RENESAS VEHICLE COMPUTER GENERATION 3

The automotive industry is approaching at top speed towards the three megatrends of autonomous driving, electric vehicles and connected cars. These trends will have a significant impact to the vehicle E/E architecture moving from domain based into a more centralized architecture. Renesas have developed a comprehensive vehicle server offering connectivity to all automotive field bus and networking systems in one device (LIN, CAN, CAN-FD, FlexRay™, MOST, Ethernet AVB/TSN) plus sufficient computing power to host user applications.
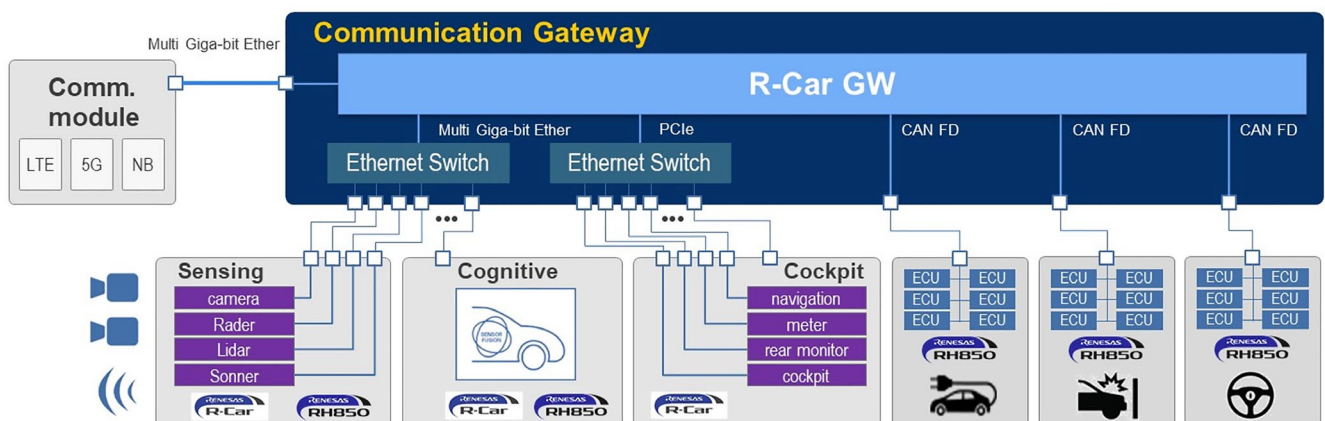
Universal development platform

This Communication Gateway ECU is considered as universal development platform for automotive customers. It comes in a robust housing for vehicle and laboratory use and offers Gateway operation of TSN Ethernet with the traditional automotive communication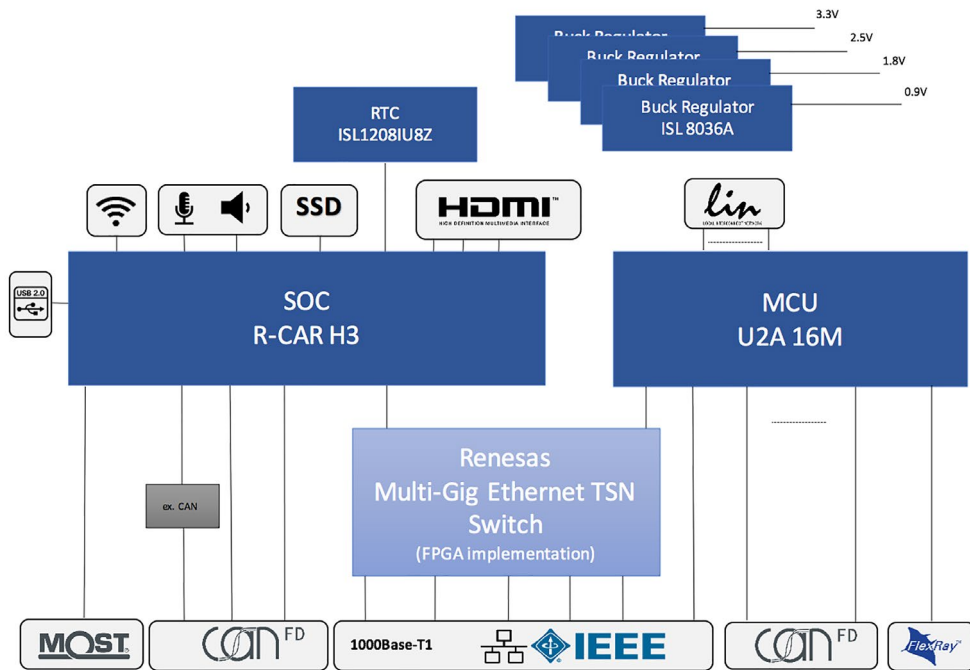 channels supported by an innovative software package. To support Service oriented Architecture (SoA) type of applications this ECU includes a middleware software stack from Renesas partner Cetitec, operating on a powerful R-CAR H3 SoC device as performance controller as well as a RH850 based MCU for control type of operations.

High level of software compatibility

The R-Car H3 performance controller is based on a cluster of ARM® Cortex®-A57/A53 cores with a performance of 40k DMIPS in ASIL-B functional safety level. This new R-Car H3 is part of the roadmap of R-Car Family with different performance classes while maintaining a high level of software compatibility. The RH850/U2A16 automotive MCU offers high performance balanced with very low power consumption and ASIL-B safety level for control applications. It contains a number of automotive communication interfaces with up to 16 CAN-FD, 24 LIN, 2 FlexRay™, 2 Eth. AVB and many more functions.

Multi-protocol Gateway	Network Security	Application Server	OTA Update
■ CAN routing ■ Ethernet handling ■ CAN-Ethernet conversion	■ Firewall, IDS/IPS ■ Message Authentication ■ Encryption	■ ECUs integration ■ Cloud-related application	■ Update agent ■ OTA orchestration

VEHICLE COMPUTER BLOCK DIAGRAM

The VC3 is based on a complete Renesas chipset. The centerpiece is an Ethernet TSN Switch, implemented as programmable logic in an FPGA. This implementation allows feature updates to cope with the evolving Ethernet TSN standards from IEEE 802.1 throughout the lifetime of the box. Beside the pure message routing it supports Ethernet End Station functionality to create the full TSN communication path from start to end points through the switched network. This offers a huge range of application use cases to evaluate next generation E/E Architectures. It is the ideal candidate for pre-silicon evaluation of next-generation R-Car devices for communication gateway systems.

Characteristics

Key Features

- **R-CAR H3 with 40k DMIPS**
- **RH850/U2A with 16 MB Flash and 4 MB RAM**
- **Renesas TSN Smart Switch (FPGA)**
- **Automotive wake up functionality**
- **802.1AS/1588 – Time Synchronization**
- **802.1Qav – Credit based Shaping**
- **802.1Qbu/802.3br – Preemption**
- **802.1Qbv – Time Aware Shaping**
- **802.1Qci – Per Stream Filtering and Policing**
- **802.1Qch – Cyclic Queuing**
- **802.1CB – Frame Replication and Elimination for Reliability**

Interfaces

- **TSN Ethernet**
  - **5 x 1 Gbps**
  - **1 x 100 Mbps**
- **19 x CAN-FD**
- **FlexRay™**
- **10 x LIN**
- **MOST150**
- **HDMI / Audio**
- **3 x USB 2.0**
- **WiFi connection**

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