NI Instrument Studio PRO

Plug-in Development with LabVIEW

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BUDLUG
Budapest LabVIEW User Group

BROAD MODULAR INSTRUMENTATION PORTFOLIO

DAQ and Control

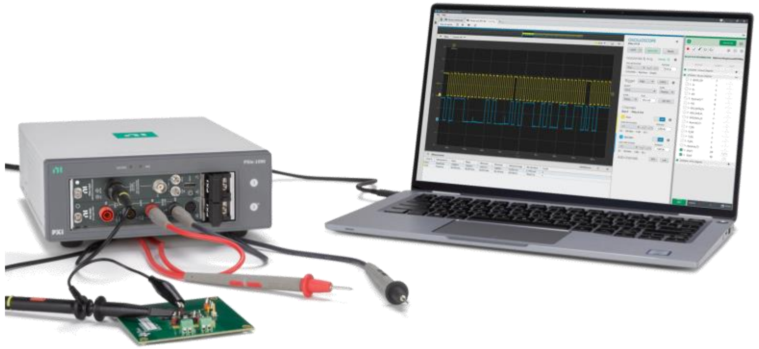
- Multifunction I/O
- Counter/Timer/Clock
- Digital I/O, SPI, I2C
- Vision, Sound & Vibration
- Analog IO with signal conditioning
- FPGA/Reconfigurable I/O

Instrumentation

- Oscilloscopes
- High-Speed Digital I/O
- DMM, SMU, LCR Meter
- Signal Generators (AWG)
- PPS and E-load up to 300W
- Switching
- RF Analyzers and Generators

Interfaces

- GPIB, USB, Ethernet, RDMA
- RS232/RS485/RS422
- CAN, LIN, FlexRay
- Automotive Ethernet
- LVDS, GMSL, FPD-Link
- EtherCat, OPC, Profinet
- CANopen, DeviceNet



InstrumentStudio

Free Companion Software for PXI Instruments

Software that provides an integrated approach to interactive PXI measurement with the ability to monitor and debug test systems, and more.

Visualize and Control Measurements with PXI Modular Instrument

Interface interactively with your PXI instruments with a customizable software front panel.

Export Project Configurations

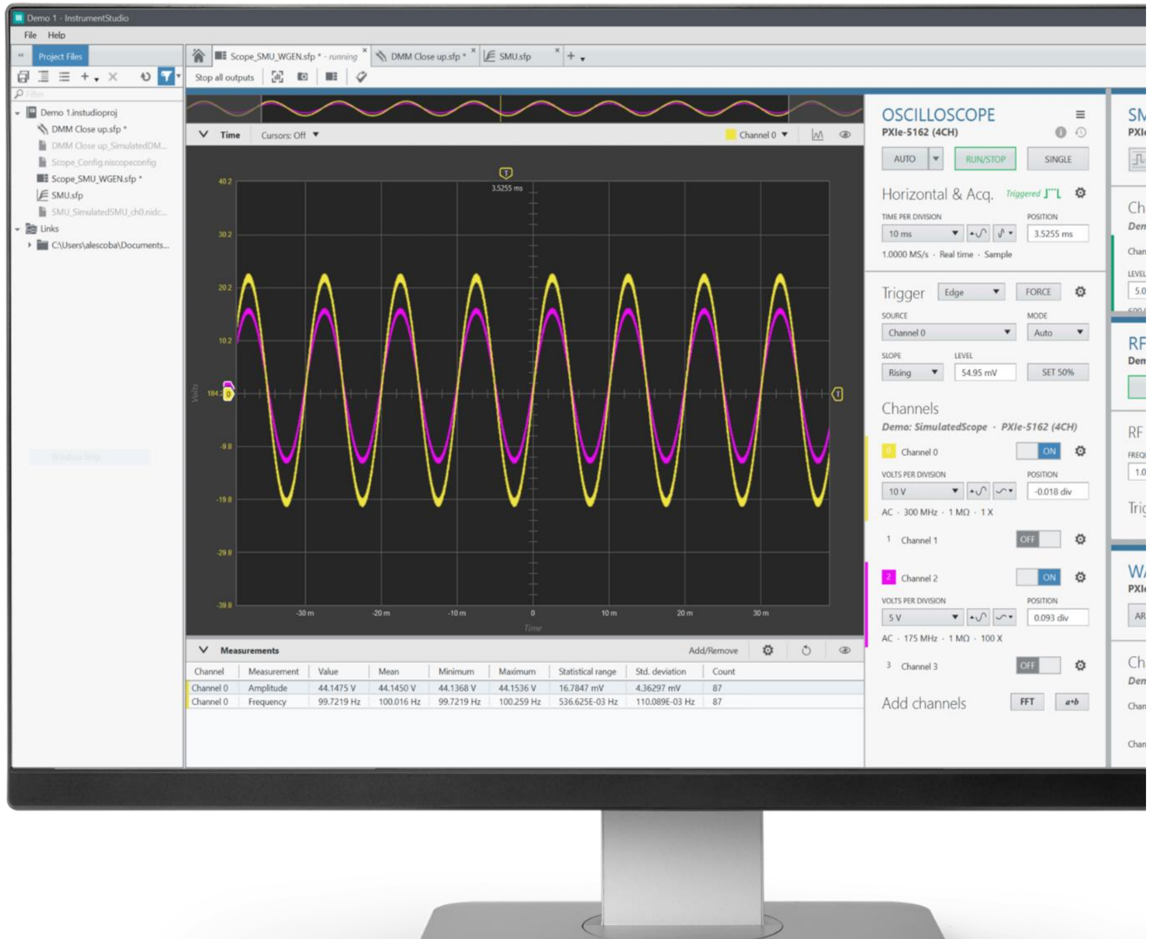
Save screenshots measurements, and raw data as TDMS or CSV files.
Save and export instrument settings.

Monitor and Debug Applications

Monitor measurements in LabVIEW, Python, TestStand, and others for run time debugging.

Share Projects with Colleagues and Systems

Store your layout and instrument configuration as a project for instant repeatability.



Horizontal & Acq.
TIME PER DIVISION: 10 ms
POSITION: 3.5255 ms
1.0000 MS/s · Real time · Sample

Trigger: Edge
SOURCE: Channel 0
MODE: Auto
SLOPE: Rising
LEVEL: 54.95 mV
SET 50%

Channels
Demo: SimulatedScope · PXIe-5162 (4CH)

Channel 0 ON
VOLTS PER DIVISION: 10 V
POSITION: -0.018 div
AC · 300 MHz · 1 MΩ · 1 X

Channel 1 OFF

Channel 2 ON
VOLTS PER DIVISION: 5 V
POSITION: 0.093 div
AC · 175 MHz · 1 MΩ · 100 X

Channel 3 OFF

Measurements

Channel	Measurement	Value	Mean	Minimum	Maximum	Statistical range	Std. deviation	Count
Channel 0	Amplitude	44.1475 V	44.1450 V	44.1368 V	44.1536 V	16.7847 mV	4.36297 mV	87
Channel 0	Frequency	99.7219 Hz	100.016 Hz	99.7219 Hz	100.259 Hz	536.625E-03 Hz	110.089E-03 Hz	87

Instrumentation

- Oscilloscopes
- High-Speed Digital I/O
- DMM, SMU, LCR Meter
- Signal Generators (AWG)
- PPS and E-load up to 300W
- RF Analyzers and Generators

