13

13.4

13.4.2 eOAMPDU

Most management functions required for the proper operation of EPON are carried out through the process of reading and writing individual attributes of the managed objects hosted in the ONU. As an example, setting the operating speed for an UNI port requires writing an appropriate value into the speed attribute of the proper port object. Likewise, information can be read from the respective managed objects hosted on the ONU using dedicated eOAMPDUs.

It is also possible to cause the ONU to perform certain actions, e.g., disable specific UNI ports, reset counters, by setting appropriate values in the stored managed objects.

13.4.2.1 eOAMPDU codes

eOAMPDUs specified for this profile shall be as defined in Table 13-87. These eOAMPDUs use the Organization Specific Extension mechanisms defined in IEEE Std 802.3, Clause 57. Other values are reserved and ignored on reception.

Table 13-87—eOAMPDUs and assignment of Opcode values

Opcode	eOAMPDUs	Defined in
0x00	Reserved, ignored on reception	
0x01	*eOAM_Get_Request*	13.4.2.2
0x02	*eOAM_Get_Response*	13.2.3.3
0x03	*eOAM_Set_Request*	13.4.2.4
0x04	*eOAM_Set_Response*	13.4.2.5
0x05	*eOAM_MC_ControleOAM_MC_Control_Dynamic*	13.4.2.6
0x06	*eOAM_MC_Register*	13.4.2.7
0x07	*eOAM_MC_Response*	13.4.2.8
0x08	*eOAM_KeyExchange*	13.4.2.11
0x09	*eOAM_Software*	13.4.2.10
0x0A	*eOAM_MC_ControlResponseeOAM_MC_ControlResponse_Dynamic*	13.4.2.9
0x0B	*eOAM_MC_Control_Static*	13.4.2.15
0x0C	*eOAM_MC_ControlResponse_Static*	13.4.2.16
0xFC	*eOAM_Early_WakeUpOLT*	13.4.2.12
0xFD	*eOAM_Early_WakeUpONU*	13.4.2.13
0xFE	*eOAM_Sleep_Allowed*	13.4.2.14

13.4.2.2 *eOAM_Get_Request* eOAMPDU

The *eOAM_Get_Request* eOAMPDU permits the management system to request the value of one or more attributes hosted on the ONU, both defined in IEEE Std 802.3, Clause 30, and defined by this profile. The `Data` field of the *eOAM_Get_Request* eOAMPDU contains a series of Variable Descriptors and *Object Context* TLVs, if needed. The size (and presence) of the `Pad` field depends on the number of individual Variable Descriptors and *Object Context* TLVs. The structure of the Variable Descriptor is defined in 13.4.1.2.1. The structure of the *Object Context* TLV is defined in 14.4.1.1.

Functionally, the *eOAM_Get_Request* eOAMPDU is identical to the Variable Request OAMPDU as defined in IEEE Std 802.3, 57.4.3.3.

The structure of the *eOAM_Get_Request* eOAMPDU shall be as specified in Table 13-88 and as described in more detail below.

Table 13-88—Structure of the *eOAM_Get_Request* eOAMPDU

Size (octets)	Field (name)	Value
21	eOAMPDU header	Varies
1	Opcode	0x01
Varies	Data	Varies, a series of Variable Descriptors and *Object Context* TLV
Varies	Pad	0x00-…-00
4	FCS	Varies

eOAMPDU header, Opcode, Data, Pad, and FCS fields are defined in 13.4.1.1.

13.4.2.3 *eOAM_Get_Response* eOAMPDU

The *eOAM_Get_Response* eOAMPDU permits the ONU to respond to the *eOAM_Get_Request* eOAMPDU and contains a series of Variable Containers and *Object Context* TLVs, if needed.. The size (and presence) of the Pad field depends on the number of individual Variable Containers and *Object Context* TLVs. Each Variable Container may carry the value of the requested variable or a return code (per 13.4.3) if the variable reading process fails for any reason. The structure of the Variable Container is defined in 13.4.1.2.2. The structure of the *Object Context* TLV is defined in 14.4.1.1.

Functionally, the *eOAM_Get_Response* eOAMPDU is identical to the Variable Response OAMPDU as defined in IEEE Std 802.3, 57.4.3.4.

The structure of the *eOAM_Get_Response* eOAMPDU shall be as specified in Table 13-89 and as described in more detail below.

Table 13-89—Structure of the *eOAM_Get_Response* eOAMPDU

Size (octets)	Field (name)	Value
21	eOAMPDU header	Varies
1	Opcode	0x02
Varies	Data	Varies, a series of Variable Containers and *Object Context* TLVs
Varies	Pad	0x00-…-00
4	FCS	Varies

eOAMPDU header, Opcode, Data, Pad, and FCS fields are defined in 13.4.1.1.

