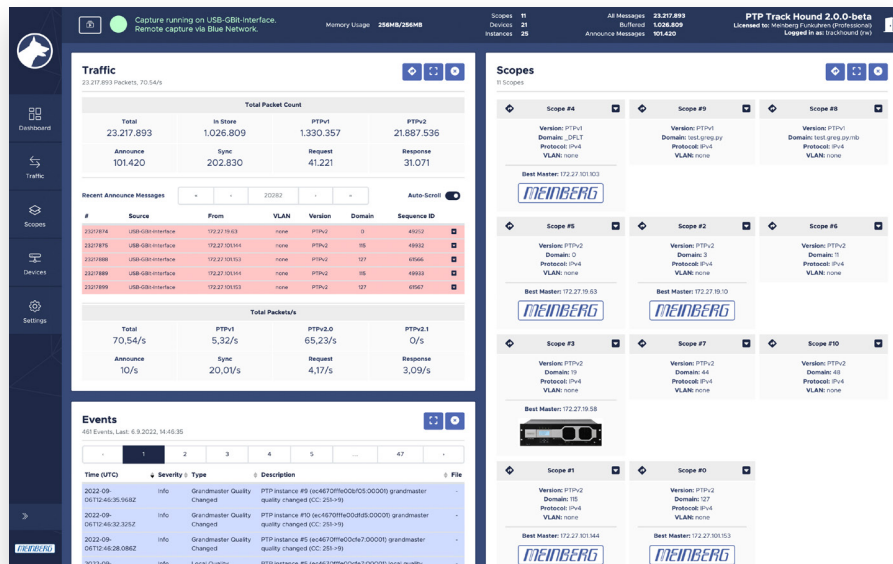




PTP Track Hound v2

IEEE 1588 / PTP Debugging & Monitoring



The new Leader of the Pack steps forth. PTP Track Hound v2 is the industry-leading solution for the monitoring, diagnosis, and optimization of PTP clock networks, with groundbreaking new features for remote monitoring and management.

PTP clocks are smartly grouped into scopes to help easily understand clock relationships, while byte-by-byte analysis, remote notifications, and a comprehensive REST API for management and queries over HTTP and HTTPS provides power users with the power tools they need to maintain absolute control over their PTP infrastructure.

Capture & Analysis of PTP Network Traffic

PTP Track Hound captures PTPv1, PTPv2 and PTPv2.1 network traffic on the configured adapters, using the main memory (RAM) for temporary storage.

A limit can be set on the maximum amount of memory used as temporary storage to ensure that the oldest packets are automatically deleted just before the limit is exceeded. It is also possible to dump all captured packets to a persistent capture file, which can then be downloaded via the Web Interface.

The Web Interface provides an overview of all captured packets at a glance, and these can be filtered based on the PTP scope (a group of PTP instances sharing a common domain, PTP version, network protocol, and VLAN tag) and packet type (e.g., Announce messages). Packet types are color-coded in the message list to enable them to be easily recognized.

Detailed statistics on the counted PTP packets captured per second and in total, both for all PTP packets and for individual packet types, provide a general idea at a glance of the load structure of PTP traffic in your network.

