[Note: Replace 80.2.9 as follows and renumber the section numbers appropriately.]

80.3 Service Interface specification method and notation

The service interface specification for 40GBASE-R and 100GBASE-R physical layers is as per the definition in 1.2.2. Note that the 40GBASE-R and 100GBASE-R inter-sublayer service interfaces use multiple scalar REQUEST and INDICATION primitives, to indicate the transfer of multiple independent streams of data units, as explained below.

The inter-sublayer service interface is described in an abstract manner and do not imply any particular implementation. The inter-sublayer service interface primitives are defined as follows:

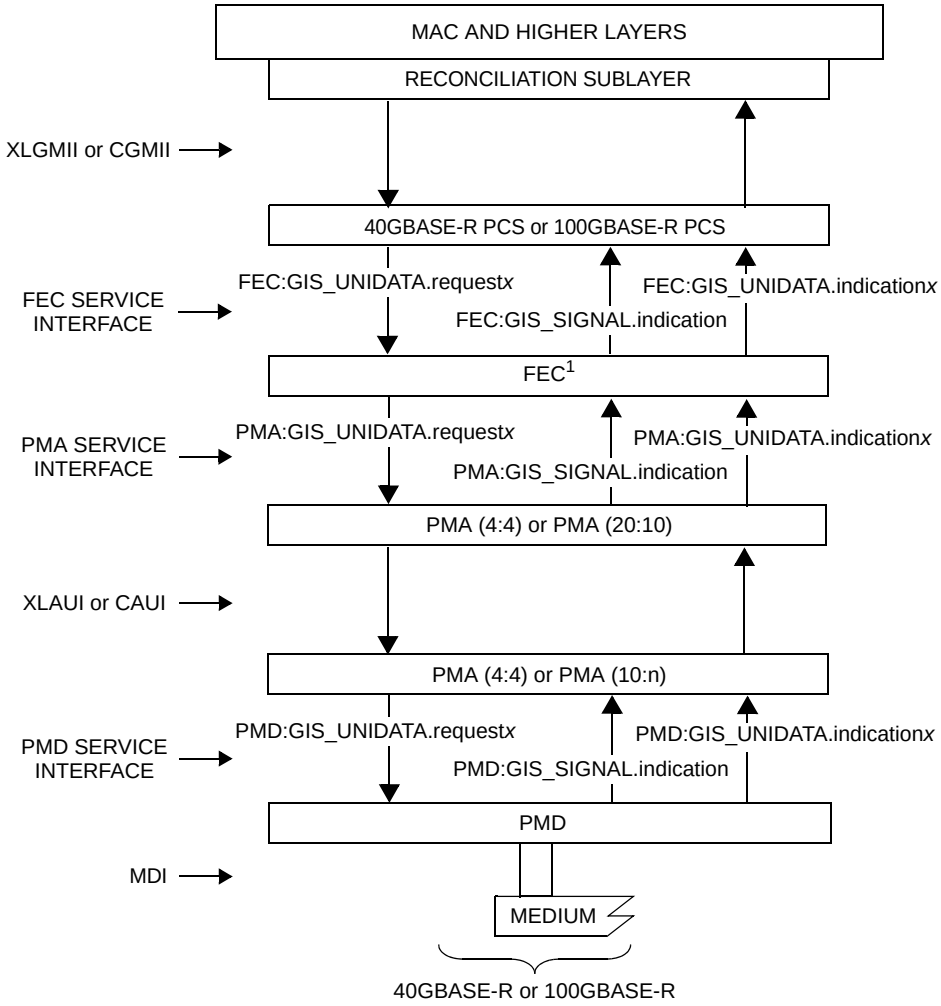
GIS_UNITDATA.request*x*
GIS_UNITDATA.indication*x*
GIS_SIGNAL.indication

The GIS_UNITDATA.request*x* (where *x* = 0 to n-1, and n is the number of streams of data units) primitive is used to define the transfer of multiple streams of data units from a sublayer N to the next lower sublayer N-1. The GIS_UNITDATA.indication*x* (where *x* = 0 to n-1, and n is the number of streams of data units) primitive is used to define the transfer of multiple streams of data units from a sublayer N-1 to the next higher sublayer N. The GIS_SIGNAL.indication primitive is used to define the transfer of signal status from a sublayer N-1 to the next higher sublayer N.