The size of individual Variable Container(s) ranges between 5 and 132 octets, with the maximum size limited by the Length field encoding used in the Variable Container, as defined in 13.4.1.2.2.

13.4.2.4 *eOAM_Set_Request* eOAMPDU

The *eOAM_Set_Request* eOAMPDU permits the management system to set the value of one or more attributes hosted on the ONU, both defined in IEEE Std 802.3, Clause 30, and defined by this profile. The Data field of the *eOAM_Set_Request* eOAMPDU contains a series of Variable Containers and *Object Context* TLVs, if needed. The size (and presence) of the Pad field depends on the number of individual Variable Containers and *Object Context* TLVs. The structure of the Variable Container is defined in 13.4.1.2.2. The structure of the *Object Context* TLV is defined in 14.4.1.1.

The *eOAM_Set_Request* eOAMPDU does not have a functional equivalent in the OAMPDU defined in IEEE Std 802.3, Clause 57. IEEE 802.3 OAM does not support operations related to setting attributes and actions.

The structure of the *eOAM_Set_Request* eOAMPDU shall be as specified in Table 13-90 and as described in more detail below.

Table 13-90—Structure of the *eOAM_Set_Request* eOAMPDU

Size (octets)	Field (name)	Value
21	eOAMPDU header	Varies
1	Opcode	0x03
Varies	Data	Varies, a series of *M* Variable Containers and *Object Context* TLVs
Varies	Pad	0x00-…-00
4	FCS	Varies

eOAMPDU header, Opcode, Data, Pad, and FCS fields are defined in 13.4.1.1.

Each Variable Container included in the *eOAM_Set_Request* eOAMPDU may map into an attribute (e.g., for branches 0x07 or 0xD7) or an action (e.g., for branches 0x09 or 0xD9), as indicated by the Branch/Leaf 2-tuple. The Value field provides a new value to be assigned to the target attribute or a parameter for the target action.

Actions instruct the target eOAM client to execute a procedure, e.g., rebooting the ONU. The management actions specified in IEEE Std 802.3, Clause 30, are not supported in the IEEE 802.3 (Clause 57) OAMPDUs. The OAM extensions specified for this profile allow the source eOAM client to request execution of both actions defined by IEEE Std 802.3, Clause 30, and actions specified in this profile. Some of the actions specified in this profile are expressed using the Variable Container, where the parameters for this action are carried in the body of the Variable Container. Actions that do not have parameters are represented with a Variable Container of zero length (Length value of 0x80).

13.4.2.5 *eOAM_Set_Response* eOAMPDU

The *eOAM_Set_Response* eOAMPDU permits the ONU to respond to management requests (read variable(s), set variable(s), or perform action(s)) and contains a series of Variable Containers and *Object Context* TLVs, if needed. The size (and presence) of the Pad field depends on the number of individual Variable Containers and *Object Context* TLVs. Each Variable Container carries a return code (see 13.4.3) together with the Branch/Leaf identification of the target attribute/action. The structure of the Variable Container is defined in 13.4.1.2.2. The structure of the *Object Context* TLV is defined in 14.4.1.1.

The structure of the *eOAM_Set_Response* eOAMPDU shall be as specified in Table 13-91 and as described in more detail below.

Table 13-91—Structure of the *eOAM_Set_Response* eOAMPDU

Size (octets)	Field (name)	Value
21	eOAMPDU header	Varies
1	Opcode	0x04
Varies	Data	Varies, a series of Variable Containers and *Object Context* TLVs
Varies	Pad	0x00-…-00
4	FCS	Varies

eOAMPDU header, `Opcode`, `Data`, `Pad`, and `FCS` fields are defined in 13.4.1.1.

13.4.2.6 ~~eOAM_MC_Controle~~*eOAM_MC_Control_Dynamic* eOAMPDU

The ~~eOAM_MC_Controle~~*eOAM_MC_Control_Dynamic* eOAMPDU is used by the OLT to configure the ONU with all information necessary to forward data from the specific dynamic multicast group into associated UNI ports.

The structure of the ~~eOAM_MC_Controle~~*eOAM_MC_Control_Dynamic* eOAMPDU shall be as specified in Table 13-92 and as described in more detail below.

