ONU Discovery for a Coexistence-enabled PON

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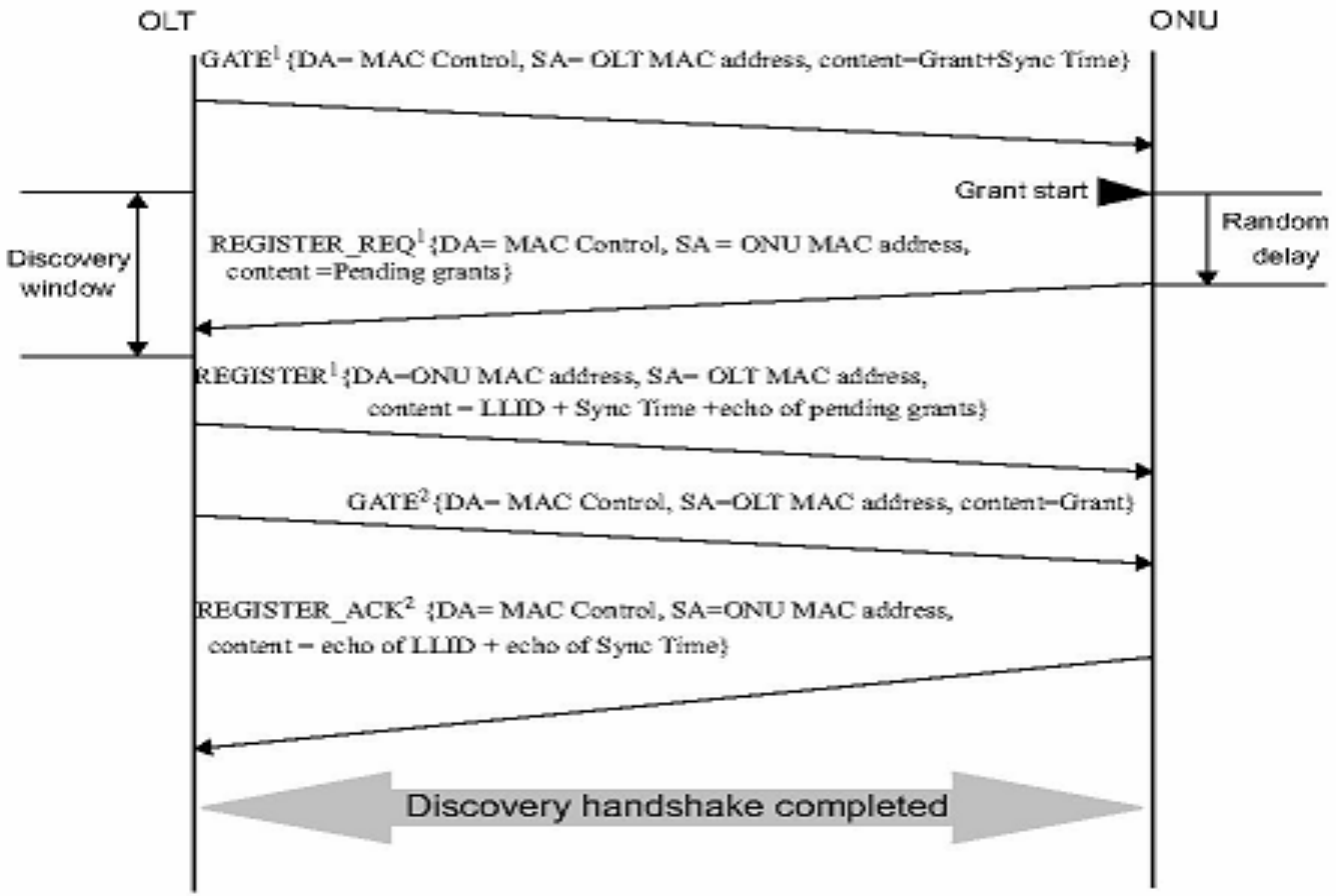
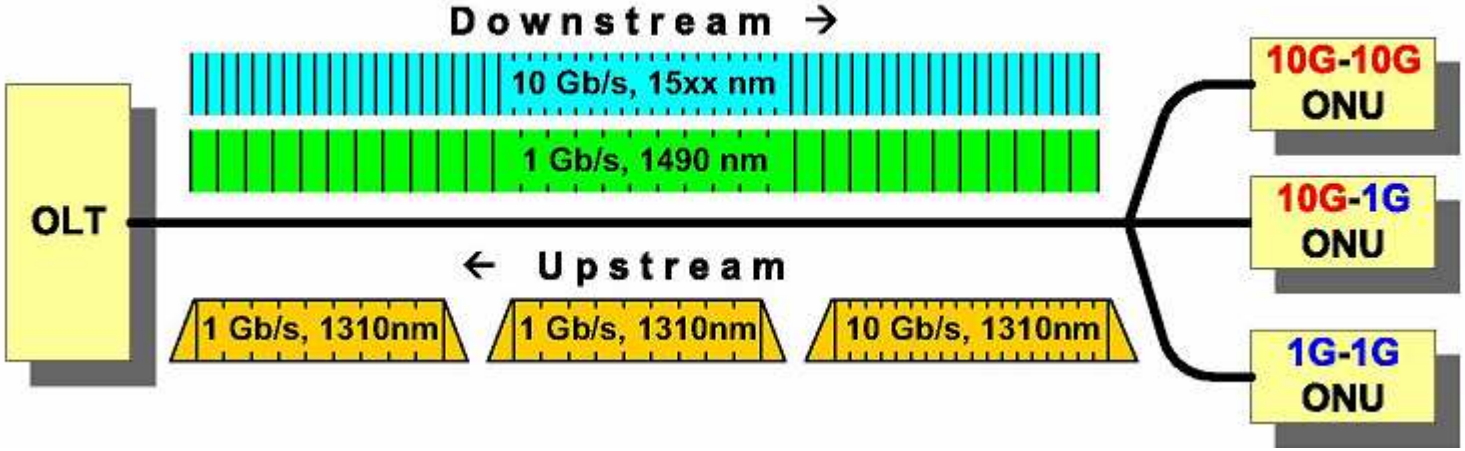
ONU Discovery handshake



