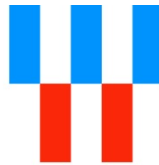


Technical Specification of the Broadband Access Interfaces in the xDSL network of NetCologne Upper Layer Protocols



NetCologne

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von: S. Förster	Von: T. Henritzi	von: T. Henritzi

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The following documents contain provisions which, through reference in this text, constitute provisions of the present document. At the time of publication, the editions indicated were valid. All listed references are subject to revision; users of this specification are therefore encouraged to investigate the possibility of applying the most recent edition of the references listed below.

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2 Scope

This document describes the upper Layer protocols between the U-Interface of the IAD and the NetCologne xDSL network. It is based on 1TR112, regarding structure and content, but can be read without knowledge of 1TR112. This specification can be used to implement the Layer2 and Layer3 services on an IAD.

This interface specification may be changed at any time to reflect changes made to the network. Anyone using this specification is requested to regularly check for the newest version at the respective Website.

This document applies to

- PPPoE and IPoE based dial in broadband services, for ATM and for Ethernet based access platforms
- Business products for ATM and for Ethernet based access platforms

The characteristics of the transmission protocol parameters for business products are described in chapter 6.

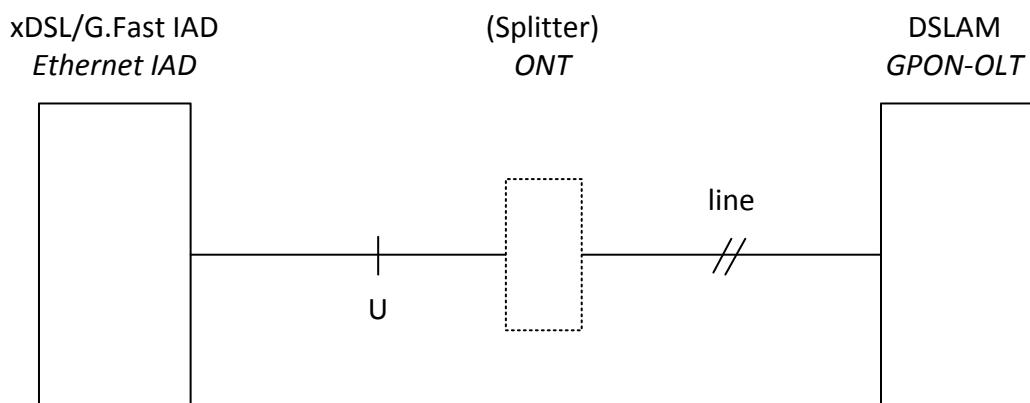


Figure 1: Reference Model for xDSL, **G.Fast and FTTH** Technologies

Note: The Splitter may not be present. This has no impact on the interface description

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3 Platform and Service Specific Requirements

NetCologne offers services on different access-platforms. The access-platforms require different parameters for service delivery. Also the Layer 2 and Layer 3 parameters are service dependent. The following chapters describe the parameters used to provide the services.

3.1 ATM Adaption Layer

The following table applies for ATM based ADSL Platforms.

Parameter	Service
Cell format UNI	Conform to [17]
GFC (Generic Flow Control)	0
VPI (Virtual Path Identifier)	8
VCI (Virtual Channel Identifier)	35
PTI (Payload Type Indication)	101: F5 OAM end to End 100: F5 OAM segment
CLP (Cell Loss Priority)	0: Downstream 0/1: Upstream
HEC (Header Error Correction)	Conform to [17], chapter 2.3.5 and [19], chapter 7.3.2
ATM Adaption Layer	AAL5 shall conform to [18]
Encapsulation Ethernet / ATM	Conform to [25] and [30], chapter 5.2
Encapsulation PPP / Ethernet	PPPoE shall conform to [29]
PPP (Point to Point Protocol)	conform to [23], [24], [26], [27] and [28] with additions

Table 1: ATM-Parameters

3.2 EFM Adaptation Layer

The EFM parameters are specified in ITU 993.2 Annex K and IEEE 802.3-2008 Clause 57. There are no additional parameters defined by NetCologne.

