

# Developing Proficiency

With Graphical System Design

Develop Faster

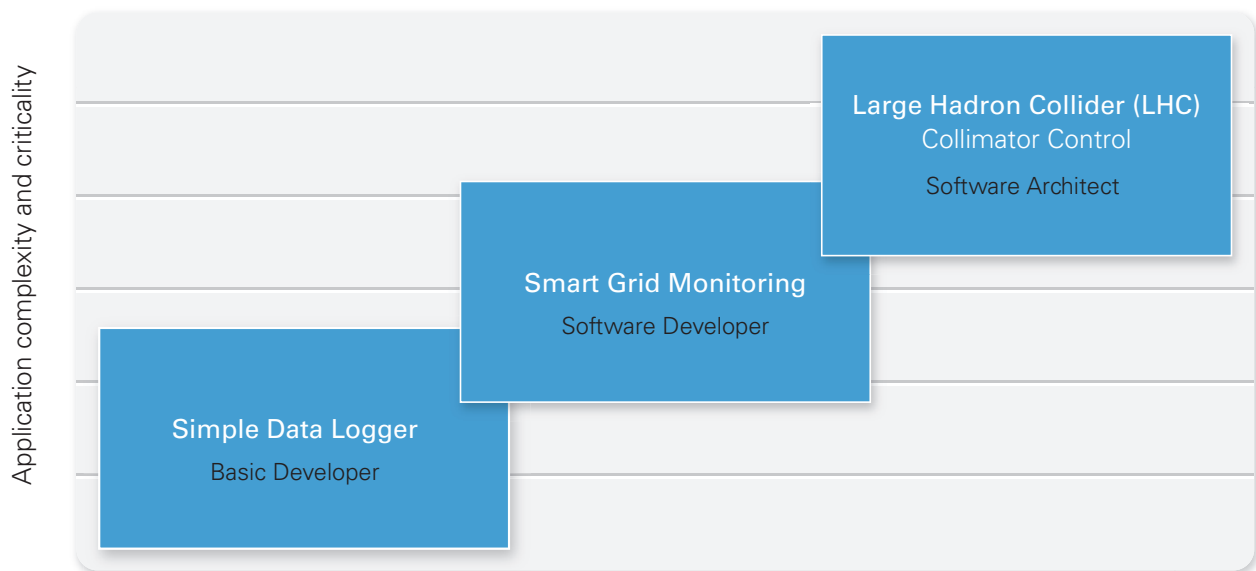
Reduce Costs

Exceed Requirements



# Your Success Depends on Proficiency

Successfully completing an application with the graphical system design approach means more than simply generating a functional program that meets requirements. A successful project also minimizes development time and maintenance costs while taking full advantage of National Instruments tools, including increased productivity with NI LabVIEW system design software and access to advanced technology through NI hardware. Proficiency with National Instruments products makes this kind of success possible.



LabVIEW and software engineering skill level required

## Proficiency Varies by Application

As the size, complexity, and criticality of your application increase, the knowledge and skills you need to be successful change. Because of this, users who have been developing simpler LabVIEW applications for many years may have difficulty delivering a more complex system. As you move from project to project, you should assess which additional concepts you need to learn and scale your skill set to match the demands of your new application.

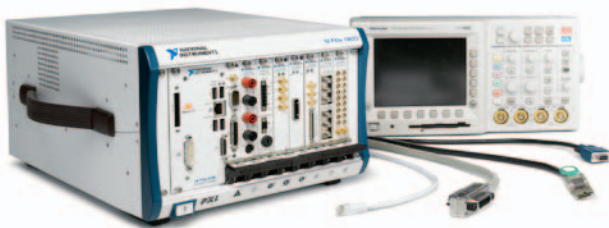
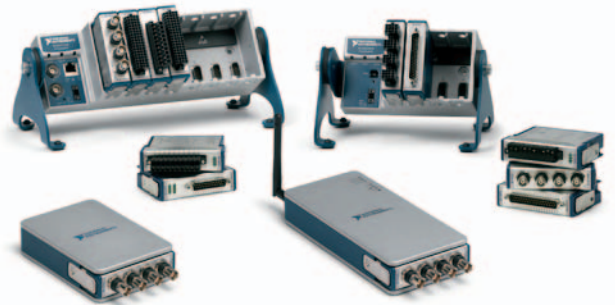
## NI Hardware Proficiency

In addition to determining which level of LabVIEW proficiency you require to achieve success with your graphical system design application, you need to identify the level of hardware proficiency required. NI offers skills guides at [ni.com/skills-guide/hardware](http://ni.com/skills-guide/hardware) for each of the following hardware platforms.

