



# VN4610 <u>M</u>anual

Version 1.3 | English

#### Imprint

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# **1** Introduction

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# 1.1 About this User Manual

## Conventions

In the two following charts you will find the conventions used in the user manual regarding utilized spellings and symbols.

Style	Utilization
bold	Blocks, surface elements, window- and dialog names of the software.ware. Accentuation of warnings and advices.[OK]Push buttons in bracketsFile SaveNotation for menus and menu entries
Source Code	File name and source code.
Hyperlink	Hyperlinks and references.
<ctrl>+<s></s></ctrl>	Notation for shortcuts.
Symbol	Utilization
1	This symbol calls your attention to warnings.
i	Here you can obtain supplemental information.
	Here you can find additional information.
Ê	Here is an example that has been prepared for you.
9 9 9	Step-by-step instructions provide assistance at these points.
	Instructions on editing files are found at these points.
X	This symbol warns you not to edit the specified file.



## 1.1.1 Warranty

Restriction of warranty

We reserve the right to change the contents of the documentation and the software without notice. Vector Informatik GmbH assumes no liability for correct contents or damages which are resulted from the usage of the documentation. We are grateful for references to mistakes or for suggestions for improvement to be able to offer you even more efficient products in the future.

## 1.1.2 Registered Trademarks

Registered trademarks

All trademarks mentioned in this documentation and if necessary third party registered are absolutely subject to the conditions of each valid label right and the rights of particular registered proprietor. All trademarks, trade names or company names are or can be trademarks or registered trademarks of their particular proprietors. All rights which are not expressly allowed are reserved. If an explicit label of trademarks, which are used in this documentation, fails, should not mean that a name is free of third party rights.

Windows, Windows 7, Windows 8.1, Windows 10 are trademarks of the Microsoft Corporation.

# 1.2 Important Notes

## 1.2.1 Safety Instructions and Hazard Warnings



### Caution!

In order to avoid personal injuries and damage to property, you have to read and understand the following safety instructions and hazard warnings prior to installation and use of this interface. Keep this documentation (manual) always near the interface.



#### Caution!

Do not operate the device without antennas! To avoid physical damage to the device, please attach the provided antennas to the device before operation!

## 1.2.1.1 Proper Use and Intended Purpose



### Caution!

The interface is designed for analyzing, controlling and otherwise influencing control systems and electronic control units. This includes, inter alia, bus systems like CAN, LIN, K-Line, MOST, FlexRay, Ethernet, BroadR-Reach and/or ARINC 429.

The interface may only be operated in a closed state. In particular, printed circuits must not be visible. The interface may only be operated (i) according to the instructions and descriptions of this manual; (ii) with the electric power supply designed for the interface, e.g. USB-powered power supply; and (iii) with accessories manufactured or approved by Vector.

The interface is exclusively designed for use by skilled personnel as its operation may result in serious personal injuries and damage to property. Therefore, only those persons may operate the interface who (i) have understood the possible effects of the actions which may be caused by the interface; (ii) are specifically trained in the handling with the interface, bus systems and the system intended to be influenced; and (iii) have sufficient experience in using the interface safely.

The knowledge necessary for the operation of the interface can be acquired in work-shops and internal or external seminars offered by Vector. Additional and interface specific information, such as "Known Issues", are available in the "Vector KnowledgeBase" on Vector's website at www.vector.com. Please consult the "Vector KnowledgeBase" for updated information prior to the operation of the interface.



## 1.2.1.2 Hazards



## Caution!

The interface may control and/or otherwise influence the behavior of control systems and electronic control units. Serious hazards for life, body and property may arise, in particular, without limitation, by interventions in safety relevant systems (e.g. by deactivating or otherwise manipulating the engine management, steering, airbag and/or braking system) and/or if the interface is operated in public areas (e.g. public traffic, airspace). Therefore, you must always ensure that the interface is used in a safe manner. This includes, inter alia, the ability to put the system in which the interface is used into a safe state at any time (e.g. by "emergency shutdown"), in particular, without limitation, in the event of errors or hazards.

Comply with all safety standards and public regulations which are relevant for the operation of the system. Before you operate the system in public areas, it should be tested on a site which is not accessible to the public and specifically prepared for performing test drives in order to reduce hazards.

## 1.2.2 Disclaimer



#### Caution!

Claims based on defects and liability claims against Vector are excluded to the extent damages or errors are caused by improper use of the interface or use not according to its intended purpose. The same applies to damages or errors arising from insufficient training or lack of experience of personnel using the interface.

# 2 VN4610 802.11p/CAN/GNSS Interface

In this chapter you find the following information:

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## 2.1 Scope of Delivery

#### Contents

The delivery includes:

- 1x VN4610 802.11p/CAN/GNSS Interface
- 2x 5.9 GHz DSRC antenna (part no. 07204)
- 1x GNSS antenna (part no. 07205)
- 1x Power supply (part no. 05024)
- 1x USB 2.0 cable (part no. 05011)

## 2.2 Introduction

#### About the VN4610

The VN4610 is a powerful interface with USB PC connection for accessing IEEE 802.11p and CAN FD networks. The dedicated short range communication (DSRC) is based on the IEEE802.11p standard, which transmits/receives frames in the 5.9 GHz frequency range. The VN4610 supports the unfiltered receiving and sending of IEEE 802.11p frames used for the implementation of Car2x/V2x applications. It is possible to synchronize the received radio frames with CAN FD messages. The built-in GNSS receiver supplies the absolute UTC time and current position.



Figure 1: VN4610 802.11p/CAN Interface (bus side)

Overview of Advantages

- Sending/receiving frames according to IEEE 802.11p
- Two configurable IEEE 802.11p WLAN channels
- Unfiltered forwarding of IEEE 802.11p data packets to the application
- Adjustable communication parameters such as radio channel selection, bandwidth, transmission power, modulation type and protocol format LPD/EPD



- ▶ Two CAN high-speed channels CAN (FD) capable
- GNSS receiver provides current position and time
- Precise time stamp based on GNSS time
- ▶ Time synchronisation with PTP according to IEEE 1588 standard (future Release)
- VN4610 and CANoe.Car2x/CANalyzer.Car2x are optimally matched to each other
- Synchronization with several interfaces and with other bus systems (Ethernet, CAN, LIN, FlexRay, ...)
- Robust housing, power supply and temperature range ideal for automotive and industrial applications
- ► IO port with digital/analog in/out
- Ethernet with IEEE802.3: 100BASE-TX and 1000BASE-T
- Support of customer CAN/DAIO applications via XL-Driver Library (XL-API)
- Multi-application support (simultaneous operation of different applications on one channel, e. g. CANoe and CANape)
- High time stamp accuracy
- Time synchronization of multiple devices and with other bus systems (CAN, LIN, FlexRay, MOST, Ethernet)
- Software time synchronization
- Hardware time synchronization
- GNSS time synchronization to absolute UTC time
- ▶ Time synchronization with PTP according to IEEE 1588 standard
- Connection to host PC via USB 2.0
- LEDs indicating status and activities
- External power supply, galvanically isolated

## 2.3 Accessories



#### Reference

Information on available accessories can be found in the separate accessories manual on our website.

