SOLUTION BROCHURE

Wireless Connectivity and IoT Functional Test Station

Production Test Solution for PCBA and Electronic Devices

CONTENTS

Driven largely by the Internet of Things (IoT) and the wireless standards explosion, wireless has become integral to connected devices. The NI test platform quickly and accurately tests a wide range of wireless devices, including wireless local area network (WLAN) access points, cellular handsets, and infotainment systems. With solutions that simplify parallel test, shorten test times, and reduce test cost, NI helps you build innovative, high-quality products.

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Test Station Architecture and Requirements

A functional test station is an integrated set of hardware and software that measures, analyzes, and publishes data confirming whether a product or component has been manufactured according to predefined specifications.
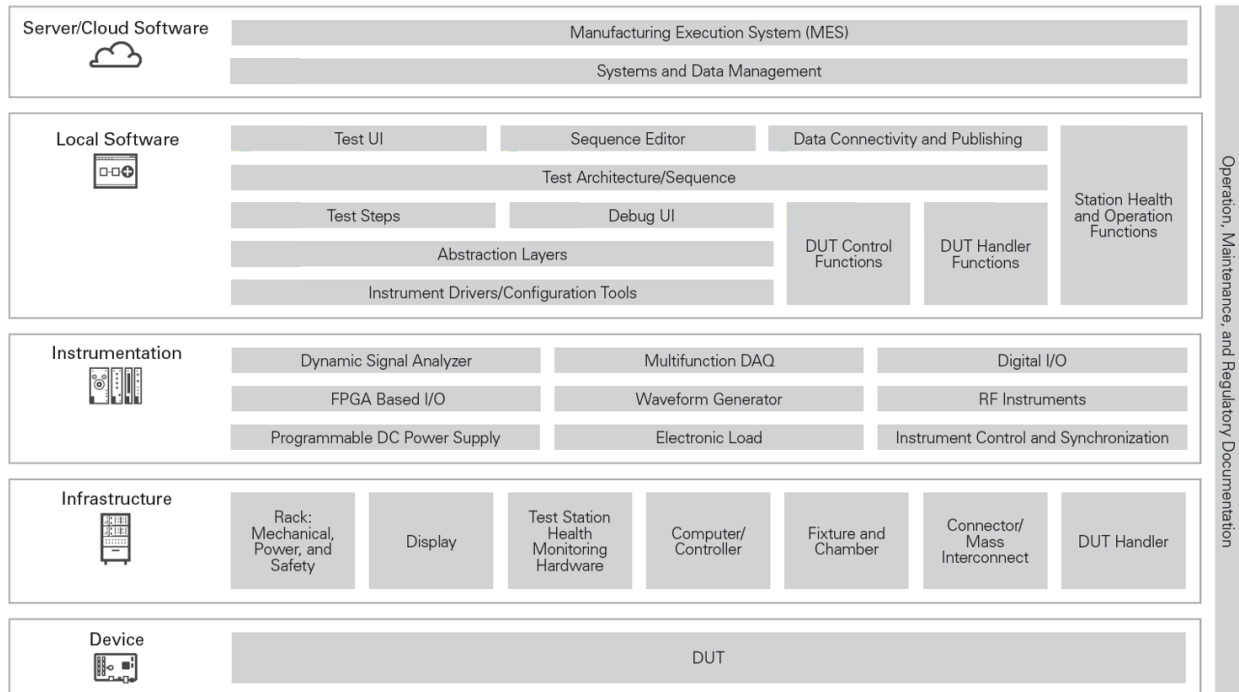

Figure 1. Test Station Architecture

Test stations are complex applications constructed of four fundamental elements: Hardware infrastructure, hardware instrumentation, local software, and server/cloud software. Each test station requires unique test steps and instrumentation types, while most test stations contain similar architectural elements.

Test stations must:

- o Meet test coverage requirements

- o Be maintainable throughout the product's market lifetime

- o Operate within a cycle-time requirement

- o Develop in time to meet a production schedule

- o Be certified and documented to meet regulatory standards

- o Deliver test data in a format accessible to all requesting departments

- o Physically and operationally fit into existing manufacturing processes

- o Be purchased within a test budget

NI Test Platform Benefits

Customize to Deliver Results

The NI test platform is optimized for production test. No matter the pressures on you and your test program, the NI test platform's breadth of hardware, software, and services means that you can customize it to meet specific needs.

- **Product Quality:** Industry-leading accuracy, repeatability, and reliability ensures that your test is never compromised—just like your trust in the product.

- **Product Complexity:** The industry's widest breadth of instrumentation supports measurements including voltage, current, digital signals, audio, RF, visual inspection and more, ensuring complete test coverage.

- **Station Longevity:** Modular instrumentation manufactured and documented with life-cycle management in mind, along with robust service program, keeps production lines running longer with less reengineering work and less recertification.

- **Production Volume:** Built-in automatic test parallelism and FPGA processing that facilitates multi-up test architectures reduces cycle time and results in increased throughput on your line.

- **Development Schedule:** Test-specific software tools can save more than 50% of your development time,[1] reducing the risk of missing tight schedule deadlines.

  Systems-management software ensures fast and error-free software deployment, minimizing delays in large or remote updates.

- **Regulatory Compliance:** Complete documentation, experienced system integration partners, and tools designed for long-term deployment ease regulatory certification and recertification processes.

- **Data Insight:** Out-of-the-box enterprise data-management software collects, analyzes, and reports test data and station health, delivering greater insights into throughput, yield, station or component utilization, and overall operational efficiency.
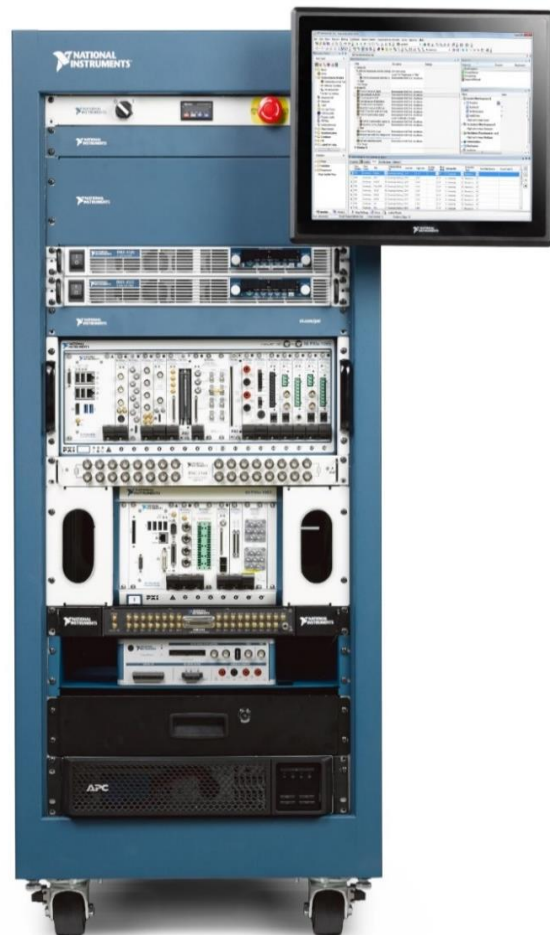
[1]Sub-Zero Group, Inc., Page 5

Figure 2. NI Test Platform

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Support Your Business Initiatives Through Test

The NI test platform is optimized for production test. NI is committed to reach beyond a vendor/client relationship and support you by delivering the value your business requires. Most large organizations have corporate-lead initiatives designed to drive efficiency or differentiate through new technology or processes. By aligning test strategy to these initiatives, best-in-class test directors ensure visibility and success of both their department and overall business.