#	Source	Packet Type	From	VLAN	Version	Domain	Sequence ID
3998402	USB-GbE-Interface	Follow Up Message	192.27.00.10	none	PTPv2	3	100
3998403	USB-GbE-Interface	Sync Message	192.27.00.03	none	PTPv2	127	50373
3998404	USB-GbE-Interface	Announce Message	192.27.00.03	none	PTPv2	127	49996
3998405	USB-GbE-Interface	Announce Message	192.27.00.04	none	PTPv2	15	50271
3998406	USB-GbE-Interface	Sync Message	192.27.00.04	none	PTPv2	15	35014
3998407	USB-GbE-Interface	Follow Up Message	192.27.00.04	none	PTPv2	15	35014
3998408	USB-GbE-Interface	Peer Delay Request	192.27.00.10	none	PTPv2	3	290
3998409	USB-GbE-Interface	Sync Message	192.27.00.03	none	PTPv2	0	35018
3998410	USB-GbE-Interface	Follow Up Message	192.27.00.03	none	PTPv2	0	35018
3998411	USB-GbE-Interface	Sync Message	192.27.00.03	none	PTPv2	127	50374
3998412	USB-GbE-Interface	Sync Message	192.27.00.04	none	PTPv2	15	35019
3998413	USB-GbE-Interface	Follow Up Message	192.27.00.04	none	PTPv2	15	35019
3998414	USB-GbE-Interface	Announce Message	192.27.00.03	none	PTPv2	127	49996
3998415	USB-GbE-Interface	Sync Message	192.27.00.03	none	PTPv2	127	50375
3998416	USB-GbE-Interface	Announce Message	192.27.00.04	none	PTPv2	15	50272
3998417	USB-GbE-Interface	Sync Message	192.27.00.04	none	PTPv2	15	35020
3998418	USB-GbE-Interface	Follow Up Message	192.27.00.04	none	PTPv2	15	35020
3998419	USB-GbE-Interface	Sync Message	192.27.00.03	none	PTPv2	..._DPLT	20865
3998420	USB-GbE-Interface	Follow Up Message	192.27.00.03	none	PTPv2	..._DPLT	35029
3998421	USB-GbE-Interface	Sync Message	192.27.00.03	none	PTPv2	127	50376

Decoding of PTP-Specific Message Data

PTP Track Hound automatically decodes PTP-specific message data and the most commonly used TLVs. It uses this data for internal analysis and evaluation and displays it in human-readable format, providing a detailed insight via the Web Interface into the data in the packets.

When viewing a PTP message in detail, mousing over any parameter in the message will highlight the location at which the raw data is located to enable easy analysis of packet content.

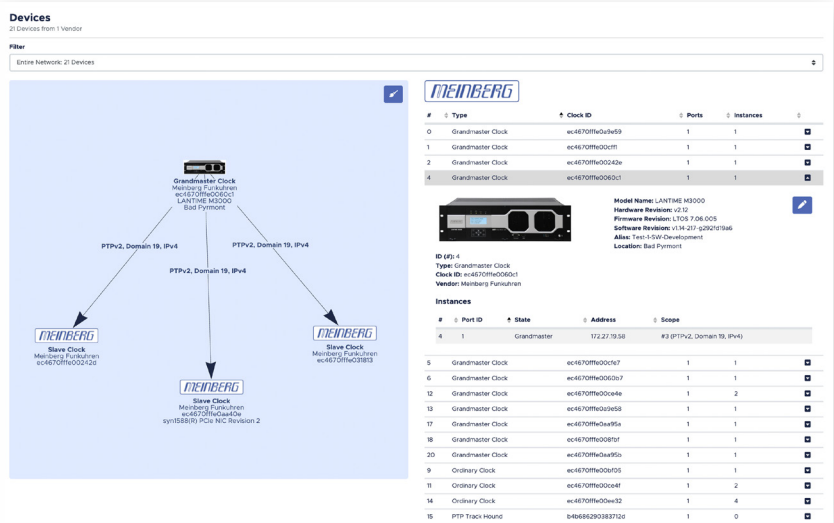
Field	Value
Type	Management TLV (0x0001)
Length	24
Management ID	Parent Delay Set (0x0002)
Parent Port Identity	0x0000000000000000
Parent Status	0
Reserved	0
Observed Offset Scaled Log Variance	150
Observed Clock Phase Change Rate	0.0000000000000000
Grandmaster Priority	128
Grandmaster Clock Class	0
Grandmaster Clock Accuracy	100000000000000000
Grandmaster Priority2	128
Grandmaster Clock ID	0x0000000000000000

Detection of PTP-Capable Devices

PTP Devices in the network are automatically detected and grouped into scopes for easy identification of clock relationships.

Device

PTP Track Hound detects and identifies each device by its PTP Clock ID. Depending on which PTP instance types are running on the device, PTP Track Hound will form founded assumptions on the type of clock that the device is intended to be - whether that's a Grandmaster, Boundary, or Slave Clock. Each device can have an individual set of metadata defined for it, including a vendor and model name, a hardware, software, and firmware revision, a custom alias, and a location. It is even possible to upload a custom image to represent it.



