AUDIO VIDEO BRIDGING END POINT STACK

Overview

Audio Video Bridging (AVB) is a method for transporting audio and video streams over Ethernet-based networks. It is based on ratified IEEE standards for Ethernet networks that define signaling, transport, and synchronization of audio and video streams. Capgemini Engineering's AVB endpoint solution is targeted at the automotive infotainment system (IVI) segment for auto original equipment manufacturers (OEMs) and tier-1 suppliers.

AVB use cases in the automotive domain are listed below:

- **Lip-synced multimedia playback:** providing truly lip-synced playback of AV content across various multimedia devices in a car environment is a core automotive use case for Ethernet AVB

- **Connected car applications:** in a connected car, the availability of and the inevitable dependency on external data is high. Whether it is streamed AV content, online maps for navigation, general internet media coming into the car, or various telematics data and service requests being sent out of the car, the demand for network bandwidth is high

- **Advanced driver assistance systems:** the flexibility and high bandwidth of an AVB network enables the realization of many modern advanced driver assistance systems (ADAS)

- **Diagnostics:** vehicle diagnostics are highly desired by automotive OEMs to troubleshoot vehicle problems at automotive OEM assembly lines and dealer service stations. No physical diagnostics exist for controller area networks (CAN bus) and only ring break diagnostics exist for media oriented systems transport (MOST)
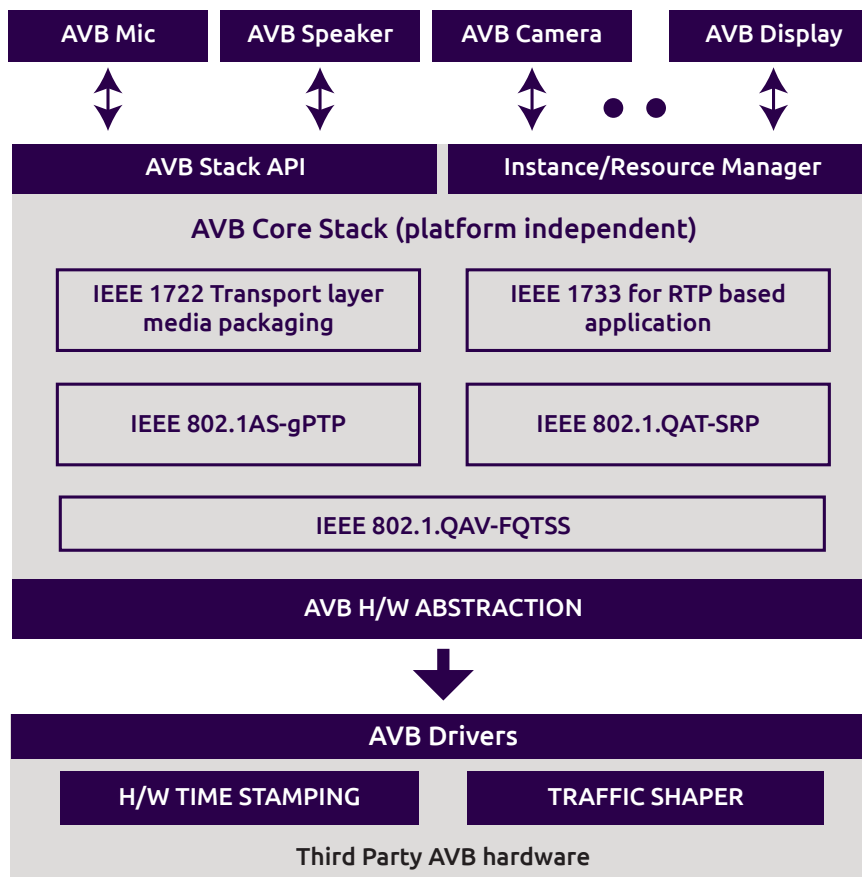
Challenges in the industry

Conventional 802.3 Ethernet is not designed for professional and automotive requirements due to limitations such as the lack of mechanisms for precision timing, QoS, and prevention of network congestion. Ethernet AVB overcomes these limitations by providing timing synchronization and eliminating buffer delay through the network and creating resource reservation.

