Contribution to the Precise Networked Clock Synchronization Working Group for the Revision of IEEE 1588-2008

Working item: Optional common P2P meanPathDelay service	
Title: Optional common P2P meanPathDelay service	
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Summary

This document is based on the forthcoming post Paso Robles draft. Proposed is a solution to the issue of multiple supported P2P domains having multiple instances of the P2P messages on the same link. What is proposed is to have a common service provide the meanPathDelay. The common meanPathDelay service operates in its own distinct domain, independent of other domains.

Discussion:

As noted in Geoff's presentation https://ieee-sa.imeetcentral.com/p/aQAAAAACm9x- , the resultant meantPathDelay must be available to all domains. It is not sufficient just for a domain to observe the services P2P messages since the domain's measure of the second may differ from that of the service

Proposal:

<current text in normal font, ~~deleted text in strikeout~~, *new text (not in2008) in italics and highlighted,* Comments not part of standard are in brackets>

8.2.2.4 currentDS.meanPathDelay

The value of currentDS.meanPathDelay is ~~an implementation specific representation of~~ the current value of the mean propagation time between a master and slave clock as computed by the slave, i.e., <meanPathDelay>; see *9.1,* 11.3 and 11.4. The data type ~~should~~ *shall* be TimeInterval. The initialization value shall be either:

-The value in nonvolatile read−write storage if implemented*, or*

-Implementation-specific

8.2.5.4.4 portDS.delayMechanism

25 The value of portDS.delayMechanism shall indicate the propagation delay measuring option used by the port in
26 computing <meanPathDelay>. The value shall be taken from the enumeration in 0. The initialization value is
27 implementation-specific unless otherwise stated in a PTP profile.

28 **Table 8—Delay mechanism** enumeration

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. This value shall not be used except when the applicable PTP profile specifies either: 1 - that the clock only supports frequency transfer (syntonization) and that neither path delay mechanism is to be used or 2 - that the clock participates in time transfer but the system accuracy requirements are such that, for a portion of the system path, delays can be neglected allowing devices in that portion of the system to use the DISABLED attribute.
COMMON_P2P	*03*	*The port is configured to use the Common Mean Path Delay Service option, see 16.ZZ*

29 NOTE—Subclause 9.1 permits reconfiguration. Autoconfiguration is allowed but is out of scope.
30
31 **8.??? *optionalPortDS. logMinCommonMeanPathDelayService***
32 *The value of optionalPortDS. logMinCommonMeanPathDelayService is the logarithm to the base 2 of the interval*
33 *between the transmission of Pdelay_Req messages by the common mean path delay serve; see 16.ZZ. The default*
34 *initialization value shall be 0. The configurable range shall be -127 to 128. NOTE-This data set member applies*
35 *only to the mentioned service and not to other instances of PTP.*
36

37 <we need to add this to the native management if approved>

38 ## 9.1 General protocol requirements for PTP ordinary and boundary clocks

39 Ordinary and boundary clocks:
40   a) May operate within more than one domain; see 7.1. The operation of each domain shall be independent of the
41   others.
42   b) When required by the state machine of 9.2, shall synchronize per 12.2.
43   c) Shall either:
44   1- correct for path delay using one of the following options:
45   i) Delay request-response mechanism; see 11.3
46   ii) Peer delay mechanism; see 11.4
47   *iii) The Common Mean Path Delay Service option; see 16.ZZ* or
48   2- Under the conditions specified for the DISABLED option of Table 9, clause 8.2.5.4.4, not use either
49 of the above path delay mechanisms.

50 **10.3.4 Peer delay mechanism in peer-to-peer transparent clocks**

51 *If the Common Mean Path Delay Service option of 16.ZZ is used, the remainder of this subclause shall not apply except*
52 *as indicated in 16.ZZ.*

53 The peer-to-peer mechanism for measuring <meanPathDelay> between two port*s* on transparent clocks is identical
54 to the mechanism used for measuring between ports on boundary and ordinary clocks, see 11.4.1 and 11.4.2, with
55 the following exceptions:

56   a) For Node-A (the requestor), the timestamps t1 and t4 shall be measured by Node-A using the timescale of the
57   domain of Node-A specified in 10.1.

58 b) For Node-B (the responder), the timestamps t2 and t3 shall be measured by Node-B using the timescale of
59 the domain of Node-B as specified in 10.1.

60

61 If the <meanPathDelay> is being measured between a pair of ports one of which is on a peer-to-peer transparent
62 clock and the other is on a boundary or ordinary clock:

63 a) For the port on the boundary or ordinary clock, the specifications on timescales of 11.4.1 shall be
64 implemented

65 b) For the port on a peer-to-peer transparent clock, the specifications of this clause shall be implemented.

