

Solution Brief

Embedded Computing
Interventional Radiology

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Prodrive Technologies Brings Performance, Platform Stability, and Easy Scalability to Interventional X-ray

Prodrive Technologies' Zeus server and Poseidon industrial PC solutions help achieve business goals with higher core counts, AI acceleration, and new technologies such as DDR5 and PCIe 5.0 in 4th Gen Intel® Xeon® Scalable processors and 12th Gen Intel® Core™ processors.



"A 10-year life cycle is huge for our customers, and it's made possible by the long-life availability² of the Intel® processors that enable our products."

—Global Sales and Business Development
Manager Marco Rietveld at Prodrive
Technologies

The interventional radiology market—which includes technologies for MRIs, CT scans, ultrasounds, and X-rays—is expected to grow at a compound annual growth rate (CAGR) of 5.6 percent and reach a valuation of USD 36.7B by 2028.¹ As the world continues to adapt to changes from COVID-19 and the number of elective procedures increases following periods of interruption, higher incidents of chronic disease worldwide are driving the demand for high-quality diagnostic and treatment options among patients and doctors. However, interventional radiology systems are typically complex, costly, and require lengthy certification cycles of two to three years before deployment.

Challenge: The need for stable, scalable, and high-performance platforms

Interventional X-ray is essential for procedures such as stenting, or the insertion of metal mesh tubes into arteries. The technology supporting interventional X-ray needs to translate data-intensive, raw X-ray input across multiple video streams while supporting on-the-fly editing operations like crop, zoom, overlay, and AI-assisted labels. Traditional systems rely on hardwired, point-to-point connections between endpoints, which make it challenging to add new devices and displays in addition to years of mandatory certification. Certification and clinical trials for new devices can take up to two years, with up to two additional years for development and software integration. This lead time for new deployments can sometimes eclipse the entirety of a traditional device's life cycle. Hospitals need a cost-effective way to expand their interventional X-ray systems while getting the performance they need to overcome data bottlenecks and the product stability they need to outlast lengthy certification cycles.

Solution: Prodrive Technologies solutions with the latest Intel® processors and long-life availability²

The leading global technology provider Prodrive Technologies exclusively serves the embedded computing market with devices and servers featuring a 10-year product life cycle. "A 10-year life cycle is huge for our customers, and it's made possible by the long-life availability² of the Intel® processors that enable our products," says Global Sales and Business Development Manager Marco Rietveld at Prodrive Technologies.



For interventional X-ray applications, Prodrive Technologies offers the combined Prodrive Zeus server enabled by 4th Gen Intel® Xeon® Scalable processors and Prodrive Poseidon industrial PC (IPC) enabled by 12th Gen Intel® Core™ processors. Both processor families offer higher core

counts, PCIe 5.0 connectivity, and DDR5 memory to deliver a much-needed performance boost.³ With these solutions, hospitals can help consolidate hardware, reduce costs, and benefit from platform stability to maximize the value of long certification cycles.

How it works

Inside a surgical theater, interventional X-ray provides a real-time view of the surgical site to help surgeons navigate the patient's body. Because every detail counts in a medical setting, X-ray outputs cannot be compressed. The Prodrive Zeus server delivers powerful video processing for raw X-ray data, which can require a data bandwidth of 12 Gbps or more. The Prodrive Poseidon IPC enables interactive editing of the video stream such as crop, zoom, overlay, and labels. Both systems output video footage to multiple display screens in the theater and to an adjacent control room.

Platform stability and reliability

Prodrive Technologies offers both the Zeus server and Poseidon IPC with a long life cycle of 10 years, backed by long-life availability for 4th Gen Intel Xeon Scalable processor and 12th Gen Intel Core processor IoT SKUs.² Within a 10-year life cycle, the first two to three years are simply for getting the platform certified. For example, in the United States, healthcare devices need to be approved by the Food and Drug Administration (FDA). Once approved, device configurations cannot be significantly changed without triggering another certification cycle, which means that hospitals need a consistent supply of parts, support, and services for their existing solutions. By providing an extended life cycle of 10 years (and longer in select cases), Prodrive Technologies and Intel are helping hospitals maximize the value from each certification cycle.

