14. Timing and synchronization management

14.1 General

14.1.1 Data set hierarchy

This clause defines the set of managed objects, and their functionality, that allow administrative configuration of clock parameters and timing and synchronization protocols.

Management data models typically represent data for the physical device (i.e., time-aware system). The specifications for discovery, management address, and security for the physical device are typically covered by standards of the management mechanism, which are outside the scope of this standard. For the management information model of this standard, the scope of work is the data contained within a time-aware system. From a management perspective, the time-aware system contains a list of one or more PTP Instances. Each entry in the list is a set of managed data sets for the respective PTP Instance.

Conformance for each managed object is optional. This standard operates correctly using default values; therefore, management is not essential. Since the management mechanism is not limited to remote protocols (e.g., SNMP, NETCONF), management can use a local mechanism with a simple interface (e.g., DIP switches). Therefore, each product can determine the support of managed objects as appropriate for its management mechanism.

The following hierarchy summarizes the managed data sets within a gPTP Node:

a) instanceList[]
   1) defaultDS
   2) currentDS
   3) parentDS
   4) timePropertiesDS
   5) pathTraceDS
   6) acceptableMasterTableDS
   7) portList[]
      i) portDS
      ii) descriptionPortDS
      iii) portStatisticsDS
      iv) acceptableMasterPortDS
      v) externalPortConfigurationPortDS
      vi) asymmetryMeasurementModeDS
      vii) commonServicesPortDS
b) commonServices
   1) commonMeanLinkDelayService
      i) cmldsDefaultDS
      ii) cmldsLinkPortList[]
         — cmldsLinkPortDS
         — cmldsLinkPortStatisticsDS
         — cmldsAsymmetryMeasurementModeDS
   2) Future common services can follow.

The instanceList is indexed using a number that is unique per PTP Instance within the time-aware system, applicable to the management context only (i.e., not used in PTP messages). The domainNumber of the PTP

Instance must not be used as the index to instanceList since it is possible for a time-aware system to contain multiple PTP Instances using the same domainNumber. The portList is indexed using a number that is unique per logical port (i.e., PTP Port) in the PTP Instance (see 8.5.1). Since the portNumber of a logical port can have any value in the range 1, 2, 3, ..., 0xFFFE (see 8.5.2.3), the portList index and portNumber values for a logical port will not necessarily be the same. PTP Instances and logical ports may be created or deleted dynamically in implementations that support dynamic create/delete of devices. Unless otherwise indicated, the data sets and managed objects under the instanceList[] are maintained separately for each PTP Instance supported by the time-aware system.

Following the instanceList[] and all the data sets of each instanceList[] member is an overall structure for common services. That structure contains one sub-structure for each common service. At present there is only one common service, namely the Common Mean Link Delay Service (CMLDS), and the corresponding sub-structure is the commonMeanLinkDelayService structure. The item "future common services can follow" is a placeholder for any common services that might be defined in the future. The commonMeanLinkDelayService structure contains the data sets and lists that are needed by the Common Mean Link Delay Service.

The commonMeanLinkDelayService structure contains the cmldsLinkPortList, which is a list of CMLDS logical ports, i.e., Link Ports (see 11.2.17), of the time-aware system that will run the common service. The CMLDS must be implemented (i.e., a CMLDS executable must be present) on every physical port for which there is a PTP Port of a PTP Instance that can use the CMLDS (i.e., where portDS.delayMechanism of that PTP Instance can have the value COMMON_P2P). Therefore, the cmldsLinkPortList[] must include Link Ports that correspond to all such physical ports. As is the case for the portList of a PTP Instance, the cmldsLinkPortList is indexed using a number that is unique per Link Port that invokes the CMLDS (see 8.5.1). Since the portNumber of a logical port (i.e., PTP Port or CMLDS Link Port) can have any value in the range 1, 2, 3, ..., 0xFFFE (see 8.5.2.3), the cmldsLinkPortList index and cmldsLinkPortDS.portIdentity.portNumber values for a logical port of the Common Mean Link Delay Service will not necessarily be the same. CMLDS Link Ports may be created or deleted dynamically in implementations that support dynamic create/delete of devices.

The Common Mean Link Delay Service Data Sets are not maintained separately for each PTP Instance. Rather, a single copy of the commonServices.cmldsDefaultDS is maintained for the time-aware system, and a single copy of each data set under the cmldsLinkPortList[] is maintained per Link Port of the time-aware system.

A PTP Instance can use the commonServicesPortDS to determine which Link Port it must use when it obtains information provided by the Common Mean Link Delay Service (see 14.14).

NOTE—This hierarchy is intended to support a wide variety of time-aware system implementations. Examples include the following:

a) A time-aware system containing four PTP Relay Instances, each of which use the same physical ports, but different domainNumber values.
b) A time-aware system that represents a chassis with slots for switch/router cards, where each switch/router card is represented as a PTP Instance using distinct physical ports and all PTP Instances can use the same domainNumber.

14.1.2 Data set descriptions

This management resource comprises the following objects:

a) The Default Parameter Data Set (defaultDS in 14.1.1; see Table 14-1), which represents the native capabilities of a PTP Instance, i.e., a PTP Relay Instance or a PTP End Instance station.

b) The Current Parameter Data Set (currentDS in 14.1.1; see Table 14-2), which represents the topological position of a local PTP Instance and other information, relative to the Grandmaster PTP Instance.

c) The Parent Parameter Data Set (parentDS in 14.1.1; see Table 14-3), which represents capabilities of the upstream PTP Instance toward the Grandmaster PTP Instance, as measured at a local PTP Instance.

d) The Time Properties Parameter Data Set (timePropertiesDS in 14.1.1; see Table 14-4), which represents capabilities of the Grandmaster PTP Instance, as measured at a local PTP Instance.

e) The Path Trace Parameter Data Set (pathTraceDS in 14.1.1; see Table 14-5), which represents the current path trace information (see 10.3.9.23) available at the PTP Instance.

f) The Acceptable Master Table Parameter Data Set (acceptableMasterTableDS in 14.1.1; see Table 14-6), which represents the acceptable master table used when an EPON port is used by a PTP Instance of a time-aware system.

g) The Port Parameter Data Set (portDS in 14.1.1; see Table 14-10), which represents time-aware capabilities at a given PTP Relay Instance or PTP End Instance port.

h) The Description Port Parameter Data Set (descriptionPortDS in 14.1.1; see Table 14-11), which contains the profileIdentifier for this PTP profile as specified in F.2.

i) The Port Parameter Statistics Data Set (portStatisticsDS in 14.1.1; see Table 14-12), which represents statistics and counters associated with time-aware capabilities at a given PTP Relay Instance or PTP End Instance port.

j) The Acceptable Master Port Parameter Data Set (acceptableMasterPortDS in 14.1.1; see Table 14-13), which represents the capability to enable/disable the acceptable master table feature on a PTP Port.

k) The External Port Configuration Port Parameter Data Set (externalPortConfigurationPortDS in 14.1.1; see Table 14-14), which is used with the external port configuration option to indicate the desired state of a PTP Port.

l) The Asymmetry Measurement Mode Parameter Data Set (asymmetryMeasurementModeDS in 14.1.1; see Table 14-15), which represents the capability to enable/disable the Asymmetry Compensation Measurement Procedure on a PTP Port (see Annex G) and is used instead of the cmldsAsymmetryMeasurementModeDS when CMLDS is not used and there is a single gPTP domain.

m) The Common Services Port Parameter Data Set (commonServicesPortDS in 14.1.1; see Table 14-16), which enables a PTP Port of a PTP Instance to determine which Link Port of the respective common service corresponds to that PTP Port.

n) The Common Mean Link Delay Service Default Parameter Data Set (cmldsDefaultDS in 14.1.1; see Table 14-18), which describes the per-time-aware-system attributes of the Common Mean Link Delay Service.

o) The Common Mean Link Delay Service Link Port Parameter Data Set (cmldsLinkPortDS in 14.1.1; see Table 14-18), which represents time-aware Link Port capabilities for the Common Mean Link Delay Service of a time-aware system.

p) The Common Mean Link Delay Service Link Port Parameter Statistics Data Set (cmldsLinkPortStatisticsDS in 14.1.1; see Table 14-19), which represents statistics and counters associated with Link Port capabilities at a given time-aware system.

q) The Common Mean Link Delay Service Asymmetry Measurement Mode Parameter Data Set (cmldsAsymmetryMeasurementModeDS in 14.1.1; see Table 14-20), which represents the capability to enable/disable the Asymmetry Compensation Measurement Procedure on a Link Port (see Annex G).

NOTE—portDS, descriptionPortDS, portStatisticsDS, and acceptableMasterPortDS correspond to a logical PTP Port of a PTP Instance; a PTP Relay Instance or PTP End Instance physical port can contain one or more logical ports (see 8.5.1). For example, a PTP Relay Instance physical port can be connected to a full-duplex point-to-point link that contains one logical port. As another example, a PTP Relay Instance physical port can be connected to a CSN link that contains more than one logical port.

14.2 Default Parameter Data Set (defaultDS)

14.2.1 General

The defaultDS represents the native capabilities of a PTP Instance, i.e., a PTP Relay Instance or a PTP End Instance.

14.2.2 clockIdentity

The value is the clockIdentity (see 8.5.2.2) of the PTP Instance.

14.2.3 numberPorts

The value is the number of PTP Ports of the PTP Instance (see 8.6.2.8). For an end station the value is 1.

14.2.4 clockQuality

14.2.4.1 General

This is a structure whose data type is ClockQuality (see 6.4.3.8).

14.2.4.2 clockQuality.clockClass

The value is the clockClass of the PTP Instance, which implements the clockClass specifications of 8.6.2.2.

14.2.4.3 clockQuality.clockAccuracy

The value is the clockAccuracy of the PTP Instance, which implements the clockAccuracy specifications of 8.6.2.3.

14.2.4.4 clockQuality.offsetScaledLogVariance

The value is the offsetScaledLogVariance of the PTP Instance, which implements the offsetScaledLogVariance specifications of 8.6.2.4.

14.2.5 priority1

The value is the priority1 attribute of the PTP Instance (see 8.6.2.1).

14.2.6 priority2

The value is the priority2 attribute of the PTP Instance (see 8.6.2.5).

14.2.7 gmCapable

The value is TRUE if the PTP Instance is capable of being a Grandmaster PTP Instance and FALSE if the PTP Instance is not capable of being a Grandmaster PTP Instance.

14.2.8 currentUtcOffset

The value is the offset between TAI and UTC, relative to the ClockMaster entity of this PTP Instance. It is equal to the global variable sysCurrentUtcOffset (see 10.3.9.18). The value is in units of seconds.

The default value is selected as follows:

a) The value is the value obtained from a primary reference if the value is known at the time of initialization, else
b) The value is the current IERS defined value of TAI – UTC (see IERS Bulletin C) when the PTP Instance is designed.

14.2.9 currentUtcOffsetValid

The value is TRUE if the currentUtcOffset, relative to the ClockMaster entity of this PTP Instance, is known to be correct. It is equal to the global variable sysCurrentUtcOffsetValid (see 10.3.9.14).

The default value is TRUE if the value of currentUtcOffset is known to be correct; otherwise, it is set to FALSE.

