



High Performance Industrial Engines Pioneer New Server-Class Applications

Commitments to Longevity and Consistency Extend Smart Xeon®-Based Design to Diverse Industrial Workloads



Introduction

With inherent challenges to maintaining longevity and consistency in system production, the industrial channel has historically been unable to pair server-class performance with a long-life system. High performance industrial engines from Corvalent solve this design limitation, embracing Intel® Xeon® technology in an application-ready, customizable server-class design with guaranteed production and availability of five to seven years. Illustrated by application examples such as medical imaging, security and surveillance, and cloud and data center processing, this white paper will highlight the broad design value these long-life systems newly enable for industrial OEMs and application developers. High-end industrial platforms can now capitalize on greater performance without restrictions of longevity and consistency – reducing costs and development resources while improving time-to-market.

Bringing Intel® Xeon® performance to the industrial channel

Industrial embedded systems must balance price, performance and system longevity, creating a right-sized solution suitable for long-life performance in demanding environments. This creates a unique set of challenges for industrial OEMs and application developers, often faced with sacrificing longevity by using commercially available workstation products to accommodate ever-increasing performance and storage needs. At the same time, traditional server products may create a competitive imbalance, offering longevity but reducing price vs performance value with a raft of costly and often unneeded certifications. Xeon®-based versions of these systems have also been considered too costly in contrast to Intel® Core™ i7 designs, enhancing performance but adding complexity in development required to fully capitalize on dual-processor capabilities.

To date, the industrial channel has had no such solution that could address all these challenges in a cost-effective, long-life system. To fill this void and maintain longevity as a core design principle, Corvalent is introducing CorServer, a long-life server-class product family as a more thoughtful and market-focused option. CorServer's Xeon® performance is customizable for unique and demanding applications, and its system longevity is guaranteed for a minimum of five years. Together these considerations create a new path for OEMs and application developers in the industrial realm – enabling server-class performance for data-intensive workloads and connected, intelligent systems.

Comprehensive, server-class design informed by real-world applications

More reliable and functional than a commercial controller deployed at the source, CorServer's dual-processor performance is optimized for Internet of Things (IoT) and industrial number crunching applications. Many of these are storage-heavy applications that benefit from a high performance server-class platform, eliminating bottlenecks and better enabling real-time processing of data. These data-intensive applications gain an operational advantage with more advanced data management close to the source, for example reducing challenges of latency and bandwidth by transmitting processed, encrypted files rather than massive amounts of raw data.

A key advantage in using CorServer as an application-ready system is that most Corvalent products are fully custom designs, supporting OEMs and application developers with features for competitive, mission-critical systems. Motherboards, chassis and peripherals are custom-built to ensure

performance requirements in a long-life product, a design process that builds on Corvalent's expertise in all major embedded markets. Development of the CorServer product family is informed by this knowledge, and provides a complete solution proven to industrial needs and standards. Server board and chassis are optimized to work together, while the cabling layout enables airflow supported by low-noise internal fans. Applications in Big Data analytics, real-time medical imaging, cloud or data center computing, security and surveillance, and more can be developed using cost-effective, long-term deployable solutions that were not previously available.

Why haven't Xeon® platforms been used in the industrial channel before? Designed for architecting next-generation data centers, Xeon® processors are optimized for software defined infrastructures. These environments must be supercharged for efficiency, performance, and delivery of agile, real-time services via both cloud-native and traditional applications. Absent longevity and consistency, these high-end systems were considered cost prohibitive to design from the ground up. Although versatile in supporting workloads for cloud, high performance computing, networking and storage, Xeon®'s dual-processor technology was less familiar to many developers, meaning they often were unable to fully capitalize on performance advances without extending development costs and time to market. CorServer packages rugged board and chassis into a smart, configurable design, in turn removing obstacles such as short production life, cost, and complexity.

