Low-Power Server Combines Efficiency with Durable, Mobile Performance

XENON* Systems developed an innovative and unique small form factor server as part of SenSen Networks'* real-time video analysis solution. The high-performance server uses only 100 watts and features Intel® products and technologies—bringing high reliability, mobility, and low maintenance requirements to demanding usage environments.

Parking enforcement vehicles like this one perform real-time video analysis thanks to small form factor, high-performance servers developed by XENON* Systems and SenSen Networks*.

With over 1 billion motor vehicles traveling the roads worldwide, and this number projected to double over the next 30 years, discovering ways for municipalities to keep traffic moving safely and streamline parking enforcement has become more important than ever. Thankfully, real-time video analytics has gone mobile, and offers a new path towards better vehicle safety and highly efficient parking enforcement.
Not Your Typical Server

Seeing an opportunity to bring real-time video analytics to an in-vehicle form factor, high-performance computing specialist XENON* Systems of Australia and Video Business Analytics (VBA) innovator SenSen Networks* developed a custom, flexible server solution. This novel server platform met the significant performance demands of real-time video analytics, while still providing the efficiency and durability required for demanding mobile and in-the-field-type environments.

Uniquely Demanding Usage Scenarios

The solution required a server able to handle various usage scenarios, including roadside gantries for traffic enforcement and in-car servers for real-time parking surveillance. Desired qualities included portability, a small form factor, low total cost of operation (TCO), low power usage, high durability, and high performance. Servers would need to be sufficiently rugged to withstand both the temperature swings associated with enclosed outdoor environments as well as the bumps, impacts and temperature swings of an in-vehicle environment. In both scenarios, limiting both power consumption and heat production was essential.

Extended Lifecycle Vital

XENON Systems and SenSen Networks also required hardware able to support wide-ranging development requirements—allowing for simple, streamlined maintenance, upkeep and product refresh cycles. Seeking hardware capable of meeting their usage needs, XENON Systems evaluated a number of technologies and components, but decided on Intel technologies and components including the low-voltage Intel® Xeon® Processor E3-1220Lv2, Intel® ST1200BTSR microATX Server Board, Intel® Solid-State Drives 520 Series and an Intel® RS2BL040 4-Port SAS/SATA 6Gb/s RAID Controller. By incorporating multiple Intel components into their configuration, XENON Systems and SenSen Networks gained flexibility to support seamless platform refreshes in the future and the confidence of using components pre-validated for seamless operation and integration.

Server Solution Requirements

- Low heat production
- High-efficiency operation (≤100 watt power budget)
- High durability/superior environmental resistance
- Performance sufficient for real-time video analysis

The server solution developed by XENON* Systems and SenSen Networks* balanced performance and sub-100 watt platform efficiency.
SenSen Networks* and XENON* Systems

As a global video and business analytics solutions provider, SenSen Networks’ systems convert images gathered through real-time video analytics into accurate data—effectively increasing safety, security and financial performance for local municipalities. With a solution able to merge and cross-correlate data gathered from multiple cameras and other sensors, SenSen’s technologies provide a highly effective response to public traffic safety and law enforcement challenges. XENON Systems, with a commitment to innovation and expertise in creating unique, custom-built, high-performance computing solutions, was asked by SenSen Networks to develop a cost-effective server offering scalability, outstanding performance, simplified management, and flexibility.

“There’s significant potential in combining off-the-shelf components with real-time video analytics to create an inventive, long-lasting solution. The latest technologies combined with SenSen proprietary video analytics technologies allowed us to exceed our performance requirements with a server solution capable of withstanding rigorous environmental demands.”

Dragan Dimitrovici
Chief Executive Officer
XENON* Systems

100 Watt Server Enables Real-Time Video Analytics

The resulting hardware solution had an overall cross-platform power usage of fewer than 100 watts—enabling it to be powered by passive solar in roadside gantries. Robust performance enabled by the low-voltage Intel Xeon processor-based server handled the demands of real-time video analytics algorithms, while a 350mm chassis depth enabled the platform to fit comfortably within confined environments—like the trunk (boot) of a car.
A significant challenge in delivering a server solution within a constrained power budget was processor selection. Low total heat output would eliminate the need for case fans through passive heat sink cooling while freeing up valuable watts for other components. After evaluating their options, XENON Systems decided on the Intel® Xeon® Processor E3-1220Lv2 with an architecture based on Intel's advanced 22-nanometer technology. Significant I/O enhancements and Intel® Turbo Boost Technology 2.0 provided intelligent performance-per-watt to match constantly shifting computing demands.