- **Standardization:** NI's modular hardware and software is ideal for standard platform development, as you can easily reuse and expand components with minimal redesign for wide-range functionality.

- **Digital Transformation:** Utilizing the IoT for test is not a futuristic idea—you can do it today using system-management tools to deliver improved test coverage insight and significant utilization improvements. The NI approach helps businesses focus on areas of greatest value without having to make an all-or-nothing investment decision.

- **Internal Proficiency:** A single NI software toolchain that applies to multiple engineering disciplines, combined with a thriving global developer community, encourages test proficiency both at the individual and team level.

- **Outsourcing Return on Investment (ROI):** By combining consultation, support, and full integration services, reach an in-house versus outsource balance without putting deadlines or build quality at risk.

- **Operational Expense:** Industry-renowned reliability, production-optimized test and data management software, and comprehensive services and support ensure minimized downtime, real-time operational insight, and cost-effective sustaining strategies.

- **Capital Expense:** Scalable, future-proof architectures, multi-up test capability, and high-channel-count instrumentation maximize return on capital investments and protect against large unexpected costs.

"Best-in-class production test teams don't just build test stations—they execute against a test strategy that actively supports their business. With our industry-leading systems and services, NI powers the world's most effective test organizations."

Kyle Voosen, *Director, Electronics Production Test, National Instruments*

NI Tool Architecture

The NI test platform includes a complete set of products, including modular hardware, development software, and management applications, to help you develop and operate functional test stations. NI and its global network of NI Alliance Partners offer integration and technical services to ensure success in designing, developing, and sustaining test stations.
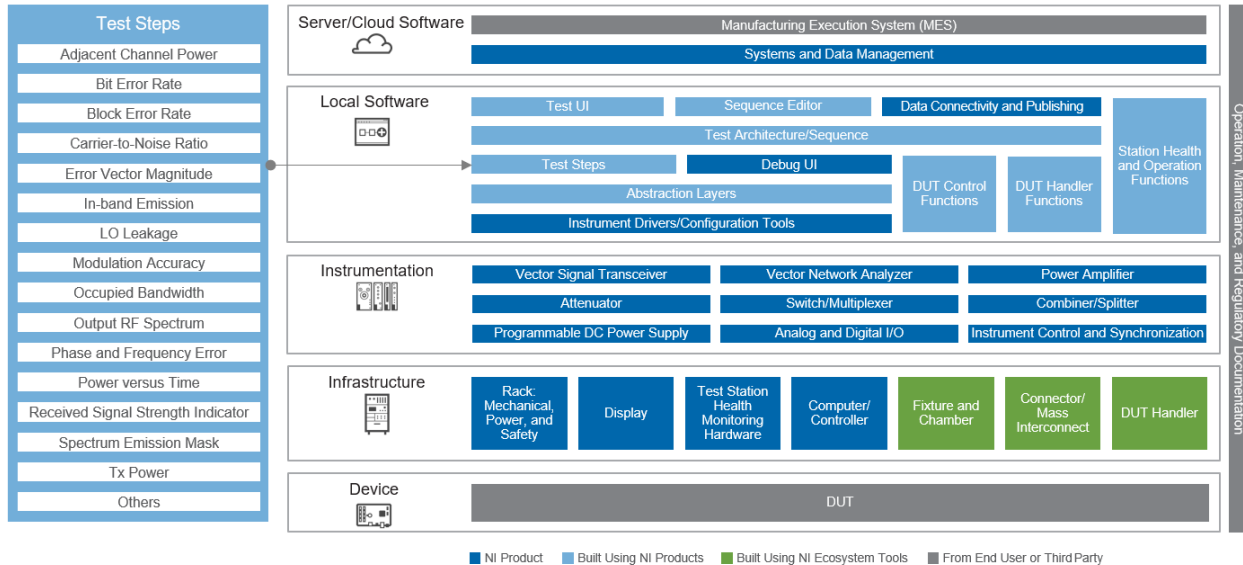

Figure 3. NI Tool Architecture

- **Instrumentation:** A PXI Vector Signal Transceiver drives confident test data with industry-leading measurement quality, supporting the latest and emerging wireless standards.

- **Local Software:** TestStand, LabVIEW, and RFmx software rapidly develop complex test steps and sequences.

- **Server/Cloud Software (Enterprise):** SystemLink™ software eliminates manual software deployment tasks and elevates reports and test-data trends, driving operational efficiency.

- **Infrastructure:** PXI systems conserve floorspace due to their small, light form factor. Order the completed rack preassembled and installed using NI ATE Core Configurations.

- **Services and Support:** Alliance Partners offer integration and hardware services and proficiency programs to ensure your short- and long-term success.

"We have developed a standard hardware platform based on NI's offerings that allows us to rapidly deploy new equipment. We do the same with LabVIEW code, which allows us to deploy a system probably 50 percent quicker than in the past."

Dave Gilmore, *Project Engineering Manager, Sub-Zero Group, Inc.*

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Electrical Instrumentation

From precise low-voltage measurements to custom digital protocols and battery simulation, PXI instruments operate across tens of thousands of manufacturing lines worldwide. Chosen for their complete and accurate test coverage, with a flexible, modular architecture, you can control the instruments via PC either remotely or mounted alongside the modules in an ultrareliable PXI chassis. The chassis also provides timing, triggering, and synchronization across a high-throughput backplane. You can rack-mount larger-format instruments alongside the PXI chassis.
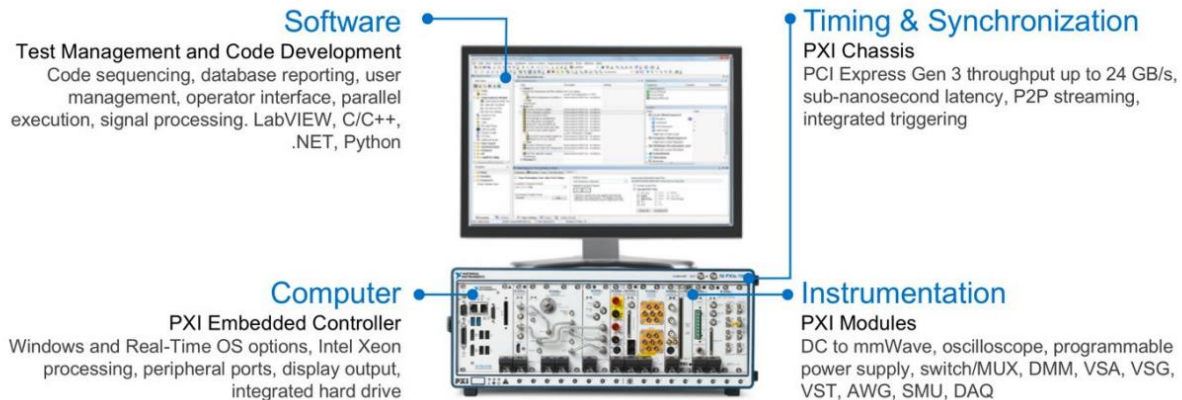

Software
Test Management and Code Development
Code sequencing, database reporting, user management, operator interface, parallel execution, signal processing. LabVIEW, C/C++, .NET, Python

Timing & Synchronization
PXI Chassis
PCI Express Gen 3 throughput up to 24 GB/s, sub-nanosecond latency, P2P streaming, integrated triggering

Computer
PXI Embedded Controller
Windows and Real-Time OS options, Intel Xeon processing, peripheral ports, display output, integrated hard drive

Instrumentation
PXI Modules
DC to mmWave, oscilloscope, programmable power supply, switch/MUX, DMM, VSA, VSG, VST, AWG, SMU, DAQ

Figure 4. PXI Chassis Configuration

PXI Platform Design

PXI is a rugged, PC-based platform that combines PCI electrical-bus features with modular CompactPCI packaging and adds specialized synchronization buses and key software features. NI is the PXI test and measurement market leader, offering an unrivaled breadth of instrumentation. The NI PXI platform uniquely fast-tracks development, seamlessly integrating with NI test software as well as achieving open compatibility with third-party hardware and software. PXI is an open industry standard governed by the PXI Systems Alliance, a group of more than 70 global test companies.

