Solution Brief

High-Performance Embedded Computing
COM Express® Modules

SECO COM Express® JULIET Pushes Performance, I/O, and Network Bandwidth for Edge Applications

Enabled by the Intel® Xeon® D-1700 processor, SECO JULIET brings across-the-board improvements to COM Express® modules for more flexibility and modularity in embedded computing.

"Our new enablement on COM Express® Type 7 offers customers a quick approach to boost performance, providing extra I/O interfaces, PCIe 4.0, more bandwidth with improved latency, and features not available in earlier-generation products such as Time-Sensitive Networking and advanced security tech such as Intel® Total Memory Encryption [Intel® TME]. Simply put, customers can do more with the JULIET COM Express module and Intel® Xeon® D-1700 processor."

—Davide Catani, CTO of SECO

Consumer electronics, connected vehicles, robotics, and 5G telecommunications are driving continual growth in the embedded computing market, which is expected to grow at a compound annual growth rate (CAGR) of 8.7 percent to reach a valuation of USD 67.29B by 2027.[1] Enterprises across all industries are looking to ramp up production to meet growing global demands, with an eye on delivering increased compute performance and higher network bandwidth to handle increasingly demanding use cases at the edge.

Challenge: Multiple industries, specific requirements

While industries share similar edge computing needs, they also have specific requirements. Use cases such as automated defect detection rely on sensors and machine vision–enabled cameras for accurate inspection. Embedded computers on an assembly line need to consolidate motion controllers, various types of sensors, and accelerators into an easier-to-manage platform. In aerospace and public sector applications, agencies need portability, ruggedness, and low-power designs. Edge servers in telecommunications likewise must withstand outdoor conditions and maintain service-level agreements (SLAs) for uptime and data throughput. To help meet these needs, solution providers need a flexible edge computing platform that delivers performance and provides a strong foundation for customization.

Up to **2.32X** faster CPU performance[2]

Up to **5.73X** faster AI inferencing[3]

Intel® Xeon® D-1746TER processor vs. previous-generation Intel® Xeon® D-1539 processor

For workloads and configurations, visit intel.com/PerformanceIndex. Results may vary.

Solution: SECO JULIET COM Express Basic Type 7 module with Intel® Xeon® D-1700 processors

The SECO JULIET COM Express module with the latest-generation Intel Xeon D-1700 processors provides customers access to the next level of processor performance, memory capacity, and PCIe connectivity at the edge. Widely accepted across all industries, the COM Express standard enables modularity and connectivity via carrier boards combined with the latest processor technology in a computer-on-module (COM) solution.

Whereas general-purpose CPUs help meet performance and data throughput requirements, this server-class system-on-chip (SoC) solution provides performance, data throughput, and powerful networking. Davide Catani, CTO of SECO, says, "Our enablement on COM Express Type 7 offers customers a quick approach to boost performance, providing extra I/O interfaces, PCIe 4.0, more bandwidth with improved latency, and features not available in earlier-generation products such as Time-Sensitive Networking and advanced security tech such as Intel® Total Memory Encryption [Intel® TME]. Simply put, customers can do more with the JULIET COM Express module and Intel Xeon D-1700 processor."

SECO JULIET COM Express® module with Intel® Xeon® D-1700 processor key use cases

Public sector guidance and intelligence

Server-grade performance with long product lifecycles

Ruggedized with extended temps on select SKUs

Industrial PC and motion controllers

Soldered-down BGA package for durability

Intel® Time Coordinated Computing (Intel® TCC) on select SKUs

Video analytics and storage servers

Hardware-accelerated AI with Intel® Deep Learning Boost (VNNI) and Intel® AVX-512

Telco and HPC edge servers

Up to 4x 10GBASE-KR networking interfaces

Edge preprocessing to help reduce compute requirements in HPC clusters

How it works

"SECO's goal is to make it as easy as possible for customers to deploy the JULIET COM Express module while guaranteeing high interoperability because of a robust design approach to signal integrity," Catani says. The updated module supports a simple validation process before hardware migration. Customers who already have COM Express Type 7 boards in service can run a signal integrity test by taking an existing board and swapping in the updated module with the latest Intel Xeon D-1700 processor. Once they're satisfied with the results, businesses can quickly integrate the board on a wider scale and start experiencing higher performance, with four to 10 cores and up to 2.32x faster CPU performance compared to the Intel® Xeon® D-1539 processor.[2]

High memory capacity of up to 128 GB DDR4 DIMM supports more simultaneous applications, and PCIe 4.0 connectivity provides a bigger I/O pipeline between PCIe devices and the CPU for fast workload processing. Customers have the flexibility to deploy custom add-in cards, accelerators, general-purpose GPUs (GPGPUs), or non-volatile memory express (NVMe) SSDs to better meet their specific requirements.