14.2.10 leap59

A TRUE value indicates that the last minute of the current UTC day, relative to the ClockMaster entity of this PTP Instance, will contain 59 s. It is equal to the global variable sysLeap59 (see 10.3.9.13).

The value is selected as follows:

a) The value is obtained from a primary reference if known at the time of initialization, else
b) The value is set to FALSE.

14.2.11 leap61

A TRUE value indicates that the last minute of the current UTC day, relative to the ClockMaster entity of this PTP Instance, will contain 61 s. It is equal to the global variable sysLeap61 (see 10.3.9.12).

The value is selected as follows:

a) The value is obtained from a primary reference if known at the time of initialization, else
b) The value is set to FALSE.

14.2.12 timeTraceable

The value is set to TRUE if the timescale and the value of currentUtcOffset, relative to the ClockMaster entity of this PTP Instance, are traceable to a primary reference standard; otherwise the value is set to FALSE. It is equal to the global variable sysTimeTraceable (see 10.3.9.16).

The value is selected as follows:

a) If the time and the value of currentUtcOffset are traceable to a primary reference standard at the time of initialization, the value is set to TRUE, else
b) The value is set to FALSE.

14.2.13 frequencyTraceable

The value is set to TRUE if the frequency determining the timescale of the ClockMaster Entity of this PTP Instance is traceable to a primary standard; otherwise the value is set to FALSE. It is equal to the global variable sysFrequencyTraceable (see 10.3.9.17).

The value is selected as follows:

a) If the frequency is traceable to a primary reference standard at the time of initialization the value is set to TRUE, else
b) The value is set to FALSE.

14.2.14 ptpTimescale

The value is set to TRUE if the clock timescale of the ClockMaster Entity of this PTP Instance is PTP (see 8.2) and FALSE otherwise.

14.2.15 timeSource

The value is the source of time used by the Grandmaster Clock (see 8.6.2.7).

14.2.16 domainNumber

The value is the domain number of the gPTP domain for this instance of gPTP supported by the time-aware system (see 8.1).

NOTE—The PTP Instance for which domainNumber is 0 has constraints applied to it, e.g., timescale (see 8.2.1).

14.2.17 sdoId

The value is the sdoId of the gPTP domain for this instance of gPTP supported by the time-aware system (see 8.1).

NOTE—The attribute sdoId is specified as a 12-bit unsigned integer in 8.1. The data type for the managed object sdoId is UInteger16 in Table 14-1, for compatibility with IEEE Std 1588-2019. The range of the managed object is limited to 12 bits; in addition, only the single value 0x100 is specified in this standard for the gPTP domain of a PTP Instance.

14.2.18 externalPortConfigurationEnabled

The value is the externalPortConfigurationEnabled attribute of the PTP Instance (see 10.3.9.24).

14.2.19 instanceEnable

The value is the instanceEnable attribute of the PTP Instance (see 10.2.4.24).

14.2.20 defaultDS table

There is one defaultDS table per PTP Instance of a time-aware system, as detailed in Table 14-1.

Table 14-1—defaultDS table

Name	Data type	Operations supported[a]	References
clockIdentity	ClockIdentity	R	14.2.2
numberPorts	UInteger16	R	14.2.3
clockQualtiy.clockClass	UInteger8	R	14.2.4.2; 7.6.2.5 of IEEE Std 1588-2019
clockQuality.clockAccuracy	Enumeration8	R	14.2.4.3; 7.6.2.6 of IEEE Std 1588-2019
clockQuality.offsetScaledLogVariance	UInteger16	R	14.2.4.4
priority1	UInteger8	RW	14.2.5
priority2	UInteger8	RW	14.2.6
gmCapable	Boolean	R	14.2.7
currentUtcOffset	Integer16	R	14.2.8
currentUtcOffsetValid	Boolean	R	14.2.9
leap59	Boolean	R	14.2.10
leap61	Boolean	R	14.2.11
timeTraceable	Boolean	R	14.2.12
frequencyTraceable	Boolean	R	14.2.13
ptpTimescale	Boolean	R	14.2.14
timeSource	TimeSource	R	14.2.15 and Table 8-2
domainNumber	UInteger8	RW	14.2.16
sdoId	UInteger16	R	14.2.17
externalPortConfigurationEnabled	Boolean	RW	14.2.18
instanceEnable	Boolean	RW	14.2.19

[a] R = Read only access; RW = Read/write access.

14.3 Current Parameter Data Set (currentDS)

14.3.1 General

The currentDS represents the position of a local system and other information, relative to the Grandmaster PTP Instance.

14.3.2 stepsRemoved

The value is the number of gPTP communication paths traversed between this PTP Instance and the Grandmaster PTP Instance, as specified in 10.3.3.

14.3.3 offsetFromMaster

The value is an implementation-specific representation of the current value of the time difference between a slave and the Grandmaster Clock, as computed by the slave, and as specified in 10.2.10. The data type shall be TimeInterval. The default value is implementation specific.

14.3.4 lastGmPhaseChange

The value (see 10.2.4.16) is the phase change that occurred on the most recent change in either Grandmaster PTP Instance or gmTimeBaseIndicator (see 9.2.2.3).

14.3.5 lastGmFreqChange

The value (see 10.2.4.17) is the frequency change that occurred on the most recent change in either Grandmaster PTP Instance or gmTimeBaseIndicator (see 9.2.2.3).

14.3.6 gmTimebaseIndicator

The value is the value of timeBaseIndicator of the current Grandmaster PTP Instance (see 9.2.2.3 and 9.6.2.3).

14.3.7 gmChangeCount

This statistics counter tracks the number of times the Grandmaster PTP Instance has changed in a gPTP domain. This counter increments when the PortAnnounceInformation state machine enters the SUPERIOR_MASTER_PORT state or the INFERIOR_MASTER_OR_OTHER_PORT state (see 10.3.12 and Figure 10-14).

14.3.8 timeOfLastGmChangeEvent

This timestamp takes the value of sysUpTime (see IETF RFC 3418) when the most recent Grandmaster PTP Instance change occurred in a gPTP domain. This timestamp is updated when the PortAnnounceInformation state machine enters the SUPERIOR_MASTER_PORT state or the INFERIOR_MASTER_OR_OTHER_PORT state (see 10.3.12 and Figure 10-14).

14.3.9 timeOfLastGmPhaseChangeEvent

This timestamp takes the value of sysUpTime (see IETF RFC 3418) when the most recent change in Grandmaster Clock phase occurred due to a change of either the Grandmaster PTP Instance or the Grandmaster Clock time base. This timestamp is updated when one of the following occurs:

a) The PortAnnounceInformation state machine enters the SUPERIOR_MASTER_PORT state or the INFERIOR_MASTER_OR_OTHER_PORT state (see 10.3.12 and Figure 10-14), or
b) The gmTimebaseIndicator managed object (see 14.3.6) changes and the lastGmPhaseChange field of the most recently received Follow_Up information TLV is nonzero.

14.3.10 timeOfLastGmFreqChangeEvent

This timestamp takes the value of sysUpTime (see IETF RFC 3418) when the most recent change in Grandmaster Clock frequency occurred due to a change of either the Grandmaster PTP Instance or the Grandmaster Clock time base. This timestamp is updated when one of the following occurs:

a) The PortAnnounceInformation state machine enters the SUPERIOR_MASTER_PORT state or the INFERIOR_MASTER_OR_OTHER_PORT state (see 10.3.12 and Figure 10-14), or

b) The gmTimebaseIndicator managed object (see 14.3.6) changes, and the lastGmFreqChange field of the most recently received Follow_Up information TLV is nonzero.

14.3.11 currentDS table

There is one currentDS table per PTP Instance of a time-aware system, as detailed in Table 14-2.

Table 14-2—currentDS table

Name	Data type	Operations supported[a]	References
stepsRemoved	UInteger16	R	14.3.2
offsetFromMaster	TimeInterval	R	14.3.3
lastGmPhaseChange	ScaledNs	R	14.3.4
lastGmFreqChange	Float64	R	14.3.5
gmTimebaseIndicator	UInteger16	R	14.3.6
gmChangeCount	UInteger32	R	14.3.7
timeOfLastGmChangeEvent	UInteger32 (sysUp Time, IETF RFC 3418)	R	14.3.8
timeOfLastGmPhaseChangeEvent	UInteger32 (sysUp Time, IETF RFC 3418)	R	14.3.9
timeOfLastGmFreqChangeEvent	UInteger32 (sysUp Time, IETF RFC 3418)	R	14.3.10

[a] R = Read only access; RW = Read/write access.

14.4 Parent Parameter Data Set (parentDS)

14.4.1 General

The parentDS represents capabilities of the upstream system, toward the Grandmaster PTP Instance, as measured at a local system.

14.4.2 parentPortIdentity

If this PTP Instance is the Grandmaster PTP Instance, the value is a portIdentity whose clockIdentity is the clockIdentity of this PTP Instance, and whose portNumber is 0.

If this PTP Instance is not the Grandmaster PTP Instance, the value is the portIdentity of the MasterPort (see Table 10-7) of the gPTP communication path attached to the single slave port of this PTP Instance.

The default value is a portIdentity for which the following apply:

a) The clockIdentity member is the value of the clockIdentity member of the default data set.

b) The portNumber member is 0.

14.4.3 cumulativeRateRatio

The value is an estimate of the ratio of the frequency of the Grandmaster Clock to the frequency of the LocalClock entity of this PTP Instance. cumulativeRateRatio is expressed as the fractional frequency offset multiplied by 2^{41}, i.e., the quantity (rateRatio – 1.0)(2^{41}), where rateRatio is computed by the PortSyncSyncReceive state machine (see 10.2.8.1.4).

14.4.4 grandmasterIdentity

The value is the clockIdentity attribute (see 8.5.2.2) of the Grandmaster PTP Instance.

The default value is the value of defaultDS.clockIdentity (14.2.2).

14.4.5 grandmasterClockQuality

14.4.5.1 General

This is a structure whose data type is ClockQuality (see 6.4.3.8).

14.4.5.2 grandmasterClockQuality.clockClass

The value is the clockClass (see 8.6.2.2) of the Grandmaster PTP Instance.

The default value is the clockClass member of the default data set.

14.4.5.3 grandmasterClockQuality.clockAccuracy

The value is the clockAccuracy (see 8.6.2.3) of the Grandmaster PTP Instance.

The default value is the clock accuracy member of the default data set.

14.4.5.4 grandmasterClockQuality.offsetScaledLogVariance

The value is the offsetScaledLogVariance (see 8.6.2.4) of the Grandmaster PTP Instance.

The default value is the offsetScaledLogVariance member of the default data set.

14.4.6 grandmasterPriority1

The value is the priority1 attribute (see 8.6.2.1) of the Grandmaster PTP Instance.

The default value is the priority1 value of the default data set.

14.4.7 grandmasterPriority2

The value is the priority2 attribute (see 8.6.2.5) of the Grandmaster PTP Instance.

The default value is the priority2 value of the default data set.

14.4.8 parentDS table

There is one parentDS table per PTP Instance of a time-aware system, as detailed in Table 14-3.

