144.3.7.1 GATE description

The purpose of GATE message is to grant transmission windows to ONUs for ~~normal~~ upstream transmission on the shared medium. A single grant to an ONU may consist of multiple GATE MPCPDUs, all having the same Grant Start Time value. Up to seven ~~grants~~ envelope allocations can be included in a single GATE MPCPDU (see Figure 144-18). Only ~~grants~~ envelope allocations with non-zero value within the ~~*Grant Length*~~*LLID* ~~*#n*~~ field are processed by the ONU. A GATE MPCPDU with no Envelope Allocations (i.e., all LLID fields equal to zero) is valid and ~~If the number of grants with non-zero value in the *Grant Length #n* field in the GATE MPCPDU is zero, such a GATE MPCPDU~~ is used as an MPCP keep alive from the OLT to the ONU.

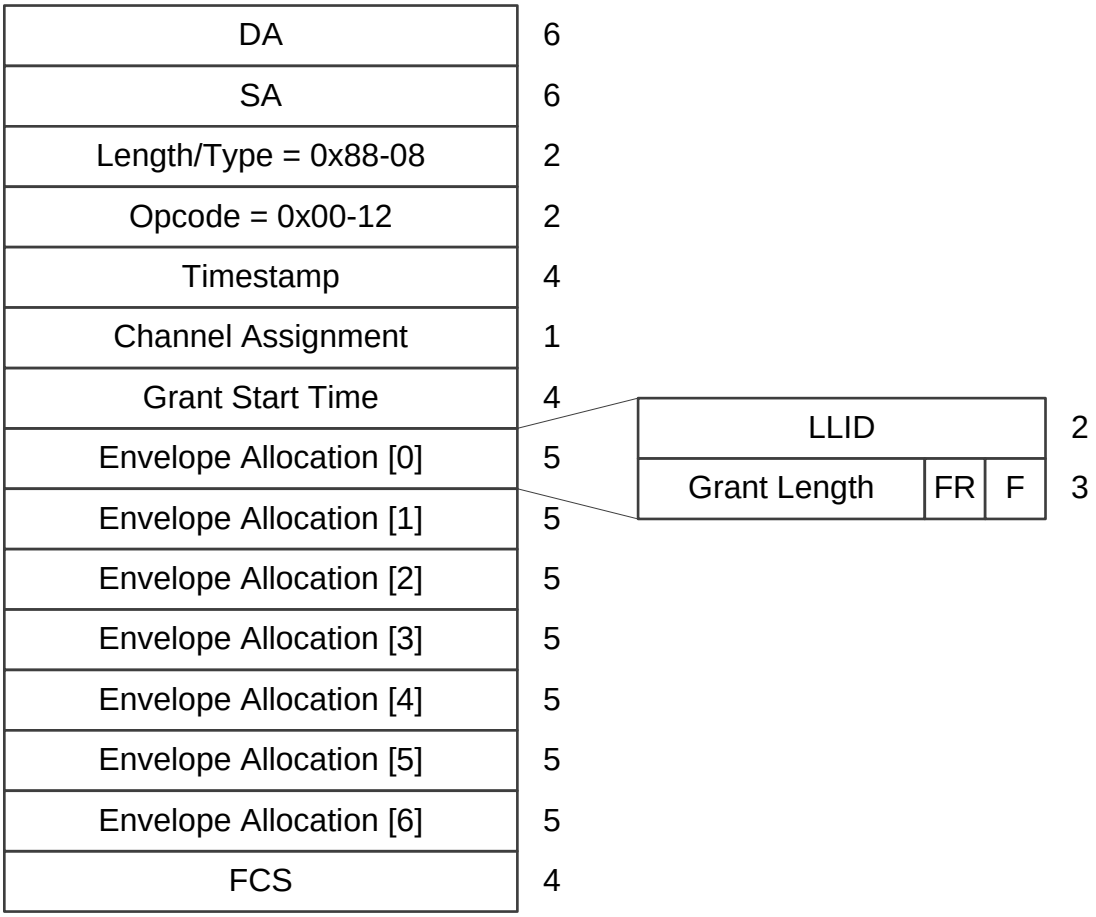

Figure 144-18 – GATE MPCPDU

The GATE MPCPDU is an instantiation of the Generic MPCPDU, and is further defined as follows:

a) *Opcode*: ~~.~~ The opcode for the GATE MPCPDU is 0x0012.
b) *Channel Assignment*: This 8-bit flag register, where bits 0-3 contain a bitmap representing the ~~wavelength~~ upstream channel(s) granted to the ONU. ~~on which to~~