Choose from the following instrumentation:

- Vector Signal Transceiver
- RF Signal Analyzer
- RF Signal Generator
- Vector Network Analyzer
- Oscilloscope/Digitizer

- RF Switches and Timing/Synchronization
- Source Measure Unit (SMU)
- Instrument Control and Synchronization

"We need a test solution that combines the RF test capability with the analog and digital components. We also need to be able to improve our overall capacity. So far, we have doubled our throughput by using multisite testing provided by the NI platform."

-Eric Westberg, Portfolio Manager, RF Power, NXP

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PXI Instrumentation

NI offers more than 600 PXI modules, ranging from DC to mmWave. Because PXI is an open industry standard, nearly 1,500 products are available from more than 70 different instrument vendors. With standard processing and control functions designated to a controller, PXI instruments need contain only the actual instrumentation circuitry, achieving effective performance in a small footprint. Combined with a chassis and controller, PXI systems feature high-throughput data movement using PCI Express bus interfaces and subnanosecond synchronization with integrated timing and triggering.

Vector Signal Transceivers

Combine a vector signal generator and vector signal analyzer with FPGA-based, real-time signal processing and control

Oscilloscopes

Sample at speeds up to 12.5 GS/s with 5 GHz of analog bandwidth, featuring numerous triggering modes and deep onboard memory

Digital Instruments

Perform semiconductor device characterization and production test with timing sets and per-channel pin parametric measurement unit (PPMU)

Frequency Counters

Perform counter-timer tasks such as event counting and encoder position; and make period, pulse, and frequency measurements

Power Supplies and Loads

Supply programmable DC power (including some modules with isolated channels, output disconnect functionality, and remote sense)

Switches (Matrix and MUX)

Utilize a variety of relay types and row/column configurations to simplify wiring in automated test systems

GPIB, Serial, and Ethernet

Integrate non-PXI instruments into a PXI system through various instrument control interfaces

Digital Multimeters

Perform voltage (up to 1000 V), current (up to 3A), resistance, inductance, capacitance, and frequency/period measurements, as well as diode tests

Waveform Generators

Generate standard functions including sine, square, triangle, and ramp, as well as user-defined, arbitrary waveforms

SMUs

Combine high-precision source-and-measure capability with high channel density, deterministic hardware sequencing, and SourceAdapt transient optimization

FlexRIO Custom Instruments and Processing

Provide high-performance I/O and powerful FPGAs for applications that require more than standard instruments can offer

Data Acquisition Modules

Measure electrical or physical phenomena with a mix of analog I/O, digital I/O, counter/timer, and trigger functionality

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Vector Signal Transceivers

Vector Signal Transceivers combine a vector signal generator, vector signal analyzer, and user-programmable FPGA into one device. Use these products for RF and wireless applications such as cellular device testing and RFIC characterization.

Key Benefits:

- Software: Includes interactive soft front panel, API support for LabVIEW and text-based languages, shipping examples, and detailed help files

- Up to 44 GHz RF frequency range

- Up to 1 GHz instantaneous/complex I/Q bandwidth

- High-speed serial and parallel digital interface

- Better than -50 dB error vector magnitude performance for higher-order modulation schemes

- Easy synchronization for multiple-input/multiple-output configurations using NI-TClk

- Baseband two-channel differential I/Q interface with 4 Vpp differential input and 2 Vpp differential output swing

- LabVIEW-programmable FPGA

Figure 5. Vector Signal Transceiver Product Family

"Using the software-designed NI PXI vector signal transceiver and NI WLAN Measurement Suite with LabVIEW system design software, we improved test speeds by more than 200 times compared to traditional rack-and-stack instruments while significantly improving test coverage."

Doug Johnson, *Qualcomm Atheros*

Instrumentation Hardware Services

Test station development and deployment is only half of the story. Best practice dictates that you consider station sustaining and maintenance from day one.
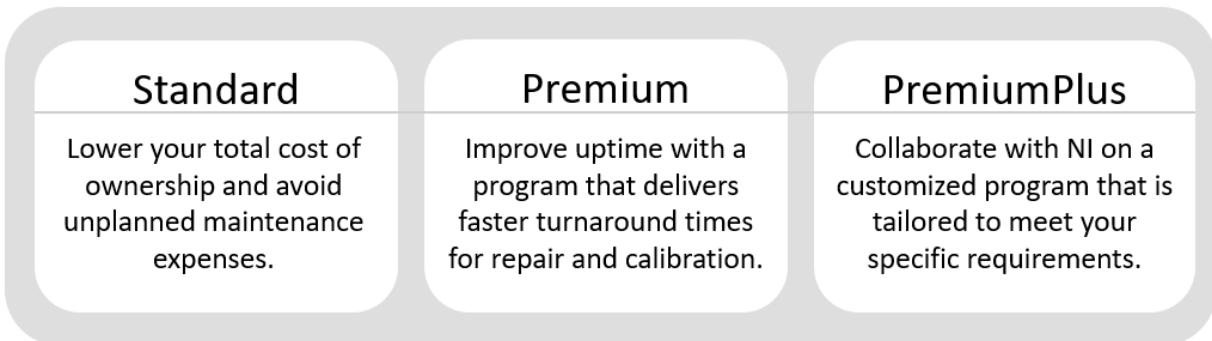
Standard	Premium	PremiumPlus
Lower your total cost of ownership and avoid unplanned maintenance expenses.	Improve uptime with a program that delivers faster turnaround times for repair and calibration.	Collaborate with NI on a customized program that is tailored to meet your specific requirements.

Figure 6. Instrumentation Hardware Service Levels

- **Budget Control:** Predict operational costs and avoid unforeseen maintenance expenses.

- **Minimize Downtime:** Get your systems back up and running within days, hours, or minutes with sparing programs, advance replacement services, and repair contracts.

- **Manage Life-Cycle Changes:** Manage technology refreshes and product obsolescence with roadmap consulting and life-cycle services programs encompassing one to twenty years.

- **Simplify Logistics:** Simplify hardware maintenance logistics and overhead with NI support.

- **Maintain Standards**: Utilize ISO 9001-traceable calibration and ISO/IEC 17025-accredited calibration services delivered on-site and through expedited shipping for confidence and convenience.

- **Speed Deployment**: Get up and running with custom installation that includes app software, custom documentation generation, individual logo/labeling, and system recovery images.

- **Quickly Troubleshoot**: Minimize development delays by consulting with experienced applications engineers based in more than 40 countries to meet your local needs in your local language.

"In the 25+ years I've been dealing with NI, I've always found their personnel to be uniformly bright, enthusiastic, and genuinely concerned with helping their customers succeed."

