

Automotive Ethernet

Agenda VectorAcademy

Delivery Format:	This Course is offered in Classroom or Remote Format
Duration:	Classroom: 2 days Remote: 12 hours
Target Group:	Users of Ethernet and IP in motor vehicles
Prerequisites:	Basic knowledge serial communication principles
Goal:	Knowledge about ISO OSI layer modell, to Ethernet, IP, TCP and UDP also automotive application protocols DoIP, SOME/IP, TSN, AUTOSAR I-PDU in vehicles.

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, ...

5. UDP and TCP Fundamentals

- > Overview UDP and TCP
- > Connectionless and connection-oriented communication
- > Addressing with ports
- > UDP packet and TCP segment

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6. Automotive Cyber Security in a nutshell

- > Common concepts for Cyber Security
- > Security in the OSI layer model
- > Short introduction Security, keys, methods
- > Overview Transport Layer Security (TLS) and IPsec

7. Introduction in Automotive Application Protocols

- > Motivation
- > Protocol overview and application areas

8. 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

9. Overview Functions for Ethernet in AUTOSAR

- > Traditional transmission of signals over Ethernet
- > AUTOSAR PDUs and container PDUs (Protocol Data Unit)
- > AUTOSAR 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