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Transporting PTP messages (1588) over MPLS Networks
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Abstract

This document defines the method for transporting PTP messages (PDUs) over an MPLS network. The method allows for the easy identification of these PDUs at the port level to allow for port level processing of these PDUs in both LERs and LSRs.

The basic idea is to transport PTP messages inside dedicated MPLS LSPs. These LSPs only carry PTP messages and possibly Control and Management packets, but they do not carry customer traffic.

Two methods for transporting 1588 over MPLS are defined. The first method is to transport PTP messages directly over the dedicated MPLS LSP via UDP/IP encapsulation, which is suitable for IP/MPLS networks. The second method is to transport PTP messages inside a PW via Ethernet encapsulation, which is more suitable for MPLS-TP networks.

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The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC2119 [RFC2119].

When used in lower case, these words convey their typical use in common language, and are not to be interpreted as described in RFC2119 [RFC2119].

1. Introduction

The objective of Precision Time Protocol (PTP) is to synchronize independent clocks running on separate nodes of a distributed system. [IEEE] defines PTP messages for clock and time synchronization. The PTP messages include PTP PDUs over UDP/IP (Annex D and E of [IEEE]) and PTP PDUs over Ethernet (Annex F of [IEEE]). This document defines mapping and transport of the PTP messages defined in [IEEE] over MPLS networks.

PTP defines several clock types: ordinary clocks, boundary clocks, end-to-end transparent clocks, and peer-to-peer transparent clocks. One key attribute of all of these clocks is the recommendation for PTP messages processing to occur as close as possible to the actual transmission and reception at the physical port interface. This targets optimal time and/or frequency recovery by avoiding variable delay introduced by queues internal to the clocks. To facilitate the fast and efficient recognition of PTP messages at the port level when the PTP messages are carried over MPLS LSPs, this document defines the specific encapsulations that should be used. In addition, it can be expected that there will exist LSR/LEs where only a subset of the physical ports will have the port based PTP message processing capabilities. In order to ensure that the PTP carrying LSPs always enter and exit ports with this capability, routing extensions are defined to advertise this capability on a port basis and to allow for the establishment of LSPs that only transit such ports. While this path establishment restriction may be applied only at the LER ingress/egress ports, it becomes more important when using Transparent Clock capable LSRs in the path.

The port based PTP message processing involves PTP event message recognition. Once the PTP event messages are recognized they can be modified based on the reception or transmission timestamp. An alternative technique to actual packet modification could include the enforcement of a fixed delay time across the LSR to remove variability in the transit delay. This latter would be applicable in a LSR which does not contain a PTP transparent Clock function.

This document provides two methods for transporting PTP messages over MPLS. One is principally focused on an IP/MPLS environment and the second is focused on the MPLS-TP environment.

While the techniques included herein allow for the establishment of paths optimized to include PTP Timestamping capable links, the performance of the Slave clocks is outside the scope of this document.

2. Terminology

1588: The timing and synchronization as defined by IEEE 1588

PTP: The timing and synchronization protocol used by 1588

Master Clock: The source of 1588 timing to a set of slave clocks.

Master Port: A port on a ordinary or boundary clock that is in Master state. This is the source of timing toward slave ports.

Slave Clock: A receiver of 1588 timing from a master clock

Slave Port: A port on a boundary clock or ordinary clock that is receiving timing from a master clock.

Ordinary Clock: A device with a single PTP port.

Transparent Clock. A device that measures the time taken for a PTP event message to transit the device and then updates the correctionField of the message with this transit time.

Boundary Clock: A device with more than one PTP port. Generally boundary clocks will have one port in slave state to receive timing and then other ports in master state to re-distribute the timing.

PTP LSP: An LSP dedicated to carry PTP messages

PTP PW: A PW within a PTP LSP that is dedicated to carry PTP messages.

CW: Pseudowire Control Word

LAG: Link Aggregation

ECMP: Equal Cost Multipath

CF: Correction Field, a field inside certain PTP messages (message type 0-3) that holds the accumulative transit time inside intermediate switches

3. Problem Statement

When PTP messages are transported over MPLS networks, there is a need for PTP message processing at the physical port level. This requirement exists to minimum uncertainty in the transit delays. If PTP message processing occurs interior to the MPLS routers, then the variable delay introduced by queuing between the physical port and the PTP processing will add noise to the timing distribution. Port based processing applies at both the originating and terminating LERs and also at the intermediate LSRs if they support transparent clock functionality.

PTP messages over Ethernet or IP can always be tunneled over MPLS. However there is a requirement to limit the possible encapsulation options to simplify the PTP message processing required at the port level. This applies to all 1588 clock types implemented in MPLS routers. But this is particularly important in LSRs that provide transparent clock functionality.

When 1588-awareness is needed, PTP messages should not be transported over LSPs or PWs that are carrying customer traffic because LSRs perform Label switching based on the top label in the stack. To detect PTP messages inside such LSPs require special hardware to do deep packet inspection at line rate. Even if such hardware exists, the payload can't be deterministically identified by LSRs because the payload type is a context of the PW label and the PW label and its context are only known to the Edge routers (PEs); LSRs don't know what is a PW's payload (Ethernet, ATM, FR, CES, etc). Even if one restricts an LSP to only carry Ethernet PWs, the LSRs don't have the knowledge of whether PW Control Word (CW) is present or not and therefore can't deterministically identify the payload.

Therefore a generic method is defined in this document that does not require deep packet inspection at line rate, and can deterministically identify PTP messages. The defined method is applicable to both MPLS and MPLS-TP networks.

4. 1588 over MPLS Architecture

1588 communication flows map onto MPLS nodes as follows: 1588 messages are exchange between PTP ports on Ordinary and boundary clocks. Transparent clocks do not terminate the PTP messages but they do modify the contents of the PTP messages as they transit across the Transparent clock. SO Ordinary and boundary clocks would exist within LERs as they are the termination points for the PTP messages carried in MPLS. Transparent clocks would exist within LSRs as they do not terminate the PTP message exchange.

Perhaps a picture would be good here.

5. Dedicated LSPs for PTP messages

Many methods were considered for identifying the 1588 messages when they are encapsulated in MPLS such as by using GAL/ACH or a new reserved label. These methods were not attractive since they either required deep packet inspection and snooping at line rate or they required use of a scarce new reserved label. Also one of the goals was to reuse existing OAM and protection mechanisms.

The method defined in this document can be used by LER/LSRs to identify PTP messages in MPLS tunnels by using dedicated LSPs to carry PTP messages.

Compliant implementations MUST use dedicated LSPs to carry PTP messages over MPLS. These LSPs are herein referred to as "PTP LSPs" and the labels associated with these LSPs as "PTP labels". These LSPs could be P2P or P2MP LSPs. The PTP LSP between Master Clocks and Slave Clocks MAY be P2MP or P2P LSP while the PTP LSP between each Slave Clock and Master Clock SHOULD be P2P LSP. The PTP LSP between a Master Clock and a Slave Clock and the PTP LSP between the same Slave Clock and Master Clock MUST be co-routed. Alternatively, a single bidirectional co-routed LSP can be used. The PTP LSP MAY be MPLS LSP or MPLS-TP LSP. This co-routing is required to limit differences in the delays in the Master clock to Slave clock direction compared to the Slave clock to Master clock direction.

The PTP LSPs could be configured or signaled via RSVP-TE/GMPLS. New RSVP-TE/GMPLS TLVs and objects are defined in this document to indicate that these LSPs are PTP LSPs.

The PTP LSPs MAY carry essential MPLS/MPLS-TP control plane traffic such as BFD and LSP Ping but the LSP user plane traffic MUST be PTP only.

6. 1588 over MPLS Encapsulation

This document defines two methods for carrying PTP messages over MPLS. The first method is carrying IP encapsulated PTP messages over PTP LSPs and the second method is to carry PTP messages over dedicated Ethernet PWs (called PTP PWs) inside PTP LSPs.

6.1. 1588 over LSP Encapsulation

The simplest method of transporting PTP messages over MPLS is to encapsulate PTP PDUs in UDP/IP and then encapsulate them in PTP LSP. The 1588 over LSP format is shown in Figure 1.

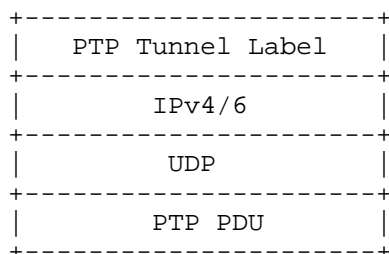


Figure 1 - 1588 over LSP Encapsulation

This encapsulation is very simple and is useful when the networks between 1588 Master Clock and Slave Clock are IP/MPLS networks.

In order for an LSR to process PTP messages, the PTP Label must be the top label of the label stack.

The UDP/IP encapsulation of PTP MUST follow Annex D and E of [IEEE].

6.2. 1588 over PW Encapsulation

Another method of transporting 1588 over MPLS networks is by encapsulating PTP PDUs in Ethernet and then transporting them over Ethernet PW (PTP PW) as defined in [RFC4448], which in turn is transported over PTP LSPs. Alternatively PTP PDUs MAY be encapsulated in UDP/IP/Ethernet and then transported over Ethernet PW.

Both Raw and Tagged modes for Ethernet PW are permitted. The 1588 over PW format is shown in Figure 2.

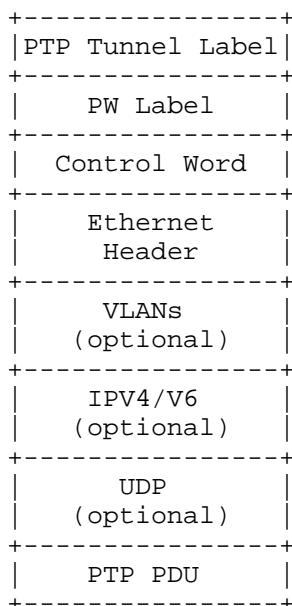


Figure 2 - 1588 over PW Encapsulation

The Control Word (CW) as specified in [RFC4448] SHOULD be used to ensure a more robust detection of PTP messages inside the MPLS packet. If CW is used, the use of Sequence number is optional.

The use of VLAN and UDP/IP are optional. Note that 1 or 2 VLANs MAY exist in the PW payload.

In order for an LSR to process PTP messages, the top label of the label stack (the Tunnel Label) MUST be from PTP label range. However in some applications the PW label may be the top label in the stack, such as cases where there is only one-hop between PEs or in case of PHP. In such cases, the PW label SHOULD be chosen from the PTP Label range.

In order to ensure congruency between the two directions of PTP message flow, ECMP should not be used for the PTP LSPs. Therefore, no Entropy label [I-D.ietf-pwe3-fat-pw] is necessary and it SHOULD NOT be present in the stack.

The Ethernet encapsulation of PTP MUST follow Annex F of [IEEE] and the UDP/IP encapsulation of PTP MUST follow Annex D and E of [IEEE].

For 1588 over MPLS encapsulations that are PW based, there are some cases in which the PTP LSP label may not be present:

- o When PHP is applied to the PTP LSP, and the packet is received without PTP LSP label at PW termination point .
- o When the PW is established between two routers directly connected to each other and no PTP LSP is needed.

In such cases it is required for a router to identify these packets as PTP packets. This would require the PW label to also be a label that is distributed specifically for carrying PTP traffic (aka PTP PW label). Therefore there is a need to add extension to LDP/BGP PW label distribution protocol to indicate that a PW label is a PTP PW labels.

7. 1588 Message Transport

1588 protocol comprises of the following message types:

- o Announce
- o SYNC
- o FOLLOW UP
- o DELAY_REQ (Delay Request)
- o DELAY_RESP (Delay Response)
- o PDELAY_REQ (Peer Delay Request)
- o PDELAY_RESP (Peer Delay Response)
- o PDELAY_RESP_FOLLOW_UP (Peer Delay Response Follow up)
- o Management
- o Signaling

A subset of PTP message types that require timestamp processing are called Event messages:

- o SYNC
- o DELAY_REQ (Delay Request)
- o PDELAY_REQ (Peer Delay Request)
- o PDELAY_RESP (Peer Delay Response)

SYNC and DELAY_REQ are exchanged between Master Clock and Slave Clock and MUST be transported over PTP LSPs. PDELAY_REQ and PDELAY_RESP are exchanged between adjacent PTP clocks (i.e. Master, Slave, Boundary, or Transparent) and MAY be transported over single hop PTP LSPs. If Two Step PTP clocks are present, then the FOLLOW_UP, DELAY_RESP, and PDELAY_RESP_FOLLOW_UP messages must also be transported over the PTP LSPs.

For a given instance of 1588 protocol, SYNC and DELAY_REQ MUST be transported over two PTP LSPs that are in opposite directions. These PTP LSPs, which are in opposite directions MUST be congruent and co-routed. Alternatively, a single bidirectional co-routed LSP can be used.

Except as indicated above for the two-step PTP clocks, Non-Event PTP message types don't need to be processed by intermediate routers. These message types MAY be carried in PTP Tunnel LSPs.

8. Protection and Redundancy

In order to ensure continuous uninterrupted operation of 1588 Slaves, usually as a general practice, Redundant Masters are tracked by each Slave. It is the responsibility of the network operator to ensure that physically disjoint PTP tunnels that don't share any link are used between the redundant Masters and a Slave.

When redundant Masters are tracked by a Slave, any prolonged PTP LSP or PTP PW outage will trigger the Slave Clock to switch to the Redundant Master Clock. However LSP/PW protection such as Linear Protection Switching (1:1,1+1), Ring protection switching or MPLS Fast Reroute (FRR) SHOULD still be used to provide resiliency to individual network segment failures..

Note that any protection or reroute mechanism that adds additional label to the label stack, such as Facility Backup Fast Reroute, MUST ensure that the pushed label is a PTP Label to ensure recognition of the MPLS frame as containing PTP messages as it transits the backup path..

9. ECMP

To ensure the optimal operation of 1588 Slave clocks and avoid errors introduced by forward and reverse path delay asymmetry, the physical path for PTP messages from Master Clock to Slave Clock and vice versa must be the same for all PTP messages listed in section 7 and must not change even in the presence of ECMP in the MPLS network.

To ensure the forward and reverse paths are the same PTP LSPs and PWs MUST NOT be subject to ECMP.

10. OAM, Control and Management

In order to manage PTP LSPs and PTP PWs, they MAY carry OAM, Control and Management messages. These control and management messages can be differentiated from PTP messages via already defined IETF methods.

In particular BFD [RFC5880], [RFC5884] and LSP-Ping [RFC4389] MAY run over PTP LSPs via UDP/IP encapsulation or via GAL/G-ACH. These Management protocols are easily identified by the UDP Destination Port number or by GAL/ACH respectively.

Also BFD, LSP-Ping and other Management messages MAY run over PTP PW via one of the defined VCCVs (Type 1, 2 or 3) [RFC5085]. In this case G-ACH, Router Alert Label (RAL), or PW label (TTL=1) are used to identify such management messages.

11. QoS Considerations

In network deployments where not every LSR/LER is PTP-aware, then it is important to reduce the impact of the non-PTP-aware LSR/LERs on the timing recovery in the slave clock. The PTP messages are time critical and must be treated with the highest priority. Therefore 1588 over MPLS messages must be treated with the highest priority in the routers. This can be achieved by proper setup of PTP tunnels. It is recommended that the PTP LSPs are setup and marked properly to indicate EF-PHB for the CoS and Green for drop eligibility.

In network deployments where every LSR/LER supports PTP LSPs, then it MAY NOT be required to apply the same level of prioritization as specified above.

