CANoe/CANalyzer for Ethernet

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Delivery Format:	This Course is offered in Classroom Format
Duration:	4 days
Target Group:	Users of Ethernet and IP in motor vehicles
Prerequisites:	Basic knowledge of serial communication principles
Goal:	Knowledge about the ISO OSI layer modell, Ethernet, IP, TCP and UDP as well as automotive application protocols DoIP, SOME/IP, TSN, AUTOSAR I-PDU in vehicles, introduction for initiation of an Ethernet network with CANoe/CANalyzer, measurement and analysis in the Ethernet context, CANoe/CANalyzer as a DoIP tester and CANoe as a simulation tool for Ethernet ECUs

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
- 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

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6. Introduction in Automotive Application Protocols

- Motivation
- Protocol overview and application areas

7. Diagnostics over IP (DoIP)

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

8. Overview Automotive Cyber Security

- Main goals of Security
- Security introduction with a TLS (Transport Layer Security) example
- DoIP via "Secured Channel" with CANoe and Security Manager

9. Overview Functions for Ethernet in AUTOSAR

- Traditional transmission of signals over Ethernet
- AUTOSAR I-PDUs and container PDUs (Protocol Data Unit)
- AUTOSAR I-PDUs and SOME/IP-SD

10. SOA and SOME/IP

- Introduction service-oriented architectures (SOA)
- Effects of SOA to vehicle architectures
- Introduction SOME/IP and SOME/IP-SD
- Types of services: Methods, Events, Fields
- Typical use cases for SOME/IP and SOME/IP-SD

11. Time Sensitive Networking (TSN)

- Introduction in AVB/TSN protocol family
- Used protocols in the automotive area
- Time synchronization in vehicle
- Available transport protocols
- Stream reservation and traffic shaping

12. Introduction into CANoe/CANalyzer for Ethernet

- Overview CANoe/CANalyzer for Ethernet
- Available hardware for Ethernet and IP
- License model

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13. Initiation of an Ethernet Network

- Creation of a CANoe/CANalyzer configuration for Ethernet
- Configuration of the used hardware

14. Measurement and analysis with CANoe/CANalyzer for Ethernet

- Measurement and analysis windows for Ethernet and IP networks
- Evaluation of application related protocol information:
- DoIP, SOME/IP, AVB/TSN, AUTOSAR IPDU und AUTOSAR NM
- Logging and offline analysis
- Sending of Ethernet frames, IP packets and TCP/UDP packets

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

- Analyzing the DoIP communication phases
- CANoe/CANalyzer for Ethernet as a DoIP tester

16. Introduction into CANoe as a development tool

- CANoe within the development process
- Signal Server concept for signals and Service-Signals
- CANoe Communication Concept for SOA and SOME/IP
- Interaction Layer for AUTOSAR PDUs and SOME/IP

17. 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