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

Figure 64–14—Discovery Handshake Message Exchange

PON supporting all ONU types



- Symmetric 10G/10G ONUs require information about Discovery windows on the 10G upstream
- Asymmetric 10G/1G ONUs (which listen on the 10G Downstream) require information about Discovery windows on the 1G Upstream
- Legacy 1G ONUs require information on the 1G Upstream Discovery windows

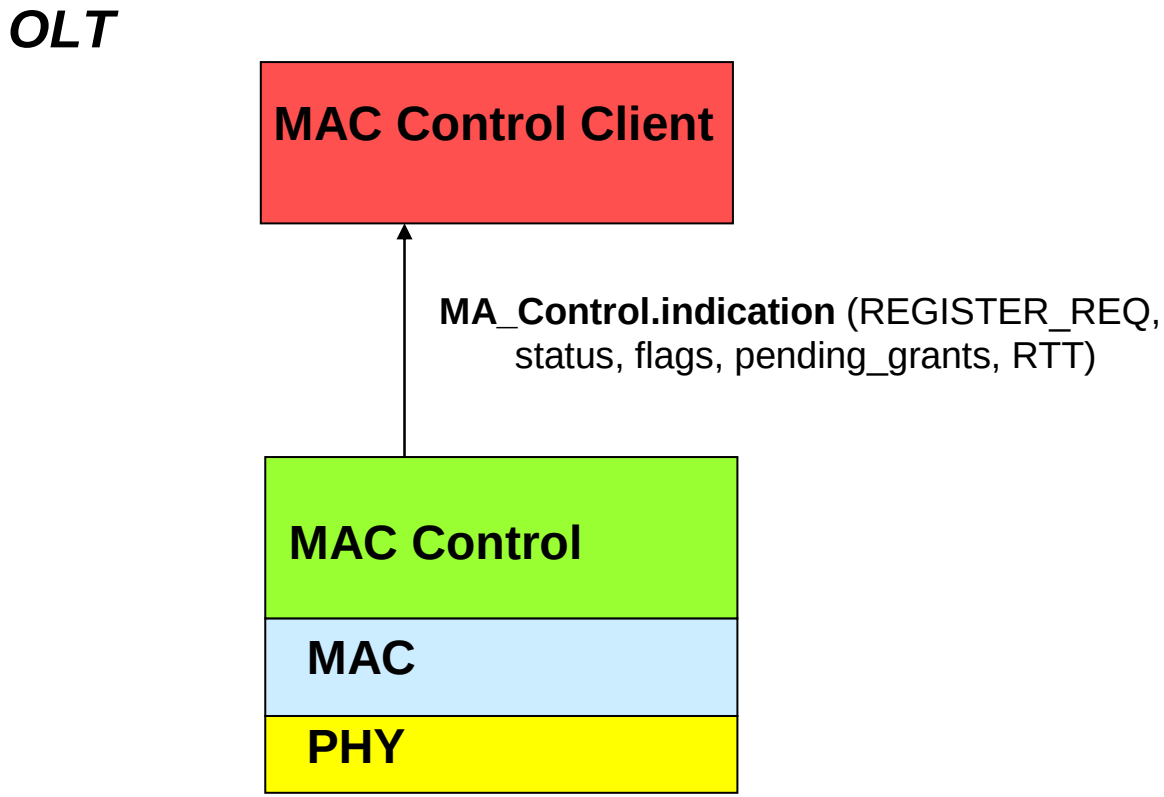
Issues for ONU Discovery in PON with coexistence

