



CANoe .Ethernet

Product Information

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Valid for CANoe .Ethernet of version 10.0.

This document presents the application and functions of the Option .Ethernet for CANoe. CANoe .Ethernet extends the standard functionality of CANoe.

Product information and **technical data** for the basic functions of CANoe can be found in separate documents.

1 Introduction

Ethernet and IP-based networks, as well as the application protocols which build upon them, are state of the art in the automotive field. Typical areas of use include control loops, assistance systems, backbones and multimedia. The need-based design of a network which takes bandwidths and real-time capacity into account, as well as the physical transmission layer used, play a main role when it comes to expenses. Therefore tools for checking the network parameters named earlier are extremely helpful in every phase of development.

With the .Ethernet option, you can expand CANoe to include support for Ethernet networks. The .Ethernet option makes possible the use of interface hardware such as the VN5600 series of interfaces. This enables direct access to physical layers such as IEEE 100BASE-T1 (OABR) and IEEE 1000BASE-T1, which are widely used in the automotive field. The .Ethernet option also expands CANoe to include specific protocols such as SOME/IP, SOME/IP-SD, IP, TCP, UDP, TSN/AVB and many more.

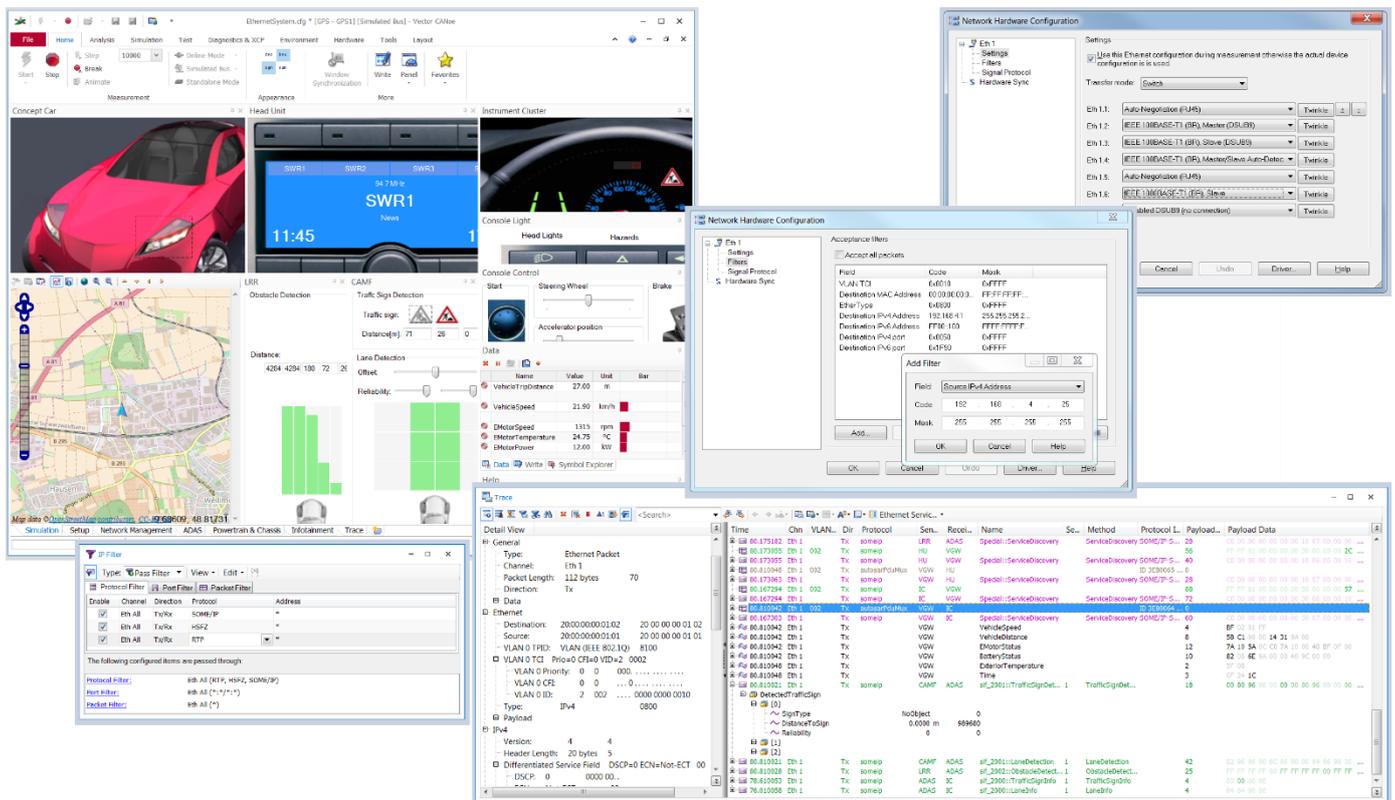


Figure 1: CANoe .Ethernet configuration for simulating and analyzing signals in the Trace window and active filter for data reduction.

