

COQOS Hypervisor SDK is a modular software kit for cockpit controllers, rear-seat entertainment solutions, smart antennas, and advanced driver assistance systems (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 or Android.

Target Automotive ECU

- Cockpit Controller
- Rear-Seat Entertainment
- Smart Antenna
- Advanced Driver Assistance Systems (ADAS)
- Gateway
- Domain Controller

Main Features

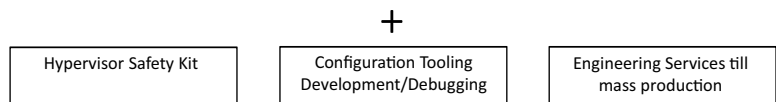
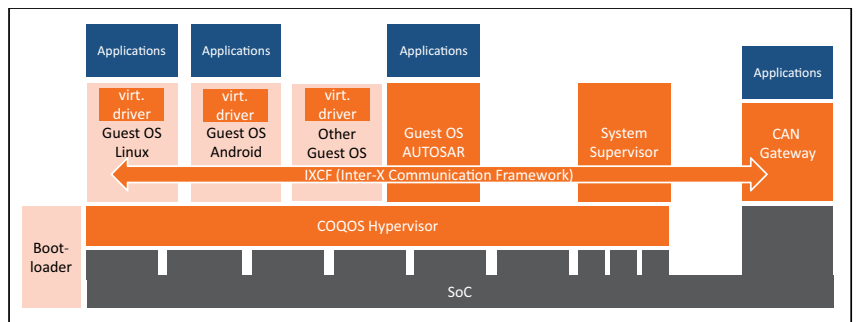
- Safe partitioning of the processor
- Freedom from interference between VM's
- CAN Gateway compliant with AUTOSAR 4.x
- Linux and Android
- Additional security features
- Multiple operating systems on a singlecore or multicore CPU
- Virtualized GPU
- Support of hardware virtualization
- Fast-boot features

Properties

- Hypervisor designed for safety- and security-critical applications
- AUTOSAR-compliant environment and tooling allow seamless integration of AUTOSAR software components and basic software modules
- Modular boot and fast boot technology ensure quick availability of critical functionality
- Virtualized Linux and Android guest operating systems make 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
- Special drivers make it possible to share hardware resources between VMs
- COQOS Hypervisor SDK 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 negligible performance overhead compared to solutions without a hypervisor
- Integrates a standard AUTOSAR environment with non-AUTOSAR functionality on a single SoC
- Uses the partitioning capabilities of the hypervisor to meet the safety requirements of standards like ISO26262
- 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.



■ 3rd party ■ integrated/modified by OpenSynergy ■ OpenSynergy ■ Hardware

Supported target processor architectures

- ARM Cortex A7
- ARM Cortex A9
- ARM Cortex A15
- ARM Cortex A53/57
- Intel® Atom™

Supported SoCs

- NXP i.MX 6 Solo/Dual/Quad/Plus
- NXP i.MX 8
- NXP S32V
- Xilinx® Zynq™-7000
- Texas Instruments Jacinto 6
- Qualcomm Snapdragon™ 602A
- Qualcomm Snapdragon™ 820A
- Renesas R-Car H3/M3
- For target support packages please contact OpenSynergy.

COQOS Hypervisor

The hypervisor creates Virtual Machines (VMs):

- Type-1 hypervisor which runs directly on the host's hardware to control the hardware and to manage guest operating systems
- Hardware virtualization enables:
 - shorter development time
 - guest OS can run unmodified
 - better performance
- 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.

Fast-boot

COQOS Hypervisor SDK includes a fast-boot loader and a modular-boot mechanism, allowing VMs to load and start sequentially.

Shared Graphics and GPU

Several VMs can share one display surface (Shared Graphics, sh-GFX) and can concurrently use the Graphics Processing Unit (sh-GPU).

Shared hardware

Many important use cases require that a single hardware resource is shared among multiple VMs. OpenSynergy's approach enables graphical output of VMs that run on top of a hypervisor with different requirements in terms of safety and real time performance on one or multiple displays.

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.

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)

System Supervisor

A configurable watchdog (contained in a separate VM) can observe the behavior of specific applications, and take action when the system does not behave correctly.

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.

Android and Linux

COQOS Hypervisor SDK supports the following guest operating systems:

- Latest linux versions (following roadmap of chipset vendors)
- Latest Android versions (following roadmap of chipset vendors).

Development Environment

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

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