1. *Support for multiple upstream rates:* The OLT is presumed to control its Dual Rate Receiver (via an explicit or implicit MAC-to-PHY mechanism) to receive at 10.3125 Gbps for some discovery intervals and at 1.25 Gbps for others. We need to examine how this can be supported by the OLT/ONU Discovery state machines.

2. *ONU Identification to OLT:* The OLT requires the capability to determine the type (ie. 10G/10G, 10G/1G, or 1G/1G) of each ONU so as to provide the correct service ie.

   - Associating the ONU's assigned LLID with the correct downstream
   - Setup of the dual rate receiver for the ONU's upstream transmissions
   - Possible consideration by DBA

Layers for Discovery Handshake



Note that the OLT MAC Control Client receives REGISTER_REQ from the stack without information regarding the Discovery window (and therefore the rate) in which the PDU was received (802.3-2005 64.3.3)

Support for multiple upstream rates

Existing OLT and ONU Discovery state machines (64.3.3.6) can be retained as follows:

- The OLT transmits identical Discovery GATEs on both downstreams (10G and 1G). For some of the windows described in the Discovery GATEs the OLT receiver will “listen” at 10G; for other it will listen at 1G.
- The ONU (10G/10G, 10G/1G, or legacy 1G/1G) sends REGISTER_REQ in each window conveyed by a received Discovery GATE that it received until it successfully registers
- Failed Registration due to receiver rate mismatch is not a concern. Registration collision between 1G ONUs and 10G ONUs is no worse than collisions of same-type ONUs

Flags field in REGISTER_REQ

The *Flags* field in the REGISTER_REQ PDU "indicates special requirements for the registration" (64.3.6.2)

Table 64–3—REGISTER_REQ MPCPDU Flags fields

Value	Indication	Comment
0	reserved	Ignored on reception.
1	Register	Registration attempt for ONU.
2	reserved	Ignored on reception.
3	Deregister	This is a request to deregister the ONU. Subsequently, the MAC is deallocated and the LLID may be reused.
4-255	reserved	Ignored on reception.