Discovering why and when to adopt server-class value

CorServer systems are server-class, offering a dual-processor platform with no unnecessary third-party hardware certifications. For developers, this smart approach reduces costs while ensuring performance with industry operating systems and advances such as Error Correcting Code (ECC), optimized thermal dissipation, and more robust remote access management.

Dual-processors, multi-threads

Xeon® technology brings a new opportunity to developers working with Core™ i7-based systems, representing a significant performance jump for long-life industrial systems. Applications that take full advantage of Core™ i7 performance are limited to a single multicore processor; Xeon® allows developers to optimize processing speed and compute functions, sharing resources for significantly improved overall performance.

This may be critical for certain applications currently using a dual server; they may be pushing the boundaries of performance, for example a medical imaging system that requires massive compute power to render high resolution images quickly. By using a server-class platform such as CorServer, the

hardware may divide the computing task in two, minimizing pressure on any single processor. Depending on the operating system and primarily the application itself, two CPUs can divide computing resources for notable performance improvements. While some developers may opt for application re-design to gain leading edge performance specifically intended for dual processors, others will find compelling performance advantages simply by using the dual-processor platform to scale up performance for single-node applications.

Xeon® E5-2600 processors also integrate Intel® Hyper-Threading Technology (Intel® HT Technology), enabling multiple threads to run on each core. Working with Intel Turbo Boost, processing dynamically adapts to the workload at hand and processes multiple threads simultaneously. Inactive cores are automatically disabled and throughput is increased on busy cores, resulting in improving overall performance for threaded applications. For developers and OEMs, this means that compute tasks are more efficient – systems can run the most demanding applications while remaining highly responsive, and also maintain headroom for growth and new capabilities.

Gaining an operating system advantage

In contrast to standard workstations or high performance desktop systems, server-class systems typically operate with a greater range of operating system (OS) options. These can include Windows, Linux and VMWare, as well the newest real-time operating systems (RTOS) such as Red Hat's Enterprise MRG Realtime; MRG allows developers to fine-tune application performance, for example implementing CorServer for applications that require highly deterministic, low latency responses to events. These options ensure high reliability, and also enable a stronger data storage and management infrastructure. A data center deployment illustrates this server-class advantage; an optimized, industrial OS would be required for critical applications of data management and storage, providing tools and performance necessary to manage RAID interfaces, drives and data.

High reliability with Error Correcting Code (ECC)

ECC distinguishes server-class performance by detecting and correcting the most common single-bit data corruptions found in industrial computing. Together, memory and chipset components are able to detect and actually repair the defect, preventing system failure for mission-critical applications. End-users are assured that memory is healthy and running at optimal performance, a feature absent in standard workstation and industrial PC products.

At the same time, not all ECC capabilities are the same. Xeon®'s robust ECC uniquely supports ECC RAM – this enhances Xeon®'s support for DDR4 memory, based on a greater range of available clock speeds and timings, reduced power consumption and latency, and higher memory bandwidth. DDR4

also uses lower voltage than DDR3, creating a follow-on advantage with a reduction in DRAM power dissipation.

Optimized thermal dissipation for rigorous deployments

CorServer is designed for optimal thermal functionality, in contrast to standard workstations or industrial systems. Thermal architecture has been considered from the ground up – capitalizing on Xeon® advancements as well as smart overall design to ensure reliability and high availability. Redundant, low-noise fans provide optimal airflow throughout an intelligently engineered cabling layout, which can also be further ruggedized via application customization.

More robust remote access management

Xeon® E5-2600 processors also integrate version 2.0 of the Intelligent Platform Management Interface (IPMI) specification, developed to reduce costs while advancing improvements in server management. IMPI defines common interfaces – for example enabling receipt of status alerts, delivery of instructions to industry-standard servers, and executing diagnostics over a network instead of localized at the server; this equips IT managers with consistency in managing multi-vendor environments. Advancements in IPMI 2.0 are compatible with earlier versions, and introduce enhanced security, remote access, and configuration capabilities that extend remote management capabilities even further.

