



Addendum to Bitstream xDSL and Fiber PON

# Bitstream xDSL and Fiber PON Shared VLAN: IPv6 addressing.

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## Table of contents

1. Purpose.....	3
2. Scope & planning .....	3
3. Allowing IPv6 .....	4
4. Ordering and provisioning process.....	5
5. E-Tools.....	5
6. Fault reporting and repair process .....	5
7. Pricing.....	6
8. Impact on the regulated offer .....	7
8.1 Adaptation on the Bitstream xDSL and Fiber PON documents .....	7

## 1. Purpose

The purpose of this addendum is to allow IPv6 addressing on Bitstream xDSL Shared VLAN and Bitstream Fiber PON Shared VLAN. The Beneficiary will then be allowed to use IPv6 addresses (besides IPv4) in Bitstream Shared VLAN.

The present addendum is communicated to the BIPT in order to update the reference offers to reflect these changes.

## 2. Scope & planning

This addendum is applicable to the Bitstream xDSL and Bitstream Fiber PON services (with Shared VLANs), as described in the related reference offers.

The present addendum has been communicated to the BIPT in order to become effective as from 20/04/2025<sup>1</sup>.

<sup>1</sup> Proximus might postpone this date in order to guarantee the quality of the deliverables. Testing and validation are still ongoing and might lead to some further updates in the concerned Reference Offers.

### 3. Allowing IPv6

The network change will allow dual stack IPv4/IPv6 addressing using SLAAC in combination with DHCPv6 Prefix Delegation on Shared VLAN with IPoE encapsulation for Bitstream xDSL and Bitstream Fiber PON. This new network functionality is only enabled on the VLANs requested by the Beneficiary.

Note that IPv6 addressing is by default available on Single VLAN. A clarification on this is added in the Bitstream Fiber PON reference offer.

## 4. **Ordering and provisioning process**

This update does not have any impact on the ordering process, nor on the communication flows during the ordering and provisioning of the xDSL or Fiber PON services as described in the prevailing versions of the Bitstream Reference Offers (Bitstream xDSL version 4 – SLA compensation and Bitstream Fiber PON version 6.3 – Addenda integration).

## 5. **E-Tools**

This update does not have any impact on the pre-check tools.

## 6. **Fault reporting and repair process**

This update does not have any impact on the fault reporting and repair process, nor on the communication flows during the fault reporting and repair process of xDSL and Fiber PON services.

## 7. Pricing

No impact on pricing.

## 8. Impact on the regulated offer

### 8.1 Adaptation on the Bitstream xDSL and Fiber PON documents

The sections of the Bitstream xDSL and Bitstream Fiber PON offer documents which are impacted by this addendum are indicated in the subsequent paragraphs (changes are highlighted in pink). These adaptations refer to the Bitstream xDSL reference offer (version 4 – SLA compensation), communicated to the BIPT on 17/02/2023 and the Bitstream Fiber PON reference offer (version 6.3 – Addenda integration), communicated to the BIPT on 17/05/2023.

#### BITSTREAM xDSL

##### Annex 2B - Technical Specifications

In section 6.7.1 Limitations:

Known limitations on the IP-DSLAM firmware are:

(see also chapter “Security” - section “Limitations” in Annex 2C “Technical Specifications” of the present reference offer).

Protocol	Shared VLAN	Dedicated VLAN
802.1x	Blocked	Transparent
ARP	Policed <sup>(6)</sup>	Policed <sup>(6)</sup>
RIP	Policed <sup>(6)</sup>	Policed <sup>(6)</sup>
CFM	Policed <sup>(6)</sup>	Transparent
ICMP	Transparent <sup>(7)</sup>	Transparent
DHCP	Policed <sup>(6)</sup>	Transparent
IGMP	Policed <sup>(6)</sup>	Transparent
PPPoEDiscovery	Policed <sup>(6)</sup>	Transparent
PPP LCP	Transparent	Transparent
PPP control	Transparent	Transparent

PPP LCP termination ack	Transparent	Transparent
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- Shared VLAN refers to the residential bridge forwarding mode.
- Dedicated VLAN refers to S/C-VLAN CC.

L2CP (Layer 2 Control Protocol) PAUSE frames are blocked.

6 For security reasons, parameters will not be publicly shared. Beneficiary shall contact Proximus if he has the need to receive the information.

7 Except for some ICMPv6 multicast packets.

### In section 6.7.2 Shared VLAN:

#### No user-to-user communication

- Frames received from a user will always be sent towards the network and never to another user.