1.1 Overview of Advantages

- > The integration of a database (FIBEX, AUTOSAR ARXML etc.) enables direct access to signal, service and RPC parameters
- > Automatic generation of simulations (remaining bus simulation) based on databases
- > Perfect interaction with the interface hardware enables the monitoring of point-to-point connections and the transmission of Ethernet packets taking the network topology into consideration
- > Simulation and analysis of data traffic occurs without the interfering influence of the operating system on the communication layer
- > Processing of Ethernet packets and signals extracted from them in CAPL
- > Send out user-configured (even faulty) Ethernet packets configured with Ethernet Packet Builder
- > Cyclic sending and simple IPv4 socket communication with the Ethernet Interactive Generator

- > Programmable sending of packets in CAPL and in .NET
- > Simulation of TCP and UDP client sockets (IPv4 and IPv6) with independent instances for each CAPL node
- > Simulation of Ethernet nodes and gateways
- > Representation of all vehicle networks referenced to a common time base
- > Testing of gateway functionality by analyzing the communication on different bus systems

1.2 Application Areas

In supporting Ethernet-based networks, in vehicle development the same use cases generally occur as in CAN bus systems, especially in such areas as video data transmission, Ethernet as a broadband backbone network, diagnostics over IP (DoIP) and communication between electric vehicles and charging stations.

One special advantage of CANoe .Ethernet is the simulation of multiple Ethernet nodes. Each network node is represented by its own TCP/IP stack here. This ensures communication behavior which corresponds to that of real nodes. In addition, reproducible embedded implementations can be tested and their robustness to protocol errors increased through the targeted falsification of Ethernet packets. With the support of database formats (AUTOSAR ARXML and Fibex) and protocols (SOME/IP, DoIP etc.) typical for the automotive field, users can access application signals directly. This enables and simplifies the analysis of communication and application data considerably.

Together with the VN5600 series of Ethernet interfaces, CANoe .Ethernet is also suitable for the measurement of lag times in signal conversion by gateways to other vehicle networks. This makes it possible to track diagnostic information through the entire vehicle, for example, and check its consistency. Errors on Ethernet protocol layer 2 (data link layer) are not only reliably detected and displayed, but can be stimulated as well. Likewise, physical layers typical for the automotive field, such as IEEE 100BASE-T1 (OABR) and 1000BASE-T1, are available directly.

1.3 Further Information

> [Vector Download-Center](#)

Various documents related to CANoe are available on the Internet. In the Demo version, for example, you get sample configurations for the various use areas and detailed online Help texts, in which all CANoe functions are described. In addition, you benefit from our valuable know-how in the form of technical articles and application notes.

> [CANoe Feature Matrix](#)

More information on variants, channels and bus system support is presented in the feature matrix.

2 Functions

Option .Ethernet extends the functional range of CANoe by adding Ethernet-specific functions:

- > Configuration of up to 32 Ethernet channels (an Ethernet channel may comprise multiple Ethernet ports. The amount of usable ports is limited by the computing power of the used PC)
- > Support for the Vector VN5600 series of Ethernet interfaces and PC Ethernet interfaces
- > No effects on network communication by the Windows operating system or other applications thanks to the isolated Ethernet interface. This may be a necessary requirement especially in real-time systems.
- > The integration of a database based on FIBEX-4.x or AUTOSAR3.x/4.x enables the use of signal and RPC parameters.
- > Support for Ethernet and Ethernet-based protocols such as VLAN, AVB, IPv4, IPv6, ICMP, DHCP, UDP, TCP, SOME/IP and DoIP
- > Various filter options (Hardware/Measurement Setup/View)
- > Display of protocol header information in the Trace Window, as well as breakdown of the Ethernet frames into individual PDUs
- > Use of individual signal protocol decoder DLLs for proprietary protocols based on Ethernet and UDP
- > Ethernet Packet Builder for configuring and sending Ethernet packets
- > Ethernet Interactive Generator for the cyclical transmission of Ethernet, UDP and TCP payload data

