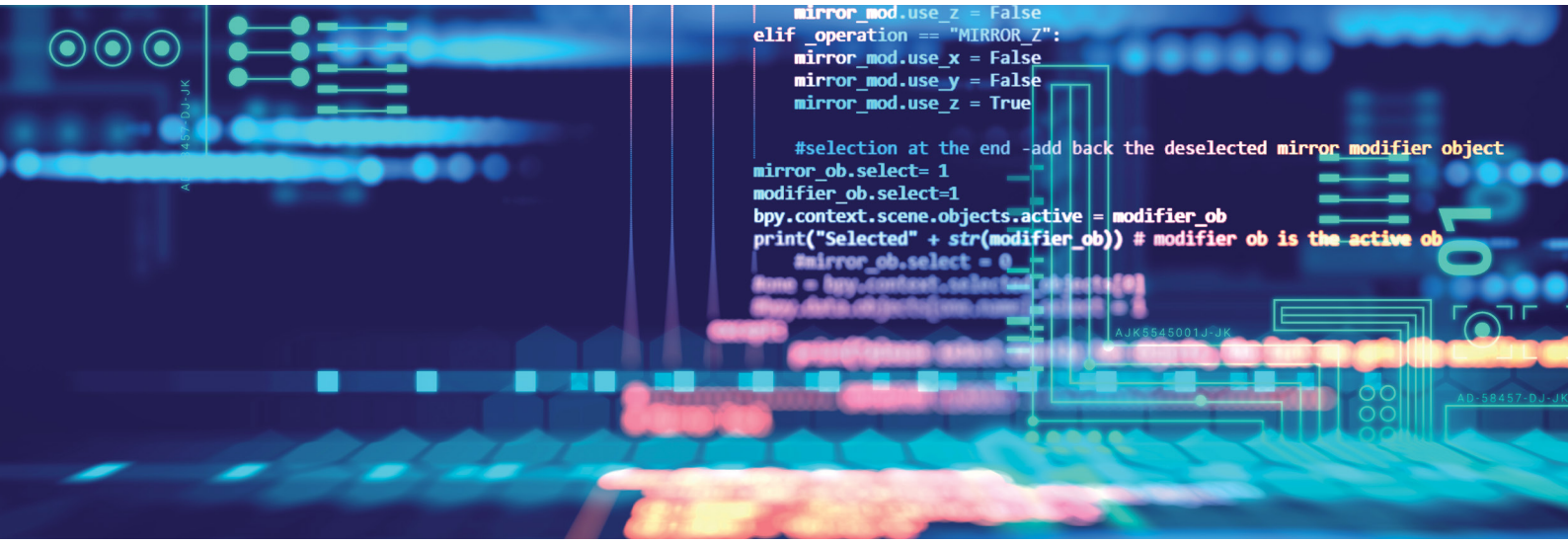
DATASHEET COQOS Hypervisor SDK v9.3.0 for Renesas R-Car H3



COQOS Hypervisor SDK is a modular software kit for cockpit controller, multi-display entertainment, smart antenna, and advanced driver assistance system (ADAS). Its hypervisor-based architecture makes it possible to run several separated virtual machines (VMs) on a single processor. Within such a VM, COQOS Hypervisor SDK supports both real-time operating systems and general-purpose operating systems like Linux and Android.

Target Automotive ECU

- Cockpit Controller
- Multi-Display Entertainment
- Smart Antenna
- Advanced Driver Assistance System (ADAS)
- Gateway
- Domain Controller.

Main Features

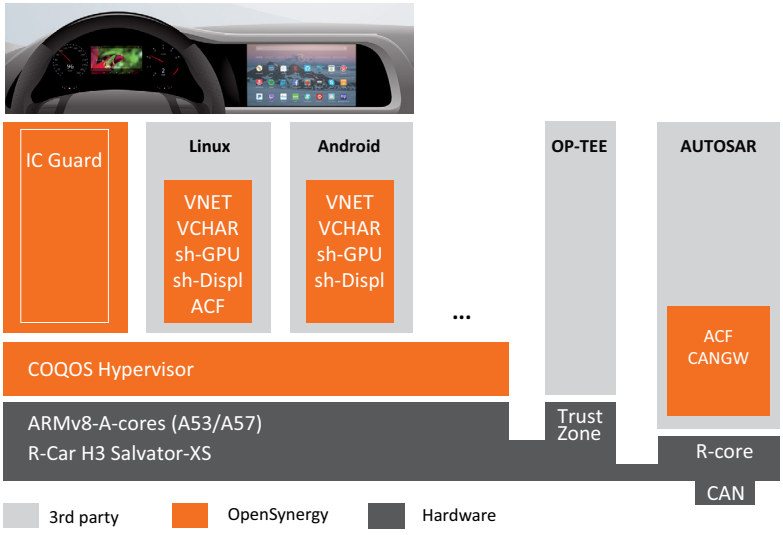
- Safe partitioning of the processor
- Freedom from interference between VM's
- CAN Gateway compliant with AUTOSAR 4.x
- General-purpose OSes like Linux/Android
- Multiple operating systems on a singlecore or multicore CPU
- Shared GPU
- Shared Display
- Support of hardware virtualization
- Developed according to ISO 26262 (ASIL-B compliant).