### Data Acquisition (DAQ)

NI is a trusted computer-based measurement provider for engineers and scientists. Find out the level of DAQ proficiency you need to take advantage of NI DAQ's high-performance I/O, industry-leading technologies, and software-driven productivity gains for your application:

- Perform basic measurements
- Develop DAQ systems
- Architect complex DAQ systems



### Instrument Control

NI offers high-quality instrument control hardware for buses such as GPIB, USB, and Ethernet to help you automate your measurements. And you can use NI resources to identify which category your application falls into and which level of instrument control proficiency you need:

- Tester/technician
- System developer
- System architect

### Embedded Monitoring and Control

To help you develop embedded monitoring and control systems, NI CompactRIO hardware offers powerful benefits including precise high-speed timing and control plus rugged hardware. Find which level of proficiency is required for your embedded application:

- High-performance (FPGA) prototype
- High-performance (FPGA) deployment
- Basic performance (Scan Engine) prototype
- Basic performance (FPGA) deployment



## How Do I Use This Brochure?

This brochure offers guidelines to determine the level of proficiency that best ensures success for current and future projects. To help you accelerate your development, create quality code that you can reconfigure and reuse, and effectively configure and control your hardware, NI skills guides assist you in identifying which proficiency level your current application requires. You can then learn more about the skill sets important for proficiency at that level and the options for obtaining those skills consistent with your time constraints, budget, and personal learning preferences.

## Steps to Graphical System Design Proficiency

- Step 1: Read the descriptions below and find the category that best applies to you.
- Step 2: Find the corresponding category in the LabVIEW Skills Guide on the back of this page to identify your proficiency path.
- Step 3: Review the applicable hardware proficiency paths online at [ni.com/skills-guide/hardware](http://ni.com/skills-guide/hardware).

### Graphical System Design Software and Hardware Skills Guide

|  | Technician or Basic Developer  | Software Engineer   | Software Architect  |
|--|--|---|---|
| Size/complexity of application                           | Develop or support/troubleshoot a small to medium application<br><br>(<20 VIs) | Design and develop a medium to large application<br><br>(20+ to 100 VIs)                | Determine and design the architecture or act as technical lead or project manager for a large application<br><br>(100+ VIs) |
| Criticality of application                               | Build a functional prototype or short-term use system                          | Develop one or more systems for ongoing use or deployment over multiple months or years | Design a "mission critical" application: incorrect execution may result in significant loss                                 |
| Support and maintenance expectations for the application | Support and maintain own applications or application will not be maintained    | Develop any applications to be used, supported, or maintained by others                 | Develop any applications to be used, supported, or maintained by others   |
| Expectation for future LabVIEW use                       | Plan to use LabVIEW for only one project                                       | Plan to use LabVIEW for multiple projects   | Plan to use LabVIEW for multiple projects   |
| Frequency of LabVIEW use on current application          | Spend less than 10 hours a week developing applications in LabVIEW             | Use LabVIEW regularly   | Either I am or the team I lead is using LabVIEW regularly   |

# LabVIEW Skills Guide

[ni.com/skills-guide](https://ni.com/skills-guide)

