

# Thunderbolt Connect

## PRECISION TIME SYNC SOFTWARE

### Commercial Linux PTP Distribution

Trimble's Thunderbolt Connect™ is the commercial distribution of opensource Linux PTP Client that allows to synchronize the time of various Linux servers, desktop PCs and embedded systems by implementing IEEE 1588 ordinary clock stack with software and hardware timestamping support.

The Thunderbolt Connect™ offers the most complete PTP feature set available. Users can configure the software to work with almost any PTP Grandmaster Clock or PTP enabled network infrastructure due to its built-in support for most PTP configuration options and operational modes.

The software currently implements PTP version 2 defined by IEEE 1588-2008. Future releases of this product will also support IEEE 1588-2019 version 2.1 supporting various security features. Interoperability with PTP monitoring solutions is provided by supporting the standard PTP management messages mechanism, which can be enabled or disabled in the configuration.

Thunderbolt Connect™ can be deployed in software only slave mode and/or supported Trimble product lines or third party hardware running a standard linux distro with PHC enabled.

### Robust Roadmap

#### Secured PTP

Thunderbolt Connect plans to introduce a number of security features supporting ultimate secured PTP stack with secured boot, both hardware and software based authentications including integration with external network security mechanisms that includes but not limited to MacSEC and IPSEC.

#### Precision Time for Virtual World

Thunderbolt Connect™ will bring secured PTP for precision time sync to system virtualization with support for hypervisor, Docker and Kubernetes that will benefit Edge Cloud and VNF containerization.

### Unparalleled Accuracy

Thunderbolt Connect™ thrives to provide highly precision time sync at sub microsecond or less by utilizing hardware timestamping capabilities on systems that integrate standard 1588 enabled PHY.

### Asymmetry Correction

Due to the asynchronous nature of modern communications networks, jitter and PDV becomes an serious issue to meet tight TE (time Error) budget for mission critical networks such as 5G fronthaul. Thunderbolt Connect™ utilizes asymmetry correction to minimize the impact of jitter and PDV.

### Management & Monitoring

Along with Command line interface and web based management capabilities, Thunderbolt Connect will support REST and NetConf API supporting management and configuration easier from central management tools.

## Key Features

- ▶ Backward compatible to system with existing Linux PTP deployments
- ▶ IEEE1588-2008 (version 2) and IEEE 1588-2019 (Version 2.1) compliant
- ▶ IEEE 802.1AS-2011 Complaint
- ▶ Hardware time stamping support
- ▶ Linux PHC support for operation with compatible NICs
- ▶ Full Master and Slave Capabilities
- ▶ Support for IPv4 and IPV6 networks.
- ▶ Various Profile Support: Default, Telecom (G.8265.1, 8275.1, 8275.2), Enterprise (IETF Draft) and Automotive (hybrid 802.1as).



### Standard Compliance

- IEEE1588-2008 (Version 2)
- IEEE1588-2019 (Version 2.1)
- IEEE 802.1AS-2011

### Generic Features

- Supports the Linux PTP Hardware Clock (PHC) subsystem by using the clock\_gettime family of calls, including the clock\_adjtimex system call.
- Software and Hardware Timestamping
- Master and Slave Capabilities
- Slave and Ordinary Clock Support
- One-step & two-step PTP support
- Delay request-response / Peer delay mechanism

### Profile Support

- Default 1588 Profile
- Telecom Profiles
  - Telecom - ITU-T G.8275.1 Phase/Time with full timing support from the network
  - Telecom - ITU-T G.8265.1 Frequency (also supporting experimental phase sync)
  - Telecom - ITU-T G.8275.2/Y.1369.2 (03/20) for Phase/Time with partial timing support from the network
- Enterprise Profile
- Automotive Profile

### Network Features

- Layer 2 and UDP/IP Support
- IPV4 and IPV6 Network support
- Unicast Support
- Adjustable message transmission intervals
- One-step & two-step PTP support
- PTP over LACP and Active-Backup hot standby bonded interface
- PTP over VLAN interfaces
- NTP Support

### Operating System

- Support for Ubuntu 32 & 64 bits
- Support for CentOS
- Support for yocto linux

### Management & Configuration

- Command Line Interface
- PTP Management Client
- Alarms & Events
- Fine-grained configuration via configuration files
- Rest API

### Disclaimer

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