

APPLICATION BRIEF

AMD ADAPTIVE COMPUTING IN VIRTUAL PRODUCTION

Advancing Real-Time Immersive Content Creation
From Camera to LED Wall



together we advance_AV

OVERVIEW

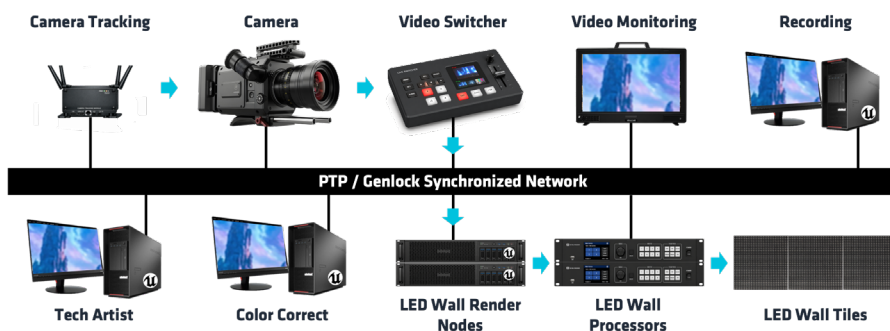
Virtual production integrates digital and physical environments in real time, enabling filmmakers, broadcasters, and content creators to visualize scenes as they shoot. By combining real-time rendering engines, LED volumes, precision camera tracking, and synchronized video processing, productions can capture final-pixel imagery in-camera, dramatically reducing reliance on post-production VFX.

What was once reserved for major film productions is now being adopted by smaller studios, broadcast news, live events, and corporate media, driven by falling hardware costs and maturing standards.

Traditional production pipelines push heavy VFX and compositing work into post-production which is an expensive, time-consuming phase. Virtual production front-loads this effort into pre-production and on-set execution, where real-time engines render environments live and in-camera VFX captures a near-finished frame at the point of shooting. This shift demands a new class of equipment capable of real-time processing at 4K and beyond, sub-frame latency, PTP-synchronized signal chains, and support for emerging AV-over-IP standards, all while meeting the power, size, and cost constraints that OEMs face when designing production-grade hardware.

END-TO-END SILICON FOR VIRTUAL PRODUCTION

AMD is the only vendor offering adaptive SoCs, FPGAs, x86 embedded processors, and discrete GPUs under one roadmap. OEMs can source the core processing, video I/O, codec acceleration, AI inference, and system control from a single supplier with mature toolchains (AMD Vivado™ Design Suite, AMD Vitis™ unified software platform, AMD ROCm™ software) and a 10+ year embedded lifecycle commitment. Compute can sit at the edge, in the core, or both, and the same silicon families re-target across product lines, protecting your platform investment as standards evolve.



KEY BENEFITS

REAL-TIME PERFORMANCE

Scalable hardware-accelerated 4K to 8K+ video processing and graphics rendering for LED wall content.

ULTRA-LOW LATENCY

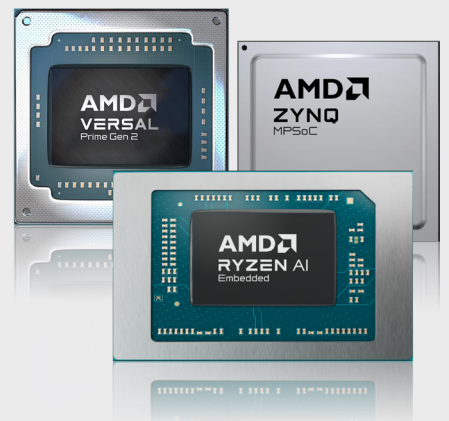
Deterministic sub-frame latency keeps camera, graphics, and LED walls synced for in-camera VFX.

PRECISION SYNCHRONIZATION

PTP and genlock frame-lock cameras, render engines, and LED displays, accelerating certification.