Table 14-3—parentDS table

Name	Data type	Operations supported[a]	References
parentPortIdentity	PortIdentity (see 6.4.3.7)	R	14.4.2
cumulativeRateRatio	Integer32	R	14.4.3
grandMasterIdentity	ClockIdentity	R	14.4.4
grandmasterClockQuality.clockClass	UInteger8	R	14.4.5.2; 7.6.2.5 of IEEE Std 1588-2019
grandmasterClockQuality.clockAccuracy	Enumeration8	R	14.4.5.3; 7.6.2.6 of IEEE Std 1588-2019
grandmasterClockQuality.offsetScaledLogVariance	UInteger16	R	14.4.5.4
grandmasterPriority1	UInteger8	R	14.4.6
grandmasterPriority2	UInteger8	R	14.4.7

[a] R = Read only access; RW = Read/write access.

14.5 Time Properties Parameter Data Set (timePropertiesDS)

14.5.1 General

The timePropertiesDS represents capabilities of the Grandmaster PTP Instance, as measured at a local system.

14.5.2 currentUtcOffset

The value is currentUtcOffset for the current Grandmaster PTP Instance (see 14.2.8). It is equal to the value of the global variable currentUtcOffset (see 10.3.9.10). The value is in units of seconds.

14.5.3 currentUtcOffsetValid

The value is currentUtcOffsetValid for the current Grandmaster PTP Instance (see 14.2.9). It is equal to the global variable currentUtcOffsetValid (see 10.3.9.6).

14.5.4 leap59

The value is leap59 for the current Grandmaster PTP Instance (see 14.2.10). It is equal to the global variable leap59 (see 10.3.9.5).

14.5.5 leap61

The value is leap61 for the current Grandmaster PTP Instance (see 14.2.11). It is equal to the global variable leap61 (see 10.3.9.4).

14.5.6 timeTraceable

The value is timeTraceable for the current Grandmaster PTP Instance (see 14.2.12). It is equal to the global variable timeTraceable (see 10.3.9.8).

14.5.7 frequencyTraceable

The value is frequencyTraceable for the current Grandmaster PTP Instance (see 14.2.13). It is equal to the global variable frequencyTraceable (see 10.3.9.9).

14.5.8 ptpTimescale

The value is ptpTimescale for the current Grandmaster PTP Instance (see 14.2.14).

14.5.9 timeSource

The value is timeSource for the current Grandmaster PTP Instance (see 14.2.15). It is equal to the global variable timeSource (see 10.3.9.11).

14.5.10 timePropertiesDS table

There is one timePropertiesDS table per PTP Instance of a time-aware system, as detailed in Table 14-4.

Table 14-4—timePropertiesDS table

Name	Data type	Operations supported[a]	References
currentUtcOffset	Integer16	R	14.5.2
currentUtcOffsetValid	Boolean	R	14.5.3
leap59	Boolean	R	14.5.4
leap61	Boolean	R	14.5.5
timeTraceable	Boolean	R	14.5.6
frequencyTraceable	Boolean	R	14.5.7
ptpTimescale	Boolean	R	14.5.8
timeSource	TimeSource	R	14.5.9 and Table 8-2

[a] R = Read only access; RW = Read/write access.

14.6 Path Trace Parameter Data Set (pathTraceDS)

14.6.1 General

The pathTraceDS represents the current path trace information available at the PTP Instance.

14.6.2 list

The value is the array of ClockIdentity values contained in the pathTrace array (see 10.3.9.23), which represents the current path trace information and which is carried in the path trace TLV (see 10.6.3.3).

The initialization value shall be the empty list (i.e., an array of length 0).

14.6.3 enable

The value is TRUE.

NOTE—This member is included for compatibility with IEEE Std 1588-2019. In IEEE Std 1588-2019, the path trace mechanism is optional, and the pathTraceDS.enable member is configurable (its value in IEEE Std 1588-2019 is TRUE or FALSE, depending on whether the path trace mechanism is operational or not operational, respectively. However, the pathTrace mechanism is mandatory in this standard, and the value of enable is always TRUE.

14.6.4 pathTraceDS table

There is one pathTraceDS table per PTP Instance, as detailed in Table 14-5.

Table 14-5—pathTraceDS table

Name	Data type	Operations supported[a]	References
list	ClockIdentity[N], where N is defined in 10.3.9.23	R	14.6.2
enable	Boolean	R	14.6.3

[a] R = Read only access; RW = Read/write access.

14.7 Acceptable Master Table Parameter Data Set (acceptableMasterTableDS)

14.7.1 General

The acceptableMasterTableDS represents the acceptable master table used when an EPON port is used by a PTP Instance of a time-aware system.

14.7.2 maxTableSize

The value is the maximum size of the AcceptableMasterTable. It is equal to the maxTableSize member of the AcceptableMasterTable structure (see 13.1.3.2).

14.7.3 actualTableSize

The value is the actual size of the AcceptableMasterTable. It is equal to the actualTableSize member of the AcceptableMasterTable structure (see 13.1.3.2 and 13.1.3.5), i.e., the current number of elements in the acceptable master array. The actual table size is less than or equal to the maxTableSize.

14.7.4 acceptableMasterArray

Each element of this array is an AcceptableMaster structure (see 13.1.3.3 and 13.1.3.5).

14.7.5 acceptableMasterTableDS table

There is one acceptableMasterTableDS table per PTP Instance of a time-aware system, as detailed in Table 14-6.

Table 14-6—acceptableMasterTableDS table

Name	Data type	Operations supported[a]	References
maxTableSize	UInteger16	R	14.7.2
actualTableSize	UInteger16	RW	14.7.3
acceptableMasterArray	AcceptableMaster[actualTableSize] (see 13.1.3.3)	RW	14.7.4

[a] R = Read only access; RW = Read/write access.

14.8 Port Parameter Data Set (portDS)

14.8.1 General

The portDS represents PTP Port time-aware capabilities for a PTP Instance of a time-aware system.

For the single PTP Port of a PTP End Instance and for each PTP Port of a PTP Relay Instance, the portDS is maintained as the basis for making protocol decisions and providing values for message fields. The number of such data sets is the same as the value of defaultDS.numberPorts.

14.8.2 portIdentity

The value is the portIdentity attribute of the local PTP Port (see 8.5.2).

14.8.3 portState

The value is the value of the PTP Port state of this PTP Port (see Table 10-2) and is taken from the enumeration in Table 14-7. It is equal to the value of the global variable selectedState (see 10.2.4.20) for this PTP Port.

Table 14-7—portState enumeration

State	Value
DisabledPort	3
MasterPort	6
PassivePort	7
SlavePort	9
	All other values reserved
NOTE—The enumeration values are consistent with Table 20 in IEEE Std 1588-2019.	

The default value is 3 (DisabledPort).

14.8.4 ptpPortEnabled

The value is equal to the value of the Boolean ptpPortEnabled (see 10.2.5.13). Setting the managed object ptpPortEnabled causes the Boolean ptpPortEnabled to have the same value.

14.8.5 delayMechanism

The value indicates the mechanism for measuring mean propagation delay and neighbor rate ratio on the link attached to this PTP Port and is taken from the enumeration in Table 14-8. If the domain number is not 0, portDS.delay mechanism must not be P2P (see 11.2.17).

Table 14-8—delayMechanism enumeration

Delay mechanism	Value	Specification
P2P	02	The PTP Port uses the peer-to-peer delay mechanism
COMMON_P2P	03	The PTP Port uses the CMLDS
SPECIAL	04	The PTP Port uses a transport that has a native time transfer mechanism and, therefore, does not use the peer-to-peer delay mechanism (e.g., IEEE 802.11, IEEE 802.3 EPON)
	All other values reserved	
NOTE—The enumeration values are consistent with Table 21 in IEEE Std 1588-2019.		

14.8.6 isMeasuringDelay

The value is equal to the value of the Boolean isMeasuringDelay (see 11.2.13.6 and 16.4.3.3).

14.8.7 asCapable

The value is equal to the value of the Boolean asCapable (see 10.2.5.1).

14.8.8 meanLinkDelay

The value is equal to the value of the per-PTP Port global variable meanLinkDelay (see 10.2.5.8). It is an estimate of the current one-way propagation time on the link attached to this PTP Port, measured as specified for the respective medium (see 11.2.17, 12.5.2, and 16.4). The value is zero for PTP Ports attached to IEEE 802.3 EPON links and for the master port of an IEEE 802.11 link, because one-way propagation delay is not measured on the latter and not directly measured on the former. The data type shall be TimeInterval. The default value is zero.

NOTE—The underlying per-port global variable meanLinkDelay is of type UScaledNS, which is a 96-bit value (see 6.4.3.2). meanLinkDelay values that are larger than the maximum value that can be represented by the TimeInterval data type, i.e., 0x7FFF FFFF FFFF FFFF (where the units are 2^{-16} ns; see 6.4.3.3), used for this managed object are set to this largest value.

14.8.9 meanLinkDelayThresh

The value is equal to the value of the per-PTP Port global variable meanLinkDelayThresh (see 11.2.13.7). It is the propagation time threshold above which a PTP Port is considered not capable of participating in the IEEE 802.1AS protocol. Setting the managed object meanLinkDelayThresh causes the per PTP Port global variable meanLinkDelayThresh to have the same value.

NOTE—The underlying per-port global variable meanLinkDelayThresh is of type UScaledNS, which is a 96-bit value (see 6.4.3.2). meanLinkDelayThresh values that are larger than the maximum value that can be represented by the TimeInterval data type, i.e., 0x7FFF FFFF FFFF FFFF (where the units are 2^{-16} ns; see 6.4.3.3), used for this managed object are set to this largest value.

14.8.10 delayAsymmetry

The value is the asymmetry in the propagation delay on the link attached to this PTP Port relative to the Grandmaster Clock time base, as defined in 10.2.5.9 and 8.3. If propagation delay asymmetry is not modeled, then delayAsymmetry is 0.

NOTE—The underlying per-port global variable delayAsymmetry is of type ScaledNS, which is a 96-bit value (see 6.4.3.1). delayAsymmetry values that are larger than the maximum value that can be represented by the TimeInterval data type, i.e., 0x7FFF FFFF FFFF FFFF (where the units are 2^{-16} ns; see 6.4.3.3), used for this managed object are set to this largest value. delayAsymmetry values that are less than the minimum value that can be represented by the TimeInterval data type, i.e., 0x8000 0000 0000 0001 written in twos complement form (where the units are 2^{-16} ns; see 6.4.3.3), used for this managed object are set to this smallest value.

14.8.11 neighborRateRatio

The value is an estimate of the ratio of the frequency of the LocalClock entity of the PTP Instance at the other end of the link attached to this PTP Port, to the frequency of the LocalClock entity of this PTP Instance (see 10.2.5.7). neighborRateRatio is expressed as the fractional frequency offset multiplied by 2^{41}, i.e., the quantity (neighborRateRatio – 1.0)(2^{41}).

14.8.12 initialLogAnnounceInterval

If useMgtSettableLogAnnounceInterval is FALSE, the value is the logarithm to base 2 of the announce interval used when:

a) The PTP Port is initialized or
b) A message interval request TLV is received with the logAnnounceInterval field set to 126 (see 10.7.2.2 and the AnnounceIntervalSetting state machine in 10.3.17).

14.8.13 currentLogAnnounceInterval

The value is the logarithm to the base 2 of the current announce interval (see 10.7.2.2).