# **3 Examples of Usage**

In this chapter you find the following information:

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## 3.1 General Use Cases

#### Analysis

The VN4610 forwards all received radio frames of the two radio channels unfiltered to the test tool for analysis. Therefore, frames can also be analyzed which would berejected by a ECU due to timing, geo information orprotocol errors caused by Car2x/V2x. Since the time stampsof the messages on the bus channels are synchronized intime, latency measurements can also be carried out.



by the application as test stimulus or for documentation. In addition, the absolute GNSS timestamps can be used to synchronize recordings of distributed measurements for subsequent analysis. Additionally, the VN4610 can act as IEEE 1588 time master and provide the GNSS time in a network (in a future release).

Time The VN4610 enables precise time synchronization with PTP according to IEEE1588 synchronization standard. The device can be configured e. g. as PTP master with UTC time base, which is provided by the built-in GNSS receiver.

Simulation/

Stimulation

# **4** Device Description

In this chapter you find the following information:

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# 4.1 Connectors Bus Side

#### Device connectors



Figure 3: Connectors on the bus side

#### Antenna 1/2 (CH1/CH2)

The VN4610 has two 802.11p channels which can be used to transmit and receive data packages. Please attach the provided antennas before using these channels.

### ► GNSS (CH5)

This channel can be used to receive GNSS time and position.

### D-SUB9 (CH3/CH4)

The VN4610 has two D-SUB9 connectors for CAN/CAN FD. The channels are electrically isolated. The pin assignment is as follows:

Pin	Assignment
1	Not connected
2	1057G CAN Low
3	GND
4	Not connected
5	Not connected
6	Not connected
7	1057G CAN High
8	Not connected
9	Not connected





# 4.2 Connectors USB Side

**Device connectors** 



Figure 4: Connectors on the USB side

#### ► USB

Connect your PC and the VN4610 over USB to install and to use the device with measurement applications (CANoe, CANalyzer). Use the USB 2.0 compliant cable found in the delivery (USB extension cables may generate faults between the PC and the device). Connect the device directly to a USB port at your PC or use a USB hub with its own power supply (self-powered).

### D-SUB9 (CH6)

The VN4610 has a D-SUB9 connector for dedicated digital input/output tasks. The pin assignment is as follows:





Internal interconnection of digital input 0/1





Extended measuring range of the analog input

In normal operation, voltages up to 18 V can be applied and measured at the analog input. The cutoff frequency  $f_c$  (-3 dB) for AC voltages is approx. 7.2 kHz.

For measurements above 18 V (max. 50 V), an external series resistor has to be applied to the analog input. The series resistor  $R_{ext}$  depends on the input voltage  $U_{input}$  and can be calculated as follows:

 $R_{ext} \; [kOhm] = \; [(U_{input} \; * \; 0.61111) \; - \; 11] \; * \; 100$ with  $\; 18 \, V < \; U_{input} \; \leq \; 50 \, V$ 



The cutoff frequency for AC voltages is also affected by the external series resistor:

$$f_c igg[ Hz igg] \, = \, rac{1}{2.33^* \, 10^{-6*} \, R_{ext} [kOhm]}$$

Examples

	24 V	32 V	36 V	48 V
R <sub>ext</sub>	367 kΩ	856 kΩ	1100 kΩ	1833 kΩ
R <sub>ext</sub> (E96)	374 kΩ (24.12 V)	866 kΩ (32.17 V)	1100 kΩ (36.00 V)	1870 kΩ (48.60 V)
f <sub>c</sub> (-3 dB)	1148 Hz	496 Hz	390 Hz	230 Hz

Device connectors (continued)

#### Ethernet (RJ45)

Connect your PC and the VN4610 via this Ethernet port to install the device and use it together with measurement applications (CANoe, CANalyzer).

### Power/Sync (Binder connector)

The VN4610 has two power/sync connectors (Binder type 711) which can be used for time synchronization of different Vector devices (see section Time Synchronization on page 35) or for power. It does not matter which connector is used to supply the device. For proper operation of the VN4610, an external power supply is required.



Power/Sync

Figure 9: Internal wiring of the power/sync connector

Pin	Assignment	
1	Power supply (typ. 12 V)	
2	Synchronization line	
3	Ground	

## 4.3 LEDs



Figure 10: LEDs of the VN4610

### ► CH1/CH2

Multicolored channel LEDs indicating the WiFi activity.

Color	Description
Green	Data frames have been sent or receicved correctly.
Red	Transmission errors during sending or receiving.
NCC: The floor bin of a many sector of the baselos of	

WiFi: The flashing frequency depends on the bus load.

#### ► CH3/CH4

Multicolored channel LED indicating the bus activity.

Color	Description
Green	Data frames have been sent or received correctly.
Orange	CAN: Error frames have been sent or received.
Red	CAN: Bus off.

CAN: The flashing frequency depends on the bus load.

### GNSS

Multicolored channel LED indicating the GNSS activity.

Color	Description
Green	On: SAT fix within the specified accuracy settings achieved.
	Flashing: SAT fix without reaching the specified accuracy settings.
Red	On: No Satellite signal.
	<ul> <li>Flashing: Satellite signal too weak.</li> </ul>

## Status

Multicolored channel LED indicating the status..

Color	Description
Green	Device is ready for operation/running measurement.
Orange	Initializing driver. Please wait.
Red	Error. Device not working.