Table 13-92—Structure of the ~~eOAM_MC_Controle~~*eOAM_MC_Control_Dynamic* eOAMPDU

Size (octets)	Field (name)	Value + notes
21	eOAMPDU header	Varies
1	Opcode	0x05
1	Action	This field defines the action to be executed on the ONU in relation with the multicast forwarding rules. The following values are supported: 0x00: Add ~~UNI port(s)~~CPE device to the group forwarding list. 0x01: Remove CPE device ~~UNI port(s)~~ from the group forwarding list. 0x02: Remove all ~~ports~~ CPE devices and deregister the mLLID. Other values are reserved and ignored on reception.
2	LLID	This field identifies the value of the multicast LLID used to transfer data for the given multicast group. The following values are supported: 0x00-00 to ~~0x7F~~0x7E-FF. Additionally, the value of 0x7F-FF is supported in 1G-EPON and the value of 0x7F-FE is supported in 10G-EPON. Other values are reserved and ignored on reception. If the OLT sends the *eOAM_MC_Control_Dynamic* eOAMPDU with a reserved value of the LLID, the ONU shall respond with the *eOAM_MC_ControlResponse_Dynamic* eOAMPDU with the return code of 0x00 (failure).
16	IpSa	This field identifies the IP source address for the given multicast group. IPv4 addresses are aligned in the four least significant octets, and the 12 most significant octets are set to 0x00.
16	IpDa	This field identifies the IP destination address for the given multicast group. IPv4 addresses are aligned in the four least significant octets, and the 12 most significant octets are set to 0x00.
~~16~~	~~PortCount~~CpeMac	This field ~~identifies the number (N) of UNI ports that are associated with the given multicast group. Identification of individual UNI ports follows.~~contains the MAC address of the CPE device that send the IGMP/MDL join request for the specific dynamic IP multicast session.
~~1~~	~~Port 1~~	~~This field is used to list all UNI port instances to be added or removed from the given multicast.~~
~~...~~	~~...~~	
~~1~~	~~Port N~~	
Varies	Pad (optional)	0x00-…-00
4	FCS	Varies

a) eOAMPDU header, `Opcode`, `Pad`, and `FCS` fields are defined in 13.4.1.1.

b) `Action` identifies the target action for the given multicast group, i.e., whether the definition of this group is modified, added, or removed.

c) `LLID` identifies the multicast LLID that carries the content for the given multicast group.

d) `IpSa`/`IpDa` identify the source and destination addresses for the given multicast group.

~~d)~~e) `CpeMac` identifies the MAC address of the CPE device that send the IGMP/MDL join request for the specific dynamic IP multicast session.

~~e) PortCount identifies the number of UNI ports associated with the given multicast group, followed by their listing in the form of a set of Port-N fields.~~

13.4.2.7 *eOAM_MC_Register* eOAMPDU

The *eOAM_MC_Register* eOAMPDU is used by the OLT to associate a multicast LLID with a unicast LLID assigned by the MPCP discovery and registration process. The default multicast LLID for a unicast link is 0x7F-FF (1G-EPON) or 0x7F-FE (10G-EPON).

The structure of the *eOAM_MC_Register* eOAMPDU shall be as specified in Table 13-93 and as described in more detail below.

Table 13-93—Structure of the *eOAM_MC_Register* eOAMPDU

Size (octets)	Field (name)	Value + notes
21	eOAMPDU header	Varies
1	Opcode	0x06
1	Flags	This field defines the action related to the registration of the multicast LLID (either target action or the status of the previous action). The following values are supported: ~~0x01~~0x02: ~~(Re)R~~Deregister ~~0x02~~0x03: ~~Deallocate~~Register ~~0x03: Success~~ ~~0x04: Nack~~ Other values are reserved and ignored on reception.
2	multiLLID	This field identifies the value of the multicast LLID used to transfer data for the given multicast group. The following values are supported: 0x00-00 to 0x7E-FF. Other values are reserved and ignored on reception.
~~2~~	~~uniLLID~~	~~This field identifies the value of the unicast LLID previously assigned to the given ONU. The following values are supported: 0x00-00 to 0x7E-FF.~~ ~~Other values are reserved and ignored on reception~~
Varies	Pad (optional)	0x00-…-00
4	FCS	Varies

a) eOAMPDU header, `Opcode`, `Pad`, and `FCS` fields are defined in 13.4.1.1.

b) `Flags` identifies target action or the status of the previous action associated with the registration of the multicast LLID on the given ONU.

c) `multiLLID` identifies the multicast LLID that carries the content for the given multicast group.

13.4.2.8 *eOAM_MC_Response* eOAMPDU

The *eOAM_MC_Response* eOAMPDU is used by the ONU to acknowledge the request from the OLT to associate a multicast LLID with a unicast LLID assigned by the MPCP discovery and registration process. The default multicast LLID for a unicast link is 0x7F-FF (1G-EPON) or 0x7F-FE (10G-EPON).

The structure of the *eOAM_MC_Response* eOAMPDU shall be as specified in Table 13-94 and as described in more detail below.