~~transmit on during the assigned transmission slot.~~ Bits 4-7 are reserved. Table 144–1 shows the mapping between individual bits and upstream channels. When multiple channels are assigned, a transmission on each channel shall start at Grant Start Time and shall have the length as necessary to transmit all allocated envelopes together with the associated optical and FEC overhead.

c) *Grant Start Time*: This 32-bit unsigned integer value represents the start time of the transmission ~~grant~~window (burst), expressed in the units of ~~1~~ EQ. The start time is compared to the local clock, to correlate the start of the grant.

d) *Envelope Allocation* is a 40-bit structure that describes the transmission window assigned to a specific LLID. Up to 7 envelope allocations may be included into a single GATE MPCPDU. The Envelope Allocation structure consists of the following sub-fields:

   i. *LLID ~~#n~~*: This 16-bit unsigned integer value represents the logical link that is being ~~granted~~ allocated a transmission slot. The value of 0 in this field signifies an empty Envelope Allocation structure that shall be skipped over by the parser.

   ii. ~~*Grant*~~ *Envelope Length ~~#n~~*: This 22-bit unsigned value represents the length of the ~~grant~~ envelope assigned to this specific LLID ~~#n~~. The length of the ~~granted transmission slot~~envelope is expressed in the units of ~~1~~ EQ. ~~Up to 7 grants may be packed into a single GATE MPCPDU.~~ The Envelope Length represents the number of EQs to be sourced from a corresponding (virtual) MAC, less one EQ reserved for the Envelope Header. The Envelope Length does not include any transmission overhead components. ~~All transmission overhead components (see TBD) are included in and thus consume part of the granted transmission slot.~~

   iii. *Fragmentation (F)*: ~~(TBD)~~This frag informs the ONU whether it is allowed to fragment new frames transmitted on the given LLID. If a frame fragment remains queued in this LLID since previous envelope transmission, this fragment is transmitted first, regardless of the value of the Fragmentation flag.

   iv. *Forced Report (FR)*: When the respective bit is set to 0, no action is required from the ONU. When the respective bit is set to 1, the ONU shall report the total length of the frames (including IPG and preamble), queued for transmission on this specific LLID.~~should issue a REPORT MPCPDU during the transmission grant indicated by the Grant Length #n field associated with this Forced Report flag.~~

e) *Pad/Reserved*. This is an empty field that is transmitted as zeros, and ignored on reception. The size of this field depends on the ~~used~~ number of used Envelope Allocations ~~Grant Length #n / LLID #n entry pairs as well as the presence of any optional fields,~~ and varies in length from 0~~-~~ to ~~30~~ 35 octets~~accordingly~~.

144.3.7.1 GATE description

The purpose of GATE message is to grant transmission windows to ONUs for upstream transmission on the shared medium. A single grant to an ONU may consist of multiple GATE MPCPDUs, all having the same Grant Start Time value. Up to seven envelope allocations can be included in a single GATE MPCPDU (see Figure 144-18). Only envelope allocations with non-zero value within the *LLID* field are processed by the ONU.A GATE MPCPDU with no Envelope Allocations (i.e., all LLID fields equal to zero) is valid and is used as an MPCP keep alive from the OLT to the ONU.

