

Advantech and Intel: Powering Lab and Life Sciences Innovation

Advantech accelerates lab and life sciences equipment development by using flexible reference architectures based on the latest Intel® technology.

ADVANTECH

Drive Market Value with Intel and Advantech:

- **Integrated hardware stack** based on Intel® processors, FPGAs, and networking technologies
- **Optimized open software layer**, including Intel® Distribution of OpenVINO™ toolkit and Intel® Smart Edge
- **Flexible reference architectures** provide a stable starting point to jump-start lab and life sciences innovation
- **Integration and customization services**, from design-in and custom manufacturing to testing and configure-to-order services (CTOS)

A ramp-up in genetics-driven research, laboratory expansion for diagnostics testing, and well-funded biotech and biopharma innovation are driving lab and life sciences equipment makers to develop increasingly advanced systems with new capabilities to process and analyze increasing amounts of data. The NIH estimates that up to 40 billion gigabytes of data are generated annually through genomics-related projects alone.¹

As a result, the market for computer technology embedded in laboratory and life sciences capital equipment such as analytical instruments and genetic sequencing equipment is growing rapidly. An 8% compound annual growth rate (CAGR) is projected through 2025.² At the same time, lab and life sciences equipment makers face specific challenges and requirements when integrating cutting-edge computing technology into specialized embedded systems:

- **Medical-grade hardware.** Product developers need access to the latest technologies on a full range of fanless systems for clean environments, from panel PCs to high-end servers.
- **Rarified expertise.** Specialized, advanced technologies such as deep learning and cloud-native networking may be outside the core expertise of product teams.
- **The race to market.** Implementing next-generation computing technologies into products as quickly as possible is a potential competitive advantage.

Advantech foundations for lab and life sciences equipment include medical-grade hardware based on Intel architecture, open-source software, and expertise to transform these components into solutions. Compact, ultra-silent, and fanless computer systems include tablet and panel PCs, box PCs, workstations, system boards, and servers. Flexible reference architectures enable Advantech to collaborate with equipment manufacturers and rapidly develop finished products. Advantech can provide anything from standalone medical-grade hardware to full design-in and custom manufacturing services.

Building Custom Solutions on Established Reference Architectures

Reference architectures are pre-integrated combinations of Intel-based Advantech computing products and optimized software components. The architectures can be adjusted to meet requirements for a given instrument platform. For example, a user-interface panel PC's physical size, compute power, and display specs can be changed, as can compute storage, and I/O. Platform modularity helps reduce time to market and optimize development costs.

Hardware Technology Solution Building Blocks

Advantech reference architectures implement an integrated Intel hardware stack, including the following (see Figure 1):

- **Intel processors** offer a broad range of core counts, power envelopes, and other features. Choice among Intel Atom®, Intel® Core™, and Intel® Xeon® processors allows compute resources to be matched to the workload.
- **Intel FPGAs** offer programmability for specialized acceleration alongside CPUs and GPUs, for workloads that include deep learning, data analytics, image and facial recognition, and live video processing.
- **Intel networking technologies** provide a wide range of data connectivity with high throughput and dependability, including by wired Ethernet, optical fiber, Thunderbolt, Wi-Fi, 5G, and Bluetooth.

Software Components

In addition to other software, Advantech reference architectures incorporate an Intel-optimized open software layer (see Figure 1):

- **Intel® Distribution of OpenVINO™ toolkit** streamlines development, optimization, and deployment of high-performance deep learning inference in the real world.
- **Intel® Smart Edge** is a Kubernetes-based portfolio of edge software solutions that enable highly optimized edge platforms to manage applications and network functions with cloud-like agility across any type of network.

Comprehensive Approach to the Solution Lifecycle

Advantech provides a comprehensive set of capabilities and services that benefit providers of lab and life sciences equipment and instruments. These include a range of integration and customization services across electronic, mechanical, industrial, system, and software design. This broad set of capabilities enables customers to pick and choose the right mix to hit performance, price, and quality targets.

Custom-branded contract manufacturing adheres to global certification requirements at world-class production facilities. Many Advantech hardware devices carry a broad range of certifications, such as IP66 ingress protection and various assurances related to electromagnetic interference, vibration, and other factors. Advantech's commitment to ensuring that solutions comply with worldwide regulations and standards includes the following:

- **ISO 13485 certified development and manufacturing processes** help ensure the transparency and traceability of medical products.
- **ISO 27001 certification** attests to the priority that Advantech places on its information security management system and framework.
- **IEC60601-1 standards compliance** or medical electrical equipment is streamlined through Advantech expertise and customer collaborations.
- **US FDA medical device expertise** helps device manufacturers secure approval through product development, validation, and consultation services.