14.8.14 useMgtSettableLogAnnounceInterval

The managed object is a Boolean that determines the source of the announce interval. If the value is TRUE, the value of currentLogAnnounceInterval is set equal to the value of mgtSettableLogAnnounceInterval (see 14.8.15). If the value is FALSE, the value of currentLogAnnounceInterval is determined by the AnnounceIntervalSetting state machine (see 10.3.17). The default value of useMgtSettableLogAnnounceInterval is FALSE for domain 0 and TRUE for domains other than domain 0.

14.8.15 mgtSettableLogAnnounceInterval

The value is the logarithm to base 2 of the announce interval used if useMgtSettableLogAnnounceInterval is TRUE. The value is not used if useMgtSettableLogAnnounceInterval is FALSE.

14.8.16 announceReceiptTimeout

The value is the number of Announce message transmission intervals that a slave port waits without receiving an Announce message before assuming that the master is no longer transmitting Announce messages and the BMCA needs to be run, if appropriate (see 10.7.3.2).

14.8.17 initialLogSyncInterval

If useMgtSettableLogSyncInterval is FALSE, the value is the logarithm to base 2 of the sync interval used when

a) The PTP Port is initialized or
b) A message interval request TLV is received with the logTimeSyncInterval field set to 126 (see 10.7.2.3, 11.5.2.3, 12.8.2, 13.9.2, and the SyncIntervalSetting state machine in 10.3.18).

14.8.18 currentLogSyncInterval

The value is the logarithm to the base 2 of the current time-synchronization transmission interval (see 10.7.2.3).

14.8.19 useMgtSettableLogSyncInterval

The managed object is a Boolean that determines the source of the sync interval. If the value is TRUE, the value of currentLogSyncInterval is set equal to the value of mgtSettableLogSyncInterval (see 14.8.20). If the value of the managed object is FALSE, the value of currentLogSyncInterval is determined by the SyncIntervalSetting state machine (see 10.3.18). The default value of useMgtSettableLogSyncInterval is FALSE for domain 0 and TRUE for domains other than domain 0.

14.8.20 mgtSettableLogSyncInterval

The value is the logarithm to base 2 of the sync interval if useMgtSettableLogSyncInterval is TRUE. The value is not used if useMgtSettableLogSyncInterval is FALSE.

14.8.21 syncReceiptTimeout

The value is the number of time-synchronization transmission intervals that a slave port waits without receiving synchronization information before assuming that the master is no longer transmitting synchronization information and that the BMCA needs to be run, if appropriate (see 10.7.3.1).

14.8.22 syncReceiptTimeoutTimeInterval

The value is equal to the value of the per-PTP Port global variable syncReceiptTimeoutTimeInterval (see 10.2.5.3). It is the time interval after which sync receipt timeout occurs if time-synchronization information has not been received during the interval.

14.8.23 initialLogPdelayReqInterval

For full-duplex IEEE 802.3 media and for CSN media that use the peer-to-peer delay mechanism to measure path delay (see 16.4.3.2), the value is the logarithm to base 2 of the Pdelay_Req message transmission interval used when:

a) The PTP Port is initialized or
b) A message interval request TLV is received with the logLinkDelayInterval field set to 126 (see 11.5.2.2 and the LinkDelayIntervalSetting state machine in 11.2.21).

For all other media, the value is 127.

14.8.24 currentLogPdelayReqInterval

For full-duplex IEEE 802.3 media and for CSN media that use the peer-to-peer delay mechanism to measure path delay (see 16.4.3.2), the value is the logarithm to the base 2 of the current Pdelay_Req message transmission interval (see 11.5.2.2).

For all other media, the value is 127.

14.8.25 useMgtSettableLogPdelayReqInterval

The managed object is a Boolean that determines the source of the mean time interval between successive Pdelay_Req messages. If the value is TRUE, the value of currentLogPdelayReqInterval is set equal to the value of mgtSettableLogPdelayReqInterval (see 14.8.26). If the value of the managed object is FALSE, the value of currentLogPdelayReqInterval is determined by the LinkDelayIntervalSetting state machine (see 11.2.21). The default value of useMgtSettableLogPdelayReqInterval is FALSE.

14.8.26 mgtSettableLogPdelayReqInterval

The value is the logarithm to base 2 of the mean time interval between successive Pdelay_Req messages if useMgtSettableLogPdelayReqInterval is TRUE. The value is not used if useMgtSettableLogPdelayReqInterval is FALSE.

14.8.27 initialLogGptpCapableMessageInterval

The value is the logarithm to base 2 of the gPTP capable message interval used when:

a) The PTP Port is initialized or
b) A gPtpCapableMessage interval request TLV is received with the logGptpCapableMessageInterval field set to 126 (see 10.6.4.5 and the GptpCapableIntervalSetting state machine in 10.4.3).

14.8.28 currentLogGptpCapableMessageInterval

The value is the logarithm to the base 2 of the current gPTP capable message interval (see 10.7.2.5).

14.8.29 useMgtSettableLogGptpCapableMessageInterval

The managed object is a Boolean that determines the source of the gPTP capable message interval. If the value is TRUE, the value of currentLogGptpCapableMessageInterval is set equal to the value of mgtSettableLogGptpCapableMessageInterval (see 14.8.30). If the value of the managed object is FALSE, the value of currentLogGptpCapableMessageInterval is determined by the GptpCapableMessageIntervalSetting state machine (see 10.4.3). The default value of useMgtSettableLogGptpCapableMessageInterval is FALSE.

14.8.30 mgtSettableLogGptpCapableMessageInterval

The value is the logarithm to base 2 of the gPtpCapableMessageInterval if useMgtSettableLogGptpCapableMessageInterval is TRUE. The value is not used if useMgtSettableLogGptpCapableMessageInterval is FALSE.

14.8.31 initialComputeNeighborRateRatio

If useMgtSettableComputeNeighborRateRatio is FALSE, then for full-duplex IEEE 802.3 media and for CSN media that use the peer-to-peer delay mechanism to measure path delay (see 16.4.3.2), the value is the initial value of computeNeighborRateRatio (see 10.2.5.10).

For all other media, the value is TRUE.

14.8.32 currentComputeNeighborRateRatio

For full-duplex IEEE 802.3 media and for CSN media that use the peer-to-peer delay mechanism to measure path delay (see 16.4.3.2), the value is the current value of computeNeighborRateRatio.

For all other media, the value is TRUE.

14.8.33 useMgtSettableComputeNeighborRateRatio

The managed object is a Boolean that determines the source of the value of computeNeighborRateRatio. If the value is TRUE, the value of computeNeighborRateRatio is set equal to the value of mgtSettableComputeNeighborRateRatio (see 14.16.17). If the value of the managed object is FALSE, the value of currentComputeNeighborRateRatio is determined by the LinkDelayIntervalSetting state machine (see 11.2.21). The default value of useMgtSettableComputeNeighborRateRatio is FALSE.

14.8.34 mgtSettableComputeNeighborRateRatio

computeNeighborRateRatio is configured to this value if useMgtSettableComputeNeighborRateRatio is TRUE. The value is not used if useMgtSettableComputeNeighborRateRatio is FALSE.

14.8.35 initialComputeMeanLinkDelay

If useMgtSettableComputeMeanLinkDelay is FALSE, then for full-duplex IEEE 802.3 media and for CSN media that use the peer-to-peer delay mechanism to measure path delay (see 16.4.3.2), the value is the initial value of computeMeanLinkDelay (see 10.2.5.10).

For all other media, the value is TRUE.

14.8.36 currentComputeMeanLinkDelay

For full-duplex IEEE 802.3 media and for CSN media that use the peer-to-peer delay mechanism to measure path delay (see 16.4.3.2), the value is the current value of computeMeanLinkDelay.

For all other media, the value is TRUE.

14.8.37 useMgtSettableComputeMeanLinkDelay

The managed object is a Boolean that determines the source of the value of computeMeanLinkDelay. If the value is TRUE, the value of computeMeanLinkDelay is set equal to the value of mgtSettableComputeMeanLinkDelay (see 14.8.38). If the value of the managed object is FALSE, the value of currentComputeMeanLinkDelay is determined by the LinkDelayIntervalSetting state machine (see 11.2.21). The default value of useMgtSettableComputeMeanLinkDelay is FALSE.

14.8.38 mgtSettableComputeMeanLinkDelay

computeMeanLinkDelay is configured to this value if useMgtSettableComputeMeanLinkDelay is TRUE. The value is not used if useMgtSettableComputeMeanLinkDelay is FALSE.

14.8.39 allowedLostResponses

The value is equal to the value of the per-PTP Port global variable allowedLostResponses (see 11.5.3 and 11.2.13.4). It is the number of Pdelay_Req messages without valid responses above which a PTP Port is considered to be not exchanging peer delay messages with its neighbor. Setting the managed object allowedLostResponses causes the per PTP Port global variable allowedLostResponses to have the same value.

14.8.40 allowedFaults

The value is equal to the value of the per-PTP Port global variable allowedFaults (see 11.5.4 and 11.2.13.5). It is the number of faults (see 11.5.4) above which asCapable is set to FALSE, i.e., a PTP Port is considered not capable of interoperating with its neighbor via the IEEE 802.1AS protocol (see 10.2.5.1). Setting the managed object allowedLostResponses causes the per PTP Port global variable allowedFaults to have the same value.

14.8.41 gPtpCapableReceiptTimeout

The value is the number of transmission intervals that a PTP Port waits without receiving the gPTP capable TLV before assuming that the neighbor PTP Port is no longer invoking gPTP (see 10.7.3.3).

14.8.42 versionNumber

This value is set to versionPTP as specified in 10.6.2.2.4.

14.8.43 nup

For an OLT port of an IEEE 802.3 EPON link, the value is the effective index of refraction for the EPON upstream wavelength light of the optical path (see 13.1.4 and 13.8.1.2.2). The default value is 1.46770 for 1 Gb/s upstream links and 1.46773 for 10 Gb/s upstream links.

For all other PTP Ports, the value is 0.

14.8.44 ndown

For an OLT port of an IEEE 802.3 EPON link, the value is the effective index of refraction for the EPON downstream wavelength light of the optical path (see 13.1.4 and 13.8.1.2.1). The default value is 1.46805 for 1 Gb/s downstream links and 1.46851 for 10 Gb/s downstream links.

For all other PTP Ports, the value is 0.

14.8.45 oneStepTxOper

The value is equal to the value of the per-PTP Port global variable oneStepTxOper (see 11.2.13.11). Its value is TRUE if the PTP Port is sending one-step Sync messages and FALSE if the PTP Port is sending two-step Sync and Follow-Up messages.

14.8.46 oneStepReceive

The value is equal to the value of the per-PTP Port global variable oneStepReceive (see 11.2.13.9). Its value is TRUE if the PTP Port is capable of receiving and processing one-step Sync messages.

14.8.47 oneStepTransmit

The value is equal to the value of the per-PTP Port global variable oneStepTransmit (see 11.2.13.10). Its value is TRUE if the PTP Port is capable of transmitting one-step Sync messages.

14.8.48 initialOneStepTxOper

If useMgtSettableOneStepTxOper is FALSE, the value is used to initialize currentOneStepTxOper when the PTP Port is initialized. If useMgtSettableOneStepTxOper is TRUE, the value of initialOneStepTxOper is not used. The default value of initialOneStepTxOper shall be FALSE.

