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

IEEE Instrumentation and Measurement Society

Sponsored by the
TC9—Technical Committee on Sensor Technology

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Abstract: A protocol to synchronize independent clocks running on separate nodes of a distributed measurement and control system to a high degree of accuracy and precision is specified. The protocol is independent of the networking technology, and the system topology is self-configuring.
Keywords: clocks, distributed system, master clock, measurement and control systems, real-time clock, synchronized clocks

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Introduction

(This introduction is not a part of IEEE Std 1588-2002, IEEE Standard for for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems.)

The objective of this standard is to specify a protocol to synchronize independent clocks running on separate nodes of a distributed measurement and control system to a high degree of accuracy and precision. The clocks communicate with each other over a communication network. In its basic form, this protocol is intended to be administration free. The protocol generates a master slave relationship among the clocks in the system. Within a given subnet of a network, there will be a single master clock. All clocks ultimately derive their time from a clock known as the grandmaster clock. The communication path between any clock and its grandmaster clock is part of a minimum spanning tree.

Participants

The following persons contributed to earlier drafts of this standard:

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Ed Powers
Jim Read
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Catherine Berger
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Contents

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

1. Overview

This standard is divided into nine clauses. They are as follows:

Clause	Purpose
1	Provides the scope and benefits of this standard
2	Lists references to other standards that are referenced by this standard
3	Provides definitions that are either not found in other standards or have been modified for use with this standard
4	Provides conventions for the notation used in this standard
5	Defines the datatypes used in this standard
6	Provides an overview of the protocol specified by the standard
7	Defines the precision time protocol (PTP)
8	Defines the format of messages passed between participating clocks
9	Defines requirements for conformance

Annexes are provided as follows:

Annex	Purpose
A	Using the PTP
B	Defines time scales and epochs in PTP
C	Defines subdomain_name to address mappings
D	Defines the Ethernet implementation of PTP
E	Bibliography

Annexes defining communication-medium-specific implementation details for additional network implementations are expected to be provided in future revisions of this standard.