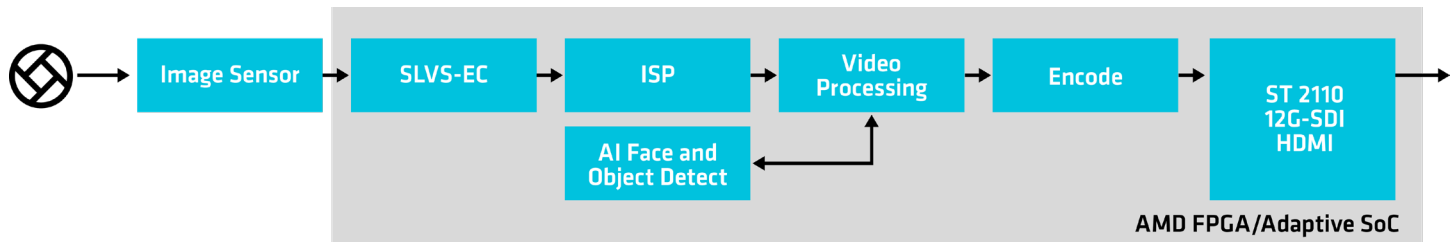
FUTURE-PROOF I/O

Re-target SDI, ST 2110, IPMX, NDI, Dante AV, and HDMI™ in firmware on one FPGA/SoC.



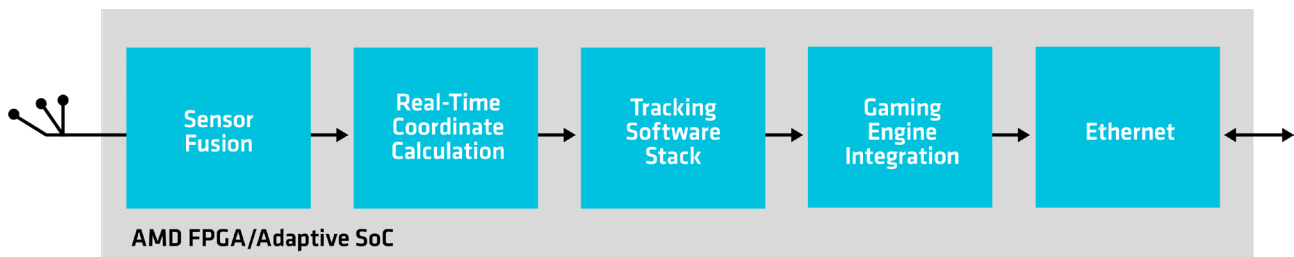
CINEMA CAMERA

A digital cinema camera built on an AMD adaptive SoC runs the entire imaging pipeline on a single chip, from large-format sensor readout and real-time debayer through ISP color science, 3D LUT application, and high-bitrate RAW or ProRes encoding. The programmable logic layer lets the same hardware output ST 2110, 12G-SDI, or HDMI streams, selectable by firmware rather than board redesign, so OEMs can certify one camera platform for IP-based virtual production stages and traditional SDI workflows alike. This hardware adaptability also allows field updates, extending product life and revenue streams.



