GPON Interface Vendor Information

Foreword

This Technical Specification (“Schnittstellenbeschreibung”) has been produced by KomMITT Ratingen GmbH (in the following named as KomMITT) and contains the interface description of the UNI between a user device (Residential Gateway / Router) and an Optical Network Termination (ONT) within a Gigabit-capable Passive Optical Network (GPON) system in the KomMITT network.

General

1 Scope

The present Technical Specification (“Schnittstellenbeschreibung”) is applicable to broadband access interface (GPON ONT) on the customer side behind the network termination point (NTP) of KomMITT.

The present document defines the physical characteristics and transmission requirements for the broadband access interfaces provided by KomMITT via the subscriber line (Ethernet-interface at GPON ONT). It provides the relevant parameters and function descriptions to enable general compatibility to the KomMITT access network interface.

The present document does not describe any specific terminal equipment (TE) requirements.

2 Purpose of this Document

This document describes the requirements for broadband access interfaces on the customer side of KomMITT access network.
The present document incorporates interface descriptions for the following access transmission technologies:

- GPON ⇨ Ethernet

This interface description is not a specification for terminal devices. It simply presents the parameters that have been made available, and that are expected for the described interface.

3 KomMITT GPON network

3.1 GPON

The GPON interface is an optical interface that provides the ability to transport data between the Optical Line Termination (OLT) and the Optical Network Units (ONUs). Each GPON interface is shared by up to 128 ONUs. Some ONUs are used to connect individual residential or business subscribers: the Single Family Unit (SFU); others connect more residential or business subscribers: the Multi-Dwelling Unit (MDU) and Multi-Tenant Unit (MTU).

The GPON interfaces must be considered as internal (user) interfaces while the ONU/ONT service interfaces are the actual (external) user interfaces in this specific case.

GPON interfaces can also be configured as subtending interfaces, similar to subtending interfaces as offered on NT and NT I/O ports. See L2 Forwarding section for additional details

All the KomMITT GPON network implementations of ONU and OLT are based on the following GPON ITU-T standards:

G.984.1 (GPON Service requirements)
G.984.2 (GPON PMD layer)
G.984.2 (GPON PMD layer) amendment 1
G.984.3 (GPON TC Layer)
G.984.3 (GPON TC Layer) amendments 1 and 2
G.984.4 (GPON OMCI)
G.984.4 (GPON OMCI) amendments 1 and 2

Encapsulation

Data sent over the GPON interface is encapsulated in the GEM header, where GEM stands for GPON Encapsulation Method. The GEM header includes a “GEM port” ID which uniquely identifies a traffic flow or group of traffic flows for a specific UNI. GEM port IDs are not exposed to the operator, but are assigned, for example, when a VLAN port is created on a UNI. In the ONU, a GEM port ID is associated with a specific traffic queue towards the PON. Thus the GEM port can be conceptualized as identifying a specific traffic class within a UNI.

Technical Specification of the UNI between GPON ONT and User device in the KomMITT network

4 Purpose of this Document

This Technical Specification ("Schnittstellenbeschreibung") describes the UNI (user interface) between a Residential Gateway / User device and an Optical Network Termination (ONT) within a Gigabit-capable Passive Optical Network (GPON) system in the network of KomMITT.

This document describes the requirements on UNI on the customer side for connecting User device to ONT of KomMITT GPON network. It incorporates requirements for the electrical Ethernet interface only.
This interface description simply presents the parameters that have been made available, and that are expected for the described interface.

5 Technical description GPON

5.1 Introduction: GPON Network

An Optical Distribution Network (ODN) based on Gigabit Passive Optical Network (GPON) technology consists of two main parts that may be implemented by network equipment that can be categorized as follows:

- Optical Line Termination (OLT):
  This unit provides central processing, switching, and control functions. This equipment is located at the network side of the Optical Distribution Network
- Optical Network Unit (ONU):
  This unit is located at the subscriber premises as distributed end-points of the ODN. This equipment implements the GPON protocol and adapts GPON Protocol Data Units to subscriber service interfaces.

Note – There is a specific case for ONU equipment that is generally referred to as Optical Network Termination (ONT). This specific term is generally used to designate a single-user subscriber premise equipment.

5.2 KomMITT GPON Network Architecture

In the KomMITT GPON network architecture, the OLT function is provided via three distinct equipment types:

