(intel®)

Intel® Solutions for Endoscopy

Stay competitive with innovative hardware and software that support next-generation endoscopic camera design and AI workloads.

Demand for minimally invasive and endoscopic procedures is growing, driven by an aging population, efforts to control healthcare costs, and new surgical techniques. Innovation in key areas like neurology, orthopedics, urology, and gynecology has driven industry growth for endoscopic cameras. An expanding volume of procedures has driven intense competition in the endoscopy market, with endoscopic camera OEMs and ODMs seeking to push new innovations to market faster to differentiate their portfolios.

Intel enhances the capabilities of endoscopic camera OEMs and ODMs, providing support and system design capable of handling imaging workloads today and scaling for advanced AI workloads in the future. Using the Intel® portfolio of hardware and software solutions can help endoscopy camera designers and manufacturers drive standardized platform development and control costs.

Supporting advanced image processing in the camera control unit (CCU)

Endoscopy camera systems are supporting increasingly advanced imaging capabilities, from 4K resolution to image enhancement techniques such as visualizing light wave manipulations and contrast dye agents, edge enhancement, and color corrections. These innovations require more computation power on the camera system. Intel® technologies provide a range of solutions to meet this need.

One option to support advanced image processing workloads is Intel® field-programmable gate arrays (Intel® FPGAs). By reprogramming and reallocating FPGA logic elements, multiple imaging techniques can be deployed using the same camera platform. With a broad FPGA portfolio and specialized FPGA design services for medical applications, Intel accelerates design and deployment of new imaging capabilities for CCUs.

A second option to support image processing is using embedded Intel® CPUs with integrated graphics. Intel's latest generation of embedded 10nm processors comes with an integrated GPU (iGPU) with an image processing unit (IPU) capable of running advanced imaging workloads. The benefit to this approach is leveraging a single computing platform with long life support to execute both system control and image processing workloads.

Artificial intelligence in endoscopy

Another area of innovation for endoscopy systems is the use of artificial intelligence (AI). Endoscopy manufacturers support a variety of AI use cases today, including detecting polyps during colorectal screenings, detecting neoplasms associated with Barrett's esophagus in esophageal screening, and assisting with surgical planning for musculoskeletal surgeries. It is expected that the use of AI in endoscopy will continue to grow as a method of supporting physicians and helping to address the growth in demand for minimally invasive screenings and procedures.

Two predominant models have emerged for adding AI capabilities to endoscopic camera systems. The first model is to incorporate the ability to run AI models in the CCU. This allows for tighter integration with the CCU image processing capabilities. The second model is to add AI capabilities using a discrete solution, like a mini PC or all-in-one medical monitor that can be added to the tower or boom. This discrete deployment model allows rapid iteration on AI solutions without impacting the CCU—and can be retrofitted to existing camera systems.
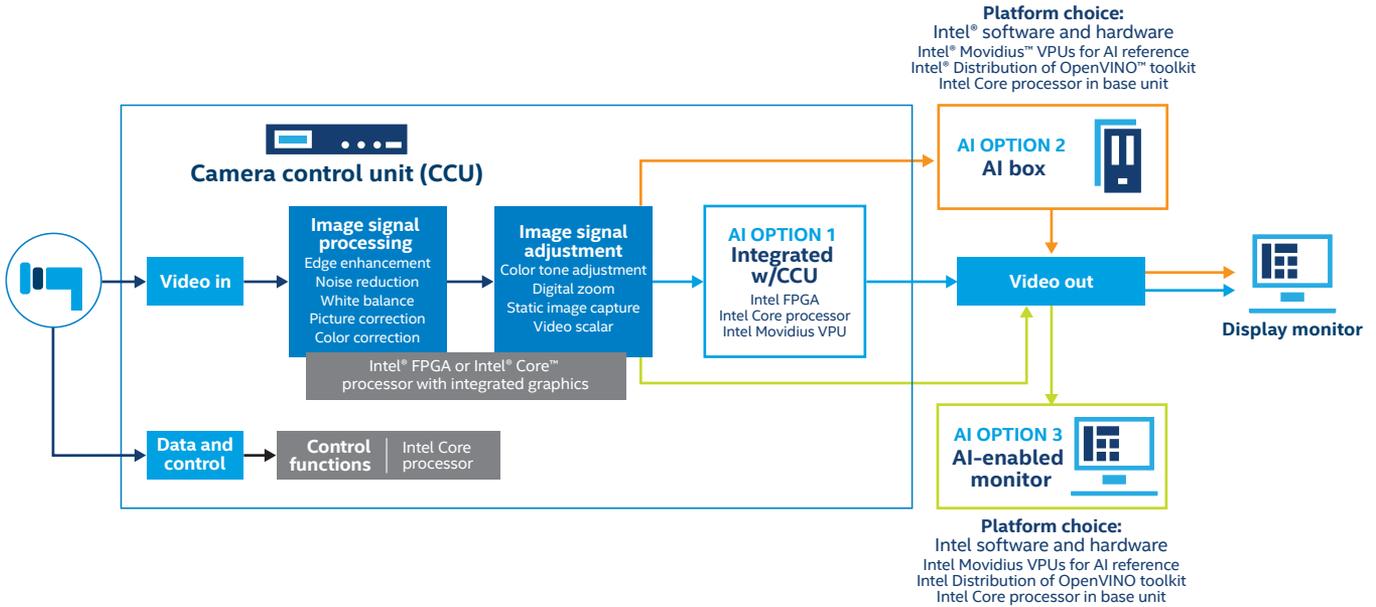
Intel has a long history of enabling the use of AI in medical imaging, from optimizing AI models to run in real time on CT systems to mobile diagnostic solutions for emerging markets. Endoscopy camera makers can leverage Intel's broad portfolio of hardware and software to support either of the two AI models described above. Intel technologies supporting AI in endoscopy include:

- **Intel® Distribution of OpenVINO™ toolkit** – Software for optimizing deep learning models for edge deployments
- **Intel® FPGA** cores and assistance from Intel Design Services to perform AI inference alongside image processing
- **Intel® Core™ processors** with models optimized using the Intel Distribution of OpenVINO toolkit
- **Intel® Movidius™** visual processing unit (VPU) PCIe card for a mini PC "AI box" or all-in-one medical monitor

Intel technologies advance innovation in endoscopy

With Intel products, endoscopy camera OEMs and ODMs can create systems with more-capable, flexible computing platforms. Intel® hardware—like Intel FPGAs, Intel Core CPUs, and Intel Movidius VPUs—can support advanced image processing and AI while optimizing for performance and power consumption. Intel® software like the Intel Distribution of OpenVINO toolkit optimizes the deployment of AI models to run in real time during procedures.

Intel also provides robust support for ODMs and OEMs at every stage of the design process. Intel has dedicated teams focused on the medical imaging market that can assist with technology selection and architecture strategy. Intel-embedded CPUs, FPGAs, and OpenVINO have long life support (greater than 15 years in some cases) to ensure minimal system redesign after regulatory approval.

Platform choice:
Intel® software and hardware
Intel® Movidius™ VPUs for AI reference
Intel® Distribution of OpenVINO™ toolkit
Intel Core processor in base unit

Camera control unit (CCU)

Video in

Image signal processing
Edge enhancement
Noise reduction
White balance
Picture correction
Color correction

Image signal adjustment
Color tone adjustment
Digital zoom
Static image capture
Video scalar

AI OPTION 1 Integrated w/CCU
Intel FPGA
Intel Core processor
Intel Movidius VPU

Intel® FPGA or Intel® Core™ processor with integrated graphics

AI OPTION 2 AI box

Video out

Display monitor

AI OPTION 3 AI-enabled monitor

Data and control

Control functions | Intel Core processor

Platform choice:
Intel software and hardware
Intel Movidius VPUs for AI reference
Intel Distribution of OpenVINO toolkit
Intel Core processor in base unit

Learn more

Staying ahead in the endoscopy market requires taking innovations to market faster than the competition. To learn more about how Intel technologies can accelerate the pace of development for new capabilities and solutions, visit:

Intel Distribution of OpenVINO toolkit ›

Intel® FPGA Design Services ›

Intel® AI product portfolio ›

CHI uses Intel for Capsule Endoscopy AI ›

Are you an ODM or OEM?

ODMs and component suppliers can **register through the Intel® Technology Provider (ITP) program** for access to technical resources and road maps and a closer connection to Intel's healthcare team.

OEMs can reach out to their circuit-board supplier to contact an Intel support representative for more details and additional endoscopy resources.

Intel Design Services
Projects can include the following IP and solutions and Quartus IP Cores for a variety of Intel FPGAs.

AI/Machine Learning IP
Deep learning processing logic

Video Processing IP
OSVP (Multi Channel Video Processing Suite)
VIP suite
Image signal processing
Warp
Stitch
3D LUT
2D graphics
Tone mapping

Connectivity IP
High-definition multimedia interface (HDMI)
PCIe DMA controller
Serial digital interface (SDI) Rx/Tx
SDI audio embed/extract
SDI gearbox/converter
DisplayPort