The inter-sublayer interface can be instantiated between different sublayers, hence a prefix notation is defined to indentify a specific instance of an inter-sublayer service interface. The following prefixes are defined.

a) PMD:, for primitives issued on the interface between the PMD sublayer and the PMA sublayer called as the PMD service interface.
b) PMA:, for primitives issued on the interface betweeen the PMA sublayer and the PCS (or the FEC) sublayer called as the PMA service interface.
c) FEC:, for primitives issued on the interface between the FEC sublayer and the PCS (or the PMA) sublayer called as the FEC service interface.

An example of inter-sublayer interfaces for 40GBASE-R and 100GBASE-R with their corresponding instance names are illustrated in Figure 80–2. For example, the primitives for one instance of the inter-sublayer service interface, named the PMD service interface, are identified as PMD:GIS_UNIDATA.request*x*, PMD:GIS_UNIDATA.request*x*, and PMD:GIS_SIGNAL.indication. Primitives for other instances, of inter-sublayer interfaces, are represented in a similar manner as described above.



CAUI = 100 Gb/s ATTACHMENT UNIT INTERFACE
CGMII = 100 Gb/s MEDIA INDEPENDENT INTERFACE
FEC = FORWARD ERROR CORRECTION
MAC = MEDIA ACCESS CONTROL
MDI = MEDIUM DEPENDENT INTERFACE
PCS = PHYSICAL CODING SUBLAYER
PMA = PHYSICAL MEDIUM ATTACHMENT
PMD = PHYSICAL MEDIUM DEPENDENT
XLAUI = 40 Gb/s ATTACHMENT UNIT INTERFACE
XLGMII = 40 Gb/s MEDIA INDEPENDENT INTERFACE
n = NUMBER OF PARALLEL STREAMS OF DATA UNITS

NOTE1—CONDITIONAL BASED ON PMD TYPE

Figure 80–2—40GBASE-R and 100GBASE-R Inter-sublayer Service Interfaces

80.3.1 Semantics of Inter-sublayer service interfaces primitives

The semantics of the inter-sublayer service interface primitives for the 40GBASE-R and 100GBASE-R sublayers is described below.

80.3.1.1 GIS_UNITDATA.request

The GIS_UNITDATA.request*x* (where x = 0 to n-1) primitive is used to define the transfer of multiple streams of data units from a sublayer N to the next lower sublayer N-1. Where n is the total number of parallel streams of data units.

80.3.1.1.1 Semantics of the service primitive

GIS_UNITDATA.request0(tx_bit)
GIS_UNITDATA.request1(tx_bit)
...
GIS_UNITDATA.requestn-1(tx_bit)

The data conveyed by GIS_UNITDATA.request0 to GIS_UNITDATA.requestn-1 consists of n parallel continuous streams of encoded bits, one stream for each lane. Each of the tx_bit parameters can take one of two values: ONE or ZERO.

80.3.1.1.2 When generated

The sublayer N continuously sends n parallel bit streams GIS_UNITDATA.request*x*(tx_bit) to the next lower sublayer N-1, each at a nominal signaling rate defined by a specific instance of the inter-sublayer service interface.

80.3.1.1.3 Effect of receipt

The effect of receipt of this primitive, is defined by the respective sublayer that receives this primitive.

80.3.1.2 GIS_UNITDATA.indication

The GIS_UNITDATA.indication*x* (where *x* = 0 to n-1) primitive is used to define the transfer of multiple streams of data units from the sublayer N-1 to the next higher sublayer N. Where n is the total number of parallel streams of data units.

80.3.1.2.1 Semantics of the service primitive

GIS_UNITDATA.indication0(rx_bit)
GIS_UNITDATA.indication1(rx_bit)
...
GIS_UNITDATA.indication*n-1*(rx_bit)

The data conveyed by GIS_UNITDATA.indication0 to GIS_UNITDATA.indicationn-1 consists of n parallel continuous streams of encoded bits, one stream for each lane. Each of the rx_bit parameters can take one of two values: ONE or ZERO.

80.3.1.2.2 When generated

The sublayer N-1 continuously sends streams of bits to the next higher sublayer N, corresponding to the signals received by the sublayer that generates this primitive, each at a nominal signaling rate defined by a specific instance of the inter-sublayer service interface.

80.3.1.2.3 Effect of receipt

The effect of receipt of this primitive, is defined by the respective sublayer that receives this primitive.

80.3.1.3 GIS_SIGNAL.indication

The GIS_SIGNAL.indication primitive is generated by the sublayer N-1 to the next higher sublayer N to indicate the status of the receive process. This primitive is generated by the receive process to propagate the detection of severe error conditions (e.g. no valid signal being received by the sublayer that generates this primitive) to the inter-sublayer server entity.