14.8.49 currentOneStepTxOper

The value is TRUE if it is desired, either via management or via a received Signaling message, that the PTP Port transmit one-step Sync messages. The value is FALSE if it is not desired, either via management or via a received Signaling message, that the PTP Port transmit one-step Sync messages.

NOTE—The PTP Port will send one-step Sync messages only if currentOneStepTxOper and oneStepTransmit (see 14.8.47) are both TRUE (see 11.2.16 and Figure 11-8).

14.8.50 useMgtSettableOneStepTxOper

The managed object is a Boolean that determines the source of currentOneStepTxOper. If the value is TRUE, the value of currentOneStepTxOper is set equal to the value of mgtSettableOneStepTxOper (see 14.8.51). If the value is FALSE, the value of currentOneStepTxOper is determined by the OneStepTxOperSetting state machine (see 11.2.16 and Figure 11-8). The default value of useMgtSettableOneStepTxOper is TRUE.

14.8.51 mgtSettableOneStepTxOper

If useMgtSettableOneStepTxOper is TRUE, currentOneStepTxOper is set equal to the value of mgtSettableOneStepTxOper. The value of mgtSettableOneStepTxOper is not used if useMgtSettableOneStepTxOper is FALSE. The default value of mgtSettableOneStepTxOper is FALSE for domains other than domain 0.

14.8.52 syncLocked

The value is equal to the value of the per-PTP Port global variable syncLocked (see 10.2.5.15). Its value is TRUE if the PTP Port will transmit a Sync as soon as possible after the slave PTP Port receives a Sync.

14.8.53 pdelayTruncatedTimestampsArray

For full-duplex IEEE 802.3 media and for CSN media that use the peer-to-peer delay mechanism to measure path delay (see 16.4.3.2), the values of the four elements of this array are as described in Table 14-9. For all other media, the values are zero. Array elements 0, 1, 2, and 3 correspond to the timestamps t1, t2, t3, and t4, respectively, in Figure 11-1 and are expressed in units of 2^{-16} ns (i.e., the value of each array element is equal to the remainder obtained upon dividing the respective timestamp, expressed in units of 2^{-16} ns, by 2^{48}). At any given time, the timestamp values stored in the array are for the same, and most recently completed, peer delay message exchange.

Table 14-9—Description of pdelayTruncatedTimestampsArray

Array element	Timestamp description	Corresponding timestamp of Figure 11-1	Units
0	pdelayReqEventEgressTimestamp for Pdelay_Req message, of most recently completed peer delay message exchange, transmitted by this PTP Instance (NOTE 1)	t1	2^{-16} ns
1	pdelayReqEventIngressTimestamp for Pdelay_Req message received at peer delay responder to which this Link Port sends Pdelay_Req, of most recently completed peer delay message exchange; it is equal to the sum of the following: a) The ns field of the requestReceiptTimestamp (see Table 11-13), multiplied by 2^{16} b) The correctionField (see Table 11-6) (NOTE 2)	t2	2^{-16} ns
2	pdelayRespEventEgressTimestamp for Pdelay_Resp message, of most recently completed peer delay message exchange, transmitted by peer delay responder to which this Link Port sends Pdelay_Req; it is equal to the sum of the following: a) The ns field of the responseOriginTimestamp (see Table 11-14), multiplied by 2^{16} b) The correctionField (see Table 11-6) (NOTE 3)	t3	2^{-16} ns
3	pdelayRespEventIngressTimestamp for Pdelay_Resp message, of most recently completed peer delay message exchange, received by this PTP Instance (NOTE 4)	t4	2^{-16} ns

NOTE 1—This quantity is not simply the nanoseconds plus fractional nanoseconds portion of the pdelayReqEventEgressTimestamp. Rather, it is equal to
[pdelayReqEventEgressTimestamp.seconds × $(10^9)(2^{16})$ +
pdelayReqEventEgressTimestamp.fractionalNanoseconds] mod 2^{48}, where
pdelayReqEventEgressTimestamp is expressed as an ExtendedTimestamp (see 6.4.3.5). Its units are 2^{-16} ns.

NOTE 2—This quantity is not simply the nanoseconds plus fractional nanoseconds portion of the pdelayReqEventIngressTimestamp. Rather, it is equal to
[pdelayReqEventIngressTimestamp>.seconds × $(10^9)(2^{16})$ +
pdelayReqEventIngressTimestamp.fractionalNanoseconds] mod 2^{48}, where
pdelayReqEventIngressTimestamp is expressed as an ExtendedTimestamp (see 6.4.3.5). Its units are 2^{-16} ns.

NOTE 3—This quantity is not simply the nanoseconds plus fractional nanoseconds portion of the pdelayRespEventEgressTimestamp. Rather, it is equal to
[pdelayRespEventEgressTimestamp.seconds × $(10^9)(2^{16})$ +
pdelayRespEventEgressTimestamp.fractionalNanoseconds] mod 2^{48}, where
pdelayRespEventEgressTimestamp is expressed as an ExtendedTimestamp (see 6.4.3.5). Its units are 2^{-16} ns.

NOTE 4—This quantity is not simply the nanoseconds plus fractional nanoseconds portion of the pdelayRespEventIngressTimestamp. Rather, it is equal to
[pdelayRespEventIngressTimestamp.seconds × $(10^9)(2^{16})$ +
pdelayRespEventIngressTimestamp.fractionalNanoseconds] mod 2^{48}, where
pdelayRespEventIngressTimestamp is expressed as an ExtendedTimestamp (see 6.4.3.5). Its units are 2^{-16} ns.

14.8.54 minorVersionNumber

This value is set to minorVersionPTP as specified in 10.6.2.2.3.

14.8.55 portDS table

There is one portDS table per PTP Port, per PTP Instance of a time-aware system. Each portDS table contains a set of parameters for each PTP Port that supports the time-synchronization capability, as detailed in Table 14-10. Each table can be created or removed dynamically in implementations that support dynamic configuration of PTP Ports and components.

Table 14-10—portDS table

Name	Data type	Operations supported[a]	References
portIdentity	PortIdentity (see 6.4.3.7)	R	14.8.2
portState	Enumeration8	R	14.8.3, Table 14-7
ptpPortEnabled	Boolean	RW	14.8.4
delayMechanism	Enumeration8	RW	14.8.5
isMeasuringDelay	Boolean	R	14.8.6
asCapable	Boolean	R	14.8.7
meanLinkDelay	TimeInterval	R	14.8.8
meanLinkDelayThresh	TimeInterval	RW	14.8.9
delayAsymmetry	TimeInterval	RW	14.8.10
neighborRateRatio	Integer32	R	14.8.11
initialLogAnnounceInterval	Integer8	RW	14.8.12
currentLogAnnounceInterval	Integer8	R	14.8.13
useMgtSettableLogAnnounceInterval	Boolean	RW	14.8.14
mgtSettableLogAnnounceInterval	Integer8	RW	14.8.15
announceReceiptTimeout	UInteger8	RW	14.8.16
initialLogSyncInterval	Integer8	RW	14.8.17
currentLogSyncInterval	Integer8	R	14.8.18
useMgtSettableLogSyncInterval	Boolean	RW	14.8.19
mgtSettableLogSyncInterval	Integer8	RW	14.8.20
syncReceiptTimeout	UInteger8	RW	14.8.21
syncReceiptTimeoutTimeInterval	UScaledNs	R	14.8.22
initialLogPdelayReqInterval	Integer8	RW	14.8.23
currentLogPdelayReqInterval	Integer8	R	14.8.24
useMgtSettableLogPdelayReqInterval	Boolean	RW	14.8.25
mgtSettableLogPdelayReqInterval	Integer8	RW	14.8.26
initialLogGptpCapableMessageInterval	Integer8	RW	14.8.27
currentLogGptpCapableMessageInterval	Integer8	R	14.8.28
useMgtSettableLogGptpCapableMessageInterval	Boolean	RW	14.8.29
mgtSettableLogGptpCapableMessageInterval	Integer8	RW	14.8.30

Table 14-10—portDS table *(continued)*

Name	Data type	Operations supported[a]	References
initialComputeNeighborRateRatio	Boolean	RW	14.8.31
currentComputeNeighborRateRatio	Boolean	R	14.8.32
useMgtSettableComputeNeighborRateRatio	Boolean	RW	14.8.33
mgtSettableComputeNeighborRateRatio	Boolean	RW	14.8.34
initialComputeMeanLinkDelay	Boolean	RW	14.8.35
currentComputeMeanLinkDelay	Boolean	R	14.8.36
useMgtSettableComputeMeanLinkDelay	Boolean	RW	14.8.37
mgtSettableComputeMeanLinkDelay	Boolean	RW	14.8.38
allowedLostResponses	UInteger8	RW	14.8.39
allowedFaults	UInteger8	RW	14.8.40
gPtpCapableReceiptTimeout	UInteger8	RW	14.8.41
versionNumber	UInteger4	R	14.8.42
nup (NOTE)	Float64	RW	14.8.43
ndown (NOTE)	Float64	RW	14.8.44
oneStepTxOper	Boolean	R	14.8.45
oneStepReceive	Boolean	R	14.8.46
oneStepTransmit	Boolean	R	14.8.47
initialOneStepTxOper	Boolean	RW	14.8.48
currentOneStepTxOper	Boolean	R	14.8.49
useMgtSettableOneStepTxOper	Boolean	RW	14.8.50
mgtSettableOneStepTxOper	Boolean	RW	14.8.51
syncLocked	Boolean	R	14.8.52
pdelayTruncatedTimestampsArray	UInteger48[4]	R	14.8.53
minorVersionNumber	UInteger4	R	14.8.54
NOTE—The values of nup and ndown in Table 14-10 depend on the particular PHY used.			

[a] R = Read only access; RW = Read/write access.

14.9 Description Port Parameter Data Set (descriptionPortDS)

14.9.1 General

The descriptionPortDS contains the profileIdentifier for this PTP profile, as specified in F.2.

14.9.2 profileIdentifier

The value is the profileIdentifier for this PTP profile (see F.2).

14.9.3 descriptionPortDS table

There is one descriptionPortDS table per PTP Port of a PTP Instance, as detailed in Table 14-11.

Table 14-11—descriptionPortDS table

Name	Data type	Operations supported[a]	References
profileIdentifier	Octet6	R	14.9.2

[a] R= Read only access.

14.10 Port Parameter Statistics Data Set (portStatisticsDS)

14.10.1 General

For the single PTP Port of a PTP End Instance and for each PTP Port of a PTP Relay Instance, the portStatisticsDS provides counters associated with PTP Port capabilities at a given PTP Instance. The number of such statistics sets is the same as the value of defaultDS.numberPorts.

14.10.2 rxSyncCount

This counter increments every time synchronization information is received, denoted by one of the following events:

— A transition to TRUE from FALSE of the rcvdSync variable of the MDSyncReceiveSM state machine (see 11.2.14.1.2 and Figure 11-6) when in the DISCARD, WAITING_FOR_SYNC, or WAITING_FOR_FOLLOW_UP states; or
— rcvdIndication transitions to TRUE (see Figure 12-7).