AVB defines a set of technical standards developed by the Institute of Electrical and Electronics Engineers (IEEE) Audio Video Bridging Task Group of the IEEE 802.1 standards committee. AVB is well-positioned to be the next-generation technology for automotive infotainment networks. AVB is advantageous since it is easy to manage, built on IEEE standards, affordable, Ethernet-based, and uses a single network for all media.

Solution

Capgemini Engineering's AVB stack provides a complete set of protocols enabling transport and synchronization services to multimedia applications with associated quality of service. The

stack provides endpoint implementation (talker and listener) and abstractions to the OS and hardware.

AVB Mic	AVB Speaker	AVB Camera	AVB Display

AVB Stack API	Instance/Resource Manager

AVB Core Stack (platform independent)

IEEE 1722 Transport layer media packaging	IEEE 1733 for RTP based application
IEEE 802.1AS-gPTP	IEEE 802.1.QAT-SRP

IEEE 802.1.QAV-FQTSS

AVB H/W ABSTRACTION

AVB Drivers

H/W TIME STAMPING	TRAFFIC SHAPER

Third Party AVB hardware

Key features

- Talkers and listener support
- Interoperates with commercial third party AVB switch
- Stack ready for auto market, compliant with AVnu standards
- Easy API for creating audio and video endpoints applications
- Hardware layer abstraction for easy porting and integration
- Multiple talkers and listeners (at a time) can run on the AVB stack
- Supports hardware time-stamping and traffic shaper
- Can be configured as grandmaster or slave. Supports BMCA implementation
- Integrated with Capgemini Engineering's multimedia framework (MMFR) with a rich set of audio and video codecs and streaming stacks

Standard compliance

- IEEE 802.1BA: AVB systems
- IEEE 802.1AS: timing and synchronization for time-sensitive applications (gPTP)
- IEEE 802.1Qat: stream reservation protocol (SRP) – MSRP, MVRP, and MMRP
- IEEE 802.1Qav: forwarding and queuing for time-sensitive streams (FQTSS) – credit-based shaping
- IEEE 1722: layer 2 transport protocol for time-sensitive applications in a bridged local area network – supports MJPEG, MPEG2-TS, H.264, and raw audio formats
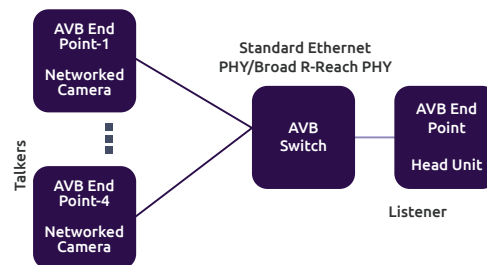
OS support

- Linux
- Android (Planned)
- QNX (Planned)

HW platforms support

- Nexcom VTC1010 with Intel i210
- NXP iMX6
- Renesas R-CAR H2 (Planned)