| Required LabVIEW Software Skills  | Online Product Documentation               | Online Training Courses                           | Classroom Training Courses                        |
|---|--|---|---|
| <b>Technician or Basic Developer</b>  |  |   |   |
| Install LabVIEW   | LabVIEW Installation Guide                 |   |   |
| Navigate the LabVIEW environment  | Getting Started with LabVIEW               | LabVIEW Core 1                                    | LabVIEW Core 1                                    |
| Apply key LabVIEW structures and data types   |  |   |   |
| Apply key LabVIEW elements for relating data  |  |   |   |
| Read and interpret existing LabVIEW code  |  |   |   |
| Troubleshoot and debug LabVIEW code   |  |   |   |
| Understand and select appropriate application timing techniques   | Controlling Timing in LabVIEW Applications |   |   |
| Use event programming to handle user interface interaction or communicate data between processes                  | Event-Driven Programming                   | LabVIEW Core 2                                    | LabVIEW Core 2                                    |
| Programmatically control UI objects   | Programmatically Controlling VIs           |   |   |
| Evaluate and use file I/O formats for data analysis and storage   | File I/O                                   |   |   |
| Optimize reuse of existing code for your projects   | LabVIEW Style Checklist                    |   |   |
| Create executables and installers to distribute your application  | Building and Distributing Applications     |   |   |
| Apply basic design patterns and LabVIEW templates such as Simple State Machine                                    | Simple State Machine Template              |   |   |
| <b>Software Engineer (builds on the skills obtained by Basic Developers)</b>                                      |  |   |   |
| Identify an appropriate software development process for the project  | Development Life Cycle Models              | LabVIEW Core 3                                    | LabVIEW Core 3                                    |
| Understand and design to requirements   | Software Engineering with LabVIEW          |   |   |
| Derive a task list and high-level flowchart to guide design and development                                       |  |   |   |
| Organize a software project using the LabVIEW Project Explorer Window   |  |   |   |
| Develop a user interface that meets user requirements and LabVIEW style guidelines                                |  |   |   |
| Handle and log errors globally or locally during code execution   |  |   |   |
| Design, implement, document, and test code modules for each task  |  |   |   |
| Integrate code modules into the application architecture  | Queued Message Handler Template            |   |   |
| Design, implement, document, and test an intermediate-level LabVIEW architecture such as a Queued Message Handler |  |   |   |
| <b>Software Architect (builds on the skills obtained by Software Engineers)</b>                                   |  |   |   |
| Determine appropriateness of an object-oriented approach for your application                                     | LabVIEW Object-Oriented Programming FAQ    | Object-Oriented Design and Programming in LabVIEW | Object-Oriented Design and Programming in LabVIEW |
| Design an application using object-oriented design principles   | LabVIEW Object-Oriented Programming        |   |   |
| Implement a basic class hierarchy using LabVIEW classes   |  |   |   |
| Use LabVIEW features that provide additional functionality to LabVIEW classes                                     |  |   |   |
| Implement an application using common object-oriented design patterns   |  | Software Engineering with LabVIEW                 | -   |
| Modify an existing LabVIEW application to replace common patterns with LabVIEW objects                            |  |   |   |
| Optimize code and resources to effectively reduce development time and costs                                      |  |   |   |
| Adapt the software engineering process to your projects   |  |   |   |
| Select and leverage appropriate tools and techniques for managing development                                     | Advanced Architectures for LabVIEW         |   | Advanced Architectures for LabVIEW                |
| Conduct an effective LabVIEW code review  |  |   |   |
| Understand tools and advanced techniques for testing and validating applications                                  |  |   |   |
| Refine a requirements document and develop an architecture for an application based on LabVIEW                    |  |   |   |
| Understand and apply the elements of a good architecture  | Actor Framework Template                   |   |   |
| Understand architecture design trade-offs and select an appropriate design pattern for your application           |  |   |   |
| Design a clean API  |  |   |   |
| Analyze, critique, and improve the architecture of a LabVIEW application  |  |   |   |
| Understand and apply advanced design patterns and LabVIEW templates such as the Actor Framework template          |  |   |   |

To find training courses near you, view the NI training catalog at [ni.com/training](https://ni.com/training).



# The Experience You Need

With NI training courses, you learn recommended techniques to reduce development time and improve application performance and scalability. In a recent survey, customers reported on average 66 percent faster learning times, 50 percent quicker development, and 43 percent less maintenance after taking NI training courses. Learn from NI and industry experts in a variety of formats, including online, virtual, and classroom settings. NI training is a smart and safe investment to unlock your application development potential.

*“I estimate that the training courses have saved me more than 150 hours in self-paced learning time to get to an equivalent skill level.”*

–Thomas Sumrak, Test Engineer, PAR Technologies, LLC

## Training Formats

NI offers courses in several languages and formats including classroom training at facilities worldwide or on-site at your facility, online courses, and virtual training to better serve your individual needs. Whichever course format you choose, NI training courses can help you achieve immediate productivity gain and long-term success.

Visit [ni.com/training/options](https://ni.com/training/options) for more details.