12. FCS Recalculation

Ethernet FCS of the outer encapsulation **MUST** be recalculated at every LSR that performs the Transparent Clock processing and FCS retention for the payload Ethernet described in [RFC4720] **MUST NOT** be used.

13. UDP Checksum Correction

For UDP/IP encapsulation mode of 1588 over MPLS, the UDP checksum is optional when used for IPv4 encapsulation and mandatory in case of IPv6. When IPv4/v6 UDP checksum is used each 1588-aware LSR must either incrementally update the UDP checksum after the CF update or should verify the UDP checksum on reception from upstream and recalculate the checksum completely on transmission after CF update to downstream node.

14. Routing extensions for 1588aware LSRs

MPLS-TE routing relies on extensions to OSPF [RFC2328] [RFC5340] and IS-IS [ISO] [RFC1195] in order to advertise Traffic Engineering (TE) link information used for constraint-based routing.

Indeed, it is useful to advertise data plane TE router link capabilities, such as the capability for a router to be 1588-aware. This capability **MUST** then be taken into account during path computation to prefer or even require links that advertise themselves as 1588-aware. In this way the path can ensure the entry and exit points into the LERs and, if desired, the links into the LSRs are able to perform port based timestamping thus minimizing their impact on the performance of the slave clock.

For this purpose, the following sections specify extensions to OSPF and IS-IS in order to advertise 1588 aware capabilities of a link.

14.1. 1588aware Link Capability for OSPF

OSPF uses the Link TLV (Type 2) that is itself carried within either the Traffic Engineering LSA specified in [RFC3630] or the OSPFv3 Intra-Area-TE LSA (function code 10) defined in [RFC5329] to advertise the TE related information for the locally attached router links. For an LSA Type 10, one LSA can contain one Link TLV information for a single link. This extension defines a new 1588-aware capability sub-TLV that can be carried as part of the Link TLV.

The 1588-aware capability sub-TLV is **OPTIONAL** and **MUST NOT** appear more than once within the Link TLV. If a second instance of the 1588-aware capability sub-TLV is present, the receiving system **MUST** only process the first instance of the sub-TLV. It is defined as follows:

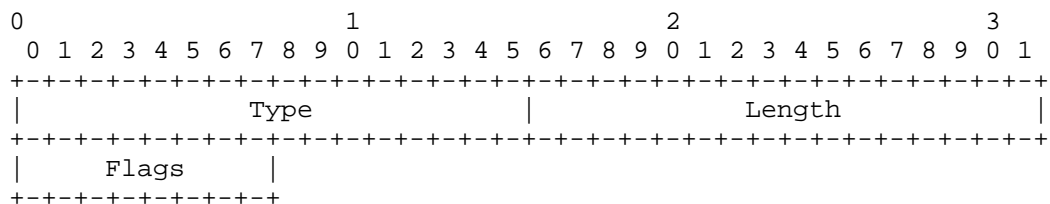


Figure 3: 1588-aware Capability TLV

Where:

Type, 16 bits: 1588-aware Capability TLV where the value is TBD

Length, 16 bits: Gives the length of the flags field in octets, and is currently set to 1

Flags, 8 bits: The bits are defined least-significant-bit (LSB) first, so bit 7 is the least significant bit of the flags octet.

```

  0 1 2 3 4 5 6 7
+---+---+---+---+
|   Reserved   |C|
+---+---+---+---+

```

Figure 4: Flags Format

Correction (C) field Update field, 1 bit: Setting the C bit to 1 indicates that the link is capable of recognizing the PTP event packets and can compensate for residence time by updating the PTP packet Correction Field. When this is set to 0, it means that this link cannot perform the residence time correction but is capable of performing MPLS frame forwarding of the frames with PTP labels using a method that support the end to end delivery of accurate timing. The exact method is not defined herein.

Reserved, 7 bits: Reserved for future use. The reserved bits must be ignored by the receiver.

The 1588-aware Capability sub-TLV is applicable to both OSPFv2 and OSPFv3.

14.2. 1588aware Link Capability for IS-IS

The IS-IS Traffic Engineering [RFC3784] defines the intra-area traffic engineering enhancements and uses the Extended IS Reachability TLV (Type 22) [RFC5305] to carry the per link TE-related information. This extension defines a new 1588-aware capability sub-TLV that can be carried as part of the Extended IS Reachability TLV.

The 1588-aware capability sub-TLV is OPTIONAL and MUST NOT appear more than once within the Extended IS Reachability TLV or the Multi-Topology (MT) Intermediate Systems TLV (type 222) specified in [RFC5120]. If a second instance of the 1588-aware capability sub-TLV is present, the receiving system MUST only process the first instance of the sub-TLV.

The format of the IS-IS 1588-aware sub-TLV is identical to the TLV format used by the Traffic Engineering Extensions to IS-IS [RFC3784]. That is, the TLV is comprised of 1 octet for the type, 1 octet

specifying the TLV length, and a value field. The Length field defines the length of the value portion in octets.

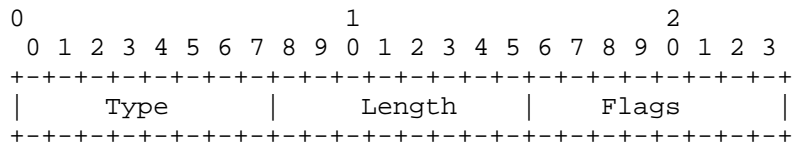


Figure 5: 1588-aware Capability sub-TLV

Where:

Type, 8 bits: 1588-aware Capability sub-TLV where the value is TBD

Length, 8 bits: Gives the length of the flags field in octets, and is currently set to 1

Flags, 8 bits: The bits are defined least-significant-bit (LSB) first, so bit 7 is the least significant bit of the flags octet.

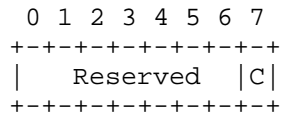


Figure 6: Flags Format

Correction (C) field Update field, 1 bit: Setting the C bit to 1 indicates that the link is capable of recognizing the PTP event packets and can compensate for residence time by updating the PTP packet Correction Field. When this is set to 0, it means that this link cannot perform the residence time correction but is capable of performing MPLS frame forwarding of the frames with PTP labels using a method that support the end to end delivery of accurate timing. The exact method is not defined herein.

Reserved, 7 bits: Reserved for future use. The reserved bits must be ignored by the receiver.

15. RSVP-TE Extensions for support of 1588

RSVP-TE signaling MAY be used to setup the PTP LSPs. A new RSVP object is defined to signal that this is a PTP LSP. The OFFSET to the start of the PTP message header MAY also be signaled. Implementations can trivially locate the correctionField (CF) location given this information. The OFFSET points to the start of the PTP header as a node may want to check the PTP messageType before it touches the correctionField (CF). The OFFSET is counted from TBD

The LSRs that receive and process the RSVP-TE/GMPLS messages MAY use the OFFSET to locate the start of the PTP message header.

Note that the new object/TLV Must be ignored by LSRs that are not compliant to this specification.

The new RSVP 1588_PTP_LSP object should be included in signaling PTP LSPs and is defined as follows:

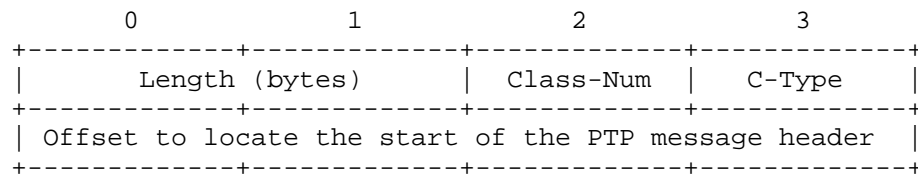


Figure 7: RSVP 1588_PTP_LSP object

The ingress LSR MUST include this object in the RSVP PATH Message. It is just a normal RSVP path that is exclusively set up for PTP messages

16. Behavior of LER/LSR

16.1. Behavior of 1588-aware LER

A 1588-aware LER advertises it's 1588-awareness via the OSPF procedure explained in earlier section of this specification. The 1588-aware LER then signals PTP LSPs by including the 1588_PTP_LSP object in the RSVP-TE signaling.

When a 1588 message is received from a non-MPLS interface, the LER MUST redirect them to a previously established PTP LSP. When a 1588 over MPLS message is received from an MPLS interface, the processing is similar to 1588-aware LSR processing.

16.2. Behavior of 1588-aware LSR

1588-aware LSRs are LSRs that understand the 1588_PTP_LSP RSVP object and can perform 1588 processing (e.g. Transparent Clock processing).

A 1588-aware LSR advertises it's 1588-awareness via the OSPF procedure explained in earlier section of this specification.

When a 1588-aware LSR distributes a label for PTP LSP, it maintains this information. When the 1588-aware LSR receives an MPLS packet, it performs a label lookup and if the label lookup indicates it is a PTP label then further parsing must be done to positively identify that the payload is 1588 and not OAM, BFD or control and management. Ruling out non-1588 messages can easily be done when parsing indicates the presence of GAL, ACH or VCCV (Type 1, 2, 3) or when the UDP port number does not match one of the 1588 UDP port numbers.

After a 1588 message is positively identified in a PTP LSP, the PTP message type indicates whether any timestamp processing is required. After 1588 processing the packet is forwarded as a normal MPLS packet to downstream node.

16.3. Behavior of non-1588-aware LSR

It is most beneficial that all LSRs in the path of a PTP LSP be 1588-aware LSRs. This would ensure the highest quality time and clock synchronization by 1588 Slave Clocks. However, this specification does not mandate that all LSRs in path of a PTP LSP be 1588-aware.

Non-1588-aware LSRs are LSRs that either don't have the capability to process 1588 packets (e.g. perform Transparent Clock processing) or don't understand the 1588_PTP_LSP RSVP object.

Non-1588-aware LSRs ignore the RSVP 1588_PTP_LSP object and just

switch the MPLS packets carrying 1588 messages as data packets and don't perform any timestamp related processing. However as explained in QoS section the 1588 over MPLS packets MUST be still be treated with the highest priority.

17. Other considerations

The use of Explicit Null (Label= 0 or 2) is acceptable as long as either the Explicit Null label is the bottom of stack label (applicable only to UDP/IP encapsulation) or the label below the Explicit Null label is a PTP label.

The use of Penultimate Hop Pop (PHP) is acceptable as long as either the PHP label is the bottom of stack label (applicable only to UDP/IP encapsulation) or the label below the PHP label is a PTP label.

18. Security Considerations

MPLS PW security considerations in general are discussed in [RFC3985] and [RFC4447], and those considerations also apply to this document.

An experimental security protocol is defined in [IEEE]. The PTP security extension and protocol provides group source authentication, message integrity, and replay attack protection for PTP messages.

19. Acknowledgements

The authors would like to thank Luca Martini, Ron Cohen, Yaakov Stein, Tal Mizrahi and other members of the TICTOC WG for reviewing and providing feedback on this draft.

20. IANA Considerations

20.1. IANA Considerations for OSPF

IANA has defined a sub-registry for the sub-TLVs carried in an OSPF TE Link TLV (type 2). IANA is requested to assign a new sub-TLV codepoint for the 1588aware capability sub-TLV carried within the Router Link TLV.

Value	Sub-TLV	References
-----	-----	-----
TBD	1588aware node sub-TLV	(this document)

20.2. IANA Considerations for IS-IS

IANA has defined a sub-registry for the sub-TLVs carried in the IS-IS Extended IS Reacability TLV. IANA is requested to assign a new sub-TLV code-point for the 1588aware capability sub-TLV carried within the Extended IS Reacability TLV.

Value	Sub-TLV	References
-----	-----	-----
TBD	1588aware node sub-TLV	(this document)

20.3. IANA Considerations for RSVP

IANA is requested to assign a new Class Number for 1588 PTP LSP object that is used to signal PTP LSPs.

1588 PTP LSP Object

Class-Num of type 11bbbbbb

Suggested value TBD

Defined CType: 1 (1588 PTP LSP)

21. References

21.1. Normative References

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Precision Time Protocol Version 2 (PTPv2)
Management Information Base
draft-ietf-tictoc-ntp-mib-02.txt

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Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in TCP/IP-based internets. In particular, it defines objects for managing networks using Precision Time Protocol.

This memo specifies a MIB module in a manner that is both compliant to the SNMPv2 SMI, and semantically identical to the peer SNMPv1 definitions.

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1. Introduction

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet Community. In particular, it describes managed objects used for managing PTP devices including the ordinary clock, transparent clock, boundary clocks.

This MIB is restricted to reading standard PTP data elements, as described in [IEEE 1588-2008]. It is envisioned this MIB will complement other managed objects to be defined to monitor, measure the performance of the PTP devices and telecom clocks. Those objects are considered out of scope for the current draft.

Similarly, this MIB is read-only and not intended to provide the ability to configure PTP clocks. Since PTP clocks are often embedded in other network elements such as routers, switches and gateways, this ability is generally provided via the configuration interface for the network element.

1.1. Relationship to other Profiles and MIBs

This MIB is intended to be used with the default PTP profile described in [IEEE 1588-2008], and the Telecom Profile described in [G.8265.1], when running over the IP network layer. As stated above, it is envisioned this MIB will complement other managed objects to be defined to monitor, measure the performance of the PTP devices and telecom clocks.

Some other PTP profiles have their own MIBs defined as part of the profile, and this MIB is not intended to replace those MIBs.

1.2. Change Log

This section tracks changes made to the revisions of the Internet Drafts of this document. It will be **deleted** when the document is published as an RFC. This section tracks changes made to the revisions of the Internet Drafts of this document. It will be **deleted** when the document is published as an RFC.

draft-vinay-tictoc-ntp-mib

-00 Mar 11 Initial version; showed structure of MIB

draft-ietf-tictoc-ntp-mib

-00 Jul 11 First full, syntactically correct and compileable MIB

-01 Jan 12 Revised following comments from Bert Wijnen:

- revised introduction to clarify the scope, and the relationship to other MIBs and profiles
- changed name to "ntpbases"
- corrected some data types
- corrected references and typos

-02 Jul 12 Revised following comment at IETF83:

- changed "ntpbasesClockPortRunningIPversion" to the more generic "ntpbasesClockPortRunningTransport", covering all transport types defined in [IEEE 1588-2008] (i.e. IPv4, IPv6, Ethernet, DeviceNet and ControlNet).
- changed addresses associated with transports from "InetAddress" (for the IP transport) to a string, to allow for the different transport types.

2. The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- o An overall architecture, described in STD62, [RFC 3411].
- o Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIV1 and described in STD 16: [RFC 1155], [RFC 1212] and [RFC 1215]. The second version, called SMIV2, is described in STD 58: [RFC 2578], [RFC 2579] and [RFC 2580].
- o Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in STD 15 [RFC 1157]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in [RFC 1901] and [RFC 1906]. The third version of the message protocol is called SNMPv3 and described in STD62: [RFC 3417], [RFC 3412] and [RFC 3414].
- o Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in STD 15 [RFC 1157]. A second set of protocol operations and associated PDU formats is described in STD 62 [RFC 3416].
- o A set of fundamental applications described in STD 62 [RFC 3413] and the view-based access control mechanism described in STD 62 [RFC 3415].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMIV2. A MIB conforming to the SMIV1 can be produced through the appropriate translations. The resulting translated MIB must be semantically equivalent, except where objects or events are omitted because no translation is possible (e.g., use of Counter64). Some machine readable information in SMIV2 will be converted into textual descriptions in SMIV1 during the translation process. However, this loss of machine readable information is not considered to change the semantics of the MIB.