80.3.1.3.1 Semantics of the service primitive

GIS_SIGNAL.indication(SIGNAL_OK)

The SIGNAL_OK parameter can take on one of two values: OK or FAIL. A value of FAIL denotes that invalid data is being presented (rx_bit parameters undefined) by the sublayer N-1 to the next higher sublayer N. A value of OK does not guarantee valid data is being presented by the sublayer N-1 to the next higher sublayer N.

80.3.1.3.2 When generated

The sublayer N-1 generates the GIS_SIGNAL.indication primitive to the next higher sublayer N whenever there is change in the value of the SIGNAL_OK parameter.

80.3.1.3.3 Effect of receipt

The effect of receipt of this primitive, is defined by the respective sublayer that receives this primitive.

[Note: Replace 84.2 and its associated subclaues as follows.]

[Note: Also rename the PMD service interface primitives throught this clause (e.g. 84.7.2, 84.7.3, 84.7.4) as per the new definition given below]

84.2 Physical Medium Dependent (PMD) service interface

This subclause specifies the services provided by the 40GBASE-KR4 PMD. The service interface for this PMD is described in an abstract manner and does not imply any particular implementation. The PMD Service Interface supports the exchange of encoded data. The PMD translates the encoded data to and from signals suitable for the medium.

The PMD service interface is an instance of the inter-sublayer service interface defined in 80.3. The PMD service interface primitives are summarized as follows:

PMD:GIS_UNITDATA.request*x*
PMD:GIS_UNITDATA.indication*x*
PMD:GIS_SIGNAL.indication

The 40GBASE-KR4 PMD has four parallel bit streams, hence x = 0 to 3.

The PMA (or the PMD) continuously sends four parallel bit streams to the PMD (or the PMA), one per lane, each at a nominal signaling speed of 10.3125 GBd.

[Note: Replace 85.2 and its associated subclaues as follows.]

[Note: Also rename the PMD service interface primitives throught this clause as per the new definition given below]

85.2 Physical Medium Dependent (PMD) service interface

This subclause specifies the services provided by the 40GBASE-CR4 and 100GBASE-CR10 PMDs. The service interfaces for these PMDs are described in an abstract manner and do not imply any particular implementation. The PMD Service Interface supports the exchange of encoded data between the PMA and PMD entities. The PMD translates the encoded data to and from signals suitable for the specified medium.

The PMD service interface is an instance of the inter-sublayer service interface defined in 80.3. The PMD service interface primitives are summarized as follows:

PMD:GIS_UNITDATA.request*x*
PMD:GIS_UNITDATA.indication*x*
PMD:GIS_SIGNAL.indication

The 40GBASE-CR4 PMD has four parallel bit streams, hence x = 0 to 3 for 40GBASE-CR4, and the 100GBASE-CR10 PMD has ten parallel bit streams, hence x = 0 to 9 for 100GBASE-CR10.

The PMA (or the PMD) continuously sends four or ten parallel bit streams to the PMD (or the PMA), one per lane, each at a nominal signaling speed of 10.3125 GBd.

[Note: Replace 86.1.1 and its associated subclaues in as follows and renumber the subsequent sections appropriately.]

[Note: Also rename the PMD service interface primitives throught this clause as per the new definition given below]

86.2 Physical Medium Dependent (PMD) service interface

This subclause specifies the services provided by the 40GBASE-SR4 and 100GBASE-SR10 PMDs. The service interfaces for these PMDs are described in an abstract manner and do not imply any particular implementation, although an optional implementation of the PMD service interface, the Parallel Physical Interface (PPI), is specified in 86.6.1 and 86.6.5. The PMD service interface supports the exchange of encoded data between the PMA and PMD entities. The PMD translates the encoded data to and from signals suitable for the specified medium.

The PMD service interface is an instance of the inter-sublayer service interface defined in 80.3. The PMD service interface primitives are summarized as follows:

PMD:GIS_UNITDATA.request*x*
PMD:GIS_UNITDATA.indication*x*
PMD:GIS_SIGNAL.indication

The 40GBASE-SR4 PMD has four parallel bit streams, hence x = 0 to 3 for 40GBASE-SR4 and the 100GBASE-SR10 PMD has ten parallel bit streams, hence x = 0 to 9 for 100GBASE-SR10.

The PMA (or the PMD) continuously sends four or ten parallel bit streams to the PMD (or the PMA), one per lane, each at a nominal signaling speed of 10.3125 GBd.