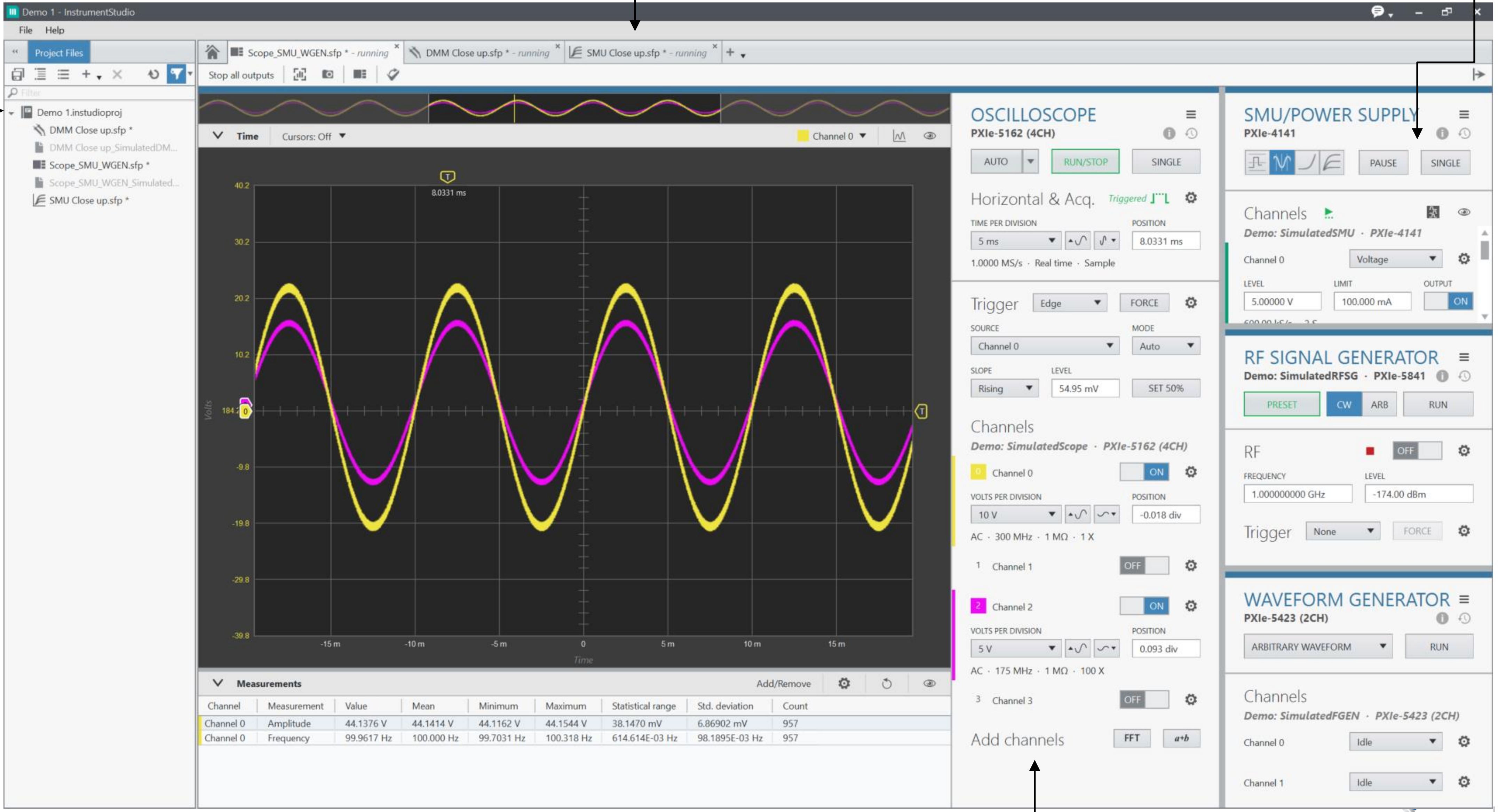
EMERSON. | NI

Instrument Studio™

Multiple **screens** avaliable in 1 project

Small panels

Project tree



Measurements

Channel	Measurement	Value	Mean	Minimum	Maximum	Statistical range	Std. deviation	Count
Channel 0	Amplitude	44.1376 V	44.1414 V	44.1162 V	44.1544 V	38.1470 mV	6.86902 mV	957
Channel 0	Frequency	99.9617 Hz	100.000 Hz	99.7031 Hz	100.318 Hz	614.614E-03 Hz	98.1895E-03 Hz	957

OSCILLOSCOPE
PXIe-5162 (4CH)

AUTO · RUN/STOP · SINGLE

Horizontal & Acq. *Triggered*

TIME PER DIVISION: 5 ms
POSITION: 8.0331 ms
1.0000 MS/s · Real time · Sample

Trigger: Edge · FORCE
SOURCE: Channel 0
MODE: Auto
SLOPE: Rising
LEVEL: 54.95 mV
SET 50%

Channels
Demo: SimulatedScope · PXIe-5162 (4CH)

0 Channel 0 · ON
VOLTS PER DIVISION: 10 V
POSITION: -0.018 div
AC · 300 MHz · 1 MΩ · 1 X

1 Channel 1 · OFF

2 Channel 2 · ON
VOLTS PER DIVISION: 5 V
POSITION: 0.093 div
AC · 175 MHz · 1 MΩ · 100 X

3 Channel 3 · OFF

Add channels · FFT · a+b

SMU/POWER SUPPLY
PXIe-4141

PAUSE · SINGLE

Channels
Demo: SimulatedSMU · PXIe-4141

Channel 0: Voltage
LEVEL: 5.00000 V
LIMIT: 100.000 mA
OUTPUT: ON

RF SIGNAL GENERATOR
Demo: SimulatedRFSG · PXIe-5841

PRESET · CW · ARB · RUN

RF · OFF
FREQUENCY: 1.000000000 GHz
LEVEL: -174.00 dBm
Trigger: None · FORCE

WAVEFORM GENERATOR
PXIe-5423 (2CH)

ARBITRARY WAVEFORM · RUN

Channels
Demo: SimulatedFGEN · PXIe-5423 (2CH)

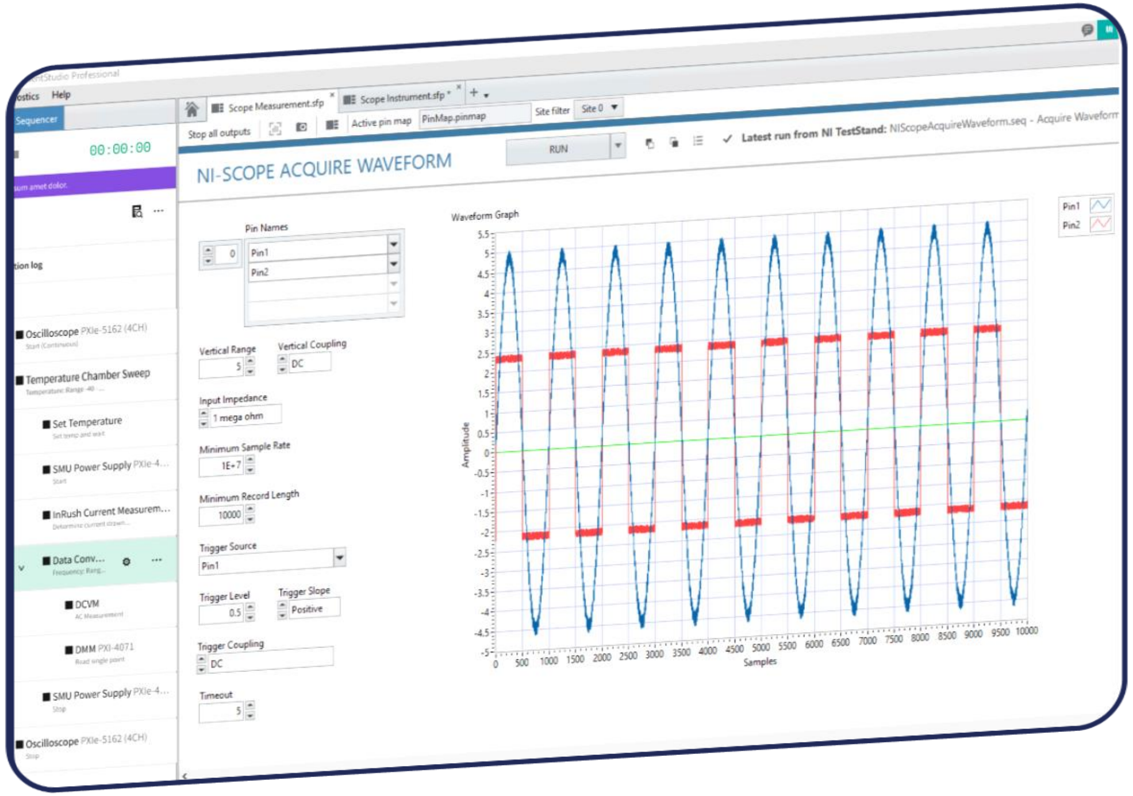
Channel 0: Idle
Channel 1: Idle

Large panel (Scope)

Instrument Studio™ Professional

Extensible Automated Validation

Released in July!



