



The automotive industry moved from having standalone systems for various functions such as Infotainment, Telematics, Instrument cluster, Diagnostics and more to more integrated systems handling multiple functions. Due to the demand for more vehicle features, OEMs have integrated multiple Electronic Control Units (ECUs). This has resulted in an explosion of ECUs in their vehicles.

Powered by Type-I ASIL B Certified hypervisor, and automotive features virtualization capabilities (camera, audio, multimedia, graphic, network), HARMAN Device Virtualization solution recommends the best way to collocate various environments on the same hardware. This reduces costs and testing/integration efforts while improving performance and guaranteeing security and safety. HARMAN's Device Virtualization capabilities enable multiple operating systems to run on a single hardware platform, securely and with full isolation. HARMAN supports diverse hardware and software platforms and enables RAM and persistent storage to be portioned and allocated per virtual machine-specific performance requirements. It fully virtualizes all hardware resources including CPU, memory, networking, interface and peripheral devices.

Key highlights of the solution

- Type-I, bare-metal hypervisor
- ASIL B certified and ISO 26262 ASPICE Level 1 certified
- Guest OS-agnostic, i.e., can run any type of operating system (not tied to any proprietary RTOS)
- Hosts several guest OSES on the same CPU (single or multi-core)
- Small footprint, highly-efficient code designed for minimum overhead
- State-of-the-art freedom of interferences mechanisms
- Advanced safety and security mechanisms
- Feature virtualization services are proposed to provide a complete virtualized automotive architecture

Top-line Benefits

- Running in hundreds of millions of devices globally
- Reduced network and software complexity
- Reduced maintenance and integration costs
- Cost savings on shared hardware resources

Why HARMAN?

Shortening Time-to-Market

Shorten your time from concept to delivery using our best practices, turn-key delivery models and rich talent pool.

Cross-platform

Take advantage of our experience in multiple industry verticals and leading platforms to rapidly exploit new market opportunities.

Global delivery footprint

Our skilled, talented engineers deliver solutions to companies like yours from centers throughout the world.

Solution accelerators

Get access to leading edge innovation and best practice by using our solution accelerators and global pool of partnerships.

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Features and Benefits

Multiple hardware and Operating systems(OS) support	<ul style="list-style-type: none">• Supports hardware of ARM V8 32 and 64 bits, Intel x86/x64 (VT) platforms• Operating systems(OSs) are not modified and fully native
State-of-the-art technology enabling freedom of interferences mechanisms	<ul style="list-style-type: none">• Head unit can run both performant and real time OSs on a single board while being fully separate from each other• Memory isolation using second stage Memory Management Unit (MMU)• Device isolation using System Memory Management Unit and VM life-cycle control• Temporal isolation based on priority-based, real-time guest OS scheduler
Peripheral Device management	<p>Device sharing and pinning</p> <ul style="list-style-type: none">• Allows sharing of all hardware resources (networks, graphic, multimedia, audio, cameras and more) across automotive applications with highly performant communication system• Can dedicate some specific HW devices access to specific virtual machines and ensure exclusivity <p>Device emulation</p> <ul style="list-style-type: none">• Provides device emulation system so that Guest OSs are using their native driver. Input/Output and memory accesses are trapped by the hypervisor.• Emulation of the native device is performed at register level. The Hypervisor manages and arbitrates access to the hardware devices.
Critical safety	The safety critical Guest OSs continue working in native mode, while collocated with non-safety critical ones so that a crash of non-safety critical Guest OSes does not impact the safety of the critical ones.
VCPU scheduling and Real time warranty	Pinning virtual CPUs to dedicated physical CPUs and assigning is to a Real Time Guest OS ensures real time performance
Advanced security mechanisms	<ul style="list-style-type: none">• Secured boot and inter-VM communication channels through use of bridge components. Multi-VM boot leverages the chain of trust established from the OEM bootloader to the system image• Controlled access to TrustZone Execution Environment and IPsec / VPN networking• Polices all normal-to-secure world transition requests via SMC
Graphics virtualization	<ul style="list-style-type: none">• Rich, flexible FW enabling complex display configurations, including PIP• Support GPU HW assisted virtualization when available
Multimedia	<ul style="list-style-type: none">• Near native performance – HD video encoding and decoding at 60+ FPS• Camera virtual driver allows to preview and record information• The virtual audio front-end driver exports Advanced Linux Sound Architecture (ALSA) devices to the client applications
Networks	Can be used for sharing various communication systems by providing adapted virtual drivers (Ethernet, IP, Can Bus, 3G/4G)

Partner with an industry expert

HARMAN International is a wholly-owned subsidiary of Samsung Electronics Co., Ltd. focused on connected technologies for automotive, consumer and enterprise markets.

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