

# Building Embedded Compute That Keeps Pace with Breakthrough Science

*How a developer of advanced medical technology and devices de-risked a next-generation instrument launch with custom-engineered hardware by AHEAD Foundry.*

## An Initial Scan

A global developer of advanced medical technology and devices was preparing to launch a new, high-throughput tissue analysis instrument. Designed for demanding lab environments, it would process massive imaging workloads and play a critical role in the client's next wave of growth.

The goal, simply put: "Stand up a reliable, scalable embedded compute platform that keeps our new instrument on schedule, in spec, and available globally."

Supporting a next-generation instrument of this capacity was as important as the instrument itself. The client needed embedded, GPU-ready compute that was thermally stable, acoustically acceptable, auditable, and repeatable at scale — without requiring constant redesigns.

### TOP 3 TAKEAWAYS

By partnering with AHEAD Foundry, the client was able to:

- ✓ De-risk a next-generation instrument launch with a GPU-ready embedded compute platform that had been thoroughly tested and validated.
- ✓ Coordinate across multiple teams (engineering, supply chain, production, and quality) with a single, accountable partner.
- ✓ Establish a scalable, repeatable program to support future instruments and regional expansion.



# Inside the Platform's Pressure Points

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The new instrument was at the heart of a multi-year product strategy. The compute platform couldn't be the weak link. Any risk of delay, rework, recall, or field failure carried revenue and reputational risk the client was determined to avoid.

## COST AND COMPLEXITY

Earlier hardware experiments revealed how difficult it was to keep pace with rapidly evolving imaging modes, algorithms, and AI-driven analysis. The client didn't want to redesign the compute platform every time workloads advanced.

## SUPPLY CHAIN AND STANDARDIZATION

It's difficult enough designing a platform in the first place. But the client was also dealing with unpredictable hardware quality and availability issues just as the product team needed to lock in designs.

## THE HARDWARE ITSELF

The complexity of the technology and real lab workloads exposed just how hard it would be to get the platform right. As the client worked with other partners to build and test prototypes, they kept running into quality, instability, and overheating issues. Performance continued to degrade, while component failure increased. Internal engineering teams were left to juggle BIOS tweaks, driver compatibility, and component substitutions, instead of staying focused on the core IP of advanced medical imaging and analysis. Hatch would become a meaningful advantage as AHEAD entered the picture, giving the client a revision-controlled view of BOM details, BIOS configurations, and production changes that had previously led to bottlenecks.

**All of that, plus needing to pass demanding QMS and ISO compliance audits.**

**In the past, the client had worked with traditional hardware suppliers, purchasing SKUs and relying on bolt-in GPU capabilities, standard validation, and warranties in the hope that it would be enough. This time around, they knew better.**

**Just like the instrument itself needed the right platform to make it run and perform, the client needed the right partner that could be accountable for that platform from design to production, through logistics and lifecycle management.**



## From Scan to Strategy

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AHEAD's medical expertise set it apart from the start, with deep experience supporting life sciences programs and navigating the quality expectations, regulated workflows, and long-term consistency those environments demand. Equally important was its lifecycle management, which would help the client maintain and reproduce the platform over the next several years without constant redesigns between builds. And AHEAD's supply chain coordination gave the client a more reliable path to scaling the instrument globally.

The work began with hardware prototyping alongside Dell OEM to help define requirements, validate performance, and establish a scalable path from design to production. Through joint discovery, AHEAD and the client then aligned on a purpose-built compute platform that met strict thermal, vibration, and acoustic requirements. This included:

- A GPU-ready architecture with deep validation of GPUs, storage, add-in cards, thermal and airflow analysis, and planning for long-term support as GPU generations evolved.
- A supply chain that could scale and adapt over a multi-year program and market fluctuations.
- Audit-ready quality practices and transparent metrics trusted by procurement, quality, and engineering teams alike.



The work unfolded across three phases:



## Advise

Both engineering teams worked together to define the platform architecture, anchoring it in enterprise-grade server hardware and GPUs tailored to the instrument's constraints. Thermal and airflow analysis ensured GPUs and NVMe storage would perform consistently under real lab conditions and workloads. AHEAD also defined BIOS, firmware, and configuration baselines for global reproduction and long-term support.

**Why the Groundwork Mattered:** Instead of “we’ll see what happens in the field,” the teams went through failure-mode scenarios upfront: What happens when fans ramp? What if cabling changes airflow? What’s the plan if a GPU generation turns over mid-program? Those questions were answered in design, not post-launch.



