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INDUSTRY

Casino Gaming

CHALLENGES

- Conventional processing platforms required compromises in system form factor, energy efficiency, cooling, ambient noise and reliability
- Multi-screen capabilities were cumbersome to achieve with traditional one-to-one system-to-display computing architectures

SOLUTION

- Quixant QX-40 gaming controller based on AMD Embedded R-Series APUs
- DisplayPort 1.2 connectivity standard for multi-screen 'daisy chaining'

RESULTS

- Significant gains in processing performance, enhanced power efficiency and lower heat dissipation, significant space savings, and lower system noise
- Ability to support between four and ten independent displays efficiently, with minimal cabling complexity
- Enhanced coding efficiency for Quixant's customers via OpenCL programming framework support

AMD TECHNOLOGY AT A GLANCE

AMD Embedded R-Series APUs

"With AMD Embedded R-Series APUs at the heart of Quixant's QX-40 casino gaming controllers, casino game developers are afforded unprecedented gains in graphics performance, power and cooling efficiencies, space savings and multi-display flexibility to help them achieve their most ambitious game design goals."

NICK JARMANY
Managing Director, Quixant



Casino Gaming

AMD Embedded R-Series APUs give Quixant a high-performance graphics processing platform for richly-interactive casino slot machines

Energy efficient, ultra-compact AMD Embedded R-Series APUs power advanced multi-screen gaming systems

Recognizing the visceral, seemingly irresistible attraction of highly immersive, multimedia-driven gaming systems, the casino industry has wholly embraced the newest generation of richly interactive, visually-driven slot machines. Designed to grab and retain players' interest in ways that more static, traditional gaming platforms simply can't, these systems deliver stunning multimedia entertainment that enralls casino guests and entices them to spend their money – no simple feat.

Quixant, a leading designer and manufacturer of computer solutions for the gaming and slot machine industry, specializes in providing sophisticated 'all in one' computer gaming controllers that equip its clients with plug-and-play embedded platforms on which to design and customize their own unique

slot machines. In order to maintain and extend its competitive advantage, Quixant's designers continue to seek out new ways to harness higher levels of embedded hardware performance without compromising on system form factor, energy efficiency, cooling or reliability requirements – all at the lowest possible cost, and with the fastest time to market.

The advent of multi-screen casino gaming systems, pioneered by Quixant in anticipation of the emerging market opportunity for this class of systems, has compounded this challenge. The transition from traditional one-to-one system-to-display gaming architectures in favor of more efficient one-to-many system-to-display ratios highlighted the need for a processing platform that can keep pace with the

corresponding increase in graphics performance demands. Today, the ability to support multiple independent display outputs simultaneously from a single gaming controller has emerged as a 'must have' requirement for the new era of visually immersive casino slot machines.

APU-CALIBER GRAPHICS PROCESSING ACCELERATION

With the recent introduction of its QX-40 gaming controller, Quixant has tapped into AMD Embedded R-Series accelerated processing units (APUs) to achieve new levels of graphics processing performance, power and cooling efficiencies, space savings and multi-display support.

Through the seamless combination of AMD's 'Piledriver' general purpose CPU architecture (second generation 'Bulldozer' architecture) and discrete-level AMD Radeon™ HD 7000 Series graphics onto a single die with a high-speed bus architecture and shared, low-latency memory model, AMD Embedded R-Series APUs can offload calculations from the CPU to the GPU to yield dramatic graphics performance acceleration for casino gaming systems like Quixant's QX-40, and in so doing free up the CPU for other processing tasks.

This integration of general purpose, programmable scalar and vector processor cores for high-speed parallel processing establishes a new foundation for high-performance casino gaming systems, while ensuring a host of system design advantages. By reducing the footprint of a traditional three-chip platform to just two chips – the APU and the companion controller hub – design complexity is simplified through a reduction in board layers and power supply needs. This enabled Quixant to achieve aggressive form factor goals while driving down overall system costs.

POWER, COOLING AND NOISE BENEFITS

With between 128 and 384 compute units delivering a calculated 172 to 563 SP GLOPs¹ of performance and Thermal Design Power (TDP) ranging from 17 to 35 Watts (average power below 13 Watts²), the performance-per-watt gains yielded via AMD Embedded R-Series APUs assure greater game controller-level power efficiency and lower heat dissipation, which in turn improves the reliability of heat-sensitive components within the game cabinet. These benefits are especially important when measured on aggregate, accounting for the hundreds of gaming systems that can populate a casino floor. The cumulative reduction in heat dissipation minimizes the demands on casino air conditioning infrastructure, which can yield sharp reductions in associated operating expenses.

Low heat dissipation can also preclude the need for fan cooling within casino gaming systems. Fan-less designs include fewer moving parts, thus helping to improve overall system reliability – an important consideration when one contemplates the risk of a malfunctioning \$5 fan compromising the viability of a \$25,000 high-end casino gaming system. Quixant's fan-less QXi-200 slot machine controllers, powered by AMD Embedded G-Series APUs, were among the first systems in their class to feature passively cooled enclosures.

