

93.3.3 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 ONUs are given the opportunity to make themselves known to the OLT. The periodicity of these windows is unspecified and left up to the implementor. The OLT signifies that a discovery period is occurring by broadcasting a discovery GATE MPCPDU, which includes the starting time and length of the discovery window, along with the Discovery Information flag field, as defined in 93.3.6.1. With the appropriate settings of individual flags contained in this 16 bit wide field, the OLT notifies all the ONUs about its upstream and downstream channel transmission capabilities. Note that the OLT may simultaneously support more than one data rate in the given transmission direction.

Off-line ONUs, upon receiving a Discovery GATE MPCPDU, wait for the period to begin and then transmit a REGISTER_REQ MPCPDU 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 MPCPDU that is shorter than the length of the discovery time window. It should be noted that multiple valid REGISTER_REQ MPCPDUs can be received by the OLT during a single discovery time period. Included in the REGISTER_REQ MPCPDU is the ONU's MAC address and number of maximum pending grants. Additionally, a registering ONU notifies the OLT on its transmission capabilities in the upstream and downstream channels by setting appropriately the flags in the Discovery Information field, as specified in 93.3.6.3.

Note that even though a compliant ONU is not prohibited from supporting more than one data rate in any transmission channel, it is expected that a single supported data rate for upstream and downstream channel will be indicated in the Discovery Information field. Moreover, in order to assure maximum utilization of the upstream channel and to decrease the required size of the guard band between individual data bursts, the registering ONU shall notify the OLT on the laser on / off times, by setting appropriate values in the Laser On Time and Laser Off Time fields, where both values are expressed in the units of time_quanta.

Upon receipt of a valid REGISTER_REQ MPCPDU, the OLT registers the ONU, allocating and assigning new port identities (LLIDs), and bonding corresponding MACs to the LLIDs.

The next step in the process is for the OLT to transmit a REGISTER MPCPDU to the newly discovered ONU, which contains the ONU's LLID, and the OLT's required synchronization time. Also, the OLT echoes the maximum number of pending grants, laser on time and laser off time. Note that the echoed parameter values i.e. required OLT synchronization time and laser on/off times are delivered to the registering ONU for confirmation purposes only and their utilization is not prescribed in this specification.

The OLT now has enough information to schedule the ONU for access to the PON and transmits a standard GATE message allowing the ONU to transmit a REGISTER_ACK. Upon receipt of the REGISTER_ACK, the discovery process for that ONU is complete, the ONU is registered and normal message traffic can begin. It is the responsibility of Layer Management to perform the MAC bonding, and start transmission from/to the newly registered ONU. The discovery message exchange is illustrated in Figure 93-14.

There may exist situations when the OLT requires that an ONU go through the discovery sequence again and reregister. Similarly, there may be situations where an ONU needs to inform the OLT of its desire to deregister. The ONU can then reregister by going through the discovery sequence. For the OLT, the REGISTER message may indicate a value, Reregister or Deregister, that if either is specified will force the receiving ONU into reregistering. For the ONU, the REGISTER_REQ message contains the Deregister bit that signifies to the OLT that this ONU should be deregistered.

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