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4 Requirements for Ethernet based Platforms

The transport layer of the U interface on Ethernet based platforms is Ethernet according to IEEE802.3 [57]. EFM is used as the adaption layer, see chapter 3.2. On these platforms all services are based on the IP protocol.

4.1 Data Plane for Data and VoIP Services

The following table applies to DATA and VOIP Services for residential products on Ethernet based access platforms.

Service	Data	VoIP
Host-Protocols	PPPoE	IPoE (DHCP)
Max. number of MAC-Addresses	4	4
MTU-Size [byte]	1500	1500
Frame-Size [byte]	1522	1522
Vlan-ID	10	20
TPID	0x8100	0x8100
QoS-US: .1p VoIP	n/a	5/6
QoS-US: .1p Data	0	0
QoS-DS: .1p VoIP	n/a	6
QoS-DS: .1p Data	0	0
US-Policer .1p=5	n/a	240 Kbit/s
US-Policer .1p=6	n/a	240 Kbit/s

Table 2: Parameters for DATA and VoIP Services on Ethernet based platforms

4.2 Requirements for ATM based ADSL Platforms

The ATM functions on layer 2 and the required adaptation between layer 3 and layer 2 are defined in the following chapters. Different ATM platforms are in place. The physical ATM layers 1 and 2 are identical for all ATM platforms. In contrast to the physical layer, the PPPoE and Ethernet parameters are service depended. For this they are listed separately for each ATM access platform.

Voice services on ATM based platforms are implemented with different technologies. Both, TDM Voice services with splitters and VoIP are used. The used technology depends on the ADSL platform.

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4.3 ATM based Platforms with TDM Voice Service

ATM based Platform with splintered TDM Voice service. These platforms do not support 802.1Q tagging.

The following table applies for DATA Services (residential products) on ATM based access platforms with TDM voice service.

Service	Data
Host-Protocols	PPPoE
Max. number of MAC-Addresses	4
MTU-Size [byte]	1500
Frame-Size [byte]	1522
Vlan-Tagging	Not supported

Table 3: Parameters for DATA Service on ADSL platforms with TDM Voice

4.4 ATM based Platforms with Voice over IP Service (VoIP)

The following table applies for DATA Services and VoIP Services (residential products) on ATM based ADSL access platforms.

Service	Data	VoIP
Host-Protocols	PPPoE	IPoE (DHCP)
Max. number of MAC-Addresses	4	4
MTU-Size [byte]	1500	1500
Frame-Size [byte]	1522	1522
Vlan-ID	10	20
TPID	0x8100	0x8100
QoS-US: .1p VoIP	n/a	5/6
QoS-US: .1p Data	0	0
QoS-DS: .1p VoIP	n/a	6
QoS-DS: .1p Data	0	0
US-Policer .1p=5	n/a	240 Kbit/s
US-Policer .1p=6	n/a	240 Kbit/s

Table 4: Parameters for DATA and VoIP service on ADSL platforms

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4.5 IP-BSA Platform of Deutsche Telekom

For Wholesale products where the IAD is connected to the xDSL platform of Deutsche Telekom, the following table applies for DATA and Voice over IP (VoIP).

Service	Data	Data and VoIP
Host-Protocols	PPPoE	PPPoE
Max. number of MAC-Addresses	4	4
MTU-Size [byte]	1500	1500
Frame-Size [byte]	1522	1522
Max. number of VLAN-IDs	1	1
VLAN-Tagging	single-tagged	single-tagged
Vlan-ID VoIP/Data	7	7
TPID	0x8100	0x8100
QoS-US: .1p VoIP	n/a	5/6
QoS-US: .1p Data	0	0
QoS-DS: .1p VoIP	n/a	6
QoS-DS: .1p Data	0	0
US-Policer .1p=5	n/a	240 Kbit/s
US-Policer .1p=6	n/a	240 Kbit/s

Table 5: Parameters for DATA and VoIP services for Wholesale products from Deutsche Telekom

4.6 L2-BSA Platform of Deutsche Telekom

For Wholesale products where the IAD is connected to the L2-BSA platform of Deutsche Telekom, the following table applies for DATA and Voice over IP (VoIP).