3. Overview

The objects defined in this MIB are to be used when describing the Precision Time Protocol (PTPv2).

4. IETF PTP MIB Definition

PTPBASE-MIB DEFINITIONS ::= BEGIN

IMPORTS

```
MODULE-IDENTITY,
OBJECT-TYPE,
Integer32,
Gauge32,
Unsigned32,
Counter32,
Counter64
    FROM SNMPv2-SMI
OBJECT-GROUP,
MODULE-COMPLIANCE
    FROM SNMPv2-CONF
TEXTUAL-CONVENTION,
TruthValue,
DisplayString
    FROM SNMPv2-TC
InterfaceIndexOrZero
    FROM IF-MIB;
```

ptpbaseMIB MODULE-IDENTITY

```
LAST-UPDATED      "201201230000Z"
ORGANIZATION      "TICTOC Working Group"
CONTACT-INFO
    "WG Email: tictoc@ietf.org

    Vinay Shankarkumar
    Cisco Systems,
    Email: vinays@cisco.com

    Laurent Montini,
    Cisco Systems,
    Email: lmontini@cisco.com"
```


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Greg Dowd,
Symmetricom Inc.,
Email: gdowd@symmetricom.com"

DESCRIPTION

"The MIB module for PTP version 2 (IEEE Std. 1588(TM)-2008)

Overview of PTP version 2 (IEEE Std. 1588(TM)-2008)

[IEEE 1588-2008] defines a protocol enabling precise synchronization of clocks in measurement and control systems implemented with packet-based networks, the Precision Time Protocol Version 2 (PTPv2). This MIB does not address the earlier version IEEE Std. 1588(TM)-2002 (PTPv1). The protocol is applicable to network elements communicating using IP. The protocol enables heterogeneous systems that include clocks of various inherent precision, resolution, and stability to synchronize to a grandmaster clock.

The protocol supports system-wide synchronization accuracy in the sub-microsecond range with minimal network and local clock computing resources. [IEEE 1588-2008] uses UDP/IP or Ethernet and can be adapted to other mappings. It includes formal mechanisms for message extensions, higher sampling rates, correction for asymmetry, a clock type to reduce error accumulation in large topologies, and specifications on how to incorporate the resulting additional data into the synchronization protocol. The [IEEE 1588-2008] defines conformance and management capability also.

MIB description

This MIB is to support the Precision Time Protocol version 2 (PTPv2, hereafter designated as PTP) features of network element system devices, when using the default PTP profile described in [IEEE 1588-2008], or the Telecom Profile described in [G.8265.1], when running over the IP network layer.

It is envisioned this MIB will complement other managed objects to be defined to monitor, measure the performance of the PTP devices and telecom clocks.

Some other PTP profiles have their own MIBs defined as part of the profile, and this MIB is not intended to replace those MIBs.

Acronyms:

ARB	Arbitrary Timescale
E2E	End-to-End
EUI	Extended Unique Identifier.
GPS	Global Positioning System
IANA	Internet Assigned Numbers Authority
IP	Internet Protocol
MAC	Media Access Control according to [IEEE 802.3-2008]
NIST	National Institute of Standards and Technology
NTP	Network Time Protocol (see IETF [RFC 5905])
OUI	Organizational Unique Identifier (allocated by the IEEE)
P2P	Peer-to-Peer
PTP	Precision Time Protocol
TAI	International Atomic Time
TC	Transparent Clock
UDP	User Datagram Protocol
UTC	Coordinated Universal Time

References:

- [IEEE 1588-2008] IEEE Standard for A Precision Clock Synchronization Protocol for Networked Measurement and Control Systems, IEEE Std. 1588(TM)-2008, 24 July 2008.
- [G.8265.1] Precision Time Protocol Telecom Profile for Frequency Synchronization, ITU-T Recommendation G.8265.1, October 2010.

As defined in [IEEE 1588-2008]:

Accuracy:

The mean of the time or frequency error between the clock under test and a perfect reference clock, over an ensemble of

measurements. Stability is a measure of how the mean varies with respect to variables such as time, temperature, and so on, while the precision is a measure of the deviation of the error from the mean.

Atomic process:

A process is atomic if the values of all inputs to the process are not permitted to change until all of the results of the process are instantiated, and the outputs of the process are not visible to other processes until the processing of each output is complete.

Boundary clock:

A clock that has multiple Precision Time Protocol (PTP) ports in a domain and maintains the timescale used in the domain. It may serve as the source of time, i.e., be a master clock, and may synchronize to another clock, i.e., be a slave clock.

Boundary node clock:

A clock that has multiple Precision Time Protocol (PTP) ports in a domain and maintains the timescale used in the domain. It differs from a boundary clock in that the clock roles can change.

Clock:

A node participating in the Precision Time Protocol (PTP) that is capable of providing a measurement of the passage of time since a defined epoch.

Domain:

A logical grouping of clocks that synchronize to each other using the protocol, but that are not necessarily synchronized to clocks in another domain.

End-to-end transparent clock:

A transparent clock that supports the use of the end-to-end delay measurement mechanism between slave clocks and the master clock. Each node must measure the residence time of PTP event messages and accumulate it in Correction Field.

Epoch:

The origin of a timescale.

Event:

An abstraction of the mechanism by which signals or conditions are generated and represented.

Foreign master:

An ordinary or boundary clock sending Announce messages to another clock that is not the current master recognized by the other clock.

Grandmaster clock:

Within a domain, a clock that is the ultimate source of time for clock synchronization using the protocol.

Holdover:

A clock previously synchronized/syntonized to another clock (normally a primary reference or a master clock) but now free-running based on its own internal oscillator, whose frequency is being adjusted using data acquired while it had been synchronized/syntonized to the other clock. It is said to be in holdover or in the holdover mode, as long as it is within its accuracy requirements.

Link:

A network segment between two Precision Time Protocol ports supporting the peer delay mechanism of this standard. The peer delay mechanism is designed to measure the propagation time over such a link.

Management node:

A device that configures and monitors clocks.

Master clock:

In the context of a single Precision Time Protocol communication path, a clock that is the source of time to which all other clocks on that path synchronize.

Message timestamp point:

A point within a Precision Time Protocol event message serving as a reference point in the message. A timestamp is defined by the instant a message timestamp point passes the reference plane of a clock.

Multicast communication:

A communication model in which each Precision Time Protocol message sent from any PTP port is capable of being received and processed by all PTP ports on the same PTP communication path.

Node:

A device that can issue or receive Precision Time Protocol communications on a network.

One-step clock:

A clock that provides time information using a single event message.

On-pass support:

Indicates that each node in the synchronization chain from master to slave can support IEEE-1588.

Ordinary clock:

A clock that has a single Precision Time Protocol port in a domain and maintains the timescale used in the domain. It may serve as a source of time, i.e., be a master clock, or may synchronize to another clock, i.e., be a slave clock.

Parent clock:

The master clock to which a clock is synchronized.

Peer-to-peer transparent clock:

A transparent clock that, in addition to providing Precision Time Protocol event transit time information, also provides corrections for the propagation delay of the link connected to the port receiving the PTP event message. In the presence of peer-to-peer transparent clocks, delay measurements between slave clocks and the master clock are performed using the peer-to-peer delay measurement mechanism.

Phase change rate:

The observed rate of change in the measured time with respect to the reference time. The phase change rate is equal to the fractional frequency offset between the measured frequency and the reference frequency.

PortNumber:

An index identifying a specific Precision Time Protocol port on a PTP node.

Primary reference:

A source of time and or frequency that is traceable to international standards.

Profile:

The set of allowed Precision Time Protocol features applicable to a device.

Precision Time Protocol communication:

Information used in the operation of the protocol, transmitted in a PTP message over a PTP communication path.

Precision Time Protocol communication path:

The signaling path portion of a particular network enabling direct communication among ordinary and boundary clocks.

Precision Time Protocol node:

PTP ordinary, boundary, or transparent clock or a device that generates or parses PTP messages.

Precision Time Protocol port:

A logical access point of a clock for PTP communications to the communications network.

Recognized standard time source:

A recognized standard time source is a source external to Precision Time Protocol that provides time and/or frequency as appropriate that is traceable to the international standards laboratories maintaining clocks that form the basis for the International Atomic Time and Universal Coordinated Time timescales. Examples of these are GPS, NTP, and NIST timeservers.

Requestor:

The port implementing the peer-to-peer delay mechanism that initiates the mechanism by sending a Pdelay_Req message.

Responder:

The port responding to the receipt of a Pdelay_Req message as part of the operation of the peer-to-peer delay mechanism.

Synchronized clocks:

Two clocks are synchronized to a specified uncertainty if they have the same epoch and their measurements of the time of a single event at an arbitrary time differ by no more than that uncertainty.

Synchronized clocks:

Two clocks are synchronized if the duration of the second is the same on both, which means the time as measured by each advances at the same rate. They may or may not share the same epoch.

Timeout:

A mechanism for terminating requested activity that, at least from the requester's perspective, does not complete within the specified time.

Timescale:

A linear measure of time from an epoch.

Traceability:

A property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties.

Translation device:

A boundary clock or, in some cases, a transparent clock that translates the protocol messages between regions implementing different transport and messaging protocols, between different versions of [IEEE 1588-2008], or different PTP profiles.

Transparent clock:

A device that measures the time taken for a Precision Time Protocol event message to transit the device and provides this information to clocks receiving this PTP event message.

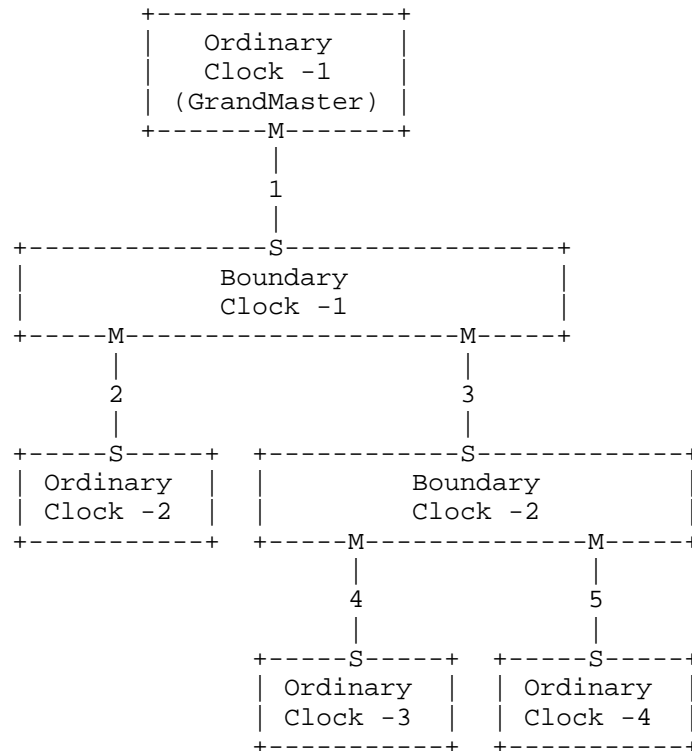
Two-step clock:

A clock that provides time information using the combination of an event message and a subsequent general message.

The table below specifies the object formats of the various textual conventions used.

Data type mapping	Textual Convention	SYNTAX
5.3.2 TimeInterval	ClockTimeInterval	OCTET STRING(SIZE(1..255))
5.3.3 Timestamp	ClockTimestamp	OCTET STRING(SIZE(6))
5.3.4 ClockIdentity	ClockIdentity	OCTET STRING(SIZE(1..255))
5.3.5 PortIdentity	ClockPortNumber	INTEGER(1..65535)
5.3.7 ClockQuality	ClockQualityClassType	

Simple master-slave hierarchy, section 6.6.2.4 [IEEE 1588-2008]:



Grandmaster

Boundary Clock(0-N) Ordinary Clocks(0-N)
Ordinary Clocks(0-N)

Relationship cardinality:

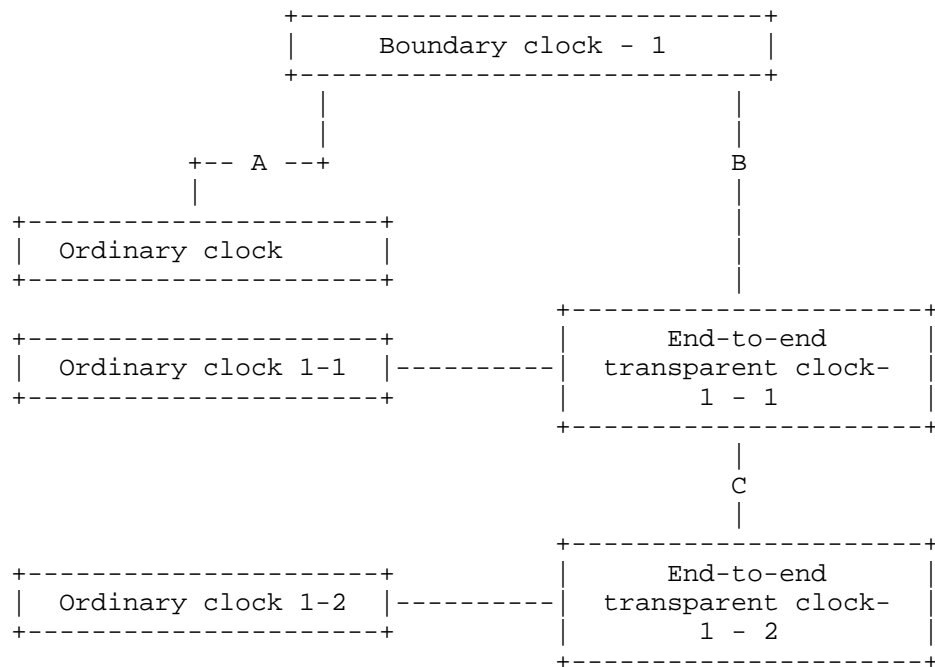
PTP system 1 : N PTP Clocks

PTP Clock 1 : 1 Domain

PTP Clock 1 : N PTP Ports

PTP Ports N : M Physical Ports (interface in IF-MIB)

Transparent clock diagram, section 6.7.1.3 of [IEEE 1588-2008]:



The MIB refers to the sections of [IEEE 1588-2008]."

-- revision log

::= { mib-2 XXX }_-- XXX to be assigned by IANA

ClockDomainType ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"

STATUS current

DESCRIPTION

"The Domain is identified by an integer, the domainNumber, in the range of 0 to 255. An integer value that is used to assign each PTP device to a particular domain. The following values define the valid domains.

Value	Definition
-----	-----
0	Default domain
1	Alternate domain 1
2	Alternate domain 2
3	Alternate domain 3
4 - 127	User-defined domains
128 - 255	Reserved"

REFERENCE "Section 7.1 Domains, Table 2 of [IEEE 1588-2008]"

SYNTAX Unsigned32 (0..255)

ClockIdentity ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The clock Identity is an 8-octet array and will be presented in the form of a character array. The value of the ClockIdentity should be taken from the IEEE EUI-64 individual assigned numbers as indicated in Section 7.5.2.2.2 of [IEEE 1588-2008]. The EUI-64 address is divided into the following fields:

OUI bytes (0-2)

Extension identifier bytes (3-7)

The clock identifier can be constructed from existing EUI-48 assignments and here is an abbreviated example extracted from section 7.5.2.2.2 [IEEE 1588-2008].

Company EUI-48 = 0xACDE4823456716

EUI-64 = ACDE48FFFE23456716

It is important to note the IEEE Registration Authority has deprecated the use of MAC-48 in any new design."

