

PROFITAP

PROFISHARK **1G** & **1G⁺** Gigabit Ethernet Troubleshooter



USER MANUAL

www.profitap.com

Package contents

- 1 x ProfiShark 1G or 1G+ main unit
- 1 x USB key containing drivers, software and manual
- 1 x USB 3.0 cable
- 1 x RJ45 cable
- 1 x GPS/GLONASS Antenna (1G+ only)
- 1 x Carrying pouch

For any questions, technical or otherwise, contact our customer support through our website:

<http://www.profitap.com/contact-us/>

or by email:

info@profitap.com

For the latest documentation and software, visit our Resource Center:

<http://www.profitap.com/resource-center/>

Table of contents

- 4 General Information**
- 5 Network TAP**
- 6 ProfiShark 1G Visual Description**
- 7 ProfiShark 1G+ Visual Description**
- 8 Driver Installation**
- 8 Analyzer Installation**
- 9 ProfiShark 1G Manager:**
 - 9 - Installation**
 - 9 - Description**
 - 9 - Statistics**
 - 9 - Counters**
 - 11 - Charts**
 - 12 - Log**
 - 12 - Network Ports Diagnostic**
 - 14 - Features**
- 16 Packet Capture:**
 - 19 - Live Capture Mode**
 - 20 - Direct Capture Mode**
 - 21 - Direct Capture Setup**
 - 22 - Timestamping**
 - 23 - Advanced Timestamping**
- 26 Additional Information**

General Information



ProfiShark 1G is a handheld plug and play device dedicated to in-line Gigabit Ethernet monitoring. It facilitates field traffic capture and troubleshooting. It is equivalent to a 10/100/1G aggregator tap and two 1 Gbps NICs. All-in-one in a pocket-sized box, the only additional hardware required being a laptop or desktop PC with a free USB 3.0 port.

As it is based on USB 3.0 (5 Gbps), the ProfiShark 1G manages full-duplex gigabit at wirespeed, without the bottleneck of an aggregator tap. It also surpasses all standard NICs in capture mode, as it catches any tag and encapsulation without altering the frames.

ProfiShark 1G is the perfect tool for the field engineer as well as for long-term traffic collection.

Features

- 10/100/1G monitoring on USB 3.0
- USB 3.0 powered, no adapter required
- Fail-safe monitoring
- Low delay, low jitter
- Hardware aggregation
- 8 ns hardware timestamping for accurate latency testing
- Real time statistics
- Low level error and bandwidth monitoring
- CRC error capture
- Capture any packet with any analyzer
- Direct capture to disk
- Dual NIC mode (SPAN)
- Very low CPU usage
- Invisible to the network

Network TAP

The ProfiShark 1G integrated network TAP provides safe access to the network for monitoring purposes. It is a passive monitoring device, in the sense that it is undetectable, the original traffic staying unaltered and no extra packets being inserted. As most of the TAP's functions are performed by dedicated hardware circuits, it is much more reliable and error proof than SPAN ports.

In a gigabit network, the TAP has to negotiate with both attached devices for the highest common speed. If no common speed can be found, or if one of the devices is disconnected, the TAP propagates the error to the other attached device, allowing a redundant path to be activated.

In case of power failure, it activates its bypass circuits, connecting the two attached devices directly. The ProfiShark 1G integrates a high performance fast failover circuit and a proprietary algorithm, reducing the unavailability of the network path down to 30ms.

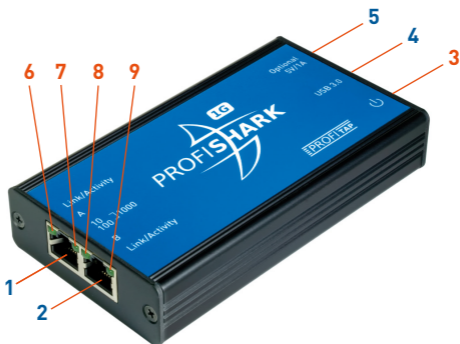
NOTE The fast failover relies on the network setup. In case the fast failover cannot perform, the two end devices have to renegotiate the link. This operation takes about 2 seconds.