- Packet - Optical Line Termination (P-OLT) unit
- Video - Optical Line Termination (V-OLT) unit which distributes Radio Frequency (RF) overlay video signals across the GPON if the network provider chooses this method for providing Video Services.
- Wavelength Division Multiplexer which is only needed in case of V-OLT presence in the network, and which is used to mix and separate the RF Video signal into/from the optical fiber going towards ONUs.
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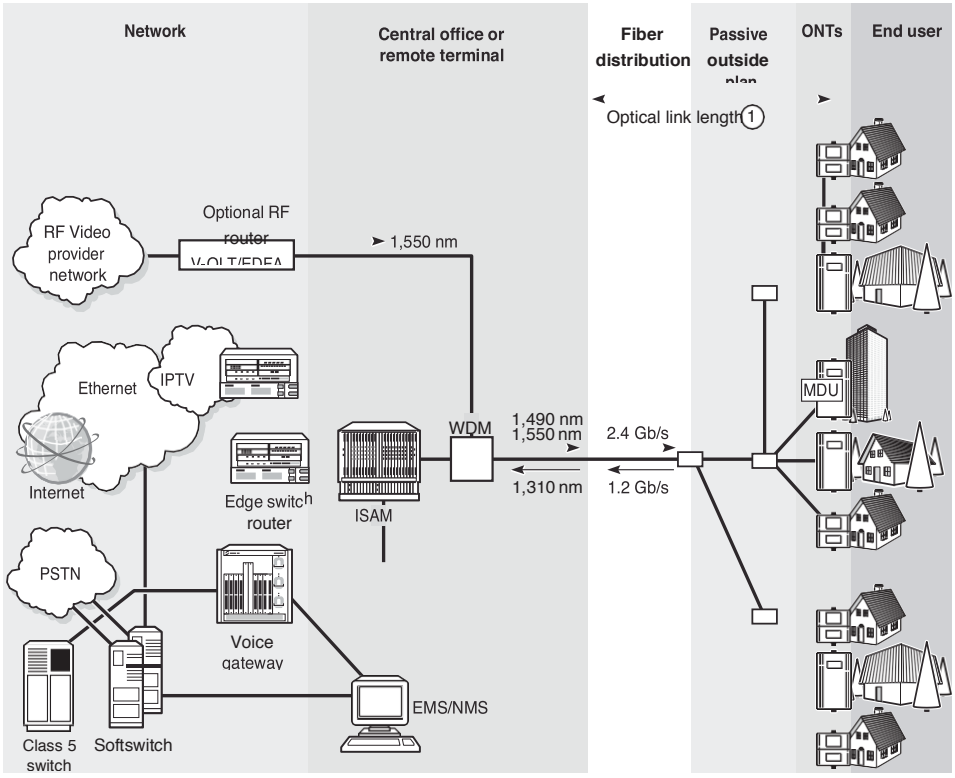
This model is shown in following Figure.

KomMITT GPON Network Architecture



1 The maximum optical link length depends on the specific equipment and deployment conditions

Standards

The Alcatel-Lucent GPON network is developed based on the following ITU-T standards:

- G.984.1 (GPON Service requirements)
- G.984.2 (GPON PMD layer)
- G.984.2 (GPON PMD layer) amendment 1
- G.984.3 (GPON TC Layer)
- G.984.3 (GPON TC Layer) amendment 1 and 2
- G.984.4 (GPON OMCI)
- G.984.4 (GPON OMCI) amendments 1 and 2

6 Technical description UNI

6.1 Physical layer Requirements

The physical layer (layer 1) parameters must conform to IEEE 802.3.

User device must support one 100/1000Base-T Ethernet Interface.

A RJ45 socket (Version: MDI-X) at the GPON ONT with pin assignment according to IEEE 802.3 should be used for the connector.

The RJ45 socket supports Auto-MDI(X) and auto-negotiation. The GPON ONT must support the use of a straight-through (patch) cable between the UNI and the RG.

Devices connected to the UNI must support auto-negotiation function. The default value is activated.

6.2 Pin and pair grouping assignment

100/1000Base-T
The pins in the RJ45 socket are allocated as follows:

PIN	Signal
1	Transmit Data Plus (TD1+)
2	Receive Data Minus (RD1-)
3	Transmit Data Plus (TD2+)
4	Transmit Data Plus (TD3+)
5	Receive Data Minus (RD3-)
6	Receive Data Minus (RD2-)
7	Transmit Data Plus (TD4+)
8	Receive Data Minus (RD4-)

100/1000Base-T must support cable lengths up to 100m.

6.3 Ethernet Parameter Requirements

The transport layer of the UNI between ONT and RG must be Ethernet.

The data link layer (layer 2) parameters must be conform to IEEE 802.2 and IEEE 802.3.

User device must be transparent to higher layer protocols.

The following chapters contain general requirements for the Ethernet layer.

6.4 UNI data plane

6.4.1 MAC addresses

Maximum number of supported MAC addresses per ONT port is 64 (per default only 4 MAC addresses are supported per ONT port).

6.4.2 MTU Size

Every packet-based network has a MTU size (maximum transmit unit) which that network can transmit. The MTU size must be configurable up to 2000 bytes. The default value must be set to 1500 bytes.

6.4.3 Ethernet Structure

Ethernet frames must be supported according to IEEE802.3.
The C-VLAN on the UNI must be used with TPID = 0x8100. All p-bit values can be used.

6.5 UNI control plane

6.5.1 Ethernet Flow Control

Devices connected to the UNI must support Ethernet flow control. It must be possible to activate / deactivate this function. Default is deactivated.