Instance

An instance is defined as a singular PTP “session” running on any given device. One device can run multiple instances concurrently, even on a single network port, such that you could run both a PTPv2 instance in Follower state and a PTPv1 instance in Leader state - a constellation not uncommon in applications such as Ravenna-Dante gateways for bridging systems using two incompatible timing standards. Each instance will have its own unique, specific scope that dictates which other clocks in the network can reach it.

Scope

PTP Track Hound defines the concept of scopes as a unique combination of network segment (an optional index value, see below for more information), PTP version, subdomain (PTPv1) or domain number (PTPv2), networking protocol (IEEE 802.3/IPv4/IPv6) and VLAN ID tag (optional).



Segment

Each network interface and each remote capture instance can be manually assigned to a custom network segment. This is useful when you have multiple PTP instances with the same combination of PTP version, (sub)domain, networking protocol, and VLAN ID in separate network segments that are accessible to the PTP Track Hound instance. Segment IDs essentially allow scopes to be “broken down” into network segment groups, allowing you to keep captured PTP traffic in one subnet separate from the identically scoped PTP traffic of another. Without defined network segments, all detected devices, instances, and scopes are assumed to be running within the same, singular network.

Detected Slave Clocks, Ordinary Clocks and Boundary Clocks are automatically matched to their Grandmaster Clock to provide an immediate, at-a-glance perspective of the synchronization hierarchy.

Generation of PTP Management Messages

PTP Track Hound can be configured to periodically send out PTP Management Messages to request common PTP datasets from instances within the monitored network(s). This allows the software to draw reliable conclusions about the synchronization status of the network, devices, and instances in a way that would not be possible by passively capturing passing traffic.

Management messages can be sent globally over all networking protocols, PTP versions, and (sub)domains, or you can limit them to a specific networking protocol, a specific PTP version, and/or a specific (sub)domain.

This feature requires a Professional license.

Send Management Messages	
Interval	60 seconds
Protocol	any
IPv6 Scope	Global scope (0x0e)
PTP Version	any
Specific PTPv1 Subdomain	☒ _DFLT
Specific PTPv2 Domain	☐
Loopback	☒

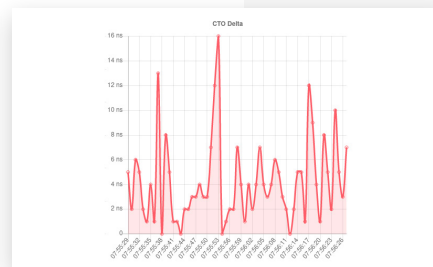
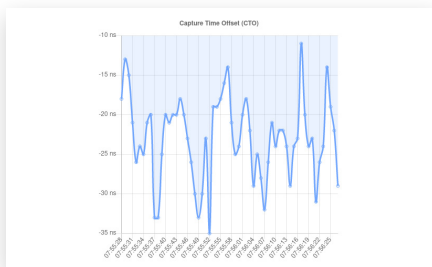
Capture Time Offsets (CTO)

Since v2.0.5, PTP Track Hound has supported precise time measurements to detect problems in devices transmitting time and network issues. It compares the timestamps of incoming Sync and Follow Up Messages with the corresponding Sync Message capture timestamp, calculating and storing the offset for analysis. However, it does not send (P)Delay Request Messages, so the offsets reflect path delay rather than real offsets between the monitored and local clocks. The change in one measured CTO relative to the prior CTO is also stored to detect clock drift.

For accurate capture time offsets, the clock providing the capture timestamps must be synchronized. The graphs below show hardware timestamps from an Intel I210 network adapter, synchronized via a 1PPS signal from a GNSS-synchronized reference clock. An [Oregon Systems syn1588 Gbit Switch](#) connects the measured clock with the monitoring device and time receivers without accuracy loss.

Thresholds for CTO and CTO Delta can be set to enable immediate event notifications when significant changes are detected. The accuracy and precision of the clock providing the capture timestamps must be considered when setting these thresholds.

This feature requires a Basic license.



NetSync Monitor (NSM)

Since v2.1.0, PTP Track Hound has supported measuring offsets and path delays of network nodes using the Meinberg NetSync Monitor. This involves PTP Track Hound sending a Delay Request message to a node, which responds with a Delay Response message. The node then sends a Sync message and, if applicable, a Follow-Up message. This process transfers the node's time to PTP Track Hound, known as "Reverse PTP". The clock providing the timestamps must be synchronized to ensure accurate measurements.