CorServer capitalizes on IPMI 2.0, allowing flexible customizations for remote access management and network configurations. For example, more advanced login and configuration options can enable access rights tailored to the end-use facility. Implementation is cost-effective, ensuring flexibility and protecting low cost server deployment. End-users in the field have even more robust troubleshooting capabilities, and can run diagnostics on a bigger scale.

CorServer's redundant power supplies also interact with Xeon®'s remote management tools to maintain awareness of system status. Rated for high reliability as part of a server-class design, they are more robust than those integrated into workstation or desktop products; if performance alarms are sounded, they enable flexibility for hot swap performance as needed.

Capitalizing on Corvalent's longevity infrastructure

Where workstation products might have even been out of production by the time an application was fully developed, CorServer is based on longevity. Developers and OEMs have more time to develop software applications, taking full advantage of the system's high performance, reliability and long-term availability.

System longevity is a core design principle for Corvalent, driving customer relationships and custom product development. Internal processes support a unique and highly flexible materials planning program, enabling product longevity like no other embedded platform provider. As a result, developers reduce time-to-market with high performance systems produced consistently over a period of years. Corvalent also owns the technology that goes into its products, eliminating compatibility issues that can arise when disparate components are used to create a system.

Assuring that systems are produced and available for more than five years is integral to Corvalent's overall business model, and a key differentiator in application-ready, customizable systems for industrial deployment. CorServer's server-class design is backed by this five to seven year consistent supply guarantee, made possible through a combination of partnerships and design commitments. While Corvalent uses only server-class processors and chipsets on Intel®'s embedded roadmap, company control of board and system design extends longevity even further. Industrial developers and OEMs can maintain the highest performance, reliability, and availability possible on an industrial controller.

Reducing costs through longevity

A single Intel® Core™ i7 processor may not provide enough performance for applications such as data management or data acquisition; at the same time, a Xeon® dual-processor platform may not offer the consistency and longevity required for long-term deployment. When a Xeon® high performance platform is required but unavailable without a longevity commitment, developers could find themselves spending thousands of dollars in re-qualifying their platforms every two to three years. Engineering resources are wasted in this process – redesigning systems and software, gaining new regulatory approvals, creating updated internal documentation, and more. It may even be prohibitive to design new products due to this daunting process. CorServer solves the challenge by bringing long-life Xeon® performance to the server-class realm.

Industrial applications demonstrate server-class value

CorServer platforms are inherently flexible, ready to handle additional controller cards for industry-specific applications. For example CorServer's expansion slots could be combined with a high-end video card, opening up application options such as animation, or real-time data acquisition or image rendering. Two processors with memory redundancy on the hard drive improve speed; when coupled with a powerful add-on video card, the system becomes a high-powered GPU workstation.

Developers can avoid commercial controllers, relying on Corvalent's flexible customization to meet the data-intensive demands of critical applications.

Execute Big Data analytics at the edge

Time-sensitive analytics require that both the application and high performance storage exist in close proximity. Corvalent's Xeon® server-class platform enables this type of meaningful Big Data analytics by allowing applications to process data at the edge. With up to 22 cores per CPU, larger cache, and faster memory, data processing is as much as 47 percent faster than earlier generations of Intel® processors. By handling analytical number crunching close to the source, only results are transmitted – this reduces the strain on data processing that comes with uploading massive amounts of data. This will be critical as companies continue to invest in Big Data analytics, as processes are likely to become even more data intensive. Future applications could include measuring, analyzing and interpreting streaming content for real-time video analytics, with systems such as CorServer handling video search indexing, digital surveillance or automated advertising that reacts to different situations detected.

Improve patient diagnosis with real-time medical imaging

Improvements in imaging enable healthcare decisions based on the best possible patient information, as practitioners access and shared patient records in real-time. Affordable, compute-intensive systems must be optimized to handle ever-increasing image quality requirements, yet function within power budgets that enhance overall system performance. Paired with the Intel® C612 (DH82029) chipset, dual socket Xeon®-based performance is ideal for applications requiring extreme image quality coupled with 3D spatial and temporal resolution. Diagnostic processes such as 2D x-rays, 3D/4D CT (computed tomography) scans, or high-resolution MRIs (magnetic resonance imaging) are not only executed quickly but also accessed faster by networked practitioners. By implementing a medical grade graphics card, CorServer can handle the entire workload of processing, storing, and sharing files in real-time.