Active pin map: PinMap.pinmap

Site filter: Site 0

✓ Latest run from NI TestStand: NIScopeAcquireWaveform.seq - Acquire Waveform

- Oscilloscope PXIe-5162 (4CH) – Start (Continuous)
- Temperature Chamber Sweep – Temperature: Range -40 ...
  - Set Temperature – Set temp and wait
  - SMU Power Supply PXIe-4... – Start
  - InRush Current Measurem... – Determine current drawn...
  - Data Conv... – Frequency: Rang...
    - DCVM – AC Measurement
    - DMM PXI-4071 – Read single point
  - SMU Power Supply PXIe-4... – Stop
- Oscilloscope PXIe-5162 (4CH) – Stop

NI-SCOPE ACQUIRE WAVEFORM

Pin Names: 0 – Pin1, Pin2

Vertical Range: 5

Vertical Coupling: DC

Input Impedance: 1 mega ohm

Minimum Sample Rate: 1E+7

Minimum Record Length: 10000

Trigger Source: Pin1

Trigger Level: 0.5

Trigger Slope: Positive

Trigger Coupling: DC

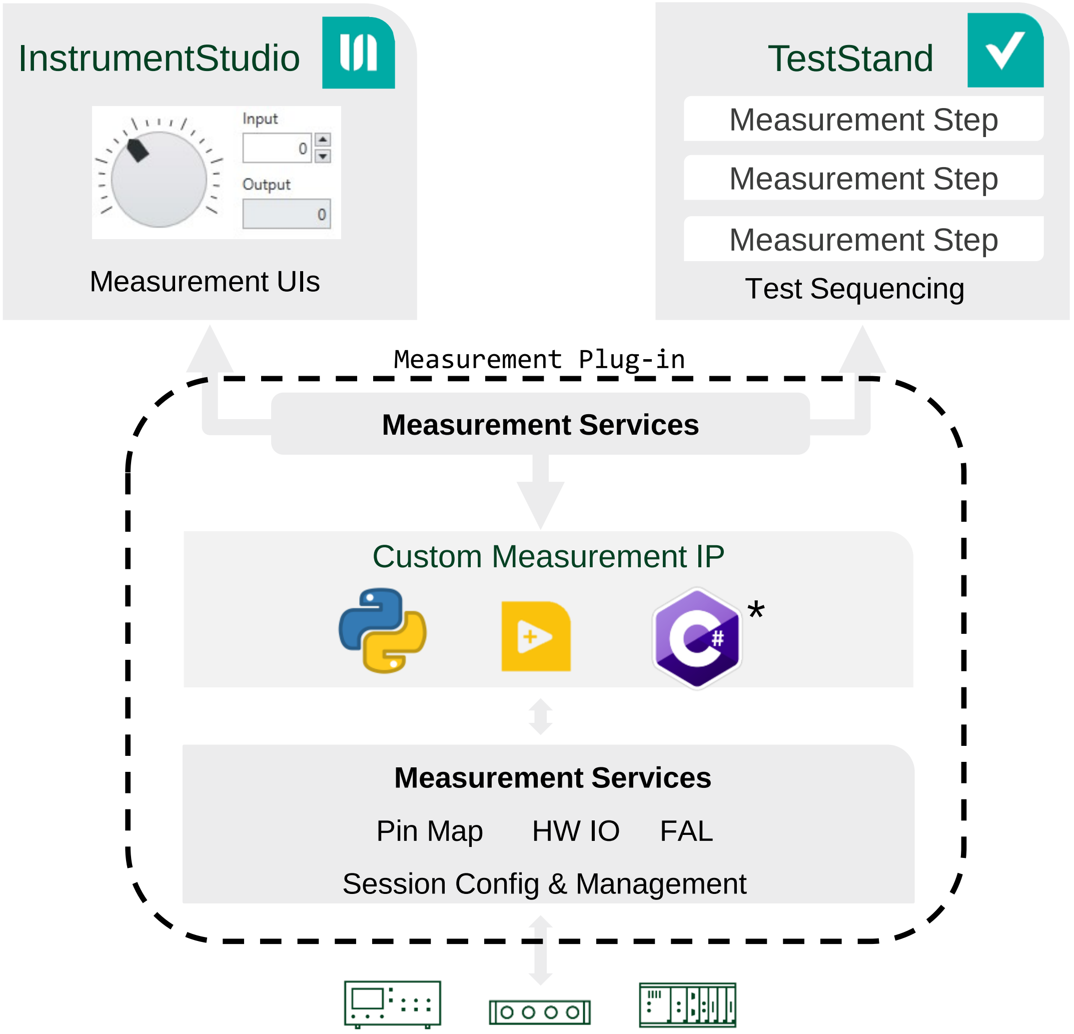
Timeout: 5

Run Custom Measurements

Automate Measurements

Control Any Instrument

InstrumentStudio Pro: Develop your own Plug-in’s



InstrumentStudio

Measurement UIs

TestStand

Measurement Step

Measurement Step

Measurement Step

Test Sequencing

Measurement Plug-in

Measurement Services

Custom Measurement IP

*

Measurement Services

Pin Map HW IO FAL

Session Config & Management

NI Measurement Framework

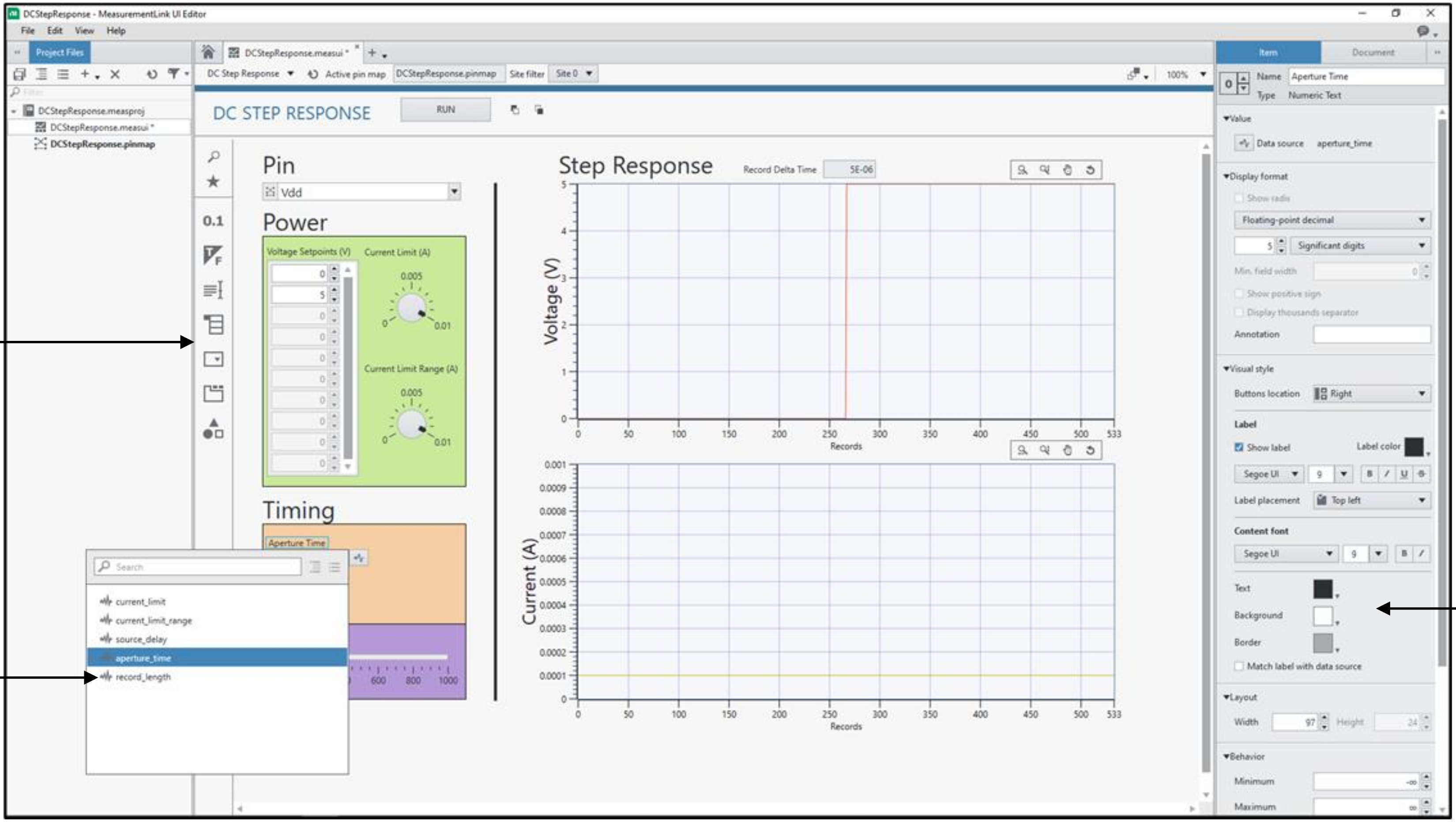
- **Leverage Measurement Framework** provided by NI
- **Focus on the Measurement** IP, not the integration
- Configure and control measurements with measurement UI after initial code is set up
- **Code** measurement IP **once** and **re-use** the same source throughout the workflow, **from bring up to automation**
- Minimize correlation issues and time spent reproducing measurement setups