14.10.3 rxOneStepSyncCount

This counter increments every time a one-step Sync message is received, denoted by a transition to TRUE from FALSE of the rcvdSync variable of the MDSyncReceiveSM state machine (see 11.2.14.1.2 and Figure 11-6) with the variable rcvdSyncPtr->twoStepFlag FALSE when in the DISCARD or WAITING_FOR_SYNC states.

14.10.4 rxFollowUpCount

This counter increments every time a Follow_Up message is received, denoted by a transition to TRUE from FALSE of the rcvdFollowUp variable of the MDSyncReceiveSM state machine (see 11.2.14.1.3 and Figure 11-6) when in the WAITING_FOR_FOLLOW_UP state.

14.10.5 rxPdelayRequestCount

This counter increments every time a Pdelay_Req message is received, denoted by a transition to TRUE from FALSE of the rcvdPdelayReq variable of the MDPdelayResp state machine (see 11.2.20.2.1 and Figure 11-10) when in the WAITING_FOR_PDELAY_REQ or INITIAL_WAITING_FOR_PDELAY_REQ states.

14.10.6 rxPdelayResponseCount

This counter increments every time a Pdelay_Resp message is received, denoted by a transition to TRUE from FALSE of the rcvdPdelayResp variable of the MDPdelayReq state machine (see 11.2.19.2.2 and Figure 11-9) when in the WAITING_FOR_PDELAY_RESP state.

14.10.7 rxPdelayResponseFollowUpCount

This counter increments every time a Pdelay_Resp_Follow_Up message is received, denoted by a transition to TRUE from FALSE of the rcvdPdelayRespFollowUp variable of the MDPdelayReq state machine (see 11.2.19.2.4 and Figure 11-9) when in the WAITING_FOR_PDELAY_RESP_FOLLOW_UP state.

14.10.8 rxAnnounceCount

This counter increments every time an Announce message is received, denoted by a transition to TRUE from FALSE of the rcvdAnnounce variable of the PortAnnounceReceive state machine (see 10.3.11 and Figure 10-13) when in the DISCARD or RECEIVE states.

14.10.9 rxPTPPacketDiscardCount

This counter increments every time a PTP message of the respective PTP Instance is discarded, caused by the occurrence of any of the following conditions:

a) A received Announce message is not qualified, denoted by the function qualifyAnnounce (see 10.3.11.2.1 and 13.1.3.4) of the PortAnnounceReceive state machine (see 10.3.11 and Figure 10-13) returning FALSE;
b) A Follow_Up message corresponding to a received Sync message is not received, denoted by a transition of the condition (currentTime >= followUpReceiptTimeoutTime) to TRUE from FALSE when in the WAITING_FOR_FOLLOW_UP state of the MDSyncReceiveSM state machine (see 11.2.14 and Figure 11-6);
c) A Pdelay_Resp message corresponding to a transmitted Pdelay_Req message is not received, denoted by a transition from the WAITING_FOR_PDELAY_RESP state to the RESET state of the MDPdelayReq state machine (see 11.2.19 and Figure 11-9);
d) A Pdelay_Resp_Follow_Up message corresponding to a transmitted Pdelay_Req message is not received, denoted by a transition from the WAITING_FOR_PDELAY_RESP_FOLLOW_UP state to the RESET state of the MDPdelayReq state machine (see 11.2.19 and Figure 11-9).

14.10.10 syncReceiptTimeoutCount

This counter increments every time sync receipt timeout occurs, denoted by entering the AGED state of the PortAnnounceInformation state machine (see 10.3.12 and Figure 10-14) with the condition (currentTime>= syncReceiptTimeoutTime && gmPresent) evaluating to TRUE.

14.10.11 announceReceiptTimeoutCount

This counter increments every time announce receipt timeout occurs, denoted by entering the AGED state of the PortAnnounceInformation state machine from the CURRENT state of the PortAnnounceInformation state machine (see 10.3.12 and Figure 10-14) with the condition (currentTime >= announceReceiptTimeoutTime) evaluating to TRUE.

14.10.12 pdelayAllowedLostResponsesExceededCount

This counter increments every time the value of the variable lostResponses (see 11.2.19.2.9) exceeds the value of the variable allowedLostResponses (see 11.2.13.4), in the RESET state of the MDPdelayReq state machine (see 11.2.19 and Figure 11-9).

14.10.13 txSyncCount

This counter increments every time synchronization information is transmitted, denoted by one of the following events:

— A transition to TRUE from FALSE of the rcvdMDSyncMDSS variable of the MDSyncSendSM state machine (see 11.2.15.1.1 and Figure 11-7) when in the INITIALIZING, SEND_FOLLOW_UP, or SET_CORRECTION_FIELD states; or
— The INITIATE_REQUEST_WAIT_CONFIRM_OR_SAVE_INFO state is entered in Figure 12-5 and TM is being used [i.e., (tmFtmSupport == 0x01 ||((tmFtmSupport & 0x01 == 0x01)&& ftmReqGrantedMaster)) in master state machine A of Figure 12-5]; or
— The INITIATE_REQUEST_WAIT_CONFIRM state is entered in Figure 12-6 (in this case FTM is being used).

14.10.14 txOneStepSyncCount

This counter increments every time a one-step Sync message is transmitted, denoted by a transition to TRUE from FALSE of the rcvdMDSyncMDSS variable of the MDSyncSendSM state machine (see 11.2.15.1.1 and Figure 11-7) with the variable oneStepTxOper TRUE when in the INITIALIZING, SEND_SYNC_ONE_STEP, or SET_CORRECTION_FIELD states.

14.10.15 txFollowUpCount

This counter increments every time a Follow_Up message is transmitted, denoted by a transition to TRUE from FALSE of the rcvdMDTimestampReceive variable of the MDSyncSendSM state machine (see 11.2.15.1.3 and Figure 11-7) when in the SEND_SYNC state.

14.10.16 txPdelayRequestCount

This counter increments every time a Pdelay_Req message is transmitted, denoted by entering the INITIAL_SEND_PDELAY_REQ or SEND_PDELAY_REQ states of the MDPdelayReq state machine (see 11.2.19 and Figure 11-9).

14.10.17 txPdelayResponseCount

This counter increments every time a Pdelay_Resp message is transmitted, denoted by the following events:

— A transition to TRUE from FALSE of the rcvdPdelayReq variable of the MDPdelayResp state machine (see 11.2.20.2.1 and Figure 11-10) when in the WAITING_FOR_PDELAY_REQ or INITIAL_WAITING_FOR_PDELAY_REQ state and
— The resulting entry to the SENT_PDELAY_RESP_WAITING_FOR_TIMESTAMP state.

14.10.18 txPdelayResponseFollowUpCount

This counter increments every time a Pdelay_Resp_Follow_Up message is transmitted, denoted by the following events:

— A transition to TRUE from FALSE of the rcvdMDTimestampReceive variable of the MDPdelayResp state machine (see 11.2.20.2.2 and Figure 11-10) when in the SENT_PDELAY_RESP_WAITING_FOR_TIMESTAMP states and
— The resulting entry to the WAITING_FOR_PDELAY_REQ state.

14.10.19 txAnnounceCount

This counter increments every time an Announce message is transmitted, denoted by entering the TRANSMIT_ANNOUNCE state of the PortAnnounceReceive state machine (see 10.3.16 and Figure 10-18).

14.10.20 portStatisticsDS table

There is one portStatisticsDS table per PTP Port, per PTP Instance of a time-aware system. Each portStatisticsDS table contains a set of counters for each PTP Port that supports the time-synchronization capability, as detailed in Table 14-12. Each table can be created or removed dynamically in implementations that support dynamic configuration of PTP Ports and components.

Table 14-12—portStatisticsDS table

Name	Data type	Operations supported[a]	References
rxSyncCount	UInteger32	R	14.10.2
rxOneStepSyncCount	UInteger32	R	14.10.3
rxFollowUpCount	UInteger32	R	14.10.4
rxPdelayRequestCount	UInteger32	R	14.10.5
rxPdelayResponseCount	UInteger32	R	14.10.6
rxPdelayResponseFollowUpCount	UInteger32	R	14.10.7
rxAnnounceCount	UInteger32	R	14.10.8
rxPTPPacketDiscardCount	UInteger32	R	14.10.9
syncReceiptTimeoutCount	UInteger32	R	14.10.10
announceReceiptTimeoutCount	UInteger32	R	14.10.11
pdelayAllowedLostResponsesExceededCount	UInteger32	R	14.10.12
txSyncCount	UInteger32	R	14.10.13
txOneStepSyncCount	UInteger32	R	14.10.14
txFollowUpCount	UInteger32	R	14.10.15
txPdelayRequestCount	UInteger32	R	14.10.16
txPdelayResponseCount	UInteger32	R	14.10.17
txPdelayResponseFollowUpCount	UInteger32	R	14.10.18
txAnnounceCount	UInteger32	R	14.10.19

[a]R= Read only access.

14.11 Acceptable Master Port Parameter Data Set (acceptableMasterPortDS)

14.11.1 General

The acceptableMasterPortDS represents the capability to enable/disable the acceptable master table feature on a PTP Port. For the single PTP Port of a PTP End Instance and for each PTP Port of a PTP Relay Instance, this data set contains the single member acceptableMasterTableEnabled, which is used to enable/disable the Acceptable Master Table Feature. The number of such data sets is the same as the value of defaultDS.numberPorts.

14.11.2 acceptableMasterTableEnabled

The value is equal to the value of the Boolean acceptableMasterTableEnabled (see 13.1.3.2 and 13.1.3.5).

14.11.3 acceptableMasterPortDS table

There is one acceptableMasterPortDS table per PTP Port, per PTP Instance of a time-aware system as detailed in Table 14-13.

Table 14-13—acceptableMasterPortDS table

Name	Data type	Operations supported[a]	References
acceptableMasterTableEnabled	Boolean	RW	14.11.2

[a] R = Read only access; RW = Read/write access.

14.12 External Port Configuration Port Parameter Data Set (externalPortConfigurationPortDS)

14.12.1 General

The externalPortConfigurationPortDS is used with the external port configuration option to indicate the desired state for the PTP Port. This data set contains the single member desiredState, which indicates the desired state for the PTP Port. The number of such data sets is the same as the value of defaultDS.numberPorts.

14.12.2 desiredState

When the value of defaultDS.externalPortConfigurationEnabled is TRUE, the value of externalPortConfigurationPortDS.desiredState is the desired state of the PTP Port. This member sets the value of the variable portStateInd (see 10.3.15.1.5). When a new value is written to the member by management, the variable rcvdPortStateInd (see 10.3.15.1.4) is set to TRUE.

14.12.3 externalPortConfigurationPortDS table

There is one externalPortConfigurationPortDS table per gPTPport, per PTP Instance of a time-aware system as detailed in Table 14-14.

Table 14-14—externalPortConfigurationPortDS table

Name	Data type	Operations supported[a]	References
desiredState	Enumeration8 (see 6.4.2)	RW	14.12.2, Table 14-7

[a] R = Read only access; RW = Read/write access.

14.13 Asymmetry Measurement Mode Parameter Data Set (asymmetryMeasurementModeDS)

14.13.1 General

The asymmetryMeasurementModeDS represents the capability to enable/disable the Asymmetry Compensation Measurement Procedure on a PTP Port (see Annex G). This data set is used instead of the cmldsAsymmetryMeasurementModeDS when only domain 0 is present and CMLDS is not used.