Table 13-94—Structure of the *eOAM_MC_Response* eOAMPDU

Size (octets)	Field (name)	Value + notes
21	eOAMPDU header	Varies
1	Opcode	0x07
1	Flags	This field defines the action related to the registration of the multicast LLID (either target action or the status of the previous action). The following values are supported: ~~0x01~~0x00: ~~(Re)Register~~Failure ~~0x02: Deallocate~~ ~~0x03~~0x01: Success ~~0x04: Nack~~ Other values are reserved and ignored on reception.
2	multiLLID	This field identifies the value of the multicast LLID used to transfer data for the given multicast group. The following values are supported: 0x00-00 to 0x7E-FF. Other values are reserved and ignored on reception.
~~2~~	~~uniLLID~~	~~This field identifies the value of the unicast LLID previously assigned to the given ONU. The following values are supported: 0x00-00 to 0x7E-FF.~~ ~~Other values are reserved and ignored on reception.~~
Varies	Pad (optional)	0x00-…-00
4	FCS	Varies

a) eOAMPDU header, Opcode, Pad, and FCS fields are defined in 13.4.1.1.

b) Flags identifies target action or the status of the previous action, associated with the registration of the multicast LLID on the given ONU.

c) multiLLID identifies the multicast LLID that carries the content for the given multicast group.

d) ~~uniLLID identifies the unicast LLID previously assigned to the given ONU.~~

13.4.2.9 *~~eOAM_MC_ControlResponse~~eOAM_MC_ControlResponse_Dynamic* eOAMPDU

The *~~eOAM_MC_ControlResponse~~eOAM_MC_ControlResponse_Dynamic* eOAMPDU is used by the ONU to confirm the reception of the *~~eOAM_MC_Control~~eOAM_MC_Control_Dynamic* eOAMPDU, carrying all information necessary to forward data from the specific dynamic multicast group into associated UNI ports.

The structure of the *~~eOAM_MC_ControlResponse~~eOAM_MC_ControlResponse_Dynamic* eOAMPDU shall be as specified in Table 13-95 and as described in more detail below.

Table 13-95—Structure of the
~~eOAM_MC_ControlResponse~~*eOAM_MC_ControlResponse_Dynamic*
eOAMPDU

Size (octets)	Field (name)	Value + notes
21	eOAMPDU header	Varies
1	Opcode	0x0A
1	ResultCode	This field defines the result of the multicast configuration operation using the ~~eOAM_MC_Control~~*eOAM_MC_Control_Dynamic* eOAMPDU. The following values are supported: 0x00: Operation failed; no changes were made to configuration.~~Operation was successful; no errors.~~ 0x01: ~~Operation failed; no changes were made to configuration.~~ Operation was successful; no errors. Other values are reserved and ignored on reception.
Varies	Pad (optional)	0x00-…-00
4	FCS	Varies

a) eOAMPDU header, Opcode, Pad, and FCS fields are defined in 13.4.1.1.

b) ResultCode identifies the return code of the configuration operation requested by the ~~eOAM_MC_Control~~*eOAM_MC_Control_Dynamic* eOAMPDU.

13.4.2.10 *eOAM_Software* eOAMPDU

This subclause provides the definition of the generic *eOAM_Software* eOAMPDU, together with the specific eOAMPDU subtypes required to implement the software update mechanism specified for this profile. The software update mechanism for this profile is specified in 12.3.3.

13.4.2.10.1 *eOAM_Software* eOAMPDU structure

The *eOAM_Software* eOAMPDU is a specific type of the generic eOAMPDU, as defined in Table 13-8.

The generic structure of the *eOAM_Software* eOAMPDU shall be as presented in Table 13-96 and as described in more detail below.

Table 13-96—Structure of the *eOAM_Software* eOAMPDU

Size (octets)	Field (name)	Value + notes
21	eOAMPDU header	Varies
1	Opcode	0x09
1	FileTransferOpcode	Indicates the type of the *eOAM_Software* eOAMPDU, per Table 13-97.
Varies	FileTransferBody	Carries the actual data portion of the *eOAM_Software* eOAMPDU, depending on the value of the FileTransferOpcode field.
Varies	Pad (optional)	0x00-…-00
4	FCS	Varies

Table 13-97—Values of the `FileTransferOpcode` field

FileTransferOpcode value	Value
Reserved	0x00
eOAM_Software_WriteRequest	0x01
eOAM_Software_FileTransferData	0x02
eOAM_Software_FileTransferAck	0x03

a) eOAMPDU header, as defined in 13.4.1.1.

b) Opcode, as defined in 13.4.1.1. This field carries the value of 0x09 for *eOAM_Software* eOAMPDU.

c) FileTransferOpcode indicates the type of the *eOAM_Software* eOAMPDU. Three types of *eOAM_Software* eOAMPDUs are defined for this profile:

> 0x01: *eOAM_Software_WriteRequest* eOAMPDU is used by the OLT to initiate the ONU software image transfer process.