[Note: Replace 87.2 and its associated subclaues as follows.]

[Note: Also rename the PMD service interface primitives throught this clause as per the new definition given below]

87.2 Physical Medium Dependent (PMD) service interface

This subclause specifies the services provided by the 40GBASE-LR4 PMD. The service interface for this PMD is described in an abstract manner and does not imply any particular implementation. The PMD Service Interface supports the exchange of encoded data between the PMA and PMD entities. The PMD translates the encoded data to and from signals suitable for the specified medium.

The PMD service interface is an instance of the inter-sublayer service interface defined in 80.3. The PMD service interface primitives are summarized as follows:

PMD:GIS_UNITDATA.request*x*
PMD:GIS_UNITDATA.indication*x*
PMD:GIS_SIGNAL.indication

The 40GBASE-LR4 PMD has four parallel bit streams, hence x = 0 to 3.

The PMA (or the PMD) continuously sends four parallel bit streams to the PMD (or the PMA), one per lane, each at a nominal signaling speed of 10.3125 GBd.

[Note: Replace 88.2 and its associated subclaues as follows.]

[Note: Also rename the PMD service interface primitives throught this clause as per the new definition given below]

88.2 Physical Medium Dependent (PMD) service interface

This subclause specifies the services provided by the 100GBASE-LR4 and 100GBASE-ER4 PMDs. The service interfaces for these PMDs are described in an abstract manner and do not imply any particular implementation. The PMD Service Interface supports the exchange of encoded data between the PMA and PMD entities. The PMD translates the encoded data to and from signals suitable for the specified medium.

The PMD service interface is an instance of the inter-sublayer service interface defined in 80.3. The PMD service interface primitives are summarized as follows:

PMD:GIS_UNITDATA.request*x*
PMD:GIS_UNITDATA.indication*x*
PMD:GIS_SIGNAL.indication

The 100GBASE-LR4 and 100GBASE-ER4 PMDs have four parallel bit streams, hence x = 0 to 3.

The PMA (or the PMD) continuously sends four parallel bit streams to the PMD (or the PMA), one per lane, each at a nominal signaling speed of 25.78125 GBd.

[Note: Replace 74.2 and its associated subclaues as follows.]

[Note: Also rename the 40GBASE-R and 100GBASE-R FEC service interface primitives throught this clause as per the new definition given below]

74.5.2 40GBASE-R and 100GBASE-R service primitives

The FEC service interface for 40GBASE-R and 100GBASE-R is an instance of the inter-sublayer service interface defined in 80.3. The FEC service interface primitives are summarized as follows:

FEC:GIS_UNITDATA.request*x*
FEC:GIS_UNITDATA.indication*x*
FEC:GIS_SIGNAL.indication

The 40GBASE-R FEC has four parallel bit streams, hence x = 0 to 3 for 40GBASE-R and the 100GBASE-R FEC has twenty parallel bit streams, hence x = 0 to 19 for 100GBASE-R.

The PCS (or the PMA) continuously sends four or twenty parallel bit streams to the FEC, one per lane, each at a nominal signaling speed of 10.3125 GBd for 40GBASE-R and 5.15625 GBd for 100GBASE-R.

[Note: Change the first sentecne of second paragraph in 74.7.4.1.2 in D2.0 as follows. Changes are highlighted in blue color.]

74.7.4.1.2 Reverse gearbox function for 40GBASE-R and 100GBASE-R

The reverse gearbox function receives data via the 40GBASE-R and 100GBASE-R FEC:GIS_UNITDATA.request*x* primitive (see 74.5.2).

[Note: Change the first two sentences of last paragraph in 74.7.4.5 in D2.0 as follows. Changes are highlighted in blue color.]

74.7.4.5 FEC decoder

The FEC Synchronization process continuously monitors PMA_SIGNAL.indication(SIGNAL_OK) or PMA:GIS_SIGNAL.indication(SIGNAL_OK). When SIGNAL_OK indicates OK, the FEC Synchroniza-

tion process accepts data units via the PMA_UNITDATA.indication or the PMA:GIS_UNITDATA.indication primitives.

[Note: In Clause 74, map transmit and receive bit steams of the FEC service interface primitives to the appropriate signals in the FEC transmit, receive, and FEC signal ok processes.]