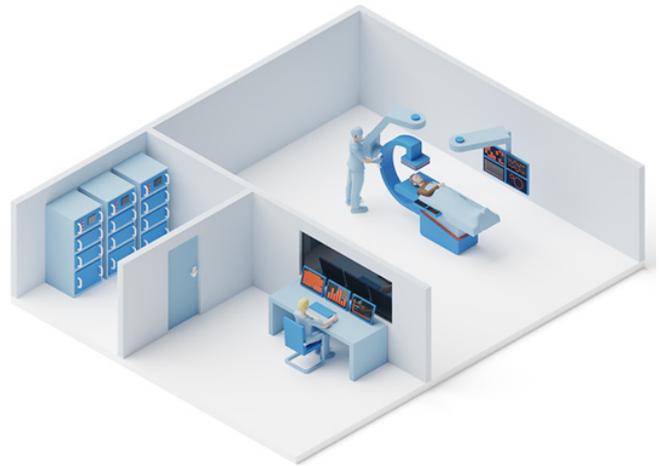


Figure 2: The Prodrive Zeus and Poseidon solutions help process data-intensive X-rays and output the footage to multiple displays in the surgical theater and an adjacent control room.



Figure 1: Minimally invasive surgeries often rely on interventional X-ray to help surgeons navigate the surgical site.

More cores for more consolidation

4th Gen Intel Xeon Scalable processors offer up to 52 cores per socket⁴ in 1U or 2U systems to deliver exceptional performance. The Prodrive Technologies solution can be customized to include up to 15 endpoints, with a mix

of IPCs, servers, and displays. This extra performance translates into faster processing for data-intensive video streams, but it also presents new opportunities to consolidate hardware. "These are multinode systems, so more cores and higher performance mean you need fewer systems overall, which lowers your cost," Rietveld says. "There's lots of potential overhead reduction when you can merge two nodes into one."

Bigger data pipelines with DDR5 and PCIe 5.0

Both the 4th Gen Intel Xeon Scalable processor and 12th Gen Intel Core processor are the first of their product lines to introduce support for DDR5 memory and PCIe 5.0 interconnects. The latest Intel® Xeon® Scalable platform supports up to eight channels of DDR5 per socket at 4,800 MT/s and up to 80 lanes of PCIe 5.0 with Compute Express Link (CXL) 1.1 for cache coherency between all bus-connected devices. Rietveld notes, "We are constantly dealing with the need for increasing bandwidth to manage higher-res X-rays. 4th Gen Intel Xeon Scalable processors will feature DDR5 and PCIe 5.0, helping customers move more data through their systems faster, which helps solve bottlenecks."

Prodrive Technologies solutions enabled by Intel for interventional X-ray

Prodrive Technologies configurations support up to 15 devices, including multiple Zeus and Poseidon nodes, displays, and workstations.



Prodrive Zeus server

- 4th Gen Intel® Xeon® Scalable processor
- New AI engine (Intel® AMX) for faster training and inference performance with BF16 and int8 support
- Fast video processing for massive workloads and raw X-ray outputs

4th Gen Intel® Xeon® Scalable processors

Compared to 3rd Gen Intel® Xeon® Scalable processors. For workloads and configurations, visit intel.com/PerformanceIndex. Results may vary.

1.33x
higher performance³

3.01x
higher AI inference performance with Intel® AMX for image classification⁵

4.25x
higher AI inference performance with Intel® AMX for object detection⁶

Prodrive Poseidon IPC

- 12th Gen Intel® Core™ processor with performance hybrid architecture
- DDR5 memory
- Up to 16 lanes PCIe 5.0
- Plugin Multi-View PCIe Card with Intel® FPGA
- Support for Intel® Time Coordinated Computing and Time-Sensitive Networking
- Fast video processing with interactive capabilities to support zoom, crop, overlay, and annotation



12th Gen Intel® Core™ desktop processors

10th Gen Intel® Core™ processors are the previous generation in this series for IoT. For workloads and configurations, visit intel.com/PerformanceIndex. Results may vary.