# 4.4 Technical Data

802.11p channels	NXP SAF5100
GNSS channel	uBlox NEO-M8U, supports GPS, GLONASS, Beidou, Galileo; up to 3 systems at the same time
CAN/CAN FD channel	2x NXP TJA1057G CAN up to 2 Mbit/s. CAN FD up to 8 Mbit/s.
Ethernet channel	IEEE 100BASE-TX/1000Base-T
Analog input	10 bit Input 0 V18 V (Ri = $1.1 \text{ M}\Omega$ ) Voltage tolerance up to 30 V
Digital input	Range 0 V32 V Schmitt trigger high 2.8 V, low 2.3 V Input frequencies up to 1 kHz
Digital output	Open Drain External supply up to 32 V Output frequency up to 1 kHz Current max. 500 mA Short circuit / over voltage protected
5 V digital output	5V TTL output signal on D-SUB9 connector, pin 7. GND reference of the signal is digital GND on pin 9.
Time stamps	Accuracy (within one device): 1 μs Accuracy software sync: typ. 50 μs Accuracy hardware sync: typ. 1 μs
PC interface	USB 2.0 / Ethernet IEEE 100Base-TX/1000Base-T
Time synchronization	PTP according to IEEE1588-2008 standard
Average response time	250 µs
Input voltage	6 V 50 V DC
Power consumption	Approx. 7 W
Temperature range (ambient temp. of the device)	Operation: -40 °C +60 °C Storage: -40 °C +85 °C
Relative humidity of ambient air	15 %95 %, non-condensing
Dimensions (LxWxH)	Approx. 111 mm x 157 mm x 45 mm without antennas
Weight	Approx. 610 g
Housing	Robust aluminium housing
Operating system requirements	Windows 7 SP1 (32 bit / 64 bit) Windows 8.1 (32 bit / 64 bit) Windows 10 (64 bit)

# **5 Getting Started**

In this chapter you find the following information:

5.1	Driver Installation	24
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	5.2.1 CAN	27



# 5.1 Driver Installation



#### Caution!

Do not operate the device without antennas! To avoid physical damage to the device, please attach the provided antennas to the device before operation!

General information The Vector Driver Disk offers a driver setup which allows the installation or the removal of Vector devices.



Note

Please note that you will need Administrator Rights for the following steps.



## Step by Step Procedure

1. Execute the driver setup from the autostart menu or directly from \Drivers\Setup.exe before the device is connected to the PC with the included USB cable.

If you have already connected the device to the PC, the Windows found new Hardware wizard appears. Close this wizard and then execute the driver setup.



2. Click [Next] in the driver setup dialog. The initialization process starts.

3. In the driver selection dialog, select your devices to be installed (or to be uninstalled).

> Vector Informatik GmbH Drive	er Setup	×
Driver Selection	VECTOR	>
The setup will install or uninstall	I the selected devices.	
Device           CAN/LIN Interface Family           VN1530 / VN1531           VN1610 / VN1611 / VN162           VN1630 log           FlexRay Interface Family           VN3300           VN3600           VN7570           VN7572           VN7600	Installed driver Driver in installation packet - not installed - 10.9.14 - not installed - 10.9.12 - not installed - 10.4.16 - not installed - 10.4.16 - not installed - 8.2.26 - not installed - 8.2.26 - not installed - 10.3.18 - not installed - 11.0.12 - not installed - 9.9.26	
VN7610 VV7640 Vector Tool Platform Vector Platform Manager VN8900 Interface Family VN8800 Interface Family Ethernet Interface Family	- not installed - 10.6.14 - not installed - 10.8.20 r - not installed - 2.4.48 - not installed - 10.2.136 - not installed - 9.3.18	-
<ul> <li>✓ VN5610 / VN5610A</li> <li>✓ VN5620</li> <li>✓ VN5640</li> <li>✓ VN5430</li> <li>MOST Interface Family</li> </ul>	- not installed - 11.2.10 - not installed - 11.2.10 - not installed - 11.2.10 - not installed - 11.2.10	_
VN2600 / VN2610 VN2640 XL Interface Family Select/deselect all devices Remove all driver component	- not installed - 8.8.22 - not installed - 8.4.36	- •
	Uninstall Install C	ancel

- 4. Click **[Install]** to execute the driver installation, or **[Uninstall]** to remove existing drivers.
- 5. A confirmation dialog appears. Click **[Close]** to exit. After successful installation, the device is ready for operation and can be connected to the PC with the included USB cable and powered by supplying external voltage (e. g. with an appropriate cable offered by Vector).



# 5.2 Loop Tests

Operation test

The test described here can be performed to check the functional integrity of the driver and the device. This test is identical for Windows 7 / Windows 8.1 / Windows 10 and independent of the used application.



## 5.2.1 CAN

Device test

The operating test for CAN requires either two high-speed or two low-speed transceivers and can be executed as follows:



### Step by Step Procedure

- Connect two CAN channels with a suitable cable. If two high-speed transceivers are being used, we recommend our CANcable1 (CANcable0 for low-speed transceivers).
- 2. Start \Drivers\Common\Loop3.exe from the Vector Driver Disk. This program accesses the Vector devices and transmits CAN messages.

Loop3 - CAN Benchmark utility			
Selected channels          Ist CANcardXLe Channel 3         1st CANcardXLe Channel 4         1st CANcardXLe Channel 1         1st CANcaseXL log Channel 2         Ist VN1610 Channel 1         1st VN1610 Channel 2	Settings Req. statistics Write logs Timer events 1.000.000 Bd Random IDs	Stress priority	Time limit [s] 0 Burst size 16 ave statistic Imp events Start Clear

3. Select the connected CAN channels of the device(s) to be tested.

- 4. Set the appropriate baudrate depending on the transceiver being used (high-speed max. 1,000,000 Bd, low-speed max. 125,000 Bd).
- 5. Click [Start].
- 6. You will see statistical data in the lower part of the window if the system has been configured properly.

Loop3 - CAN Benchmark utility						
Selected channels           Itst CANcard&Le Channel 3           1st CANcard&Le Channel 4           1st CANcard&Le Channel 4           1st CANcard&Le Channel 1           1st CANcase&L log Channel 1           1st CANcase&L log Channel 2           Ist VN1610 Channel 1           1st VN1610 Channel 2	Settings V Req. statistics Stress priority Write logs Timer events 1.000.000 Bd Random IDs	Time limit [s] 0 Burst size 16 Save statistic Dump events Clear				
Channel4 = 0x10 Channel8 = 0x100 Setting bit rate to 1000000 bit/s, t1=5, t2=2, sampling point 75% bit0=00,bit1=14 FwVersion=07090000E, HwVersion=00000000, SerialNumber=164 FwVersion=0800000E, HwVersion=00000000, SerialNumber=393917 Setting timer rate to 1 Started at Mon Mar 19 12:07:38 2012 Time synchronization disabled.						
0:00:06.493 ClkDiff=2.188ms Tim=5492 04 Delay[ns]: AvRcv=246716 Av=3123 08 Delay[ns]: AvRcv=264817 Av=0. Mir Total global delays[ns]: Average=16761	2 Stats=30/30 Msg=50859/107196 I/O=10197/213 2, Min=10000, Max=20000, Giobal [Av=0, Min=0, M I=0, Max=0, Global [Av=33522, Min=10000, Max=2 Min=0, Max=20000, Average ClkDiff=-2248.27us, I	78msg/s ax=0, Last=0) 0000, Last=10000] BusLoad=100%				

7. The test procedure can be terminated with the **[Stop]** button. An **OK** should appear in the upper part of the window.