Python repository: https://github.com/ni/measurement-plugin-python
LabVIEW repository: https://github.com/ni/measurement-plugin-labview

**C# support on roadmap*

Build Custom User Interfaces for your Plug-in’s

Speed Up UI Development with Drag And Drop Tools

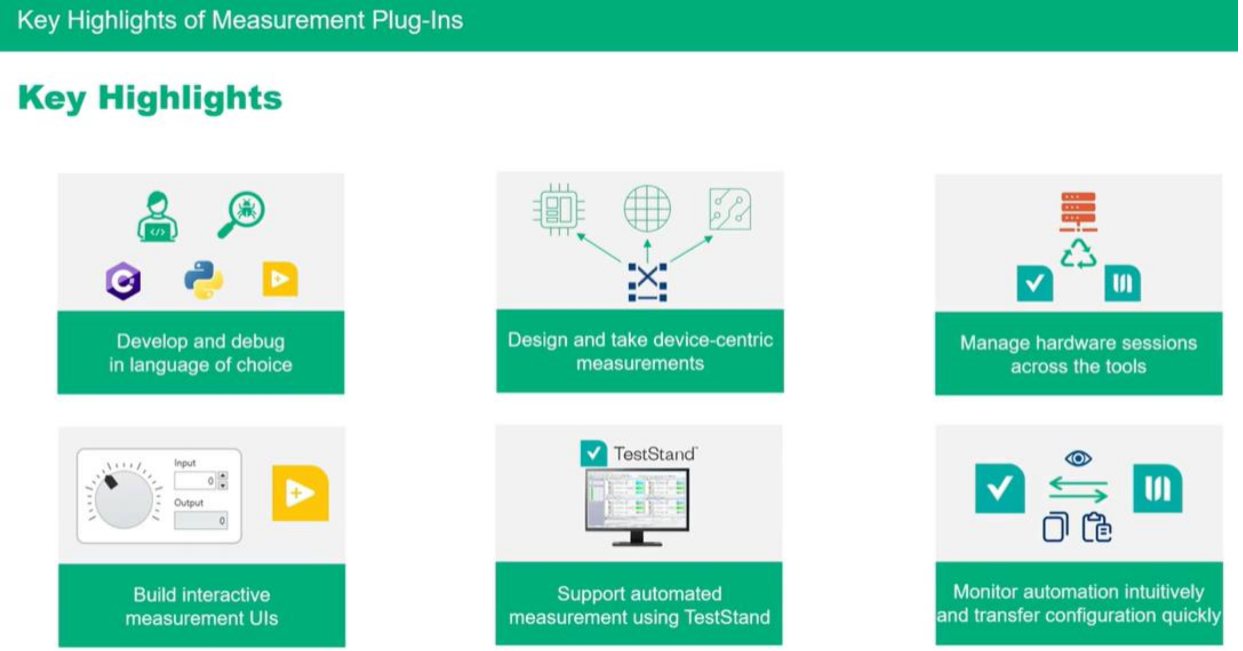


Drag and drop icons for Python, LabVIEW and other languages

Automatically detected variables from measurement IP

Save UI with measurement IP for interactive debugging

Tools to customize text and colors

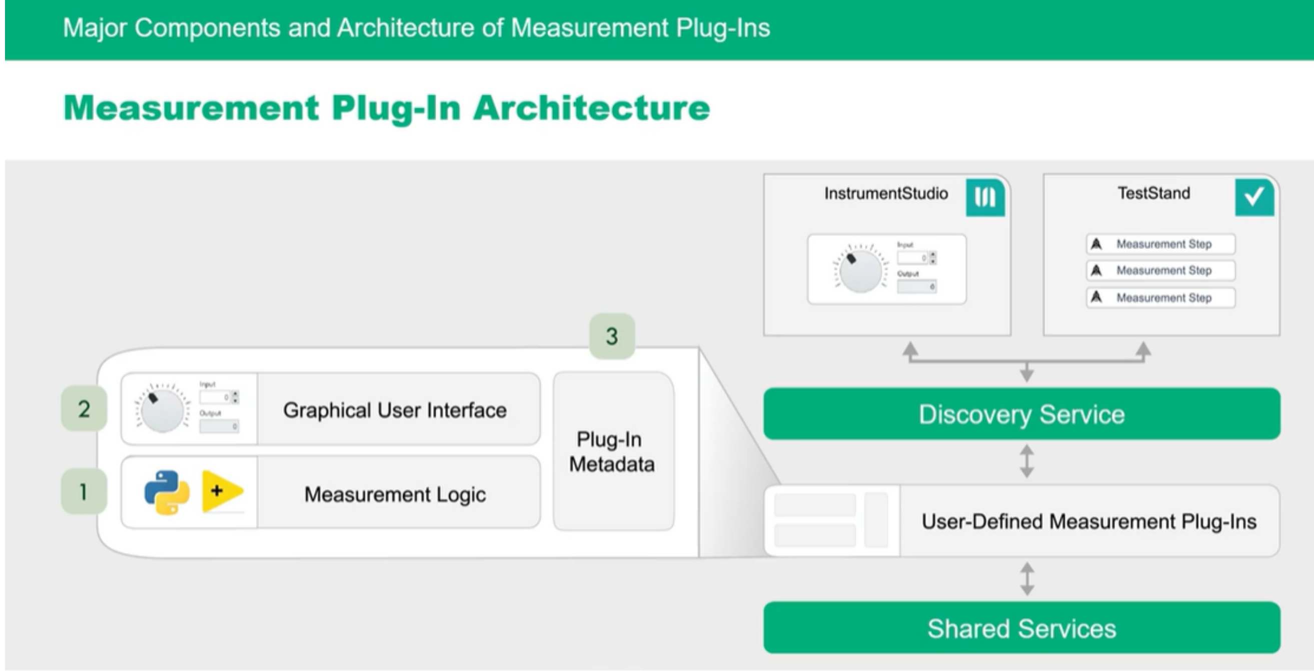


Key Highlights of Measurement Plug-Ins

Key Highlights

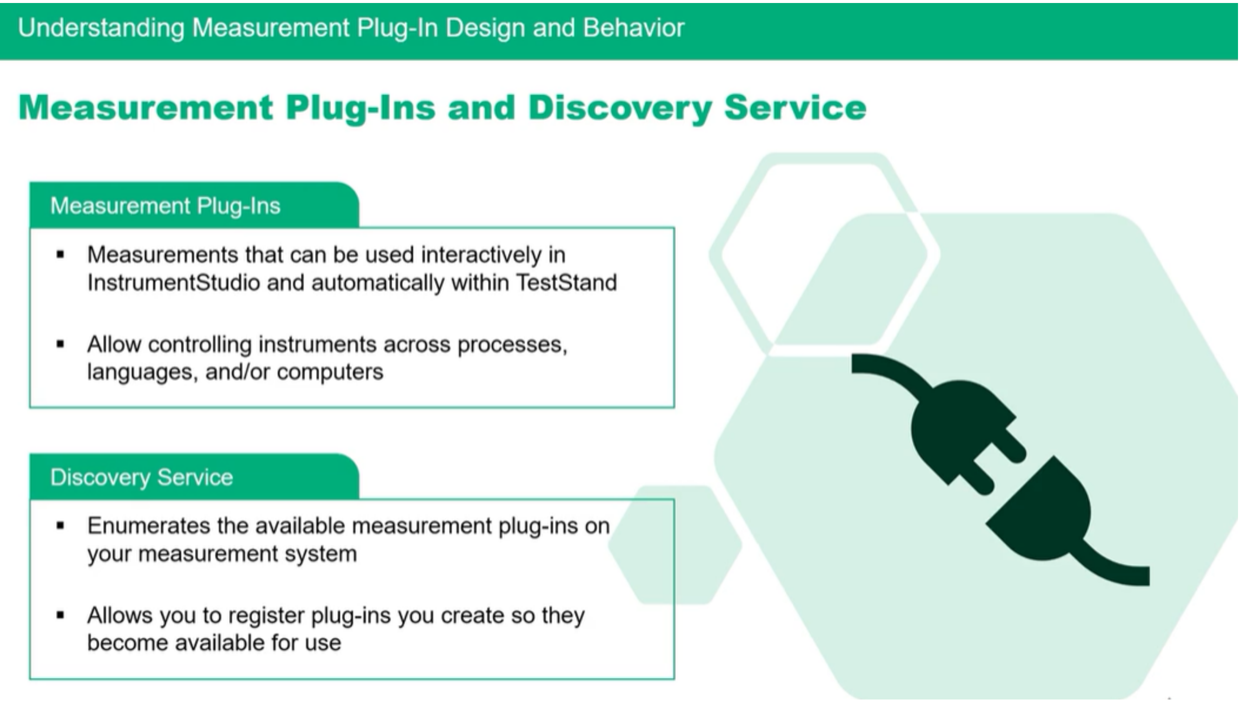
- Develop and debug in language of choice
- Design and take device-centric measurements
- Manage hardware sessions across the tools
- Build interactive measurement UIs
- Support automated measurement using TestStand
- Monitor automation intuitively and transfer configuration quickly

