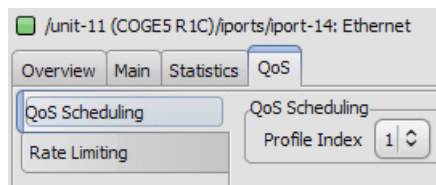### 8.9.4.1　AP: / unit-x / iports / iport-b, QoS – QoS Scheduling

Table 39:　AP: / unit-x / iports / iport-b, QoS – QoS Scheduling

Operation Name	Parameter Name	Range	Descriptions / Details
QoS Scheduling	Profile Index	1 … 5	Select the QoS scheduling profile number. QoS scheduling profiles are configured with ECST in the "Switching" view at Switching/ Bridges, bridge-1/QoS, Scheduling Profiles.

8.9.4.2　AP: / unit-x / iports / iport-b, QoS – Rate Limiting

Please note:

The Rate Limiting tab is only available if the port type of the Ethernet port is configured to PWAC or to CVP.

→　First configure the port type to PWAC or to CVP.

For a description of the

−　"QoS - Rate Limiting"

management function, please refer to [302] User Guide "XMC25/XMC23/XMC22".

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8.10 AP: / unit-x / iports / iport-b / mau

8.10.1 AP: / unit-x / iports / iport-b / mau, Overview

For a description of the
- − "Overview - Alarms"

management function, please refer to [302] User Guide "XMC25/XMC23/ XMC22".

8.10.2 AP: / unit-x / iports / iport-b / mau, Main

For a description of the
- − "Main - General"

management function, please refer to [302] User Guide "XMC25/XMC23/ XMC22".

9 Annex

9.1 Associated XMC20 Documents

Any version(s) and/or release(s) indicated with the below listed document titles identify the specific state of the software and/or feature set at the creation time of the present document. If the present document is published as part of a document collection, the hyperlinks might open a document valid for a newer version/release. That updated version is valid in the context of all units and features described in the document collection.

Please note:

For the HTML-based documentation site there are no interdocument hyperlinks realized yet.

→ Please find the required document via the navigation tree on the left.

[012] Release Note "XMC20 System Release R6B"

[201] System Description "XMC20 R6B"

[202] Safety Instructions "Precautions and safety"

[301] User Guide "XMC25 Installation"

[310] User Guide "XMC23 Installation"

[322] User Guide "XMC22 Installation"

[302] User Guide "XMC25/XMC23/XMC22"

[323] User Guide "Management Communication"

[354] Quick Guide "ECST"

[355] User Manual "ECST"

[341] Quick Guide "Ethernet Switching"

[356] User Manual "Ethernet Switching"

[358] User Manual "MPLS-TP"

[359] Quick Guide "MPLS-TP"

[314] User Guide "TDM Services and Cross Connections in XMC20"

[340] Quick Guide "TDM Services over PDH/SDH"

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[506] User Manual "XMC20 cables"

[915] Technical Bulletin "Feature Licences for XMC20"

9.2 Technical Support

Please refer to the KEYMILE Extranet (via http://www.keymile.com) for support contact information.

9.3 Product Training

Training courses are available for a wide range of KEYMILE products and applications.

For contact information, course descriptions, locations and dates, go to the Website http://www.keymile.com, then search for "product training".