0:00:22.092 ClkDiff=-2.188ms Tim=21092 Stats=120/120 Msg=209829/440823 I/D=10233/21450msg/s 04 Delay[ns]: AvRcv=203431 Av=31899, Min=0, Max=50000, Global [Av=0, Min=0, Max=0, Last=0] 08 Delay[ns]: AvRcv=218295 Av=0, Min=0, Max=0, Global [Av=34229, Min=0, Max=50000, Last=10000] Total global delays[ns]: Average=17114, Min=0, Max=50000, Average ClkDiff=-2247.3us, BusLoad=100%
--

# **6 Vector Hardware Configuration**

In this chapter you find the following information:

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	6.2.2 Tree View	32



## 6.1 General Information

#### Executing Vector Hardware Config

After the successful driver installation, you will find the configuration application **Vector Hardware** in the Control Panel (see below). The tool gives you information about the connected and installed Vector devices. There are also several settings that can be changed.



Figure 11: Icon in Control Panel

Control Panel Windows 7  Category view
 Windows Start | Control Panel | Hardware and Sound, click Vector Hardware in the list.

 Symbols view
 Windows Start | Control Panel, click Vector Hardware in the list.

Control Panel Windows 8.1 Category view <Windows key>+<X> | Control Panel | Hardware and Sound, click Vector Hardware in the list.

Symbols view <Windows key>+<X> | Control Panel, click Vector Hardware in the list.

Control Panel Windows 10 Category view <Windows key>+<X> | Control Panel | Hardware and Sound, click Vector Hardware in the list.

Symbols view <Windows key>+<X> | Control Panel, click Vector Hardware in the list.

# 6.2 Tool Description

## 6.2.1 Introduction

Vector Hardware Config



Figure 12: General view of Vector Hardware Config

Logical and physical channels

**Vector Hardware Config** enables the channel configuration between installed Vector devices and applications. Applications use so-called logical channels which are hardware independent and have to be assigned to real hardware channels.



Figure 13: Concept of channel assignments

pplication License Support Help					
Hardware	Details	Interfa	ce Device Channel	Description	
Application	CAN				
	CAN 1 CAN 2	VN163 Not as	30A 1 (000020) Channel 1 signed		
	CAN 3	No	Virtual CAN Bus	•	
🕰 Global Settings	CAN 4	No	VN1610	*	
	LIN		VN1630A	•	VN1630A 1 (000020) Channel 1
🖳 😭 License	1.181.4	NI.	VN7610	•	VN1630A 1 (000020) Channel 2
	LIN 2	Nd VN5640 VN5610A	VN5640	•	VN1630A 1 (000020) Channel 3
			VN5610A	•	VN1630A 1 (000020) Channel 4
	FlexRay	_	Remove assignment		
	FlexRay 1 VN		nemove assignment		-1
		_	Refresh		

Figure 14: Channel assignment in Vector Hardware Config



## 6.2.2 Tree View

Accessing Vector devices The tool is split into two windows. The left window has a tree view and lets you access the installed Vector devices, the right window displays the details of the selection. The following nodes are available in the tree view:

Hardware

The **Hardware** section lists the installed Vector devices. Each device item has physical channels which can be assigned to any number of logical channels (e. g. CANalyzer CAN 1). A logical channel can be assigned to only one physical channel.



Figure 15: Hardware

Application

In **Application**, all available applications are displayed in a tree view. According to each application, the assignments of logical and physical channels are displayed in the right part of the window. If no assignment exists, the information **Not assigned** appears. The assignment can be edited via a right-click.

🖡 Vector Hardware Config				Ж
Application License Support Help				
Hardware	Details	Interface Device Channel	Description	<b>_</b>
i → → → Application	CAN			
	CAN 1	VN1630A 1 (000020) Channel 1		
ZANoe	CAN 2	Not assigned		
My_XL_API_App	CAN 3	Not assigned		
🚛 Global Settings	CAN 4	Not assigned		
Driver status	LIN			
	LIN 1	Not assigned		
	LIN 2	Not assigned		
	FlexRay			
	FlexRay 1	VN76101 (000804) Channel 1		<b>.</b>
	4			▶
				-

Figure 16: Application



Global settings

**Global settings** contains global device configuration possibilities, e. g. software time synchronization, GNSS time synchronization, transmit queue size, configuration flags or the number of virtual CAN devices.

- Vector Hardware Config			
Application License Support Help	_		
	* III *	Details Software time synchronization Software time synchronization (VN4610) Software synchronization (VN4610) Softwa	YES NO 256 messages 0x0 1 YES

Figure 17: Global settings

### **Driver status**

**Driver status** offers an overall status information of devices and applications currently in use. You can see whether the channels are connected to the bus (online/off-line) and whether the time synchronization is activated or not (Time-Sync-On/Time-Sync-Off).