TestStand
Input
Output



Major Components and Architecture of Measurement Plug-Ins

Measurement Plug-In Architecture



Understanding Measurement Plug-In Design and Behavior

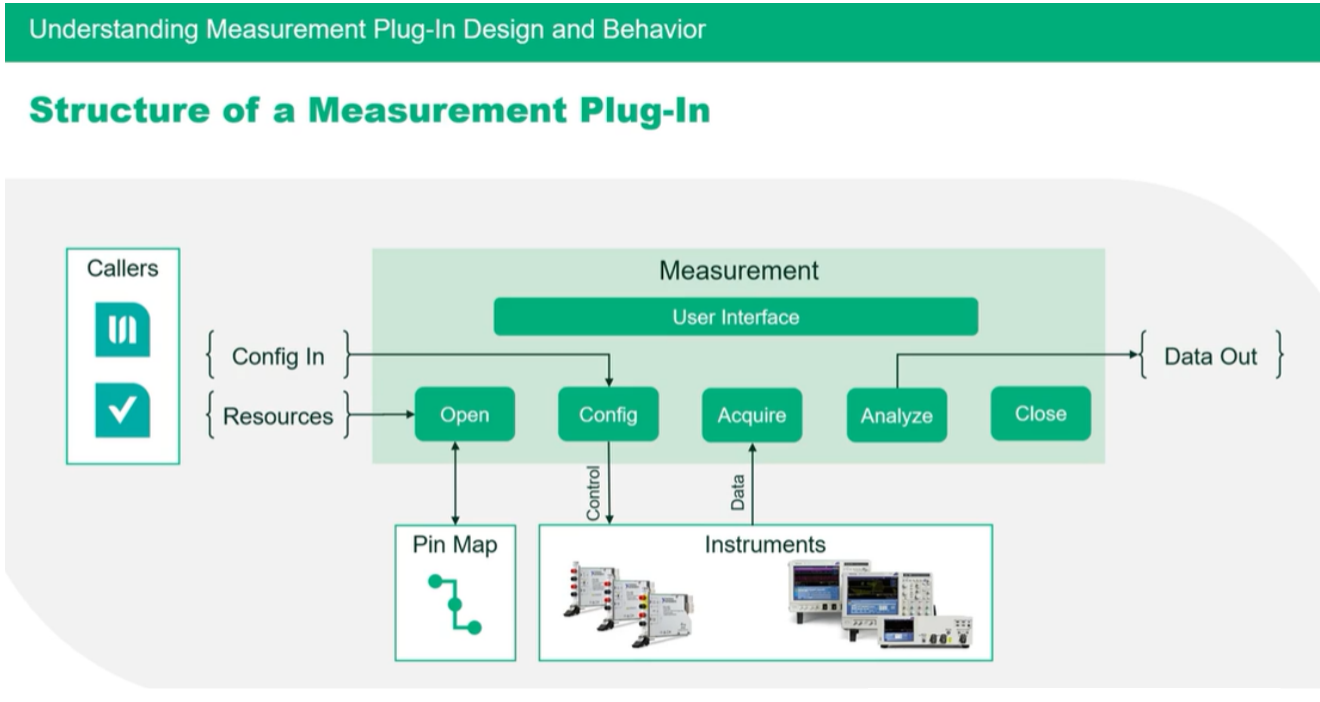
Measurement Plug-Ins and Discovery Service

Measurement Plug-Ins

- Measurements that can be used interactively in InstrumentStudio and automatically within TestStand
- Allow controlling instruments across processes, languages, and/or computers

Discovery Service

- Enumerates the available measurement plug-ins on your measurement system
- Allows you to register plug-ins you create so they become available for use

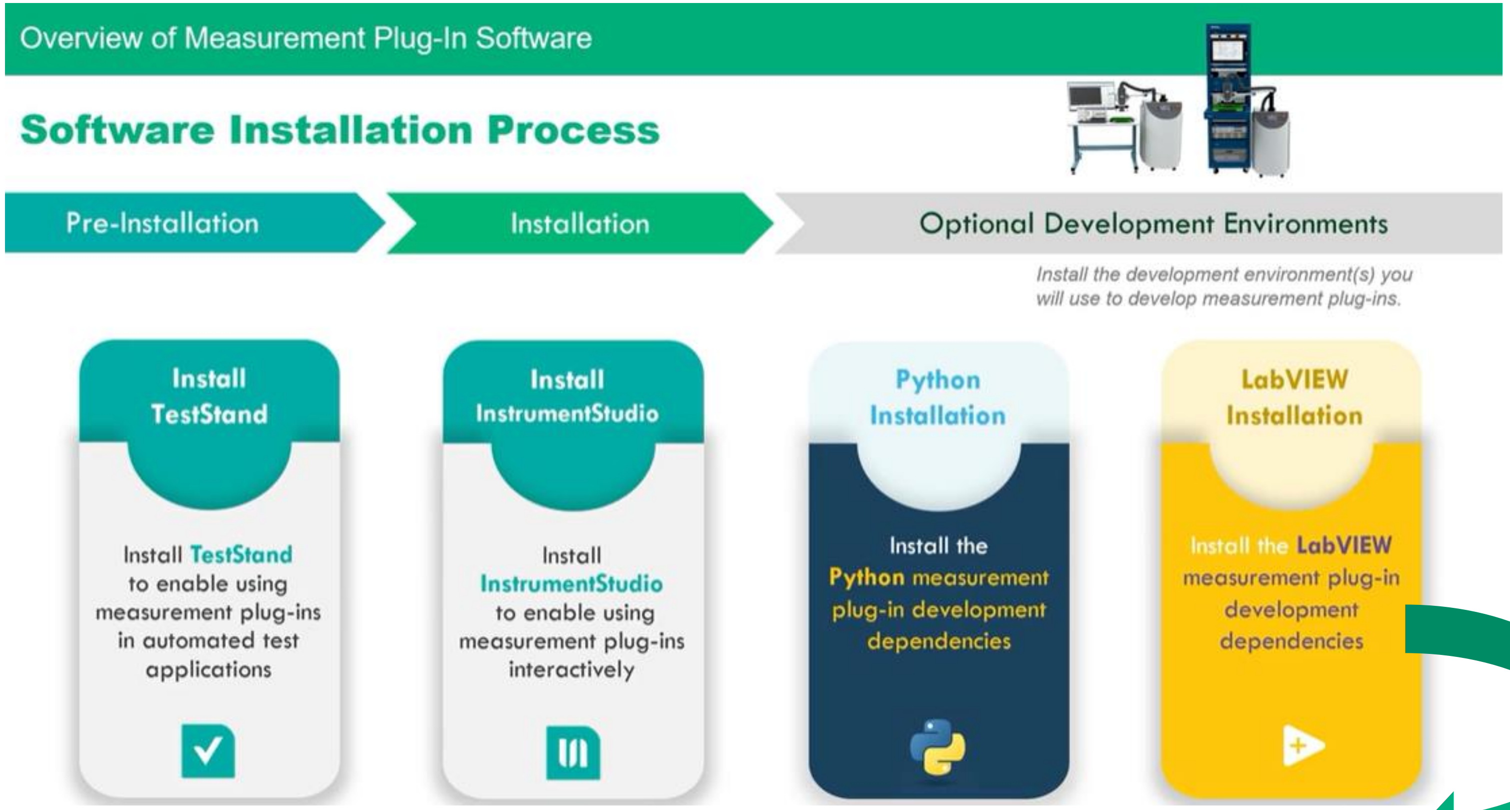


Understanding Measurement Plug-In Design and Behavior

Structure of a Measurement Plug-In

[Creating Measurement Plug-Ins for InstrumentStudio On- Demand course]

Plug-in development with LabVIEW - Preparation



Overview of Measurement Plug-In Software

Software Installation Process

Pre-Installation → Installation → Optional Development Environments

Install the development environment(s) you will use to develop measurement plug-ins.