Cary Long, *Software Engineer*

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Local Test-Station Software

Because software development monopolizes the majority of test-project development labor, software tool and architecture choices significantly impact deployment schedules. Adopting a standard software approach across a team or organization increases both efficiency and proficiency, lowering the risk of missed deadlines and improving test quality and reliability.
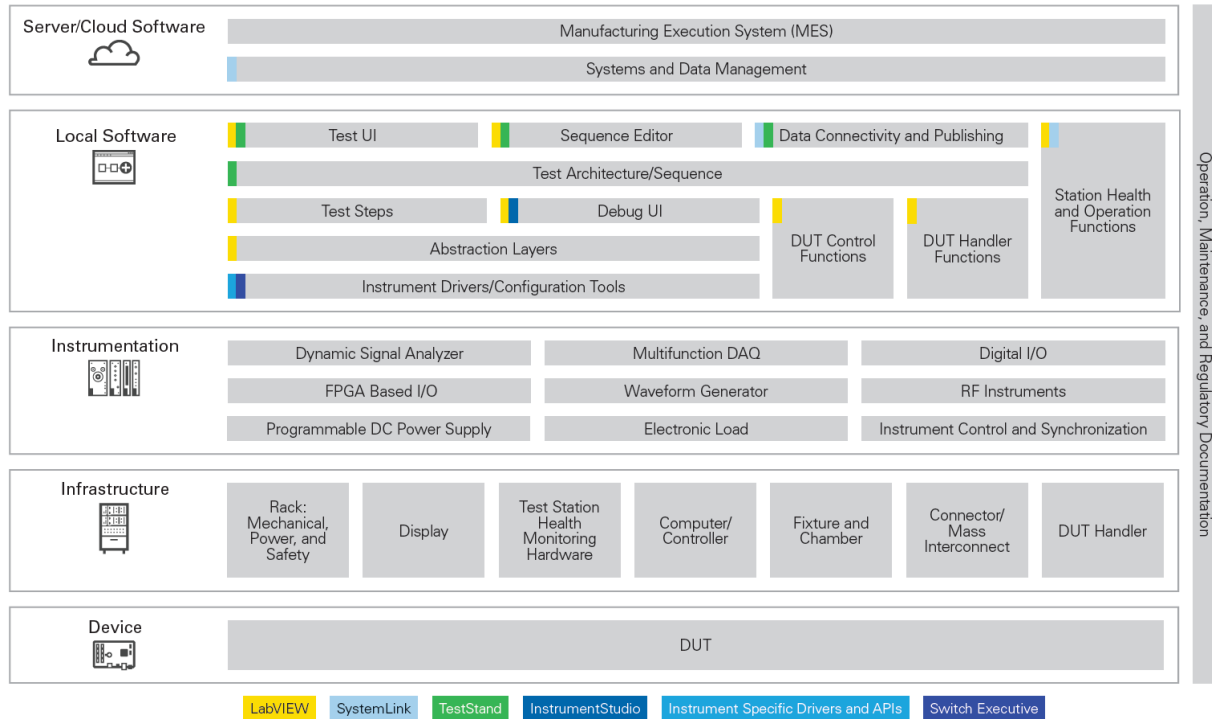
Figure 7. Test Station Software

National Instruments is the global leader in test software. Tens of thousands of engineers worldwide choose NI software for its rapid development environment, open architecture, and throughput-enhancing features, such as automatic parallel test-step execution. National Instruments test software is the most complete engineering toolchain on the market, consisting of TestStand, LabVIEW, SystemLink software, InstrumentStudio™ software, and more.

NI test software is open and compatible with most other development languages, including C, C#, and Python, so that teams can reuse existing IP within test steps and sequences without sacrificing NI software platform-development benefits.

"The NI platform (especially LabVIEW and TestStand) has greatly increased our productivity and is a department standard. It probably saves us at least 40 hours on each project."

Makenna Shaske, *Test Development Engineer, Benchmark Electronics*

LabVIEW

LabVIEW offers a graphical programming approach that helps you visualize every aspect of your application, including hardware configuration, measurement data, and debugging. This visualization makes it simple to integrate measurement hardware from any vendor, represent complex logic on the diagram, develop data analysis algorithms, and design custom engineering user interfaces.

Key Benefits:

- Reduce system setup with access to thousands of instrument drivers, example programs, and documentation to connect to virtually any instrument.

- Use hundreds of instrument-specific example code modules and included measurement libraries to reduce development time.

- Reuse existing code libraries from languages including C/C++/C#, .NET, Python, and MathWorks MATLAB® software.

- Quickly create professional user interfaces to visualize test outcomes.

- Build proficiency with extensive online and in-person training options for both new users and certified NI tool architects.
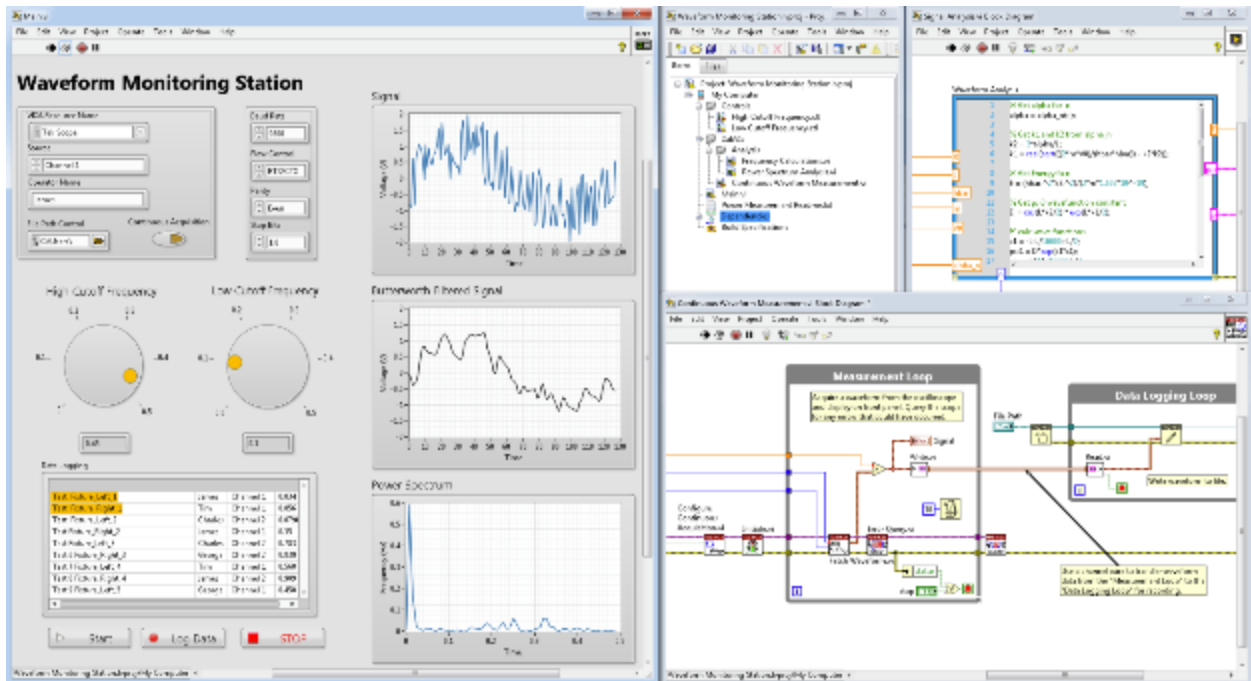
Figure 8. LabVIEW Software Interface

"Our team uses a common hardware platform across testing of numerous products. Reusability of common hardware configurations and utilization of common LabVIEW code simplifies development of new test systems."

Brian Teschendorf*, Software Engineer, Boston Scientific Corporation*

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TestStand

TestStand ready-to-run test management software is designed to help you quickly develop and execute transaction processing system (TPS) software. You can extend TPS functionality by developing TestStand test sequences that integrate code modules written in a variety of programming languages, including G in LabVIEW, C/C++, .NET, and Python. TestStand also provides extensible plug-ins for reporting, database logging, and connectivity to other enterprise systems. You can deploy test systems to production with easy-to-use operator interfaces.