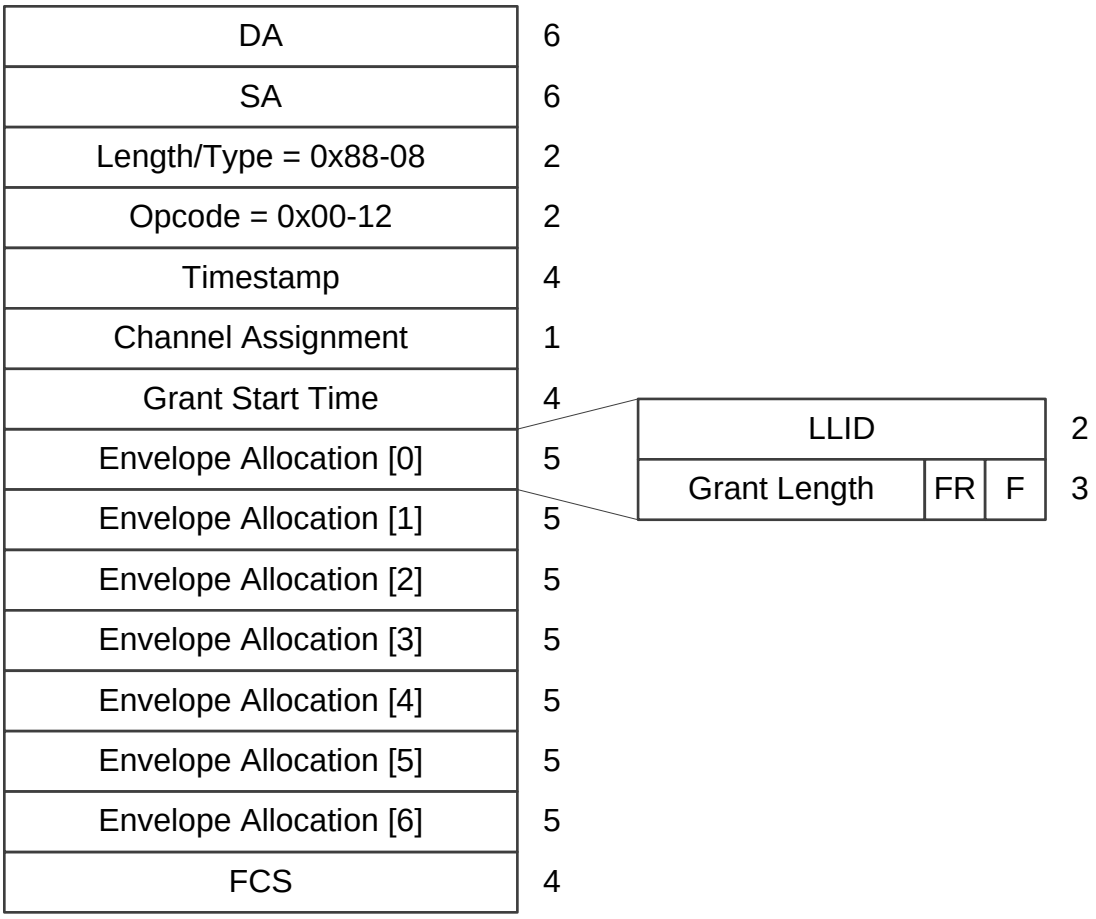

Figure 144-18 – GATE MPCPDU

The GATE MPCPDU is an instantiation of the Generic MPCPDU, and is further defined as follows:

~~d)~~f) *Opcode*: The opcode for the GATE MPCPDU is 0x0012.

~~e)~~g) *Channel Assignment*: This 8-bit flag register, where bits 0-3 contain a bitmap representing the upstream channel(s) granted to the ONU. Bits 4-7 are reserved. Table 144–1 shows the mapping between individual bits and upstream channels. When multiple channels are assigned, a transmission on each channel shall start at Grant Start Time and shall have the length as necessary to transmit all allocated envelopes together with the associated optical and FEC overhead.

~~f)~~h) *Grant Start Time*: This 32-bit unsigned integer value represents the start time of the transmission window (burst), expressed in the units of EQ. The start time is compared to the local clock, to correlate the start of the grant.

~~g)~~i) *Envelope Allocation* is a 40-bit structure that describes the transmission window assigned to a specific LLID. Up to 7 envelope allocations may be included into a single GATE MPCPDU. The Envelope Allocation structure consists of the following sub-fields:

v. *LLID*: This 16-bit unsigned integer value represents the logical link that is being allocated a transmission slot. The value of 0 in this field signifies an empty Envelope Allocation structure that shall be skipped over by the parser.

vi. *Envelope Length*: This 22-bit unsigned value represents the length of the envelope assigned to this specific LLID. The length of the envelope is expressed in the units of EQ. The Envelope Length represents the number of EQs to be sourced from a corresponding (virtual) MAC, less one EQ reserved for the Envelope Header. The Envelope Length does not include any transmission overhead components.

vii. *Fragmentation (F)*: This frag informs the ONU whether it is allowed to fragment new frames transmitted on the given LLID. If a frame fragment remains queued in this LLID since previous envelope transmission, this fragment is transmitted first, regardless of the value of the Fragmentation flag.

viii. *Forced Report (FR)*: When the respective bit is set to 0, no action is required from the ONU. When the respective bit is set to 1, the ONU shall report the total length of the frames (including IPG and preamble), queued for transmission on this specific LLID.

~~h)~~j) *Pad/Reserved*. This is an empty field that is transmitted as zeros, and ignored on reception. The size of this field depends on the number of used Envelope Allocations and varies in length from 0 to 35 octets.