Performance Validated Hardware

Avoid ‘Plug and Pray’ with a Performance Validated Hardware Platform

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Achieving robust 16/25 gbaud signaling in OpenVPX systems

Keeping a new deployable system on schedule is a constant challenge. Closely related is demonstrating progress to your customer. These hurdles become even higher when software application testing is impacted by problems related to hardware integration. Components that are totally functional on an individual basis will often create system issues when they are first configured together. Signal integrity failures, power draw fluctuations, and thermal hot spots are just some of the common challenges with new hardware configurations.

You need technology vendors that work together to test complete hardware configurations and resolve system issues BEFORE delivery to your team. A truly integrated system delivers seamless connectivity between components, supporting both early application development and on-time delivery of deployable systems.

Technology Partners Committed to Customer Success

At Atrenne, EIZO Rugged Solutions, and Extreme Engineering Solutions, a shared focus on defense electronics drove a collaboration targeting consistently successful systems integration. With decades of design experience, our combined engineering teams work together to configure, test, and modify complete hardware systems.

First, we start with SWaP-C optimized components but re-examine the full system configuration thru that lens. There are many small ways to reduce weight and power draw as design details are worked out, small improvements add up to significant enhancements; our teams have been there before and know what to look for.

When a customer needs advanced computing power from high-end processors, there is an increased focus on efficient and effective cooling. Optimal cooling method choices vary based on the target deployment platform and environmental specifications. Our combined engineering teams are always exploring new cooling methods; recent Air Flow Thru (AFT) cooling advances are just one example.

After the design, there are the hands-on challenges of hardware integration. Many of these issues can be avoided early on, as our engineers know what questions to ask, but some will inevitably arise during testing. Experience is, again, a great resource for making efficient, effective changes during the hardware integration process.

The end result is customer delivery of hardware platforms fully ready to accept application software and operate in a deployed environment.

A Powerful Example of Collaborative Systems Integration

To help new, prospective customers easily visualize the value of an already-integrated hardware platform, we've developed a publicly available example, with three primary components:

1. Atrenne's 717-SM full ATR chassis – This rugged, AFT enclosure has a seven-slot 3U VPX backplane and an integrated power supply.

2. EIZO's Condor GR2-RTX5000 GPGPU processing card – Based on NVIDIA™ Turing™ architecture and the NVIDIA RTX™ platform, this new 3U VPX module incorporates one of the most powerful CPUs currently available in the rugged market.

3. XPedite8672 SBC from Extreme Engineering Solutions – Using an Intel® Xeon™ processor, this mature SBC, running a Linux RTOS, provides general-purpose computational performance and highly flexible I/O functionality.

A Secure, High-performance Single Board Computer

The rugged 717-SM ATR chassis supports deployed applications in the harshest environments. Its tightly sealed enclosure uses conduction to move heat from computing components to the sidewalls. Within the sidewalls are plenums (air-moving chambers); exhaust fans pull outside air over heat dissipation fins in the plenums. This air-over-conduction cooling approach, often called AFT, efficiently removes elevated levels of thermal energy from the system without exposing critical electronics to dust, smoke, or corrosive conditions.

Operating across an extended temperature range and at altitudes up to 50K ft., the 717-SM truly is deployable on a broad range of air, land, and sea platforms. Resistance to shock and vibration (MIL-STD-810G) further defines its rugged characteristics. A 7-slot, 3U VPX backplane enables highly flexible configurations, including SBCs from Extreme Engineering Solutions and powerful processing cards from EIZO Rugged Solutions and proprietary modules developed by customers.

Industry-leading Processing Power in a 3U VPX Form Factor

The Condor GR2-RTX5000 uses the NVIDIA Quadro RTX 5000 GPU to deliver market-leading GPGPU computing performance. This powerful, highly parallel compute engine comprises 3072 CUDA® Cores, 384 Tensor Cores, and 48 RT Cores, delivering a combined total of 9.39 TFLOPS in FP32 Single Floating-Point Performance. Based on MMX technology, it is MIL-STD-810 compliant and designed for deployment in harsh environments.