Up to **1.36x**
faster single-thread performance⁷

Up to **1.35x**
faster multithread performance⁷

Up to **1.94x**
faster graphics performance⁷

Up to **2.81x**
faster in GPU image classification inference performance⁷

AI-assisted annotations for more-detailed X-rays

Live annotation is the practice of labeling elements of an X-ray stream or identifying anomalies that demand the surgeon's attention. AI can perform this task much faster than human operators, potentially increasing the quality of care and the number of patients treated. Hospitals are still architecting the best way to implement these capabilities. Rietveld comments, "We are seeing more and more customers add AI capabilities to their systems, but they're still figuring out how to do it efficiently. The fact that Intel integrates AI acceleration into the chip offers a huge possibility for deploying applications effectively."

Both the Intel Xeon Scalable processor and the Intel® Core™ processor feature hardware-enabled AI acceleration, with dramatic boosts to AI inferencing and training.³ The 4th Gen Intel Xeon Scalable processor in particular features a new AI engine called Intel® Advanced Matrix Extensions (Intel® AMX), which delivers fast AI inference performance.

Integrated graphics that boost AI and deliver 4K visuals

In addition to powerful AI, 12th Gen Intel Core processors in the Prodrive Poseidon solution offer an integrated graphics engine with up to 32 graphics execution units (EUs) based on Intel® UHD Graphics 770, driven by Intel® Xe architecture. These EUs contribute to parallel processing for AI workloads, driving exceptional GPU image classification performance and fast graphics performance. Enabled by Intel, the Poseidon IPC supports up to four 4K displays per processor and smooth synchronization for video walls to aid surgical procedures with an even larger display surface.

The Prodrive Zeus and Poseidon solutions also feature a custom Intel® FPGA-enabled Multi-View PCIe Card (MVPC) that serves as a network-based compositing card. This device receives a video stream from the network and sends it back to a display while imparting interactive functionality such as scaling, interlacing, and overlaying. Customers can take this functionality a step further. Rietveld comments, "This really comes down to how much performance you want and where you want it. The MVPC in the network enables customers to layer in even-more-advanced, application-specific uses through their own software, leveraging the API provided by the Prodrive AVIDIS low-level software."

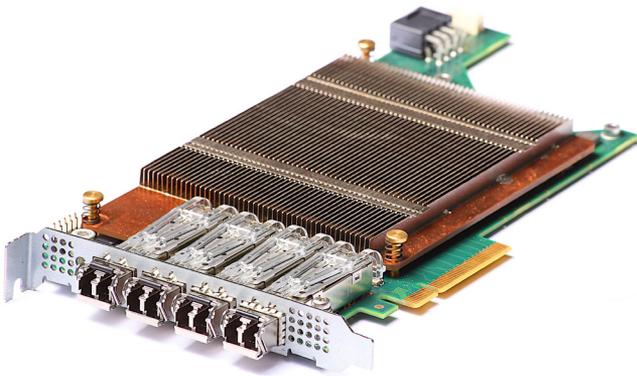


Figure 3: The Prodrive MVPC enables key video stream editing capabilities such as overlay, crop, and zoom.

Scalability to easily add more devices over Ethernet

A key advantage to the Prodrive Technologies solution is that everything is connected over Ethernet using familiar switch technology. Customers and solution providers can scale the



Figure 4: AVIDIS converts video input/output to 10GbE data, allowing hospitals to easily add more equipment and displays with a simple network connection.

solution up or down simply by connecting more devices to the Ethernet network using the Prodrive audio-video distribution (AVIDIS) system. AVIDIS converts standard video interfaces to 10GbE and vice versa, allowing hospitals to integrate more Prodrive Zeus servers, more Prodrive Poseidon IPCs, or more displays to support healthcare practitioners in the operating room. (Both the Zeus and Poseidon solutions rely on Intel® Ethernet controllers for high-speed Ethernet connectivity.) The ability to add a display wherever it's needed means that surgeons can stay focused on the patient and have an X-ray view close by, without having to crane their neck or turn away. Support specialists in the control room can have more displays and workstations for on-the-fly editing, making their jobs easier as well.

