LLID: Logical Link Identifier

LGID: Logical Group Identifier

64.3.3 Discovery Processing

Discovery is the process whereby newly connected or off-line ONUs are provided access to the PON. The process is driven by the OLT, which periodically makes available Discovery Time Windows during which off-line ONU's are given the opportunity to make themselves known to the OLT. The periodicity of these windows is unspecified and left up to the implementer. The OLT signifies that a discovery period is occurring by broadcasting a discovery gate message, which includes the starting time and length of the discovery window. Off-line ONUs, upon receiving this message, wait for the period to begin and then transmit a Register_Req message to the OLT. Discovery windows are unique in that they are the only times where multiple ONUs can access the PON simultaneously, and transmission overlap can occur. In order to reduce transmission overlaps, a contention algorithm is used by all ONUs. Measures are taken to reduce the probability for overlaps by artificially simulating a random distribution of distances from the OLT. Each ONU shall wait a random amount of time before transmitting the Register_Req message that is shorter than the length of the discovery time window. It should be noted that multiple valid Register_Req messages can be received by the OLT during a single discovery time period. Included in the Register_Req message is the ONU's MAC address and number of maximum pending grants. Upon receipt of a valid Register_Req message, the OLT registers the ONU, allocating and assigning new port identities (LLIDs), and bonding corresponding MACs to the LLIDs. Additionally, the OLT assigns new group identifies (LGIDs), for grouping or separating some ports from other port groups. These LGIDs can be related to the VLAN group identifiers (VIDs) or multicast address/addresses, and can be applied for link segregation or multicasting.
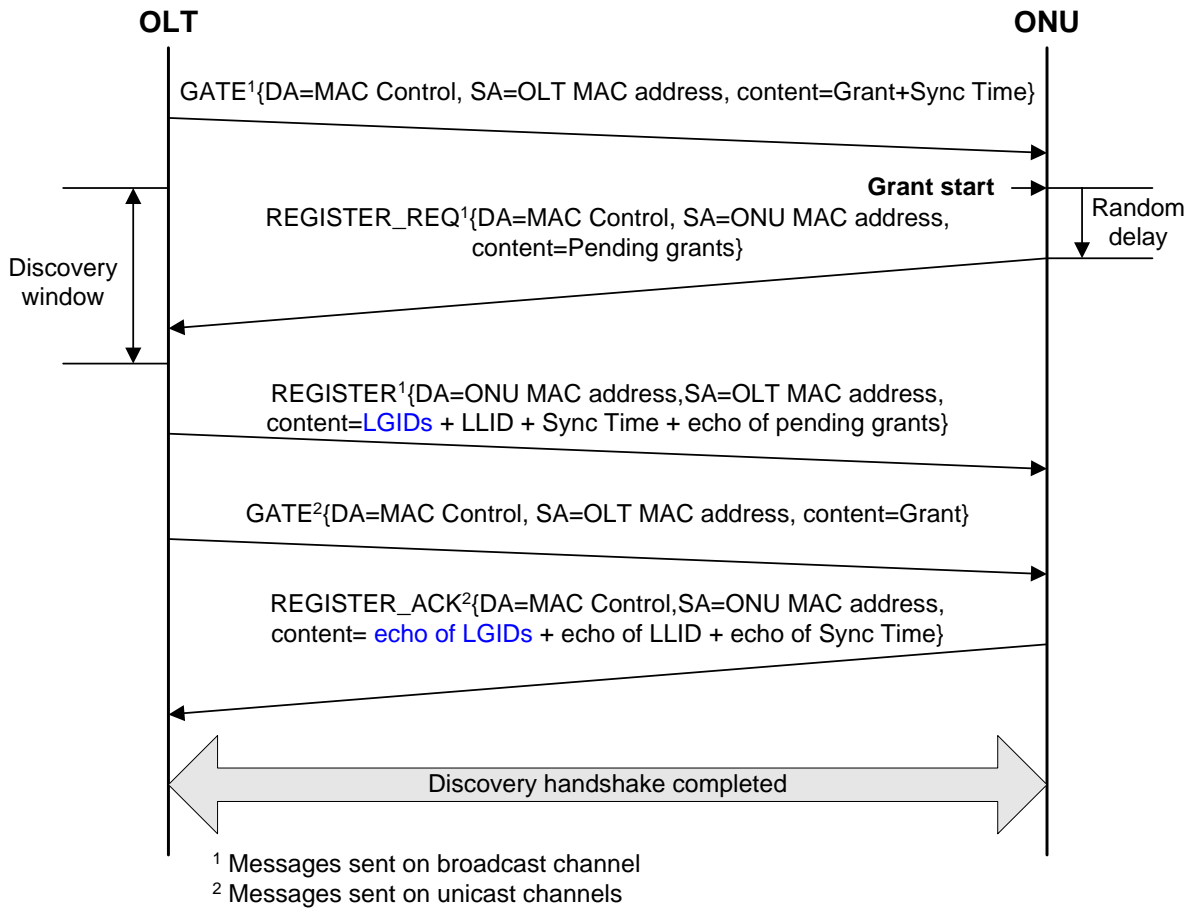
…

OLT   **ONU**

GATE[1]{DA=MAC Control, SA=OLT MAC address, content=Grant+Sync Time}

Grant start

Random delay

Discovery window

REGISTER_REQ[1]{DA=MAC Control, SA=ONU MAC address, content=Pending grants}

REGISTER[1]{DA=ONU MAC address,SA=OLT MAC address, content=LGIDs + LLID + Sync Time + echo of pending grants}

GATE[2]{DA=MAC Control, SA=OLT MAC address, content=Grant}

REGISTER_ACK[2]{DA=MAC Control,SA=ONU MAC address, content= echo of LGIDs + echo of LLID + echo of Sync Time}

Discovery handshake completed

[1] Messages sent on broadcast channel
[2] Messages sent on unicast channels

Figure 64-14 – Discovery Handshake Message Exchange

65. Extensions of the Reconciliation Sublayer (RS) for Point to Point Emulation

…

65.1.3 Functional specifications

The variables below provide a mapping between MODE, LGID and LLID variables and multiple MACs. While the usage of this mapping is less interesting in the ONU, it is critical in the OLT. This mapping is used to replace transmitted preambles with MODE, LGID and LLID fields as well as to steer received packets to the appropriate MAC.