Key Benefits:

- Customize test sequences to meet every requirement

- Automate saving and reporting test data

- Increase test throughput with parallel testing

- Efficiently replicate and deploy test systems

- Troubleshoot test systems with integrated debugging tools

- Customize user interfaces to meet testing needs
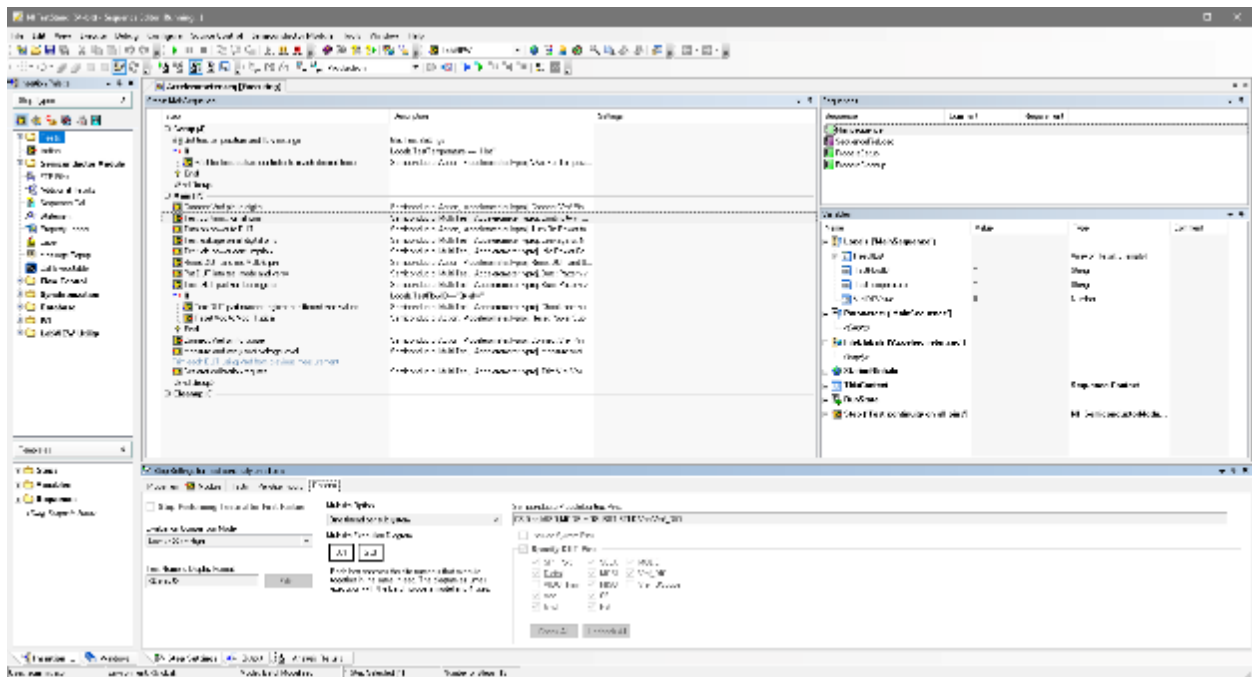
Figure 9. TestStand Software Interface

"TestStand has helped to decrease the time spent testing product and gets it to the market faster."

Jared Smith, Test Engineer, Schneider Electric

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API

NI RFmx is an easy-to-use intuitive programming API that offers advanced measurement configuration. Its highly-optimized API performs tasks ranging from digital and analog modulated signal measurements to RF spectral measurements—including channel power, adjacent channel power, and power spectrum. Use it to automate programs with accurate, high-performance, standard-based measurements for LTE-A, WCDMA/HSPA+, GSM/EDGE, Bluetooth, Bluetooth LE, and more. In addition to supporting cellular and general purpose measurements with RFmx, NI offers wireless test-standards software for GPS/GNSS simulation and FM/RDS, and the NI WLAN Toolkit gives you direct, fine control over IEEE 802.11a/b/g/n/ac and ax signal and 802.11j/p/ah/af waveform generation and analysis with industry-leading speed and accuracy.
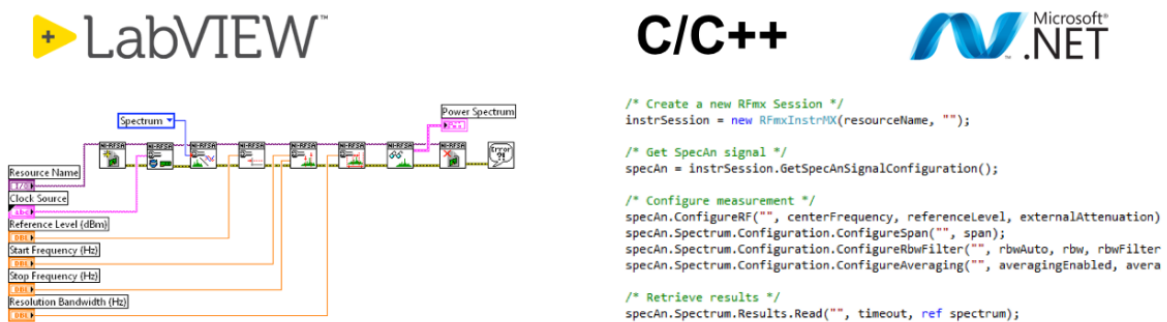
Figure 10. NI RFmx Power Spectrum Measurements in LabVIEW and C

Figure 10 illustrates a power spectrum measurement in RFmx LabVIEW with eight function calls. Get started with one of more than 100 C, .NET, and LabVIEW example programs designed to make instrument automation straightforward. The NI RFmx API includes high-level parameters that intelligently optimize instrument settings to help you achieve the highest quality measurements with the fewest software calls. Additionally, NI-RFmx features vastly simplify multimeasurement parallelism and multi-DUT measurement software complexity. The modular software architecture offers access to lower-level NI-RFSA instrument- and application-specific functions that balance ease of use and test-code flexibility. NI-RFmx works with all NI software-designed Vector Signal Transceivers (VSTs) and preserves NI-RFSA instrument driver FPGA extensions, which are available only on LabVIEW FPGA-enabled products. Achieve industry-leading measurement speeds using the latest processor technologies and easy-to-program multithreaded measurements for test-time reduction.
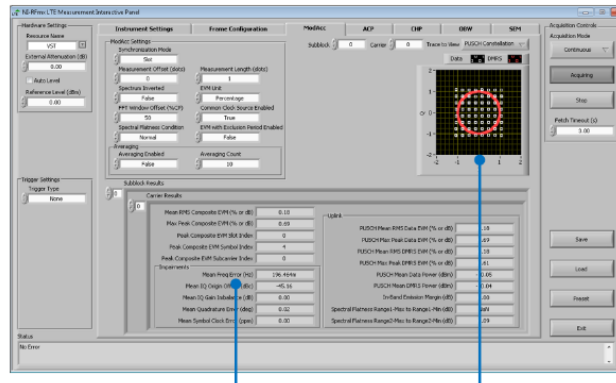
Soft Front Panel

VST offers the simplest software use model in its soft front panel. Quickly and easily configure the RF signal generator or analyzer to debug fixtures and obtain fast measurement results. Use the soft front panel to configure the VST for an adjacent channel power measurement, as shown in Figure 11.
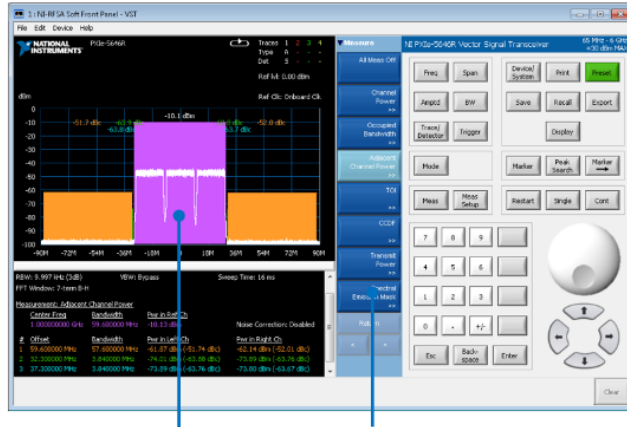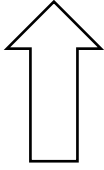

Figure 11. Configure the VST for quick measurements using the NI-RFSA and NI-RFSG soft front panels (other interactive examples act as soft front panels for different standards).