Sector Hardware Config		
Application License Support Help		
😥 🗮 Hardware	Details	<u>ـ</u>
🖶 🚋 Application	🗘 VN5610A 1 (000005) Channel 2	Offline, Time-Sync-On
Global Settings	🙀 VN5610A 1 (000005) Channel 3	Offline, Time-Sync-On
	🖨 VN5610A 1 (000005) Channel 4	Offline, Time-Sync-On
🗄 🙀 License	📽 VN5610A 1 (000005) Channel 5	Offline, Time-Sync-On
	🚝 CANalyzer:	VN1610 1 (000145) Channel 1, Init, Activated
		VN16101 (000145) Channel 2, Init, Activated VN1630A 1 (000020) Channel 1, Init, Activated
	🗯 CANoe:	VN1630A 1 (000020) Channel 2, Init, Activated VN5610A 1 (000005) Channel 1, Init, Activated
		VN5640 1 Channel 17, Init, Activated
		VN56401 Channel 18, Init, Activated
		VN76101 (000804) Channel 1, Init, Activated 📃 💌

Figure 18: Driver status



#### License

The **License** section contains information on all current available licenses (Vector bus devices, Vector License USB dongle devices).

pplication License Support	<u>H</u> elp		
🕀 💐 Hardware	Details		-
🗄 📷 Application	Sec CANoe		
📲 🚮 Global Settings		CANoe	
Driver status		CANce BLIN Mersion < 4.0)	
		CANce PEX	
Overview		CANoe CANopen / ProCANopen	
Device view		CANce BLIN (Version >= 4 0)	
Control Horn		Application DENoe PBD	
		CAN for DENoe PBD	
		CANce./1587 /./1708	
		MOST for DENce PBD	
		FLEXBAY for DENce PBD	
		LIN for DENoe PBD	
		DENoe Car2x	
		BEAN for DENce PBD	
		AMD for DENce PBD	
		DENce Ethernet	
		XCP for DENoe PB0	
		SCOPE for DENoe/DENalvzer	
		J1939 for CANoe/CANalyzer	
		ISO11783 for CANoe	
		CANaero for CANoe/CANalvzer	
		CANoe/CANalvzer Standalone basic	
		CANoe/CANalvzer Standalone extended	
		CANoe/CANalvzer Standalone professional	
	- CANape		
		CANape < 5.6	
		CANape >= 5.6	
		CANape Server	
		CANape >= 8.0 / CANdito >= 4.0	
		CANade BCP	

Figure 19: License



## Reference

You will find a detailed description of **Vector Hardware Config** in the online help **(Help | Contents)**.

# 7 Time Synchronization

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# 7.1 General Information

Time stamps and events

Time stamps are useful when analyzing incoming or outgoing data or event sequences on a specific bus.

	-д т	rac	e	<b>—</b> 11				1							x
	0	=1h	£ 🖌	<b>3</b> A	× 1	III ≜t	1				• <	<b>p</b>	1	•	Ŧ
	8	Tìr	me		Chn	ID	Name	Dir	DLC	Data					٢
	8		;···· 🖂 0.	100376	2	100		Rx	8	23 19	05 4	47 79	34	52 8	2 🔶
Þ	8		····· 🖂 0.	100378	1	100		Tx	8	23 19	05 4	47 79	34	52 8	2 =
:			🖂 0.	200382	2	100		Rx	8	03 04	06 9	95 06	07	56 7	4
			···· 🖂 0.	200384	1	100		Tx	8	03 04	06 9	95 06	07	56 7	4
			🖂 0.	300372	1	102		Rx	8	74 02	31	73 94	12	04 9	3
Þ			🖂 0.	300374	2	102		Tx	8	74 02	31	73 94	12	04 9	3 _
			···· 🖂 0.	400406	2	100		Rx	8	23 19	05 4	47 79	34	52 8	2
		-	<b>n</b>	400408	1	100		Tv	8	77 10	ns ,	17 70	24	52.8	<u>,</u>
		•													P

Figure 20: Time stamps of two CAN channels in CANalyzer

# Generating time stamps

Each event which is sent or received by a Vector network interface has an accurate time stamp. Time stamps are generated for each channel in the Vector network interface. The base for these time stamps is a common hardware clock in the device.



Figure 21: Common time stamp clock for each channel

If the measurement setup requires more than one Vector network interface, a synchronization of all connected interfaces and their hardware clocks is needed.

Due to manufacturing and temperature tolerances, the hardware clocks may vary in speed, so time stamps of various Vector devices drift over time.



PC						
CAN	alyze	er/CA	ANoe			
↓ USB			↓ USB			
Vector	0.000000 0.100376	0.000000 0.100383	Vector			
CAN Interface CH1 CH2 Time Stamp Clock	0.200382 0.300372 0.400406 0.500593 0.600242	0.200982 0.301456 0.402612 0.503885 0.604092	Ethernet Interface Port 1 Port Time Stamp Clock	e 2		
	CA	١N				
Ethernet						

Figure 22: Example of unsynchronized network interfaces. Independent time stamps drift apart

To compensate for these time stamp deviations between the Vector network interfaces, the time stamps can be either synchronized by software, hardware, PTP or GNSS (see next section).



### Note

The accuracy of the software, hardware, PTP or GNSS sync depends on the interface. Further information on specific values can be found in the technical data of the respective devices.



# 7.2 Software Sync

## 7.2.1 General Information

Synchronization by software

The software time synchronization is driver-based and available for all applications without any restrictions. The time stamp deviations from different Vector network interfaces are calculated and synchronized to the common PC clock. For this purpose no further hardware setup is required.



Figure 23: Time stamps of devices are synchronized to the PC clock



#### Note

Software time synchronization may lead to an increased latency for all connected Vector network interfaces. If a use case requires low latency, deactivate this option and use another synchronization mechanism.



## 7.2.2 Configuration

VectorUse the software synchronization if at least one device has no hardware sync con-<br/>nector and to configure all devices to legacy software synchronization.

The setting of the software time synchronization can be changed in the **Vector Hard-ware Config** tool via a right-clicking on the device and by selecting **Time sync device configuration**.

Software sync modes

In section Protocol Mode | Software, select the required mode:

Off

Synchronization mechanism is turned off.

Legacy

Device is synchronized to PC performance counter. This setting is compatible with the previous synchronization mechanism **Software time synchronization**. Can be used in conjunction with device drivers older than 11.2.

Master

Device operates as software synchronization time master.

Slave

Device operates as software synchronization time slave.



Figure 24: Configuring software synchronization

# 7.3 Hardware Sync

## 7.3.1 General Information

Synchronization by hardware

A more accurate time synchronization of multiple devices is provided by the hardware synchronization. Two Vector network interfaces can therefore be connected with the SYNCcableXL (see accessories manual, part number 05018).

In order to synchronize up to five devices at the same time, a distribution box is available (see accessories manual, part number 05085).



Figure 25: Example of a time synchronization with multiple devices



Figure 26: Example of a time synchronization with VN8914 and additional devices

At each falling edge on the sync line which is initiated by the driver, the Vector network interface generates a time stamp that is provided to the driver. This allows the driver to calculate the deviations between the network interfaces and to synchronize



the time stamps to a common time base (master clock) which can be defined by the user.