Thresholds for measured offsets, delays, and their changes can be defined to enable PTP Track Hound to send notifications when significant changes are detected.

This feature requires a Basic license.



Modern Web Interface

While PTP Track Hound v1 was a monolithic application that was unable to capture PTP traffic without the graphical user interface running, PTP Track Hound v2 comes with an integrated web server and a modern, feature-rich Web Interface accessible via HTTP or HTTPS that can run independently of the capture service running in the background.

Both HTTP and HTTPS access can be individually configured or completely disabled.

With a Free license, the web server can only be accessed from the local device.

Network access requires a Basic or Professional license.



Event Notifications via SNMP, e-mail or Syslog

PTP Track Hound v2 can send out event notifications as SNMP traps, e-mails (sent via SMTP), or syslog messages when predefined or highly customizable event conditions are triggered. This allows the software to be used as the central monitoring hub for timing-critical infrastructure.

Predefined alarm triggers: Capture Started, Capture Stopped, Scope Detected, Device Detected, Port Detected, Instance Detected, Port State Changed, Local Quality Changed, Grandmaster Quality Changed, Custom Alarm Triggered, Custom Alarm Cleared.

Custom alarms allow you to have PTP Track Hound monitor any parameter that is available via the REST API and generate an alarm as soon as the value of the parameter meets a specific condition, i.e., if the parameter equals/does not equal or is greater than/less than a specific value.

This feature requires a Professional license.

Time (UTC)	Severity	Type	Description	File
2022-08-07T06:30:23.28Z	Info	Port State Changed	PTP instance #23 (ec467011c0d1b8-0000) state changed from Unknown to Follower	-
2022-08-07T06:29:31.01Z	Info	Port State Changed	PTP instance #23 (ec467011c0d1b8-0000) state changed from Follower to Unknown	-
2022-08-07T05:33:04.9Z	Info	Grandmaster Quality Changed	PTP instance #10 (ec467011c0d1b8-0000) grandmaster quality changed (CC: 251-19)	-
2022-08-07T05:33:00.40Z	Info	Grandmaster Quality Changed	PTP instance #1 (ec467011c0d1b8-0000) grandmaster quality changed (CC: 251-19)	-
2022-08-07T05:32:08.9Z	Info	Grandmaster Quality Changed	PTP instance #5 (ec467011c0d1b8-0000) grandmaster quality changed (CC: 251-19)	-
2022-08-07T05:32:08.9Z	Info	Local Quality Changed	PTP instance #5 (ec467011c0d1b8-0000) local quality changed (CC: 251-19)	-
2022-08-07T05:32:17.7Z	Info	Grandmaster Quality Changed	PTP instance #9 (ec467011c0d1b8-0000) grandmaster quality changed (CV: 65535-13056)	-
2022-08-07T05:32:17.7Z	Info	Grandmaster Quality Changed	PTP instance #10 (ec467011c0d1b8-0000) grandmaster quality changed (CV: 65535-13056)	-
2022-08-07T05:32:17.7Z	Info	Local Quality Changed	PTP instance #5 (ec467011c0d1b8-0000) local quality changed (CV: 65535-13056)	-
2022-08-07T05:32:17.7Z	Info	Grandmaster Quality Changed	PTP instance #1 (ec467011c0d1b8-0000) grandmaster quality changed (CV: 65535-13056)	-