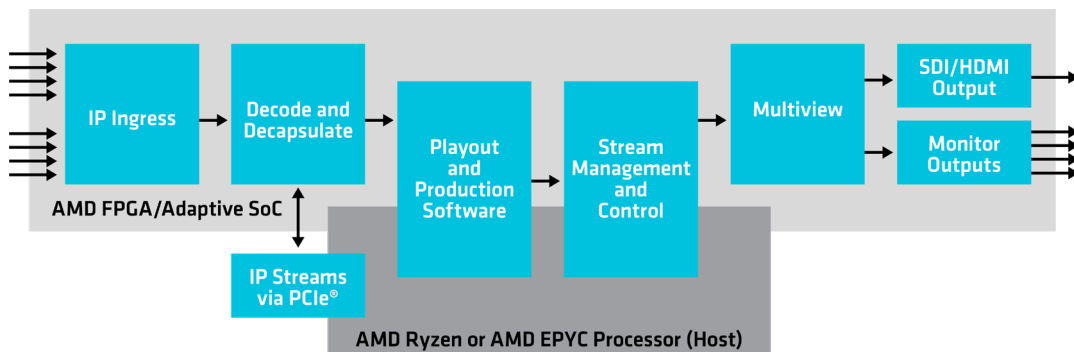
CAMERA TRACKING SYSTEM

An optical or hybrid camera-tracking system built on an AMD adaptive SoC fuses data from multiple sensor sources, including infrared marker arrays, inertial measurement units, and rotary encoders, to compute the camera's precise 3D position and orientation in real time. The FPGA fabric performs sensor fusion and coordinate-space transformations at sub-frame latency, delivering tracking data to the render engine so virtual backgrounds update in lockstep with physical camera movement. A dedicated software stack on the embedded Arm® cores handles calibration, lens modelling, and game-engine integration, streaming low-latency position packets over Ethernet to Unreal, Unity etc. for on-set perspective-correct LED wall compositing.



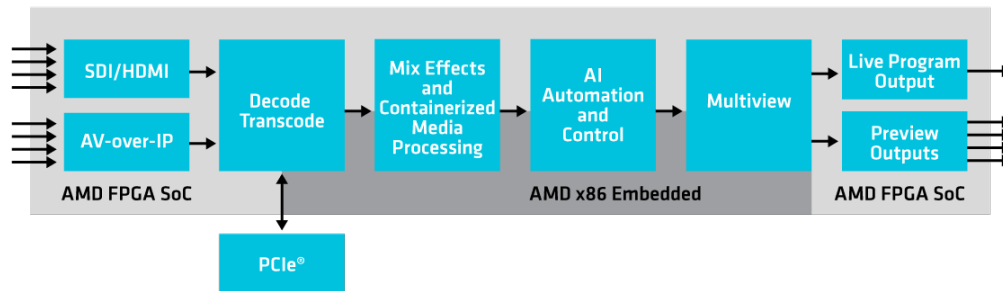
PCIe® AV-OVER-IP CAPTURE CARD

A PCIe add-in card built on AMD FPGA silicon ingests multiple AV-over-IP streams directly into a media server or production workstation, pairing hardware-accelerated decode with AMD Ryzen™ or AMD EPYC™ host processors. The card handles ST 2110, NDI, Dante AV and IPMX de-encapsulation and decompression in the FPGA fabric, delivering uncompressed frames to the host over PCIe with minimal latency. This architecture ties the adaptive silicon to the broader AMD x86 ecosystem, giving system integrators a single-vendor solution from network ingress through to application processing, monitoring, and playout.



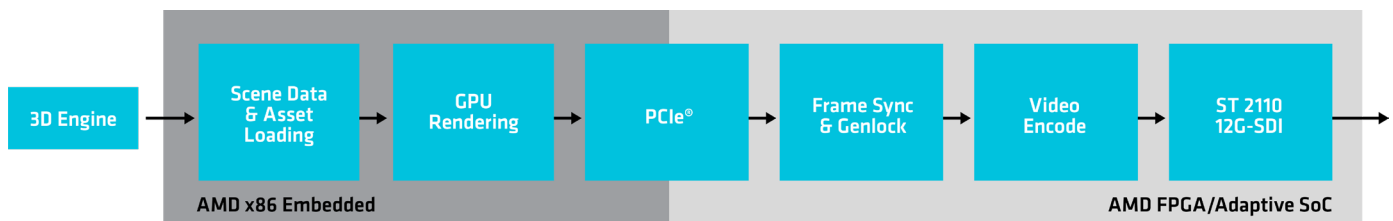
PRODUCTION SWITCHER

The switcher sits at the center of a complex signal mesh, routing live camera feeds alongside real-time render engine outputs, LED wall preview streams, and augmented-reality overlays with frame-accurate synchronization. AMD FPGAs and SoCs perform crosspoint switching, chroma/luma keying, and mix-effects compositing between physical and CG sources, while format-converting between 12G-SDI, ST 2110, and HDMI 2.1 at 4K/8K in real time. AMD Ryzen Embedded processors drive the software control surface, multiviewer monitoring of both on-set cameras and rendered backgrounds, and AI-powered scene automation via the AMD XDNA™ architecture. For large LED-volume stages running multiple render nodes, AMD EPYC Embedded processors support virtualized, containerized switching workloads that scale with stage complexity.