Install TestStand

Install TestStand to enable using measurement plug-ins in automated test applications

Install InstrumentStudio

Install InstrumentStudio to enable using measurement plug-ins interactively

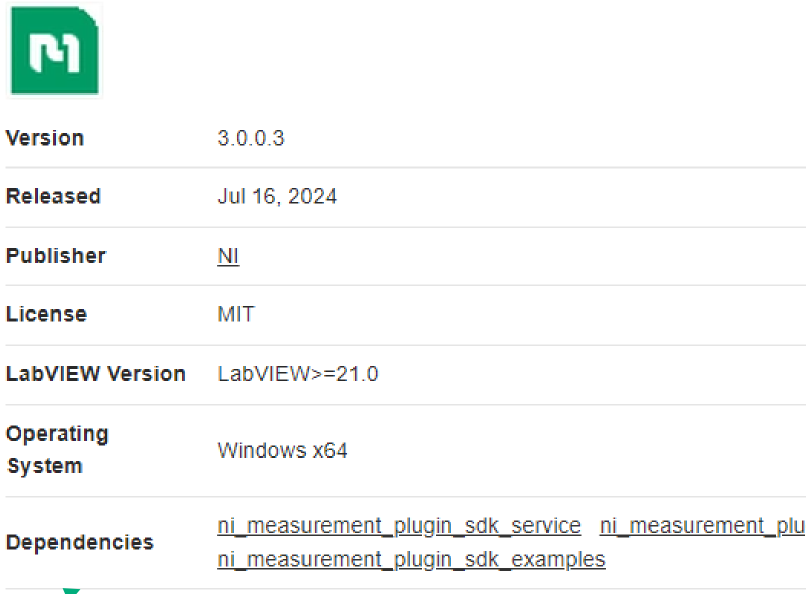
Python Installation

Install the Python measurement plug-in development dependencies

LabVIEW Installation

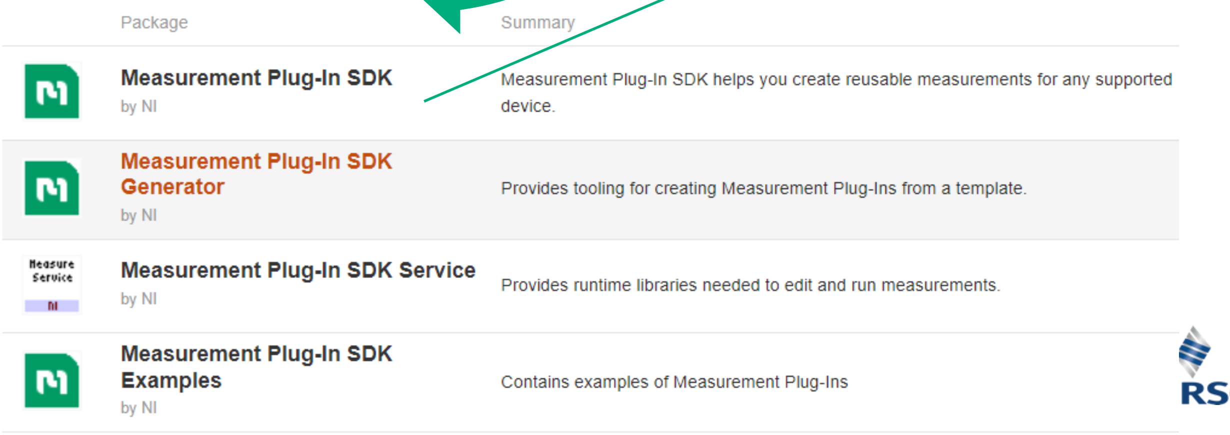
Install the LabVIEW measurement plug-in development dependencies

SDK package details:



Version	3.0.0.3
Released	Jul 16, 2024
Publisher	NI
License	MIT
LabVIEW Version	LabVIEW>=21.0
Operating System	Windows x64
Dependencies	ni_measurement_plugin_sdk_service ni_measurement_plu ni_measurement_plugin_sdk_examples

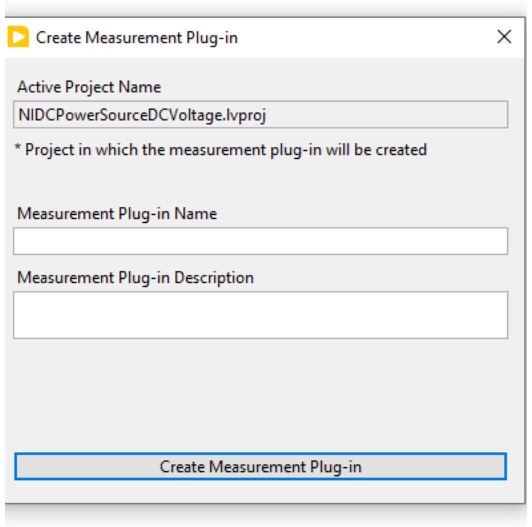
LabVIEW Measurement Development Dependencies
https://www.vipm.io/search/?q=Measurement+Plug-In



Package	Summary
Measurement Plug-In SDK by NI	Measurement Plug-In SDK helps you create reusable measurements for any supported device.
Measurement Plug-In SDK Generator by NI	Provides tooling for creating Measurement Plug-Ins from a template.
Measurement Plug-In SDK Service by NI	Provides runtime libraries needed to edit and run measurements.
Measurement Plug-In SDK Examples by NI	Contains examples of Measurement Plug-Ins

Supported LabVIEW version: 2021+

Plug-in development with LabVIEW - Workflow



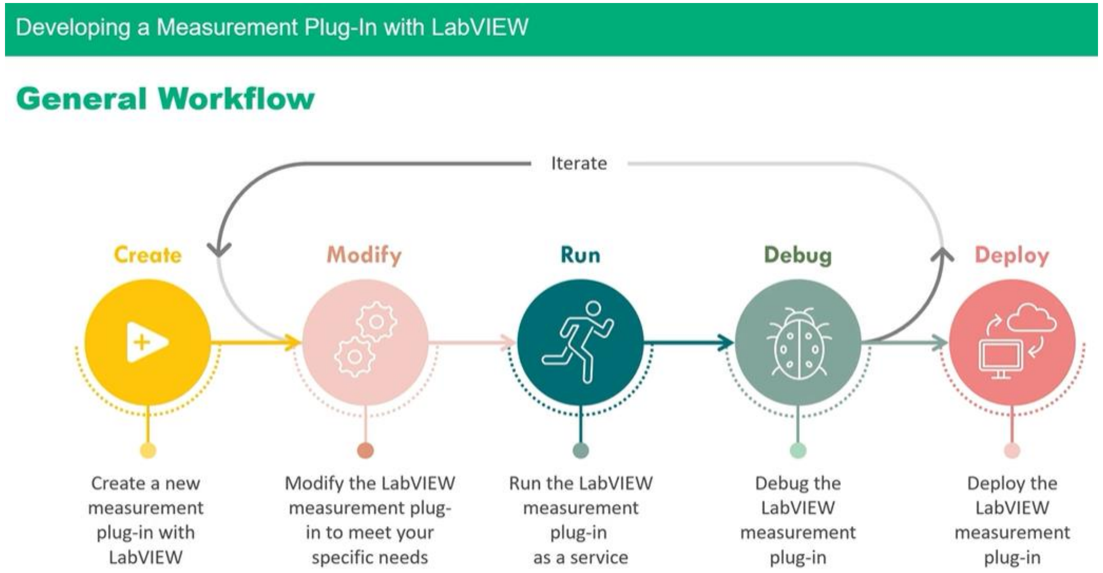
Active Project Name

NIDCPowerSourceDCVoltage.lvproj

* Project in which the measurement plug-in will be created

Measurement Plug-in Name

Measurement Plug-in Description



Developing a Measurement Plug-In with LabVIEW

General Workflow

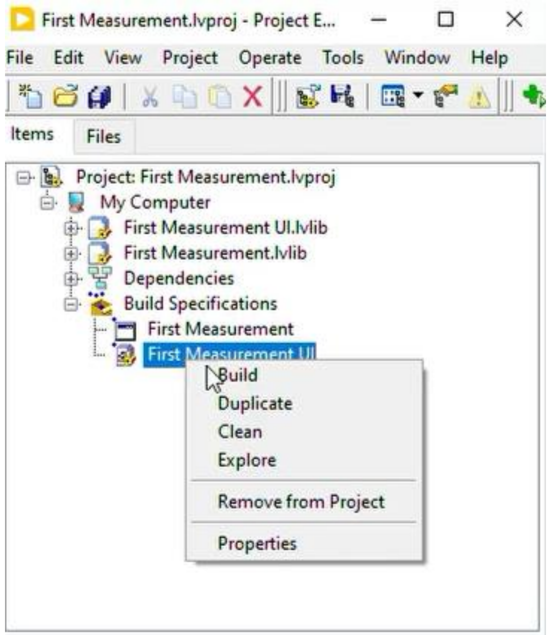
Create – Create a new measurement plug-in with LabVIEW