Server/Cloud Software (Enterprise)

Test data visibility is increasingly in demand. Best-in-class companies realize that scrutinizing their functional test data provides real-time insight into changes in manufacturing yield, throughput, line health, and product quality.

Data Insights	Team Requesting Data	Data Usage Need
Enterprise Data Requirement	Company Leadership	Business Operations Insight
	Product Returns Team	Fault Traceability
	Product R&D Team	Product Design Improvement
	Test Development Team	Tester Improvement and Optimization
	Manufacturing Floor Operations Team	Utilization and Line-Balancing Operations
Basic Data Requirement	Local Test Operator	Test-Station Status

Home-grown test data management solutions are prevalent. But effectively developing and maintaining these solutions requires expertise in domains misaligned with test engineering workflows, including database connectivity, web services, IT systems, security, and visualization. Because these areas often do not contribute to key metrics by which test organizations are measured, they detract from the team's success.

To offset this, test organizations are moving towards a COTS systems and data management solution in which test engineers work within the areas that add the most business value.

NI SystemLink software is a leading solution that addresses this issue, as well as expands the capabilities of systems and data management tools far beyond what most engineering teams have experienced. SystemLink software integrates seamlessly with NI TestStand software and PXI hardware and offers an open architecture to effectively manage a wide range of third-party data and instruments.
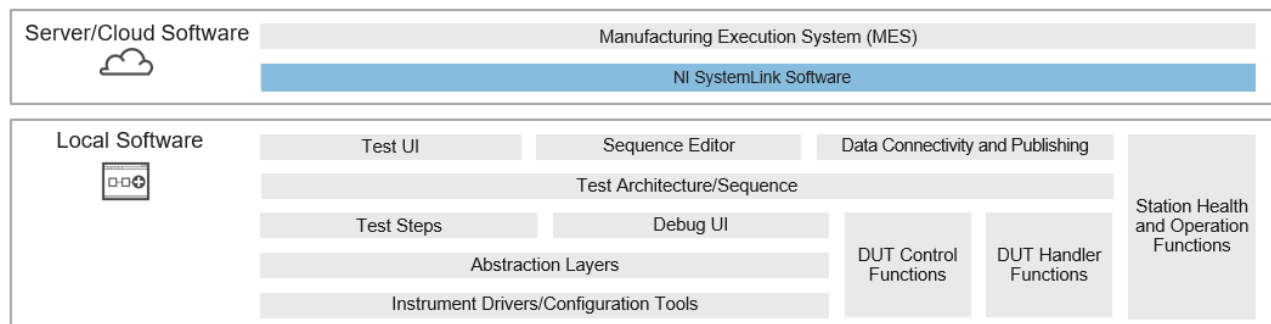
Figure 12. Software Architecture Highlighting NI SystemLink Software

SystemLink Software

SystemLink software eliminates the manual tasks related to keeping test systems current and healthy. From automating software updates to monitoring system health, SystemLink software delivers key information that improves situational awareness and test readiness. Leveraging an automation and connectivity framework, SystemLink software aggregates test and measurement data from all test systems into a centralized data repository. Users have ready access to asset utilization, calibration forecasts, and test-result history, trends, and production metrics data to make proactive decisions on capital expense, maintenance events, and test or product modifications.

SystemLink software is comprised of four modules—Software Configuration, Asset, Test, and TDM Data Finder. These modules provide application-specific capabilities that use the SystemLink server for data communication, transmission, and movement, as well as services for managing NI and non-NI instruments, software packages, alarms and notifications, and dashboards.

Key Benefits:

- Centrally manage distribution software

- Optimize your software deployment process

- Perform remote device configuration and diagnostics

- Manage TPS performance health with alarms management, notifications, and calibration reporting

- Automatically prepare your data from multiple query and analysis sources

- Quickly access and search measurement data across TPSs

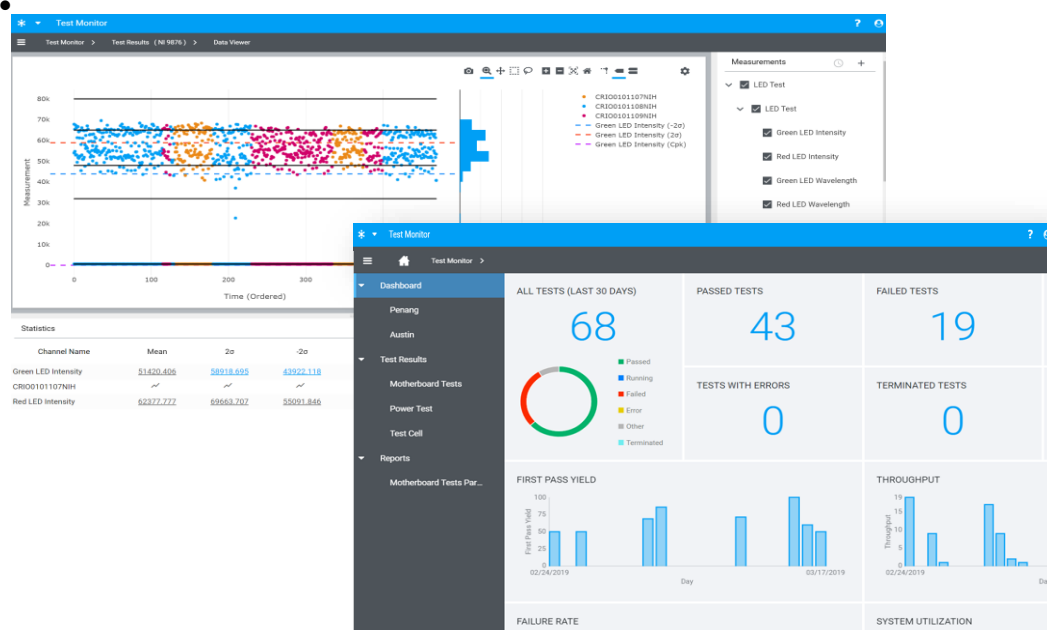- Intelligently analyze files and generate reports automatically

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Figure 13. SystemLink Software

Functional Test Infrastructure Elements

While the infrastructure around a test station isn't typically recognized in test coverage specifications, it plays a vital part in ongoing test-station operation. Carefully considering test infrastructure component quality, practicality, and functionality ensures long-term test-station success. NI provides many of the key infrastructure elements and partners with an ecosystem of trusted vendors to make recommendations on how to complete a fully operational deployed system.

