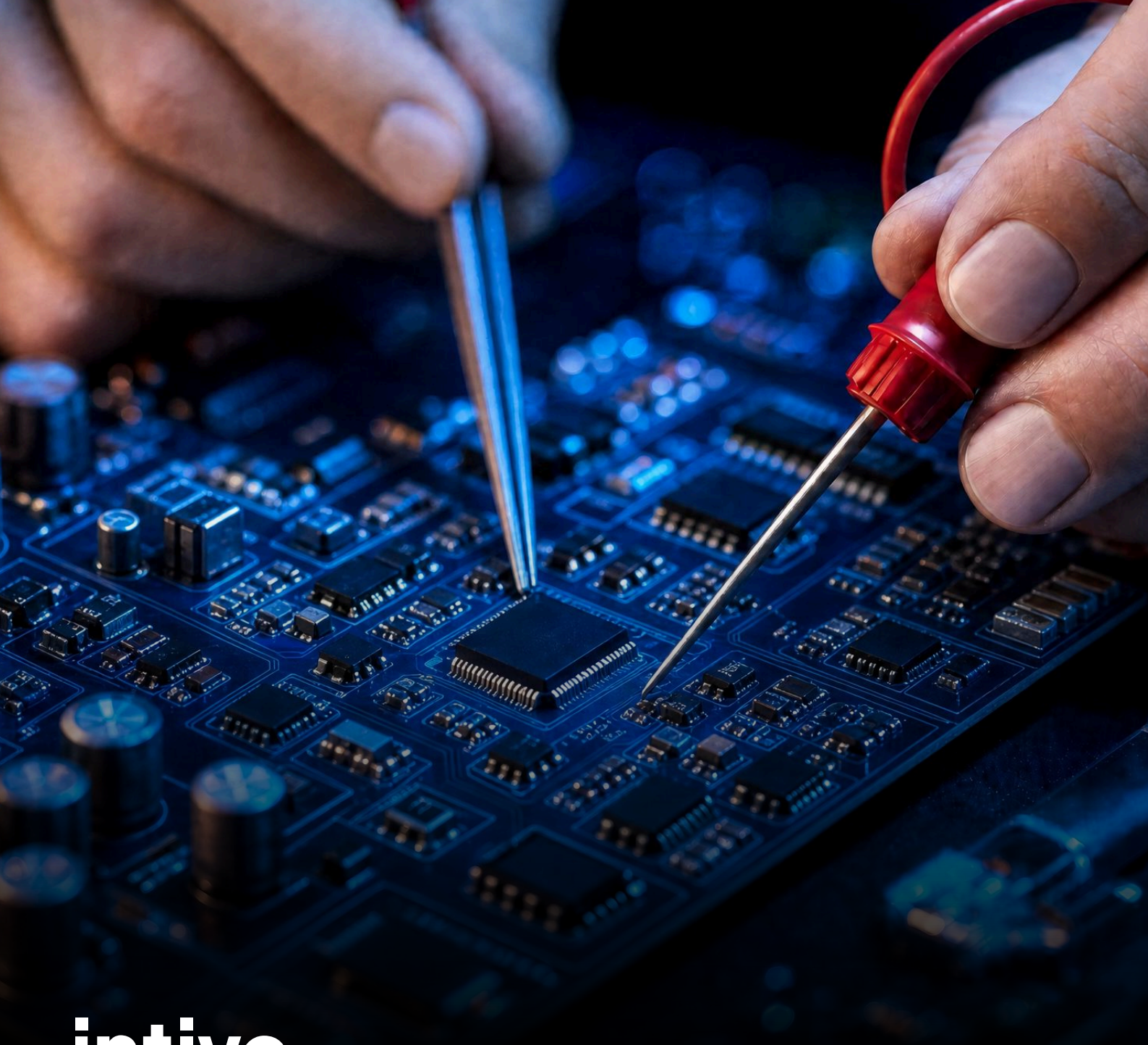


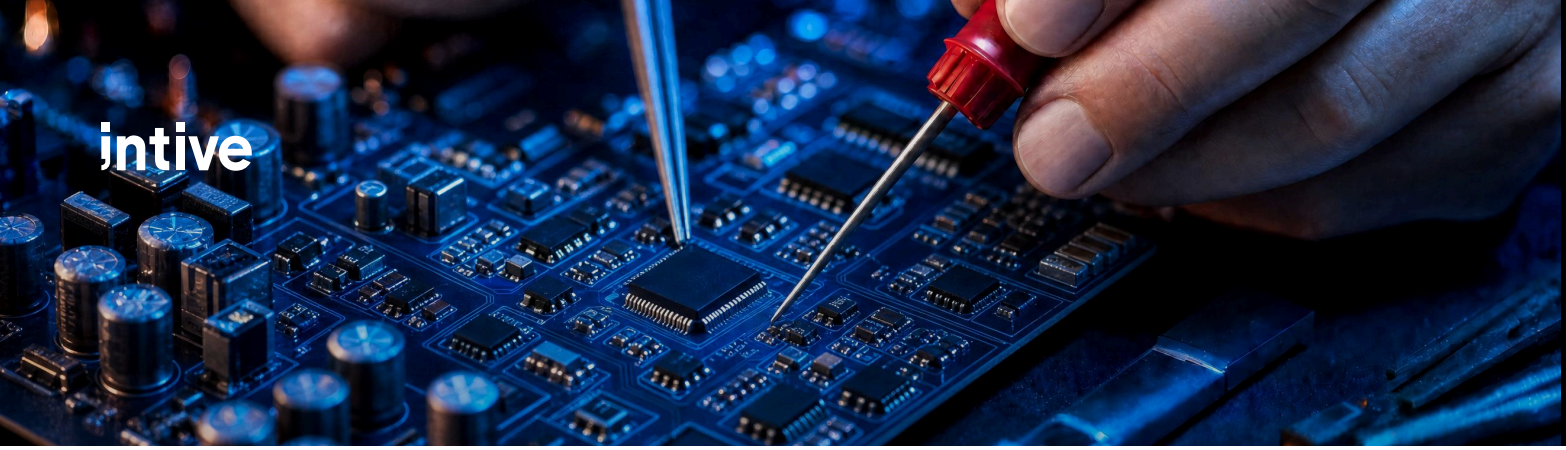
intive

Hardware-in-the-Loop (HiL) Testing Excellence

Shift left. Test faster. Release with confidence.

sales@intive.com

https://www.intive.com/services/embedded-software



The Challenge

Embedded software is growing faster than most validation teams can keep up with. More interfaces, more system interactions, an ever-growing amount of sensor data to integrate, challenging functional safety requirements, shorter release cycles – all while customers expect continuous delivery. But prototype hardware is scarce and expensive. And field testing is usually not an option.

The result: defects get caught too late, tests stay manual, and lab capacity becomes a bottleneck. Every defect found during integration instead of during development costs more – in rework, in schedule, in engineering hours, in reputation and in confidence in the release. Moreover, there are industries with particular safety-critical requirements in that regard:

Car HMI, connectivity & infotainment	**Battery energy storage systems**	**Rail vehicle & railway systems**
Integrated vessel navigation systems	**Machine engineering & operations**	**Aerospace & defense applications**

What you need isn't more testing. **It's testing that happens earlier, runs itself, and gives you the same reproducibility every time.**