66 …

11.4 Peer delay mechanism for Ordinary and Boundary Clocks

67

11.4.1 Peer delay mechanism general requirements

68

69 *If the Common Mean Path Delay Service option of 16.ZZ is used, the specifications of 11.4.1, 11.4.2, and 11.4.3 shall*
70 *not apply to the ordinary or boundary clock using the option except as indicated in 16.ZZ.*
71

72 The peer delay mechanism measures the port-to-port propagation time, i.e., the link delay, between two
73 communicating ports supporting the peer delay mechanism.
74 …
75
76

77
78 **16.ZZ Common Mean Path Delay Service (optional)**
79
80 **16.ZZ.1 General**
81 *This option specifies a service primitive that enables any PTP clock that would normally obtain the value of a link's*
82 *meanPathDelay using the peer-to-peer method to instead obtain this value from a service common to all PTP*
83 *domains in a node. If the value of portDS.delayMechanism is COMMON_P2P then the specifications of this option*
84 *shall be in effect, otherwise the specifications shall not be in effect.*
85
86 *This option shall only be used when all domains using this service:*
87 *a) Use a single Local Clock at each PTP device, i.e. not a PTP Clock,*
88 *b) In the absence of this service use the peer-to-peer mechanism, and*
89 *c) Use the cumulative frequency mechanism of TBD.*
90 *In addition, this option shall not be used when any domain in the network makes any adjustments to, e.g. physically*
91 *syntonizes, the Local Clock.*
92
93

94 **16.ZZ.2 Using the Common Mean Path Delay Service.**
95 *A port shall obtain the value of the meanPathDelay for a link by invoking the following service request primitive on*
96 *the port whenever it normally would have issued a Pdelay_Req message when not using this option:*
97
98 *commonMeanPathDelayInformation commonMeanPathDelayRequest {UInteger16 portNumber};*
99
100 *where the value of portNumber is the port number of the PTP port requesting the information.*
101
102

103 *If the measurementValid field of the returned indication is TRUE, then based on the returned indication, see*
104 *16.ZZ.3, the port shall convert the returned information into the timescale of the domain and update the value of*
105 *currentDS.meanPathDelay.*
106

107 *If the measurementValid field of the returned indication is FALSE, then the port shall revert to using the normal*
108 *Pdelay mechanism specified in 10.3.4 for transparent clocks or 11.4.1 for ordinary or boundary clocks. Profiles*
109 *should specify any needed timeouts to handle failure to receive an indication or for retrying the Common Mean Path*
110 *Service.*
111
112 ***16.ZZ.3 Common Mean Path Delay Service***
113 *The service shall run on all physical ports of all PTP devices of a network in the isolated domain with SdoId value*
114 *0x200 and a domainNumber value of 0. Note- This is a value owned by the IEEE 1588 working group. NOTE- A*
115 *failure to run this service on all links can result in a using domain not being provided with the needed estimate of*
116 *meanPathDelay on such links.*
117
118
119 *For each physical port, the service shall measure the meanPathDelay using the Pdelay mechanism and multicast*
120 *communications as specified in 10.3.4 for transparent clocks or 11.4.1 for ordinary or boundary clocks. The*
121 *measurements shall be based on the Local Clock of the device running the service. The measurement shall be made*
122 *at a rate defined as follows:*
123   *-The initial Pdelay_Req message may be transmitted when required.*
124   *− Subsequent Pdelay_Req messages shall be transmitted at a rate such that the logarithm to the base 2 of the*
125 *mean value of the interval in seconds between message transmissions is no smaller than the interval computed from*
126 *the value of optionalPortDS.logMinCommonMeanPathDelayService of the transmitting port.*
127
128
129 *NOTE- This rate must be higher than that of any of the requesting domains.*
130
131 *NOTE-One way of implementing the above is for the service to run an instance of the P2P protocol on the entire*
132 *network with SdoId value 0x200 and a domainNumber value of 0. However the only requirement is that the Pdelay*
133 *mechanism be implemented as specified above.*
134
135 *Upon receipt of a commonMeanPathDelayRequest, the service shall provide a return indication primitive for the*
136 *port indicated in the service request as:*
137
138 *void commonMeanPathDelayIndication {CommonMeanPathDelayIndication value};*
139
140 *Where the data type is defined as:*
141
142 *struct CommonMeanPathDelayIndication*
143 *{*
144   *Boolean measurementValid;*
145   *TimeInterval meanPathDelay;*
146   *PortIdentity portIdentifier;*
147   *Double neighborRateRatio;*
148 *}*
149
150 *Where:*
151   *a) The value of measurementValid shall:*
152   *i- Be FALSE if (a) no Pdelay_Resp and, if indicated, Pdelay_Resp_Follow_Up message is received in*
153 *response to a Pdelay_Req message, or (b) if multiple Pdelay_Resp and, if indicated, multiple*
154 *Pdelay_Resp_Follow_Up messages are received in response to a single Pdelay_Req message, or (c) any other*
155 *failure conditions specified by the applicable PTP profile are satisfied, otherwise*
156   *ii- Be TRUE.*
157   *b) The value of meanPathDelay shall be the measured value for the port indicated by the portNumber field of the*
158 *request computed based on the Pdelay messages and the Local Clock of the device,*
159   *c) The value of portIdentifier shall be the PortIdentity, see 7.5.2, of the port conducting the measurement,*
160   *d) The value of neighborRateRatio shall be computed based on the Pdelay mechanism measurements as specified*
161 *in TBD.*
162

163

164 **References**

165   1588-2008 Table 5