#### Prevention of Broadcast storms

- Downstream:
  - All broadcast frames are dropped including specific control protocol, e.g. ARP Requests
  - Ethernet frames with unknown destination MAC@ are dropped and not flooded as within a standard L2 bridge. Ageing timer bridge = 900s (=> application shall send a message upstream at startup and every x sec, x<900, in order to remain joinable from the network)
- Upstream:
  - Rate limiting control plane (DHCP, IGMP, ARP...)
  - Discard L2CP control frames (STP, Pause frames...)
  - Multicast blocking except for some ICMPv6 packets to enable DHCPv6 Prefix Delegation for IPv6 addressing on the subscriber LAN. DHCPv6 Prefix Delegation will be enabled upon Beneficiary request.

Limit of the number of MAC@ per PVC (Residential Bridge): max 4

Limit of the number of PPP sessions per PVC (PPP aware Bridge): for PPPoA 1 session per PVC; for PPPoE the max number of MAC@ (4) per PVC needs to be taken into account if PPPoE clients with different MAC@ are used.

#### MAC anti-spoofing (Residential Bridge)

It prevents duplicate MAC addresses within the same VLAN during a certain session. The traffic of the duplicate MAC address is blocked. The bridge port of the End-User is blocked.

The MAC anti spoofing feature cannot be disabled. The duplicate MAC is removed after ageing timer.

## Annex 2C - Technical Specifications

In section 8.5.1 Shared VLAN:

On UNI it is possible to provision up to 4 VLAN IDs. Proximus will use VLAN 20 for management and upgrade of the CPE.

### Mapping Table:

p-bit	0 & 1 *	1	3	5
VLAN ID =	10	50	40	21

**Table 1:** Mapping p-bit and VLAN ID

\* Note about VLAN 10:

*Downstream:* in the IP-DSLAM, VLAN 10 contains p0 and p1 tagged Ethernet frames, as sent by the Beneficiary. The p1 tagged frames are handled in the IP-DSLAM with the same QoS as p1 tagged frames in VLAN 50.

*Upstream:* in VLAN 10, the IP-DSLAM retags all Ethernet frames to p0 except DHCP control frames with the p-bit set to p1 by the CPE, which pass transparently.

This VLAN ID scheme is identical for all OLOs.

**No multicast Ethernet packets are allowed** except for some ICMPv6 packets to enable DHCPv6 Prefix Delegation for IPv6 addressing on the subscriber LAN. DHCPv6 Prefix Delegation will be enabled upon Beneficiary request.

Upstream Marking: p-bit setting on VLAN on bridge port.

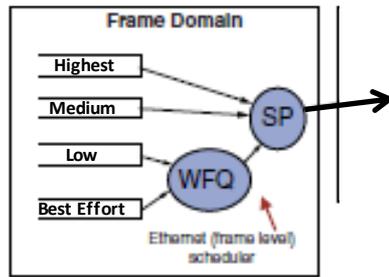
Policing: No policing in upstream in the IP-DSLAM.

### Downstream Scheduling:

Hierarchical scheduler:

- P=0: best effort.
- P=1: low priority.
- P=3: medium priority.
- P=5: highest priority.

The highest two priorities (highest priority and medium priority) are served by a Strict Priority (SP) mechanism, assuring that these – mostly – real-time applications do not suffer from too large delays. “Best effort” and “low priority” Ethernet frames compete for bandwidth in a fair manner. The weight of the low priority queue = 66%.



Graph 1: Scheduling mechanism on VDSL2 in downstream

In section 8.7.1 Limitations:

Known limitations on the IP-DSLAM firmware are:

Protocol	Shared VLAN	Dedicated VLAN	Single VLAN
802.1x	Blocked	Transparent	Blocked
ARP	Policed <sup>B</sup>	Policed <sup>B</sup>	Policed <sup>B</sup>
RIP	Policed <sup>B</sup>	Policed <sup>B</sup>	Policed <sup>B</sup>
CFM	Policed <sup>B</sup>	Transparent	Transparent
ICMP	Transparent <sup>B</sup>	Transparent	Transparent
DHCP	Policed <sup>B</sup>	Transparent	Policed <sup>B</sup>
IGMP	Policed <sup>B</sup>	Transparent	Transparent
<u>PPPoE discovery</u>	Policed <sup>B</sup>	Transparent	Policed <sup>B</sup>
PPP LCP	Transparent	Transparent	Transparent
PPP control	Transparent	Transparent	Transparent
PPP LCP termination ack	Transparent	Transparent	Transparent

Table 2: Known limitations on the IP-DSLAM firmware

- Shared VLAN refers to the residential bridge forwarding mode.
- Dedicated VLAN refers to S-VLAN CC.
- Single VLAN refers to S/C-VLAN CC.