In addition to the aforementioned power and cooling benefits, fan-less casino gaming systems like Quixant's QXi-200 and forthcoming AMD Embedded R-Series-based sister product provide the added benefit of lower overall system noise. This ensures that the gaming systems don't contribute to ambient casino floor noise, drowning out game audio, player conversations and/or music entertainment.

SIZE MATTERS

Conventional casino gaming controllers that rely on add-on graphics cards for high performance graphics are generally ill suited for the compact system enclosures that casino game designers prefer, as graphics cards are typically mounted vertically to right-edge connectors within the system. In space-constrained designs, edge-connected graphics card architectures are often too bulky (card-edge boards are typically 3" to 5" taller), especially for smaller-profile table and bar-top gaming systems.

The combination of a low-power CPU and a discrete-level GPU into a single embedded APU eliminates the need for bulky add-on graphics cards for casino gaming controllers. As a result, Quixant's slim-profile QX-40 fits easily into compact game cabinets and affords game designers greater design flexibility.

MULTI-SCREEN MULTIMEDIA IMMERSION

The ability to support multiple independent game screens simultaneously from a single system controller has emerged as a key requirement for casino gaming systems. Today, dual-screen games are the norm for high-end casino gaming systems. But three-screen games – which often feature 'topper' overhead screens for multiplayer tracking – are quickly emerging as a popular option. And as casino gaming systems grow increasingly sophisticated, visually immersive multi-display configurations spanning four screens and beyond will become more prevalent.

Where previously multi-screen gaming systems required one computer to power each individual screen – far from ideal in terms of space, power and cost efficiencies – Quixant's QX-40 takes advantage of the multi-display output capabilities provided via AMD Embedded R-Series APUs. The AMD R-Series APU within the QX-40 can power up to four independent multimedia feeds or a single multimedia feed distributed across a four-panel display, in stunning HD resolution. The QX-40 also features an option to include an additional on-board AMD Radeon E6460 or E6760 GPU, which can be utilized in combination with the APU to power up to ten screens.

The Video Electronics Standards Association's (VESA) royalty-free DisplayPort connectivity standard, enthusiastically endorsed by AMD, is another key enabler for the multi-display capabilities at the heart of Quixant's QX-40. DisplayPort 1.2, the latest version of the standard, boasts features such as higher bandwidth (5.4 Gbit/s per lane) and support for high bit-rate audio. Perhaps its most interesting feature, however, is the micro-packet architecture that enables the ability to address and drive several displays through one DisplayPort connector,

a feature commonly referred to as daisy-chaining. Where DVI and HDMI both require a dedicated clock source for each display, DisplayPort only requires a single reference clock source to drive as many DisplayPort streams as there are display pipelines in the GPU, yielding the most efficient possible multi-display game system designs. The resulting ability to connect multiple displays to the QX-40 controller via a single cable simplifies the cabling within game system cabinets.

OPENCL AND MULTI-PLATFORM SUPPORT

AMD's early and ongoing support for the cross-platform, non-proprietary Open Computing Language (OpenCL™) programming framework has played to Quixant's favor, equipping casino game developers to easily and more cost-effectively program code that accelerates graphics processing performance for their unique Quixant QX-40-based game systems. With OpenCL APIs, developers can repurpose code across CPU, GPU and APU platforms from the leading processor vendors, thereby maximizing the value of their investment in source code

development. OpenCL can also be used to accelerate the decoding of proprietary video and image compression formats commonly used in the gaming industry. Where previously this task was accomplished via CPU processing alone, it can now be handled much more efficiently by utilizing the advanced parallel processing capabilities enabled by AMD APUs. AMD Embedded R-Series APUs provide native support for OpenCL 1.1, as well as OpenGL 4.2 and DirectX® 11, which can be used to achieve stunning 3D visual effects.

With AMD Embedded R-Series APUs at the heart of Quixant's QX-40 casino gaming controllers, casino game developers are afforded unprecedented gains in graphics performance, power and cooling efficiencies, space savings and multi-display flexibility to help them achieve their most ambitious game design goals. Quixant's "total solution" approach to game system enablement – made possible with help from AMD APUs – allows casino game developers to focus on what they do best – creating innovative, visually-stunning slot machine games.

ABOUT QUIXANT

Quixant is the world's premier company focused exclusively on the design and manufacture of the most advanced PC-based computer systems for the global gaming industry. Based in the UK, Quixant has subsidiary companies in Italy, the United States and Taiwan, with customers in every region of the world. For more information, visit www.quixant.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.



¹ Calculated SP GFLOPs = (# of x86 cores x (128 bit (FPUs) / 32-bit (SP Operation)) * CPU Base Frequency) + (# of shader units * (64 bit (shader) / 32-bit (SP Operation)) * GPU Max Frequency)

² The average power for the 35W TDP AMD R-464L APU when system is running one iteration of 3DMark 06 default run was 12.861 Watts. R-464L testing was performed on an equivalent A10 Series APU. System configuration: AMD A10 2.3GHz 4/1/D, "Pumori" development platform, 4 GB RAM, Windows 7 Ultimate.