REFERENCE "Section 7.5.2.2.1 of [IEEE 1588-2008]"
SYNTAX OCTET STRING (SIZE (1..255))

ClockIntervalBase2 ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"

STATUS current

DESCRIPTION

"The interval included in message types Announce, Sync, Delay_Req, and Pdelay_Req as indicated in section 7.7.2.1 of [IEEE 1588-2008].

The mean time interval between successive messages shall be represented as the logarithm to the base 2 of this time interval measured in seconds on the local clock of the device sending the message. The values of these logarithmic attributes shall be selected from integers in the range -128 to 127 subject to further limits established in an applicable PTP profile."

REFERENCE "Section 7.7.2.1 General interval specification of [IEEE 1588-2008]"
SYNTAX Integer32 (-128..127)

ClockMechanismType ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The clock type based on whether End to End or peer to peer mechanisms are used. The mechanism used to calculate the Mean Path Delay as indicated in Table 9 of [IEEE 1588-2008].

Delay mechanism	Value(hex)	Specification
-----	-----	-----
E2E	01	The port is configured to use the delay request-response mechanism.
P2P	02	The port is configured to use the peer delay mechanism.
DISABLED	FE	The port does not implement the delay mechanism."

REFERENCE "Sections 8.2.5.4.4, 6.6.4, 7.4.2 of [IEEE 1588-2008]."
SYNTAX INTEGER {
 e2e(1),
 p2p(2),

```
        disabled(254)
    }
```

ClockInstanceType ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"

STATUS current

DESCRIPTION

"The instance of the Clock of a given clock type in a given domain."

SYNTAX Unsigned32 (0..255)

ClockPortNumber ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"

STATUS current

DESCRIPTION

"An index identifying a specific Precision Time Protocol (PTP) port on a PTP node."

REFERENCE "Sections 7.5.2.3 and 5.3.5 of [IEEE 1588-2008]"

SYNTAX Unsigned32 (0..65535)

ClockPortState ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"This is the value of the current state of the protocol engine associated with this port."

Port state	Value	Description
initializing	1	In this state a port initializes its data sets, hardware, and communication facilities.
faulty	2	The fault state of the protocol.
disabled	3	The port shall not place any messages on its communication path.
listening	4	The port is waiting for the announceReceiptTimeout to expire or to receive an Announce message from a master.
preMaster	5	The port shall behave in all respects as though it were in the MASTER state except that it shall not place any messages on its communication path except for Pdelay_Req, Pdelay_Resp,

		Pdelay_Resp_Follow_Up, signaling, or management messages.
master	6	The port is behaving as a master port.
passive	7	The port shall not place any messages on its communication path except for Pdelay_Req, Pdelay_Resp, Pdelay_Resp_Follow_Up, or signaling messages, or management messages that are a required response to another management message
uncalibrated	8	The local port is preparing to synchronize to the master port.
slave	9	The port is synchronizing to the selected master port."

REFERENCE "Section 8.2.5.3.1 portState and 9.2.5 of [IEEE 1588-2008]"

SYNTAX INTEGER {
 initializing(1),
 faulty(2),
 disabled(3),
 listening(4),
 preMaster(5),
 master(6),
 passive(7),
 uncalibrated(8),
 slave(9)
}

ClockProfileType ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"Clock Profile used. A profile is the set of allowed Precision Time Protocol (PTP) features applicable to a device."

REFERENCE "Section 3.1.30 and 19.3 PTP profiles of [IEEE 1588-2008]"

SYNTAX INTEGER {
 default(1),
 telecom(2),
 vendorspecific(3)
}

ClockQualityAccuracyType ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The ClockQuality as specified in section 5.3.7, 7.6.2.5 and Table 6 of [IEEE 1588-2008].

The following values are not represented in the enumerated values.

0x01-0x1F Reserved

0x32-0x7F Reserved

It is important to note that section 7.1.1 RFC2578 allows for gaps and enumerate values to start with zero when indicated by the protocol."

REFERENCE "Section 5.3.7, 7.6.2.5 and Table 6 of [IEEE 1588-2008]"

SYNTAX INTEGER {
 reserved00(1), -- 0
 nanoSecond25(32), -- 0x20
 nanoSecond100(33), -- 0x21
 nanoSecond250(34), -- 0x22
 microSec1(35), -- 0x23
 microSec2dot5(36), -- 0x24
 microSec10(37), -- 0x25
 microSec25(38), -- 0x26
 microSec100(39), -- 0x27
 microSec250(40), -- 0x28
 milliSec1(41), -- 0x29
 milliSec2dot5(42), -- 0x2A
 milliSec10(43), -- 0x2B
 milliSec25(44), -- 0x2C
 milliSec100(45), -- 0x2D
 milliSec250(46), -- 0x2E
 second1(47), -- 0x2F
 second10(48), -- 0x30
 secondGreater10(49), -- 0x31
 unknown(254), -- 0xFE
 reserved255(255) -- 0xFF
}

ClockQualityClassType ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"

STATUS current

DESCRIPTION

"The ClockQuality as specified in section 5.3.7, 7.6.2.4 and Table 5 of [IEEE 1588-2008]."

Value	Description
-------	-------------

-----	-----
-------	-------

- | | |
|-------|--|
| 0 | Reserved to enable compatibility with future versions. |
| 1-5 | Reserved |
| 6 | Shall designate a clock that is synchronized to a primary reference time source. The timescale distributed shall be PTP. A clockClass 6 clock shall not be a slave to another clock in the domain. |
| 7 | Shall designate a clock that has previously been designated as clockClass 6 but that has lost the ability to synchronize to a primary reference time source and is in holdover mode and within holdover specifications. The timescale distributed shall be PTP. A clockClass 7 clock shall not be a slave to another clock in the domain. |
| 8 | Reserved. |
| 9-10 | Reserved to enable compatibility with future versions. |
| 11-12 | Reserved. |
| 13 | Shall designate a clock that is synchronized to an application-specific source of time. The timescale distributed shall be ARB. A clockClass 13 clock shall not be a slave to another clock in the domain. |
| 14 | Shall designate a clock that has previously been designated as clockClass 13 but that has lost the ability to synchronize to an application-specific source of time and is in holdover mode and within holdover specifications. The timescale distributed shall be ARB. A clockClass 14 clock shall not be a slave to another clock in the domain. |
| 15-51 | Reserved. |
| 52 | Degradation alternative A for a clock of |

clockClass 7 that is not within holdover specification. A clock of clockClass 52 shall not be a slave to another clock in the domain.

53-57 Reserved.

58 Degradation alternative A for a clock of clockClass 14 that is not within holdover specification. A clock of clockClass 58 shall not be a slave to another clock in the domain.

59-67 Reserved.

68-122 For use by alternate PTP profiles.

123-127 Reserved.

128-132 Reserved.

133-170 For use by alternate PTP profiles.

171-186 Reserved.

187 Degradation alternative B for a clock of clockClass 7 that is not within holdover specification. A clock of clockClass 187 may be a slave to another clock in the domain.

188-192 Reserved.

193 Degradation alternative B for a clock of clockClass 14 that is not within holdover specification. A clock of clockClass 193 may be a slave to another clock in the domain.

194-215 Reserved.

216-232 For use by alternate PTP profiles.

233-247 Reserved.

248 Default. This clockClass shall be used if none of the other clockClass definitions apply.

249-250 Reserved.

251 Reserved for version 1 compatibility; see Clause 18.

252-254 Reserved.

255 Shall be the clockClass of a slave-only clock; see 9.2.2."

REFERENCE "Section 5.3.7, 7.6.2.4 and Table 5 of [IEEE 1588-2008]."

SYNTAX Unsigned32 (0..255)

ClockRoleType ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The Clock Role. The protocol generates a Master Slave relationship among the clocks in the system.

Clock Role	Value	Description
Master clock	1	A clock that is the source of time to which all other clocks on that path synchronize.
Slave clock	2	A clock which synchronizes to another clock (master)."
SYNTAX	INTEGER { master(1), slave(2) }	

ClockStateType ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The clock state returned by PTP engine.

Clock State	Value	Description
Freerun state	1	Applies to a slave device that is not locked to a master. This is the initial state a slave starts out with when it is not getting any PTP packets from the master or because of some other input error (erroneous packets, etc).
Holdover state	2	In this state the slave device is locked to a master but communication with the master is lost or the timestamps in the ptp packets are incorrect. But since the slave was locked to the master, it can run with the same accuracy for sometime. The slave can continue to operate in this state for some time. If communication with the master is not restored for a while, the device is moved to the FREERUN state.

Acquiring state 3 The slave device is receiving packets from a master and is trying to acquire a lock.

Freq_locked state 4 Slave device is locked to the Master with respect to frequency, but not phase aligned

Phase_aligned state 5 Locked to the master with respect to frequency and phase."

SYNTAX INTEGER {
 freerun(1),
 holdover(2),
 acquiring(3),
 frequencyLocked(4),
 phaseAligned(5)
}

ClockTimeSourceType ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The ClockQuality as specified in section 5.3.7, 7.6.2.6 and Table 7 of [IEEE 1588-2008].

The following values are not represented in the enumerated values.

0xF0-0xFE For use by alternate PTP profiles
0xFF Reserved

It is important to note that section 7.1.1 RFC2578 allows for gaps and enumerate values to start with zero when indicated by the protocol."

REFERENCE "Section 5.3.7, 7.6.2.6 and Table 7 of [IEEE 1588-2008]."

SYNTAX INTEGER {
 atomicClock(16), -- 0x10
 gps(32), -- 0x20
 terrestrialRadio(48), -- 0x22
 ntp(64), -- 0x40
 ntp(80), -- 0x50
 handSet(96), -- 0x60

```
        other(144), -- 0x90
        internalOscillator(160) -- 0xA0
    }
```

ClockTimeInterval ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"This textual convention corresponds to the TimeInterval structure indicated in section 5.3.2 of [IEEE 1588-2008]. It will be presented in the form of a character array.

The TimeInterval type represents time intervals.

```
struct TimeInterval
{
    Integer64 scaledNanoseconds;
};
```

The scaledNanoseconds member is the time interval expressed in units of nanoseconds and multiplied by 2**16.

Positive or negative time intervals outside the maximum range of this data type shall be encoded as the largest positive and negative values of the data type, respectively.

For example, 2.5 ns is expressed as 0000 0000 0002 8000 in Base16."

REFERENCE

"Section 5.3.2 and section 7.7.2.1 Timer interval specification of [IEEE 1588-2008]"

SYNTAX OCTET STRING (SIZE (1..255))

ClockTxModeType ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"Transmission mode.

unicast. Using unicast communication channel.

multicast. Using Multicast communication channel.

multicast-mix. Using multicast-unicast communication channel"

```
SYNTAX          INTEGER {
                    unicast(1),
                    multicast(2),
                    multicastmix(3)
                }
```

ClockType ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The clock types as defined in the MIB module description."

REFERENCE "Section 6.5.1 of [IEEE 1588-2008]."

```
SYNTAX          INTEGER {
                    ordinaryClock(1),
                    boundaryClock(2),
                    transparentClock(3),
                    boundaryNode(4)
                }
```

ClockPortTransportType ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

DESCRIPTION

"The Clock port transport type. The transport protocol used for the communication between the clock nodes. This includes IP version 4, IP version 6, Ethernet, DeviceNet, ControlNet and IEC61158."

REFERENCE "Annex D (IPv4), Annex E (IPv6), Annex F (Ethernet), Annex G (DeviceNet), Annex H (ControlNet) and Annex I (IEC61158) of [IEEE 1588-2008]"

```
SYNTAX          INTEGER {
                    ipversion4(1),
                    ipversion6(2),
                    ethernet(3),
                    DeviceNet(4),
                    ControlNet(5),
                    IEC61158(6)
                }
```

ClockPortTransportTypeAddress ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The Clock port transport protocol address used for the

communication between the clock nodes. This is a string corresponding to the address type as specified by the ClockPortTransportType.

This can be an address of types IP version 4, IP version 6, Ethernet, DeviceNet, ControlNet and IEC61158."

REFERENCE "Annex D (IPv4), Annex E (IPv6), Annex F (Ethernet), Annex G (DeviceNet), Annex H (ControlNet) and Annex I (IEC61158) of [IEEE 1588-2008]"

SYNTAX OCTET STRING (SIZE (1..255))

ptpbaseMIBNotifs OBJECT IDENTIFIER
::= { ptpbaseMIB 0 }

ptpbaseMIBObjects OBJECT IDENTIFIER
::= { ptpbaseMIB 1 }

ptpbaseMIBConformance OBJECT IDENTIFIER
::= { ptpbaseMIB 2 }

ptpbaseMIBSystemInfo OBJECT IDENTIFIER
::= { ptpbaseMIBObjects 1 }

-- Conformance Information Definition

ptpbaseMIBCompliances OBJECT IDENTIFIER
::= { ptpbaseMIBConformance 1 }

ptpbaseMIBGroups OBJECT IDENTIFIER
::= { ptpbaseMIBConformance 2 }

ptpbaseMIBCompliances1 MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"Compliance statement for agents that provide read-only support for PTPBASE-MIB. Such devices can only be monitored using this MIB module.

The Module is implemented with support for read-only. In other words, only monitoring is available by implementing this MODULE-COMPLIANCE."

MODULE -- this module

MANDATORY-GROUPS { ptpbaseMIBSystemInfoGroup }

```
 ::= { ptpbaseMIBCompliances 1 }

ptpbaseMIBCompliances2 MODULE-COMPLIANCE
    STATUS          current
    DESCRIPTION
        "Compliance statement for agents that provide read-only support
        for PTPBASE-MIB. Such devices can only be monitored using this
        MIB module.

        The Module is implemented with support for read-only. In other
        words, only monitoring is available by implementing this
        MODULE-COMPLIANCE."
    MODULE          -- this module
    MANDATORY-GROUPS {
        ptpbaseMIBClockCurrentDSGroup,
        ptpbaseMIBClockParentDSGroup,
        ptpbaseMIBClockDefaultDSGroup,
        ptpbaseMIBClockRunningGroup,
        ptpbaseMIBClockTimepropertiesGroup
    }
 ::= { ptpbaseMIBCompliances 2 }

ptpbaseMIBCompliances3 MODULE-COMPLIANCE
    STATUS          current
    DESCRIPTION
        "Compliance statement for agents that provide read-only support
        for PTPBASE-MIB. Such devices can only be monitored using this
        MIB module.

        The Module is implemented with support for read-only. In other
        words, only monitoring is available by implementing this
        MODULE-COMPLIANCE."
    MODULE          -- this module
    MANDATORY-GROUPS {
        ptpbaseMIBClockPortGroup,
        ptpbaseMIBClockPortDSGroup,
        ptpbaseMIBClockPortRunningGroup,
        ptpbaseMIBClockPortAssociateGroup
    }
 ::= { ptpbaseMIBCompliances 3 }

ptpbaseMIBCompliances4 MODULE-COMPLIANCE
    STATUS          current
```

DESCRIPTION

"Compliance statement for agents that provide read-only support for PTPBASE-MIB. Such devices can only be monitored using this MIB module.

The Module is implemented with support for read-only. In other words, only monitoring is available by implementing this MODULE-COMPLIANCE."