L2CP (Layer 2 Control Protocol) PAUSE frames are blocked.

This behaviour is subject to change due e.g. to CPE, IP-DSLAM or aggregation network software upgrade.

Reference is made to the chapter “Modem” for the known limitations of the A-modem configured for “Dedicated VLAN”.

8 For security reasons, parameters will not be publicly shared. Beneficiary shall contact Proximus if he has the need to receive the information.

9 Except for some ICMPv6 multicast packets.

In section 8.7.3 Shared VLAN:

- o No U2U communication
- o Prevention of Broadcast storms:
  - Downstream:
    - Broadcast frames are dropped.
    - Ethernet frames with unknown destination MAC@ are dropped.  
**Ageing timer bridge = 900s (=> application shall send a message upstream at startup and every x sec, x<900, in order to remain joinable from the network)**
  - Upstream:
    - Rate limiting control plane (DHCP, IGMP, ARP...). See table in section “Limitations”.
    - Discard L2CP frames (STP, Pause frames...).
    - Multicast blocking **except for some ICMPv6 packets to enable DHCPv6 Prefix Delegation for IPv6 addressing on the subscriber LAN. DHCPv6 Prefix Delegation will be enabled upon Beneficiary request.**
- o Maximum number of MAC@ per DSL port=8
- o MAC anti spoofing

## BITSTREAM Fiber PON

### Annex 2 - Technical Specifications

In section 8.4.1 Shared VLAN:

The forwarding model for Fiber PON with Shared VLANs can be considered as a L2 bridge with additional security features. Within this mode it is possible to associate different logical ports to one Virtual LAN. In the upstream direction, frames are forwarded from a VLAN at the user side to a service VLAN at the network side, with a MAC learning process. In the downstream direction, the frames are forwarded based on the MAC address, with a check on the correctness of the VLAN ID/MAC address usage.

Each subscriber’s VLAN/Service on the UNI is mapped to the Service VLAN(s) of the respective OLO at the Fiber PON ODN & OLT NT with VLAN Translation in the ONT.

No multicast Ethernet packets are allowed in the OLO Shared VLANs, except for some ICMPv6 packets for DHCPv6 prefix delegation. DHCPv6 Prefix Delegation will be enabled upon Beneficiary request.

Figure 7 shows an example of an OLO, connecting one UNI to its services: p0(bis), p1(bis), p3(bis) and p5(bis).