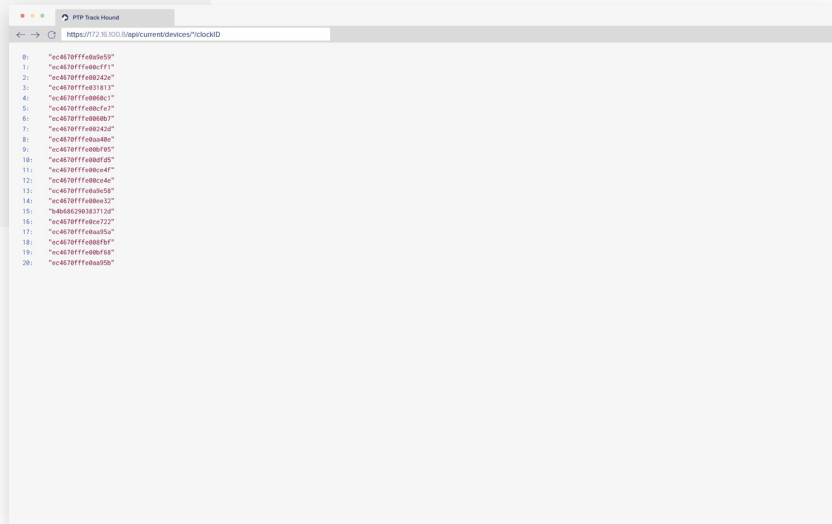
Comprehensive REST API

For advanced infrastructure monitoring, PTP Track Hound v2 offers a comprehensive REST API that allows practically every parameter shown in the Web Interface - and even some not available via the WebUI - to be returned in JSON format by means of HTTP or HTTPS calls.

Sending a request to a wildcard path such as “/api/current/devices/*/clockID” or “/api/current/instances/*/address” will provide a response containing an array of results, such that a single request is often sufficient to obtain all the data of interest.

The REST API can be used not only to fetch data, but also modify the configuration and control the capture service.

This feature requires a Professional license.



Continuous Multi-Site Monitoring

PTP Track Hound v2 enables multiple independent capture services to be run concurrently in different networks or different segments of a network, and to forward captured sync traffic to one or more data collection instances. Such data collection instances will then capture and analyze the forwarded traffic as if it had been captured on one of its own network interfaces. Communication between the remote capture service and the data collection instance can be encrypted using pre-shared keys. It is also possible to limit access to a list of allowed IP addresses (from the perspective of the PTP Track Hound instance).

If a PTP Track Hound instance is only to be used for traffic forwarding, it is possible to completely disable the evaluation of incoming traffic.

Traffic forwarding requires a Basic license.

Central data collection instances require a Professional license.

Remote Connections

Host	Port	Encryption	Alias	Segment-ID
172.16.100.137	32676	aes-256	Blue Network	1

Host

172.16.100.137

Port

32676

Encryption

aes-256

Key

Ot?WhB%+LFMtig+OvB(CAj#DT?K'SZUd

Alias

Blue Network

Assign Segment-ID

☒

ID (0-65534)

1

OK

Cancel

Supervision

Supervision allows device/vendor specific APIs of 3rd-party (and also Meinberg) equipment to be queried via HTTP/HTTPS. By reusing existing management networks for periodically sent API queries, Supervision eliminates the need for PTP Track Hound to be connected to a PTP-enabled port on each appliance to be monitored, making it much easier to monitor large Boundary Clock infrastructures.

Currently Supported APIs

- Arista eAPI
- Cisco NX-API REST
- Luminex GigaCore Gen2 API
- Meinberg LANTIME REST API
- meinbergOS REST API

Supervision requires a Professional license.

The Professional license includes monitoring for 10 appliances. License expansions for more appliances can be requested.

The screenshot displays the PTP Track Hound 2.2.0 web interface. The top navigation bar includes status indicators for Multi-Site Monitoring, Supervision, and various system metrics. The main content area is divided into two panels. The left panel shows a network topology diagram with nodes labeled 'ARISTA', 'LUMINEX', and 'NETGEAR'. The right panel provides detailed information for a selected device, an Arista switch. This includes a table of clock types and IDs, a detailed view of the selected clock (ID 13), and a table of instances. The interface is dark-themed with a blue sidebar on the left.

#	Type	Click ID	Ports	Instances
18	Boundary Clock	ec46707f0d25b6	1	1
11	Grandmaster Clock	ec46707f0d0c969	1	1
12	Grandmaster Clock	ec46707f0d0c968	1	1
15	Receiver Clock	ec46707f0d0c982	1	1
16	Receiver Clock	ec46707f0d2394	1	1
17	Receiver Clock	ec46707f0d0c990	1	1
19	Receiver Clock	ec46707f0d0c986	1	1