Service	Data	VoIP
Host-Protocols	PPPoE	IPoE (DHCP)
Max. number of MAC-Addresses	4	4
MTU-Size [byte]	1500	1500
Frame-Size [byte]	1526	1526
Vlan-ID	10	20
TPID	0x8100	0x8100

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Table 6: Parameters for L2-BSA Wholebuy products from Deutsche Telekom

5 Description of Used Parameters

This chapter describes the used parameters on the Data Plane of the U-Interface. The transport layer of the U-Interface must be Ethernet or ATM, dependent on the xDSL platform.

The data link layer (layer 2) parameters must be compliant to IEEE 802.2 [59] and IEEE 802.3 - 2008 [57]. The ATM data link layer is described in [13].

The U-Interface has to be transparent to OSI protocols above layer 3 according [53].

5.1 Host Protocols

On the U-Interface, only the protocols PPPoE and IPoE (DHCP) are allowed for retail services according [29].

5.2 MAC Addresses

Maximum number of supported MAC addresses. Frames from additional MAC addresses may be discarded.

5.3 MTU Size

The MTU size is the maximum transmit unit size a packet based network can handle.

5.4 Frame Size

The frame size is defined by the whole Ethernet frame including all overhead, e.g. PPPoE encapsulation, VLAN tags, etc.

5.5 VLAN Support /Handling

IEEE 802.1Q must be supported for the specified number of VLANs on the U-Interface. At the U-Interface the VLAN-ID range is defined from 1 to 4096. However for the different services VLAN IDs

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are predefined according Table 1: Parameters for DATA and VoIP Services on Ethernet based platforms.

5.6 TPID (Tagged Protocol Identifier)

The VLAN at the U-Interface must be marked with the specified TPID.

5.7 QoS

QoS is used to prioritize and mark traffic in all traffic classes using MAC layer frame tagging according to IEEE 802.1D-2004 Annex G [47].

5.8 Policing

Policing is used to limit bandwidth for QoS marked traffic.

5.9 Parameters for Broadband Services over ATM based Access Platforms

The parameters in this chapter apply for the U Interface of ADSL ATM based access platforms. The PPPoE / PPP parameters apply only to DATA services. VoIP services use IPoE

5.10 Cell format UNI

The cell format shall be compliant to [17]

5.11 GFC (Generic Flow Control)

GFC = 0000

Only “uncontrolled equipment/access” mode is required. The GFC function is not used. Therefore, no action is performed on the GFC field setting at the receive side and the GFC field is always set to all zero at the transmit side according to [17].

5.12 VPI (Virtual Path Identifier)

VPI = 8

5.13 VCI (Virtual Channel Identifier)

VCI = 35

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5.14 PTI (Payload Type Indication)

PTI = 101: F5 OAM End to End

PTI = 100: F5 OAM segment

Full functionality shall be according to [17], chapter 2.3.3

5.15 CLP (Cell Loss Priority)

Upstream: CLP = 0

Downstream: CLP = 0/1

5.16 HEC (Header Error Correction)

Coding and function shall be compliant to [17], chapter 2.3.5 and [19], chapter 7.3.2; only support of bit error detection based on HEC field is used

5.17 ATM Adaptation layer

AAL5 shall be compliant to [18].

5.18 Encapsulation Ethernet / ATM

Encapsulation Ethernet / ATM shall be compliant to [25] and [30], chapter 5.2.

5.19 Encapsulation PPP / Ethernet

PPPoE shall be compliant to [29]

On ATM based platforms PPPoE encapsulation is only used for Data Service

5.20 Point to Point Protocol (PPP)

PPP shall conform to [23], [24], [26], [27] and [28] with additions.

On ATM based platforms PPP encapsulation is only used for Data Service

6 Separation of VoIP and Data Services

The VoIP and DATA services must be isolated from each other within the IAD. That means the IAD must support a virtual Router for each service. No communication or data transfer between different

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services within the IAD are permitted. Each service uses a different VLAN for data transportation between the U-Interface and the xDSL Network.