Built-in security capabilities to better protect patient data

Chip-enabled security features better protect patient confidentiality and hospital intellectual property (IP) in both the Prodrive Zeus and Poseidon systems. 4th Gen Intel Xeon Scalable processors feature many capabilities that enable below-the-OS protection and end-to-end data encryption and help prevent data loss due to physical tampering:

- Intel® Software Guard Extensions (Intel® SGX) isolates key workloads in trusted memory enclaves.
- Intel® Total Memory Encryption (Intel® TME) fully encrypts all data in memory, including security keys.
- Intel® Platform Firmware Resilience (Intel® PFR) verifies platform integrity and can restore corrupted firmware.

12th Gen Intel Core processors feature Intel® Converged Security and Management Engine (Intel® CSME) version 16, which provides a root of trust through a security controller that's isolated from the CPU. This gives the IT department more tools to restore compromised systems while helping to thwart advanced digital attacks.

Conclusion: The performance, stability, and reliability that clinicians need

Enabled by Intel, Prodrive Technologies leads the industry with a deep understanding of hospital and clinician needs that goes beyond just installing a PC or server. "We bring 20+ years of experience and massive scale that other companies don't have," Rietveld says. "For video solutions like the Prodrive Zeus and Poseidon, our install base includes 100K+ endpoints in the market today." Prodrive Zeus servers enabled by 4th Gen Intel Xeon Scalable processors and Prodrive Poseidon IPCs enabled by 12th Gen Intel Core processors deliver the long-life availability, higher performance, easy scalability over Ethernet, and the latest technologies like DDR5 and PCIe 5.0 that will help hospitals reduce costs and improve their quality of care.

Learn more

Continue your journey with a deeper dive into the solutions mentioned in this brief and start planning your deployment today.

Prodrive Technologies solutions

[Prodrive Zeus server >](#)

[Prodrive Poseidon IPC >](#)

[Prodrive MVPC >](#)

Intel® architecture

[4th Gen Intel Xeon Scalable processors >](#)

[12th Gen Intel Core processors >](#)

About Prodrive Technologies

Prodrive Technologies is a Titanium-level Intel® Partner Alliance member and leading OEM for embedded systems in healthcare, automotive, and semiconductor manufacturing. Prodrive Technologies specializes in multinode systems with high reliability and long life cycles.

prodrive-technologies.com



Notices and disclaimers

1. "Interventional Radiology Market Size By Product (MRI Systems, CT Scanners, Ultrasound Imaging Systems, Angiography Systems), By Application (Cardiology, Oncology, Urology, Gastroenterology, Obstetrics, Gynaecology), By End-use (Hospitals, Clinics, Ambulatory Surgical Centres), Industry Analysis Report, Regional Outlook, Application Potential, Covid-19 Impact Analysis, Price Trends, Competitive Market Share & Forecast, 2022 – 2028," Global Market Insights, February 2022, [gminsights.com/industry-analysis/interventional-radiology-market](https://www.gminsights.com/industry-analysis/interventional-radiology-market).
2. Intel does not commit or guarantee product availability or software support by way of road map guidance. Intel reserves the right to change road maps or discontinue products, software, and software support services through standard EOL/PDN processes. Contact your Intel account rep for additional information.
3. See [N23] at [intel.com/processorclaims](https://www.intel.com/processorclaims): 4th Gen Intel® Xeon® Scalable processors. Results may vary.
4. The 4th Gen Intel® Xeon® Scalable platform offers a maximum of 60 cores/socket; a maximum of 52 cores/socket are offered on the IOTG road map.
5. See [N21] at [intel.com/processorclaims](https://www.intel.com/processorclaims): 4th Gen Intel® Xeon® Scalable processors. Results may vary.
6. See [N22] at [intel.com/processorclaims](https://www.intel.com/processorclaims): 4th Gen Intel® Xeon® Scalable processors. Results may vary.
7. Performance varies by use, configuration, and other factors. Learn more at [edc.intel.com/content/www/us/en/products/performance/benchmarks/internet-of-things](https://www.edc.intel.com/content/www/us/en/products/performance/benchmarks/internet-of-things).

Availability of accelerators varies depending on SKU. Visit the [Intel® Product Specifications page](#) for additional product details.

Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates.

No product or component can be absolutely secure.

Your costs and results may vary.

Intel® technologies may require enabled hardware, software, or service activation.

Intel does not control or audit third-party data. You should consult other sources to evaluate accuracy.

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