Case Study:
In-Vehicle Computing
Application Story

CUSTOMER:
Sintrones

INDUSTRY:
In-Vehicle Computing

CHALLENGES:
Conventional processor platforms for in-vehicle computing systems lack the video/graphics processing performance required to power multiple seat-back displays in crisp HD resolution. Ad hoc chipsets and bulky graphics cards can handicap design efficiencies for space-constrained in-vehicle environments, and introduce additional power and cooling penalties.

SOLUTION:
AMD Embedded G-Series APUs give Sintrones an optimal mix of processing performance and multi- display video/ graphics capabilities while enabling a compact system form factor and low power consumption.

RESULTS:
Sintrones' GPS-assisted VBOX-3200 in-vehicle computing system is among the industry's most versatile solutions, measured both in form and function. Optimized for digital signage, infotainment, mobile communication and navigation applications for commercial and municipal vehicles, high-performance VBOX-3200 systems are compact and energy efficient.

AMD TECHNOLOGY AT A GLANCE:
AMD Embedded G-Series APUs

Sintrones Pioneers Next-Generation In-Vehicle Computing Platform with AMD Embedded G-Series APUs

VBOX-3200 in-vehicle computer is optimized for high-performance digital signage, infotainment, mobile communication and navigation applications

In-vehicle computer technology is one of the fastest growing domains in embedded design today, spanning a diverse range of applications including digital signage, infotainment, mobile communication and navigation for commercial and municipal vehicles from buses to taxis, police cars and beyond. Whether the goal is to inform tourists about local attractions via seat-back video monitors, provide Internet access to passengers, track and coordinate the locations of maintenance or mass transit vehicles, or even remotely inspect municipal infrastructure with vehicle-mounted cameras, GPS-assisted in-vehicle computing systems can provide users with helpful, targeted information that optimizes travel experiences and/ or transportation operations in real-time.

Taiwan-based Sintrones is helping to lead the in- vehicle computing revolution with its advanced, ruggedized VBOX-3200 onboard computer system. Built upon the AMD Embedded G-Series Accelerated Processing Unit (APU) platform, Sintrones' VBOX-3200 provides an optimal balance of high performance processing, multi- display HD video and graphics capabilities, space savings and energy efficiency. The VBOX-3200 system's ability to support all of the aforementioned applications via a single platform distinguishes it as one of the most versatile systems in this product category, providing Sintrones' customers with a host of capabilities that competing single-function in-vehicle computing systems can't match.

"AMD Embedded G-Series APUs gave us the high-performance processing platform we needed to achieve our design goals with as little friction as possible. Our VBOX-3200 systems are a testament to the superior value and functionality that APUs can help enable."

Kevin Hsu, President, Sintrones

High-Performance, Multi-Display Video and Graphics

One of the key features afforded by Sintrones' VBOX-3200 is its ability to feed independent dual displays with crisp HD video and graphics for seat-back signage and infotainment installations. At the processor level, this requires high-speed performance, highly efficient video and graphics rendering, and multi-output connectivity support. Where today's in-vehicle media systems often require one controller to power each individual screen – far from ideal in terms of space conservation, as well as power and cost efficiencies – multi-display-capable in-vehicle computing systems can help preserve valuable vehicle cabin space that would otherwise be lost to accommodate these one-to-one system-to-display configurations.

AMD Embedded G-Series APUs combine a CPU and advanced HD-caliber GPU in a tightly integrated, power efficient package that maximizes multimedia performance. The CPU takes care of the scalar processing, including memory, networking, and storage processing, and also runs the operating system, applications, and user interface. The on-die GPU offloads graphics and multimedia processing using Single Instruction, Multiple Data (SIMD) parallel processing, driving high-definition video and graphics displays with great efficiency.

This combination of CPU and GPU onto a single die provides a robust, high-performance architecture. AMD Embedded G-Series APUs can offload data parallel processing from the CPU to the GPU, including multimedia streaming. Freed from this task, the CPU can focus on compute, memory, and I/O requests with much lower latency, thereby improving real-time video and graphics processing performance via a fully optimized data path and shared access to the memory controller.

AMD Embedded G-Series APUs support dual independent displays leveraging a combination of display technologies including DisplayPort, DVI, VGA, and HDMI™. Sintrones' VBOX-3200 supports independent dual displays using DVI+VGA and DVI-I+DVI-D connectivity options.

With this combination of high-performance processing and multi- display support, Sintrones' AMD G-Series APU-based VBOX-3200 dual-display systems can be optimized to present multiple layers of dynamic video content across in-vehicle displays in HD resolution; in other words, overall picture resolution isn't compromised. The integration of AMD Radeon™ HD graphics on the APU provides an additional hardware acceleration boost that optimizes the video pipeline, ensuring smooth video playback.