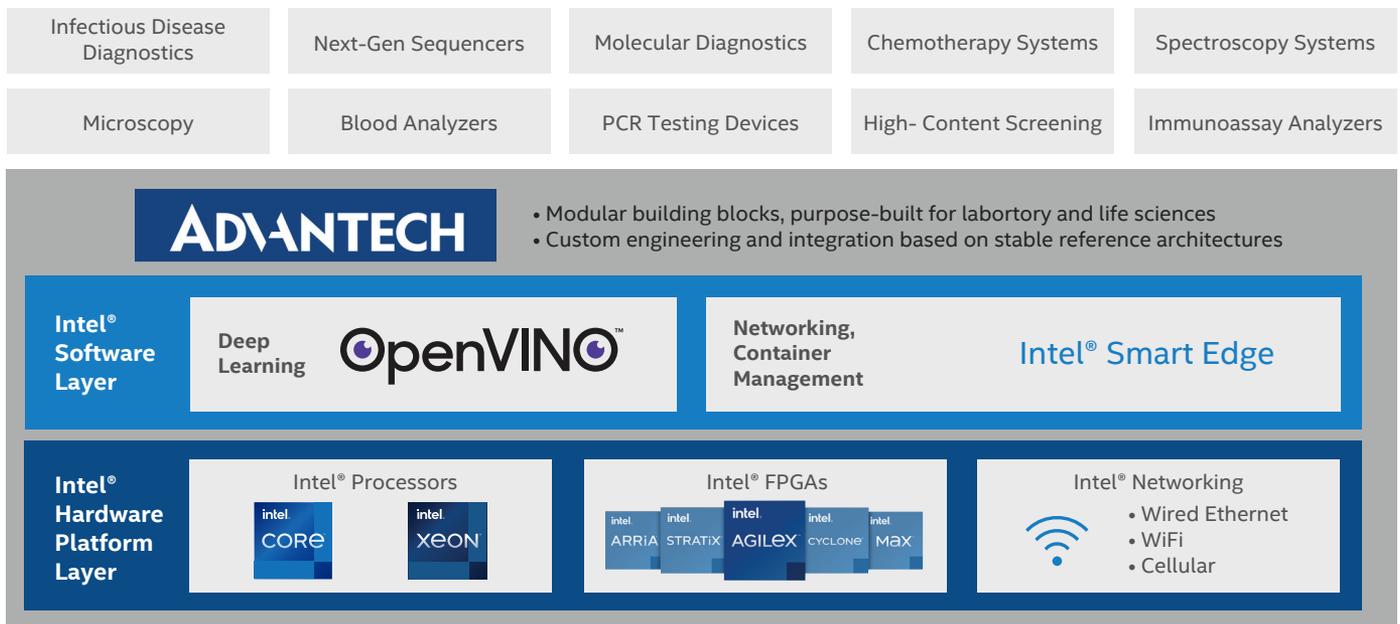


Figure 1. Sample Advantech implementations for laboratory and life sciences.

Working with solution providers, Advantech can also conduct or facilitate quality assurance testing for reliability and safety regulatory requirements, including customized burn-in and stress testing. To help meet solution longevity requirements, Advantech provides extended support over a projected equipment lifecycle of 10 to 15 years.

In addition to custom manufacturing, Advantech offers eBusiness configure-to-order services (CTOS) that enable customers to tailor individual needs such as system capacity and peripherals. It also enables the specification of global services for support and service packages across the Americas, Europe, and Asia. With simple, instant customer ordering, Advantech CTOS can help streamline sales and distribution efforts, especially for well-established solutions.

Illustrations of Advantech Building Blocks in Action

Advantech solution architectures accelerate the cycle of prototyping, productizing, and bringing solutions to market. They offer a comprehensive computing platform across usages, with early and expert access to emerging hardware features and capabilities. The reference architecture's holistic approach to hardware, software, and services offers deeply integrated platform solutions that deliver performance, stability, and lasting value.

Usage Example: Configure-to-Order Embedded Computer for Electron Microscopes

Electron microscopes require high-performance compute to analyze such properties of samples as composition, structure, and particle state. This computationally intensive processing may produce significant electromagnetic fields that interfere with surrounding equipment and cause potential electrostatic discharges.

Advantech offers an electromagnetically shielded, configure-to-order computing solution for electron microscopes, based on the Advantech EPC-B2275 embedded PC, powered by the Intel® Core™ processor. CTOS supports configurability across processor, I/O combinations, operating systems, and peripheral components.

[More information >](#)

Advanced User Interfaces Built on Panel PCs

Panel PCs are well suited to delivering an outstanding end-user experience for data-intensive graphical user interfaces (GUIs). They combine a computer system with a multi-touch display that functions as a user control panel. Advantech industrial fanless panel PCs are built to integrate into complex marketable solutions easily and inexpensively.