Instrument Chassis

The PXI chassis, the backbone of a PXI system, equates to a desktop PC mechanical enclosure and motherboard. It provides power, cooling, and a communication bus to the system, and supports multiple instrumentation modules within the same enclosure. PXI uses commercial PC-based PCI and PCI Express bus technology while combining rugged CompactPCI modular packaging, as well as key

Figure 14. PXI Chassis

timing and synchronization features. Chassis range in size from four to 18 slots to fit the needs of any application, whether its intentions are to be a portable, benchtop, rack-mount, or embedded system.

Controllers

PXI embedded controllers eliminate the need for an external PC and provide a high-performance, compact, in-chassis embedded computer. These embedded controllers have extended temperature, shock, and vibration specifications and include the latest integrated CPUs, hard drive, memory, Ethernet, video, serial, USB, and other peripherals.

Figure 15. PXI Controllers

Controllers comes preconfigured with LabVIEW Real-Time or Microsoft Windows and all device drivers preinstalled. NI's embedded controllers also include managed life-cycles and vendor support to ensure test system longevity and compatibility with the PXI ecosystem.

Industrial PC Link

- Connects the PXI chassis to an external controller such as a rack-mounted industrial PC through a software-transparent link that requires no additional programming
- Creates synchronized, data-connected, multichassis PXI systems with up to 13.7 GB/s of sustained data throughput
- Optimizes costs

Mechanical, Power, and Safety Infrastructure

Not all racks are created equally: Rack vendors seeking to reduce costs can compromise accessibility, durability, mobility, and reliability. NI has standardized a mechanical, power, and safety infrastructure for deploying rack-based automated test systems with trustworthy, high-quality components in a flexible, easy-to-maintain system.
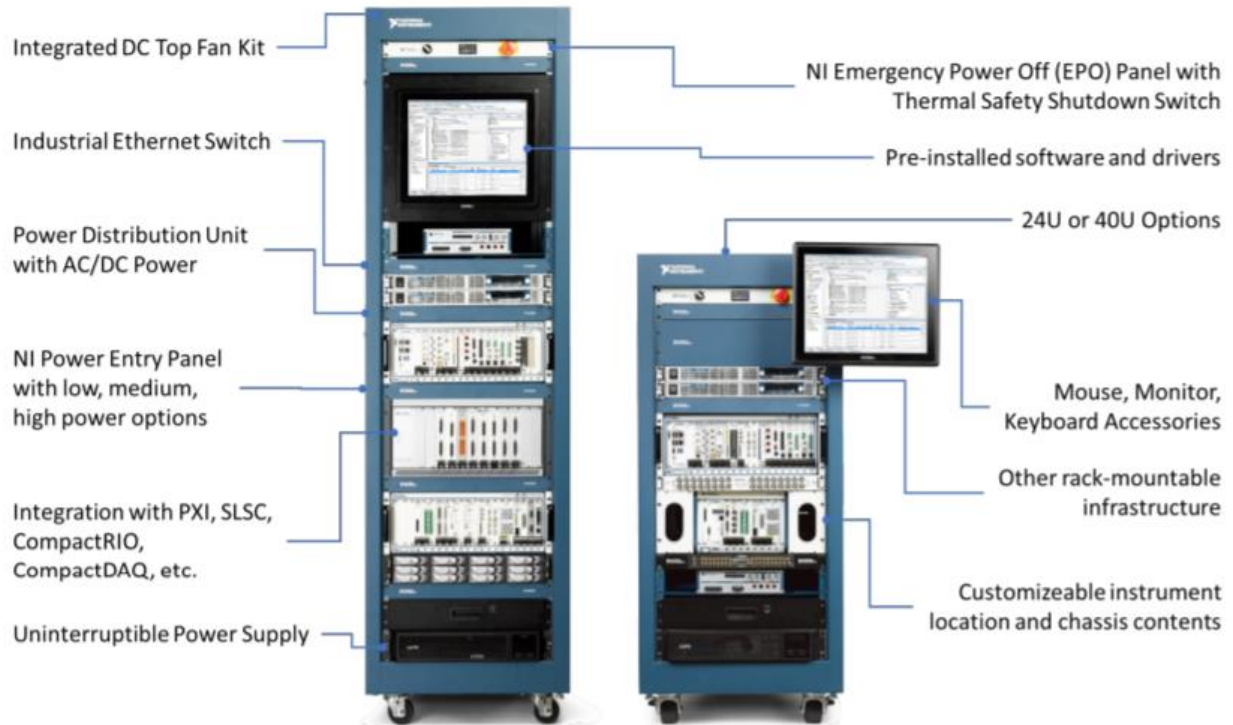

Figure 16. Rack

Streamline your automated test-system procurement and control costs and timelines with a single-vendor expedited preassembled, configured systems delivery. Reduce time and cost associated with multiple purchase orders by acquiring a full tester from one vendor, and having it shipped directly to your site anywhere in the world (IEC 61010-01-compliant). Each system is delivered with reusable packaging materials ideal for future redeployment.

Benefit from a single warranty covering your system, repair and replace parts from a single source, and trust NI's single service program to sustain your entire system. NI-configured systems save time and money while accelerating system deployments.

"By standardizing on NI's ATE core configs, we were able to reduce the time it takes to build new testers by 40 percent."

Chris Becher, *Engineering Manager, Alstom Signaling*

Mass Interconnect

Product life cycles decrease as new features and options roll out. To ensure positive ROI, engineers are deploying customizable modular test systems to meet the coverage needs of multiple DUTs and SKUs. This modular best practice includes both the instrumentation and the test interface.

Interfaces must:

- Allow rapid system changeover through a standardized approach

- Not compromise test coverage by supporting a full range of signals from the DUT

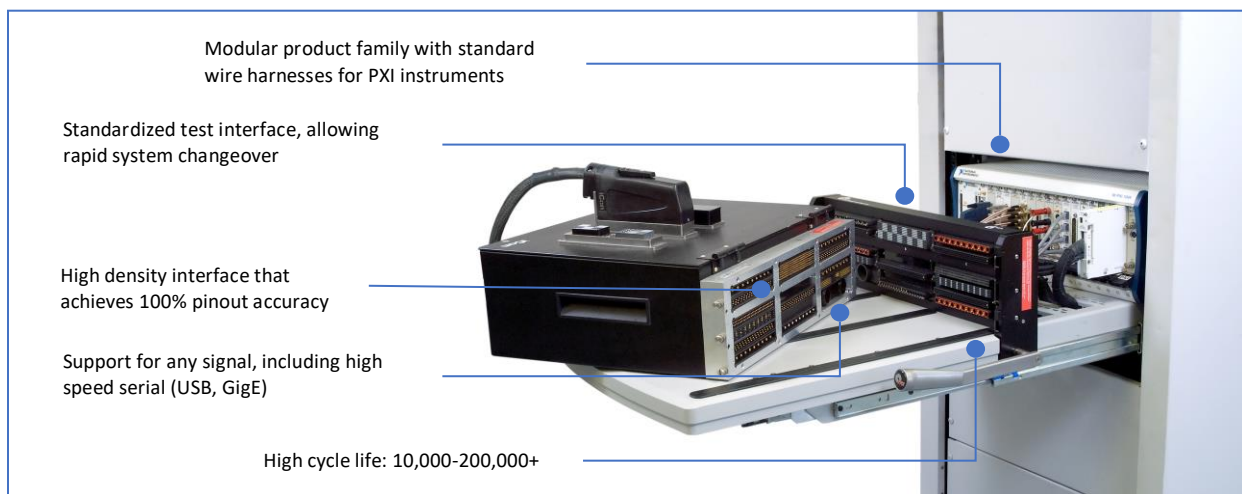- Minimize downtime and reduce maintenance with reliable long-term operation

Modular product family with standard wire harnesses for PXI instruments

Standardized test interface, allowing rapid system changeover

High density interface that achieves 100% pinout accuracy

Support for any signal, including high speed serial (USB, GigE)

High cycle life: 10,000-200,000+

Figure 17. Modular Mass Interconnect

Featured Product Partner: Virginia Panel Corporation (VPC)

For almost 60 years, dedicated VPC employees have provided reliable mass interconnect solutions. VPC designs, manufactures, and markets interface connector products for commercial, consumer electronic, medical, telecommunications, aerospace, and automotive applications.