| Format Features  | Classroom   |  |  |   |
|--|---|--|--|---|
|  | Online<br>Prerecorded modules<br>viewable at ni.com | Virtual<br>1- to 4-day classes<br>held live remotely | Regional<br>1- to 3-day classes held<br>at training facilities | On-Site<br>1- to 3-day classes held<br>at your location |
| Learn from a certified instructor who can answer questions | –   | ✓  | ✓  | ✓   |
| Access relevant hardware <sup>1</sup>                      | –   | ✓  | ✓  | ✓   |
| Eliminate distractions with a classroom setting            | –   | –  | ✓  | ✓   |
| Interact with other students                               | –   | –  | ✓  | ✓   |
| Content modified to meet your group's specific needs       | –   | –  | –  | ✓   |
| Avoid travel expenses                                      | ✓   | ✓  | –  | ✓   |
| Printed manual that accompanies the course <sup>2</sup>    | –   | ✓  | ✓  | ✓   |
| Exercises to practice concepts you learn                   | ✓   | ✓  | ✓  | ✓   |
| Multimedia training  | ✓   | ✓ <sup>3</sup>                                       | –  | –   |
| Concept review quizzes                                     | ✓   | ✓  | ✓  | ✓   |
| Full-day class (8 hours per day)                           | –   | –  | ✓  | ✓   |
| Half-day class (4 hours per day)                           | –   | ✓  | –  | –   |
| Learn on your own schedule (24 hours/7 days)               | ✓   | –  | –  | –   |
| Price  | \$ <sup>4</sup>                                     | \$\$   | \$\$\$   | \$\$\$  |

<sup>1</sup>Some courses use simulated hardware; <sup>2</sup>Manuals differ in format and content detail by course; <sup>3</sup>Recorded video of the class can be reviewed; <sup>4</sup>Or included with software service contract

## Courses

National Instruments provides many different training courses designed to help you become successful using your NI hardware and software. NI engineers and certified professional instructors design and teach courses that help you learn to develop robust, maintainable applications.

| Development Courses  |   |
|--|---|
| <b>NI LabVIEW Development Courses</b> <ul style="list-style-type: none"> <li>LabVIEW Core 1</li> <li>LabVIEW Core 2</li> <li>LabVIEW Core 3</li> <li>LabVIEW Connectivity</li> <li>LabVIEW Performance</li> <li>Object-Oriented Design and Programming in LabVIEW</li> <li>Advanced Architectures in LabVIEW</li> <li>Managing Software Engineering in LabVIEW</li> <li>Using NI LabVIEW for Test and Automation in Regulated Markets</li> </ul> | <b>LabVIEW Development With NI Hardware Courses</b> <ul style="list-style-type: none"> <li>LabVIEW Real-Time 1</li> <li>LabVIEW Real-Time 2</li> <li>LabVIEW FPGA</li> <li>High-Throughput LabVIEW FPGA</li> <li>NI FlexRIO</li> <li>Data Acquisition and Signal Conditioning</li> <li>LabVIEW Instrument Control</li> <li>Sound and Vibration Fundamentals</li> <li>Modular Instruments: Switches</li> <li>Modular Instruments: Digital Multimeters (DMMs)</li> <li>Modular Instruments: High-Speed Digital I/O</li> <li>RF Measurement Fundamentals</li> <li>RF Application Development</li> <li>LabVIEW Machine Vision and Image Processing</li> </ul> |
| <b>NI TestStand Courses</b> <ul style="list-style-type: none"> <li>TestStand 1: Test Development</li> <li>TestStand 2: Framework Development</li> </ul>  |   |
| <b>NI LabWindows™/CVI Courses</b> <ul style="list-style-type: none"> <li>LabWindows/CVI Core 1</li> <li>LabWindows/CVI Core 2</li> </ul>   | <b>NI Multisim and Ultiboard Courses</b> <ul style="list-style-type: none"> <li>Multisim Basics</li> <li>Ultiboard Basics</li> </ul>  |
| <b>NI VeriStand Course</b> <ul style="list-style-type: none"> <li>NI VeriStand Fundamentals</li> </ul>   | <b>NI DIAdem Courses</b> <ul style="list-style-type: none"> <li>DIAdem Basics</li> <li>DIAdem Advanced</li> </ul>   |

## Purchasing Options

### Purchase Now, Schedule Now

If you already know the course you need and when you would like to take it, you can get started now by browsing our training catalog at [ni.com/training](http://ni.com/training).

### Purchase Now, Schedule Later

Buy training credits now and redeem them within the year for any training or certification offering. Credits can be applied to anyone and are valid anywhere in the country of purchase.

### Membership Savings

Take regional and online courses and certification exams for one low price. Memberships are available in six-month, one-year, and two-year options.

## Already a Member of the Standard Service Program (SSP)?

With an active LabVIEW SSP membership, you are entitled to online training. Visit [ni.com/ssp](http://ni.com/ssp) to see the courses you are eligible for and begin viewing training videos immediately.