> 0x02: *eOAM_Software_FileTransferData* eOAMPDU is used by the OLT to transfer a fragment of the given ONU software image between the OLT and the ONU.

> 0x03: *eOAM_Software_FileTransferAck* eOAMPDU is used by the ONU to provide a return code to the OLT, indicating the current status of the ONU software image transfer process.

> Other values are reserved and ignored on reception.

d) FileTransferBody carries the actual information related to the given software upgrade process. There are several supported messages types, as specified by the FileTransferOpcode field.

> Individual *eOAM_Software* eOAMPDUs (*eOAM_Software_WriteRequest* eOAMPDU, *eOAM_Software_FileTransferData* eOAMPDU, and *eOAM_Software_FileTransferAck* eOAMPDU) are further defined in the following subclauses.

> The size of this field is variable and depends on the eOAMPDU subtype as indicated in the Type field.

e) Pad, as defined in 13.4.1.1. The length of this field is variable and depends on the size of the total size of the FileTransferOpcode and FileTransferBody fields.

f) FCS, as defined in 13.4.1.1.

13.4.2.10.2 *eOAM_Software_WriteRequest* eOAMPDU

The *eOAM_Software_WriteRequest* eOAMPDUs is used by the OLT to initiate a file transfer from the OLT to the selected ONU and deliver the name of the ONU software filename to be stored in the *aOnuFwFileName* (0xD7/0x01-0E) attribute. After this eOAMPDU is received, the ONU prepares for the reception of the software image.

The structure of the *eOAM_Software_WriteRequest* eOAMPDU shall be as specified in Table 13-98 and as described in more detail below.

Table 13-98—Structure of the *eOAM_Software_WriteRequest* eOAMPDU

Size (octets)	Field	Value + notes
21	eOAMPDU header	Varies
1	Opcode	0x09
1	FileTransferOpcode	0x01
Varies	FileName	null-terminated ASCII string
Varies	Pad (optional)	0x00-…-00
4	FCS	Varies

a) eOAMPDU header, Opcode, FileTransferOpcode, Pad, and FCS fields are defined in 13.4.2.10.1.

b) FileTransferOpcode identifies the *eOAM_Software_WriteRequest* eOAMPDU.

c) FileName represents the ONU software filename, to be stored at the ONU in the *aOnuFwFileName* (0xD7/0x01-0E) attribute.

13.4.2.10.3 *eOAM_Software_FileTransferData* eOAMPDU

The *eOAM_Software_FileTransferData* eOAMPDUs are used to carry individual fragments of the ONU software image file. Each eOAMPDU carries the block number (BlockNumber field) and data fragment size indicator (BlockWidth field), specifying the number of file data octets to follow.

The structure of the *eOAM_Software_FileTransferData* eOAMPDU shall be as specified in Table 13-99 and as described in more detail below.

Table 13-99—Structure of the *eOAM_Software_FileTransferData* eOAMPDU

Size (octets)	Field (name)	Value + notes
21	eOAMPDU header	Varies
1	Opcode	0x09
1	FileTransferOpcode	0x02
2	BlockNumber	This field reflects the sequential number of the current ONU software image fragment carried in this eOAMPDU.
2	BlockWidth	This field reflects the size of the BlockData field. Its value is expressed in units of octets. When the value of this field is equal to 0x00-00, this eOAMPDU is used to keep the ONU software image transfer process alive.
Varies	BlockData	This field carries the actual fragment of the ONU software image.
Varies	Pad (optional)	0x00-…-00
4	FCS	Varies

a) eOAMPDU header, Opcode, FileTransferOpcode, Pad, and FCS fields are defined in 13.4.2.10.1.

b) FileTransferOpcode identifies the *eOAM_Software_FileTransferData* eOAMPDU.

c) BlockNumber contains the sequential number of the current ONU software image fragment carried in the *eOAM_Software_FileTransferData* eOAMPDU.

d) `BlockWidth` represents the size of `BlockData`. Its value is expressed in units of octets. When the *eOAM_Software_FileTransferData* eOAMPDU is used to keep the ONU software image transfer process alive (keep-alive message), the value of this field is equal to 0x00-00.

e) `BlockData` carries the actual fragment of the ONU software image.

13.4.2.10.4 *eOAM_Software_FileTransferAck* eOAMPDU

The *eOAM_Software_FileTransferAck* eOAMPDU is used by the ONU to indicate the current status of the ONU software image transfer process. Each eOAMPDU of this type carries the block number (`BlockNumber` field) and the response code (`ResponseCode` field). The block number indicates the number of the next ONU software image data block expected by the ONU.