Training and simulation

Training and simulation applications require a huge amount of compute horsepower, with advances in augmented and virtual reality (AR/VR) driving new performance expectations. The industry is also evolving toward “training as a service” – where elements such as compute processing, storage, and image rendering are considered flexible building blocks, enabling options ranging from instructor-led or desktop training to immersive, full mission simulations. By centralizing performance, for example using a system such as CorServer to deliver both storage and image rendering, developers can reduce hardware footprint and costs while ensuring trainees have access to point-of-need training. These are key advantages in meeting industry requirements, particularly in military settings where system

longevity is of paramount importance. Systems are deployable for five or more years, and capable of handling graphics that are continually evolving to represent increasingly diverse threats and missions.

Handle diverse cloud and data center workloads

Developers working with cloud-based applications will see added value from a high performance Xeon®-based system such as CorServer, now capable of executing all compute processes on a single platform. Developers and OEMs can handle diverse media needs right from the data center, tapping cutting-edge graphics performance per watt and efficient rendering in the cloud. Performance is optimized for graphics-intensive workloads such as video transcoding at scale, 3D CAD, and animation applications.

Data center OEMs also gain a power consumption advantage, tapping Xeon®'s enhanced energy efficiency and performance to help reduce operational costs. Real-time power awareness and load balancing, ability to optimize rack density, energy reduction at the server level all add essential value in reducing operating costs and increasing overall efficiency.

Ensure quality and speed of video processing for broadcast applications

As video streaming services proliferate, including live services in a variety of applications, developers and OEMs must deliver systems capable of handling continued performance expectations. HD (hi-def), UHD (ultra hi-def), FHD (full hi-def), 4K, 8K, and even 360-degree cinematic processing demand compute power that supports broadcasters with the necessary horsepower but also ensures a great end-user experience. Xeon®-based systems such as CorServer enable a competitive edge for multimedia providers, creating advantages in the speed, quality, efficiency and security of video and image data. Processors in the Intel® Xeon® E5-2600 family have been documented to deliver a 23 percent improvement in 4K processing compared to earlier generations. Higher bandwidth and increased core count readily handles video processing workloads with significant memory access demands and computing requirements.

Crunch numbers at the source for critical security and surveillance applications

High performance and reliability is essential to enable digital video recording, a sophisticated application that relies on high-end number crunching executed in real-time. Systems may grab images, upload them to a connected or cloud interface, and store and manage data for analytics, satellite image analysis, or situational awareness; these tasks may happen simultaneously or in multiple locations that rely on immediate data access and sharing. CorServer enables high performance data

management at the source, or where the system's cameras are physically located. High resolution images are processed locally instead of uploading raw data, reducing size of encrypted files and eliminating data bottlenecks. With high performance storage on site, end-users also have better control of mission-critical data that may be sensitive to latency or have deeper requirements for compliance or privacy guidelines. Broader advantages are compelling as well – maintenance staff can be reduced or refocused on more strategic technical activities, data reliability and security is enhanced, and data access is accelerated.

Breaking new ground in long-life application development

CorServer provides a new foundation for developing competitive, high performance products; with compute and graphics processing optimized for connected applications, developers have a new advantage in creating intelligent systems for industrial embedded markets. Systems are supported with Corvalent's extensive engineering customization and support, assuring the performance and high reliability required for mission-critical embedded computing environments.

As connected systems grow across the range of embedded markets, dual-processor performance is needed for more and more applications. Long-life server-class options can make a competitive difference, getting your product to market quickly with proven performance, longevity and consistency of production.

Call 888-776-7896 or contact us [here](#) to learn about how CorServer can support your industrial application.