Sintrones is taking seat-back display technology one step further with the integration of touch-enabled interactive features that provide passengers with Internet access, which can be used to purchase movie or theater tickets, or access online tourism information, for example. The VBOX-3200's onboard GPS transmitter comes into play, enabling a 'location awareness' capability that local businesses can tap into to trigger their advertisements to display when a VBOX-3200-equipped vehicle approaches their place of business. Local businesses recognizing the value of high proximity advertising capabilities are increasingly vying for available in-vehicle digital advertising space, and this revenue can be enough to offset the capital and operating expenses tied to mobile digital signage and infotainment installations.

Smaller Is Better

Designing and implementing ruggedized computing systems for space-constrained, in-vehicle installations can pose many challenges for system designers. High-performance video and graphics capabilities can be especially difficult to achieve without compromising space to accommodate graphics cards or ad hoc disparate chipsets. To meet its aggressive design goals, Sintrones required a tightly integrated, high performance processing platform that conserves system space and helps reduce susceptibility to shock and vibration.

Conventional, multimedia-capable computer systems with integrated add-on graphics cards are generally ill-suited for in-vehicle installations, as graphics cards are typically mounted to right-edge connectors within the system. An edge connector takes up more space (card-edge boards are typically 3" to 5" taller) and exposes it to additional shock and vibration that can lead to system integrity issues.

The combination of a low-power CPU and a discrete-level GPU into a single AMD Embedded G-Series APU eliminates the need for bulky add-on graphics cards for video/graphic-optimized in-vehicle computing systems, enabling Sintrones to achieve an ultra-compact form factor for its VBOX-3200 system. The AMD APU architecture reduces the footprint of a traditional three-chip platform to just two chips – the APU and the companion controller hub. This two-chip solution simplifies design complexity through a reduction in board layers and power needs, and helped enable Sintrones to achieve ambitious form factor goals.

The VBOX-3200's system chassis measures a mere 250mm (W) x 150mm (D) x 55mm (H) – enabling the unit to be easily slipped into tight spaces within vehicle cabins. The system supports a wide temperature range of -40°C to ~70°C for thermally-demanding environments, and also meets the MIL-STD-810F standard for shock and vibration.

Energy Efficiency On the Go

Unlike most wall-plugged computing systems, in-vehicle computers can be especially sensitive to power consumption constraints. Low power draw is important if a computer is to be powered by, for example, a taxi vehicle battery. This energy efficiency requirement will likely become even more pronounced as municipalities accelerate their adoption of more environmentally-friendly electric and hybrid-electric vehicle fleets.

The performance-per-watt gains enabled by AMD Embedded G-Series APUs assure greater power efficiency and lower heat dissipation, which, in turn, can preclude the need for fan cooling within in-vehicle computing systems. Supporting thermal design power (TDP) profiles starting at 4.5W and up to 18W – with average power as low as 2.3W – AMD G-Series APUs allowed Sintrones to keep board-level total power consumption to less than 20W, enabling its designers to optimize VBOX-3200 systems to overcome challenging power constraints.

System cooling is, of course, another critical design consideration for in-vehicle computing systems. Fan-cooled systems are vulnerable to airborne particulates and debris, as well as considerable shock and vibration – all of which are common environmental factors for vehicle-based systems. Sintrones' designers are therefore understandably wary of fan cooling mechanisms due to the inherent risk of failure. AMD Embedded G-Series APUs' low power profile helped ensure that Sintrones' VBOX-3200 systems can be passively cooled – no fan required.

VBOX-3200 systems accommodate 12V and 24V inputs from vehicle batteries, and include optional 'smart' battery backup for uninterrupted power support. The systems also feature advanced power ignition capabilities that enable adaptability to dynamic power supply conditions.

x86 Versatility

With AMD Embedded G-Series APUs at the heart of its VBOX-3200 systems, Sintrones is afforded processing and cost efficiencies that help its customers maximize their return on investment. These natural efficiencies are amplified significantly on the underlying embedded x86 platform, given the inherent PC-compatibility and rich ecosystem of industry-standard, x86-optimized software, applications, operating systems and development environments available to Sintrones' designers and its customers.

x86 support also ensures greater interoperability with the enterprise IT network, which can introduce additional benefits for in-vehicle applications such as security and surveillance and/or centralized fleet management applications hosted on network infrastructure. With AMD Embedded G-Series APUs, Sintrones' design team benefitted from wide ranging operating system and driver support spanning Linux® and Windows® Embedded environments. These interoperability features helped Sintrones' designers minimize design complexity and speed time to market considerably.

ABOUT SINTRONES

Sintrones is a leading provider of in-vehicle computing and digital signage systems. For more information about Sintrones, visit www.sintrones.com

ABOUT AMD

AMD is a semiconductor design innovator leading the next era of vivid digital experiences with its groundbreaking AMD Accelerated Processing Units (APUs) that power a wide range of computing devices. AMD Embedded Solutions give designers ample flexibility to design scalable, x86- based, low-cost and feature-rich products, and drive energy conservation into their systems without compromising application performance or compatibility, graphics performance or features. For more information, visit www.amd.com/embedded.