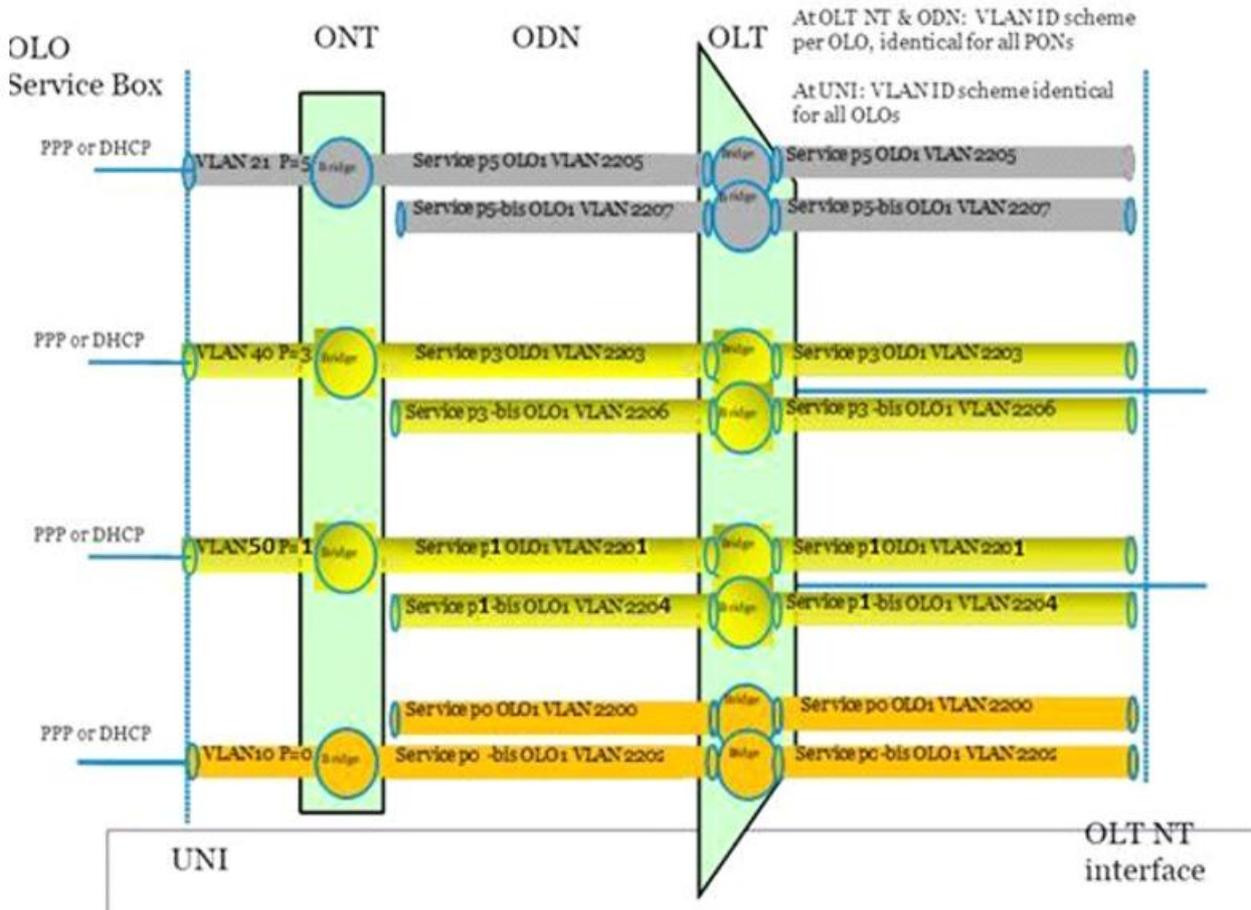


Figure 1: Ethernet Forwarding Mechanisms on Fiber PON (Shared VLANs)

In section 8.5.1 Shared VLAN:

On UNI it is possible to provision up to 4 VLAN IDs.

p-bit	0 & 1*	1	3	5
VLAN ID =	10	50	40	21

Table 1: Mapping p-bit and VLAN ID

\* Note about VLAN 10:

*Downstream:* in the OLT, VLAN 10 contains p0 and p1 tagged Ethernet frames, as sent by the Beneficiary. The p1 tagged frames are handled in the OLT with the same QoS as p1 tagged frames in VLAN 50.

*Upstream:* in VLAN 10, the OLT retags all Ethernet frames to p0.

This VLAN ID scheme is identical for all OLOs.

**No multicast Ethernet packets are allowed, except for some ICMPv6 packets for DHCPv6 prefix delegation. DHCPv6 Prefix Delegation will be enabled upon Beneficiary request.**

Upstream Marking: p-bit setting on VLAN on bridge port.

Policing: policing at UNI in the OLT in upstream based upon rate limiting types (cf. Table 2).

Downstream Scheduling:

Hierarchical scheduler:

- P=0: best effort.
- P=1: low priority.
- P=3: medium priority.
- P=5: highest priority.

The priorities are handled on the Network Termination (NT) card of the OLT in a Strict Priority (SP) mechanism assuring that the nearly real-time applications do not suffer from too large delays. On the Line Termination (LT) card of the OLT, the two highest priorities are handled in a Strict Priority mechanism while the two lowest priorities compete in a fair manner like Weighted Fair Queuing.

Rate limiting per VLAN at UNI

A rate limiting is applied in upstream and downstream, on the flows of the UNI, as described in Table 2 below.

The burst size of the rate limiter on the UNI-interface for the P5 service class is 22500 octets of contiguous packets in the upstream.

Profile In Mbps <sup>2</sup>	P0 + P1 Max DS/Max US	P3 Max DS/Max US	P5 Max DS/Max US
Type 0	50/10	65/2 (Unicast)	12/12
Type 1	150/50	65/2 (Unicast)	12/12
Type 2	500/100	65/2 (Unicast)	12/12
Type 3	1000/500	65/2 (Unicast)	12/12
Type 4	2500/1000	65/2 (Unicast)	12/12
Type 5	8500/1500	65/2 (Unicast)	12/12

**Table 2: Rate limiting types - Shared VLAN**

No data volume limitation is applied on the different profiles and service quality.

In section 8.6.3 Single VLAN:

Line identification will be enabled for both IPoE (DHCP) and PPPoE on each S/C cross-connect VLAN.