MODULE -- this module

```
MANDATORY-GROUPS {  
    ptpbaseMIBClockTransparentDSGroup,  
    ptpbaseMIBClockPortTransDSGroup  
}  
::= { ptpbaseMIBCompliances 4 }
```

ptpbaseMIBSystemInfoGroup OBJECT-GROUP

```
OBJECTS {  
    ptpbaseSystemDomainTotals,  
    ptpDomainClockPortsTotal,  
    ptpbaseSystemProfile  
}  
STATUS current
```

DESCRIPTION

"Group which aggregates objects describing system-wide information"

```
::= { ptpbaseMIBGroups 1 }
```

ptpbaseMIBClockCurrentDSGroup OBJECT-GROUP

```
OBJECTS {  
    ptpbaseClockCurrentDSStepsRemoved,  
    ptpbaseClockCurrentDSOffsetFromMaster,  
    ptpbaseClockCurrentDSMeanPathDelay  
}  
STATUS current
```

DESCRIPTION

"Group which aggregates objects describing PTP Current Dataset information"

```
::= { ptpbaseMIBGroups 2 }
```

ptpbaseMIBClockParentDSGroup OBJECT-GROUP

```
OBJECTS {  
    ptpbaseClockParentDSParentPortIdentity,  
    ptpbaseClockParentDSParentStats,  
}
```

```
        ptpbaseClockParentDSOffset,
        ptpbaseClockParentDSClockPhChRate,
        ptpbaseClockParentDSGMClockIdentity,
        ptpbaseClockParentDSGMClockPriority1,
        ptpbaseClockParentDSGMClockPriority2,
        ptpbaseClockParentDSGMClockQualityClass,
        ptpbaseClockParentDSGMClockQualityAccuracy,
        ptpbaseClockParentDSGMClockQualityOffset
    }
    STATUS          current
    DESCRIPTION
        "Group which aggregates objects describing PTP Parent Dataset
        information"
    ::= { ptpbaseMIBGroups 3 }

ptpbaseMIBClockDefaultDSGroup OBJECT-GROUP
    OBJECTS
        {
            ptpbaseClockDefaultDSTwoStepFlag,
            ptpbaseClockDefaultDSClockIdentity,
            ptpbaseClockDefaultDSPriority1,
            ptpbaseClockDefaultDSPriority2,
            ptpbaseClockDefaultDSSlaveOnly,
            ptpbaseClockDefaultDSQualityClass,
            ptpbaseClockDefaultDSQualityAccuracy,
            ptpbaseClockDefaultDSQualityOffset
        }
    STATUS          current
    DESCRIPTION
        "Group which aggregates objects describing PTP Default Dataset
        information"
    ::= { ptpbaseMIBGroups 4 }

ptpbaseMIBClockRunningGroup OBJECT-GROUP
    OBJECTS
        {
            ptpbaseClockRunningState,
            ptpbaseClockRunningPacketsSent,
            ptpbaseClockRunningPacketsReceived
        }
    STATUS          current
    DESCRIPTION
        "Group which aggregates objects describing PTP running state
        information"
    ::= { ptpbaseMIBGroups 5 }
```



```
ptpbasesMIBClockTimepropertiesGroup OBJECT-GROUP
    OBJECTS {
        ptpbaseClockTimePropertiesDSCurrentUTCOffsetValid,
        ptpbaseClockTimePropertiesDSCurrentUTCOffset,
        ptpbaseClockTimePropertiesDSLeap59,
        ptpbaseClockTimePropertiesDSLeap61,
        ptpbaseClockTimePropertiesDSTimeTraceable,
        ptpbaseClockTimePropertiesDSFreqTraceable,
        ptpbaseClockTimePropertiesDSPTPTimescale,
        ptpbaseClockTimePropertiesDSSource
    }
    STATUS current
    DESCRIPTION
        "Group which aggregates objects describing PTP Time Properties
        information"
    ::= { ptpbasesMIBGroups 6 }

ptpbasesMIBClockTransparentDSGroup OBJECT-GROUP
    OBJECTS {
        ptpbaseClockTransDefaultDSClockIdentity,
        ptpbaseClockTransDefaultDSNumOfPorts,
        ptpbaseClockTransDefaultDSDelay,
        ptpbaseClockTransDefaultDSPrimaryDomain
    }
    STATUS current
    DESCRIPTION
        "Group which aggregates objects describing PTP Transparent
        Dataset
        information"
    ::= { ptpbasesMIBGroups 7 }

ptpbasesMIBClockPortGroup OBJECT-GROUP
    OBJECTS {
        ptpbaseClockPortName,
        ptpbaseClockPortSyncOneStep,
        ptpbaseClockPortCurrentPeerAddress,
        ptpbaseClockPortNumOfAssociatedPorts,
        ptpbaseClockPortCurrentPeerAddressType,
        ptpbaseClockPortRole
    }
    STATUS current
    DESCRIPTION
```

```
    "Group which aggregates objects describing information for a
    given PTP Port."
 ::= { ptpbaseMIBGroups 8 }

ptpbaseMIBClockPortDSGroup OBJECT-GROUP
    OBJECTS
        {
            ptpbaseClockPortDSName,
            ptpbaseClockPortDSPortIdentity,
            ptpbaseClockPortDSAnnouncementInterval,
            ptpbaseClockPortDSAnnounceRctTimeout,
            ptpbaseClockPortDSSyncInterval,
            ptpbaseClockPortDSMinDelayReqInterval,
            ptpbaseClockPortDSPeerDelayReqInterval,
            ptpbaseClockPortDSDelayMech,
            ptpbaseClockPortDSPeerMeanPathDelay,
            ptpbaseClockPortDSGrantDuration,
            ptpbaseClockPortDSPTPVersion
        }
    STATUS      current
    DESCRIPTION
        "Group which aggregates objects describing PTP Port Dataset
        information"
 ::= { ptpbaseMIBGroups 9 }

ptpbaseMIBClockPortRunningGroup OBJECT-GROUP
    OBJECTS
        {
            ptpbaseClockPortRunningName,
            ptpbaseClockPortRunningState,
            ptpbaseClockPortRunningRole,
            ptpbaseClockPortRunningInterfaceIndex,
            ptpbaseClockPortRunningTransport,
            ptpbaseClockPortRunningEncapsulationType,
            ptpbaseClockPortRunningTxMode,
            ptpbaseClockPortRunningRxMode,
            ptpbaseClockPortRunningPacketsReceived,
            ptpbaseClockPortRunningPacketsSent
        }
    STATUS      current
    DESCRIPTION
        "Group which aggregates objects describing PTP running interface
        information"
 ::= { ptpbaseMIBGroups 10 }
```

```
ptpbasesystemClockPortTransDSGroup OBJECT-GROUP
    OBJECTS                {
                            ptpbaseClockPortTransDSPortIdentity,
                            ptpbaseClockPortTransDSlogMinPdelayReqInt,
                            ptpbaseClockPortTransDSFaultyFlag,
                            ptpbaseClockPortTransDSPeerMeanPathDelay
                            }
    STATUS                  current
    DESCRIPTION
        "Group which aggregates objects describing PTP TransparentDS
        Dataset
        information"
        ::= { ptpbasesystemGroups 11 }

ptpbasesystemClockPortAssociateGroup OBJECT-GROUP
    OBJECTS                {
                            ptpbaseClockPortAssociatePacketsSent,
                            ptpbaseClockPortAssociatePacketsReceived,
                            ptpbaseClockPortAssociateAddress,
                            ptpbaseClockPortAssociateAddressType,
                            ptpbaseClockPortAssociateInErrors,
                            ptpbaseClockPortAssociateOutErrors
                            }
    STATUS                  current
    DESCRIPTION
        "Group which aggregates objects describing information on peer
        PTP ports for a given PTP clock-port."
        ::= { ptpbasesystemGroups 12 }
ptpbasesystemClockInfo OBJECT IDENTIFIER
    ::= { ptpbasesystemObjects 2 }

ptpbasesystemTable OBJECT-TYPE
    SYNTAX                  SEQUENCE OF PtpbaseSystemEntry
    MAX-ACCESS              not-accessible
    STATUS                  current
    DESCRIPTION
        "Table of count information about the PTP system for all
        domains."
        ::= { ptpbasesystemInfo 1 }

ptpbasesystemEntry OBJECT-TYPE
    SYNTAX                  PtpbaseSystemEntry
```

MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"An entry in the table, containing count information about a
single domain. New row entries are added when the PTP clock for
this domain is configured, while the unconfiguration of the PTP
clock removes it."

INDEX {
ptpDomainIndex,
ptpInstanceIndex
}

::= { ptpbaseSystemTable 1 }

PtpbaseSystemEntry ::= SEQUENCE {
ptpDomainIndex ClockDomainType,
ptpInstanceIndex ClockInstanceType,
ptpDomainClockPortsTotal Gauge32
}

ptpDomainIndex OBJECT-TYPE

SYNTAX ClockDomainType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This object specifies the domain number used to create logical
group of PTP devices. The Clock Domain is a logical group of
clocks and devices that synchronize with each other using the
PTP protocol."

0 Default domain
1 Alternate domain 1
2 Alternate domain 2
3 Alternate domain 3
4 - 127 User-defined domains
128 - 255 Reserved"

::= { ptpbaseSystemEntry 1 }

ptpInstanceIndex OBJECT-TYPE

SYNTAX ClockInstanceType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This object specifies the instance of the Clock for this

```
    domain."
 ::= { ptpbaseSystemEntry 2 }

ptpDomainClockPortsTotal OBJECT-TYPE
    SYNTAX          Gauge32
    UNITS            "ntp ports"
    MAX-ACCESS       read-only
    STATUS           current
    DESCRIPTION
        "This object specifies the total number of clock ports
        configured within a domain."
 ::= { ptpbaseSystemEntry 3 }

ptpbaseSystemDomainTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF PtpbaseSystemDomainEntry
    MAX-ACCESS       not-accessible
    STATUS           current
    DESCRIPTION
        "Table of information about the PTP system for all clock modes
        -- ordinary, boundary or transparent."
 ::= { ptpbaseMIBSystemInfo 2 }

ptpbaseSystemDomainEntry OBJECT-TYPE
    SYNTAX          PtpbaseSystemDomainEntry
    MAX-ACCESS       not-accessible
    STATUS           current
    DESCRIPTION
        "An entry in the table, containing information about a single
        clock mode for the PTP system. A row entry gets added when PTP
        clocks are configured on the router."
    INDEX           { ptpbaseSystemDomainClockTypeIndex }
 ::= { ptpbaseSystemDomainTable 1 }

PtpbaseSystemDomainEntry ::= SEQUENCE {
    ptpbaseSystemDomainClockTypeIndex ClockType,
    ptpbaseSystemDomainTotals          Unsigned32
}

ptpbaseSystemDomainClockTypeIndex OBJECT-TYPE
    SYNTAX          ClockType
    MAX-ACCESS       not-accessible
```

STATUS current

DESCRIPTION

"This object specifies the clock type as defined in the
Textual convention description."

::= { ptpbaseSystemDomainEntry 1 }

ptpbaseSystemDomainTotals OBJECT-TYPE

SYNTAX Unsigned32

UNITS "domains"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the total number of PTP domains for this
particular clock type configured in this node."

::= { ptpbaseSystemDomainEntry 2 }

ptpbaseSystemProfile OBJECT-TYPE

SYNTAX ClockProfileType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the PTP Profile implemented on the
system."

REFERENCE "Section 19.3 PTP profiles of [IEEE 1588-2008]"

::= { ptpbaseMIBSystemInfo 3 }

ptpbaseClockCurrentDSTable OBJECT-TYPE

SYNTAX SEQUENCE OF PtpbaseClockCurrentDSEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Table of information about the PTP clock Current Datasets for
all domains."

::= { ptpbaseMIBClockInfo 1 }

ptpbaseClockCurrentDSEntry OBJECT-TYPE

SYNTAX PtpbaseClockCurrentDSEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the table, containing information about a single

```

    PTP clock Current Datasets for a domain."
REFERENCE
    "1588 Version 2.0 Section 8.2.2 currentDS data set member
    specifications of [IEEE 1588-2008]"
INDEX
    {
        ptpbaseClockCurrentDSDomainIndex,
        ptpbaseClockCurrentDSClockTypeIndex,
        ptpbaseClockCurrentDSInstanceIndex
    }
 ::= { ptpbaseClockCurrentDSTable 1 }

PtpbaseClockCurrentDSEntry ::= SEQUENCE {
    ptpbaseClockCurrentDSDomainIndex      ClockDomainType,
    ptpbaseClockCurrentDSClockTypeIndex   ClockType,
    ptpbaseClockCurrentDSInstanceIndex    ClockInstanceType,
    ptpbaseClockCurrentDSStepsRemoved     Unsigned32,
    ptpbaseClockCurrentDSOffsetFromMaster ClockTimeInterval,
    ptpbaseClockCurrentDSMeanPathDelay    ClockTimeInterval
}

ptpbaseClockCurrentDSDomainIndex OBJECT-TYPE
    SYNTAX      ClockDomainType
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "This object specifies the domain number used to create logical
        group of PTP devices."
    ::= { ptpbaseClockCurrentDSEntry 1 }

ptpbaseClockCurrentDSClockTypeIndex OBJECT-TYPE
    SYNTAX      ClockType
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "This object specifies the clock type as defined in the
        Textual convention description."
    ::= { ptpbaseClockCurrentDSEntry 2 }

ptpbaseClockCurrentDSInstanceIndex OBJECT-TYPE
    SYNTAX      ClockInstanceType
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
```

"This object specifies the instance of the clock for this clock type in the given domain."
 ::= { ptpbaseClockCurrentDSEntry 3 }

ptpbaseClockCurrentDSStepsRemoved OBJECT-TYPE

SYNTAX Unsigned32
UNITS "Steps"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The current clock dataset StepsRemoved value."

This object specifies the distance measured by the number of Boundary clocks between the local clock and the Foreign master as indicated in the stepsRemoved field of Announce messages."

REFERENCE "1588 Version 2.0 Section 8.2.2.2 stepsRemoved"
 ::= { ptpbaseClockCurrentDSEntry 4 }

ptpbaseClockCurrentDSOffsetFromMaster OBJECT-TYPE

SYNTAX ClockTimeInterval
UNITS "Time Interval"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the current clock dataset ClockOffset value. The value of the computation of the offset in time between a slave and a master clock."
REFERENCE "1588 Version 2.0 Section 8.2.2.3 of [IEEE 1588-2008]"
 ::= { ptpbaseClockCurrentDSEntry 5 }

ptpbaseClockCurrentDSMeanPathDelay OBJECT-TYPE

SYNTAX ClockTimeInterval
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the current clock dataset MeanPathDelay value."

