


Version 1.6 – May 2019

Abstract

This application note describes the process of running the Precision Time Protocol (PTP) as defined in IEEE1588-2008 on a PC or server using a syn1588[®] PCIe NIC. It highlights the basic steps required to install and use the syn1588[®] PCIe NIC as well as references to the syn1588[®] User Guide (indicated by this symbol )


Prerequisites

- A syn1588[®] PCIe NIC.
- A PC with a free PCIe slot.
- The wooden USB-Stick bundled with your syn1588[®] PCIe NIC containing both the syn1588[®] PTP software and all accompanying drivers all bundled within a syn1588[®] Linux Live System.
- In case the software is to be installed on an existing operating systems rather than using the syn1588[®] Linux Live System administrator rights are required.

Basic Installation of the syn1588[®] PCIe NIC

To set up the syn1588[®] PCIe NIC please start with the following steps:

- Power off your PC.
- Insert the syn1588[®] PCIe NIC into an empty PCIe slot. Use an appropriate slot that supports PCIe x1 cards.
- Connect the syn1588[®] PCIe NIC to a network or to another PC using a standard Ethernet cable (or optical fiber in case of the SFP version of the syn1588[®] PCIe NIC).

There are two different ways of continuing: Either use the bootable syn1588[®] Linux Live System contained on the USB Stick provided with the syn1588[®] PCIe NIC or you could install the software together with the drivers onto an existing Windows/Linux PC. If there are any problems during the installation of the syn1588[®] PCIe NIC, please consult the UG at chapter  4.4.

Using the syn1588[®] Linux Live System

The syn1588[®] Linux Live System starts a dedicated Linux (Ubuntu 16.04, 32 bit) with all drivers and utilities pre-installed. Please make sure, that the PC you are using is able to boot from an USB stick; you might have to check the BIOS settings for this.

Insert the USB stick into your computer and select the appropriate boot option. After the boot procedure has been completed successfully you will

see an Ubuntu desktop. There are several icons on the desktop of the syn1588® Linux Live System. To run PTP using the syn1588® PCIe NIC double-click one of the icons on the desktop:

- “PTP-Stack in Master mode” to start a syn1588® PTP master
- “PTP-Stack in Slave mode” to start a syn1588® PTP slave


Installing Driver and Software on your PC

The first step which has to be completed after powering up your PC is the installation of the device driver. Please note, that this step usually needs Administrator-Rights on Windows, root-rights on Linux respectively.

Installation of the Device Driver

There are tools to verify the proper operation of the syn1588® PCIe NIC hardware. This allows to deal with systems that behave somewhat different from standard systems. These tools can be found on the provided USB-Stick or other medium. If you are able to see an additional network adapter in the system you can proceed.


Windows

If not already prompted to install a new device, simply browse to the Control Panel and open the Device Manager. Select the new device, which may be listed as “unknown device” and update the drivers. Manually select “syn1588.inf” in the device driver folder “/sw/drv/windows” on the provided USB-Stick. After successful installation, the syn1588® PCIe NIC should be listed at the section “network cards” in the Windows device manager or System Control. For troubleshooting or further information refer to  4.4.2.

Linux

For a Linux operating system open a root shell, browse to the Linux driver-directory “/sw/drv/linux” and execute:

```
> make
> make modules_install
> modprobe SyncDriver
```

Note, that all corresponding source files for your kernel have to be installed prior compiling the driver. For details and information about a permanent installation, refer to  4.4.1.

First Steps with your installed syn1588® PCIe NIC

The easiest way to use the syn1588® PTP Stack and other tools is the command line or shell. Please ensure your shell-session has sufficient rights. For Windows an administrator-command line, and for Linux a root-shell is recommended.

As a first step you need to ensure that the syn1588® PCIe NIC has a valid IP-address assigned to it either via DHCP or manual configuration. For Windows write down this IP-address (i.e. 192.168.0.123) for further reference. For Linux you require the adapter name (i.e. eth3).

First change to the directory on the USB stick where the mentioned utilities are located: “/sw/apps/windows” or “/sw/apps/linux”

Windows

```
> cd sw/apps/windows
> syn1588.exe
```

The output of the syn1588 utility on Windows will look like this example output:

```
syn1588(R) Driver Interface
Build date: Apr 19 2019 - V 1.8-4 Rev g274ca2e0
Copyright (c) Oregano Systems - Design & Consulting GesmbH 2005-2018
Confidential unpublished data - All rights reserved

Syn1588Ifc requires at least:
- linux driver version 1.4-15-g05b7283
- windows driver version 10/05/2017, 10.9.16.182
syn1588(R) Hardware Clock M 2.3.4 f=125000000 Hz
Selected syn1588(R) card 0
```

Linux

```
> cd sw/apps/linux  
> ./syn1588
```

The output of the syn1588 utility on Linux will look like this example output:

```
syn1588(R) Driver Interface  
Build date: Apr 19 2019 - V 1.8-4 Rev g274ca2e  
Copyright (c) Oregano Systems - Design & Consulting GesmbH 2005-2018  
Confidential unpublished data - All rights reserved  
  
Syn1588Ifc requires at least:  
- linux driver version 1.4-15-g05b7283  
- windows driver version 10/05/2017, 10.9.16.182  
Syn1588Impl: Device /dev/syncD0 found  
syn1588(R) Hardware Clock M 2.3.4 f=125000000 Hz  
Selected syn1588(R) card 0  
>
```

Version and status information about the tool and your syn1588® PCIe NIC is shown, if everything was set up correctly. Additionally, one may enter the command “build” on the prompt of the syn1588 utility to get even more information on the syn1588® PCIe NIC.

If any problems occur, please ensure the previous steps were completed successfully.

To start your PC as a PTP node, run the syn1588® PTP Stack as follows. Please change the IP-address or interface name accordingly to your system settings.

Windows

```
> ptp.exe -i 10.0.0.2 -v2
```


Linux

```
> ptp -i eth4 -v2
```

If you have several PTP nodes in your network, you can use a command line parameter to force the PTP mode of your nodes. Use the command line parameter „-CM_EXT“ to force a node into IEEE1588 Master mode. Use the command line parameter „-CS“ to force your node into IEEE1588 Slave mode.

FAQ, Caveats, and Common Traps and Pitfalls

- Linux kernels between 2.6.16 and 4.15 are supported.
- Windows Versions 7, 8, 8.1, 10, Server 2003, Server 2008 and Server 2012, 32 bit and 64 bit versions are supported.
- Please ensure, that your syn1588[®] PCIe NIC has an IP-address assigned. Check also for correct setting of the subnet mask, gateway IP address and DNS server.
- Check, if the IP address set does not interfere with other IP addresses on the same machine or in the network. Ideally a separated subnet should be assigned to all PTP devices at least during initial testing.
- On all operating systems the syn1588[®] PTP Stack requires root-privileges to run correctly.
- Check, if the firewall blocks any PTP traffic. PTP (in layer 3 mode) communicates via IP/UDP port 319 and 320. Please make sure that these ports are not blocked by your firewall.
- Simple way to check the configured IP address and functioning of hardware and/or software is to ping another host IP address. Also Wireshark can be used to check if the packets are received/transmitted at the configured network interface.
- If there are difficulties in using the syn1588[®] hardware and/or software, generate a system information report as specified in the application note syn1588[®] System Information Report and send it to us for further support.

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