Deutsche Glasfaser

Technical Specification – inexio – DSL

Informationsklasse: Intern / Information class: Internal

1 Inhalt

2 Document Control

2.1 Releases

Version	Date	Changes	By
V.0.1	31-08-2022	Document structure and description of the design	Bereich Engineering / Abteilung Access & CPE / Gerhard Botsch
V.0.2	09-09-2022	Extension with technical specifications and visualizations	Bereich Engineering / Abteilung Access & CPE / Gerhard Botsch
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2.2 Distribution List

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4 Abbrevations

ADSL	Asymmetric Digital Subscriber Line
CPE	Customer Premises Equipment
DOS	Denial Of Service
DSL	Digital Subscriber Line
FTTC	Fiber To The Curb
FTTB	Fiber To The Building
FTTH	Fiber To The Home
GB	Gigabit Ethernet
G.fast	G stands for the ITU-T G series of recommendations;
fast is a recursive acronym for fast access to subscriber terminals.	
GPON	Gigabit Passive Optical Network
HG	Home Gateway (another term for IAD)
IAD	Integrated Access Device
ix	inexio
LC	Line Card
OLT	Optical Line Terminal
ONT	Optical Network Terminal
PVID	Port VLAN ID
RG	Residential Gateway
SDSL	Symmetric Digital Subscriber Line
SFP	Small Form Factor Pluggable device
SP	Service Provider
TAE	Telekommunikations-Anschluss-Einheit
VDSL	Very high-speed Digital Subscriber Line

5 Introduction

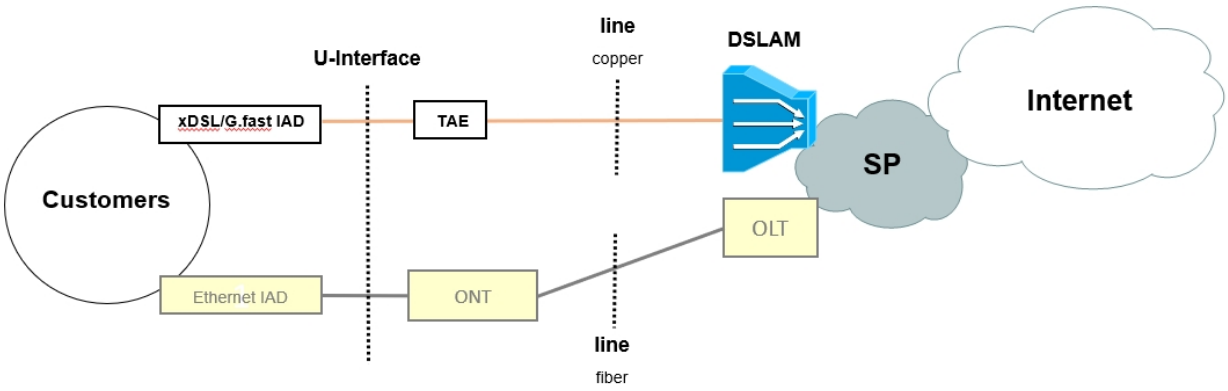
5.1 Document Purpose

This document describes the upper layer protocols between the U-Interface (= SP facing interface of the IAD) and the inexio xDSL network. It is based on Broadband-Access-Interface specification 1TR112 of Deutsche Telekom. This specification is relevant for implementing the Layer2 and Layer3 services on an IAD.

This document focuses solely on copper-based last mile customer access connections towards inexio. The interconnecting DSLAM has fiber or copper GB-Uplink(s) to the inexio network. So FTTC and FTTB are valid deployment options, long as the last mile towards customer is copper based. In contrast FTTH (for example based on GPON/XGSPON), although a valid alternative inexio connection option, is not further detailed in this document.

5.2 Document Scope

Reference Model for xDSL, G.fast and FTTH Technologies:

