The Ethernet protocol – ideal for meeting the growing bandwidth and communication requirements of the modern automobile

The automotive industry has seen unprecedented growth in vehicle electronics in recent years. From in-vehicle safety systems, Advanced Driver Assistance Systems (ADAS), and infotainment, to a variety of connectivity options – these innovative types of networking applications continue to expand and grow in complexity. By using the Ethernet protocol, automotive OEMs and their Tier 1 suppliers gain access to wide range of bandwidth and data rates, bringing a more robust networking capability to a variety of vehicles.

Mentor Automotive VSTAR for Ethernet

Mentor® Automotive Volcano™ VSTAR™ implements the required Ethernet functionality in AUTOSAR 4.2.1. The main Ethernet features supported are: 1) Ethernet as backbone; 2) Ethernet diagnostics (DoIP) and transport layer communication; 3) Audio/Video Bridging (AVB) and other stream-based communication protocols; 4) Service Discovery (including SOME/IP); and 5) Switch configuration.

To further increase the usability of VSTAR Ethernet, it may be extended with the following features (only a partial list):

- Resource-efficient embedded firewall solutions for Intrusion Detection and Intrusion Protection
- Network cryptographic protocols: Transport Layer Security (TLS) and Secure Sockets Layer (SSL)
- Internet Protocol Security (IPsec) services and policy definitions. Internet Key Exchange (IKE), a security protocol designed to automate management of Security Automation (SA)
- The Domain Name System (DNS) enables an application level program to map a high-level domain name to an IP address and vice versa. DNS is implemented as a distributed database of host names
- IP Network Address Translator (NAT) router protocol which allows nodes on a private network to transparently communicate with nodes on an external network and vice versa

PRODUCT FEATURES:

- VSTAR supports Ethernet stack in the VSTAR42 (implementing AUTOSAR v4.2.1) and VSTAR40 (implementing AUTOSAR v4.0.3)
- VSTAR Software Download Flash Loader (supporting gateway feature)
- Communication design of Ethernet communication in Volcano™ VSA COM Designer™
- Generation and configuration of the Ethernet stack configuration in Volcano™ VSB™
- Extensible support for additional features in the Ethernet stack not specified by AUTOSAR
- Scalable for small footprint platforms
- Top-down toolchain supports AUTOSAR methodology
- ECU Configuration Generator
- Code generators for generating c-code from AUTOSAR XML format

BENEFITS:

- Seamless toolchain support for Ethernet from communication design to embedded software
- Ethernet stack provides highly scalable solution; footprint, performance, and functionality are all configurable
- Production-ready code, proven in many production projects

THE VOLCANO TOOL SUITE:

Mentor Automotive offers a complete and highly integrated tool suite for top-down vehicle system and ECU design. Mentor’s Volcano™ VSTAR™ is part of a comprehensive toolchain of Volcano products built specifically for automotive ECUs and AUTOSAR. All of Mentor’s tools are built upon the Eclipse framework.
SNMP is an embedded implementation of the management protocol as two separate products: Nucleus® SNMP, supplies only version 1 functionality of the protocol and Nucleus SNMPv3, provides versions 1, 2c, and 3 agents.

The HTTP Lite Server is an HTTP 1.1 compliant Web Server and a Web Application development framework. HyperText Transfer Protocol (HTTP) server designed for embedded applications.

The ReadyStart implementation of the WebSocket protocol complies with RFC 6455 to provide a complete WebSocket client/server implementation.

SNTP client is an embedded implementation of the SNTP Version 4 client tuned for applications where memory and CPU resources are limited.

Wi-Fi Protected Access (WPA) security protocol for wireless computer networks, specifically the 802.11i and 802.1X IEEE standards.

Mentor has a long tradition and deep experience working with Ethernet in various industries including Industrial, Mil-Aero, and High Performance Computing.

Volcano software downloads for Ethernet

The Volcano Software Download Flash Loader resides in the ECU, and is able to re-flash the software in the ECU. Volcano software supports gateway functionality to allow gateways of software download requests intended for sub-networks.

Volcano VSB Ethernet support

The Volcano VSB™ tool is the software component (SWC) designer and ECU configuration tool. With Volcano VSB, it’s possible to configure all the VSTAR Ethernet modules. Volcano VSB can import common standard Ethernet exchange formats e.g., Fibex and AUTOSAR exchange format in different revisions. With the ECU Configuration Generator, Volcano VSB can generate a complete configuration for VSTAR Ethernet stack basic software (BSW) modules.

VSA COM Designer Ethernet Support

Mentor Volcano VSA COM™ Designer designs and analyzes the entire car communication. It is a complete system level communication design tool handling the many different vehicle protocols, supporting various types of communication software (not only AUTOSAR). Main functions of the tool include:

- Communication design: signals, PDUs, frames, transport protocols, streamed communication
- Topology design
- Timing requirement capturing and analysis
- Synthesis: frame-packing, communication matrix generation, communication balancing
- Communication analysis: end-to-end timing analysis, bandwidth analysis, jitter analysis for stream-based communication

Why not use an open source Ethernet stack?

Open source software is now used in a number of electronic applications throughout a variety of industries. Using an open source Ethernet stack may look attractive, but there are drawbacks including version control and on-going support. The benefits of the Volcano VSTAR Ethernet solution from a reputable and trusted vendor include:

- Developed according to safety and quality requirements
- Optimized for embedded and automotive requirements
- Strong support for extended features not yet standardized by AUTOSAR
- Predictive implementation in terms of execution time and footprint
- Guarantee for integration into the software stack and specific hardware

More about Mentor Automotive

Mentor Automotive provides advanced systems engineering solutions with a leading portfolio of automation design tools and software, built on deep expertise in systems engineering, to help customers solve the most complex design challenges facing the industry. Solutions reside in three key areas for automotive electrical and electronic design: connectivity and networking; in-car experience; and subsystems and technology.