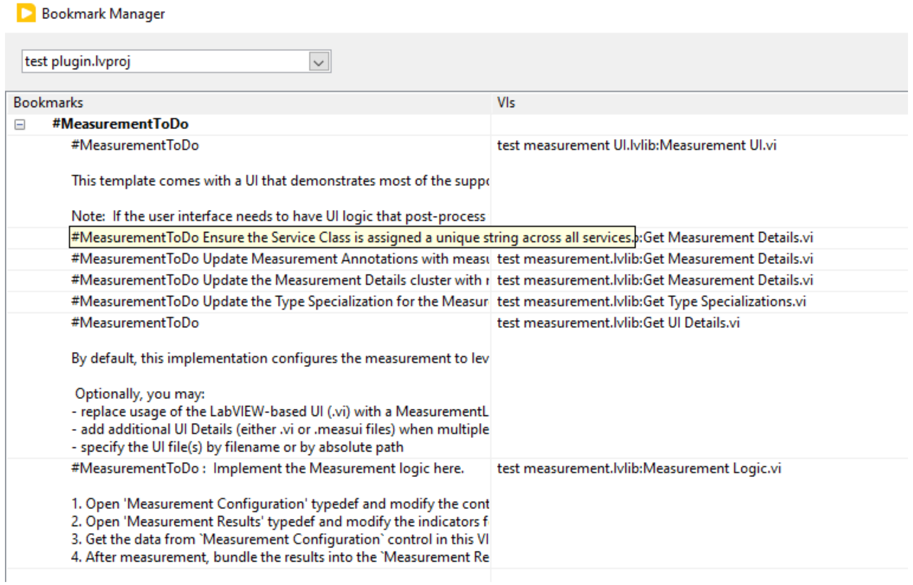
Modify – Modify the LabVIEW measurement plug-in to meet your specific needs

Run – Run the LabVIEW measurement plug-in as a service

Debug – Debug the LabVIEW measurement plug-in

Deploy – Deploy the LabVIEW measurement plug-in

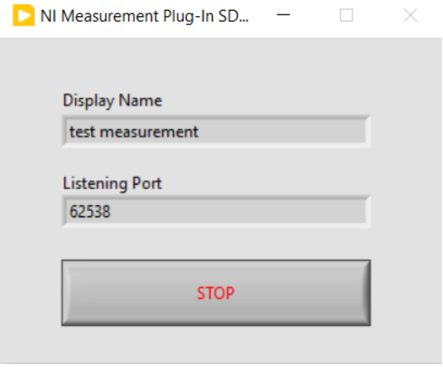




Bookmark Manager

test plugin.lvproj

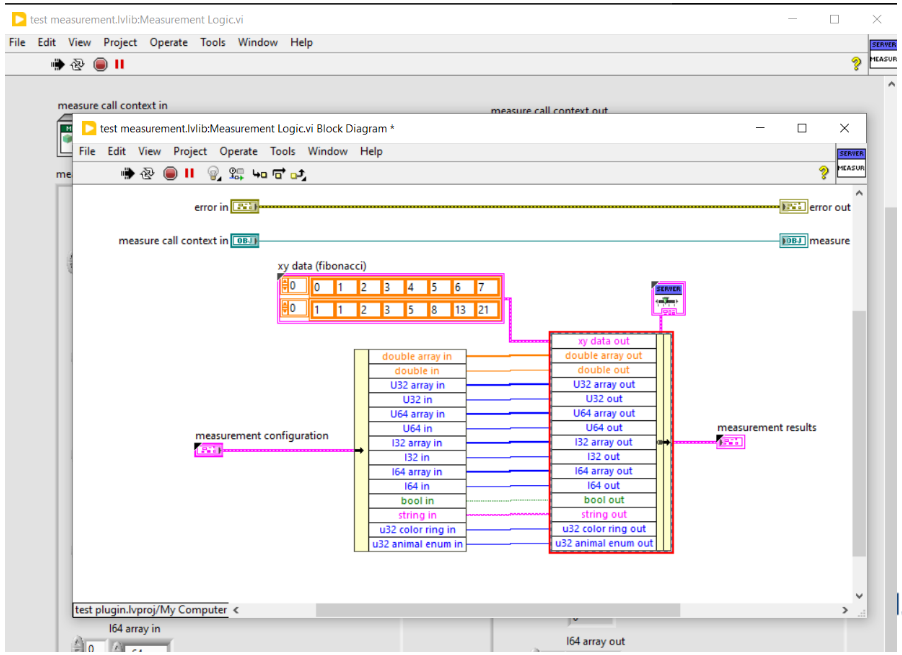
Bookmarks	VIs
#MeasurementToDo	
#MeasurementToDo This template comes with a UI that demonstrates most of the suppo Note: If the user interface needs to have UI logic that post-process	test measurement UI.lvlib:Measurement UI.vi
#MeasurementToDo Ensure the Service Class is assigned a unique string across all services.	:Get Measurement Details.vi
#MeasurementToDo Update Measurement Annotations with measu	test measurement.lvlib:Get Measurement Details.vi
#MeasurementToDo Update the Measurement Details cluster with r	test measurement.lvlib:Get Measurement Details.vi
#MeasurementToDo Update the Type Specialization for the Measur	test measurement.lvlib:Get Type Specializations.vi
#MeasurementToDo By default, this implementation configures the measurement to lev Optionally, you may: - replace usage of the LabVIEW-based UI (.vi) with a MeasurementL - add additional UI Details (either .vi or .measui files) when multiple - specify the UI file(s) by filename or by absolute path	test measurement.lvlib:Get UI Details.vi
#MeasurementToDo : Implement the Measurement logic here. 1. Open 'Measurement Configuration' typedef and modify the cont 2. Open 'Measurement Results' typedef and modify the indicators f 3. Get the data from `Measurement Configuration` control in this VI 4. After measurement, bundle the results into the `Measurement Re	test measurement.lvlib:Measurement Logic.vi



NI Measurement Plug-In SD...

Display Name: test measurement

Listening Port: 62538



test measurement.lvlib:Measurement Logic.vi

test measurement.lvlib:Measurement Logic.vi Block Diagram *

https://www.ni.com/docs/en-US/bundle/measurementplugins/page/labview-measurements.html

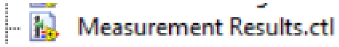
Plug-in development with LabVIEW - Project structure

Run Service.vi

The launcher of our plugin

Measurement Configuration.ctl

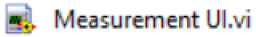
Input typedef of the measurement


Measurement Results.ctl

Outputs of the measurement

Measurement Logic.vi

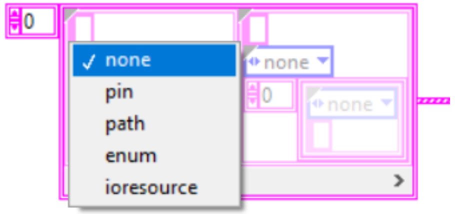
Logic of the measurement
UI is not used in the clients!
Logic can be test isolated by running this VI directly


Measurement UI.vi

UI of the measurement
Separated from the logic, sits in different library
Control an indicator labels, data types MUST match elements of the 2 ctl-s