For the single PTP Port of a PTP End Instance and for each PTP Port of a PTP Relay Instance, the asymmetryMeasurementModeDS contains the single member asymmetryMeasurementMode, which is used to enable/disable the Asymmetry Compensation Measurement Procedure. The number of such data sets is the same as the value of defaultDS.numberPorts.

14.13.2 asymmetryMeasurementMode

The value is equal to the value of the Boolean asymmetryMeasurementMode (see G.3). For full-duplex IEEE 802.3 media, the value is TRUE if an asymmetry measurement is being performed for the link attached to this PTP Port and FALSE otherwise. For all other media, the value shall be FALSE (see 10.2.5.2). Setting the managed object asymmetryMeasurementMode causes the Boolean asymmetryMeasurementMode to have the same value.

NOTE—If an asymmetry measurement is being performed for a link, asymmetryMeasurementMode must be TRUE for the PTP Ports at each end of the link.

14.13.3 asymmetryMeasurementModeDS table

There is one asymmetryMeasurementModeDS table for the single PTP Instance whose domain number is 0, per PTP Port, as detailed in Table 14-15. This data set is used only when there is a single gPTP domain and CMLDS is not used.

Table 14-15—asymmetryMeasurementModeDS table

Name	Data type	Operations supported[a]	References
asymmetryMeasurementMode	Boolean	RW	14.13.2

[a] R = Read only access; RW = Read/write access.

14.14 Common Services Port Parameter Data Set (commonServicesPortDS)

14.14.1 General

The commonServicesPortDS enables a PTP Port of a PTP Instance to determine which port of the respective common service corresponds to that PTP Port.

At present, the only common service specified is the CMLDS, and the only member of the commonServicesPortDS is the cmldsLinkPortPortNumber. This member contains the port number of the CMLDS Link Port that corresponds to this PTP Port.

14.14.2 cmldsLinkPortPortNumber

The value is the portNumber attribute of the cmldsLinkPortDS.portIdentity (see 14.16.2) of the Link Port that corresponds to this PTP Port.

14.14.3 commonServicesPortDS table

There is one commonServicesPortDS table per PTP Port, per PTP Instance of a time-aware system as detailed in Table 14-16.

Table 14-16—commonServicesPortDS table

Name	Data type	Operations supported[a]	References
cmldsLinkPortPortNumber	UInteger16	R	14.14.2

[a] R = Read only access.

14.15 Common Mean Link Delay Service Default Parameter Data Set (cmldsDefaultDS)

14.15.1 General

The cmldsDefaultDS describes the per-time-aware-system attributes of the Common Mean Link Delay Service.

NOTE—The value of sdoId for the Common Mean Link Delay Service is fixed as 0x200 (see 11.2.17) and cannot be changed. Therefore, a corresponding data set member for sdoId is not needed.

14.15.2 clockIdentity

The value is the clockIdentity (see 8.5.2.2) that will be used to identify the Common Mean Link Delay Service.

14.15.3 numberLinkPorts

The value is the number of Link Ports of the time-aware system on which the Common Mean Link Delay Service is implemented. For an end station the value is 1.

14.15.4 cmldsDefaultDS table

There is one cmldsDefaultDS table per time-aware system, as detailed in Table 14-17.

Table 14-17—cmldsDefaultDS table

Name	Data type	Operations supported[a]	References
clockIdentity	ClockIdentity	R	14.15.2
numberLinkPorts	UInteger16	R	14.15.3

[a] R = Read only access; RW = Read/write access.

14.16 Common Mean Link Delay Service Link Port Parameter Data Set (cmldsLinkPortDS)

14.16.1 General

The cmldsLinkPortDS represents time-aware Link Port capabilities for the Common Mean Link Delay Service of a Link Port of a time-aware system.

For every Link Port of the Common Mean Link Delay Service of a time-aware system, the cmldsLinkPortDS is maintained as the basis for making protocol decisions and providing values for message fields. The number of such data sets is the same as the value of cmldsDefaultDS.numberLinkPorts.

14.16.2 portIdentity

The value is the portIdentity attribute of the local port (see 8.5.2).

14.16.3 cmldsLinkPortEnabled

The value is equal to the value of the Boolean cmldsLinkPortEnabled (see 11.2.18.1).

14.16.4 isMeasuringDelay

The value is equal to the value of the Boolean isMeasuringDelay (see 11.2.13.6 and 16.4.3.3).

14.16.5 asCapableAcrossDomains

The value is equal to the value of the Boolean asCapableAcrossDomains (see 11.2.2 and 11.2.13.12).

14.16.6 meanLinkDelay

The value is equal to the value of the per-port global variable meanLinkDelay (see 10.2.5.8). It is an estimate of the current one-way propagation time on the link attached to this Link Port, measured as specified for the respective medium (see 11.2.17, 12.5.2, and 16.4). The value is zero for Link Ports attached to IEEE 802.3 EPON links and for the master port of an IEEE 802.11 link because one-way propagation delay is not measured on the latter and not directly measured on the former. The data type shall be TimeInterval. The default value is zero.

NOTE—The underlying per-port global variable meanLinkDelay is of type UScaledNS, which is a 96-bit value (see 6.4.3.2). meanLinkDelay values that are larger than the maximum value that can be represented by the TimeInterval data type, i.e., 0x7FFF FFFF FFFF FFFF (where the units are 2^{-16} ns; see 6.4.3.3), used for this managed object are set to this largest value.

14.16.7 meanLinkDelayThresh

The value is equal to the value of the per-Link-Port global variable meanLinkDelayThresh (see 11.2.13.7). It is the propagation time threshold above which a Link Port (and therefore any PTP Ports that use the CMLDS on this Link Port) is considered not capable of participating in the IEEE 802.1AS protocol. Setting the managed object meanLinkDelayThresh causes the per-Link-Port global variable meanLinkDelayThresh to have the same value.

NOTE—The underlying per-port global variable meanLinkDelayThresh is of type UScaledNS, which is a 96-bit value (see 6.4.3.2). meanLinkDelayThresh values that are larger than the maximum value that can be represented by the TimeInterval data type, i.e., 0x7FFF FFFF FFFF FFFF (where the units are 2^{-16} ns; see 6.4.3.3), used for this managed object are set to this largest value.

14.16.8 delayAsymmetry

The value is the asymmetry in the propagation delay on the link attached to this Link Port relative to the local clock, as defined in 10.2.5.9 and 8.3. If propagation delay asymmetry is not modeled, then delayAsymmetry is 0.

NOTE—The underlying per-port global variable delayAsymmetry is of type ScaledNS, which is a 96-bit value (see 6.4.3.1). delayAsymmetry values that are larger than the maximum value that can be represented by the TimeInterval data type, i.e., 0x7FFF FFFF FFFF FFFF (where the units are 2^{-16} ns; see 6.4.3.3), used for this managed object are set to this largest value. delayAsymmetry values that are less than the minimum value that can be represented by the TimeInterval data type, i.e., 0x8000 0000 0000 0001 written in twos complement form (where the units are 2^{-16} ns; see 6.4.3.3), used for this managed object are set to this smallest value.

14.16.9 neighborRateRatio

The value is an estimate of the ratio of the frequency of the LocalClock entity of the time-aware system at the other end of the link attached to this Link Port, to the frequency of the LocalClock entity of this time-aware system (see 10.2.5.7). neighborRateRatio is expressed as the fractional frequency offset multiplied by 2^{41}, i.e., the quantity (neighborRateRatio – 1.0)(2^{41}).

14.16.10 initialLogPdelayReqInterval

If useMgtSettableLogPdelayReqInterval is FALSE, then for full-duplex IEEE 802.3 media and for CSN media that use the peer-to-peer delay mechanism to measure path delay (see 16.4.3.2), the value is the logarithm to base 2 of the Pdelay_Req message transmission interval used when:

a) The Link Port is initialized, or
b) A message interval request TLV is received with the logLinkDelayInterval field set to 126 (see 11.5.2.2 and the LinkDelayIntervalSetting state machine in 11.2.21).

For all other media, the value is 127.

14.16.11 currentLogPdelayReqInterval

For full-duplex IEEE 802.3 media and for CSN media that use the peer-to-peer delay mechanism to measure path delay (see 16.4.3.2), the value is the logarithm to the base 2 of the current Pdelay_Req message transmission interval (see 11.5.2.2).

For all other media, the value is 127.

14.16.12 useMgtSettableLogPdelayReqInterval

The managed object is a Boolean that determines the source of the sync interval and mean time interval between successive Pdelay_Req messages. If the value is TRUE, the value of currentLogPdelayReqInterval is set equal to the value of mgtSettableLogPdelayReqInterval (see 14.16.13). If the value of the managed object is FALSE, the value of currentLogPdelayReqInterval is determined by the LinkDelayIntervalSetting state machine (see 11.2.21). The default value of useMgtSettableLogPdelayReqInterval is FALSE.

14.16.13 mgtSettableLogPdelayReqInterval

The value is the logarithm to base 2 of the mean time interval between successive Pdelay_Req messages if useMgtSettableLogPdelayReqInterval is TRUE. The value is not used if useMgtSettableLogPdelayReqInterval is FALSE.

14.16.14 initialComputeNeighborRateRatio

If useMgtSettableComputeNeighborRateRatio is FALSE, then for full-duplex IEEE 802.3 media and for CSN media that use the peer-to-peer delay mechanism to measure path delay (see 16.4.3.2), the value is the initial value of computeNeighborRateRatio (see 10.2.5.10).

For all other media, the value is TRUE.

14.16.15 currentComputeNeighborRateRatio

For full-duplex IEEE 802.3 media and for CSN media that use the peer-to-peer delay mechanism to measure path delay (see 16.4.3.2), the value is the current value of computeNeighborRateRatio.

For all other media, the value is TRUE.

14.16.16 useMgtSettableComputeNeighborRateRatio

The managed object is a Boolean that determines the source of the value of computeNeighborRateRatio. If the value is TRUE, the value of computeNeighborRateRatio is set equal to the value of mgtSettablecomputeNeighborRateRatio (see 14.16.17). If the value of the managed object is FALSE, the value of currentComputeNeighborRateRatio is determined by the LinkDelayIntervalSetting state machine (see 11.2.21). The default value of useMgtSettableComputeNeighborRateRatio is FALSE.

14.16.17 mgtSettableComputeNeighborRateRatio

computeNeighborRateRatio is configured to this value if useMgtSettableComputeNeighborRateRatio is TRUE. The value is not used if useMgtSettableComputeNeighborRateRatio is FALSE.

14.16.18 initialComputeMeanLinkDelay

If useMgtSettableComputeMeanLinkDelay is FALSE, then for full-duplex IEEE 802.3 media and for CSN media that use the peer-to-peer delay mechanism to measure path delay (see 16.4.3.2), the value is the initial value of computeMeanLinkDelay (see 10.2.5.10).

For all other media, the value is TRUE.

14.16.19 currentComputeMeanLinkDelay

For full-duplex IEEE 802.3 media and for CSN media that use the peer-to-peer delay mechanism to measure path delay (see 16.4.3.2), the value is the current value of computeMeanLinkDelay.

For all other media, the value is TRUE.