## Build

With the architecture defined, AHEAD Foundry moved into build and validation. Prototype systems were run through structured test plans that mirrored real instrument use (high GPU utilization, sustained I/O, and harsh duty cycles). AHEAD conducted Failure Mode and Effects Analysis (FMEA) to identify potential risks with the platform and build mitigations into the process rather than patching them in later. New Product Introduction (NPI) processes captured system imaging, BIOS/firmware settings, and hardware revisions in repeatable, auditable workflows.

**How It Came to Life:** By the time the product team committed to the platform, they had a tested, documented build recipe they knew they could trust.



## Run

Once the instrument launched, AHEAD turned its attention to ongoing performance and support. AHEAD Foundry's program management helped coordinate across engineering, supply chain, and quality teams so changes could be managed as part of a single, coherent roadmap. Close collaboration with Dell OEM secured competitive pricing, while ongoing quality and feedback loops further supported audit readiness and quality improvement.

**How It Kept Delivering:** This marked a fundamental shift between the client and AHEAD. It wasn't just about buying servers. It was about running an effective compute program together.

## The Readout

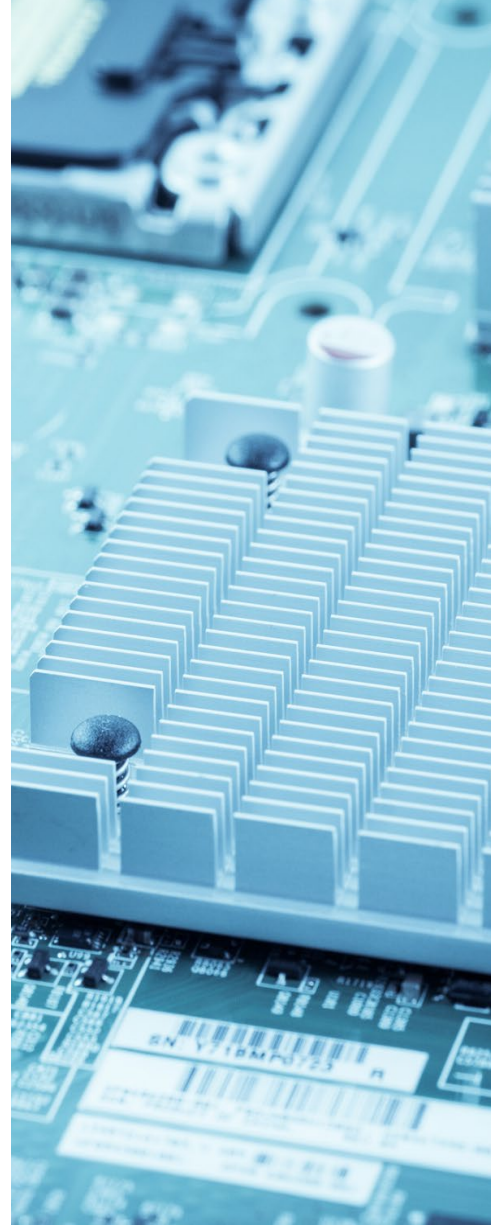
Treating embedded compute as a program rather than a one-time hardware purchase fundamentally changed the client's operations.

**A Foundation to Build Off.** The platform was no longer a limiting factor, but an element of growth. Teams could confidently plan new workflows, imaging modes, and AI-driven analysis without worrying whether the hardware could keep up.

**A Single Accountable Partner.** AHEAD Foundry consolidated engineering, supply chain, and quality responsibilities. The client no longer needed to manage a tangle of vendors, which meant reduced internal coordination overhead. It also allowed their teams to focus purely on advancing the instrument itself.

**Anticipating and Adapting to Risk.** Thermal and fitment issues were mitigated early through FMEA and NPI. Combined with audit-ready quality practices and transparent metrics, this significantly reduced the risk of launch delays, field failures, and supplier audit findings.

With a scalable, repeatable platform now in place, the client could confidently forecast production and expand into new markets through a multi-year compute program that finally matched their broader product strategy.



## What's Next

For medical device and life sciences organizations building advanced instruments, diagnostics platforms, or lab systems, this approach offers a clear path forward:

- Invest in GPU-ready, AI-capable compute at the edge without turning your product organization into a mini-OEM.
- Guard against thermal behavior, supply chain volatility, and quality findings that can derail a launch.
- Choose a partner willing to own the embedded compute program

AHEAD Foundry grounds every engagement in client initiatives and outcomes. We then turn those priorities into a structured, auditable program that we manage and continue to improve over time.

# AHEAD

Combining cloud-native capabilities in software and data engineering with an unparalleled track record of modernizing infrastructure, we're uniquely positioned to help accelerate the promise of digital transformation.

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