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Kapsch TrafficCom

EVK-3300. *V2X Evaluation Kit.*

The EVK-3300 is a comprehensive in-vehicle V2X platform for evaluation, development and demonstration of innovative connected vehicle solutions. To fit the rapid prototyping needs of different OEMs, Tier 1 companies and V2X integrators, the EVK-3300 is equipped with multiple host interfaces, a modular software architecture and a modular hardware design with chipset daughterboards from different market leading vendors. Together this enables scalability, functional distribution and the ability to evaluate system configurations for performance and cost in one common environment. By also including a state of the art communication stack configurable to both ETSI ITS G5 and IEEE WAVE™ protocols and related standards, the EVK-3300 is the optimal evaluation platform for any connected vehicle system development.

The EVK-3300 is the fundament in the Kapsch productline for vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) solutions. Being a fully featured V2X Evaluation Kit, the EVK-3300 offers the ability to assess several product realizations such as a fully featured V2X ECU, for line-fit, retro-fit or independent after-market devices, or as a V2X sensor with distributed functionality. The EVK-3300 is the perfect platform for various proof-of concept and feasibility studies

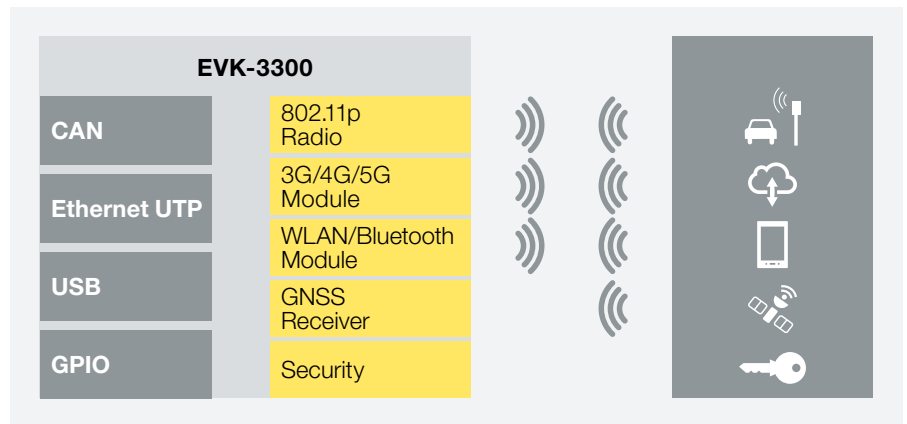
within the V2X area utilizing the ETSI ITS G5 or the IEEE WAVE™ wireless communication protocol. The flexible, scalable and configurable nature of the EVK-3300 makes it an essential tool for the automotive industry in their evaluation of different architectural concepts and corresponding performance measures. Additionally, the EVK-3300 is capable to support the development, integration and verification of full in-vehicle V2X functionality.



EVK-3300 – Scalability and Exchangeability.

The EVK-3300 generally comprises a mainboard, which supports platform management and wired external interfaces, and four slots for plug-in add-on modules that provides additional functionality and interfaces respectively. Following add-on modules are available:

- > IEEE 802.11p radio
- > Cellular LTE radio
- > Bluetooth radio
- > Multi-constellation GNSS receiver
- > Hardware security acceleration and secure storage



A variety of IEEE 802.11p radio add-on modules based on chipsets of different vendors are available providing a selection of antenna diversity schemes, supporting the evaluation of different antenna system concepts in the vehicle.

Different Modes of Operation.

The EVK-3300 features different modes of operation targeting two different product types:

V2X Communication Module.

In this mode the EVK-3300 facilitates the V2X communication stack, a Local Dynamic Map, the Facility Database and security processing. All V2X messages, such as CAM, DENM, BSM, TIM or IVI

are generated in the EVK 3300. Positioning data can be obtained by an internal positioning solution or be provided together with vehicle status data from the host system via an external interface. In this

mode, the host system interfaces the facility layer of the V2X communication stack via a proxy.

