new-cummings-1588-optional-announce-history, August 2022

[The following is an individual contribution from Rodney Cummings, intended for discussion in the context of the liaison from 802.1 to 1588 regarding optional Announce. During the IEEE 1588 Working Group meeting in Paso Robles in 2016, Rodney submitted a proposal to make Announce optional when external port configuration is enabled. During the resulting discussion, the 1588 Working Group heard excellent arguments against that proposal, and as a result Rodney withdrew the proposal. This document attempts to capture that discussion from notes and memory (which might be flawed).]

In the design of PTP, Announce is used to transfer information from the Grandmaster PTP Instance, through relay PTP Instances (i.e., 1588 BC and TC, 802.1AS PTP Relay Instance), to end PTP Instances (i.e., 1588 OC, 802.1AS PTP End Instance). The transfer of Announce information occurs via exchange through the PTP data sets. For a PTP Profile like 802.1AS that uses the peer-to-peer delay mechanism, the Announce message is the only message that carries information throughout the network. With respect to PTP specifications, PTP's Sync and PDelay messages carry information between peer ports only.

Based on the intended use of Announce, some members of the IEEE 1588 working group feel that the Announce message is very fundamental to the design of PTP. For example, some members predict that if a PTP Profile standard were to remove Announce, that standard would eventually use Sync or PDelay messages to transfer information throughout the network, which in turn violates the core design principles of IEEE Std 1588.

If an application does not want to use the core design of the IEEE 1588 protocol (PTP), it raises questions as to why that application wants to use PTP at all. If PTP is not technically useful for an application, that application is welcome to avoid basing its standard on PTP (i.e., invent another protocol).

The mandatory use of Announce by PTP is not stated on one single line. Its usage is integrated into the design of the protocol, and therefore removing it would require non-trivial effort. Many "shall" statements for Announce exist in IEEE Std 1588-2019 as published (e.g., 9.5.8, 17.6.5.5).

In addition to the core design principles, some members of IEEE 1588 do not agree with many of the arguments made in favor of removing Announce, including:

1. *My protocol does not use BMCA*: Since Announce is not limited to the BMCA, this argument does not hold. For example, Announce is used for UTC offset, alternate time offset, synchronizationUncertain (i.e., validity of the sync path), originTimestamp (for data set members like offsetFromMaster to diagnose problems), grandmaster quality, and so on. These features are optional, but even if none are used today, it is predicted that at least one will be used in the future.
2. *Announce takes too much bandwidth*: The interval between successive Announce messages can be configured to be as slow as desired. When Announce transmits slowly, Announce takes less bandwidth than other background protocols that currently operate in engineered networks (e.g., service discovery).
3. *I don't want to write source code for Announce*: Since Announce is mandatory, it is part of all IEEE Std 1588 source code today, and Announce is a relatively small percentage of that code. One of the biggest benefits of using a protocol standard is the ability to re-use existing work, which in turn makes it straightforward to re-use code for Announce.
4. *Announce takes space in my compiled binary*: Announce is a relatively small percentage of this binary (compared to other essential features like security).
5. *I don't want to test Announce*: Testing is an unavoidable investment, so this argument is valid. Nevertheless, the level of investment in testing is dependent on how Announce is used. If BMCA is not used, and none of the optional features of Announce are used, then operation of the PTP Profile does not depend on Announce, and testing can be minimal. In the future, when Announce is used for a feature that is essential to PTP Profile operation, that feature can be tested extensively.

[Postscript from Rodney: It is worth noting that the predictions made in 2016 actually came true. The AUTOSAR specifications for time synchronization over Ethernet do not formally claim conformance to either IEEE Std 1588 or IEEE Std 802.1AS, and therefore the 802.1-to-1588 liaison does not apply to those documents. AUTOSAR does not specify an Announce message, but it does specify a Sync and Follow_Up message. AUTOSAR-specific TLVs are specified for Follow_Up, containing data that is intended to transfer throughout the network, such as the upstream source of time (e.g., SyncToGTM flag), and an alternate time offset (e.g., OfsTimeSec/Nsec). Since Announce does not exist in AUTOSAR, this data was specified in Follow_Up. There is nothing at all wrong with AUTOSAR's practice, but if a PTP Profile (i.e., document conforming to IEEE Std 1588) were to follow this practice, moving data from Announce to Follow_Up represents the predicted violation of core PTP design.]