This unprecedented level of embedded processing power in a rugged package means new, AI-enhanced applications, such as Cognitive Radar and Cognitive EW, can move to the tactical edge. With multiple output configurations, the rugged 3U VPX card offers I/O customizations with options that include DisplayPort++, Single-Link DVI-D, and VGA using EIZO Rugged Solutions' Adapt video converter.

The module's GPUDirect® RDMA implementation offers fast data transfer/communication from connected hardware, such as FPGAs and switches, directly into GPU memory. This avoids unnecessary memory copies and CPU overhead, resulting in minimal latency. Multiple precision modes, such as FP64, FP32, FP16, INT8, INT4, and INT1, enable up to 32X throughput compared to previous generations, enabling advanced capabilities like AI de-noising. The module also delivers real-time performance for encoding applications with dedicated H.265, and H.264 encode and decode engines.

EIZO Rugged Solutions continues to bring to market new, powerful computing modules, implementing the latest rugged GPGPU technology

A Secure, High-performance Single Board Computer

The Xpedite7672 is a 3U VPX SBC based on the Intel® Xeon® D-1500 family processor. It provides up to 16 Xeon®-class cores in a single, power-efficient System-on-Chip (SoC) package, with native extended temperature support for up to 12 core count SKUs. The XPedite7672 was designed for defense applications requiring maximum data and information protection.

Extreme Engineering's product portfolio provides customers with a choice of SBCs ready for deployment. Most of these integrate SecureCOTS™ technology with a Microsemi SmartFusion®2 security SoC for hosting custom functions to protect data from being modified or observed, providing an ideal solution when stringent security capabilities are required.

A Validated Hardware Platform, Optimized for Your Program

The system described above is just one example of the validated hardware solutions available from the Atrenne-EIZO-Extreme collaboration; they are all deployable application platforms where any integration issues have already been addressed. For example, Atrenne's signal integrity experts ensure that components work together seamlessly at today's high signaling rates. They also address any system hotspots with adjusted airflow or advanced conduction cooling techniques.

These validated platforms also deliver high- performance integration between SBCs and GPGPU cards. The EIZO and Extreme engineering teams work together, creating sample environments with various software stacks to discover and resolve inter-operational issues. Examples include PCIe negotiation and memory allocation, system reset handling, and power state change spiking; all of these, and more, are resolved before system delivery to a customer.

Most programs face a tight development schedule. By starting with a customized, SwaP-C optimized, and validated hardware platform, your program can focus on application development and testing. Our combined engineering teams, working together, handle the hardware integration, so your team will avoid the 'plug and pray' risks that can ruin a development timetable.

Engage With Our Design Teams

At Atrenne, EIZO, and Extreme, we've learned that all our innovations are complemented and enhanced by collaborating with our customers to solve problems. We see close cooperation with technology visionaries, program managers, and engineering teams as key to getting the maximum value from our hardware platforms.

Engage with our combined team to explore how they can meet your most demanding embedded requirements and help move your programs forward. We take pride in working collaboratively with each other and our customers on product integration to ensure that every program is a success.

About EIZO

EIZO Rugged Solutions is a leading manufacturer of high-performance visual technology for Command, Control, Communications, Computers, Cyber, Intelligence, Surveillance, and Reconnaissance (C5ISR) applications. Having been in the video electronics market since 1987, EIZO has a broad product range including rugged LCD monitors, open architecture embedded GPGPU hardware, H.264/265 video encoders, and other stand-alone video splitter and adapter accessories. Our commercial off-the-shelf (COTS) electronic hardware solutions are used in a variety of applications including video capture and display, GPGPU computing, video encoding, streaming, video conversion, Artificial Intelligence (AI), Machine Learning (ML), multi-sensor processing and video stitching for 360° situational awareness.

Our goal is to develop SWaP-C optimized cutting-edge technology that exceeds customers performance expectations and deliver robust solutions that support the continuous operation of mission-critical applications. From designing board level graphics processing units (GPUs) and high compression encoders to FPGA targeted special graphics/imaging algorithms, EIZO Rugged Solutions offers industry knowledge and product customizations designed to meet the needs of your project.