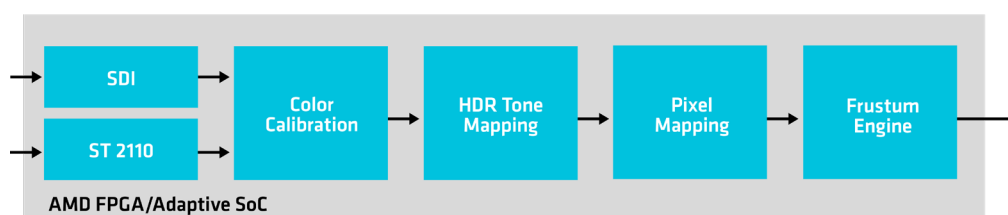
RENDER NODE / MEDIA SERVER

The render node is the computational heart of a virtual production stage, running real-time 3D engines to generate the LED wall content frame by frame. AMD Ryzen or EPYC Embedded processors deliver the multi-threaded CPU performance needed for scene management, physics, and asset streaming, while discrete or integrated AMD GPUs handle real-time ray tracing, global illumination, and final-pixel rendering at 4K or higher. An AMD FPGA-based I/O card captures genlock and PTP timing references from the stage clock and synchronizes the rendered output to the LED wall's refresh cycle, outputting finished frames over ST 2110 or 12G-SDI with sub-frame latency. This tightly coupled CPU-GPU-FPGA architecture lets a single rack-mount server replace what previously required multiple dedicated appliances.



LED WALL PROCESSOR

An LED wall processor bridges the gap between render engine output and the physical LED volume, receiving high-resolution frames over ST 2110 or 12G-SDI from render nodes and mapping them pixel-accurately onto curved or flat LED panel arrays. The FPGA fabric handles real-time color calibration, per-panel brightness and gamma correction, inner/outer frustum blending, and genlock-synchronized frame delivery so the rendered background tracks the camera with zero visible tearing. On-chip pixel-mapping engines remap the rectangular render output to the physical tile geometry of the LED wall, compensating for panel boundaries, rotation offsets, and resolution mismatches. This single-chip approach lets OEMs build compact, low-latency wall processors that scale from small in-studio volumes to large soundstage LED installations without changing the core hardware.



AMD SILICON BENEFITS FOR VIRTUAL PRODUCTION

AMD TECHNOLOGY	OEM BENEFIT
AMD RYZEN EMBEDDED PROCESSORS AMD EPYC EMBEDDED PROCESSORS	• 10+ year supply commitment, broad I/O, and virtualization support let a single vendor cover render nodes, switchers, and control surfaces. • Shared driver and BIOS stack across AMD Ryzen and AMD EPYC Embedded processors that cuts software validation time.
AMD ULTRASCALE+™ FPGAS	• Programmable I/O and custom video processing cut BOM versus fixed-function multi-chip ASSPs. • Re-target one board across various connectivity standards and protocols. • Production-ready partner IP cores for ST 2110, NDI, Dante AV, JPEG-XS, SMPTE 2022-7 and more skip months of RTL work.
AMD ZYNQ™ SOCS AMD VERSAL™ ADAPTIVE SOCS	• Tightly integrated Arm® processing with FPGA fabric and video codecs on one device, minimizing board size and power for compact, rack-friendly switchers, encoders, and LED wall processors.
AMD RYZEN THREADRIPPER™ PRO AMD EPYC PROCESSORS	• A familiar client x86 platform alongside the embedded portfolio simplifies development, validation, and demonstration of full pipelines from the workstation to the stage. • Engineers debug on the desk and deploy on the stage with the same toolchain and drivers, cutting time-to-market on every new product.

NEXT STEPS

For more information on Broadcast AV solutions, visit www.amd.com/broadcastav

For more on Media & Entertainment solutions (content creation), visit www.amd.com/en/solutions/media-and-entertainment.html

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