7 IP Address Assignment for Data Services

Dual Stack, IPv4 and IPv6 must be supported. To assign IPv4 address parameters, PPP is used according [23], [24], [26], [27] and [28]. IPv6 addresses are assigned via, IPv6CP for the Link Local address, ND/RA for the WAN prefix and DHCPv6 IA_PD for the LAN prefix. The IPv6 address assignment is done according to RFC 7084 [75].

8 DS-Lite Support

The IAD must support DS-Lite according to [77]. The name of the Address Family Transition Router (AFTR) is assigned via DHCPv6 Option Code 64 as stated in [78]. A manual configuration of the AFTR name is not supported. For DS-Lite operation only an IPv6 Prefix is assigned, no IPv4 address.

9 User Authentication for Data Services

PPP PAP / CHAP must be supported for User authentication according to [76] and [28].

10 Address Assignment for VoIP Services

The address assignment for VoIP services depend on the access platform as stated in the chapters 10.1 , 10.2 and 10.3

10.1 Ethernet based Platforms and ATM based Platforms with VoIP

The VoIP service uses IPv4 addresses only. IPv6 is not supported. For assigning the IPv4 address to the IAD IPoE, DHCP is used. The IAD must be compliant to [71] within the appropriate VLAN.

10.2 IP-BSA Platform of Deutsche Telekom

On these platform the IPv4 address is used for VoIP and Data. For assigning the IPv4 address to the IAD PPP is used.

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10.3 Ethernet based Platforms and ATM based Platforms with VoIP

The VoIP service uses IPv4 addresses only. IPv6 is not supported. For assigning the IPv4 address to the IAD IPoE, DHCP is used. The IAD must be compliant to [71] within the appropriate VLAN.

11 NTP (Network Time Protocol)

NTP is used for time reference by the IAD. NTP information is provided according to [72]. Table 6 shows on which data paths the IAD can obtain the time information.

xDSL Access Platform	NTP Service
Ethernet based platform	VLAN 10, VLAN20
ATM based platform with VoIP	VLAN 10, VLAN20
ATM based platform with TDM Voice	Data Plane

Table 7: Source of NTP Information

12 DNS (Domain Name System)

The IAD obtains DNS Resolver IP addresses during the PPP establishing phase. For this the IAD must support IPCP according to [24].

13 Quality of Service (QoS)

QoS is used to prioritize and mark traffic in all traffic classes using MAC layer frame tagging according to IEEE 802.1D-2004 Annex G [47].

13.1 Policing

Policing is used to limit bandwidth for QoS marked traffic.

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NetCologne

Specification of Broadband Interfaces in the NetCologne xDSL Network

Upper Layer Protocols

13.2 QoS in Upstream Direction

In upstream direction (from the IAD to the xDSL network) VoIP traffic must be prioritized higher than data traffic. The IAD must use a strict priority queuing mechanism for VoIP.

13.3 QoS in Downstream Direction

Prioritizing VoIP traffic higher than data traffic in the downstream direction is done in the xDSL network.

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14 Business Products

Business products are available on ATM and Ethernet platforms. The ATM and EFM adaption layers are the same as for residential products, see chapter 3.1 and 3.2. The VLAN-IDs on the Ethernet Data Link Layer are different. The used parameters are shown in Table 7.

Service	Data	VoIP
Host-Protocols	PPPoE	IPoE (DHCP)
Max. number of MAC-Addresses	product dependent	product dependent
MTU-Size [byte]	1500	1500
Frame-Size [byte]	1522	1522
Vlan-ID	50	21
TPID	0x8100	0x8100
QoS-US: .1p VoIP	n/a	5/6
QoS-US: .1p Data	0	0
QoS-DS: .1p VoIP	n/a	6
QoS-DS: .1p Data	0	0
US-Policer .1p=5	n/a	product dependent
US-Policer .1p=6	n/a	product dependent

Table 8: Parameters for Business Products

Other protocols and applications that are necessary for providing the services like User Authentication, IP Address assignment, DHCP, NTP, DNS, etc. are also made available on the U interface. But their existences depend on the respective product.

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