END DEVICE 1	END DEVICE 2	1 CABLE TYPES
DTE	DCE	STRAIGHT THROUGH AND CROSSOVER
DCE	DTE	STRAIGHT THROUGH AND CROSSOVER
DCE	DCE	THROUGH AND STRAIGHT THROUGH
DTE	DTE	THROUGH AND STRAIGHT THROUGH

NOTE The user should verify that the two end devices connect together with either a single cable, an RJ45 coupler, or the unpowered TAP. The straight or crossover cables must be employed in case of end devices that do not support Auto MDI/MDIX operation (i.e. Auto Crossover). Experienced users can bypass this procedure.

NOTE Although some vendors recommend the use of the non-IEEE compliant "Forced Gigabit" mode, we strongly recommend activating auto-negotiation when Gigabit speed is required. More generally, auto-negotiation should always be enabled on both end devices in order to avoid duplex mismatch issues.

ProfiShark 1G Visual Description



- 1 - Port A (RJ45) connected to the network
- 2 - Port B (RJ45) connected to the network
- 3 - Power indicator LED
- 4 - USB 3.0 connector linked to your monitoring device (i.e. a laptop computer)
- 5 - Optional DC input (5V/1A)
- 6 - 7 - 8 - 9 - The ProfiShark's state is displayed on the front LEDs. LEDs functions are named on top of the ProfiShark.

TAP functions:

Steady LED 10 (7): TAP is operating at 10 Mbit/s

Steady LED 100 (8): TAP is operating at 100 Mbit/s

Steady LED 10 (7) + LED 100 (8): TAP is operating at 1000 Mbit/s

Steady Link/Activity (6)(9): the port is linked up

Blinking Link/Activity (6)(9): the port is linked up and has RX/TX activity

Blinking LED 10 (7) + LED 100 (8): TAP not connected or trying to connect

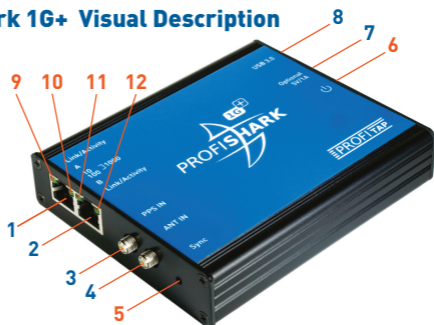
Alternating LED 10 (7) + LED 100 (8): TAP cannot find a common speed between network A and network B

General functions:

Blinking LED 10 (7): The ProfiShark is initializing

Blinking LED 100 (8): The ProfiShark HW firmware is corrupted

ProfiShark 1G+ Visual Description



- 1 - Port A (RJ45) connected to the network
- 2 - Port B (RJ45) connected to the network
- 3 - PPS input (SMA Female)
- 4 - GNSS (GPS/GLONASS) antenna input (SMA Female)
- 5 - Sync LED
- 6 - Power indicator LED
- 7 - Optional DC input (5V/1A)
- 8 - USB 3.0 connector linked to your monitoring device (i.e. a laptop computer)
- 9 - 10 - 11 - 12 - The ProfiShark's state is displayed on the front LEDs. LEDs functions are named on top of the ProfiShark.

TAP functions:

- Steady LED 10 (10): TAP is operating at 10 Mbit/s
- Steady LED 100 (11): TAP is operating at 100 Mbit/s
- Steady LED 10 (10) + LED 100 (11): TAP is operating at 1000 Mbit/s
- Steady Link/Activity (9)(12): the port is linked up
- Blinking Link/Activity (9)(12): the port is linked up and has RX/TX activity
- Blinking LED 10 (10) + LED 100 (11): TAP not connected or trying to connect
- Alternating LED 10 (10) + LED 100 (11): TAP cannot find a common speed between network A and network B
- Steady Sync LED (5): the internal timestamping is synchronized with the UTC time with a $\pm 16\text{ns}$ precision

General functions:

- Blinking LED 10 (10): The ProfiShark is initializing
- Blinking LED 100 (11): The ProfiShark HW firmware is corrupted

Driver Installation

Drivers are available for Windows 7 32/64 bits, Windows 8 32/64 bits, and Linux.