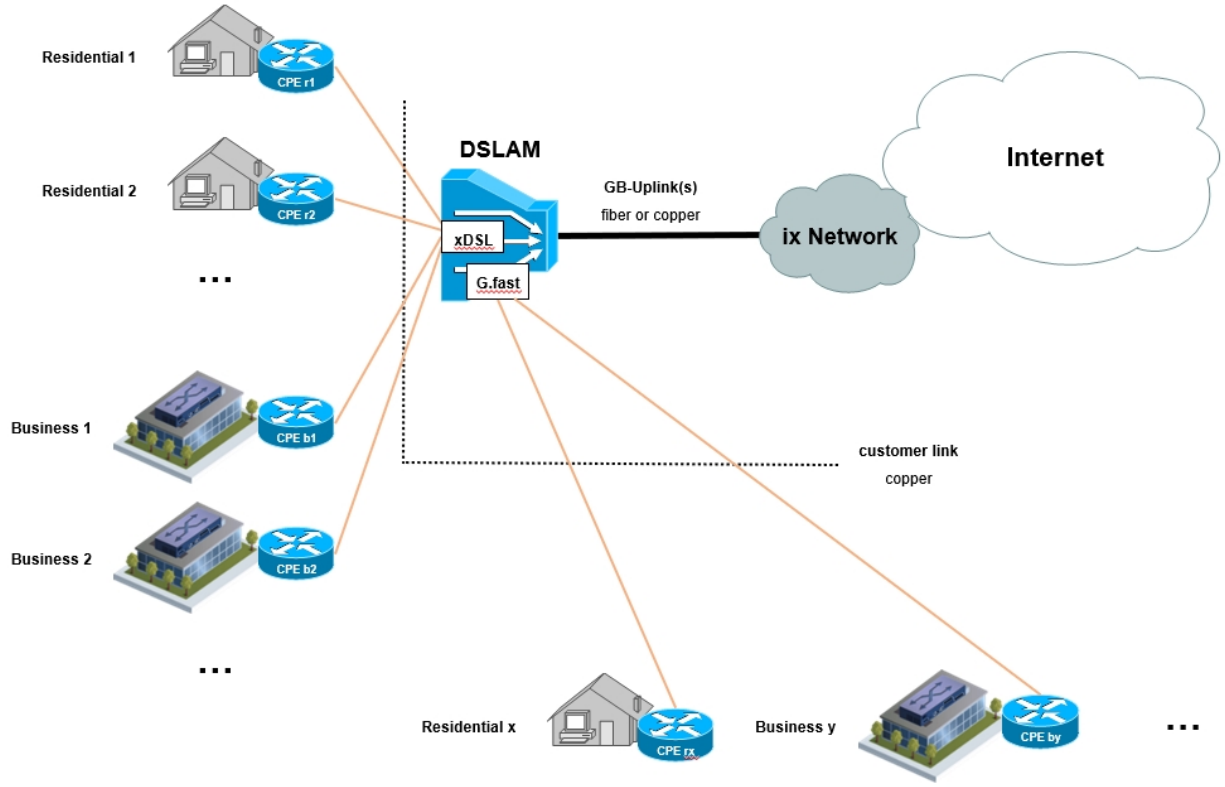


Customers can either be connected copper or fiber based to the inexio network infrastructure. The PON option is detailed in another technical specification and therefore out of scope for this document.

6 Technical Description

The relevant inexio requirements for copper-based xDSL connections are specified in this chapter.

FTTC-Footprint for copper-based customer connections:



In essence the function of a IAD can be narrowed down to a routing and to some extend security providing hardware device towards the peering SP. Therefore, the term CPE is accurate as it covers both mentioned functions.

inexio generally uses the term CPE for the customer side hardware equipment. This applies to both residential and business customers. CPE also covers other terms often used for the IAD in residential environments: HG or RG.

G.fast is a access technology for achieving high speed connections over short length copper distance. It is typically been used in FTTB deployment scenarios, where the distance between the G.fast termination device and the customer IAD is less than 250m. With dedicated G.fast-LC's used in the DSLAM even greater copper distances can be satisfied without significant bandwidth degradation.

6.1 CPE Requirements for xDSL

If no special variant distinction is required, the notation ADSL will be used throughout this document. The physical interface of ADSL, HDSL, SDSL and VDSL2 all conform to the 1TR112 specification.

Passive transfer interface:

- TAE, according to mechanical specification DIN 41715

Solution dependent, compliance to the following standards is mandatory:

ADSL variants:

- ITU-T G.992.1 (ADSL)
- ITU-T G.992.3 (ADSL2)
- ITU-T G.992.5, Annex B (ADSL2+)

HDSL:

- ITU-T G991.1

SDSL:

- ITU-T G991.2 (SDSL, G-SHDSL, EFM Bonding)

VDSL2:

- ITU-T G.993.2 Annex B (VDSL2)
- ITU-T G.993.2 Annex Q (VDSL2-Supervectoring 35b)
- ITU-T G.993.5 / G.Vector (VDSL2 vectoring)
- ITU-T G.998.4 / G.INP (VDSL2 vectoring)

6.2 CPE Requirements for G.fast

SHDSL:

- ITU-T G.9700
- ITU-T G.9701

6.3 Used Parameters on the U-Interface

This chapter details the Data Plane parameters of the U-Interface. The transport layer of the U-Interface must be Ethernet.

6.3.1 VLAN Tagging Support

VLAN Tagging must comply to IEEE 802.1Q. The L2 functionality is crucial for separating different traffic types (in general MGMT, DATA & VOICE) at the U-Interface.

6.3.2 Host Protocols

The following protocols are supported on the U-Interface:

- PPPoE (RFC 2516)
- IPoE with support for:
  - DHCPv4 (RFC 2131) and
  - DHCPv6 (RFC 8415)

6.3.3 Maximum number of MAC Addresses

Due to security constraints (DOS), a maximum of 4 customer MAC addresses are supported per VLAN interface. Traffic from additional MAC addresses will be silently dropped. Increase of this number can eventually be negotiated in the future.

6.3.4 QoS Support

Traffic differentiation between different VLAN's and within a specific VLAN must be possible, nevertheless if it is customer or provider side configured and activated. Driving motivation is to give high prior traffic better service quality and access to underlying resources than "not so important" traffic.

The functional elements of the IEEE 802.1p working group is today included in the IEEE 802.1Q standard.