The mean path delay between a pair of ports as measure by the delay request-response mechanism."
REFERENCE "1588 Version 2.0 Section 8.2.2.4 mean path delay"
 ::= { ptpbaseClockCurrentDSEntry 6 }


```

ptpbasedClockParentDSTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF PtpbasedClockParentDSEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "Table of information about the PTP clock Parent Datasets for
        all domains."
    ::= { ptpbaseMIBClockInfo 2 }

ptpbasedClockParentDSEntry OBJECT-TYPE
    SYNTAX          PtpbasedClockParentDSEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "An entry in the table, containing information about a single
        PTP clock Parent Datasets for a domain."
    REFERENCE
        "Section 8.2.3 parentDS data set member specifications of
        [IEEE 1588-2008]"
    INDEX
        {
            ptpbasedClockParentDSDomainIndex,
            ptpbasedClockParentDSClockTypeIndex,
            ptpbasedClockParentDSInstanceIndex
        }
    ::= { ptpbasedClockParentDSTable 1 }

PtpbasedClockParentDSEntry ::= SEQUENCE {
    ptpbasedClockParentDSDomainIndex      ClockDomainType,
    ptpbasedClockParentDSClockTypeIndex    ClockType,
    ptpbasedClockParentDSInstanceIndex     ClockInstanceType,
    ptpbasedClockParentDSParentPortIdentity OCTET STRING,
    ptpbasedClockParentDSParentStats       TruthValue,
    ptpbasedClockParentDSOffset            ClockIntervalBase2,
    ptpbasedClockParentDSClockPhChRate     Integer32,
    ptpbasedClockParentDSGMClockIdentity   ClockIdentity,
    ptpbasedClockParentDSGMClockPriority1   Unsigned32,
    ptpbasedClockParentDSGMClockPriority2   Unsigned32,
    ptpbasedClockParentDSGMClockQualityClass ClockQualityClassType,
    ptpbasedClockParentDSGMClockQualityAccuracy ClockQualityAccuracyType,
    ptpbasedClockParentDSGMClockQualityOffset Unsigned32
}

```

```
}

ptpbasedClockParentDSDomainIndex OBJECT-TYPE
    SYNTAX          ClockDomainType
    MAX-ACCESS       not-accessible
    STATUS           current
    DESCRIPTION
        "This object specifies the domain number used to create logical
        group of PTP devices."
    ::= { ptpbasedClockParentDSEntry 1 }

ptpbasedClockParentDSClockTypeIndex OBJECT-TYPE
    SYNTAX          ClockType
    MAX-ACCESS       not-accessible
    STATUS           current
    DESCRIPTION
        "This object specifies the clock type as defined in the
        Textual convention description."
    ::= { ptpbasedClockParentDSEntry 2 }

ptpbasedClockParentDSInstanceIndex OBJECT-TYPE
    SYNTAX          ClockInstanceType
    MAX-ACCESS       not-accessible
    STATUS           current
    DESCRIPTION
        "This object specifies the instance of the clock for this clock
        type in the given domain."
    ::= { ptpbasedClockParentDSEntry 3 }

ptpbasedClockParentDSParentPortIdentity OBJECT-TYPE
    SYNTAX          OCTET STRING(SIZE(1..256))
    MAX-ACCESS       read-only
    STATUS           current
    DESCRIPTION
        "This object specifies the value of portIdentity of the port on
        the master that issues the Sync messages used in synchronizing
        this clock."
    REFERENCE
        "Section 8.2.3.2 parentDS.parentPortIdentity of
        [IEEE 1588-2008]"
    ::= { ptpbasedClockParentDSEntry 4 }

ptpbasedClockParentDSParentStats OBJECT-TYPE
```

SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the Parent Dataset ParentStats value.

This value indicates whether the values of ParentDSOffset
and ParentDSClockPhChRate have been measured and are valid.
A TRUE value shall indicate valid data."

REFERENCE "Section 8.2.3.3 parentDS.parentStats of
[IEEE 1588-2008]"
 ::= { ptpbaseClockParentDSEntry 5 }

ptpbaseClockParentDSOffset OBJECT-TYPE

SYNTAX ClockIntervalBase2 (-128..127)
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"This object specifies the Parent Dataset
ParentOffsetScaledLogVariance value.

This value is the variance of the parent clocks phase as
measured by the local clock."

REFERENCE "Section 8.2.3.4
parentDS.observedParentOffsetScaledLogVariance
[IEEE 1588-2008]"
 ::= { ptpbaseClockParentDSEntry 6 }

ptpbaseClockParentDSClockPhChRate OBJECT-TYPE

SYNTAX Integer32
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"This object specifies the clock's parent dataset
ParentClockPhaseChangeRate value.

This value is an estimate of the parent clocks phase change
rate as measured by the slave clock."

REFERENCE "Section 8.2.3.5
parentDS.observedParentClockPhaseChangeRate of
[IEEE 1588-2008]"

```
::= { ptpbaseClockParentDSEntry 7 }
```

ptpbaseClockParentDSGMClockIdentity OBJECT-TYPE

SYNTAX ClockIdentity

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the parent dataset Grandmaster clock identity."

REFERENCE

"Section 8.2.3.6 parentDS.grandmasterIdentity of [IEEE 1588-2008]"

```
::= { ptpbaseClockParentDSEntry 8 }
```

ptpbaseClockParentDSGMClockPriority1 OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the parent dataset Grandmaster clock priority1."

REFERENCE

"Section 8.2.3.8 parentDS.grandmasterPriority1 of [IEEE 1588-2008]"

```
::= { ptpbaseClockParentDSEntry 9 }
```

ptpbaseClockParentDSGMClockPriority2 OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the parent dataset grandmaster clock priority2."

REFERENCE

"Section 8.2.3.9 parentDS.grandmasterPriority2 of [IEEE 1588-2008]"

```
::= { ptpbaseClockParentDSEntry 10 }
```

ptpbaseClockParentDSGMClockQualityClass OBJECT-TYPE

SYNTAX ClockQualityClassType (0..255)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the parent dataset grandmaster clock quality class."

REFERENCE

"Section 8.2.3.7 parentDS.grandmasterClockQuality of [IEEE 1588-2008]"

::= { ptpbaseClockParentDSEntry 11 }

ptpbaseClockParentDSGMClockQualityAccuracy OBJECT-TYPE

SYNTAX ClockQualityAccuracyType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the parent dataset grandmaster clock quality accuracy."

REFERENCE

"Section 8.2.3.7 parentDS.grandmasterClockQuality of [IEEE 1588-2008]"

::= { ptpbaseClockParentDSEntry 12 }

ptpbaseClockParentDSGMClockQualityOffset OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the parent dataset grandmaster clock quality offset."

REFERENCE

"Section 8.2.3.7 parentDS.grandmasterClockQuality of [IEEE 1588-2008]"

::= { ptpbaseClockParentDSEntry 13 }

ptpbaseClockDefaultDSTable OBJECT-TYPE

SYNTAX SEQUENCE OF PtpbaseClockDefaultDSEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Table of information about the PTP clock Default Datasets for all domains."

::= { ptpbaseMIBClockInfo 3 }

ptpbaseClockDefaultDSEntry OBJECT-TYPE

```

SYNTAX          PtpbaseClockDefaultDSEntry
MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION
    "An entry in the table, containing information about a single
    PTP clock Default Datasets for a domain."
INDEX           {
                ptpbaseClockDefaultDSDomainIndex,
                ptpbaseClockDefaultDSClockTypeIndex,
                ptpbaseClockDefaultDSInstanceIndex
            }
 ::= { ptpbaseClockDefaultDSTable 1 }

PtpbaseClockDefaultDSEntry ::= SEQUENCE {
    ptpbaseClockDefaultDSDomainIndex      ClockDomainType,
    ptpbaseClockDefaultDSClockTypeIndex   ClockType,
    ptpbaseClockDefaultDSInstanceIndex    ClockInstanceType,
    ptpbaseClockDefaultDSTwoStepFlag      TruthValue,
    ptpbaseClockDefaultDSClockIdentity    ClockIdentity,
    ptpbaseClockDefaultDSPriority1        Unsigned32,
    ptpbaseClockDefaultDSPriority2        Unsigned32,
    ptpbaseClockDefaultDSSlaveOnly        TruthValue,
    ptpbaseClockDefaultDSQualityClass     ClockQualityClassType,
    ptpbaseClockDefaultDSQualityAccuracy  ClockQualityAccuracyType,
    ptpbaseClockDefaultDSQualityOffset    Integer32
}

ptpbaseClockDefaultDSDomainIndex OBJECT-TYPE
    SYNTAX          ClockDomainType
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "This object specifies the domain number used to create logical
        group of PTP devices."
    ::= { ptpbaseClockDefaultDSEntry 1 }

ptpbaseClockDefaultDSClockTypeIndex OBJECT-TYPE
    SYNTAX          ClockType
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "This object specifies the clock type as defined in the
        Textual convention description."

```

```
::= { ptptimeClockDefaultDSEntry 2 }
```

ptptimeClockDefaultDSInstanceIndex OBJECT-TYPE

SYNTAX ClockInstanceType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This object specifies the instance of the clock for this clock
type in the given domain."

```
::= { ptptimeClockDefaultDSEntry 3 }
```

ptptimeClockDefaultDSTwoStepFlag OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies whether the Two Step process is used."

```
::= { ptptimeClockDefaultDSEntry 4 }
```

ptptimeClockDefaultDSClockIdentity OBJECT-TYPE

SYNTAX ClockIdentity

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the default Datasets clock identity."

```
::= { ptptimeClockDefaultDSEntry 5 }
```

ptptimeClockDefaultDSPriority1 OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the default Datasets clock Priority1."

```
::= { ptptimeClockDefaultDSEntry 6 }
```

ptptimeClockDefaultDSPriority2 OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the default Datasets clock Priority2."

```
::= { ptptimeClockDefaultDSEntry 7 }
```

ptpbasedefaultDSSlaveOnly OBJECT-TYPE

SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Whether the SlaveOnly flag is set."
::= { ptpbasedefaultDSEntry 8 }

ptpbasedefaultDSQualityClass OBJECT-TYPE

SYNTAX ClockQualityClassType (0..255)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the default dataset Quality Class."
::= { ptpbasedefaultDSEntry 9 }

ptpbasedefaultDSQualityAccuracy OBJECT-TYPE

SYNTAX ClockQualityAccuracyType
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the default dataset Quality Accuracy."
::= { ptpbasedefaultDSEntry 10 }

ptpbasedefaultDSQualityOffset OBJECT-TYPE

SYNTAX Integer32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the default dataset Quality offset."
::= { ptpbasedefaultDSEntry 11 }

ptpbasedefaultRunningTable OBJECT-TYPE

SYNTAX SEQUENCE OF PtpbasedefaultRunningEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"Table of information about the PTP clock Running Datasets for all domains."
::= { ptpbaseMIBClockInfo 4 }

ptpbaseClockRunningEntry OBJECT-TYPE

SYNTAX PtpbaseClockRunningEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the table, containing information about a single
PTP clock running Datasets for a domain."

INDEX {
ptpbaseClockRunningDomainIndex,
ptpbaseClockRunningClockTypeIndex,
ptpbaseClockRunningInstanceIndex
}

::= { ptpbaseClockRunningTable 1 }

PtpbaseClockRunningEntry ::= SEQUENCE {

ptpbaseClockRunningDomainIndex ClockDomainType,

ptpbaseClockRunningClockTypeIndex ClockType,

ptpbaseClockRunningInstanceIndex ClockInstanceType,

ptpbaseClockRunningState ClockStateType,

ptpbaseClockRunningPacketsSent Counter64,

ptpbaseClockRunningPacketsReceived Counter64

}

ptpbaseClockRunningDomainIndex OBJECT-TYPE

SYNTAX ClockDomainType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This object specifies the domain number used to create logical
group of PTP devices."

::= { ptpbaseClockRunningEntry 1 }

ptpbaseClockRunningClockTypeIndex OBJECT-TYPE

SYNTAX ClockType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This object specifies the clock type as defined in the
Textual convention description."

::= { ptpbaseClockRunningEntry 2 }

ptpbaseClockRunningInstanceIndex OBJECT-TYPE

SYNTAX ClockInstanceType

MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
 "This object specifies the instance of the clock for this clock
 type in the given domain."
 ::= { ptpbaseClockRunningEntry 3 }

ptpbaseClockRunningState OBJECT-TYPE

SYNTAX ClockStateType
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "This object specifies the Clock state returned by PTP engine
 which was described earlier.

 Freerun state. Applies to a slave device that is not locked to
 a master. This is the initial state a slave starts out with
 when
 it is not getting any PTP packets from the master or because of
 some other input error (erroneous packets, etc).

 Holdover state. In this state the slave device is locked to a
 master but communication with the master is lost or the
 timestamps in the ptp packets are incorrect. But since the
 slave was locked to the master, it can run with the same
 accuracy for
 sometime. The slave can continue to operate in this state for
 some time. If communication with the master is not restored for
 a while, the device is moved to the FREERUN state.

 Acquiring state. The slave device is receiving packets from a
 master and is trying to acquire a lock.

 Freq_locked state. Slave device is locked to the Master with
 respect to frequency, but not phase aligned

 Phase_aligned state. Locked to the master with respect to
 frequency and phase."
 ::= { ptpbaseClockRunningEntry 4 }

ptpbaseClockRunningPacketsSent OBJECT-TYPE

SYNTAX Counter64
MAX-ACCESS read-only

STATUS current
DESCRIPTION
"This object specifies the total number of all packet Unicast
and multicast that have been sent out for this clock in this
domain for this type."
::= { ptpbaseClockRunningEntry 5 }

ptpbaseClockRunningPacketsReceived OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the total number of all packet Unicast
and multicast that have been received for this clock in this
domain for this type."
::= { ptpbaseClockRunningEntry 6 }

ptpbaseClockTimePropertiesDSTable OBJECT-TYPE
SYNTAX SEQUENCE OF PtpbaseClockTimePropertiesDSEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"Table of information about the PTP clock Timeproperties
Datasets for all domains."
::= { ptpbaseMIBClockInfo 5 }

ptpbaseClockTimePropertiesDSEntry OBJECT-TYPE
SYNTAX PtpbaseClockTimePropertiesDSEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"An entry in the table, containing information about a single
PTP clock timeproperties Datasets for a domain."
REFERENCE "Section 8.2.4 of [IEEE 1588-2008]"
INDEX {
ptpbaseClockTimePropertiesDSDomainIndex,
ptpbaseClockTimePropertiesDSClockTypeIndex,
ptpbaseClockTimePropertiesDSInstanceIndex
}
::= { ptpbaseClockTimePropertiesDSTable 1 }

```
PtpbaseClockTimePropertiesDSEntry ::= SEQUENCE {  
    ptpbaseClockTimePropertiesDSDomainIndex      ClockDomainType,  
    ptpbaseClockTimePropertiesDSClockTypeIndex    ClockType,  
    ptpbaseClockTimePropertiesDSInstanceIndex      ClockInstanceType,  
    ptpbaseClockTimePropertiesDSCurrentUTCOffsetValid TruthValue,  
    ptpbaseClockTimePropertiesDSCurrentUTCOffset    Integer32,  
    ptpbaseClockTimePropertiesDSLeap59              TruthValue,  
    ptpbaseClockTimePropertiesDSLeap61              TruthValue,  
    ptpbaseClockTimePropertiesDSTimeTraceable        TruthValue,  
    ptpbaseClockTimePropertiesDSFreqTraceable        TruthValue,  
    ptpbaseClockTimePropertiesDSPTPTimescale         TruthValue,  
    ptpbaseClockTimePropertiesDSSource               ClockTimeSourceType  
}
```

ptpbaseClockTimePropertiesDSDomainIndex OBJECT-TYPE

```
SYNTAX          ClockDomainType  
MAX-ACCESS      not-accessible  
STATUS          current  
DESCRIPTION  
    "This object specifies the domain number used to create logical  
    group of PTP devices."  
::= { ptpbaseClockTimePropertiesDSEntry 1 }
```

ptpbaseClockTimePropertiesDSClockTypeIndex OBJECT-TYPE

```
SYNTAX          ClockType  
MAX-ACCESS      not-accessible  
STATUS          current  
DESCRIPTION  
    "This object specifies the clock type as defined in the  
    Textual convention description."  
::= { ptpbaseClockTimePropertiesDSEntry 2 }
```

ptpbaseClockTimePropertiesDSInstanceIndex OBJECT-TYPE

```
SYNTAX          ClockInstanceType  
MAX-ACCESS      not-accessible  
STATUS          current  
DESCRIPTION  
    "This object specifies the instance of the clock for this clock  
    type in the given domain."  
::= { ptpbaseClockTimePropertiesDSEntry 3 }
```

ptpbaseClockTimePropertiesDSCurrentUTCOffsetValid OBJECT-TYPE

```
SYNTAX          TruthValue
```

MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "This object specifies the timeproperties dataset value of
 whether current UTC offset is valid."
REFERENCE "Section 8.2.4.2 of [IEEE 1588-2008]"
::= { ptpbaseClockTimePropertiesDSEntry 4 }

ptpbaseClockTimePropertiesDSCurrentUTCOffset OBJECT-TYPE

SYNTAX Integer32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "This object specifies the timeproperties dataset value of
 current UTC offset.