Product Focus: Advantech POC-621 Point of Care Terminal

Advantech POC-621 terminal is based on the Intel Core i5 or i7 processor, with an integrated 21.5-inch full HD multi-touch display and support for Windows or Linux.

The all-in-one (AIO) device is configurable with I/O, mobility, card reader, and camera options. It features a fanless design, with an IP54-rated protective enclosure.



[More Information >](#)

Advantech panel PCs provide tremendous versatility, including flexible compute performance based on a choice among Intel Core processors tailored to the needs of the solution, with a range of display sizes. Intel networking technologies meet diverse requirements for either fixed or portable medical-grade equipment, including combinations of 5G, Intel Wi-Fi 6 and 6E (Gig+), Bluetooth, wired Ethernet, or other connectivity.

Usage Example: Intelligent Automation for Smart Pharma

Collaborating with Advantech, a pharmaceutical equipment maker developed an intelligent monitoring and control solution that inspects and verifies the quality of medicines on pharmaceutical production lines.

At the center of the solution is an IP66-certified Advantech SPC-815W industrial panel PC that communicates with multiple defect-detection stations based on Advantech ACP-4340 industrial controllers, with cameras and specialized video-processing hardware.

[More Information >](#)

AI and Deep Learning at The Edge

AI and deep learning is growing in importance in the lab and life sciences industries as researchers and clinicians seek to extract more insight from large and diverse data sets. Due to the size and sensitivity of certain data sets in these industries, there is growing demand for computing platforms that can run AI algorithms "at the edge" or near where the data is created. Running AI and deep learning applications

at the edge requires scalable storage and highly parallel compute for training models and powerful CPUs for running inference. The Advantech MIC-7000 Series of compact modular computers can be configured to meet a range of AI workloads. They feature fanless designs and expandability using MIC i-Modules that support simple configuration and reconfiguration of resources.

The i-Modules support PCI or PCI Express add-on cards such as frame grabbers, graphics processing units (GPUs), and motion control cards that may be integrated into AI and deep learning implementations, as well as add-on power supply units (PSUs) and drive bays. Flex I/O Series modules add to these capabilities for flexible expansion with support for more displays, controls, and communications interfaces.

Responding to Emerging Use Cases

Advantech helps providers meet the requirements of new use cases and identify potential features and capabilities in existing solutions. High-performance, high-resolution video capture can support a wide variety of documentary, authentication, and analytical roles. Advantech building blocks commonly used in lab and life sciences equipment include the following:

- **AVAS-401 medical-grade video recorder** captures at 4Kp60 resolution using the H.265 compression standard to combine high quality with efficient storage. It provides open SDKs and APIs to streamline system integration.
- **AIMB-217 Mini-ITX industrial motherboard** supports Intel® Pentium®, Celeron®, or Atom® processors, up to 8 GB DRAM, and either Windows 10 or Yocto Linux.



AVAS-401 video recorder



AIMB-217 motherboard



MIO-5271 single-board computer

Solution provided by



¹ NIH National Human Genome Research Institute, updated March 22, 2021. "Genomic Data Science Fact Sheet." <https://www.genome.gov/about-genomics/fact-sheets/Genomic-Data-Science>.

² Research and Markets, June 8, 2021. "Global Analytical Laboratory Instrument Market Report 2021: Market is Expected to Reach \$123.83 Billion in 2025 at a CAGR of 8% - Long-term Forecast to 2030." <https://www.globenewswire.com/news-release/2021/06/08/2243620/28124/en/Global-Analytical-Laboratory-Instrument-Market-Report-2021-Market-is-Expected-to-Reach-123-83-Billion-in-2025-at-a-CAGR-of-8-Long-term-Forecast-to-2030.html>.

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Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See configuration disclosure for configuration details. No product or component can be absolutely secure.

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Your costs and results may vary.

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- **MIO-5271 single-board computers** are based on low-power Intel Core processors, with an optimized thermal design for high-efficiency fanless operation.

Collaborative solution development with Advantech can help providers move from imagination to prototype to production more quickly than would otherwise be possible. In the process, Advantech reference architectures can reduce costs and increase solution quality.

Conclusion

Advantech reference architectures provide a solid but flexible starting point to accelerate development of lab and life sciences equipment and instruments. Based on medical-grade fanless computers and peripherals, the reference architectures incorporate Intel hardware as well as software optimized to run on it. Advantech applies specialized, solution-specific custom engineering and integration based on these components to produce finished products with less time, effort, and cost than would otherwise be possible.

More Information

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