#	Type	Click ID	Ports	Instances
13	Boundary Clock	fb0e7f7f5b963	2	2

ARISTA

ID: 13
Type: Boundary Clock
Click ID: fb0e7f7f5b963
Vendor: Arista

Model Name: CCS-7200P-48P15-F
Hardware Revision: 1.00
Firmware Revision: 4.24.2P-432223564.4342P
Software Revision: 4.24.2P
Alias: arista-7200p-1c1
Location: Unknown

#	Port ID	State	Host	Scope	Parent Port Identity
3	#1 (Ethernet)	Online/Receiver	192.168.12.13	#1 (PTPv2.1, Domain 127, subID 0x000, Pw4)	bc0d7f7f5b963-457.5
4	#2	Online/Transmitter	192.168.12.13	#1 (PTPv2.1, Domain 127, subID 0x000, Pw4)	bc0d7f7f5b963-457.5

#	Type	Click ID	Ports	Instances
14	Boundary Clock	bc0d7f7f5b963-457	4	4

Luminex

#	Type	Click ID	Ports	Instances
9	Boundary Clock	d06899a7f5f94cc	2	2

NETGEAR

#	Type	Click ID	Ports	Instances
10	Boundary Clock	5407797f5b963-72	2	2

If you would like us to add support for your API or the API of a device you wish to monitor with PTP Track Hound, [please let us know!](#)

License Comparison

PTP Track Hound v2 is available with four different single-user license levels: **Free**, **Capture**, **Basic** and **Professional**. The table below shows which features are included with each license level.

	Free	Capture	Basic	Professional
Available for Windows, Linux and macOS PTP Track Hound is available for the three most commonly used operating systems	✓	✓	✓	✓
Dedicated Capture Service Continuous sync packet capture which can be set up to run automatically in the background on system startup	✓	✓	✓	✓
Integration into Native Service Management of OS Can be installed to and managed by the service manager of the operating system	✓	✓	✓	✓
Modern Web Interface Configuration and operation via modern Web Interface (HTTP/HTTPS)	✓ (access from local device only)	✓	✓	✓
Network Segmentation Support Each network interface and each remote capture instance can be assigned to separate segments, allowing for per-segment capture analysis	✓	✓	✓	✓
User-defined Terminology Use terms like Leader and Follower, or any other terms you prefer, instead of the default PTP port state notations	✓	✓	✓	✓
Dashcam Mode Automated event-driven recording of PTP traffic allowing analysis of problems at any given moment in time	✓	✓	✓	✓
Multi-site Monitoring Run PTP Track Hound at multiple locations and forward captured sync traffic to one or more central PTP Track Hound Professional instance(s)	✗	✓ (traffic forwarding only)	✓ (traffic forwarding only)	✓
PTP Management Messages Periodically send out PTP management messages to request common PTP datasets from PTP capable devices within the monitored network(s)	✗	✗	✓	✓
NetSync Monitor (NSM) Periodically send out PTP management messages to request common PTP datasets from PTP capable devices within the monitored network(s)	✗	✗	✓	✓
Capture Time Offsets (CTO) Measure and store the offset between timestamps of incoming Sync and Follow Up Messages and the corresponding local capture timestamp of the Sync Message	✗	✗	✓	✓
Supervision Monitor synchronization in large networks via vendor-specific APIs for Arista, Cisco, Meinberg and other devices.	✗	✗	✗	✓ (10 appliances included)
Extensive Event Notifications Send out notifications via SNMP traps, e-mail (SMTP) or syslog messages when predefined or highly customizable event conditions are triggered	✗	✗	✗	✓
REST API Acquire all of the data provided in the Web Interface via REST API (HTTP/HTTPS)	✗	✗	✗	✓

Get in Touch

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The Synchronization Experts.

A foremost innovator of the synchronization industry with longstanding roots in Bad Pyrmont, Germany, Meinberg is a family-owned company with over four decades of world-leading expertise in developing and manufacturing a range of high-end synchronization technology, including high-end PTP & NTP servers, receiver technology for satellite & radio synchronization signals, time code generators & readers, and an array of related accessories such as antennas, converters, and signal distribution systems.

With the Meinberg family of companies also encompassing our subsidiary Meinberg USA Inc. in Santa Rosa, California and embedded systems specialist Oregano Systems in Vienna, Austria, as well as a robust network of distribution & service partners in over 40 countries around the world, Meinberg's quality and expertise is never far away.

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