

# LOW-COST INTEGRATED COCKPIT WITH RENESAS R-CAR

Robust, Safe, and Secure Cockpit Systems



Cockpit Market Trend

The car cockpit is a differentiating feature for car sales. Therefore, OEMs are continuously striving to improve the cockpit user experience. At the same time, keeping cost under control is mandatory, especially for hardware and for software development and maintenance.

To achieve this target, more and more car OEMs are integrating several cockpit functions into one integrated cockpit domain controller, including IVI / head unit, instrument cluster, HUD, and camera-based systems such as driver monitoring and surround view.

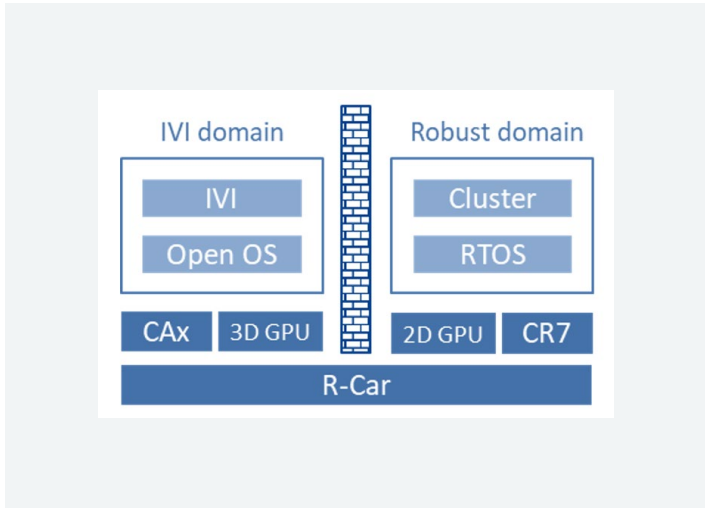
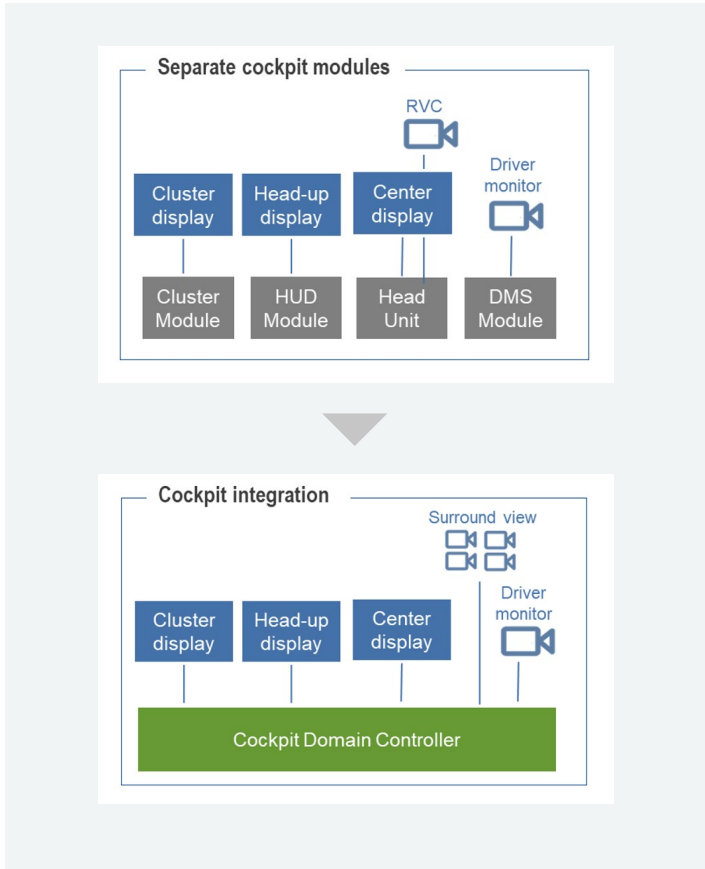
Cockpit integration has already started on the high to premium segments but is now considered more and more also for entry to mid car models.

The “Multi Domain” Integration Challenge

Tier1s and OEMs are challenged by the task to integrate multiple domains with different safety requirements. For example, the instrument cluster usually needs to achieve ASIL-B, whereas multimedia does not have any safety target.

One option for multi-domain separation is to run different applications on virtual machines using a hypervisor. The R-Car SoC family supports a wide range of industry-proven hypervisors and provides real hardware sharing capabilities to ensure high system performance. Dedicated hardware mechanisms enable freedom from interference (FFI) and clear priority setting.