ProfiShark 1G **Windows** drivers are included in the ProfiShark 1G Manager. Please refer to the *ProfiShark 1G Manager Installation* section of this manual.

After having installed the ProfiShark 1G Manager, connect the ProfiShark 1G on a free USB 3.0 port and the drivers should install automatically. For a manual installation, the drivers can be found in the default installation folder:

"C:\Program Files (x86)\Profitap\ProfiShark 1G\Driver\PT3".

When the ProfiShark hardware is connected for the first time, a reboot of the PC is required in order to refresh the Winpcap/Wireshark device list. The Winpcap/Wireshark device list may also be refreshed using the following command lines in a *cmd.exe* window:

- open a CMD window
- `net stop npf`
- `net start npf`

To install the ProfiShark 1G drivers on **Linux**, follow the instructions in the *Installation.txt* file located on the USB flash drive.

The latest driver releases can be found in the Resource Center at **www.profitap.com**. You will need to register to access this area. Registering is free and will let you participate in ongoing product improvements.

Analyzer Installation

Any of the compatible analyzers can be used to perform the analysis. Compatible analyzers are listed on the ProfiShark 1G product page at: **www.profitap.com**.

Wireshark is recommended and can be downloaded at: **www.wireshark.org**.

To start capturing network data, launch your preferred network analyzer and select the new network interface named "ProfiShark 1G Device". Refer to your analyzer's user manual to learn more about how to select a network interface.

ProfiShark 1G Manager

Installation

To install the ProfiShark 1G Manager on **Windows**, execute the setup utility located in the “Windows” folder of the USB flash drive. Please make sure any previous version of the ProfiShark 1G Manager has been uninstalled before starting the setup utility. The setup utility will create a launch icon in your start menu.

To install the ProfiShark 1G Manager on **Linux**, follow the instructions in the *Installation.txt* file located on the USB flash drive.

The latest software releases can be found in the Resource Center at **www.profitap.com**.

Description

ProfiShark 1G Manager is a standalone application designed by Profitap. It provides means for statistical analysis of a network prior to a deeper investigation using an analyzer. It also provides options for port diagnostic, port control, timestamping, and traffic capture. It also includes a firmware flashing utility. ProfiShark 1G Manager can be used simultaneously with a software network analyzer, without the need to interrupt data capture.

Statistics

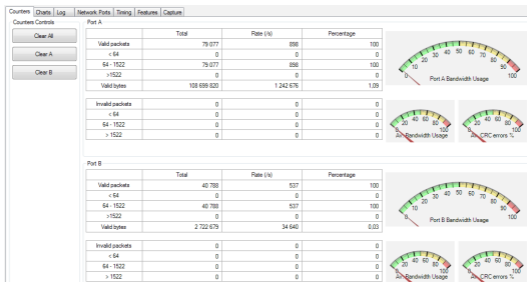
ProfiShark 1G Manager provides several different visual representations for network statistics.

Counters

The *Counters* tab lists every counter embedded in the ProfiShark 1G for both network ports. The counters are 64-bit hardware counters. They are cleared at hardware startup and at link reconnection.

Statistics can be reset individually for each port or for the two ports at the same time using the buttons on the left.

Clearing the counters using the buttons does not clear the hardware counters, but stores all counters in reference counter. The displayed counters are the result of the formula *[hardware counter - reference counter]*.