 In PTP systems whose epoch is the PTP epoch, the value of
 timePropertiesDS.currentUtcOffset is the offset
 between TAI and UTC; otherwise the value has no meaning. The
 value shall be in units of seconds.
 The initialization value shall be selected as follows:
 a) If the timePropertiesDS.ptpTimescale (see 8.2.4.8) is TRUE,
 the value is the value obtained from a
 primary reference if the value is known at the time of
 initialization, else.
 b) The value shall be the current number of leap seconds (7.2.3)
 when the node is designed."
REFERENCE "Section 8.2.4.3 of [IEEE 1588-2008]"
::= { ptpbaseClockTimePropertiesDSEntry 5 }

ptpbaseClockTimePropertiesDSLeap59 OBJECT-TYPE

SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "This object specifies the Leap59 value in the clock Current
 Dataset."
REFERENCE "Section 8.2.4.4 of [IEEE 1588-2008]"
::= { ptpbaseClockTimePropertiesDSEntry 6 }

ptpbaseClockTimePropertiesDSLeap61 OBJECT-TYPE

SYNTAX TruthValue
MAX-ACCESS read-only

STATUS current
DESCRIPTION
 "This object specifies the Leap61 value in the clock Current Dataset."
REFERENCE "Section 8.2.4.5 of [IEEE 1588-2008]"
::= { ptpbaseClockTimePropertiesDSEntry 7 }

ptpbaseClockTimePropertiesDSTimeTraceable OBJECT-TYPE

SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "This object specifies the Timetraceable value in the clock Current Dataset."
REFERENCE "Section 8.2.4.6 of [IEEE 1588-2008]"
::= { ptpbaseClockTimePropertiesDSEntry 8 }

ptpbaseClockTimePropertiesDSFreqTraceable OBJECT-TYPE

SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "This object specifies the Frequency Traceable value in the clock Current Dataset."
REFERENCE "Section 8.2.4.7 of [IEEE 1588-2008]"
::= { ptpbaseClockTimePropertiesDSEntry 9 }

ptpbaseClockTimePropertiesDSPTPTimescale OBJECT-TYPE

SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "This object specifies the PTP Timescale value in the clock Current Dataset."
REFERENCE "Section 8.2.4.8 of [IEEE 1588-2008]"
::= { ptpbaseClockTimePropertiesDSEntry 10 }

ptpbaseClockTimePropertiesDSSource OBJECT-TYPE

SYNTAX ClockTimeSourceType
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "This object specifies the Timesource value in the clock Current

Dataset."
 REFERENCE "Section 8.2.4.9 of [IEEE 1588-2008]"
 ::= { ptpbaseClockTimePropertiesDSEntry 11 }

ptpbaseClockTransDefaultDSTable OBJECT-TYPE
 SYNTAX SEQUENCE OF PtpbaseClockTransDefaultDSEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "Table of information about the PTP Transparent clock Default
 Datasets for all domains."
 ::= { ptpbaseMIBClockInfo 6 }

ptpbaseClockTransDefaultDSEntry OBJECT-TYPE
 SYNTAX PtpbaseClockTransDefaultDSEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "An entry in the table, containing information about a single
 PTP Transparent clock Default Datasets for a domain."
 REFERENCE "Section 8.3.2 of [IEEE 1588-2008]"
 INDEX {
 ptpbaseClockTransDefaultDSDomainIndex,
 ptpbaseClockTransDefaultDSInstanceIndex
 }
 ::= { ptpbaseClockTransDefaultDSTable 1 }

PtpbaseClockTransDefaultDSEntry ::= SEQUENCE {
 ptpbaseClockTransDefaultDSDomainIndex ClockDomainType,
 ptpbaseClockTransDefaultDSInstanceIndex ClockInstanceType,
 ptpbaseClockTransDefaultDSClockIdentity ClockIdentity,
 ptpbaseClockTransDefaultDSNumOfPorts Counter32,
 ptpbaseClockTransDefaultDSDelay ClockMechanismType,
 ptpbaseClockTransDefaultDSPrimaryDomain Integer32
 }

ptpbaseClockTransDefaultDSDomainIndex OBJECT-TYPE
 SYNTAX ClockDomainType
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

```

    "This object specifies the domain number used to create logical
    group of PTP devices."
 ::= { ptpbaseClockTransDefaultDSEntry 1 }

ptpbaseClockTransDefaultDSInstanceIndex OBJECT-TYPE
    SYNTAX      ClockInstanceType
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "This object specifies the instance of the clock for this clock
        type in the given domain."
    ::= { ptpbaseClockTransDefaultDSEntry 2 }

ptpbaseClockTransDefaultDSClockIdentity OBJECT-TYPE
    SYNTAX      ClockIdentity
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "This object specifies the value of the clockIdentity attribute
        of the local clock."
    REFERENCE    "Section 8.3.2.2.1 of [IEEE 1588-2008]"
    ::= { ptpbaseClockTransDefaultDSEntry 3 }

ptpbaseClockTransDefaultDSNumOfPorts OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "This object specifies the number of PTP ports of the device."
    REFERENCE    "Section 8.3.2.2.2 of [IEEE 1588-2008]"
    ::= { ptpbaseClockTransDefaultDSEntry 4 }

ptpbaseClockTransDefaultDSDelay OBJECT-TYPE
    SYNTAX      ClockMechanismType
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "This object, if the transparent clock is an end-to-end
        transparent clock, has the value shall be E2E; If the
        transparent clock is a peer-to-peer transparent clock, the
        value
        shall be P2P."
    REFERENCE    "Section 8.3.2.3.1 of [IEEE 1588-2008]"
```



```
::= { ptpbaseClockTransDefaultDSEntry 5 }
```

```
ptpbaseClockTransDefaultDSPrimaryDomain OBJECT-TYPE
```

```
SYNTAX          Integer32
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
    "This object specifies the value of the primary syntonization
    domain. The initialization value shall be 0."
REFERENCE       "Section 8.3.2.3.2 of [IEEE 1588-2008]"
::= { ptpbaseClockTransDefaultDSEntry 6 }
```

```
ptpbaseClockPortTable OBJECT-TYPE
```

```
SYNTAX          SEQUENCE OF PtpbaseClockPortEntry
MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION
    "Table of information about the clock ports for a particular
    domain."
::= { ptpbaseMIBClockInfo 7 }
```

```
ptpbaseClockPortEntry OBJECT-TYPE
```

```
SYNTAX          PtpbaseClockPortEntry
MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION
    "An entry in the table, containing information about a single
    clock port."
INDEX           {
                ptpbaseClockPortDomainIndex,
                ptpbaseClockPortClockTypeIndex,
                ptpbaseClockPortClockInstanceIndex,
                ptpbaseClockPortTablePortNumberIndex
            }
::= { ptpbaseClockPortTable 1 }
```

```
PtpbaseClockPortEntry ::= SEQUENCE {
    ptpbaseClockPortDomainIndex      ClockDomainType,
    ptpbaseClockPortClockTypeIndex   ClockType,
    ptpbaseClockPortClockInstanceIndex ClockInstanceType,
    ptpbaseClockPortTablePortNumberIndex ClockPortNumber,
```

```
        ptpbaseClockPortName                DisplayString,
        ptpbaseClockPortRole                ClockRoleType,
        ptpbaseClockPortSyncOneStep        TruthValue,
        ptpbaseClockPortCurrentPeerAddressType ClockPortTransportType,
        ptpbaseClockPortCurrentPeerAddress
ClockPortTransportTypeAddress,
        ptpbaseClockPortNumOfAssociatedPorts Gauge32
    }

ptpbaseClockPortDomainIndex OBJECT-TYPE
    SYNTAX      ClockDomainType
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "This object specifies the domain number used to create logical
        group of PTP devices."
    ::= { ptpbaseClockPortEntry 1 }

ptpbaseClockPortClockTypeIndex OBJECT-TYPE
    SYNTAX      ClockType
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "This object specifies the clock type as defined in the
        Textual convention description."
    ::= { ptpbaseClockPortEntry 2 }

ptpbaseClockPortClockInstanceIndex OBJECT-TYPE
    SYNTAX      ClockInstanceType
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "This object specifies the instance of the clock for this clock
        type in the given domain."
    ::= { ptpbaseClockPortEntry 3 }

ptpbaseClockPortTablePortNumberIndex OBJECT-TYPE
    SYNTAX      ClockPortNumber (1..65535)
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "This object specifies the PTP Portnumber for this port."
    ::= { ptpbaseClockPortEntry 4 }
```

ptpbasedClockPortName OBJECT-TYPE
SYNTAX DisplayString (SIZE (1..64))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the PTP clock port name configured on the
router."
::= { ptpbasedClockPortEntry 5 }

ptpbasedClockPortRole OBJECT-TYPE
SYNTAX ClockRoleType
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object describes the current role (slave/master) of the
port."
::= { ptpbasedClockPortEntry 6 }

ptpbasedClockPortSyncOneStep OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies that one-step clock operation between
the PTP master and slave device is enabled."
::= { ptpbasedClockPortEntry 7 }

ptpbasedClockPortCurrentPeerAddressType OBJECT-TYPE
SYNTAX ClockPortTransportType
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the current peer's network address used
for PTP communication."
::= { ptpbasedClockPortEntry 8 }

ptpbasedClockPortCurrentPeerAddress OBJECT-TYPE
SYNTAX ClockPortTransportTypeAddress
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the current peer's network address used

```

    for PTP communication."
 ::= { ptpbaseClockPortEntry 9 }

```

ptpbaseClockPortNumOfAssociatedPorts OBJECT-TYPE

```

SYNTAX          Gauge32
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION

```

```

    "This object specifies -
    For a master port - the number of PTP slave sessions (peers)
    associated with this PTP port.
    For a slave port - the number of masters available to this slave
    port (might or might not be peered)."
```

```

 ::= { ptpbaseClockPortEntry 10 }

```

ptpbaseClockPortDSTable OBJECT-TYPE

```

SYNTAX          SEQUENCE OF PtpbaseClockPortDSEntry
MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION

```

```

    "Table of information about the clock ports dataset for a
    particular domain."
```

```

 ::= { ptpbaseMIBClockInfo 8 }

```

ptpbaseClockPortDSEntry OBJECT-TYPE

```

SYNTAX          PtpbaseClockPortDSEntry
MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION

```

```

    "An entry in the table, containing port dataset information for
    a single clock port."
```

```

INDEX          {
                ptpbaseClockPortDSDomainIndex,
                ptpbaseClockPortDSClockTypeIndex,
                ptpbaseClockPortDSClockInstanceIndex,
                ptpbaseClockPortDSPortNumberIndex
            }

```

```

 ::= { ptpbaseClockPortDSTable 1 }

```

PtpbaseClockPortDSEntry ::= SEQUENCE {

```

    ptpbaseClockPortDSDomainIndex          ClockDomainType,
```

```
    ptpbaseClockPortDSClockTypeIndex      ClockType,
    ptpbaseClockPortDSClockInstanceIndex   ClockInstanceType,
    ptpbaseClockPortDSPortNumberIndex      ClockPortNumber,
    ptpbaseClockPortDSName                  DisplayString,
    ptpbaseClockPortDSPortIdentity          OCTET STRING,
    ptpbaseClockPortDSAnnouncementInterval Integer32,
    ptpbaseClockPortDSAnnounceRctTimeout   Integer32,
    ptpbaseClockPortDSSyncInterval          Integer32,
    ptpbaseClockPortDSMinDelayReqInterval  Integer32,
    ptpbaseClockPortDSPeerDelayReqInterval Integer32,
    ptpbaseClockPortDSDelayMech             ClockMechanismType,
    ptpbaseClockPortDSPeerMeanPathDelay     ClockTimeInterval,
    ptpbaseClockPortDSGrantDuration         Unsigned32,
    ptpbaseClockPortDSPTPVersion            Integer32
}

ptpbaseClockPortDSDomainIndex OBJECT-TYPE
    SYNTAX      ClockDomainType
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "This object specifies the domain number used to create logical
        group of PTP devices."
    ::= { ptpbaseClockPortDSEntry 1 }

ptpbaseClockPortDSClockTypeIndex OBJECT-TYPE
    SYNTAX      ClockType
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "This object specifies the clock type as defined in the
        Textual convention description."
    ::= { ptpbaseClockPortDSEntry 2 }

ptpbaseClockPortDSClockInstanceIndex OBJECT-TYPE
    SYNTAX      ClockInstanceType
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "This object specifies the instance of the clock for this clock
        type in the given domain."
    ::= { ptpbaseClockPortDSEntry 3 }
```

ptpbasedClockPortDSPortNumberIndex OBJECT-TYPE
SYNTAX ClockPortNumber (1..65535)
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This object specifies the PTP portnumber associated with this
PTP port."
::= { ptpbasedClockPortDSEntry 4 }

ptpbasedClockPortDSName OBJECT-TYPE
SYNTAX DisplayString (SIZE (1..64))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the PTP clock port name."
::= { ptpbasedClockPortDSEntry 5 }

ptpbasedClockPortDSPortIdentity OBJECT-TYPE
SYNTAX OCTET STRING(SIZE(1..256))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the PTP clock port Identity."
::= { ptpbasedClockPortDSEntry 6 }

ptpbasedClockPortDSAnnouncementInterval OBJECT-TYPE
SYNTAX Integer32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the Announce message transmission
interval associated with this clock port."
::= { ptpbasedClockPortDSEntry 7 }

ptpbasedClockPortDSAnnounceRctTimeout OBJECT-TYPE
SYNTAX Integer32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the Announce receipt timeout associated
with this clock port."
::= { ptpbasedClockPortDSEntry 8 }

ptpbasedClockPortDSSyncInterval OBJECT-TYPE

SYNTAX Integer32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the Sync message transmission interval."
::= { ptpbasedClockPortDSEntry 9 }

ptpbasedClockPortDSMinDelayReqInterval OBJECT-TYPE

SYNTAX Integer32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the Delay_Req message transmission interval."
::= { ptpbasedClockPortDSEntry 10 }

ptpbasedClockPortDSPeerDelayReqInterval OBJECT-TYPE

SYNTAX Integer32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the Pdelay_Req message transmission interval."
::= { ptpbasedClockPortDSEntry 11 }

ptpbasedClockPortDSDelayMech OBJECT-TYPE

SYNTAX ClockMechanismType
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the delay mechanism used. If the clock is an end-to-end clock, the value of the is e2e, else if the clock is a peer to-peer clock, the value shall be p2p."
::= { ptpbasedClockPortDSEntry 12 }

ptpbasedClockPortDSPeerMeanPathDelay OBJECT-TYPE

SYNTAX ClockTimeInterval
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the peer meanPathDelay."
::= { ptpbasedClockPortDSEntry 13 }

ptpbasedClockPortDSGrantDuration OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the grant duration allocated by the master."

::= { ptpbasedClockPortDSEntry 14 }

ptpbasedClockPortDSPTPVersion OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the PTP version being used."