[Note: Replace 83.3 as follows. Also change the prefix to the PMA service interface primitives from "PMA_" to "PMA:GIS_" in Clause 83 (text and figures) to indicate that this is an instance of the inter-sublayer service interface. Also move any PMA specific description in subclauses 83.3.x.x to a separate paragraph in 83.3 (since the primitive description follows the definition in 80.3]

83.3 PMA primitives

The PMA service interface for 40GBASE-R and 100GBASE-R utilizes the inter-sublayer service interface defined in 80.3. The PMA service interface primitives are summarized as follows:

PMA:GIS_UNITDATA.request*x*
PMA:GIS_UNITDATA.indication*x*
PMA:GIS_SIGNAL.indication

For a PMA with *p* lanes at the PMA service interface, the primitives are defined for *x*=0 to *p*-1.

The PMA (or PMA client) continuously sends four (for 40GBASE-R) or twenty (for 100GBASE-R) parallel bit streams to the PMA client (or PMA), each at the nominal signaling speed of PCSL. For example the PMA client could be PCS or FEC sublayers.

[Note: Replace 83.4 as follows. Also change the prefix to the PMA Server service interface primitives from "PMAServer_" to "PMAServer:GIS_" in Clause 83 (text and figures) to indicate that this is an instance of the inter-sublayer service interface. Also move any PMA specific description in subclauses 83.4.x.x to a separate paragraph in 83.4 (since the primitive description follows the definition in 80.3]

83.4 PMA server service interface

Since the architecture supports multiple PMA sublayers for various PMD lane counts and device partitioning, there are several different sublayers that may appear below a PMA, including FEC, the PMD, or another PMA. The sublayer below a given PMA is referred to generically as the *PMAserver* sublayer, where *PMA-*

server can represent whichever sublayer appears below the PMA (for example another PMA, FEC, or PMD).

The *PMAserver* layer below the PMA utilizes the inter-sublayer service interface defined in 80.3 The PMA server service interface primitives to the PMA are summarized as follows:

PMAserver:GIS_UNITDATA.request*x*(tx_bit), *x*=0 through *q*-1

PMAserver:GIS_UNITDATA.indication*x*(rx_bit), *x*=0 through *q*-1

PMAserver:GIS_SIGNAL.indication(SIGNAL_OK)

The number of lanes *q* for the *PMAserver* service interface matches the number of lanes expected by the PMA. The *PMAserver*:GIS_UNITDATA primitives are defined for each lane *x*=0 to *q*-1 of the *PMAserver* service interface. Note that electrical and timing specifications of the *PMAserver* service interface are defined if the interface is physically instantiated (e.g., XLAUI/CAUI or the PMD service interface for 40GBASE-SR4 and 100GBASE-SR10 PMDs). For other *PMAserver* sublayers, the *PMAserver* service interface is specified only abstractly. The interface between the PMA and the *PMAserver* sublayer consists of *q* lanes for data transfer and a status indicating a good signal sent by the *PMAserver* sublayer (see Figure 83–5).

[Note: Insert the following sentence (highlighted in blue) to 82.1.4 and 82.1.5 in D2.0 as follows. Also change the prefix to the PMA service interface primitives from "PMA_" to "PMA:GIS_" in Clause 82 (text and figures) to indicate that this is an instance of the inter-sublayer service interface.]

82.1.4 Inter-sublayer interfaces

There is one distinct interface employed for each rate of PCS. The PMA service interface uses an abstract service model to define the operation of the interface. The PMA service interface is defined in 83.2 and is an instance of the inter-sublayer service interface definition in 80.3. The PCS service interface is the MII that is defined in Clause 81. The MII is a logical interface.

The upper interface of the PCS may connect to the Reconciliation Sublayer through the MII. The lower interface of the PCS connects to the PMA sublayer to support a PMD. If the optional FEC sublayer is implemented (see Clause 74), then the lower interface connects to the FEC sublayer. The 40GBASE-R PCS has a nominal rate at the PMA service interface of 10.3125 Gtransfers/s per lane, which provides capacity for the MAC data rate of 40 Gb/s. The 100GBASE-R PCS has a nominal rate at the PMA service interface of 5.15625 Gtransfers/s per lane, which provides capacity for the MAC data rate of 100 Gb/s.

It is important to note that, while this specification defines interfaces in terms of bits, octets, and frames, implementations may choose other data-path widths for implementation convenience.

82.1.5 Physical Medium Attachment (PMA) service interface

The PMA service interface for the PCS is described in an abstract manner and does not imply any particular implementation. The PMA Service Interface supports the exchange of encoded data between the PCS and PMA. ~~It is defined in 83.2~~. The PMA service interface is defined in 83.2 and is an instance of the inter-sublayer service interface definition in 80.3.