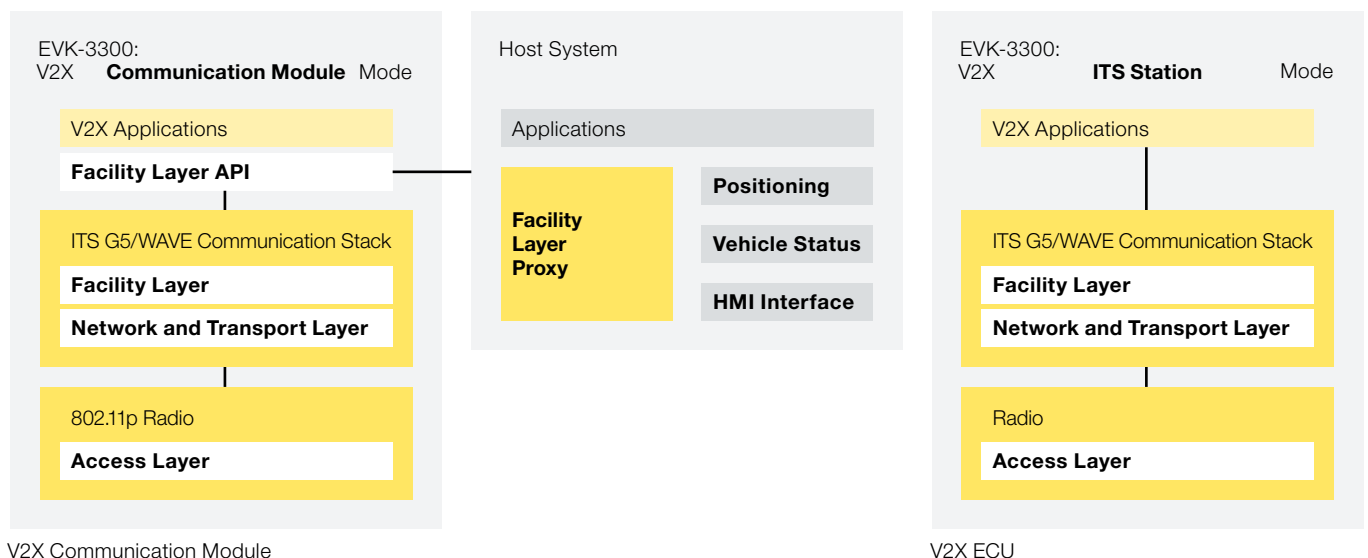
V2X ECU.

In this configuration the EVK-3300 acts as a fully featured self-contained V2X ECU, including the positioning solution and, if applicable, also interfacing to

vehicle data buses for the exchange of vehicle status and V2X data. In addition to the features stated above, V2X applications such as Stationary Vehicle War-

ning, Forward Collision Warning, Intersection Movement Assist and Green Light Optimal Speed Advisory will be running on the EVK-3300.

EVK-3300 configurations supporting rapid prototyping.



V2X Communication Module

V2X ECU

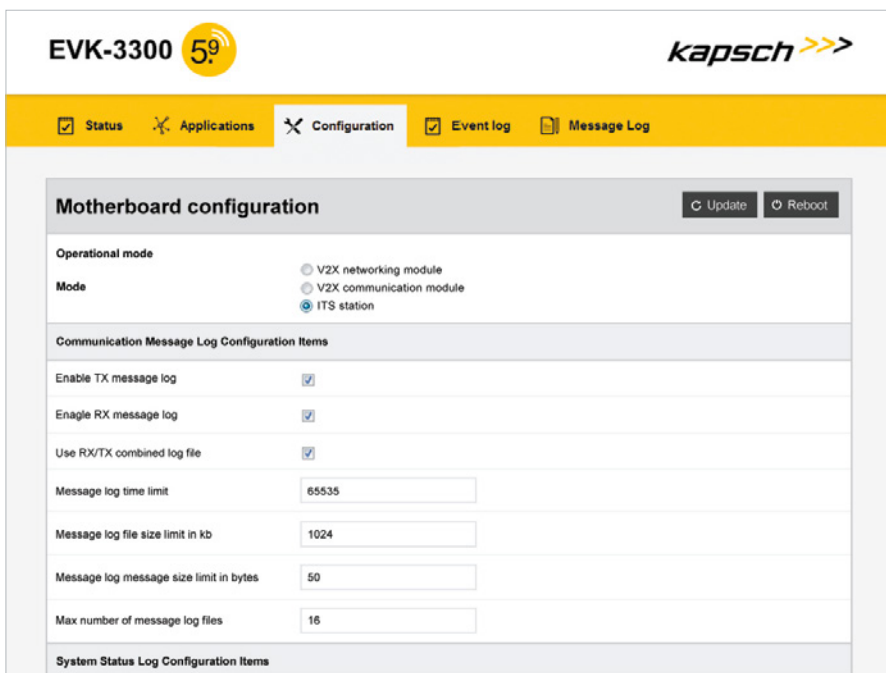
Simple configuration and monitoring.