65.1.3.1 Variables

enable

> Value: Boolean
>
> This variable shall be TRUE for an ONU MAC. For an OLT MAC, this variable is defined as below:
>
> > TRUE when management has assigned a value to mode, logical_group_id and logical_link_id. Indicates the MAC is enabled to receive frames.
> >
> > FALSE when the MAC is not in use.

mode

> Value: 1 bit
>
> This variable shall be 0 for an ONU MAC and may be 0 or 1 for an OLT MAC.
>
> When the LLID is used to emulate a single copy broadcast or multicast channel, this variable will be set to 1. When emulating a unicast channel, this variable will be set to 0.

logical_group_id

> Value: 3 bit
>
> This variable shall be assigned a value to indicate this MAC is grouped with this value.

logical_link_id

> Value: ~~15~~ 12 bits
>
> This variable shall be set to the broadcast value of 0x~~7~~FFF for the unregistered ONU MAC. Enabled OLT MACs may use any value for this variable. Registered ONU MACs may use any value other than 0x~~7~~FFF for this variable.

65.1.3.2 Transmit

…

Table 65-1 – Preamble/SFD replacement mapping

Offset	Field	Preamble/SFD	Modified preamble/SFD
1	-	0x55	same
2	-	0x55	same
3	SPD	0x55	0xd5
4	-	0x55	Same
5	-	0x55	Same
6	LLID[15:8]	0x55	<mode, logical_group_id[14:12], logical_link_id[~~14~~11:8]>[a]
7	LLID[7:0]	0x55	<logical_link_id[7:0]>[b]
8	CRC8	0xd5	The 8 bit CRC calculated over offset 3 through 7

[a]mode maps to TXD[7], logical_link_id[14] maps to TXD[6], logical_link_id[8] maps to TXD[0]

[b]logical_link_id[7] maps to TXD[7], logical_link_id[0] maps to TXD[0]

…

65.1.3.2.2 LLID

The LLID field is two octets in length and replaces the last two octets of preamble. The LLID field is a concatenation of the mode, logical_group_id and logical_link_id variables for the associated MAC.

…

65.1.3.3 Receive function

…

Table 65-2 shows the mapping of the modified preamble/SFD to RXD.

Table 65-2 – Preamble/SFD replacement mapping

Signal	Bit values of octets received through GMII[a]									
RXD0	X	1[b]	1	1[c]	1	1	logical_link_id[8][d]	logical_link_id[0][e]	X7[f]	D0[g]
RXD1	X	0	0	0	0	0	logical_link_id[9]	logical_link_id[1]	X6	D1
RXD2	X	1	1	1	1	1	logical_link_id[10]	logical_link_id[2]	X5	D2
RXD3	X	0	0	0	0	0	logical_link_id[11]	logical_link_id[3]	X4	D3
RXD4	X	1	1	1	1	1	~~logical_link_id[12]~~ logical_group_id[0]	logical_link_id[4]	X3	D4
RXD5	X	0	0	0	0	0	~~logical_link_id[13]~~ logical_group_id[1]	logical_link_id[5]	X2	D5

RXD6	X	1	1	1	1	1	logical_link_id[14] logical_group_id[2]	logical_link_id[6]	X1	D6
RXD7	X	0	0	1	0	0	mode	logical_link_id[7]	X0	D7
RX_DV	0	1	1	1	1	1	1	1	1	1

[a]Leftmost octet is the first received

[b]This octet may be missing per 1000BASE-X PCS transmit state diagram (see CROSS REF Figure 36-5)

[c]SPD field

[d]First octet of LLID field

[e]second octet of LLID field

[f]CRC8 field

[g]D0 through D7 is the first octet of the PDU (first octet of the Destination Address)

…

65.1.2.4.2 LLID

The third and fourth octets following the SPD contain the mode, logical_group_id and logical_link_id values. These values are acted upon differently for OLTs and ONUs.

If the device is an OLT then the following comparison is made:
   a) the received mode bit and logical_group_id isare ignored
   b) if the received logical_link_id value matches 0x7FFF and an enabled MAC exists with a logical_link_id variable with the same value then the comparison is considered a match to that MAC.
   c) if the received logical_link_id value is any value other than 0x7FFF and an enabled MAC exists with a mode variable with a value of 0 and a logical_link_id variable with a value matching the received logical_link_id value then the comparision is considered a match to that MAC.

If the device is an ONU then the following comparison is made:
   a) if the received mode bit is 0, the received logical_group_id value matches one of the logical_group_id variables, and the received logical_link_id value matches the logical_link_id variable then the comparison is considered a match;
   b) if the received mode bit is 1, the received logical_group_id value matches one of the logical_group_id variables, and the received logical_link_id value doesn't match the logical_link_id variable, or the received logical_link_id matches 0x7FFF, then the comparison is considered a match.

…