Figure 27: Time stamps are synchronized to the master clock



## 7.3.2 Configuration

Vector Hardware Config	Use hardware synchronization if at least one device is connected with USB or PCIe to the PC and all devices are hardware sync capable. One device should be con- figured as master and all other devices as slaves. Therefore, all devices must be inter- connected with SYNCcableXL and Multi SYNCbox external or SYNCbox active.			
	The setting of the hardware time synchronization can be changed in the <b>Vector Hard-</b> ware <b>Config</b> tool via a right-clicking on the device and by selecting <b>Time sync</b> device configuration.			
Hardware sync modes	<ul> <li>In section Protocol Mode   Hardware, select the required mode:</li> <li>Off Synchronization mechanism is turned off.</li> <li>Master Device operates as synchronization master, sending sync pulses on the sync line.</li> </ul>			

Slave

Device operates as synchronization slave, awaiting sync pulses on the sync line.



Figure 28: Configuring hardware synchronization

# 7.4 Precision Time Protocol Sync

## 7.4.1 General Information

Overview

The Precision Time Protocol (PTP) is a protocol used to synchronize clocks through a computer network. On a local area network, it achieves a synchronization accuracy in the sub-microsecond range, making it suitable for measurement and control systems.

Vector network interfaces support time synchronization with IEEE1588-2008 standard. The following IEEE1588 features are supported.



#### Note

The PTP feature can only be used on the Ethernet host ports of these devices. Therefore, it can only be used, if the device is connected via Ethernet host port to the PC.



#### Figure 29: Setup example

## 7.4.2 Supported Features

IEEE1588 Features	VN Device Support
Clock Types	
Ordinary Clock Master	X
Ordinary Clock Slave	X
Synchronization	
2-step clock	X
E2E	X
BMCA	X
Transport	
PTP over UDP with IPv4	X
PTP over UDP with IPv6	-
Multicast Master/Slave	X
Unicast Master/Slave	-
Synchronization accuracy	
1 µs	X



## 7.4.3 Network Topology

Network switches

To achieve a maximum accuracy, PTP needs transparent clock support in network equipment. Therefore, a PTP transparent clock capable network switch is strongly suggested.

If no such network switch is available, we have experienced good results with the following network switches. Keep in mind that these switches do not support PTP transparent clocks and thus do not guarantee the promised synchronization accuracy.

- NETGEAR GS108Ev3
- TP-Link TL-SG105
- LogiLink NS0051A2.0
- Cisco SG110D-08



## 7.4.4 Configuration

Vector Hardware Config Use the PTP synchronization if all devices are connected via Ethernet host port to the PC and one device is configured as master and all other devices are configured as slaves.

The setting of the PTP synchronization can be changed in the **Vector Hardware Con**fig tool via a right-clicking on the device and by selecting **Time sync device con**figuration.

PTP sync modes In section Protocol Mode | PTP, select the required mode:

► Off

Synchronization mechanism is turned off.

- Master Device operates as fixed IEEE1588 master.
   Slave
  - Device operates as fixed IEEE1588 slave.
- Auto

Devices uses the Best Master Clock Algorithm (BMCA) to determine operation mode.

Repeat the steps above to configure each Vector network interface. Keep in mind that only one IEEE1588 Master should be used at the same time and that IEEE1588 Slaves need at least one IEEE1588 Master.

() [VN4610] - Time sync device configuration							
Reload Default Write Factory Reset							
▲ Device Type							
Device	VN4610						
▲ Protocol Mode							
GNSS Synchronization	Off 🔹						
Hardware Synchronization	Off 🗸						
PTP	Off						
Software Synchronization	Off						
▲ PTP Synchronization	Slave						
Physical Port	Auto						
PTP Set the port specific PTP protocol mode.							
Modified	11.2.20.0						

Figure 30: Configuring PTP synchronization



# 7.5 GNSS Sync

## 7.5.1 General Information

Synchronization by GNSS

This device supports time synchronization via GNSS, i. e. the internal time stamp clock of the device is synchronized to the GNSS master time.



Figure 31: Time stamps are synchronized to GNSS master time

You can use this GNSS synchronization to provide the time to other Vector devices by using PTP time synchronization, hardware time synchronization or software time synchronization. In this case, the GNSS synchronized device has to be configured as time master.





## 7.5.2 Configuration

Vector Hardware Config The setting of the GNSS time synchronization can be changed in the **Vector Hard-ware Config** tool via a right-clicking on the device and by selecting **Time sync device configuration**.

In section Protocol Mode | GNSS, select the required mode:

GNSS sync modes

Synchronization mechanism is turned off.

Slave

► Off

Device synchronizes to GNSS.

0	[VN4610] - Time sync device o	onfiguration	• 🔀					
	Reload Default Reset							
4	Device Type							
	Device	VN4610						
4	Protocol Mode							
	GNSS Synchronization	Off	•					
	Hardware Synchronization	Off						
	PTP	UTT Slave						
	Software Synchronization	Off	-					
4	PTP Synchronization							
	Physical Port	ETH Host						
GNSS Synchronization Enable or disable Global Navigation Satellite System (GNSS) synchronization.								
M	odified		11.2.20.0					

Figure 32: Configuring GNSS synchronization



## 7.6 Protocol Combinations

General information

All described time synchronization protocols can be combined in several ways to support different use cases. The following example illustrates this in a generic way:

Setup



Figure 33: Combination example

Legend

Symbol	Description
S	Active Slave protocol on first device, i. e. protocol which corrects the time on the device.
S	Possible active Slave protocols on second device, i. e. protocol which corrects the time on the device
Μ	Possible active Master protocol on first device, i. e. protocol which distributes the time to other devices.

#### Possible combinations

The following table outlines the possible protocol combinations. See legend above. For example, if the first device is synced to GNSS the second device can be synced to the same time using PTP synchronization

	Root Device		2nd Device Level			
Sync Role	Slave Master		Slave			
		Hardware Sync				
	None	Software Sync				
		PTP				
Time	GNSS	Hardware Sync				
Synchronization			Software Sync			
Protocol			PTP			
	PTP *	Hardware Sync				
	HW Sync	Software Sync				
	SW Sync	-				
* with external master or Vector device						

with external master or Vector device



## Note

Only one slave protocol can be active on a device but a device can drive multiple master protocols.



# 7.7 Use Cases and Configuration Examples

## 7.7.1 GNSS Synchronization

TAI/UTC time Synchronizing Vector network interfaces to GNSS (TAI/UTC) time.