The *eOAM_Software_FileTransferAck* eOAMPDU is also used by the OLT to indicate the end of the ONU software image file. In this case, the *eOAM_Software_FileTransferAck* eOAMPDU carries the `BlockNumber` value of 0x00-00, together with the `ResponseCode` value indicating the end of the transfer process.

The structure of the *eOAM_Software_FileTransferAck* eOAMPDU shall be as specified in Table 13-100 and as described in more detail below.

Table 13-100—Structure of the *eOAM_Software_FileTransferAck* eOAMPDU

Size (octets)	Field (name)	Value + notes
21	eOAMPDU header	Varies
1	Opcode	0x09
1	FileTransferOpcode	0x03
2	BlockNumber	This field reflects the sequential number of the current ONU software image fragment carried in this eOAMPDU.
1	ResponseCode	This field carries the response code generated by the sender entity (either ONU or OLT).
Varies	Pad (optional)	0x00-…-00
4	FCS	Varies

a) eOAMPDU header, `Opcode`, `FileTransferOpcode`, `Pad`, and `FCS` fields are defined in 13.4.2.10.1.

b) `FileTransferOpcode` identifies the *eOAM_Software_FileTransferData* eOAMPDU.

c) `BlockNumber` contains the number of the software image block, as described in 13.4.2.10.3.

d) `ResponseCode` carries the response code, as defined in Table 13-101. Only the values specified in Table 13-101 are allowed. Other values are reserved and cause the *eOAM_Software_FileTransferAck* eOAMPDU to be ignored.

Table 13-101—Response Code values carried in `ResponseCode` field

Response Code	Value	Meaning
OK	0x00	No errors.
Undefined	0x01	Unknown error, or one not covered elsewhere.
Not Found	0x02	Read requested file that is not available.
No Access	0x03	Access permissions do not allow the requested read/write.
Full	0x04	Storage is full, and cannot hold the written file.
Illegal Operation	0x05	Cannot perform requested operation in current state.
Unknown ID	0x06	Requested file ID is not supported by this device.

Response Code	Value	Meaning
Bad Block	0x07	Block received in error.
Timeout	0x08	No block received before timer expiration.
Busy	0x09	Cannot perform requested action due to other activity.
Incompatible File	0x0A	Received file is incompatible with this device. File incompatibility is determined by the device vendor.
Corrupted File	0x0B	File was received corrupted and is unusable by this device. File integrity is determined by the device vendor.

13.4.2.11 *eOAM_KeyExchange* eOAMPDU

The *eOAM_KeyExchange* eOAMPDU is used to implement the key exchange protocol between the OLT and the ONU.

13.4.2.11.1 *eOAM_KeyExchange* eOAMPDU structure

The *eOAM_KeyExchange* eOAMPDU is a specific type of the generic eOAMPDU, as defined in Table 13-8.

The structure of the *eOAM_KeyExchange* eOAMPDU shall be as presented in Table 13-102 and as described in more detail below.

Table 13-102—Structure of the *eOAM_KeyExchange* eOAMPDU

Size (octets)	Field (name)	Value + notes
21	eOAMPDU header	Varies
1	Opcode	0x08
1	KeyExchangeOpcode	Indicates the type of the *eOAM_KeyExchange* eOAMPDU.
Varies	KeyExchangeBody	Carries the actual data portion of the *eOAM_KeyExchange* eOAMPDU, depending on the value of the Key Exchange Opcode field.
Varies	Pad (optional)	0x00-...-00
4	FCS	Varies

a) eOAMPDU header, as defined in 13.4.1.1.

b) Opcode, as defined in 13.4.1.1. This field carries the value of 0x08 for *eOAM_KeyExchange* eOAMPDU.

c) KeyExchangeOpcode indicates the type of the *eOAM_KeyExchange* eOAMPDU. Two types of *eOAM_KeyExchange* eOAMPDUs are defined for this profile:

0x00: *eOAM_KeyExchange_Assign* eOAMPDU is used to assign the encryption key.

0x01: *eOAM_KeyExchange_ACK* eOAMPDU is used to acknowledge the assignment of the encryption key.

Other values are reserved and ignored on reception.

d) KeyExchangeBody carries the actual information related key exchange process. There are several supported messages types, as specified by the Key Exchange Opcode field.

Individual *eOAM_KeyExchange* eOAMPDUs (*eOAM_KeyExchange_Assign* and *eOAM_KeyExchange_ACK* eOAMPDU) are further defined in the following subclauses.

