

CANoe/CANalyzer Ethernet

Agenda VectorAcademy

Delivery Format:	This Course is offered in Classroom.
Duration:	4 days
Target Group:	Users of Ethernet and IP in motor vehicles
Prerequisites:	Basic knowledge of serial communication principles
Goal:	At the end of the training, the trainee will have knowledge of the ISO OSI, Ethernet, IP, TCP and UDP models and the automotive automotive application protocols, DoIP, SOME/IP, TSN. It will also see the introduction and initiation to the network IP with CANoe/CANalyzer, measurement and analysis in Ethernet, CANoe/CANalyzer as a DoIP tester and CANoe for simulation of Ethernet ECUs

Evaluation:

Validation of learning based on practical exercises

Pedagogical, technical and supervisory resources:

Course material is sent to each trainee. A link will be sent to each participant to install the CANalyzer software and use hardware interface VN5610. The training will be carried out in adapted rooms.

Competence of the trainer: 15 years of experience in training related to embedded developments, network architectures.

Method of follow-up of the trainee:

A sign-off sheet must be validated by the trainee. A first satisfaction questionnaire is planned at the end of the training.

1. Introduction

- > Motivation for the usage of Ethernet in vehicles
- > Protocols and their user areas

2. Physical Layers

- > OSI layer model
- > Physical network architectures and topologies
- > Automotive Ethernet: IEEE 100BASE-T1 and IEEE 1000BASE-T1
- > Traditional office Ethernet: IEEE 100BASE-TX and IEEE 1000BASE-T

3. Ethernet Fundamentals

- > Introduction into the Ethernet protocol
- > Addressing with MAC addresses and VLAN tag
- > Basic MAC frame and tagged MAC frame
- > Local Area Network (LAN) and Virtual Local Area Network (VLAN)
- > Switch as the coupling element

4. Internet Protocol (IP) Fundamentals

- > Introduction into IPv4 und IPv6
- > IP addresses and subnet masks
- > IP packet

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- > Auxiliary protocols DHCP, ICMP, ARP, NDP and AutoIP

5. UDP and TCP Fundamentals

- > Overview UDP and TCP
- > Connection-oriented and connectionless communication
- > Addressing with ports
- > TCP segment and UDP packet
- > TCP und UDP Sockets

6. Introduction in Automotive Application Protocols

- > > Overview CANoe/CANalyzer for Ethernet
- > Hardware interfaces for Ethernet and IP
- > License model

7. Introduction to the Ethernet network

- > Creation of an Ethernet configuration with CANoe/CANalyzer
- > Configuration of interfaces (Network Based)

8. Measurement and analysis with CANoe/CANalyzer Ethernet

- > Measurement and analysis windows for Ethernet and IP networks
- > Offline analysis of the 4 OSI layers
- > Generator block for sending Ethernet frames, IP TCP/UDP packets
- > CAPL and CAPL reminder for Ethernet
- > CAPL API for sending Ethernet frames
- > Use of the Ethernet Layer Interaction for sending packets
- > CAPL API to simulate UPD/TCP

9. Introduction to Automotive Application Protocols

- > Motivation
- > Overview of Protocols and various applications

10. Diagnostic sur IP (DoIP)

- > Introduction to DoIP
- > Roles: tester, gateway and ECU
- > Phases of DoIP communication
- > DoIP packet and diagnostic transmission service (UDS)

11. Diagnostics over IP (DoIP) with CANoe/CANalyzer Ethernet

- > DoIP analyse offline d'enregistrements, analyse des phases de communication DoIP

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- > CANoe/CANalyzer pour Ethernet comme DoIP testeur
- > API DoIP (DLL)
- > Test en mode Réel avec CANoe, Diagnostic d'un calculateur CAN via DoIP

12. Automotive Cybersecurity Overview

- > Basic objectives of cybersecurity
- > Introduction to TLS (Transport Layer Security)
- > Introduction to CANoe and Security Manager
- > DoIP and Secured Channel with CANoe and Security Manager

13. AUTOSAR Overview for Ethernet

- > AUTOSAR I-PDUs and Protocol Data Units (PDUs)
- > AUTOSAR I-PDUs and Ethernet socket
- > Dynamic LPDU
- > Signal concept and service signals

14. SOA and SOME/IP

- > Introduction to SOA (service-oriented architectures)
- > Interest of the service
- > Introduction to SOME/IP and SOME/IP-SD
- > Types of services: Methods, Events, Fields
- > Use cases of SOME/IP and SOME/IP-SD

15. CANoe for the SOME/IP

- > CANoe in the development process
- > API for SOME/IIP
- > Sending a SOME/IP frame without database (.arxml)

16. Simulating with Interaction Layers

- > Creation of a CANoe configuration for Interaction Layers
- > Adding the needed libraries
- > Model Generation Wizard
- > System panel, node and network panels as well as signal generators
- > Creating panels with the Panel Designer
- > CAPL for signals and service signals
- > Controlling Interaction Layers with CAPL
- > CAPL for Ethernet

17. Simulation with CANoe Communication Concept (optional – outlook)

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- > Overview of CANoe Communication Concept
- > Creating a configuration for CANoe Communication Concept
- > CAPL and vCDL for CANoe Communication Concept
- > Examples

18. Time Sensitive Networking (TSN)

- > Introduction to the AVB/TSN protocol
- > Time synchronization in vehicles
- > Transport protocol (AVTP)
- > Stream reservation and traffic shaping

19. Simulation with CANoe AVB/TSN

- > Measurement and analysis with CANoe in offline mode of an AVB recording
- > Interaction Layer for AVB/TSN API
- > Simulation exercise with camera and display
- > Simulated and real mode test with CANoe