Our Approach

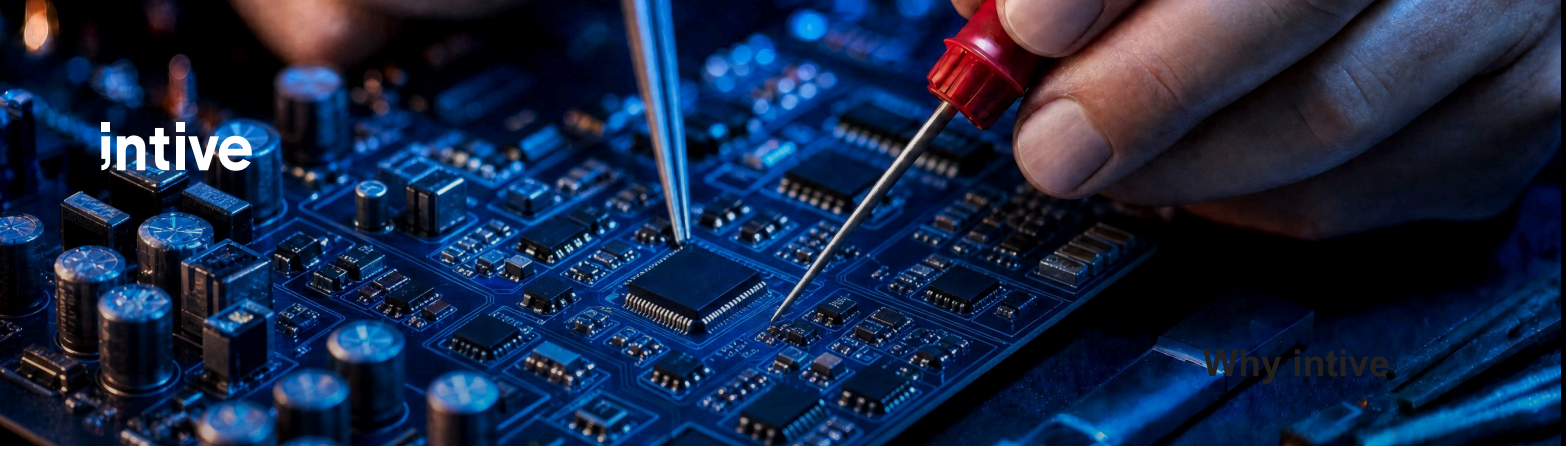
intive helps you shift left and run your firmware tests **at the earliest possible stage of development,** so issues surface while they're still cheap to fix.

We build with you, not just for you. That means:

- **Custom automated regression testing**, developed around your product, not a generic template.
- **Tailored automated HiL testing pipelines,** built for your architecture and your release cadence.
- **Standardized, automated testing** across multiple **product lines**, so quality doesn't depend on which team built which variant.
- **Comprehensive documentation, delivered fast** and in a **standardized format** your whole organization can rely on.
- The ability to **iterate, test, and validate at high pace** across every product line you run.
- Targeted use of AI to **speed up spotting anomalies** in test results, alongside human-led expert review.
- Functional safety verification for your hardware systems, **built into the pipeline as early as your process allows.**

sales@intive.com

https://www.intive.com/services/embedded-software



The outcome: valid results, faster. Less time spent chasing defects, less money spent on rework, less risk carried into production. And there's more to be found. Our engineers routinely surface additional efficiencies once they're inside your environment – gaps a generic assessment would miss.

The Value of Hardware-in-the-Loop (HiL) Testing

HiL testing enables realistic validation before final system integration. Catching issues at this stage saves time and money and helps reduce risk, long before they become expensive problems in the field.

HiL Capabilities

- Hardware simulation
- Automated testing
- Repeatable execution
- Fault simulation
- Regression automation
- Continuous validation

Customer Outcomes

- Earlier issue detection
- Faster validation
- Improved quality
- Increased robustness
- Faster releases
- Reduced project risk