The size of this field is variable and depends on the eOAMPDU subtype as indicated in the `Type` field.

e) `Pad`, as defined in 13.4.1.1. The length of this field is variable and depends on the size of the total size of the `KeyExchangeOpcode` and `KeyExchangeBody` fields.

f) `FCS`, as defined in 13.4.1.1.

13.4.2.11.2 *eOAM_KeyExchange_Assign* eOAMPDU

The *eOAM_KeyExchange_Assign* eOAMPDU is used to assign the new encryption key to the link peer.

The structure of the *eOAM_KeyExchange_Assign* eOAMPDU shall be as specified in Table 13-103 and as described in more detail below.

Table 13-103—Structure of the *eOAM_KeyExchange_Assign* eOAMPDU

Size (octets)	Field (name)	Value + notes
21	eOAMPDU header	Varies
1	Opcode	0x08
1	KeyExchangeOpcode	0x00
2	LLID	This field carries the value of LLID (as in LLID carried in the frame preamble) for L-ONU to which this eOAMPDU applies. The supported range of values is 0x00-00 to 0x7F-FF. Other values are reserved and ignored on reception.
1	KeyNumber	This field indicates the key exchange phase. The supported range of value is 0x00 to 0x01. Other values are reserved and ignored on reception
1	KeyLength	This field indicates the length of the encryption key. The value is expressed in units of octets.
Varies	Key	This field carries the actual encryption key of the length indicates by the `Key Length` field.
Varies	Pad (optional)	0x00-…-00
4	FCS	Varies

a) eOAMPDU header, `Opcode`, `Pad`, and `FCS` fields are defined in 13.4.1.1.

b) `KeyExchangeOpcode` identifies the *eOAM_KeyExchange_Assign* eOAMPDU.

c) `LLID` indicates the value of L-ONU LLID to which this *eOAM_KeyExchange_Assign* eOAMPDU refers.

d) `KeyNumber` indicates the key exchange phase, indicating to the receiving link peer whether the current or previous key is to be used.

e) `KeyLength` provides information on the length of the actual encryption key, expressed in units of octets.

f) `Key` carries the actual encryption key.

13.4.2.11.3 *eOAM_KeyExchange_ACK* eOAMPDU

The *eOAM_KeyExchange_ACK* eOAMPDU is used by the link peer to confirm the assignment of the new encryption key.

The structure of the *eOAM_KeyExchange_ACK* eOAMPDU shall be as specified in Table 13-104 and as described in more detail below.

Table 13-104—Structure of the *eOAM_KeyExchange_ACK* eOAMPDU

Size (octets)	Field (name)	Value + notes
21	eOAMPDU header	Varies
1	Opcode	0x08
1	KeyExchangeOpcode	0x01
2	LLID	This field carries the value of LLID (as in LLID carried in the frame preamble) for L-ONU to which this eOAMPDU applies. The supported range of values is 0x00-00 to 0x7F-FF. Other values are reserved and ignored on reception.
1	KeyNumber	This field indicates the key exchange phase. The supported range of value is 0x00 to 0x01. Other values are reserved and ignored on reception.
Varies	Pad (optional)	0x00-…-00
4	FCS	Varies

a) eOAMPDU header, `Opcode`, `Pad`, and `FCS` fields are defined in 13.4.1.1.

b) `KeyExchangeOpcode` identifies the *eOAM_KeyExchange_ACK* eOAMPDU.

c) `LLID` indicates the value of L-ONU LLID to which this *eOAM_KeyExchange_ACK* eOAMPDU refers.

d) `KeyNumber` indicates the key exchange phase, indicating to the receiving link peer whether the current or previous key is to be used.

13.4.2.12 *eOAM_Early_WakeUpOLT* eOAMPDU

The OLT with enabled support for early wake-up function sends the *eOAM_Early_WakeUpOLT* eOAMPDU to request the ONU to leave the sleep state and enter the active state.

The structure of the *eOAM_Early_WakeUpOLT* eOAMPDU shall be as specified in Table 13-105 and as described in more detail below.

Table 13-105—Structure of the *eOAM_Early_WakeUpOLT* eOAMPDU

Size (octets)	Field (name)	Value
21	eOAMPDU header	Varies
1	Opcode	0xFC
38	Pad	0x00-…-00
4	FCS	Varies

eOAMPDU header, `Opcode`, `Pad`, and `FCS` fields are defined in 13.4.1.1.

13.4.2.13 *eOAM_Early_WakeUpONU* eOAMPDU

The ONU sends the *eOAM_Early_WakeUpONU* eOAMPDU to indicate to the OLT that it left the sleep state and entered the active state. This information allows the OLT to enable the downstream queues and resume downstream transmission to this particular ONU.