Build Your Application on SWaP-C Optimized Hardware

SWaP-C has always been important, but now, as C4ISR systems move out to the tactical edge, it is absolutely critical. While system developers face a host of other challenges, SWaP-C is an issue that can be dealt with early on by starting with a hardware platform that is already SWaP-C optimized.

To make that optimization happen, our engineering teams use a range of design approaches and techniques. It's useful to look at those in terms of the individual SWaP-C variables.

Size

Atrenne offers chassis across the full range of standard form factors, including Mini-ITX, 3U-VPX, 6U-VPX, ½ ATR, and full ATR; we also create custom chassis. Customers will always get the right-sized chassis for their deployment platform.

EIZO Rugged Solutions optimizes system size by maximizing card processing power with the latest GPU technology. We also pack maximum functionality into each of our interface and frame grabber modules. Customers get the computing functionality they need with fewer cards; reducing the system card count means smaller chassis can be used.

Extreme Engineering Solutions puts maximum capability into each single-slot SBC. We select appropriate processors from the latest Intel technology, then implement enhanced security features.

Weight

Chassis weight is greatly affected by the selected cooling method; conduction-cooled chassis simply weigh more than equally sized air-cooled chassis. However, Atrenne's innovative design techniques can still deliver significant weight reductions. For example, we've reduced the amount of heat conduction material on some airborne systems by using heat exchangers that transfer thermal energy to flowing jet fuel. For air-cooled systems, we've used aluminum alloy 3D printing to create chassis incorporating lattice structures with outstanding strength-to-weight characteristics.

EIZO's and Extreme's impact on system weight parallel's our reductions in system size. By maximizing the capability of each system card, we reduce the card count, cutting weight.

Power

Power is the converse of weight for chassis, as air-cooling needs power for fans and conduction-cooling does not. Many Atrenne chassis designs minimize fan power draw by guiding airflows over hot spots for maximum thermal transfer efficiency. Others use ATF to combine the best characteristics of air- and conduction-cooling.

EIZO Rugged Solutions optimizes system size by maximizing card processing power with the latest GPGPU technology. Reducing the system card count means smaller chassis can be used.

Extreme Engineering Solutions provides options that let designers choose the lowest power SBC appropriate for an application. For example, if a system uses multiple high-end GPGPU cards, the SBC probably does not need an onboard GPU.

Cost

The validated integration provided by the Atrenne-EIZO-Extreme collaboration has a huge impact on customer costs by shrinking development schedules. Application development can start on time, avoiding the risks and schedule impact of the 'plug and pray' approach.

Atrenne
A Celestica Company

For more than 50 years, Atrenne has been designing and manufacturing rugged electronic packaging, chassis, backplanes, and integrated assemblies. We are proud to provide customers with fully tested, reliable, electromechanical solutions on-schedule and with world-class quality Our mission-critical and performance-critical embedded computing platforms are currently deployed in over a hundred programs, operating reliably in the harshest environments.

EIZO

EIZO Rugged Solutions is a global leader in rugged, high-performance embedded video and sensor processing solutions for C5ISR, EW, and tactical edge systems. Our solutions set the standard within the defense market for HPE graphics, GPGPU processing, video capture, and displays, all MIL-STD-810 compliant and manufactured in the USA. We understand the importance of SwaP-C, product reliability, and supporting extended product life cycles.

X-ES

Extreme Engineering Solutions

Extreme Engineering Solutions (X-ES) is a leader in rugged and highly secure embedded computing, with boards 100% designed, manufactured, and supported in the U.S. Their proven designs, from COTS to fully custom solutions tailored to a program's precise specifications, utilize the latest technology and are ideal for the uncompromising demands of mission-critical applications where size, weight, and power (SWaP) take priority. Purpose-built for maximum reliability in the face of unique environmental challenges, X-ES products continuously deliver where others can't.

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