Another possibility is hardware domain separation, avoiding the overhead and maintenance of a virtualized system. Therefore, the R-Car SoCs feature a high-performance ARM Cortex-R7 (“CR7”) real-time CPU. The CR7 is implemented as dual-core lock-step processor and allows the system to run robust and safety-critical applications fully independently from the main CPU cores. A powerful 2.5D GPU complements the 3D GPU for robust HMI rendering.

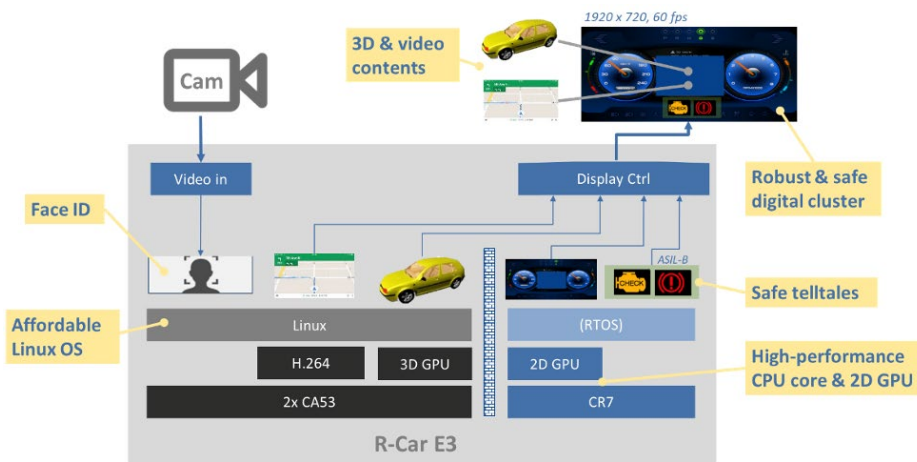


## Cockpit Use Cases with ARM Cortex-R7 Real Time CPU

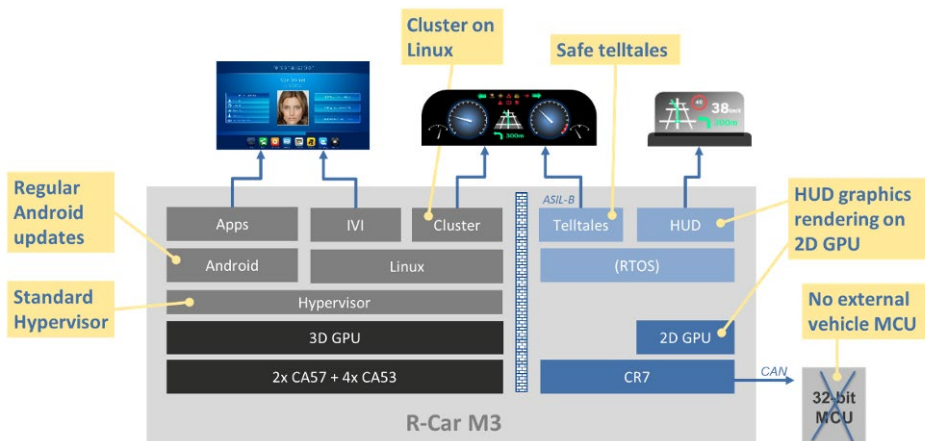
### Leverage the potential of R-Car to improve system performance and reduce cost:

- Safe telltale rendering and monitoring
- Robust 2.5D cluster HMI drawing
- Audio alert monitoring
- Rear-view camera and surround view with frozen image detection
- Vehicle control through CAN bus, eliminating external 32-bit MCU
- Fast boot <1sec with early CAN, cluster HMI, camera, and alarm sound
- CR7 full display control using VirtIO

### Example: Digital cluster with integrated driver ID on R-Car E3



### Example: Integrated cockpit with Android on R-Car M3



# Powerful Development Support

## THE R-CAR CONSORTIUM

Renesas launched online Market Place, which offers a one-stop source of solutions that help accelerate technical innovation for the future mobility market. Developers can download various solutions designed for Renesas' R-Car automotive system-on-chips (SoCs) directly from the Market Place. Developers can also use the Market Place as a portal to obtain reference evaluation software from R-Car Consortium Proactive Partners or contact Proactive Partner companies directly, allowing for timely support to match customer requirements. Through the Market Place, developers can quickly and easily access R-Car evaluation software, documentation such as hardware manuals, technical updates, application notes, and basic software such as Linux and Android board support packages (BSPs).

### New Online Market Place for R-Car



<https://www.renesas.com/jp/en/about/press-center/news/2020/news20201027.html>