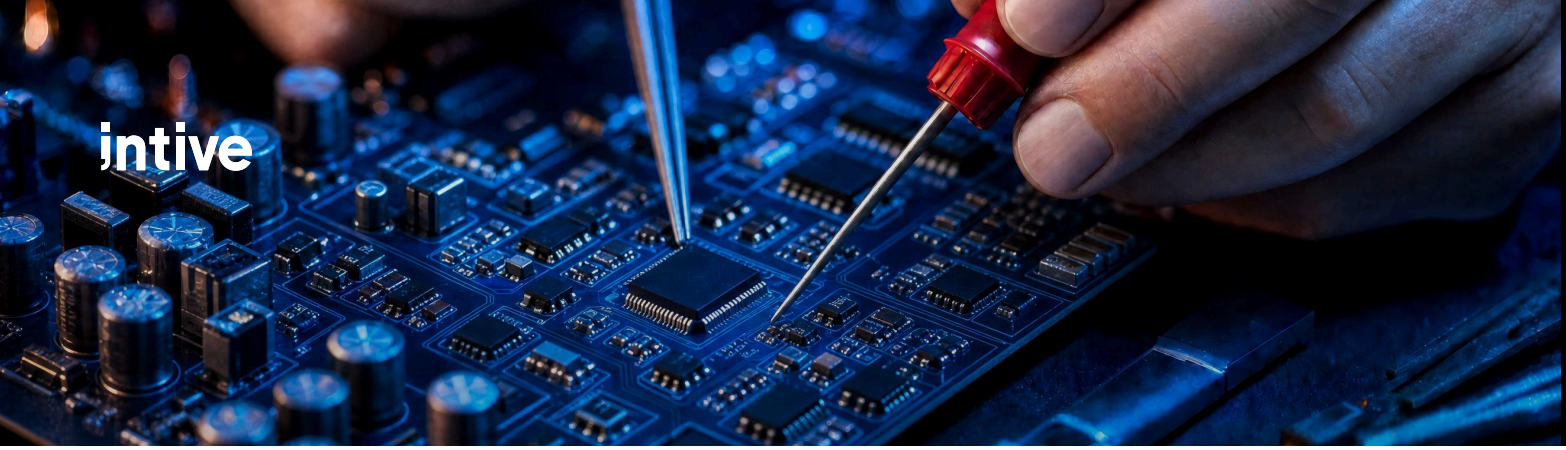
Why intive

Many providers can run tests. Fewer can combine testing expertise with real embedded engineering know-how. Very few have applied these skills, building technology that scales across safety-critical product categories in highly regulated industries. **intive has.**

We bring 20+ years of experience in embedded verification engineers, developers, architects, and testers who have vast experience **across automotive, industrial equipment, transportation, and energy systems.** That depth means we don't just execute your test plan - we bring ideas and best practices f**or building automated HiL testing pipelines** that hold up over time.

AI-native engineering fluency is part of how we work. Where it's useful, our engineers can bring AI into the process to speed up the repetitive parts, reveal gaps in documentation, flag faulty builds, run automated code reviews, or equip build components with model context providers – but the judgment always stays with the experts.

Our labs in Regensburg, Buxheim, and Kraków are TISAX-certified, and **we deliver on-site, remote, or hybrid**, depending on what fits your program.



KATE: Our Modular HiL Platform

Traditional HiL setups tend to be expensive, hard to customize, and slow to deploy. **KATE (Krakow Automated Testing Environment)**, our proprietary modular HiL platform, fixes that.

Configurable modules for power simulation, sensor simulation, load emulation, relay control, and networked system management mean we assemble a validation environment around your requirements, not the other way round. It's CI/CD ready, fully traceable, and you only pay for the functionality you actually need.

