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IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems

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IEEE Instrumentation and Measurement Society

Developed by the
Technical Committee on Sensor Technology (TC-9)

IEEE Std 1588™-2019
(Revision of IEEE Std 1588-2008)

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Technical Committee on Sensor Technology (TC-9)
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Approved 7 November 2019

IEEE SA Standards Board

Abstract: In this standard, a protocol is defined that provides precise synchronization of clocks in packet-based networked systems. Synchronization of clocks can be achieved in heterogeneous systems that include clocks of different inherent precision, resolution, and stability. The protocol supports synchronization accuracy and precision in the sub-microsecond range with minimal network and local computing resources. Customization is supported by means of profiles. The protocol includes default profiles that permit simple systems to be installed and operated without the need for user management. Sub-nanosecond time transfer accuracy can be achieved in a properly designed network.

Keywords: Boundary Clock, clock, Grandmaster Clock, IEEE 1588™, management, Ordinary Clock, security, synchronization, Transparent Clock

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Introduction

This introduction is not part of IEEE Std 1588-2019, IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems.

This standard defines a protocol that provides precise synchronization of clocks in packet-based networked systems. The Precision Time Protocol (PTP) generates a master–slave relationship among the PTP Instances in the system. The clocks in all PTP Instances ultimately derive their time from a clock known as the "Grandmaster Clock." In its basic form, this protocol is intended to be administration free.

IEEE Std 1588-2019 includes content that was not present in IEEE Std 1588-2008. Similarly some content that was present in the IEEE Std 1588-2008 is not in IEEE Std 1588-2019. The following Annexes in 1588-2008 are not present in IEEE Std 1588-2019:

— Annex C (informative) Examples of residence and asymmetry corrections

— Annex K (informative) Security protocol (experimental)

— Annex L (informative) Transport of cumulative frequency scale factor offset (experimental)

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