Size < 64 bytes:

CRC valid frames with a size inferior to 64 bytes

64 < size < 1518:

CRC valid frames with a size superior or equal to 64 bytes and inferior or equal to 1518 bytes

Size > 1518 bytes:

CRC valid frames with a size superior to 1518 bytes

Collisions:

CRC error frames with a size inferior to 64 bytes

CRC errors:

CRC error frames with a size superior or equal to 64 bytes and inferior or equal to 1518 bytes

Jabbers:

CRC errors frames with a size superior to 1518 bytes

Valid frames:

CRC valid frames of any size

Invalid frames:

CRC error frames of any size

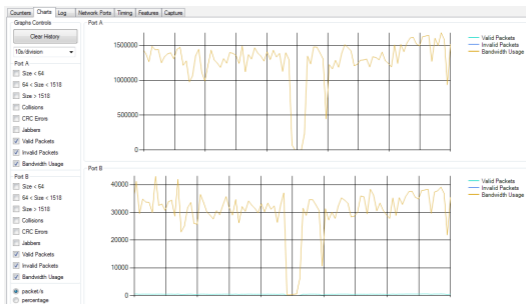
Total bytes:

Valid frame bytes

Meters:

The meters on the right display the current bandwidth usage, the average bandwidth usage and the average CRC error rate for each port.

Charts



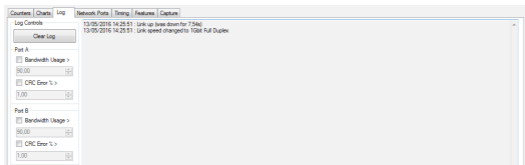
The *Charts* tab allows the inspection of statistical data over time, using plots.

For each port, you can plot any of the statistical data by using the checkboxes on the left. Once a box is checked, the corresponding data appears on the chart on the right. Refresh rate can be selected using the drop down list on the left, allowing you to plot up to 10 hours of statistics.

When “packet/s” is selected, each series displays the corresponding number of packets per second, except for the bandwidth usage which is displayed in bytes per second. When “percentage” is selected, each series is displayed in term of percentage of the total number of packets, except for the bandwidth usage which is displayed in percentage of the total bandwidth.

Both graphs' history can be reset using the *Clear History* button on the left. Disconnecting the ProfiShark 1G also reset the graphs' data.

Log



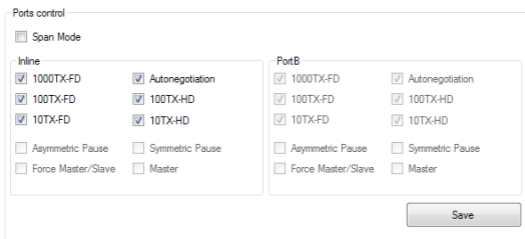
The *Log* tab offers to set thresholds for bandwidth usage and CRC error rate. Every time the threshold is exceeded, a log entry is added, allowing to easily identify the type, date, and port of the event.

This can be used for long term analysis, where events happen randomly over a long period of time.

Network Ports Diagnostic

Ports Control

Customizable port settings are located on the right side of this tab:



The ProfiShark 1G is set to in-line mode by default. Span mode can be enabled or disabled in this section.

In in-line mode, both ports are controlled at the same time. In Span mode, both ports can be configured separately (speed, Full-Duplex/Half-Duplex, enable/disable autonegotiation).

Network Port Status

On the left side of this tab is a chart giving in-depth information on the network link:

- Link status and speed
- Master/slave resolution
- Link partner capabilities
- Faults

Status	Port A	Port B
Link	1Gbit FDX	1Gbit FDX
Master / Slave resolution	Slave	Master
Link Partner Status		
Link Partner Auto-Neg capable	Yes	Yes
Link Partner Next Page capable	Yes	Yes
Next Page request	Yes	Yes
Acknowledge	Yes	Yes
Advertise 1000BASE-T FDX	Yes	Yes
Advertise 1000BASE-T HDX	Yes	Yes
Advertise 100BASE-TX FDX	Yes	Yes
Advertise 100BASE-TX HDX	Yes	Yes
Advertise 10BASE-T FDX	Yes	Yes
Advertise 10BASE-T HDX	Yes	Yes
Advertise Asymmetric pause	Yes	Yes
Advertise Symmetric pause	Yes	Yes
Fault Status		
Parallel detection fault	No	No
Remote fault	No	No
Master / Slave fault	No	No
Local receiver	OK	OK
Remote receiver	OK	OK
Idle error count	0	0
100BASE-TX lock error	No	No
100BASE-TX receive error	No	No
100BASE-TX transmit error	No	No

