NI Hardware-in-the-Loop Test
The NI HIL Platform

The NI hardware-in-the-loop (HIL) test platform uses open hardware and software technologies to reduce the time, cost, and risk associated with control system development.

Meeting the diverging challenges of shorter time to market, greater reliability, and increasing product complexity requires an HIL test platform that is efficient, scalable, and flexible enough to deliver the latest technology to your applications. From low-cost PC-based testers to high-performance multichassis systems, the NI HIL platform offers industry-leading real-time multicore and FPGA technology, global services, support, and partner expertise. With these tools at your disposal, you can extend beyond HIL test to initial requirements definition, test cell and in-field test activities, and more.

Siemens Wind Power A/S
Using the NI HIL platform, Siemens developed a new wind power test system capable of meeting the growing requirements of the rapidly evolving wind energy technology industry.

Ford Motor Company
The NI HIL platform provided Ford with the performance necessary to design and validate a real-time embedded control system for automotive fuel cells.
NI HIL Industries and Applications

The NI HIL test platform is used to validate embedded control devices in a variety of applications including renewable and fossil fuel energy, automotive and off-highway, and even military, aerospace, and medical.

“Because of the modularity of the system, it is easy to improve, adapt, and further develop. The system under test can be quickly replaced without any changes in the test system architecture.”

Samir Bico, Design Engineer, Siemens Wind Power A/S

Successful companies across many industries have chosen the NI platform for their HIL test applications to ensure they keep up with market demands by using high-quality products.
High-performance, modular I/O interfaces are essential to building a successful HIL test system. In addition to supporting third-party hardware interfaces, NI provides the largest variety of I/O hardware to complete your HIL test system. Select from multifunction, vehicle bus, and FPGA-based interfaces.

**1. Real-time, multicore processors**
**2. Support for third-party I/O**
**3. User-programmable FPGA interfaces**
**4. Small-footprint and portable applications**

**Analog and Digital I/O**
NI data acquisition products feature a range of analog, digital, and counter/timer I/O combinations on a single device to offer:

- High-performance analog-to-digital and digital-to-analog converters
- Flexible NI FPGA-based I/O interfaces
- Low-latency data transfers to a real-time processor

**Bus Interfaces**
NI provides a variety of automotive, avionic, and industrial bus interfaces including:

- Reflective memory for high-speed data transfer
- CAN, LIN, and FlexRay for automotive test
- MILSTD-1553 and ARINC 429 for avionic applications
- Serial, Modbus, and Ethernet connectivity

**Hardware Fault Insertion**
NI delivers several types of fault insertion topologies so you can:

- Comply with IEC 61010-1 international standards
- Know each design has been verified through third-party agencies such as UL
- Increase long-term reliability with onboard relay count tracking to predict maintenance events
NI HIL Software

Whether you want to configure, program, or simply turn on your HIL test system, NI offers a variety of development tools and turnkey integration options that can help you from setup to implementation and throughout the life of your system. These tools help you perform a wider range of tests earlier in the software development process, which reduces overall cost while improving quality.

Create
Use VeriStand real-time test and simulation software to quickly create your HIL test system application using a configuration-based approach.

Experience
Customize and extend a flexible, multicore-optimized application architecture using LabVIEW, C/C++, and other environments.

Reduce
Drive down development time and application maintenance costs with out-of-the-box functionality.

“By adopting FPGA-based simulation using the NI hardware and software platforms, we achieved the simulation speed and model fidelity required for verification of an electric motor ECU. We reduced test time to 1/20 of the estimated time for equivalent testing on a dynamometer.”

Tomohiro Morita, FUJI Heavy Industries, Ltd.
Software Extensions

HIL test often requires a series of tests and extensive data analysis. With the NI HIL platform, you can automate your HIL test sequences and take advantage of tools to easily create reports and analysis documents. By performing post-processing and report generation and mapping test results to requirements, you gain deeper insight into your application.

Test Automation and Requirements Traceability

Use TestStand to develop, manage, and execute test sequences written. Link your development and verification documents with formal requirements.

Analysis and Reporting

Create reusable analysis scripts and report templates or implement automated analysis and report generation processes.

Third-Party Compatibility

Access support for many third-party analysis packages, so you have a unified process for quickly turning HIL test system data into results you can use to make decisions.

Specialty NI HIL Hardware

Some HIL applications require additional flexibility and performance. NI provides high-performance RF and instrument-grade I/O as well as machine vision for your HIL application.

Machine Vision and Motion Control

Add image analysis to your HIL test system to verify instrument panel displays or actuator response. By doing this, you can process images directly on the smart camera and minimize the impact on your HIL test system. You also can use NI motion control products to stimulate components in the loop.

RF and Instrument-Grade I/O

NI modular instruments offer instrument-grade measurement and signal generation in a modular form factor so you can integrate new equipment into your HIL test system. Choose from a variety of digital multimeters, scopes, signal generators, and RF instruments.

Turnkey HIL Solutions

The worldwide NI Alliance Partner Network includes nearly 1,000 independent, third-party companies who partner with NI. This partnership approach to turnkey HIL test system development provides the highest quality HIL test solutions at the greatest value. You benefit from a focused investment in product development along with the deep domain expertise of certified integration partners whose business models help them offer superior system delivery times and on-site services.
NI Global Services and Support

**Leverage Expertise**—Consulting and Integration
Develop solutions faster and mitigate risk with the help of NI and Alliance Partners. Together we provide a wide range of professional services from feasibility analysis to integration of complex projects.

**Work With a Partner**—Alliance Partner Network
Over 1,000 Alliance Partners are available worldwide, many of which offer deep expertise in HIL applications. Get local support to help with a portion of your project or manage the entire process.

**Develop the Skills You Need**—Training and Certification
Design and develop high-quality applications that scale. NI provides specialized learning paths for HIL applications that includes courses, exams, and events.

**Overcome Challenges**—Technical Support
Take advantage of NI’s award-winning global support program, including phone and e-mail assistance from NI engineers. NI can also provide a dedicated support specialist, priority escalations, and architecture reviews.

**Simplify License Management**—Software License Programs
NI provides flexible licensing and software maintenance tools so you can streamline license management and increase the ease of auditing as your development team scales.

**Receive Global Support, Locally Delivered**
Rely on a single service network that includes over 30 service locations (including repair centers, calibration labs, and logistics hubs) and more than 700 support and systems engineers in 49 countries.