# Validate Your Expertise

For developers and engineers using NI software, certification is a proven way to boost career potential. Certification helps inspire confidence in technical skills, leading to promotions, new opportunities, and higher pay for individuals. For organizations, certification is a strategic investment that pays off in increased productivity, reduced turnover, and an overall competitive advantage.

| Certifications Offered |   |   |   |   |
|------------------------|---|---|---|---|
| Skill Level            | NI LabVIEW  |   | NI TestStand  | NI LabWindows™/CVI  |
|                        | Core  | Embedded Systems Developer  |   |   |
| Architect              | Master architecting and managing applications   | Proficiency in designing and deploying embedded control and monitoring applications | Architect and manage applications                         | No certification offered                                  |
| Developer              | Ability to create functional, well-documented code with minimal development             |   | Complete understanding of core features and functionality | Complete understanding of core features and functionality |
| Associate Developer    | Broad understanding of core features and the ability to interpret existing LabVIEW code |   | No certification offered                                  | No certification offered                                  |

## Benefits of Certification

NI certification demonstrates that you have the skills needed to create high-quality applications with NI software platforms and gives customers, peers, and employers confidence in your abilities. A recent survey of NI Certified LabVIEW Developers revealed tangible benefits that have a direct, measurable, and positive impact on employee and manager alike, such as the following:

- 54 percent said the quality of their work improved
- 45 percent said their peers' perceptions of them improved
- 29 percent received new project opportunities
- 36 percent said the certification increased their compensation by more than 5 percent
- 10 percent received a promotion at work





## Reasons to Certify Your Employees

NI certification provides a standard, industry-accepted way of gauging employees' skills, whether they are developing a part of a program or the complete application architecture.

It also allows employers to clearly define and recognize technical skill development goals for individual employees while gaining the benefits of better work quality. At the same time, certification helps individuals within the organization recognize their peers and technical leaders, allowing the development of communication channels and communities that promote the use of good development practices and quick problem resolution.

*“You can be confident in what you are getting if that certification level is there. Those individuals have the knowledge and experience to hit the ground running, and we had an aggressive timetable for completing the project.”*

—David Hakey, Certified LabVIEW Architect and GE Energy Employee

## Prepare for Your NI Certification

National Instruments provides a variety of materials to help you prepare for your certification exam. Go online to view preparation guides, webcasts, sample exams, solutions, and a recommended preparation plan based on when you're taking the test and how much experience you have.

Visit [ni.com/training/certification\\_prep](https://ni.com/training/certification_prep).

## Register for an Exam Near You

In the Americas and Europe, National Instruments offers many certification exams through Pearson VUE testing centers. For all other exams, please refer to the upcoming exam schedule for your area or contact your local National Instruments office to request a different date or location.

Visit [ni.com/certificationschedule](https://ni.com/certificationschedule).

## Already Certified?

Find a job that leverages your skills set. There are great companies out there looking for the best and brightest Certified LabVIEW Developers. Find employers at [ni.com/labviewcareers](https://ni.com/labviewcareers).

# Need More Help?

Additional Resources for Continuing Your Learning

## LabVIEW User Groups

LabVIEW user groups provide the opportunity for you to learn from and interact with other LabVIEW developers face-to-face. Find a user group in your area to get connected. Visit [ni.com/usergroups](http://ni.com/usergroups) for more information.

## Live Events and Webcasts

Free technical sessions presented live at local NI events and virtually via webcast help you learn additional tips and tricks and keep up with the latest NI product and technology developments. Visit [ni.com/events](http://ni.com/events) for more information.

## Discussion Forums

Visit [ni.com/forums](http://ni.com/forums) and ask questions and start discussions with peers and NI experts.

## NI Developer Community

Visit [ni.com/community](http://ni.com/community) to find the latest example code, tutorials, and more from LabVIEW and other NI product users across the globe.

## Technical Support Resources

Access technical support resources such as online product manuals, the NI KnowledgeBase, and written tutorials. Visit [ni.com/support](http://ni.com/support) for more information.

# No Time to Learn?

If you are unable to gain the skill level you need in the time allotted for your project, NI can augment your expertise by connecting you with an NI Alliance Partner or certified user who can help.

## NI Alliance Partner Network

The NI Alliance Partner Network is a program of more than 700 companies worldwide that provide complete solutions and high-quality products based on graphical system design. To find an NI Alliance Partner, visit [ni.com/alliance](http://ni.com/alliance).

## NI Certified Users

Thousands of certified professionals all over the world have proven their knowledge and skills with NI products by successfully completing NI certification exams. To view a list of certified users in your area, visit [ni.com/training/certification](http://ni.com/training/certification).

### US Corporate Headquarters

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