3. Overall Network Architecture of Bitstream Fiber PON with Shared VLANs

3.1 End-to-End view

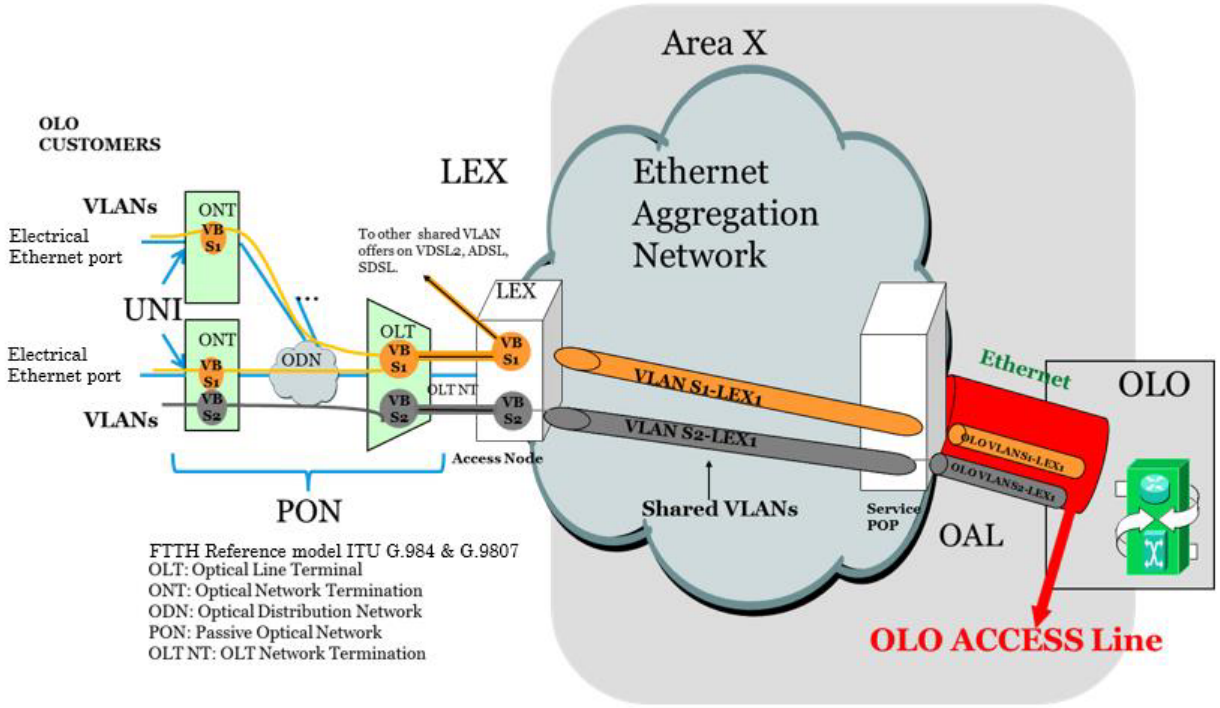

Figure 1: End-to-end overview (Shared VLANs)

This **Bitstream Fiber PON Shared VLAN** service offers an end-to-end Ethernet connectivity between one OLO Access Line and the ONT GE or 10 GE port at UNI installed at the End-User premises. Eight service classes are defined on the Ethernet Network, differentiated by the Ethernet p-bit, two service classes for each p-bit:

- P=0 : best effort (P0 & P0bis)
- P=1 : low priority (P1 & P1bis)
- P=3 : medium priority (P3 & P3bis)
- P=5 : highest priority (P5 & P5bis), and better performance for jitter and delay sensitive traffic.

Each service class can carry Bitstream Fiber PON traffic and Bitstream xDSL traffic.

Each Fiber PON UNI can offer to the End-User one or none of the two P0 service classes, one or none of the two P1 service classes, one or none of the two P3 service classes and one or none of the two P5 service classes. At least one service class needs to be configured on the Fiber PON UNI.

The service quality P=5 has the highest priority in the network and is also designed to offer better performance for jitter and delay sensitive traffic (e.g. voice and real-time traffic). This performance is obtained with a reduced size of the buffers compared to other service qualities. The traffic sent on a VLAN with P=5 should take into account that this service quality is less tolerant to burst of data. It is advised to send traffic with an appropriate shaping to avoid packet losses. An appropriate shaping can be implemented as follows: for traffic with service quality P=5 the shaper shall be configured slightly below the ordered P5 transport bandwidth and the traffic shall be sent with a constant bitrate to avoid packet loss. For P5-traffic on a Shared VLAN the sum of the shaped bandwidths shall stay slightly below the ordered P5 transport bandwidth.

The VLAN-ID scheme on all Fiber PON UNIs is common for all OLOs.

- VLAN-ID 10 = Best Effort traffic (P0 or P0bis) (note that the Ethernet frames can be p0 and p1 tagged).
- VLAN-ID 50 = Low priority traffic (P1 or P1bis).
- VLAN-ID 40 = Medium priority traffic (P3 or P3bis).
- VLAN-ID 21 = Highest priority traffic (P5 or P5bis).

The PON network works as a VLAN Ethernet bridge performing translation between the VLAN-ID on the ONT UNI, to a VLAN, dedicated for 1 service class and 1 OLO. This bridge is shared amongst all End-Users of the same service class of the same OLO.
E.g.: All Best Effort P0 traffic of OLO1 End-Users is bridged to VLAN 2200 on the OLT NT. All P0bis traffic of OLO1 End-Users is bridged to VLAN 2202 on the OLT NT.

Per service class, the VLANs of the End-User lines of a Beneficiary will be aggregated on LEX level in the Access node of the Ethernet Aggregation Network and transported in 1 VLAN to the Service PoP, where the standard OLO Access Line is connected. When a Multichassis-LAG OLO Access Line is used, two OALs are connected to the 2 different Service PoPs. There are 2 Service PoPs, located in 2 different buildings, per Aggregation Network, and 5 Aggregation Networks for whole Belgium. Each of the 5 Aggregation Networks covers 1 geographical Area.

When a standard OLO Access Line is used, the VLAN ends in 1 VLAN on the OLO Access Line.

When a Multichassis-LAG OLO Access Line is used, one link is working and the other is standby. The VLAN ends in 1 VLAN on the working OLO Access Line.

Per service class and per LEX where the Beneficiary wants to be active, he will need to order 1 separate VLAN between the LEX and one of the 2 Service PoPs of the Aggregation Network to which the LEX belongs (in case of a Multichassis LAG OLO Access Line these VLANs will dynamically be terminated on the Service PoP with the working OLO Access Line). In this LEX, all End-Users of the Beneficiary with the same service class (e.g.: P0bis) will share this same VLAN separated from the VLAN (e.g.: P0) of the same OLO or any other OLO.

The OLO will connect the OLO Access Lines to his OLO Router or other equipment. When Multichassis LAG OLO Access Lines are used the OLO Router or other equipment must support multichassis LAG.

3.2 Aggregation Network structure

The Aggregation Network structure schematized in Figure 2 below is common to Bitstream Fiber PON and Bitstream xDSL.