

Tutorial on sdold values

Overview:

IEEE 1588 is a protocol for synchronizing the clocks of devices in a network environment. Devices supporting IEEE 1588 are named PTP Nodes. Each PTP Node is permitted to support multiple PTP Instances of the protocol, with each PTP Instance participating in a different collection, a domain, of PTP Instances and where the timing topology and timescale of each domain may differ.

For each PTP Instance, IEEE 1588 defines several attributes used by the protocol. The sdold, Standards Development Organization Identifier, is one of these attributes used to distinguish between different PTP Profiles. An IEEE PTP Profile customizes The IEEE 1588 Protocol, the PTP Protocol, for a particular application. The rules for creating an IEEE PTP Profile were first defined in IEEE Std 1588-2008.

IEEE 1588 defines a domain as “A logical grouping of PTP Instances using the PTP protocol to ensure that all Local PTP Clocks in the grouping are synchronized to the Grandmaster Clock of the domain, but which are not necessarily synchronized to the Local PTP Clocks in another PTP domain.” PTP Instances within the domain communicate via PTP messages and use the domainNumber and sdold fields in the common header to determine whether a received PTP message is in the domain of the PTP Instance, see IEEE Std 1588-2019 clauses 7.1.1, 7.1.2 and 7.1.3.

The PTP Profile specifies either a mandatory value of domainNumber, or that the value is user configurable, subject to certain restrictions.

Depending on the value of the sdold, certain ranges of the domainNumber might be reserved.

The value of the sdold indicates the standards organization responsible for certain aspects of the operation of the PTP protocol as discussed in the “Assignment of sdold values” section of this tutorial.

The sdold is composed of two parts: the majorSdold and the minorSdold fields. Additional information on the structure and interpretation of the sdold can be found in IEEE Std 1588-2019.

In addition to determining the applicable domain of a PTP message, the sdold message field is the basis for providing isolation of protocol operations specified by different classes of IEEE PTP Profiles as discussed in the section “IEEE PTP Profile isolation”.

IEEE PTP Profile isolation

Historically, the PTP protocol was envisioned as enabling clock synchronization in a well-controlled LAN environment such as a corporate laboratory or a small manufacturing facility. It was realized that independent implementations of the protocol could still occur on the same LAN. In this case, isolation of these independent implementations could be achieved either through the assignment of domainNumber values or by using different transport mechanisms, e.g. IP and layer 2, both techniques clearly requiring agreement among the independent users.

In the 2008 standard, the value of the transportSpecific field divided the shared LAN space to provide isolation, i.e. independent operation of operations based strictly on the specifications of IEEE Std 1588-2008 using a transportSpecific value of 0, and those based on IEEE Std 802.1AS using a transportSpecific value of 1. However, within these two categories, the value of the domainNumber remained the primary means for isolation of independent instances.

Starting with IEEE 1588-2019, the isolation capabilities present in IEEE Std 1588-2008 have been extended by enabling isolation of operations based on IEEE PTP Profiles written by qualified standards organizations if these organizations choose to provide this capability, see IEEE Std 1588-2019 clause 16.5, 7.1.1, 7.1.2, and 7.1.3.

Assignment of sdold values

The sdold attribute indicates the standards organization responsible for certain aspects of the operation of the PTP protocol. Qualified standards development organizations, QSDOs, wishing to provide the capability of isolating instances operating under an IEEE PTP Profile created by the QSDO, must apply to the IEEE Registration Authority for an sdold. Only a single sdold value will be assigned to a given QSDO. A QSDO that creates several IEEE PTP Profiles must specify additional requirements to provide isolation between their several profiles, e.g. by specifying additional restrictions on the domainNumber space.

Semantics of sdold values

The interpretation of sdold values is given in the following table:

sdold	QSDO owning the sdold
0x000	IEEE 1588 Working Group; this value is used for implementations based on IEEE 1588-2008, excluding implementations based on IEEE 802.1AS which uses the value 0x100. It is used for any non-IEEE 802.1AS implementation based on this edition where the expanded profile isolation capabilities are not required.
0x001-0x0FF	IEEE 1588 Working Group; to preserve compatibility with IEEE 1588-2008, these values shall not be used
0x100	IEEE 802.1 Working Group
0x101-0x1FF	IEEE 1588 Working Group; to preserve compatibility with IEEE 1588-2008, these values shall not be used
0x200	IEEE 1588 Working Group; for the Common Mean Link Delay Service
0x201-0x2FF	IEEE 1588 Working Group for future use

0x300 – 0xFFC	For assignment by IEEE RA to QSDOs for IEEE PTP Profiles using the expanded profile isolation capabilities based on option 16.5 of IEEE Std 1588-2019.
0xFFD, 0xFFE	For experimental use only on a temporary basis by anyone (see IEEE Std 1588-2019 4.2.10 for the definition of “experimental”)
0xFFF	IEEE 1588 Working Group (as a possible extension)

Definition of a Qualified Standards Development Organization

A Qualified standards development organization, (QSDO), is defined as:

An organization writing an IEEE PTP Profile that:

- a) Is “A recognized standards organization with standards activity relevant to an industry, e.g., the IEC, IEEE, IETF, or ITU”, etc.
- b) Is “An industry trade association, regulatory, government, or other similar organization writing standards for an industry”

provided that:

- “a) The organization’s membership consists of representatives from multiple companies, academic or government entities who are active within the industry governed by the organization. The process of developing PTP Profiles by the organization must be an open process that does not exclude viewpoints of any member from consideration.
- b) The PTP Profiles developed by the organization must be approved either:
 - i. by a vote of the membership according to the organizations by-laws if such exist, else
 - ii. based on the normal operation procedures agreed upon by the organization.

References:

IEEE Std 1588-2019