14.16.20 useMgtSettableComputeMeanLinkDelay

The managed object is a Boolean that determines the source of the value of computeMeanLinkDelay. If the value is TRUE, the value of computeMeanLinkDelay is set equal to the value of mgtSettableComputeMeanLinkDelay (see 14.16.17). If the value of the managed object is FALSE, the value of currentComputeMeanLinkDelay is determined by the LinkDelayIntervalSetting state machine (see 11.2.21). The default value of useMgtSettableComputeMeanLinkDelay is FALSE.

14.16.21 mgtSettableComputeMeanLinkDelay

computeMeanLinkDelay is configured to this value if useMgtSettableComputeMeanLinkDelay is TRUE. The value is not used if useMgtSettableComputeMeanLinkDelay is FALSE.

14.16.22 allowedLostResponses

The value is equal to the value of the per-Link-Port global variable allowedLostResponses (see 11.5.3 and 11.2.13.4). It is the number of Pdelay_Req messages without valid responses above which a Link Port is considered to be not exchanging peer delay messages with its neighbor. Setting the managed object allowedLostResponses causes the per-Link-Port global variable allowedLostResponses to have the same value.

14.16.23 allowedFaults

The value is equal to the value of the per-Link-Port global variable allowedFaults (see 11.5.4 and 11.2.13.5). It is the number of faults (see 11.5.4) above which asCapableAcrossDomains is set to FALSE, i.e., a Link Port is considered not capable of interoperating with its neighbor via the IEEE 802.1AS protocol (see 10.2.5.1). Setting the managed object allowedFaults causes the per-Link-Port global variable allowedFaults to have the same value.

14.16.24 versionNumber

This value is set to versionPTP as specified in 10.6.2.2.4.

14.16.25 pdelayTruncatedTimestampsArray

For full-duplex IEEE 802.3 media and for CSN media that use the peer-to-peer delay mechanism to measure path delay (see 16.4.3.2), the values of the four elements of this array are as described in Table 14-9. For all other media, the values are zero. Array elements 0, 1, 2, and 3 correspond to the timestamps t1, t2, t3, and t4, modulo 2^{32}, respectively, in Figure 11-1 and are expressed in units of 2^{-16} ns (i.e., the value of each array element is equal to the remainder obtained upon dividing the respective timestamp, expressed in units of 2^{-16} ns, by 2^{48}). At any given time, the timestamp values stored in the array are for the same, and most recently completed, peer delay message exchange.

NOTE—This managed object is used with the asymmetry measurement compensation procedure, which is based on line-swapping.

14.16.26 minorVersionNumber

This value is set to minorVersionPTP as specified in 10.6.2.2.3.

14.16.27 cmldsLinkPortDS table

There is one cmldsLinkPortDS table per Link Port, for the PTP Instance of a time-aware system. Each cmldsLinkPortDS table contains a set of parameters for each Link Port that supports the time-synchronization capability, as detailed in Table 14-18. Each table can be created or removed dynamically in implementations that support dynamic configuration of Link Ports and components.

Table 14-18—cmldsLinkPortDS table

Name	Data type	Operations supported[a]	References
portIdentity	PortIdentity (see 6.4.3.7)	R	14.16.2
cmldsLinkPortEnabled	Boolean	R	14.16.3
isMeasuringDelay	Boolean	R	14.16.4
asCapableAcrossDomains	Boolean	R	14.16.5
meanLinkDelay	TimeInterval	R	14.16.6
meanLinkDelayThresh	TimeInterval	RW	14.16.7
delayAsymmetry	TimeInterval	RW	14.16.8
neighborRateRatio	Integer32	R	14.16.9
initialLogPdelayReqInterval	Integer8	RW	14.16.10
currentLogPdelayReqInterval	Integer8	R	14.16.11
useMgtSettableLogPdelayReqInterval	Boolean	RW	14.16.12
mgtSettableLogPdelayReqInterval	Integer8	RW	14.16.13
initialComputeNeighborRateRatio	Boolean	RW	14.16.14
currentComputeNeighborRateRatio	Boolean	R	14.16.15
useMgtSettableComputeNeighborRateRatio	Boolean	RW	14.16.16
mgtSettableComputeNeighborRateRatio	Boolean	RW	14.16.17
initialComputeMeanLinkDelay	Boolean	RW	14.16.18
currentComputeMeanLinkDelay	Boolean	R	14.16.19
useMgtSettableComputeMeanLinkDelay	Boolean	RW	14.16.20
mgtSettableComputeMeanLinkDelay	Boolean	RW	14.16.21
allowedLostResponses	UInteger8	RW	14.16.22
allowedFaults	UInteger8	RW	14.16.23
versionNumber	UInteger4	R	14.16.24
pdelayTruncatedTimestampsArray	UInteger48[4]	R	14.16.25
minorVersionNumber	UInteger4	R	14.16.26

[a] R = Read only access; RW = Read/write access.

14.17 Common Mean Link Delay Service Link Port Parameter Statistics Data Set (cmldsLinkPortStatisticsDS)

14.17.1 General

For every Link Port of the Common Mean Link Delay Service of a time-aware system, the cmldsLinkPortStatisticsDS provides counters associated with Link Port capabilities at a given time-aware system. The number of such statistics sets is the same as the value of cmldsDefaultDS.numberLinkPorts.

14.17.2 rxPdelayRequestCount

This counter increments every time a Pdelay_Req message is received, denoted by a transition to TRUE from FALSE of the rcvdPdelayReq variable of the MDPdelayResp state machine (see 11.2.20.2.1 and Figure 11-10) when in the WAITING_FOR_PDELAY_REQ or INITIAL_WAITING_FOR_PDELAY_REQ states.

14.17.3 rxPdelayResponseCount

This counter increments every time a Pdelay_Resp message is received, denoted by a transition to TRUE from FALSE of the rcvdPdelayResp variable of the MDPdelayReq state machine (see 11.2.19.2.2 and Figure 11-9) when in the WAITING_FOR_PDELAY_RESP state.

14.17.4 rxPdelayResponseFollowUpCount

This counter increments every time a Pdelay_Resp_Follow_Up message is received, denoted by a transition to TRUE from FALSE of the rcvdPdelayRespFollowUp variable of the MDPdelayReq state machine (see 11.2.19.2.4 and Figure 11-9) when in the WAITING_FOR_PDELAY_RESP_FOLLOW_UP state.

14.17.5 rxPTPPacketDiscardCount

This counter increments every time a PTP message of the Common Mean Link Delay Service is discarded, caused by the occurrence of any of the following conditions:

— A Pdelay_Resp message corresponding to a transmitted Pdelay_Req message is not received, denoted by a transition from the WAITING_FOR_PDELAY_RESP state to the RESET state of the MDPdelayReq state machine (see 11.2.19 and Figure 11-9).
— A Pdelay_Resp_Follow_Up message corresponding to a transmitted Pdelay_Req message is not received, denoted by a transition from the WAITING_FOR_PDELAY_RESP_FOLLOW_UP state to the RESET state of the MDPdelayReq state machine (see 11.2.19 and Figure 11-9).

14.17.6 pdelayAllowedLostResponsesExceededCount

This counter increments every time the value of the variable lostResponses (see 11.2.19.2.9) exceeds the value of the variable allowedLostResponses (see 11.2.13.4) in the RESET state of the MDPdelayReq state machine (see 11.2.19 and Figure 11-9).

14.17.7 txPdelayRequestCount

This counter increments every time a Pdelay_Req message is transmitted, denoted by entering the INITIAL_SEND_PDELAY_REQ or SEND_PDELAY_REQ states of the MDPdelayReq state machine (see 11.2.19 and Figure 11-9).

14.17.8 txPdelayResponseCount

This counter increments every time a Pdelay_Resp message is transmitted, denoted by the following events:

— A transition to TRUE from FALSE of the rcvdPdelayReq variable of the MDPdelayResp state machine (see 11.2.20.2.1 and Figure 11-10) when in the WAITING_FOR_PDELAY_REQ or INITIAL_WAITING_FOR_PDELAY_REQ states and
— The resulting entry to the SENT_PDELAY_RESP_WAITING_FOR_TIMESTAMP state.

14.17.9 txPdelayResponseFollowUpCount

This counter increments every time a Pdelay_Resp_Follow_Up message is transmitted, denoted by the following events:

— A transition to TRUE from FALSE of the rcvdMDTimestampReceiveMDPResp variable of the MDPdelayResp state machine (see 11.2.20.2.2 and Figure 11-10) when in the SENT_PDELAY_RESP_WAITING_FOR_TIMESTAMP state and
— The resulting entry to the WAITING_FOR_PDELAY_REQ state.

14.17.10 cmldsLinkPortStatisticsDS table

There is one cmldsLinkPortStatisticsDS table per Link Port of a time-aware system. The cmldsLinkPortStatisticsDS table contains a set of counters for each Link Port that supports the time-synchronization capability, as detailed in Table 14-19. Each table can be created or removed dynamically in implementations that support dynamic configuration of Link Ports and components.

Table 14-19—cmldsLinkPortStatisticsDS table

Name	Data type	Operations supported[a]	References
rxPdelayRequestCount	UInteger32	R	14.17.2
rxPdelayResponseCount	UInteger32	R	14.17.3
rxPdelayResponseFollowUpCount	UInteger32	R	14.17.4
rxPTPPacketDiscardCount	UInteger32	R	14.17.5
pdelayAllowedLostResponsesExceededCount	UInteger32	R	14.17.6
txPdelayRequestCount	UInteger32	R	14.17.7
txPdelayResponseCount	UInteger32	R	14.17.8
txPdelayResponseFollowUpCount	UInteger32	R	14.17.9

[a] R= Read only access.

14.18 Common Mean Link Delay Service Asymmetry Measurement Mode Parameter Data Set (cmldsAsymmetryMeasurementModeDS)

14.18.1 General

The cmldsAsymmetryMeasurementModeDS represents the capability to enable/disable the Asymmetry Compensation Measurement Procedure on a Link Port (see Annex G).

For every Link Port of the Common Mean Link Delay Service of a time-aware system, the cmldsAsymmetryMeasurementModeDS contains the single member asymmetryMeasurementMode, which is used to enable/disable the Asymmetry Compensation Measurement Procedure. The number of such data sets is the same as the numberLinkPorts value of the cmldsDefaultDS.

14.18.2 asymmetryMeasurementMode

The value is equal to the value of the Boolean asymmetryMeasurementMode (see G.3). For full-duplex IEEE 802.3 media, the value is TRUE if an asymmetry measurement is being performed for the link attached to this Link Port and FALSE otherwise. For all other media, the value shall be FALSE (see 10.2.5.2). Setting the managed object asymmetryMeasurementMode causes the Boolean asymmetryMeasurementMode to have the same value.

NOTE—If an asymmetry measurement is being performed for a link, asymmetryMeasurementMode must be TRUE for the Link Ports at each end of the link.

14.18.3 cmldsAsymmetryMeasurementModeDS table

There is one cmldsAsymmetryMeasurementModeDS table for all PTP Instances, per Link Port, as detailed in Table 14-20.

Table 14-20—cmldsAsymmetryMeasurementModeDS table

Name	Data type	Operations supported[a]	References
asymmetryMeasurementMode	Boolean	RW	14.18.2

[a] R = Read only access; RW = Read/write access.