Features

Counters | Charts | Log | Network Ports | Timing | **Features** | Capture

ProfiShark 1G+ Connected
Driver Version : 0.1.3.15
SW Firmware Version : 0.2.3.2
HW Firmware Version : 0102
MAC Address : 00:1e:c0:94:1b:22

Link Up 1Gbit Full Duplex
Software Dropped Packets : 0
Hardware Dropped Packets : 0
Link Up Duration : 0:04:43
Last Link Down Duration : 7,665e

Firmware Update

Capture Format

Enable timestamps in live capture Disable Port A
 Transmit CRC Errors Disable Port B
 Keep CRC32 Packet Slicing

The *Features* tab regroups information about the driver and firmware version, port status, the firmware update utility, and a way to enable or disable certain ProfiShark 1G features.

To update the ProfiShark 1G firmware, press the *Browse* button, select the appropriate firmware file and press the *Flash Firmware* button.

The corresponding firmware update will begin. The ProfiShark 1G Manager cannot be used while the update is in progress. The update process can take a few minutes to complete. Unplug and replug the ProfiShark device to use the new firmware. Do not disconnect the USB port or shut your computer down during the update process.

The latest firmware can be downloaded from the Resource Center at: **www.profitap.com**.

The following features can be turned on and off:

Transmit CRC Errors:

If checked, the ProfiShark will not filter out network packets with CRC errors like a normal NIC would.

Keep CRC32:

Keep the CRC32 information (32-bit Frame Check Sequence) located at the end of the packets. FCS can be interpreted in Wireshark (Edit -> Preferences -> Protocols -> Ethernet -> Assume packets have FCS).

Disable Port A:

If checked, the frames which input on port A are not captured.

Disable Port B:

If checked, the frames which input on port B are not captured.

Packet Slicing:

If checked, the first 128 bytes of each frame are captured.

Enable timestamps:

If checked, a Unix formatted timestamp is adjoined at the end of the packet data, after the FCS. This timestamp can be interpreted by the Profitap Wireshark dissector in live capture mode.

Unix timestamp format: the 64-bit timestamp is organized in two 32-bit words, representing the seconds since 01/01/1970, and the fraction of second.

NOTE If the "Packet Slicing" feature is enabled, the hardware automatically disables the "Keep CRC32" feature. No padding is added to frames smaller than 128 bytes.

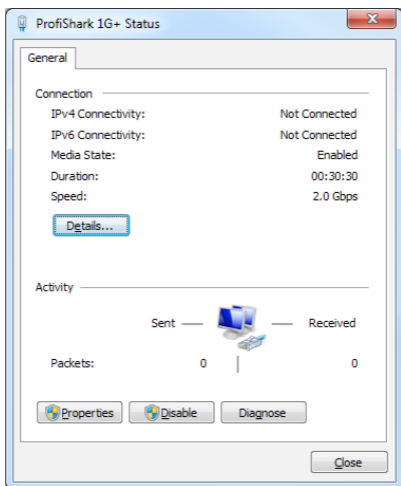
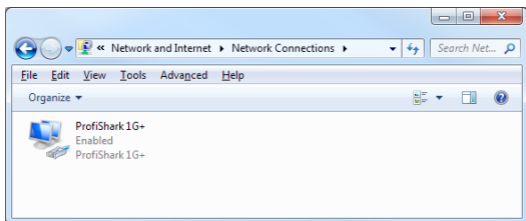
NOTE If both options "Transmit CRC Errors" and "Keep CRC32" are enabled, all erroneous packets will be treated as correct ones.