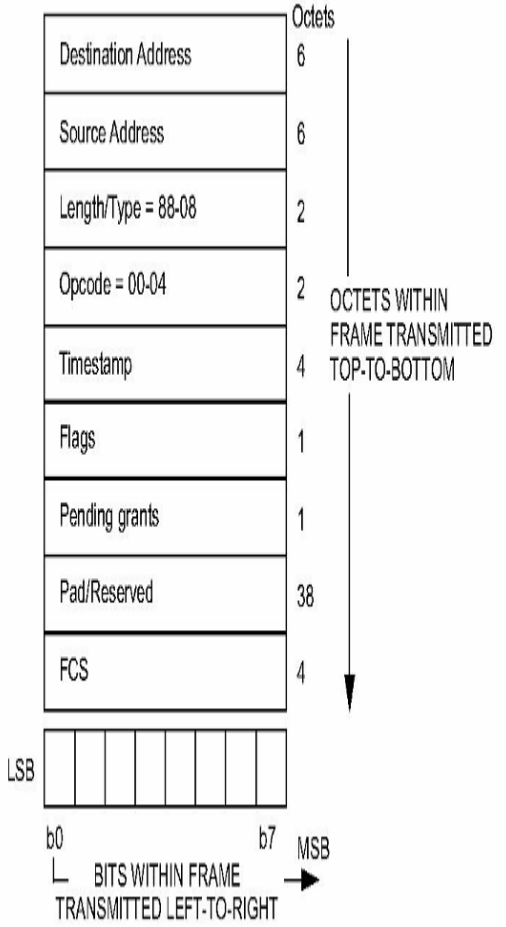


Figure 64–33—REGISTER_REQ MPCPDU

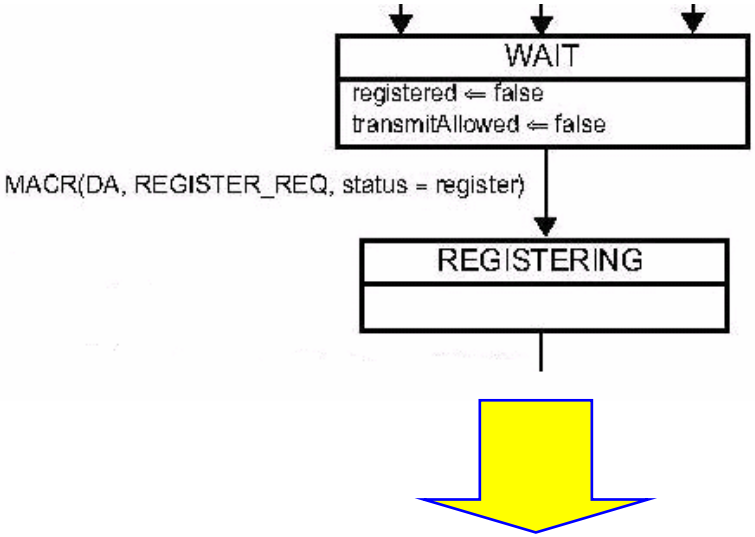
ONU Identification to OLT via new *Flags* values in REGISTER_REQ

value	indication	comment
4	Register 10G	This is a request to register a 10G/10G ONU to use the 10G downstream/upstream
5	Register 10G Asymmetric	This is a request to register a 10G/1G ONU to use 10G downstream and 1G upstream

1. Define new values for the *Flags* octet of REGISTER_REQ to enable an ONU to explictly register on the downstream/upstream that it needs to use
2. 1G/1G ONUs use the original *Flags* value (so “Register” [value = 2] means Register 1G/1G)
3. OLT associates the new ONU with the appropriate downstream for data transmission and the appropriate upstream for receiver control
4. The *MAC Control Client* elements in the ONU and OLT are (as always) responsible for setting and parsing the contents of the *Flags* field.

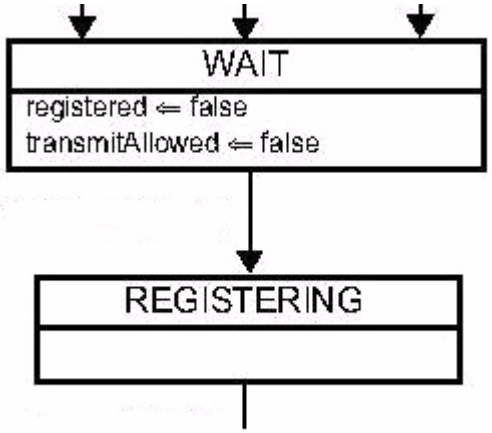
Adjustment to *ONU Discovery* state diagram

1G ONU



10G ONU

MACR(DA, REGISTER_REQ, status = register)
| MACR(DA, REGISTER_REQ, status = register10G)
| MACR(DA, REGISTER_REQ, status = register_10G_asym)



Modify the transition from WAIT to REGISTERING state in figure 64-22 to recognize the new registration types

Summary of Proposal

1. The 10G OLT receives a 1G signal in some Discovery windows and a 10G signal in other Discovery windows. There is no change necessary to the Discovery GATE mechanisms described in 64.3.3 for support of dual upstream rates.

2. Two new values are defined for the *Flags* field of the REGISTER_REQ PDU as illustrated on slide 8.

3. The 10G ONU shall set the value of the *Flags* field in REGISTER_REQ to indicate the particular upstream and downstream that it requires.

4. Discovery state diagram for 10G ONU includes a minor change from 1G as shown on slide 9.

An Alternative Approach

The following is a broad outline of an alternative scheme:

1. The OLT sends different Discovery GATEs on the 1G and 10G downstreams

2. Interlayer interfaces could be modified to convey PDU timestamp information from REGISTER_REQ to the OLT's MAC Control Client

3. The OLT MAC Control client uses the timing information to infer which Discovery window the ONU is responding to

However, this approach seems to include additional complexity, necessitates changes to logical interfaces in Clause 64, and might be susceptible to timing issues.

Straw Poll

I prefer to:

- Maintain the GEPON Discovery scheme and identify the ONU in REGISTER_REQUEST ____
- Enhance Discovery so that it will use message arrival timing to identify the ONU ____
- Something different ____