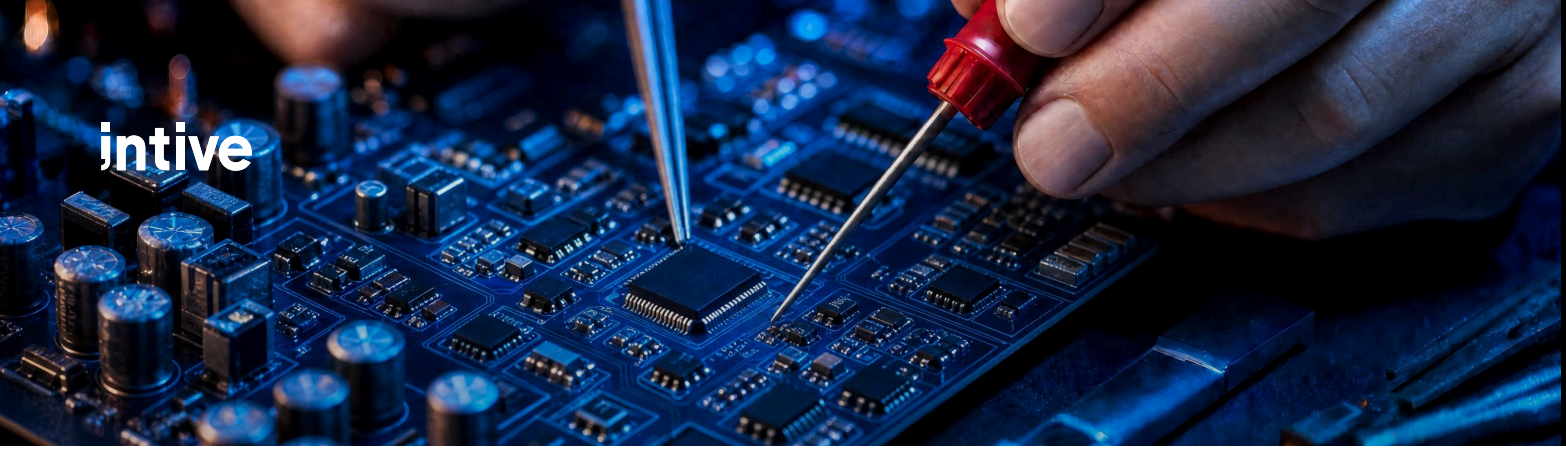


What This Looks Like in Practice

An automotive client came to us **with a growing regression scope and a lab that couldn't keep pace.** We built a managed HiL environment with the continuous validation and automation layer on top of the customer's existing setup. **The result: faster test execution, broader coverage, earlier issue identification, and a release process** the team could finally plan around instead of firefighting.

An industrial equipment manufacturer had a challenge: **validating controller behavior under real operating conditions** without pulling hardware off the line. intive built **a customized HiL environment and a tailored test strategy** to meet that need, cutting field-testing effort and surfacing issues weeks earlier than before.

Different products, same pattern: **shift the testing left, automate what used to be manual**, and you stop losing time to last-minute fixes.



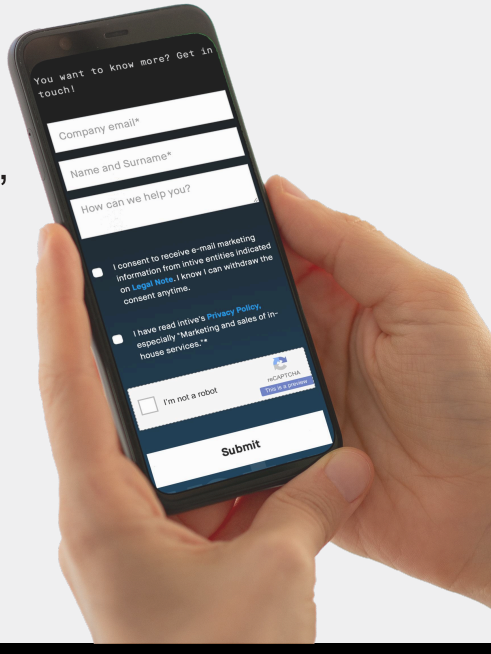
What You Gain

Faster	Safer	More Predictable
Accelerated validation cycles	Earlier issue detection	Repeatable testing processes
Quicker environment setup	Improved software quality	Stable validation environments
Higher automation levels	Higher validation coverage	Reliable quality indicators
Reduced bottlenecks	Reduced integration risks	Increased release confidence

Next Steps

Whether you're looking to assess your current HiL maturity, pilot an automated pipeline, or see KATE in action, we can start small and scale from there.

Possible starting points include a HiL capability assessment, a pilot project, a test strategy workshop, or a KATE demonstration.



Let's talk about where shifting left could save you the most time, money, and risk.

sales@intive.com

https://www.intive.com/services/embedded-software