Packet Capture

ProfiShark 1G has the ability to capture:

- Any type of frames (VLAN, VXLAN, MPLS, Pause frames, etc.)
- Any encapsulated frames
- CRC errors frames
- Short frames (< 64 bytes)
- Jumbo frames (> 1518 bytes)
- Any frames between 10 bytes and 10 Kbytes

Once the drivers have been properly installed, a new connection is added in the Network Connection panel. ProfiShark 1G acts as two 1 Gbit/s unidirectional NICs, regardless of the network connection speed. Frame aggregation is done in the ProfiShark hardware and respects the original frame order. As opposed to FIFO (First In, First Out), the ProfiShark 1G employs an FCFS (First Come, First Served) mechanism.

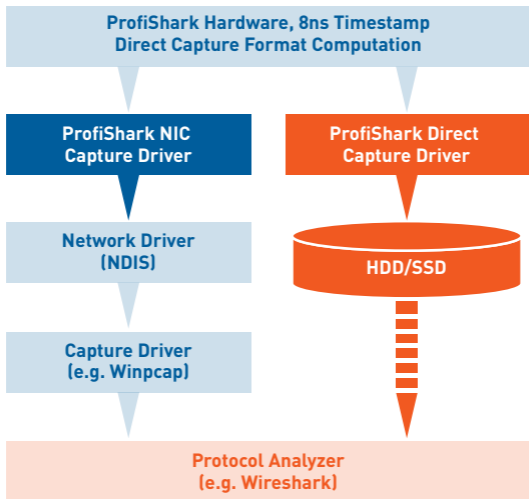


Two modes of capture are available:

- NIC Capture mode
- Direct Capture mode.

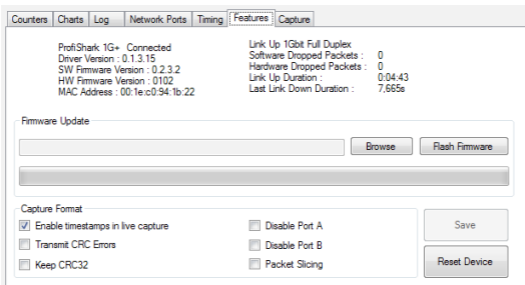
In NIC Capture mode (live capture), the capture is performed like on any other network card. The frames are routed to the NDIS driver.

In Direct Capture mode, the frame stream is dumped to the disk. The capture file format is computed in the ProfiShark hardware.



Live Capture Mode

ProfiShark 1G transmits network frames to the capture software without altering them. It is transparent for packet size, packet type, or protocols. All tags and encapsulation are preserved (e.g. VLAN, MPLS, GRE).



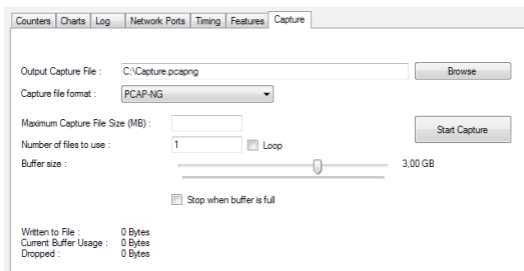
The “Software Dropped Packets” counter in the *Features* tab indicates the number of packets dropped by the driver in Live Capture mode. It is not representative of the packets dropped in Direct Capture (see “Direct Capture Mode” chapter). These drop events are caused by high CPU usage.

The “Hardware Dropped Packets” counter indicates the amount of captured packets that were dropped due to low USB bandwidth (e.g. Gigabit capture on USB 2.0). In USB 3.0 mode, this counter should not increase, even in full speed gigabit capture.

NOTE Capture of small packet at full speed gigabit is extremely challenging for processors and can cause software drops. For that reason, another capture mode is available (see “Direct Capture Mode” chapter).

Direct Capture Mode

ProfiShark 1G provides with the option to capture traffic without the need for third-party capture software. This mode of capture is performed on a driver level, prior to all network stacks and frame processing. With the support of direct capture, small packet capture can be performed at wire speed.