The EVK-3300 features a web based graphical user interface for configuration and monitoring of the device. This convenient tool enables the user to configure

the device and monitor the status of the add-on modules, i.e. the IEEE 802.11p radios, GNSS receiver and the platform. The tool can also be used to manage

applications running on the EVK-3300 and extract message and event logs in a simple manner.

Software Development Kit.



A rich SDK is supported for customers who are interested in V2X application development on the EVK-3300. Example code, interfaces and clear instructions for usage are provided in the SDK manual. By implementing the applications on the EVK-3300 in conjunction with a tablet for viewing purposes, it becomes a robust stand-alone unit for in-vehicle demonstrations and similar.

EVK-3300 Graphical User Interface.

EVK Proxy.

In order to provide a more flexible development solution, the EVK-3300 can be delivered with an external proxy client for a host machine supporting Remote

Procedure Calls. Hence, the developers using the EVK-3300 do not need to spend time on setting up and manage the interface between the EVK-3300

and their system, but can focus on the application or subsystem development without overhead.

Modular and Portable Architecture.

The hard- and software architecture of the EVK-3300 allows an efficient partitioning of the function blocks needed for the different product realizations, which in turn will reduce the time-to-market for

these products significantly. The hardware components are compliant AEC-Q100, automotive grade 3, to the largest extent possible. The software components in the EVK-3300 are designed to be platform

and operating system independent complying to partitioning and porting requirements of functional blocks that are distributed between different physical entities.

EVK-3300 Features.

- > Supports V2X dual communication stack, both IEEE WAVE™ and ETSI ITS G5. (Add cellular)
- > Dual radio support for either concurrent or redundant channel operation.
- > Flexible interfaces and configurable modes of operation representing different in-vehicle product types.
- > Easy-to-Use graphical user interface for configuration and monitoring.
- > Hybrid V2X communication through cellular network and 802.11p & SDK

References.

Kapsch IEEE 802.11p radio and V2X communication stack experience is one of the longest and most extensive in the market, being developed and evaluated since 2008 in various projects, POCs and FOTs on a variety of platforms.

IEEE WAVE™.

- > US DOT RSE and ASD, HIA projects
- > Singapore ERP2 SET

ETSI ITS G5.

- > ETSI Plugtest PT#2, PT#3, PT#4
- > Testfeld Telematik FOT
- > ECo-AT pre-deployment project
- > NordicWay

Technical Specifications.

Dimensions	> (LxWxH): 120 x 170 x 35 mm
Weight >	> 550 g
Main connector	> Tyco MQS 26W
RF connectors	> FAKRA
Operating temperature	> -40 °C to +85 °C
Power Management	<ul style="list-style-type: none">> Supply voltage: 8-36 VDC> Protection according to ISO 7637> Simple Power Management scheme to avoid draining of vehicle battery when parked based on:<ul style="list-style-type: none">> Ignition status sensing> CAN activity/inactivity> On/Off button
Power Consumption (12V)	<ul style="list-style-type: none">> Full operation: typically 500 mA> Parked mode: 100uA
Interfaces	<ul style="list-style-type: none">> BroadR-Reach® automotive Ethernet or Ethernet (RJ45)> USB 2.0 HS OTG> 2x HS CAN 2.0B> 3x Digital Inputs> 2x Digital Outputs
Available add-on modules Sync to text regarding cellular	<ul style="list-style-type: none">> 802.11p radio(s)> 1x1 802.11p radio> Sensitivity: -93 dBm @ 6Mbps> Maximum output power: +23 dBm> 2x2 802.11p radio (MRC)> Sensitivity: -93 dBm @ 6Mbps> Maximum output power: +23 dBm> GNSS Module> Multi constellation GNSS receiver: GPS, Galileo, GLONASS and QZSS> SBAS support; WAAS, EGNOS, MSAS> Up to 20Hz update rate> Bluetooth Module v2.1+EDR> Serial Port Profile (SPP)> Cellular LTE Module
Security	<ul style="list-style-type: none">> Tamper resistant secure storage, EAL 4+> Signing: up to 20 messages per second> Verification: up to 400 messages per second