### Setup



Figure 34: GNSS example

Configuration

In this use-case the devices shall be configured in the following way:

Devices	GNSS	PTP	Software Sync	Hardware Sync
VN4610	Slave	Master	Off	Off
VN5640	Off	Slave	Off	Off

Check the synchronization status of all devices. Configuration shall be ok and all devices shall be In-Sync.



## 7.7.2 4.2 IEEE1588 Synchronization

PTP master

Synchronizing Vector network interfaces to a PTP master.

Setup



Configuration

In this use-case the devices shall be configured in the following way:

Devices	GNSS	PTP	Software Sync	Hardware Sync
VN5640 (1)	Off	Master	Off	Off
VN5640 (2)	Off	Slave	Off	Off

Check the synchronization status of all devices. Configuration shall be ok and all devices shall be In-Sync.



## 7.7.3 Hardware Synchronization

Active sync

Synchronizing more than five Vector network interfaces via Multi SYNCbox active.

#### Setup



Figure 36: Active sync example



The hardware synchronization topology should be evenly balanced to achieve the best synchronization results. This means all synchronization participants (except the master) shall be interconnected on the same topology level.

### Configuration

In this use-case the devices shall be configured in the following way:

Devices	GNSS	PTP	Software Sync	Hardware Sync
VN7572	Off	Off	Off	Master
all others	Off	Off	Off	Slave

Check the synchronization status of all devices. Configuration shall be ok and all devices shall be In-Sync.

# 7.8 Compatibility

## 7.8.1 Vector Software

- CANoe 12.0 SP3 or higher
- CANape 18.0 or higher

## 7.8.2 Device Drivers

- For backwards compatibility, use software synchronization Legacy for all devices.
- For devices with driver versions < 11.2, activate Global Settings | Software time synchronization in Vector Hardware Config tool.</p>



Figure 37: Global settings

Alternatively, disable all synchronization mechanisms and use application hardware synchronization.



### Note

The hardware synchronization must be supported by the application. For further information please refer to the relevant application manual. Please note that the software synchronization must be disabled, if application hardware synchronization is used.

# 7.9 Troubleshooting

Problem	Possible Reason	Solution
Vector Hardware Configuration does not show the context menu to con- figure timesync on the device.	Old driver.	Update device driver to most recent driver.
Error messages:		
IEEE1588 sync not supported (only with ETH connection)	<ul> <li>IEEE1588 Synchronization is only available if the used Host Interface is Ethernet.</li> <li>A device which uses USB connection for Host Interface cannot be configured for IEEE1588 synchronization (although the Ethernet cable is connected physically in addition to the USB cable).</li> </ul>	<ul> <li>Disconnect the USB cable from the device.</li> <li>Connect the Ethernet Host cable to the device.</li> <li>Power cycle the device.</li> <li>Use another synchronization protocol if you want to keep the USB Host connection.</li> </ul>
Software sync not supported (only with USB connection).	<ul> <li>Software synchronization is only available if the host interface used is USB or PCIe.</li> <li>A device that uses an Ethernet port for the host interface cannot be configured for software synchronization (although the Ethernet cable is physically connected in addition to the USB cable).</li> </ul>	<ul> <li>Disconnect the Ethernet Host cable from the device.</li> <li>Connect the USB cable to the device.</li> <li>Power cycle the device.</li> <li>Use another synchronization protocol if you want to keep the</li> </ul>
		Ethernet Host con- nection.
Synchronization cannot be established. Red icon in Vector Hardware Con-	<ul> <li>Sync cluster not properly con- figured.</li> </ul>	
figuration Tool (Status: Out of sync).	<ul> <li>Slave configured but no Master available.</li> </ul>	
	<ul> <li>Hw Sync cable not properly con- nected.</li> </ul>	
	<ul> <li>No GNSS satellite signal available (check GNSS LED).</li> </ul>	
	<ul> <li>Used Ethernet Switch for IEEE1588 introduces too much jit- ter.</li> </ul>	

# 8 Ethernet Host Connections

In this chapter you find the following information:

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# 8.1 General Hints

Network switches

It is best to avoid network switches between your Vector network interface and your PC. Best throughput and performance can be achieved by directly connecting your Vector network interface to your PC.

## 8.2 Getting Started

## 8.2.1 Connecting the Device



#### Step by Step Procedure

If you want to connect your device to the PC via Ethernet, the device and the PC have to be configured first.

1. In Windows, first check your TCP/IPv4 settings.

Internet Protocol Version 4 (TCP/IP	v4) Properties						
General							
You can get IP settings assigned au this capability. Otherwise, you need for the appropriate IP settings.	itomatically if your network supports d to ask your network administrator						
ODtain an IP address automatically							
• Use the following IP address:							
IP address:	192.168.0.10						
Subnet mask:	255.255.255.0						
Default gateway:							
Obtain DNS server address au	itomatically						
• Use the following DNS server	addresses:						
Preferred DNS server:	· · · · ·						
Alternate DNS server:							
Uaļidate settings upon exit	Valjdate settings upon exit Advanced						
	OK Cancel						



#### Note

#### Default subnet of device:

The devices are initially configured to the subnet 192.168.0.0\24.

The default IP address of the devices is 192.168.0.5

#### Firewall settings:

The firewall may block the communication. The firewall requires exceptions for the following ports:

- UDP 42600 (used by Scan network in Vector Hardware Config)
- TCP 4200, 4201 (necessary for establishing a connection to device)



- 2. Connect the device to your PC via Ethernet. Ensure that no USB cable is connected.
- 3. Open Vector Hardware Config.

