Abstract

This application note answers the questions that frequently arise when using the syn1588® PTP Stack for the first time.

Ordering

Where to buy syn1588®

Oregano Systems sells the syn1588® products worldwide. For this there are selected qualified distributors that serve a specific region. Please check our web site for the most recent list:

https://www.oreganosystems.at/contact/distributors

For all other regions, one may directly order the syn1588® products at Oregano Systems. Simply send an email to contact@oregano.at or sales@oregano.at and you'll receive quotations for your chosen syn1588® products.

Where to start (for syn1588® PCIe/Dual NIC customers)?

Both the syn1588® PCIe NIC and the syn1588® Dual NIC comes with a wooden USB stick. This USB stick holds not only all required software, drivers and documentation but also the syn1588® Live System. Thus, one just needs to insert the card into any PCIe slot and boot the computer using this USB stick. One does not have to install any software this way.

Caution! Please observe the usual ESD pre-cautions when handling the syn1588® PCIe/Dual NIC.

For more information we suggest to start with the syn1588® PCIe NIC Quick Start Guide:

https://www.oreganosystems.at/application/files/2716/7385/3435/an004_syn1588nic_quick_start_guide.pdf

If one sets up the first real life PTP network the following application note is a useful guide for debugging typical PTP setup issues:

https://www.oreganosystems.at/application/files/1516/4259/5166/an003_ptp_analysis.pdf

Finally there is the datasheet as a reference for all kinds of specifications:

https://www.oreganosystems.at/application/files/2516/7446/7338/syn1588_pcie_nic_ds.pdf

All the details of using the software and utilities are described in the syn1588® User Guide which is again available on the wooden USB stick (directory "doc", file name "ug_syn1588.pdf").

Where to start (for source code customers)?

All the details of using the software and utilities are described in the syn1588® User Guide which is electronically delivered (PDF file "ug_syn1588.pdf") with the source code.

Software

Is there an API/SDK?

Yes, there is an API called "Shared Memory API" available to control and monitor the operation of the syn1588® PTP Stack. There is an application note AN015 available describing this API (directory "doc", PDF file "an_shared_memory_api.pdf"); the document is available on our web site as well.

https://www.oreganosystems.at/download_file/view/457/242

Which PTP timing profiles are supported?

The syn1588® PTP Stack is known for its wide support of PTP timing profiles. There is the application note "AN006 syn1588® & timing profiles" that summarizes the currently supported PTP timing profiles.

https://www.oreganosystems.at/download_file/view/445/242

Which OS are supported?

The syn1588® PTP Stack supports out-of-the box Windows and Linux. For a detailed view of the OS support for the whole syn1588® Software Suite please check this document.

https://www.oreganosystems.at/application/files/8016/5477/8021/syn1588_release_OS_support.pdf

Source code license customer may port the syn1588® PTP Stack to support any other OS; even operation without OS just using a light-weight IP stack is feasible. A special layering of the source code ensures that the OS specific functions are separated which eases the porting task.

Is there a porting guideline?

The application note "AN016 Porting the syn1588® PTP Stack" describes all actions required to add support for another IEEE 1588 hardware and/or operating system. The application note is available on our web site

https://www.oreganosystems.at/download_file/view/191/242

and comes with the source code drop (directory "doc", PDF file "an_porting_syn1588_ptpstack.pdf").

Is there an evaluation version available?

Note, that an evaluation version of the syn1588® PTP Stack cannot be provided in general since a PTP node requires both IEEE1588 capable software AND IEEE1588 capable hardware. Running PTP without hardware support (also referred to as software mode) will end up with accuracies known from NTP. One can test the protocol communication in such a scenario but will not achieve accurate synchronized clocks.

The syn1588® PTP Stack has built-in support for syn1588® hardware. For Linux the syn1588® PTP Stack offers additionally support for PHC compatible network interface cards.

Hardware

Does PTP require dedicated hardware?

Yes, PTP requires both hardware and software for its operation. The hardware function resides within the network interface which may be either a separate card or part of the embedded processor that includes the network interface function. The hardware performs accurate timestamping of specific PTP packets sent or received. Additionally, the PTP clock runs in hardware as well.

Running PTP without hardware support (i.e. software mode) will end up with accuracies known from NTP. One can test the protocol communication in such a scenario but will not achieve accurate synchronized clocks.

Does syn1588® synchronize my system clock?

PTP in general synchronizes a local (high accuracy) hardware clock which is definitely not any of the standard system clocks present on a PC's or server's motherboard. There are several reasons for this:

- the system clock on the motherboard uses cheapest oscillators. Their frequency varies with any physical parameter to a great extend
- the system clock on the motherboard cares about accuracy in terms of fractional seconds but not nanoseconds
- the system clock on the motherboard offers limited clock rate control
- the system clock on the motherboard uses human readable time

notation while PTP uses TAI in seconds, nanoseconds and fractional nanoseconds

- the system clock on the motherboard offers a time resolution of microseconds (in best case); for example the syn1588® PCIe NIC uses a resolution of 2^{-16} nanoseconds

To summarize this: any PTP system uses a hardware clock in the NIC.

There is a utility lSync available that allows one to synchronize the system clock to the high accuracy PTP hardware clock. lSync is not part of the syn1588® PTP Stack source code license; it is separately licensed. Naturally, one will end up with an degraded accuracy compared to the hardware clock; but that's in the nature of the system clock.

When acting as PTP master are slaves supported with 1-step and 2-step?

This first of all depends on the PTP hardware used. The Oregano Systems syn1588® NICs and the syn1588®Clock_M IP core fully support 1-step and 2-step operation. Please note, that the syn1588®Clock_M IP core currently does not support 1-step mode for network line speeds greater than 10 Gbit/s.

If a node running the syn1588® PTP Stack acting as PTP Master either 1-step or 2-step PTP Slaves can be supported. One can mix 1-step and 2-step PTP Slaves on the same PTP Master just under certain conditions:

a) 1-step is IPv4 and 2-step is IPv6 mode (or vice versa)
b) both 1-step and 2-step use the same IP version but have to use different sub nets.
c) both 1-step and 2-step use VLAN but different VLAN addresses
d) either 1-step or 2-step use VLAN while the other doesn't

Solution a.) to d.) requires two different PTP instances as well as two timestamping units on the network interfaces.

Franzosengraben 8
A-1030 Vienna
Austria
http://oregano.at
contact@oregano.at