The structure of the *eOAM_Early_WakeUpONU* eOAMPDU shall be as specified in Table 13-106 and as described in more detail below.

Table 13-106—Structure of the *eOAM_Early_WakeUpONU* eOAMPDU

Size (octets)	Field (name)	Value
21	eOAMPDU header	Varies
1	Opcode	0xFD
38	Pad	0x00-…-00
4	FCS	Varies

eOAMPDU header, `Opcode`, `Pad`, and `FCS` fields are defined in 13.4.1.1.

13.4.2.14 *eOAM_Sleep_Allowed* eOAMPDU

The *eOAM_Sleep_Allowed* eOAMPDU is used by the OLT to request the ONU to enter the specified sleep mode (indicated by the `SleepMode` field) for a specific duration of time (indicated by the `SleepDuration` field).

The structure of the *eOAM_Sleep_Allowed* eOAMPDU shall be as specified in Table 13-107.

Table 13-107—Structure of the *eOAM_Sleep_Allowed* eOAMPDU

Size (octets)	Field (name)	Value
21	eOAMPDU header	Varies
1	Opcode	0xFE
1	SleepMode	Sleep mode requested by the OLT
4	SleepDuration	The duration of the sleep state, expressed in units of time quanta
Varies	Pad	0x00-…-00
4	FCS	Varies

eOAMPDU header, `Opcode`, `Pad`, and `FCS` fields are defined in 13.4.1.1.

13.4.2.15 *eOAM_MC_Control_Static* eOAMPDU

The *eOAM_Sleep_Allowed* eOAMPDU is used by the OLT to configure the ONU with all information necessary to forward data from the specific static_multicast group into associated UNI ports.

The structure of the *eOAM_MC_Control_Static* eOAMPDU shall be as specified in Table 13-107 and as described in more detail below.

Table 13-107—Structure of the *eOAM_MC_Control_Static* eOAMPDU

Size (octets)	Field (name)	Value
21	eOAMPDU header	Varies
1	Opcode	0x0B
1	Action	This field defines the action to be executed on the ONU in relation with the multicast forwarding rules. The following values are supported: 0x00: Add the specific UNI port to the group forwarding list. 0x01: Remove the specific UNI port from the group forwarding list. 0x02: Remove all UNI ports and deregister the mLLID. Other values are reserved and ignored on reception.

Formatted Table

Size (octets)	Field (name)	Value
2	LLID	This field identifies the value of the multicast LLID used to transfer data for the given multicast group. The following values are supported: 0x00-00 to 0x7F-FF. Other values are reserved and ignored on reception. If the OLT sends the *eOAM_MC_Control_Static* eOAMPDU with a reserved value of the LLID, the ONU shall respond with the *eOAM_MC_ControlResponse_Static* eOAMPDU with the return code of 0x00 (failure).
16	IpSa	This field identifies the IP source address for the given multicast group. IPv4 addresses are aligned in the four least significant octets, and the 12 most significant octets are set to 0x00.
16	IpDa	This field identifies the IP destination address for the given multicast group. IPv4 addresses are aligned in the four least significant octets, and the 12 most significant octets are set to 0x00.
1	Port 1	This field is used to list the UNI port instance to be added or removed from the given multicast.
Varies	Pad (optional)	0x00-…-00
4	FCS	Varies

 Formatted Table

eOAMPDU header, `Opcode`, `Pad`, and `FCS` fields are defined in 13.4.1.1.

13.4.2.16 *eOAM_MC_ControlResponse_Static* eOAMPDU

The *eOAM_MC_ControlResponse_Static* eOAMPDU is used by the ONU to confirm the reception of the *eOAM_MC_Control_Static* eOAMPDU, carrying all information necessary to forward data from the specific static multicast group into associated UNI ports.

The structure of the *eOAM_MC_ControlResponse_Static* eOAMPDU shall be as specified in Table 13-23 and as described in more detail below.

Table 13-2395—Structure of the *eOAM_MC_ControlResponse_Static* eOAMPDU

Size (octets)	Field (name)	Value + notes
21	eOAMPDU header	Varies
1	Opcode	0x0C
1	ResultCode	This field defines the result of the multicast configuration operation using the *eOAM_MC_Control_Static* eOAMPDU. The following values are supported: 0x00: Operation failed; no changes were made to configuration. 0x01: Operation was successful; no errors. Other values are reserved and ignored on reception.
Varies	Pad (optional)	0x00-…-00
4	FCS	Varies

a) eOAMPDU header, `Opcode`, `Pad`, and `FCS` fields are defined in 13.4.1.1.

b) `ResultCode` identifies the return code of the configuration operation requested by the *eOAM_MC_Control_Static* eOAMPDU.