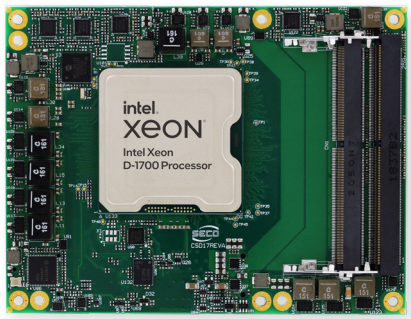

Figure 1: The SECO JULIET COM Express® Basic Type 7 module with Intel® Xeon® D-1700 processor.

Key features

- COM Express® Basic Type 7 module
- Intel® Xeon® D-1700 processor SoC with four to 10 cores, ~40 to 67W power ranges
- Up to 128 GB memory via four DDR4 SO-DIMM slots on three DDR4 72-bit channels supporting DDR4-2400/2666/2933 memory, error-correcting-code (ECC) capable
- 2x SATA Gen3 storage channels
- 4x USB 3.0 host ports
- 16x lanes PCIe Gen 4.0, 16x lanes PCIe Gen 3.0
- 1x Gigabit Ethernet LAN port, 4x 10Gb Ethernet interfaces (10GBASE-KR)
- Support for industrial and extended temperature use conditions on select SKUs

For workloads and configurations, visit intel.com/PerformanceIndex. Results may vary.

Enhanced inference performance for AI video at the edge

Not only will higher memory capacity and PCIe 4.0 connectivity help move more data faster, but the cores in the Intel Xeon D-1700 processor feature Intel® Deep Learning Boost (VNNI) and Intel® AVX-512 instruction sets, which accelerate inference in edge applications. This generation delivers up to 5.73x faster video AI compared to Intel Xeon D-1539 processors,[3] so customers can support large video camera systems while maintaining accurate and timely AI inference results across multiple video streams.

Developers also benefit from the Intel® Distribution of OpenVINO™ toolkit, which supports training model conversion to practically any framework for optimized performance on Intel® architecture. This flexibility helps cut down on AI model training and development time to speed deployment and time to value.

Ruggedized for consistent, 24/7 operation in harsh environments

Ruggedization is critical to many edge use cases, especially where devices are situated outdoors, on moving vehicles, or adjacent to assembly lines that produce intense shocks and vibrations. The Intel Xeon D-1700 processor is a soldered-down SoC, improving the durability and shock resistance of the JULIET COM Express module. Select SKUs of the processor also offer support for industrial and extended temperature use conditions, which help the module withstand excess heat generated on the factory floor or the extreme cold and heat that vehicular devices can experience.

"Onboard or edge devices are commonly exposed to extreme operating conditions. The module must continue efficient operation. The extended operating temperature and soldered package help provide the required reliability," Catani says. SECO also offers a variety of passive or active cooling options for modules designed to operate 24/7 in the toughest environments.

Timely, smooth operations for embedded applications

Factory automation, robotic motion control, and assembly lines need coordinated computing to ensure smooth operations and timely signal processing. The JULIET COM Express module with Intel Xeon D-1700 processors supports Time-Sensitive Networking (TSN) with Intel® Time Coordinated Computing (Intel® TCC) Mode and Intel® TCC Tools.[4] These capabilities help prioritize temporally bounded performance for latency-sensitive applications and work in conjunction with real-time hypervisors like ACRN and real-time operating systems like Yocto Linux with PREEMPT_RT or Wind River VxWorks. Enterprises can use these solutions to maximize the determinism and throughput of operations, ensuring high quality when producing, inspecting, or moving goods on the factory floor.

