DATASHEET COQOS Hypervisor

OpenSynergy provides a next-generation hypervisor, enabling the secure convergence of software functions with very different safety and security requirements. The new hypervisor achieves this by generating virtual machines (VMs) where multi-purpose operating systems such as Linux or Android can coexist and interact with real-time operating systems (RTOS). It boasts a minimalistic design for high efficiency and flexibility. These benefits stem in large part from a lean kernel and support for hardware virtualization.

Benefits

- Trusted code base with small footprint
- Designed and optimized for next-generation processor architectures
- Minimal performance overhead
- Developed for ASIL-B compliance underpinned by Automotive Spice Level 3
- Tailored to the needs of automotive use cases
- Based on OpenSynergy's long-term experience in hypervisor technology in the automotive domain.
- Supports flexible hardware resource management

Features

- Designed for mixed criticality systems
- Supports multicore guest VM's
- Enables integration of arbitrary guest operating systems
- Innovative scheduler provides both realtime and fair share simultaneously
- Highly efficient, low overhead inter-VM communication

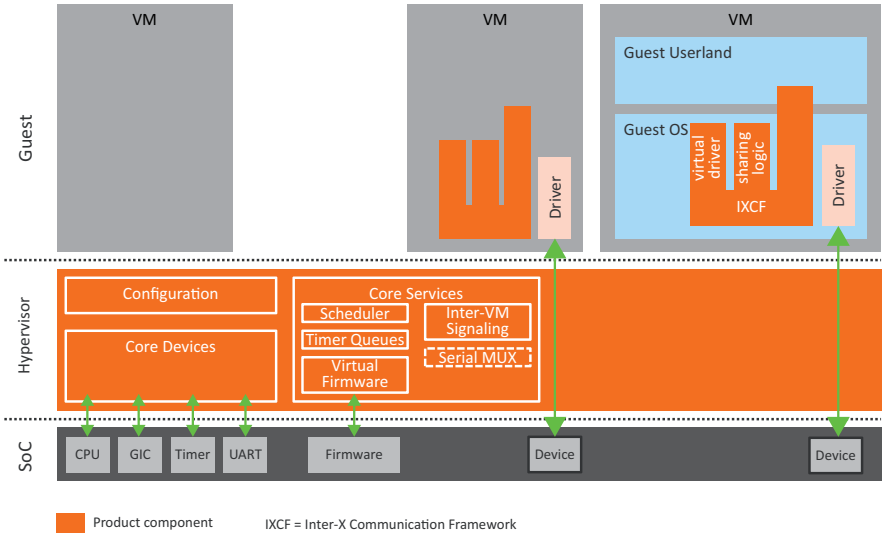
Supported Hardware

Architecture

- ARMv7VE-A
- ARMv8-A

Supported SoC's

- Texas Instruments Jacinto 6
- Renesas R-Car H3
- Qualcomm® Snapdragon S820A
- NXP i.MX 8



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Core Parts

Full OS Flexibility

- Unmodified core system
- No need of paravirtualization of guest OS

Hypervisor Configuration and Platform Integration

- Static configuration
- Model based configuration
  - Configuration of hypervisor binary
  - Runtime configuration for hypervisor and guests
- Human understandable model
- Tools guarantee consistent configuration data
- Configuration tools easily integrate to customer build environment

Strong Separation

- Memory protection
- Scheduling
- Device access

Scheduling

- Highly predictable scheduling for real-time OS (e.g. AUTOSAR or other RTOS's)
- High performance for non-real-time OS (e.g. Linux, Android)

System Startup

Early functions first (fast-boot) to satisfy boot time requirements:

- Controlled boot order: Early functions start rapidly (e.g. RVC, CAN)
- Modular boot: Orchestration of boot regime

Security

- Secure boot
- Inter-VM communication configuration cannot be bypassed
- Integration of platform security (secure boot, encrypted storage, TrustZone)

Safety and Reliability

- Design guided by safety requirements
- Small code size, below 10k SLOC due to low complexity kernel architecture

ISO 26262

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

Kernel Architecture

- Multi-kernel architecture supports multicore SoCs efficiently
- Supports SMP guest OS
- Low complexity allows for affordable certification

Power Management

- Complexity awareness
- Provides passive power management functions

Optional Parts

System Supervisor

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

CAN Gateway

The CAN Gateway is a minimalisitc 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 configure 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.

Linux and Android Support

The hypervisor supports the latest linux versions (following roadmap of Chipset vendors).

Additional Shared Hardware

Many important use cases require that a single hardware resource is shared among multiple guests. OpenSynergy provides support for advanced sharing solutions (e.g. shared display and shared GPU).

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