AVB demonstrator

Demonstration of time synchronization with multiple cameras (talker), third party AVB switch, and listener.
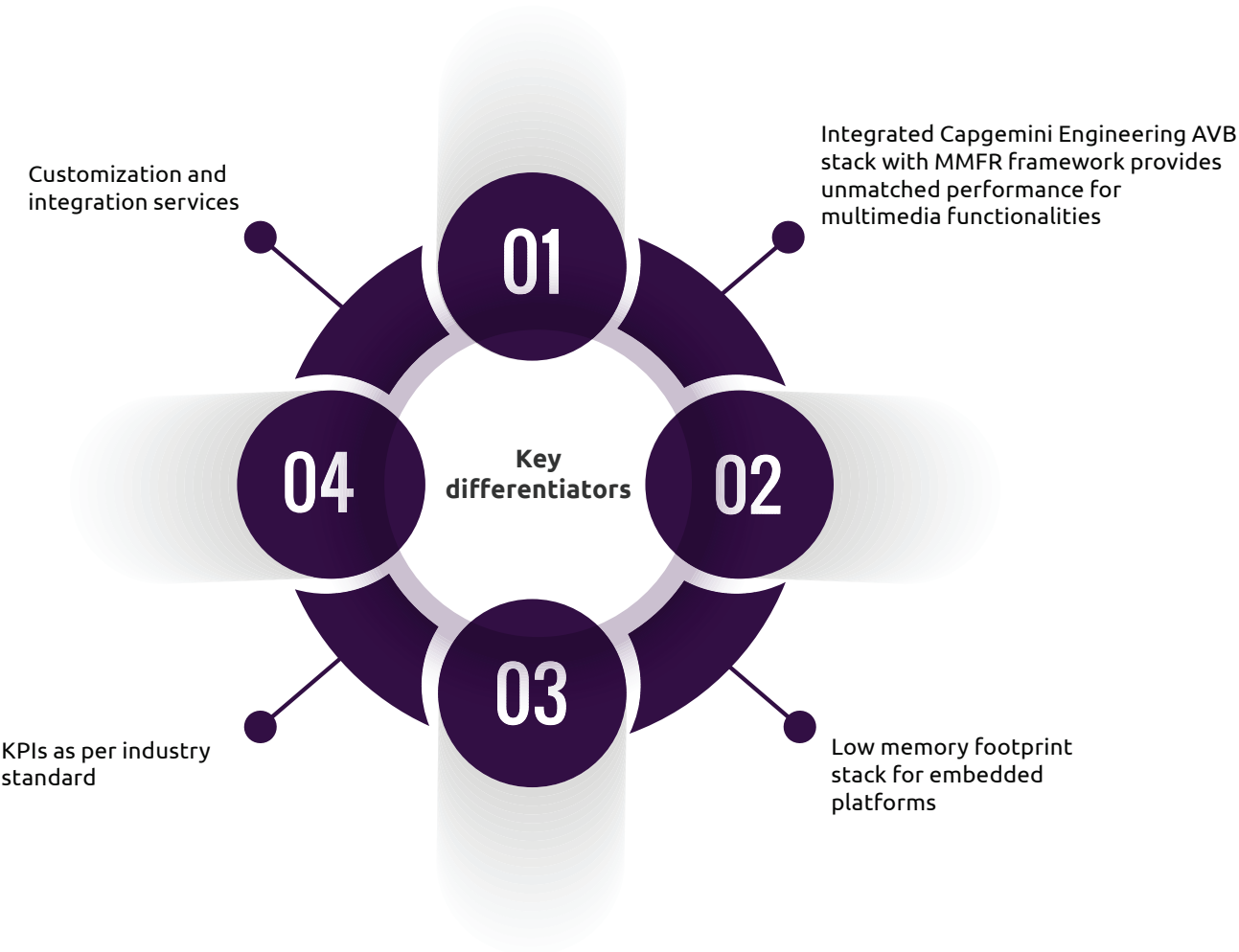
Target applications

- Automotive IVI systems
- Driver assist (ADAS) systems
- In-vehicle gateways

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Why Capgemini Engineering

Our software frameworks offer best-in-class solutions that significantly reduce the total cost of ownership and time to market. We are a trusted partner with over 25 years of experience in technology and engineering and up to-the-minute expertise in the domain.

We also deliver unique in-car user experiences by leveraging a strong pedigree in communications (short and long range), multimedia, and embedded domains, and by partnering with leading automotive forums and platform providers.

With a strong culture of innovation, we offer continuous experimentation with newer technologies and collaboration with leading standards, bodies, and forums, along with a global delivery model for optimized cost and timely delivery.

Customization and integration services

Integrated Capgemini Engineering AVB stack with MMFR framework provides unmatched performance for multimedia functionalities

Key differentiators

01

02

03

04

KPIs as per industry standard

Low memory footprint stack for embedded platforms

About Capgemini Engineering

Capgemini Engineering combines, under one brand, a unique set of strengths from across the Capgemini Group: the world leading engineering and R&D services of Altran — acquired by Capgemini in 2020 - and Capgemini's digital manufacturing expertize. With broad industry knowledge and cutting-edge technologies in digital and software, Capgemini Engineering supports the convergence of the physical and digital worlds. We help clients unleash the potential of R&D, a key component of accelerating their journey towards Intelligent Industry. Capgemini Engineering has more than 52,000 engineer and scientist team members in over 30 countries across sectors including aeronautics, space and defense, automotive, railway, communications, energy, life sciences, semiconductors, software, and internet and consumer products.

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