The capture file is saved in PCAP Next Generation format (.pcapng).

The packet timestamps are hardware generated with 8 nanosecond accuracy. The direct capture feature is compatible with the different hardware features: "Packet Slicing", "Transmit CRC errors", "Keep CRC32", "Disable Port" (see "Features" chapter).

Direct Capture Setup

Output Capture File:

Specify the name and location of the capture file. Name extension will be added to the specified name: (`_####_YYYYMMDDHHMMSS`).

Maximum Capture File Size (MB):

The capture will stop when the file reaches the specified size in MB.

Loop:

If selected, the capture does not stop. The files are erased to keep the specified amount of capture files. A round-robin capture can be done, with one or multiple files.

Number of files to use:

Specify the amount of capture files to be created.

Start Capture:

When capture isn't running, starts the capture with the specified parameters.

Stop Capture:

When capture is running, stops the capture and releases the capture file.

Written to File:

Indicates the amount of data written in the Output Capture File.

Current Cache Usage:

Indicates the RAM cache's current usage.

Dropped:

Indicates the amount of data dropped during the capture.

NOTE The amount of dropped data depends on the data storage throughput and the amount of RAM cache. Disk arrays or SSDs can drastically improve capture performance.

Timestamping

The hardware timestamping feature can be used in Live Capture mode, using Profitap's Wireshark dissector. The dissector files can be found on the provided USB flash drive, or in the Resource Center at: **www.profitap.com**.

The dissector is compatible with Wireshark (x86 and x64) 1.12.x and 2.0.x.

Linux:

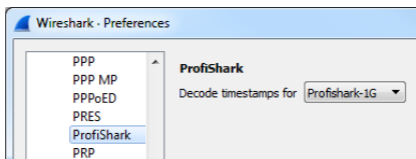
Copy the two files (profishark_1g.la and profishark_1g.so) to: `'/usr/local/lib/wireshark/plugins/[wireshark_version]'`, from x86 or x64 depending on the Linux version.

Windows:

Copy the file (profishark_1g.dll) in: `'C:/Program Files/Wireshark/plugins/[wireshark_version]'`, from x86 or x64 depending on the Windows version.

The dissector can be enabled or disabled in the Wireshark preferences (Edit -> Preferences -> Protocols -> ProfiShark -> Decode timestamps for ProfiShark 1G).

The timestamp option must be enabled in the ProfiShark Manager's Features tab (see «Features» chapter).



If «Decode timestamps for ProfiShark 1G» is enabled, Wireshark assumes that every packet contains the ProfiShark timestamp.

If timestamps aren't displayed in nanosecond resolution in Wireshark, select 'Nanoseconds' in 'View -> Time Display Format'.

Advanced Timestamping (ProfiShark 1G+ only)

The Timing tab contains information and settings related to timestamping. It only appears on the ProfiShark Manager if a ProfiShark 1G+ is connected.

The ProfiShark 1G+ offers multiple advanced timestamping features. The GPS chip can retrieve the UTC time, and synchronize it with the internal PPS, with a typical precision of ± 16 ns. The ProfiShark 1G+ can also retrieve the time via SNTP, or use the internal RTC (real-time clock), and synchronize it via an external PPS signal. A PPS output is possible, for synchronization with another ProfiShark device, or with any other device accepting PPS input.

These systems can be combined in different ways, providing multiple possible options for accurate and precise timestamping of packets.

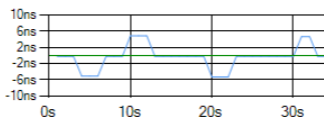
Note that the GPS antenna should be set up outside, or near a window, for the best results. The GPS can take about a minute to synchronize the UTC time with the internal PPS. The stability of synchronicity increases over time, and may take 10 to 15 minutes to reach its peak.

The following section of the Timing tab informs you about the status of advanced timestamping systems.