World-class security for a more hardened edge[5]

The Intel Xeon D-1700 processor brings several hardware-enabled security features to the JULIET COM Express module to help reduce attack surface and help protect sensitive intellectual property (IP). Intel® Boot Guard helps prevent unauthorized software or malware takeovers so that the system boots in a trusted state. Intel TME helps protect data in physical memory to safeguard the system from memory snooping or DIMM removal–based attacks. Intel® Software Guard Extensions (Intel® SGX) further isolate applications in trusted memory enclaves during runtime, helping protect data that's not at rest.

Supported Intel® Xeon® D-1700 processors for the SECO JULIET COM Express® module

Processor Number[A]		Cores	TDP	DDR Channels	DDR4 1DPC	Integrated Intel® Ethernet	PCIe 4.0 Lanes	High-Speed Input/Output (HSIO) Lanes	Extended Temp	Intel® Time Coordinated Computing
Intel® Xeon® D-1746TER processor	Base	10	67W	3	2667 MHz	100GbE	16	24	Yes	Yes
	SST-PP profile	10	56W							
	SST-BF profile	6 + 4	67W							
Intel® Xeon® D-1735TR processor		8	59W	3	2933 MHz	50GbE	16	24	No	Yes
Intel® Xeon® D-1732TE processor		8	52W	3	2667 MHz	50GbE	16	24	Yes	No
Intel® Xeon® D-1715TER processor		4	50W	3	2667 MHz	50GbE	16	24	Yes	Yes
Intel® Xeon® D-1712TR processor		4	40W	3	2400 MHz	50GbE	16	24	No	Yes

A. Intel® processor numbers are not a measure of performance. Processor numbers differentiate features within each processor family, not across different processor families.

Intel® Time Coordinated Computing is available on select SKUs only.
For workloads and configurations, visit intel.com/PerformanceIndex. Results may vary.

Fast deployment with the SECO validation kit

As the COM Express® standard is designed for simple hardware migrations from generation to generation, SECO helps customers validate each new deployment with a flexible evaluation kit, enabling a quick approach to test the solution in the operating use case scenario prior to widespread deployment. Customers can make sure that each feature performs as expected and measure the performance impact of the new Intel® processor.

SECO also offers the Clea platform, a cloud-based management and analytics solution that helps customers manage their AI and IoT applications across numerous locations from a single point of control. These resources help customers easily deploy, manage, and get metrics to support optimization efforts for their edge deployments.

Conclusion: Server-class performance closer to the edge

With more performance, memory, connectivity, ruggedness, and advanced features for TSN and cybersecurity, the Intel-based JULIET COM Express module drives server-class performance in embedded computing at the edge. Not only can customers benefit from the flexibility and modularity of the COM Express solution, but the ability to ingest, analyze, and move more data at the edge also helps reduce computational and networking burdens in the cloud. Catani comments, "The JULIET COM Express module with the Intel Xeon D-1700 processor definitely broadens the architectural options in the edge computing space, bringing computational power, fast storage, high-bandwidth networking and real-time capabilities closer to data sources. Customers can deploy massive, accelerated AI solutions with help from SECO and Intel."

Learn more

Learn more about the SECO JULIET COM Express module at edge.seco.com/en/Juliet.

Discover the capabilities of the Intel® Xeon® D-1700 processor at intel.com/icelake-d.

About SECO

With over 40 years delivering high-tech electronics, SECO offers cutting-edge embedded computing, HMI, communications gateway, custom packaged product, and IoT software solutions through worldwide engineering design, manufacturing, and technical support excellence.

seco.com/en

intel + SECO

1. "Embedded Computing Market to 2027 – Global Analysis and Forecasts by Component (Microprocessor, Microcontroller, ASIC, Digital Signal Processor, FPGA, Memory, Other Hardware and Software); Industry Vertical (Automotive, Industrial, Transport, Consumer Electronics, Enterprise & Government, Communications, and Others)," theinsightpartners.com, date of access: January 2022. https://www.theinsightpartners.com/reports/embedded-computing-market
2. See [15] at intel.com/processorclaims: Intel® Xeon® D. Results may vary.
3. See [8] at intel.com/processorclaims: Intel® Xeon® D. Results may vary.
4. Not all features are available on all SKUs. Not all features are supported in every operating system.
5. No product or component can be absolutely secure.