For more information, email info@vpc.com.

Fixtures

Functional test typically applies full operational power to a loaded printed circuit board to determine whether the printed circuit board assembly (PCBA) functions as designed. Most functional test stations require custom-built test equipment and custom test fixturing.

Figure 18. Custom Test Fixture

Fixture architecture depends on product volume and the frequency with which you change the model of DUT being tested. Fixture can represent a significant capital expenditure as cost is proportional to the number of tested SKUs rather than the number of testers, but because connectivity in the fixture is a leading cause of false failures, best practice dictates that this is not a test system element on which to compromise quality. Although many high-volume lines are moving to in-line architectures due to labor cost, manual or pneumatic architectures still are common. If volumes are low, you can use personalized drop-in plates within the fixture to minimize capital expense over time.

Programming heads for flashing embedded software should be integrated into the fixture, as longer cables and multiple connections commonly introduce errors. During this process embedded software security should also be considered

NI partners with trusted fixture vendors across the world as experienced fixture manufacturer is crucial for mechanically durable and ergonomic functionality.

Choose the right Alliance Partner to meet your fixturing needs by visiting ni.com/alliance.

Learn more about our featured electrical functional test Alliance Partners on pages 22-23.

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Services and Support

Change initiatives are common within test teams. Whether building a new test strategy, driving a technology refresh, or extending the life cycle of an existing project, product schedules and budgets are often high-risk. Managing this risk is a tricky balance between meticulous planning and agile design choices.

Utilizing consultation, educational resources, and ongoing support programs can mean the difference between a culture of missed deadlines and budgetary strain, and a culture of on-time, on-target delivery. NI consultation, integration, and education services offer guidance and industry expertise to help build and execute a practical plan to achieve your business and operational outcomes.

Methodology Consulting Services

With more than 40 years' test experience, NI is an expert in test-related processes and strategies. NI provides a framework to help you evaluate your people, processes, and technology, and recommends a test strategy appropriately customized to your business. Work with NI to solidify a business case that articulates your future state and expected program ROI to secure the funding you need.

Planning and project management consulting helps build a project-execution plan that keeps teams on track to hit major development milestones. Work together with NI to establish priorities, identify the right resources, and make trade-offs to optimize cost without putting projects at risk.

Integration Engineering Services

With global solution centers and NI engineers in more than 40 countries supported by more than 900 Alliance Partner companies, NI delivers design and development assistance in every region and industry. NI engineers help you mitigate risk, develop faster, and reduce costs through project management, architecture development, and system documentation to deliver an integrated solution.

Education Services

Test teams new to NI software and seasoned veterans of the platform alike benefit from investing in their education through learning resources designed for personal and team proficiency. NI provides a comprehensive customer education program designed to increase productivity, reduce development time, and improve your team's ability to engineer robust, maintainable applications with NI products. Tailor the experience to fit any schedule with online, in-person, and flexible programs.

Engineers who have adopted NI education services save time in development and maintenance and learn faster.
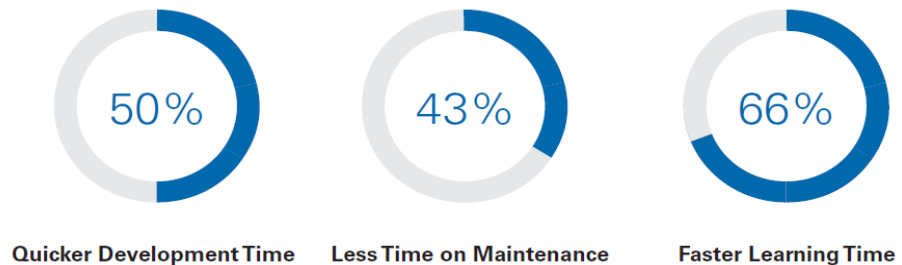

Quicker Development Time — 50%   Less Time on Maintenance — 43%   Faster Learning Time — 66%

Figure 19. Save Time and Effort with NI Products and Services

NATIONAL INSTRUMENTS™

Alliance Partners

Best-in-class test engineering teams realize that there is seldom a simple question of in-house development versus outsourced development. Instead, they realize how complex it is to decide how to balance development teams to optimize for deployment schedule, bandwidth, domain specific expertise, proficiency development, and available budget.

NI Alliance Partners are uniquely positioned to support your business with the service that it requires, including strategic design, system integration, specialist tools, software IP, and ongoing support. More than 1,000 NI Alliance Partners, each certified and vouched for by NI and positioned globally, stand ready to consult with you on projects and provide complete solutions based on NI's productive software and modular hardware.
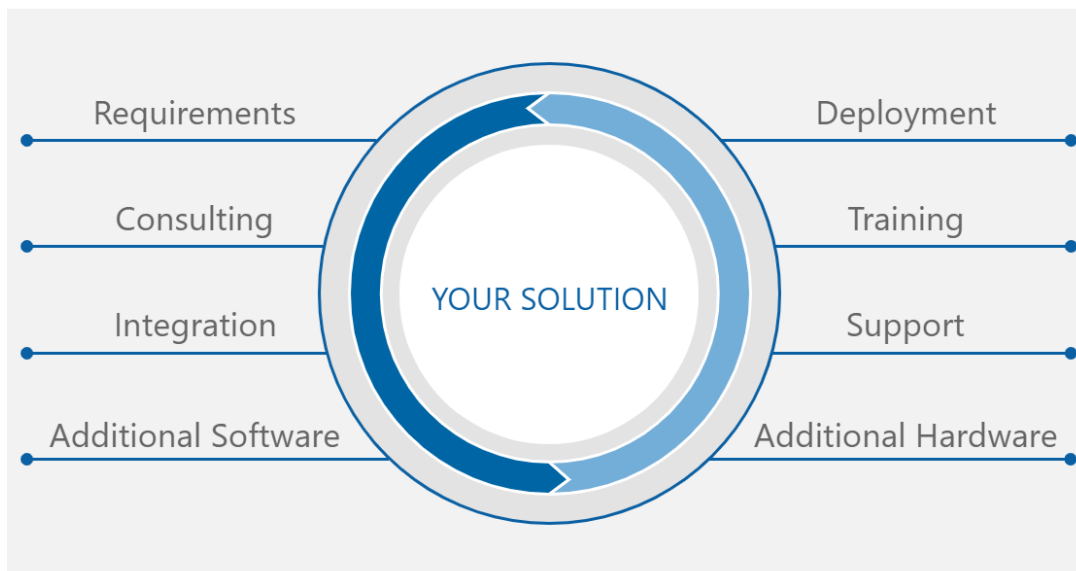
Figure 20. Alliance Partners Can Help Ensure Your Success

Partnering in Your Success

- **Integrators:** These Alliance Partner integration companies offer certified production test specialists to help reduce development time and cost by providing expertise and complete solutions.

- **Consultants:** These hourly consultants help mitigate risk and shorten design cycles through software architecture design, code review, and individual or team training.

- **Tools and Apps:** Build specialist IP into your solution to add functionality or reduce development time. The LabVIEW Tools Network offers hundreds of add-ons, toolkits, and reference applications compatible with NI and industry platforms.