- > Function library for Ethernet access from CAPL or .NET
- > Interaction layer for simulation of ECUs based on SOME/IP
- > Separate TCP/IP communication software instances for each CAPL node (IPv4 and IPv6)
- > Recording of data traffic, incl. Rx/Tx direction, channel and time stamp

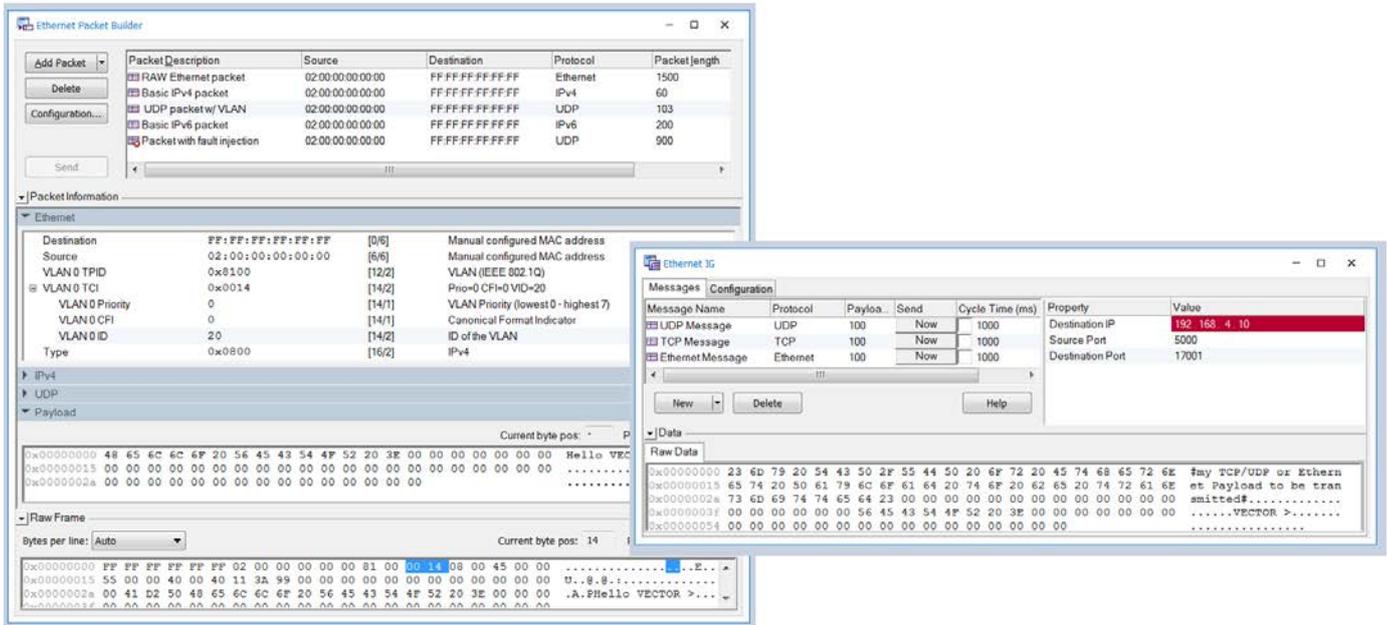


Figure 2: Ethernet Packet Builder and Ethernet Interactive Generator is used to create and send out Ethernet frames conveniently and without programming

3 Hardware

At least one Ethernet interface is required to analyze Ethernet communication. Either a Vector Ethernet interface (e.g. VN5600 series) or the Ethernet interfaces available on the PC can be used as the interface. The VN5600 series of Ethernet interfaces is specially designed for simulation and measurement purposes, offering specific advantages such as high time stamp resolution, synchronization with other Vector bus interfaces, monitoring of point-to-point connections and topology-accurate stimulation/simulation. Automotive-specific physical layers such as 100BASE-T1 (OABR) and 1000BASE-T1 are also supported. More detailed information can be found on the Internet here: [VN5600 series](#).

4 Trainings

Our training offer for IP/Ethernet and CANoe includes various training classes and workshops at our training facilities or at the customer's location.

For more information on individual training classes and schedules, go to: www.vector-academy.com

5 Note

CANoe .Ethernet includes software developed by the University of California, Berkeley and its contributors.



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