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4 Nx25G-EPON architecture

4.1 Introduction

4.2 Optical distribution network

4.3 Nx25G-EPON devices

4.4 Media access and transmission arbitration

4.5 Concept of logical links

OLT and ONU devices instantiate multiple MAC instances. A *logical link* is created by binding a MAC instance at the OLT with a MAC instance at the ONU.

The mechanism of establishing logical links relies on tagging each frame (or frame fragment) with a logical link identification (LLID) value and mapping each instance of a MAC to a specific LLID value. See IEEE Std 802.3, 143.2.1 for the detailed explanation of the of logical link creation and operation.

4.5.1 Logical link connectivity

From the connectivity perspective, an Nx25G-EPON system can be viewed as a collection of logical point-to-point (P2P) and point-to-multipoint (P2MP) links.

A P2P logical link connects a single MAC instance at the OLT to a single MAC instance at the ONU. A frame sent by the OLT on a P2P link is delivered to only a single MAC instance in a single ONU.

A P2MP logical link takes advantage of the broadcasting nature of the PON tree topology and connects a single MAC instance at the OLT to multiple MAC instances in different ONUs. To establish a P2MP logical link, the NMS provisions multiple ONUs to accept the same LLID value. A downstream frame sent by the OLT to such P2MP logical link gets delivered to multiple ONUs. The P2MP logical links are the fundamental mechanism for supporting broadcast and multicast operations in Nx25G-EPON (see 7.4.2.1).

4.5.2 Logical link directionality

ONUs are unaware whether a given logical link is of P2P or P2MP type (i.e., ONUs are unaware whether the same LLID value has been provisioned in other ONUs). However, ONUs distinguish the *bidirectional* logical links from the *unidirectional* logical links.

A bidirectional logical link requires an allocation of an upstream queue at the ONU to buffer the upstream frames between the transmission opportunities. A unidirectional logical link carries traffic only in the downstream direction (from the OLT to an ONU) and does not require an upstream queue at the ONU.

LLIDs are provisioned to the ONUs using the *acConfigLlid* extended action, which includes the LLID directionality parameter (see 14.6.2.8).

It is generally the case that multicast services are supported by the P2MP links that are provisioned as unidirectional (downstream-only) links. However, there could a special shared-access mode of operation whereby a bidirectional LLID is provisioned as P2MP LLID (see 7.4.2.1.3).

4.5.3 Types of logical links

The Nx25G-EPON architecture defines several types of LLIDs (see IEEE Std 802.3, 144.3.4.1):

- The *Physical layer ID* (PLID) logical link carries messages used to control critical Nx25G-EPON operations, such as ONU registrations and arbitration of ONUs' access to the PON medium. All Multipoint Control Protocol data units (MPCPDUs) are transported using the PLID.
- *Management link ID* (MLID) logical link carries management traffic flows, such as OAM Protocol data units (OAMPDUS, see IEEE Std 802.3, 57.4) and Channel Control Protocol data units (CCPDUs, see IEEE Std 802.3, 144.4).
- *User link IDs* (ULIDs) carry subscriber traffic. It is expected that a single subscriber may be assigned one or more ULIDs to allow for separation of traffic classes and types. ULID values are assigned (provisioned) to an ONU by NMS.
- *Group link ID* (GLID) is used to consolidate several LLIDs into arbitrary groups for the purposes of bandwidth granting by the OLT and reporting by the ONU. The configuration and operation of GLID is specified in **TBD**.

4.5.4 Configuration or logical links

Upon successful registration, the ONU is connected to the OLT via two point-to-point logical links: primary PLID and primary MLID. Additionally, two broadcast logical links are pre-defined: `BCAST_PLID` and `BCAST_MLID` (see IEEE Std 802.3, Table 144–1). Together, the two primary LLIDs and the two predefined broadcast LLIDs are referred as *system* LLIDs.

Additional P2P and/or P2MP logical links between the OLT and ONUs may be provisioned by the NMS based on specific access network configuration and service requirements. Provisioning of such additional logical links is accomplished using the eOAM action *acConfigLlid* (see [14.6.2.8](#)).

Although the OLT and ONUs instantiate multiple MAC entities at their PON-facing ports, each device may use a single MAC address. Within the EPON Network, each MAC instance is uniquely identified by its associated LLID value.