**IPoE**

For IPv4 over Ethernet access, per service VLAN a layer 2 DHCP relay function is implemented on the OLT as described within Broadband Forum TR-156. The DHCP packet format is specified in RFC 2131. The DHCP Relay Agent Information option (option 82) format is specified in RFC 3046.

In upstream, the access loop identification will be encoded within the “Agent Circuit ID” sub-option 1 of DHCP Option 82 during the DHCP session set-up.

In downstream, the OLT will remove DHCP option 82.

For IPv6 over Ethernet, the access loop identification will be encoded in the Interface-ID option (option 18 - RFC 3315) of the DHCPv6 RELAY messages. The “Circuit ID” of the Beneficiary will be included in the Relay Agent Remote-ID Option (option 37, defined in RFC 4649) which is added to the DHCPv6 Relay-forward messages.

**PPPoE**

For PPPoE access, per service VLAN the PPPoE Intermediate Agent function is implemented on the OLT as described within Broadband Forum TR-156.

<sup>2</sup> The speed profiles are up to, without guarantee that the max speed is reached at all times.

In upstream, the access loop identification will be encoded within the “Agent Circuit ID” sub-option 1 of the PPPoE vendor specific tag in the discovery messages (PADI, PADR, PADT) of the PPPoE protocol.

Format agent circuit ID for IPoE and PPPoE:

<Access\_Node\_ID> eth< Rack/Frame/Slot/Port/ONU/OnuSlr/UNI:Q-VID

Example: F03BRM00001 eth 1/1/01/01/16/1/1:10

In section 8.7.1 Shared VLAN:

- o No U2U communication.
- o Prevention of Broadcast storms:
  - Downstream:
    - Broadcast frames are dropped.
    - Ethernet frames with unknown destination MAC@ are dropped.  
**Ageing timer bridge = 900s (=> application shall send a message upstream at start up and every x sec, x<900, in order to remain joinable from the network)**
  - Upstream:
    - Rate limiting control plane (DHCP, IGMP, ARP...).
    - Discard control frames (STP, Pause frames...).
    - Multicast blocking, except for some ICMPv6 packets for DHCPv6 prefix delegation.  
**DHCPv6 Prefix Delegation will be enabled upon Beneficiary request.**
- o Maximum number of MAC@ per UNI port=16
- o MAC anti spoofing.

In section 8.7.4 Protocol limitations:

The Bitstream Fiber GPON service is intended for transport of IP packets by Ethernet frames (IPoE or PPPoE). Some protocols do not transparently pass, as described in Table 6 below. Therefore, Proximus does not guarantee their correct functioning. Known limitations related to the current GPON equipment firmware R.5.6.02x are mentioned in Table 6 below.

Protocol	Shared VLAN	Dedicated VLAN	Single VLAN <sup>8</sup>
802.1x	Blocked	Transparent	Blocked
ARP	Policed <sup>7</sup>	Policed <sup>7</sup>	Policed <sup>7</sup>
RIP	Transparent	Transparent	Transparent
CFM	Blocked	Blocked	Blocked
ICMP	Transparent <sup>10</sup>	Transparent	Transparent
DHCP	Policed <sup>7</sup>	Policed <sup>7</sup>	Policed <sup>7</sup>
IGMP	Policed <sup>7</sup>	Policed <sup>7</sup>	Policed <sup>7</sup>
PPPoEDiscovery	Policed <sup>7</sup>	Transparent	Policed <sup>7</sup>

PPP LCP	Transparent	Transparent	Transparent
PPP control	Transparent	Transparent	Transparent
PPP LCP termination ack	Transparent	Transparent	Transparent

**Table 6: Known protocols limitation related to the GPON equipment**

Similar limitations exist in XGS-PON. Lab tests have still to be executed. We expect the results listed in Table 7.

Protocol	Shared VLAN	Dedicated VLAN	Single VLAN <sup>9</sup>
802.1x	Blocked	Not applicable	Blocked
ARP	Policed <sup>7</sup>	Not applicable	Policed <sup>7</sup>

<sup>7</sup> For security reasons, parameters will not be publicly shared. Beneficiary shall contact Proximus if he has the need to receive the information.

<sup>8</sup> The protocol limitations for Single VLAN are mainly extrapolated from the Dedicated VLAN and have been partially tested in Lab.

<sup>9</sup> The protocol limitations for Single VLAN are mainly extrapolated from the Dedicated VLAN and have been partially tested in Lab.

<sup>10</sup> Except for some ICMPv6 multicast packets.

\*\*\* End of the document \*\*\*