“After evaluating multiple hardware components for their performance throughput and resilience in extreme environments, we selected a low-voltage Intel Xeon processor, Intel Server Board, and Intel Solid-State Drives—as these components provided the best fit given the unique nature of this mobile platform capable of real-time video analytics.”

Dragan Dimitrovici
Chief Executive Officer
XENON® Systems

Balancing Performance and Efficiency
The Intel Xeon processor also complied with strict power usage limits dictated by the usage scenarios. In all, the car and roadside server platforms had to consume no more than 100W in total. This total power budget included the processor, graphics card, RAID controller, and server board. With a low 17 watt Thermal Design Power (TDP), the Intel Xeon processor did its part in keeping the total power usage low. This also ensured that a UPS backup could keep the server up and running for a minimum of 30 minutes in the event of a power outage.

In-house research conducted by XENON Systems showed that the Intel Xeon processor, at 2.2 GHz, was more than capable of handling the real-time video analysis of the solution. When coupled with the platform's discrete graphics solution, the low-voltage Intel Xeon processor handled real-time video analysis better than any of the CPU alternatives evaluated.
Additional Intel® Technologies Complete the Solution
After evaluating multiple server boards from different vendors, XENON Systems decided on an Intel® Server Board S1200BTS in the microATX form factor. Selection of this board addressed both physical and technological constraints—including fitting within a small 2RU Server housing while supporting both a discrete GPU and SenSen Networks video capture cards. To top it all off, Error-Correcting Code (ECC) Memory enabled greater uptime and superior platform reliability unavailable with non-server alternatives.

Solid-State Storage: Reliability Plus Storage Throughput
Due to the performance requirements of real-time video processing and analysis, significant data throughput was vital to the server platform. After evaluating their options, XENON Systems decided to move beyond traditional hard disk drives and chose the Intel® Solid-State Drive 520 Series. These reliable, high-performance drives provided an optimal choice—combining superior storage throughput with the durability enabled by data storage with no moving parts. The SATA-III interface of the Intel SSD combined with the SATA-III interface of the Intel Server Board provided optimal I/O throughput and better overall performance.

Data Redundancy Essential
Another consideration was data redundancy. Choosing the best compatible card with Linux Fedora* 13 (with an eventual move to Linux Ubuntu 12.04 in mind) was crucial in replicating and protecting stored data against errors or possible failures—especially for platforms far-removed from IT support. After conducting an in-depth product comparison, XENON Systems found that the Intel® RS2BL040 PCIe SAS/SATA 6Gb/s 4-Port Internal RAID Controller provided the best option for the solution. Out of the box, the Intel RAID Controller offered better compatibility with Fedora Linux 13 and was compatible with Ubuntu 12.04 Linux—allowing for a seamless transition to the Ubuntu operating system in the future.

Solution Components
- Intel® Xeon® Processor E3-1220Lv2 2.2 GHz
- Intel® Server Board S1200BTS microATX
- 240 GB Intel® Solid-State Drive 520 Series (x3)
- Intel® RS2BL040 4-Port SAS/SATA 6Gb/s RAID Controller

Cutting-Edge Technology With Unlimited Potential
The versatile, innovative server solution created by XENON Systems was successfully implemented in multiple environments—including roadside gantries for traffic enforcement and in-car servers for real-time parking surveillance. Deploying the compute-intensive algorithms used in the real-time video analysis would not have been possible in a mobile format until recently with the help of multiple Intel products and technologies—chosen for their long-lasting, reliable and high-performance capabilities. The powerful, portable server solution allowed for maximum efficiency, excellent performance-per-watt, minimal maintenance and an extended product lifecycle. With this new, state-of-the-art server configuration in place, SenSen Networks can take flexible servers supporting real-time video analysis into entirely new—and uniquely demanding—environments.