Application License Suppo	rt <u>H</u> elp	
- 🗮 Hardware ⊕- 📃 Virtual CAN Bus 1	Details	
	Device	VN5610A 1 (000925)
🖶 🚓 VN5610A 1 (000925)	Тире	USB 2.0. connected with Hi-Speed 480 MBi
- 🖧 Network Devices	Article number	007167
Application	Serial number	000925
Global Settings	Driver version	11.2.16
- 10 Driver status	Firmware version	11.2.16
	Hardware revision	1.0
	Capabilities	CAN, D/A 10, Activation Line, ETHERNET
	Features	Vector License Management
	() Time sync info	
	Status	In sync, Cfg. OK
	Time scale	Performance Counter
	Active master protocol	No active protocol(s)
	Active slave protocol	Legacy

4. Click on Network Devices.



5. Click [Scan network]. The Ethernet device interface will be listed.





		et interface le avaliable via your re
Vector Hardware Config		– 🗆 ×
pplication <u>L</u> icense <u>S</u> uppor	t <u>H</u> elp	
🖃 💐 Hardware	Details	
🖶 📃 Virtual CAN Bus 1	The Device	VN5610A 1 (000925) (172.31.31.5)
⊪ 🖧 VN5610A 1 (000925) (	Туре	IP
	Article number	007167
- My Application	Serial number	000925
📲 🚛 Global Settings	Driver version	11.2.16
- 🕑 Driver status	Firmware version	11.2.16
🗄 🙀 License	Hardware revision	1.0
	Capabilities	CAN, D/A IO, Activation Line, ETHERNET
	C Time sync info	
	Status	Off, Cfg. not OK -> Software sync not supported (
	Time scale	Arbitrary
	Active master protocol	No active protocol(s)
	Active slave protocol	No active protocol(s)
>	1	• • • • • • • • • • • • • • • • • • •

## 8.2.2 Changing the IP Address



#### Step by Step Procedure

- 1. Connect the device to your PC via Ethernet (see section Connecting the Device on page 56) or via USB.
- 2. In **Vector Hardware Config**, select an installed Ethernet interface with a rightclick and select **Change IP address** in the context menu.

🚆 Vector Hardware Config		– 🗆 X
Application License Sup	port Help	
Hardware	Details	VN5610A 1 (000925)
	<ul> <li>Ethernet device configuration</li> <li>Time sync device configuration</li> <li>Ethernet access mode configuration</li> </ul>	10, connected with Hi-Speed 480 MBil 7 5 6
Driver status	Change IP address	6
	Remove assignment	D/A IO, Activation Line, ETHERNET
	Refresh	License-Management
	C Time sync info	
	<ul> <li>Status</li> <li>Time scale</li> <li>Active master protocol</li> </ul>	In sync, Cfg. OK Performance Counter No active protocol(s)
	Active slave protocol	Legacy
Hardware change detected.		

3. Enter a suitable IP address according to your network settings and click [OK].

	Change IP address of VN5610A (000925)
(P Version 4	
Mode:	Static $\checkmark$
IP V4 Address	172 . 31 . 31 . 5

#### Please follow the extra steps below if your device is connected via USB:

- 4. Remove the USB cable from your host and the device. Otherwise, the USB connection is always preferred to the Ethernet connection.
- 5. Connect your host and the device via an Ethernet cable. The device will be listed as not available (red icon).
- 6. Connect the power supply to your device.

## 8.3 Windows Network Throttling

## 8.3.1 Issue

Throttled networkEthernet network traffic is throttled on Windows PC when running a multimedia appli-<br/>cation like Windows Media Player or an internet browser. This results in increased<br/>latency and less data throughput for Vector network interfaces, connected to the PC<br/>via Ethernet.

## 8.3.2 Solution

Disabling Network Throttling Index In Windows operating systems, a network throttling mechanism has been existing since 2007 which is activated as soon as the Multimedia Class Scheduler Service is active.

In order to reduce CPU utilization by the network driver, the Network Driver Interface Specification (NDIS) framework passes along a maximum number of packets per milliseconds. This number of packets is defined by the following registry key:

HKEY\_LOCAL\_MACHINE\SOFTWARE\ Microsoft\Windows NT\CurrentVersion\Multimedia\ SystemProfile\NetworkThrottlingIndex



#### Step by Step Procedure

Follow the steps below to disable the Network Throttling Index:

1. Open Registry Editor and navigate to the key SystemProfile.

∎° I	Registry	/ Editor						-	×
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew	F <u>a</u> vorites	<u>H</u> elp					
		MCI32	2		^	Name	Туре	Data	
		MiniD	umpAuxilia	ryDlls		(Default)	REG_SZ	(value not set)	
	2.5	MsiCo	orruptedFile	Recov		NetworkThrottlingIndex	REG_DWORD	0x0000000a (10)	 
	Y -	Multi	media			SystemResponsiveness	REG DWORD	0x00000014 (20)	 
	~	Sy	stemProfile			~~~~			
	_	> - <	Tasks						
	>	Netwo	orkCards						
	>	Netwo	orkList						
	×	Nolm	eModelmes		×				
۲.				~		<			>
Com	Computer\HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Multimedia\SystemProfile								

2. Change the Value NetworkThrottlingIndex to 0xfffffff.

Edit DWORD (32-bit) Value	×
Value <u>n</u> ame:	]
Value data:	Base <u>H</u> exadecimal <u>D</u> ecimal
	OK Cancel

3. Reboot your PC.



## 8.4 Jumbo Frames

## 8.4.1 Issue

Jumbo Frames not supported

For Vector network interfaces connected to a PC via Ethernet, Jumbo Frames must be supported to achieve maximum data throughput.

## 8.4.2 Solution

Activating Jumbo Frames Jumbo Frames allow larger Ethernet frame sizes compared to standard Ethernet frames. Thus more user data can be transferred with a single Jumbo Frame. The data throughput is improved by a smaller proportion of header data relative to the entire packet.

If the data throughput should be maximized, activate Jumbo Frames. This is achieved by directly connecting the Vector network interface to the PC or by using the correct network switches.



Step by Step Procedure

Follow the steps below to enable Jumbo Frames:

- 1. Open Device Manager.
- 2. In the tree view, open node Network Adapters.
- 3. Select the NIC that is connected to the Vector network interface with a rightlick and select **Properties**.
- 4. Select tab Advanced.
- 5. Select the property Jumbo Packet and choose the highest possible option.



# 8.5 Interrupt Moderation Rate

## 8.5.1 Issue

Increased latency Some network interface cards (NIC) have a property called Interrupt Moderation Rate (IMR). If this property is enabled, the latency is increased while the data throughput is improved.

## 8.5.2 Solution

**Disabling IMR** 

If latency should be low, disable Interrupt Moderation Rate.



Step by Step Procedure

Follow the steps below to enable Jumbo Frames:

- 1. Open Device Manager.
- 2. In the tree view, open node Network Adapters.
- 3. Select the NIC that is connected to the Vector network interface with a rightlick and select **Properties**.
- 4. Select tab Advanced.
- 5. Select the property Interrupt Moderation Rate and choose Disable.



#### Note

Depending on the network interface, this option may no be available.

# 8.6 Known Issues with 3rd Party Hardware

## 8.6.1 Intel I218 / I219 Network Cards

Intel I218 and I219 network cards have issues with jumbo frames.

Solution Disable Jumbo Frames.



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