Properties

- Hypervisor designed for safety- and security-critical applications
- Virtualized Linux and Android guest operating system makes the power of open source solutions available to automotive systems
- Configurable communication bridge (IXCF) between the VMs enables easy and deterministic communication between the VMs
- AUTOSAR compliant CAN Gateway functionality
- Comes with a set of out-of-the-box configurations.

Benefits

- Cockpit Controller combines mixed criticality functions (safety and non-safety relevant) within a single system
- Takes full advantage of the SoC hardware features and incurs a negligeable performance overhead compared to solutions without a hypervisor
- Reduces hardware cost by migrating from multi-chip solutions to a single, highly integrated system-on-chip
- Integrates Advanced Driver Assistance Systems (informational ADAS), connectivity functionality, and infotainment directly on the head unit.



VNET - Virtual Network
VCHAR - Virtual Character Driver
ACF - Automotive Communication Framework
sh -GPU - Shared GPU
sh-Displ - Shared Display
CANGW - CAN Gateway

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OPENSYNERGY

Supported Target Processor Architectures

- ARM Cortex A53/57 (Hypervisor)
- ARM® Cortex®-R7 (AUTOSAR OS).

Supported Target Hardware

- Renesas R-Car H3 Salvator-XS HW rev 2.0.

Hypervisor

- Type-1 hypervisor which runs directly on the host's hardware to manage guest operating systems
- Takes advantage of hardware virtualization
- Especially tailored to the needs of automotive applications
- Lean kernel, high efficiency and supporting functional reliability
- Partitioning of processor resources (execution time and memory)
- Periphery only visible from the VM it is assigned to
- Scheduling enables to run several virtual cores on a single physical core.

Inter-X Communication Framework (IXCF)

IXCF transfers data between VMs running multi-purpose or real time operating systems. IXCF consist of:

- Automotive Communication Framework (ACF)
- Virtual Network (VNET)
- Virtual Character Driver (VCHAR)
- VIRTIO over MMIO: support for the VIRTIO standard

Guest OSes

COQOS Hypervisor SDK supports:

- Renesas Yocto BSP 2.23.1
- Renesas Android O-MR1 (8.1.0 -r1)

Shared GPU

Several VMs can concurrently use the Graphics Processing Unit (sh-GPU). Virtualization support by PowerVR Rogue DDK 1.9.

Shared Display

This feature decouples virtual from physical displays. Applications in VMs can render in virtual displays. A central compositor controls how these virtual displays are shown on the physical displays available to the Cockpit Controller.

Shared Block Device

Several VMs can concurrently use mass storage devices.

ISO 26262

TÜV-Süd has confirmed that the COQOS Hypervisor as part of the COQOS Hypervisor SDK meets the requirements of ISO 26262 up to ASIL-B and has issued an associated Technical Report.

CAN Gateway

The CAN Gateway is a minimalistic AUTOSAR stack, that contains:

- a full AUTOSAR OS implementation
- a full CAN Driver
- partial AUTOSAR CAN stack (Com, PduR, CanIf)
- minimalistic RTE implementation
- OpenSynergy's AUTOSAR Configurator automatically configures the CAN Gateway stack based on a CAN-CFG file (DSL describing the CAN DB)
- ACF “Automotive Communication Framework” which is a CDD responsible on communication between AUTOSAR and non-AUTOSAR partitions.

IC Guard

The IC Guard subsystem independently verifies the safety critical subset of the graphical elements rendered by Linux.

Development Tools

Development Host Hardware

- x86 / Pentium or compatible
- 8GB RAM minimum; 16GB RAM recommended
- 64 GB of free hard disk space; 250 GB recommended.

Development Host Support

COQOS Hypervisor SDK development tools are designed for use on Linux Ubuntu 16.04. Support is also available for other Linux distributions.

Hypervisor Configuration

COQOS Hypervisor SDK tooling generates the hypervisor configuration from a model described in XML.

Build and Integrate

- Integrated build system "Oskar"
- Supports the seamless integration of Yocto based Board Support Packages (BSP).

Test and Debug

- Guest debugging
- Periscope: multiple bidirectional communication channels over a single physical serial link.

Support

COQOS SDK comes with standard support and access to updates of the product. In addition, OpenSynergy’s Professional Services are available to port COQOS SDK to your hardware or to help in configuration or integration tasks.

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