Status	
GPS module detected	● The GPS antenna is detected by the device.
GPS fix	● Green: the GPS connexion is stable. Yellow: the GPS connexion is close to being stable.
GPS PPS	● Once the GPS has enough stable GPS connexions, the PPS chip will start its synchronization.
External PPS	● If green, an external PPS is detected (bypasses the internal PPS).
Timestamp initialized	● GPS Indicates that the time data has been obtained, and how it has been obtained (GPS/SNTP/System clock/RTC).
Timestamp synced	● Indicates that the internal timestamping is synchronized with the UTC time (± 16 ns precision).

The following section displays the status of GPS synchronization and its deviation from the internal PPS over time:

GPS : 12 GLONASS : 7 Satellites used : 11
GPS PPS estimated accuracy : 6 ns
Deviation from PPS : -0.23 ns



The *Timing* tab provides the following configuration options:

Control

Timestamp initialization : Initialize from System Time ▼

Wait for sync Force PPS generation

PPS port output

set time from SNTP set time from GPS Save

Timestamp initialization:

Specifies how the timestamp will be set at hardware startup.

Wait for sync:

Waits until timestamp synchronization before allowing traffic capture.

PPS port output:

Sets the PPS port to output mode. Will output a PPS signal if the GPS is synchronized.

Force PPS generation:

If PPS port output is set, forces the generation of a PPS signal from the internal RTC (real-time clock).

Set time from SNTP / Set time from GPS:

Sets the ProfiShark 1G+ to the selected mode of timestamping.

PPS compensation:

The PPS *compensation* slider can set the PPS to compensate for latency. For instance, 1 meter of cable adds 3 ns of latency, in which case the slider should be set to -3 ns (-15 ns for 5 meters, -30 ns for 10 meters, etc.).



Timestamp on:

- *Capture*: timestamps are set to the packets at the moment they are captured within the device.
- *Ingress*: timestamps are adjusted to account for latency in order to simulate timestamping at port ingress.
- *Egress*: timestamps are adjusted to account for latency in order to simulate timestamping at port egress.
- *Example of use*: set one port to egress on a first ProfiShark and one to ingress on a second ProfiShark to measure the latency between both ports.

Additional information

Ordering reference

ProfiShark 1G: C1AP-1G

ProfiShark 1G+: C1AP-1G2

Connectors: 1G

2 x RJ45 8 pins

1 x USB 3.0

1 x 5 VDC optional input

Connectors: 1G+

2 x RJ45 8 pins

1 x USB 3.0

1 x 5 VDC optional input

1 x SMA female (PPS)

1 x SMA female (GPS)

LEDs: 1G

2 x Link activity

2 x Speed

1 x Power

LEDs: 1G+

2 x Link activity

2 x Speed

1 x Power

1 x Sync

Dimensions (WxDxH)

1G: 69 x 124 x 24 mm

1G: 2.72 x 4.88 x 0.94 in

1G+: 105 x 124 x 26 mm

1G+: 4.13 x 4.88 x 1.02 in

Weight

1G: 176 g - 0.39 lb

1G+: 280 g - 0.62 lb

Compliance: 1G

RoHS

CE

Compliance: 1G+

RoHS

Max Network Latency

Link @ 1Gpbs370 ns

Link @ 100Mbps.....660 ns

Link @ 10Mbps6600 ns

Power Consumption 1G (5V)

1 Gbps (full traffic).....600 mA

100 Mbps (full traffic)..450 mA

10 Mbps (full traffic).....520 mA

System requirements

Dual Core Processor

4 GB memory

USB 3.0 port

Supported OS

Windows 8 32 & 64 bits

Windows 7 32 & 64 bits

Linux

Operating Temperature

0 to +50°C - 32 to 122°F

Storage Temperature

-40 to +80°C - -40 to 176°F

Relative humidity

10 to 95%, non-condensing

Accessories: 1G

1.8m USB 3.0 cable

RJ45 cable

Pouch

USB key

Accessories 1G+

1.8m USB 3.0 cable

RJ45 cable

Pouch

USB key

GPS/GLONASS Antenna

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