::= { ptpbasedClockPortDSEntry 15 }

ptpbasedClockPortRunningTable OBJECT-TYPE

SYNTAX SEQUENCE OF PtpbasedClockPortRunningEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Table of information about the clock ports running dataset for a particular domain."

::= { ptpbasedMIBClockInfo 9 }

ptpbasedClockPortRunningEntry OBJECT-TYPE

SYNTAX PtpbasedClockPortRunningEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the table, containing running dataset information about a single clock port."

INDEX {
ptpbasedClockPortRunningDomainIndex,
ptpbasedClockPortRunningClockTypeIndex,
ptpbasedClockPortRunningClockInstanceIndex,
ptpbasedClockPortRunningPortNumberIndex
}

::= { ptpbasedClockPortRunningTable 1 }


```

PtpbaseClockPortRunningEntry ::= SEQUENCE {
    ptpbaseClockPortRunningDomainIndex      ClockDomainType,
    ptpbaseClockPortRunningClockTypeIndex   ClockType,
    ptpbaseClockPortRunningClockInstanceIndex ClockInstanceType,
    ptpbaseClockPortRunningPortNumberIndex  ClockPortNumber,
    ptpbaseClockPortRunningName             DisplayString,
    ptpbaseClockPortRunningState            ClockPortState,
    ptpbaseClockPortRunningRole             ClockRoleType,
    ptpbaseClockPortRunningInterfaceIndex   InterfaceIndexOrZero,
    ptpbaseClockPortRunningTransport
ClockPortTransportType,
    ptpbaseClockPortRunningEncapsulationType Integer32,
    ptpbaseClockPortRunningTxMode           ClockTxModeType,
    ptpbaseClockPortRunningRxMode           ClockTxModeType,
    ptpbaseClockPortRunningPacketsReceived  Counter64,
    ptpbaseClockPortRunningPacketsSent     Counter64
}

```

```

ptpbaseClockPortRunningDomainIndex OBJECT-TYPE
    SYNTAX      ClockDomainType
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This object specifies the domain number used to create logical
        group of PTP devices."
    ::= { ptpbaseClockPortRunningEntry 1 }

```

```

ptpbaseClockPortRunningClockTypeIndex OBJECT-TYPE
    SYNTAX      ClockType
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This object specifies the clock type as defined in the
        Textual convention description."
    ::= { ptpbaseClockPortRunningEntry 2 }

```

```

ptpbaseClockPortRunningClockInstanceIndex OBJECT-TYPE
    SYNTAX      ClockInstanceType
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This object specifies the instance of the clock for this clock

```

type in the given domain."
 ::= { ptpbaseClockPortRunningEntry 3 }

ptpbaseClockPortRunningPortNumberIndex OBJECT-TYPE

SYNTAX ClockPortNumber (1..65535)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This object specifies the PTP portnumber associated with this clock port."

::= { ptpbaseClockPortRunningEntry 4 }

ptpbaseClockPortRunningName OBJECT-TYPE

SYNTAX DisplayString (SIZE (1..64))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the PTP clock port name."

::= { ptpbaseClockPortRunningEntry 5 }

ptpbaseClockPortRunningState OBJECT-TYPE

SYNTAX ClockPortState

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the port state returned by PTP engine.

initializing - In this state a port initializes its data sets, hardware, and communication facilities.
 faulty - The fault state of the protocol.
 disabled - The port shall not place any messages on its communication path.
 listening - The port is waiting for the announceReceiptTimeout to expire or to receive an Announce message from a master.
 preMaster - The port shall behave in all respects as though it were in the MASTER state except that it shall not place any messages on its communication path except for Pdelay_Req, Pdelay_Resp, Pdelay_Resp_Follow_Up, signaling, or

management messages.

master - The port is behaving as a master port.

passive - The port shall not place any messages on its communication path except for Pdelay_Req, Pdelay_Resp, Pdelay_Resp_Follow_Up, or signaling messages, or management messages that are a required response to another management message

uncalibrated - The local port is preparing to synchronize to the master port.

slave - The port is synchronizing to the selected master port."

::= { ptpbaseClockPortRunningEntry 6 }

ptpbaseClockPortRunningRole OBJECT-TYPE

SYNTAX ClockRoleType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the Clock Role."

::= { ptpbaseClockPortRunningEntry 7 }

ptpbaseClockPortRunningInterfaceIndex OBJECT-TYPE

SYNTAX InterfaceIndexOrZero

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the interface on the router being used by the PTP Clock for PTP communication."

::= { ptpbaseClockPortRunningEntry 8 }

ptpbaseClockPortRunningTransport OBJECT-TYPE

SYNTAX ClockPortTransportType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the transport protocol being used for PTP communication (the mapping used)."

::= { ptpbaseClockPortRunningEntry 9 }

ptpbaseClockPortRunningEncapsulationType OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the type of encapsulation if the interface is adding extra layers (eg. VLAN, Pseudowire encapsulation...) for the PTP messages."

::= { ptpbaseClockPortRunningEntry 10 }

ptpbaseClockPortRunningTxMode OBJECT-TYPE

SYNTAX ClockTxModeType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the clock transmission mode as

unicast: Using unicast communication channel.

multicast: Using Multicast communication channel.

multicast-mix: Using multicast-unicast communication channel"

::= { ptpbaseClockPortRunningEntry 11 }

ptpbaseClockPortRunningRxMode OBJECT-TYPE

SYNTAX ClockTxModeType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the clock receive mode as

unicast: Using unicast communication channel.

multicast: Using Multicast communication channel.

multicast-mix: Using multicast-unicast communication channel"

::= { ptpbaseClockPortRunningEntry 12 }

ptpbaseClockPortRunningPacketsReceived OBJECT-TYPE

SYNTAX Counter64

UNITS "packets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the packets received on the clock port (cumulative)."

::= { ptpbaseClockPortRunningEntry 13 }

ptpbaseClockPortRunningPacketsSent OBJECT-TYPE

```

SYNTAX          Counter64
UNITS            "packets"
MAX-ACCESS       read-only
STATUS           current
DESCRIPTION
    "This object specifies the packets sent on the clock port
    (cumulative)."
```

::= { ptpbaseClockPortRunningEntry 14 }

ptpbaseClockPortTransDSTable OBJECT-TYPE

```

SYNTAX          SEQUENCE OF PtpbaseClockPortTransDSEntry
MAX-ACCESS       not-accessible
STATUS           current
DESCRIPTION
    "Table of information about the Transparent clock ports running
    dataset for a particular domain."
```

::= { ptpbaseMIBClockInfo 10 }

ptpbaseClockPortTransDSEntry OBJECT-TYPE

```

SYNTAX          PtpbaseClockPortTransDSEntry
MAX-ACCESS       not-accessible
STATUS           current
DESCRIPTION
    "An entry in the table, containing clock port Transparent
    dataset information about a single clock port"
```

INDEX {

ptpbaseClockPortTransDSDomainIndex,
ptpbaseClockPortTransDSInstanceIndex,
ptpbaseClockPortTransDSPortNumberIndex

}

::= { ptpbaseClockPortTransDSTable 1 }

```

PtpbaseClockPortTransDSEntry ::= SEQUENCE {
    ptpbaseClockPortTransDSDomainIndex      ClockDomainType,
    ptpbaseClockPortTransDSInstanceIndex    ClockInstanceType,
    ptpbaseClockPortTransDSPortNumberIndex  ClockPortNumber,
    ptpbaseClockPortTransDSPortIdentity     ClockIdentity,
    ptpbaseClockPortTransDSlogMinPdelayReqInt Integer32,
    ptpbaseClockPortTransDSFaultyFlag      TruthValue,
    ptpbaseClockPortTransDSPeerMeanPathDelay ClockTimeInterval
}
```

```
ptpbasedClockPortTransDSDomainIndex OBJECT-TYPE
    SYNTAX          ClockDomainType
    MAX-ACCESS       not-accessible
    STATUS           current
    DESCRIPTION
        "This object specifies the domain number used to create logical
        group of PTP devices."
    ::= { ptpbasedClockPortTransDSEntry 1 }

ptpbasedClockPortTransDSInstanceIndex OBJECT-TYPE
    SYNTAX          ClockInstanceType
    MAX-ACCESS       not-accessible
    STATUS           current
    DESCRIPTION
        "This object specifies the instance of the clock for this clock
        type in the given domain."
    ::= { ptpbasedClockPortTransDSEntry 2 }

ptpbasedClockPortTransDSPortNumberIndex OBJECT-TYPE
    SYNTAX          ClockPortNumber (1..65535)
    MAX-ACCESS       not-accessible
    STATUS           current
    DESCRIPTION
        "This object specifies the PTP port number associated with this
        port."
    REFERENCE        "Section 7.5.2 Port Identity [IEEE 1588-2008]"
    ::= { ptpbasedClockPortTransDSEntry 3 }

ptpbasedClockPortTransDSPortIdentity OBJECT-TYPE
    SYNTAX          ClockIdentity
    MAX-ACCESS       read-only
    STATUS           current
    DESCRIPTION
        "This object specifies the value of the PortIdentity
        attribute of the local port."
    REFERENCE        "Section 8.3.3.2.1 of [IEEE 1588-2008]"
    ::= { ptpbasedClockPortTransDSEntry 4 }

ptpbasedClockPortTransDSlogMinPdelayReqInt OBJECT-TYPE
    SYNTAX          Integer32
    MAX-ACCESS       read-only
    STATUS           current
```

DESCRIPTION

"This object specifies the value of the logarithm to the base 2 of the minPdelayReqInterval."

REFERENCE "Section 8.3.3.3.1 of [IEEE 1588-2008]"
 ::= { ptpbaseClockPortTransDSEntry 5 }

ptpbaseClockPortTransDSFaultyFlag OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the value TRUE if the port is faulty and FALSE if the port is operating normally."

REFERENCE "Section 8.3.3.3.2 of [IEEE 1588-2008]"
 ::= { ptpbaseClockPortTransDSEntry 6 }

ptpbaseClockPortTransDSPeerMeanPathDelay OBJECT-TYPE

SYNTAX ClockTimeInterval

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies, (if the delayMechanism used is P2P) the value is the estimate of the current one-way propagation delay, i.e., <meanPathDelay> on the link attached to this port computed using the peer delay mechanism. If the value of the delayMechanism used is E2E, then the value will be zero."

REFERENCE "Section 8.3.3.3.3 of [IEEE 1588-2008]"
 ::= { ptpbaseClockPortTransDSEntry 7 }

ptpbaseClockPortAssociateTable OBJECT-TYPE

SYNTAX SEQUENCE OF PtpbaseClockPortAssociateEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Table of information about a given port's associated ports."

For a master port - multiple slave ports which have established sessions with the current master port.

For a slave port - the list of masters available for a given

slave port.

Session information (pkts, errors) to be displayed based on availability and scenario."

::= { ptpbaseMIBClockInfo 11 }

ptpbaseClockPortAssociateEntry OBJECT-TYPE

SYNTAX PtpbaseClockPortAssociateEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the table, containing information about a single associated port for the given clockport."

INDEX {
 ptpClockPortCurrentDomainIndex,
 ptpClockPortCurrentClockTypeIndex,
 ptpClockPortCurrentClockInstanceIndex,
 ptpClockPortCurrentPortNumberIndex,
 ptpbaseClockPortAssociatePortIndex
 }

::= { ptpbaseClockPortAssociateTable 1 }

PtpbaseClockPortAssociateEntry ::= SEQUENCE {

ptpClockPortCurrentDomainIndex	ClockDomainType,
ptpClockPortCurrentClockTypeIndex	ClockType,
ptpClockPortCurrentClockInstanceIndex	ClockInstanceType,
ptpClockPortCurrentPortNumberIndex	ClockPortNumber,
ptpbaseClockPortAssociatePortIndex	Unsigned32,
ptpbaseClockPortAssociateAddressType	ClockPortTransportType,
ptpbaseClockPortAssociateAddress	

ClockPortTransportTypeAddress,

ptpbaseClockPortAssociatePacketsSent	Counter64,
ptpbaseClockPortAssociatePacketsReceived	Counter64,
ptpbaseClockPortAssociateInErrors	Counter64,
ptpbaseClockPortAssociateOutErrors	Counter64

}

ptpClockPortCurrentDomainIndex OBJECT-TYPE

SYNTAX ClockDomainType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This object specifies the given port's domain number."


```
::= { ptpbaseClockPortAssociateEntry 1 }
```

ptpClockPortCurrentClockTypeIndex OBJECT-TYPE

SYNTAX ClockType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This object specifies the given port's clock type."

```
::= { ptpbaseClockPortAssociateEntry 2 }
```

ptpClockPortCurrentClockInstanceIndex OBJECT-TYPE

SYNTAX ClockInstanceType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This object specifies the instance of the clock for this clock type in the given domain."

```
::= { ptpbaseClockPortAssociateEntry 3 }
```

ptpClockPortCurrentPortNumberIndex OBJECT-TYPE

SYNTAX ClockPortNumber

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This object specifies the PTP Port Number for the given port."

```
::= { ptpbaseClockPortAssociateEntry 4 }
```

ptpbaseClockPortAssociatePortIndex OBJECT-TYPE

SYNTAX Unsigned32 (1..65535)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This object specifies the associated port's serial number in the current port's context."

```
::= { ptpbaseClockPortAssociateEntry 5 }
```

ptpbaseClockPortAssociateAddressType OBJECT-TYPE

SYNTAX ClockPortTransportType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the peer port's network address type used for PTP communication."

```
::= { ptpbaseClockPortAssociateEntry 6 }
```

ptpbaseClockPortAssociateAddress OBJECT-TYPE

SYNTAX ClockPortTransportTypeAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the peer port's network address used for PTP communication."

```
::= { ptpbaseClockPortAssociateEntry 7 }
```

ptpbaseClockPortAssociatePacketsSent OBJECT-TYPE

SYNTAX Counter64

UNITS "packets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of packets sent to this peer port from the current port."

```
::= { ptpbaseClockPortAssociateEntry 8 }
```

ptpbaseClockPortAssociatePacketsReceived OBJECT-TYPE

SYNTAX Counter64

UNITS "packets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of packets received from this peer port by the current port."

```
::= { ptpbaseClockPortAssociateEntry 9 }
```

ptpbaseClockPortAssociateInErrors OBJECT-TYPE

SYNTAX Counter64

UNITS "packets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the input errors associated with the peer port."

```
::= { ptpbaseClockPortAssociateEntry 10 }
```

ptpbaseClockPortAssociateOutErrors OBJECT-TYPE

SYNTAX Counter64

```
UNITS          "packets"
MAX-ACCESS     read-only
STATUS         current
DESCRIPTION    "This object specifies the output errors associated with the
                peer port."
 ::= { ptpbaseClockPortAssociateEntry 11 }
```

END

5. Security Considerations

This MIB contains readable objects whose values provide information related to PTP objects. While unauthorized access to the readable objects is relatively innocuous, unauthorized access to the writeable objects could cause a denial of service, or could cause unauthorized creation and/or manipulation of tunnels. Hence, the support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

SNMPv1 by itself is such an insecure environment. Even if the network itself is secure (for example by using IPSec), even then, there is no control as to who on the secure network is allowed to access and SET (change/create/delete) the objects in this MIB.

It is recommended that the implementers consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model [RFC 3414] and the View-based Access Control Model [RFC 3415] is recommended.

It is then a customer/user responsibility to ensure that the SNMP entity giving access to this MIB, is properly configured to give access to those objects only to those principals (users) that have legitimate rights to access them.

6. IANA Considerations

To be added.

7. References

7.1. Normative References

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7.2. Informative References

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8. Acknowledgements

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