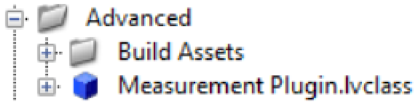
Get Type Specializations.vi

Needed for IO Resources, enums and paths that are considered as special types



Get Measurement Details.vi

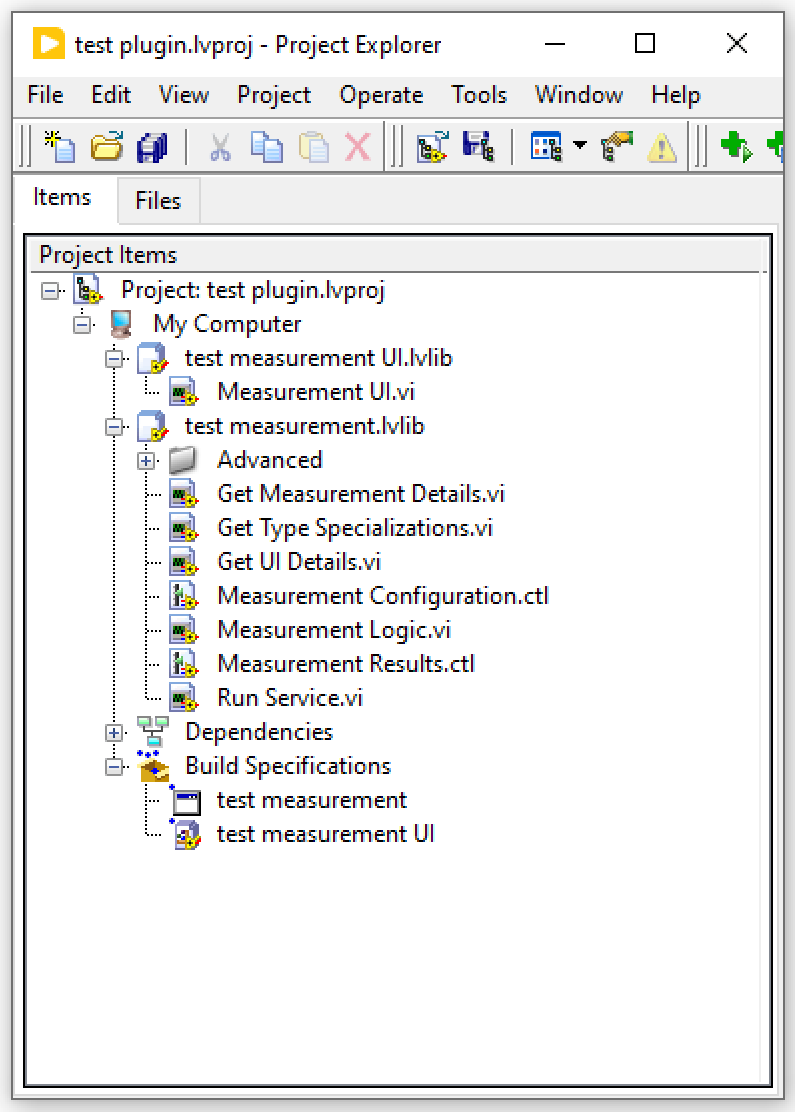
Provides the information of about the measurement plugin


Advanced
Build Assets
Measurement Plugin.lvclass

Customization of plug-in behavior, not recommended to change

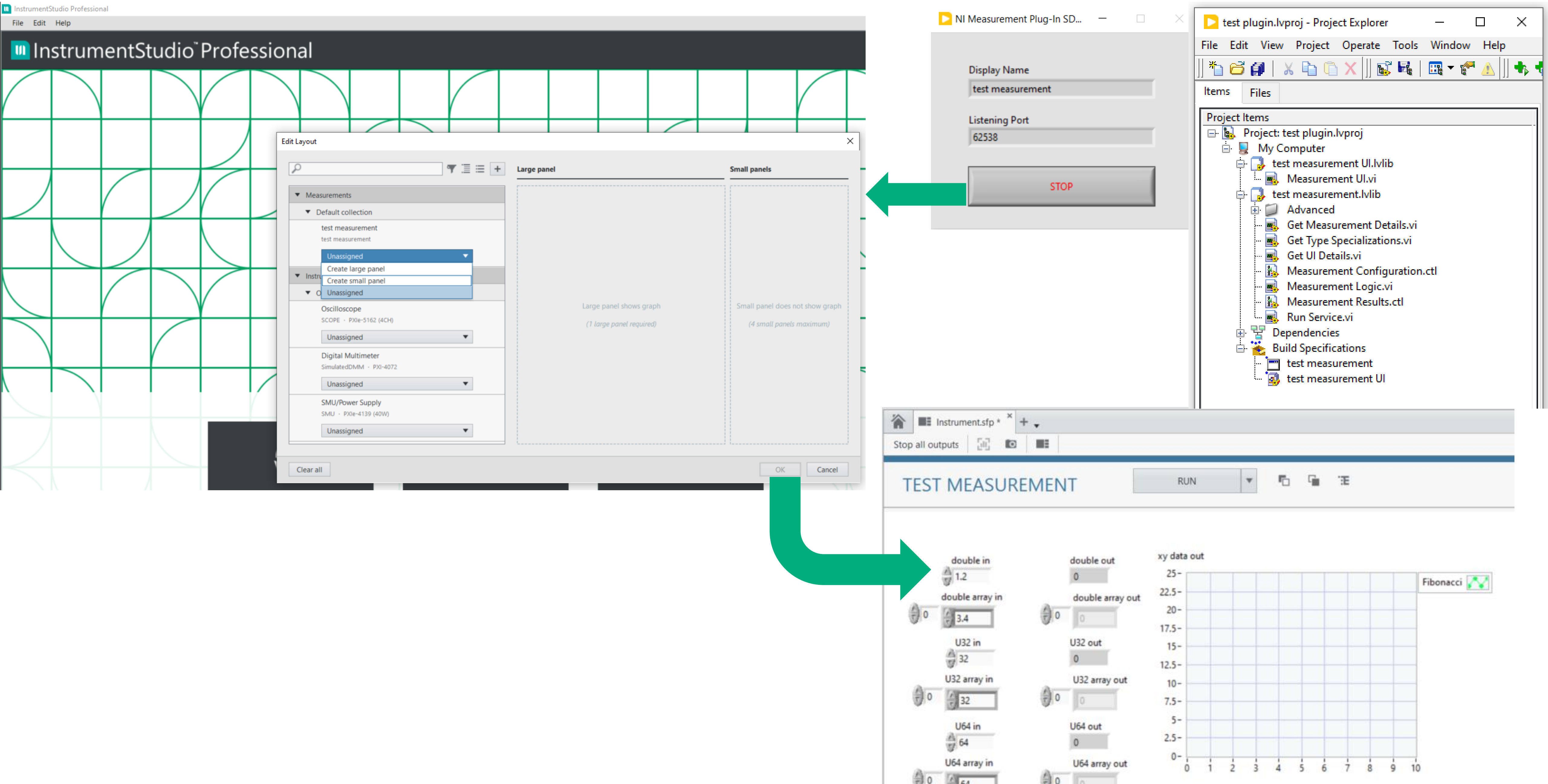
Pre-defined build spec:

Build Specifications
First Measurement
First Measurement UI



Project Items
- Project: test plugin.lvproj
  - My Computer
    - test measurement UI.lvlib
      - Measurement UI.vi
    - test measurement.lvlib
      - Advanced
      - Get Measurement Details.vi
      - Get Type Specializations.vi
      - Get UI Details.vi
      - Measurement Configuration.ctl
      - Measurement Logic.vi
      - Measurement Results.ctl
      - Run Service.vi
    - Dependencies
    - Build Specifications
      - test measurement
      - test measurement UI

Steps to use a Plug-in



InstrumentStudio Professional

File Edit Help

InstrumentStudio Professional

Edit Layout

Large panel

Small panels

Measurements

Default collection

test measurement
test measurement

Unassigned
- Create large panel
- Create small panel
- Unassigned

Oscilloscope
SCOPE · PXIe-5162 (4CH)
Unassigned

Digital Multimeter
SimulatedDMM · PXI-4072
Unassigned

SMU/Power Supply
SMU · PXIe-4139 (40W)
Unassigned

Large panel shows graph
(1 large panel required)

Small panel does not show graph
(4 small panels maximum)

Clear all | OK | Cancel

NI Measurement Plug-In SD...

Display Name: test measurement

Listening Port: 62538

STOP

test plugin.lvproj - Project Explorer

File Edit View Project Operate Tools Window Help

Items | Files

```
Project Items
Project: test plugin.lvproj
  My Computer
    test measurement UI.lvlib
      Measurement UI.vi
    test measurement.lvlib
      Advanced
      Get Measurement Details.vi
      Get Type Specializations.vi
      Get UI Details.vi
      Measurement Configuration.ctl
      Measurement Logic.vi
      Measurement Results.ctl
      Run Service.vi
    Dependencies
    Build Specifications
      test measurement
      test measurement UI
```

Instrument.sfp *

Stop all outputs

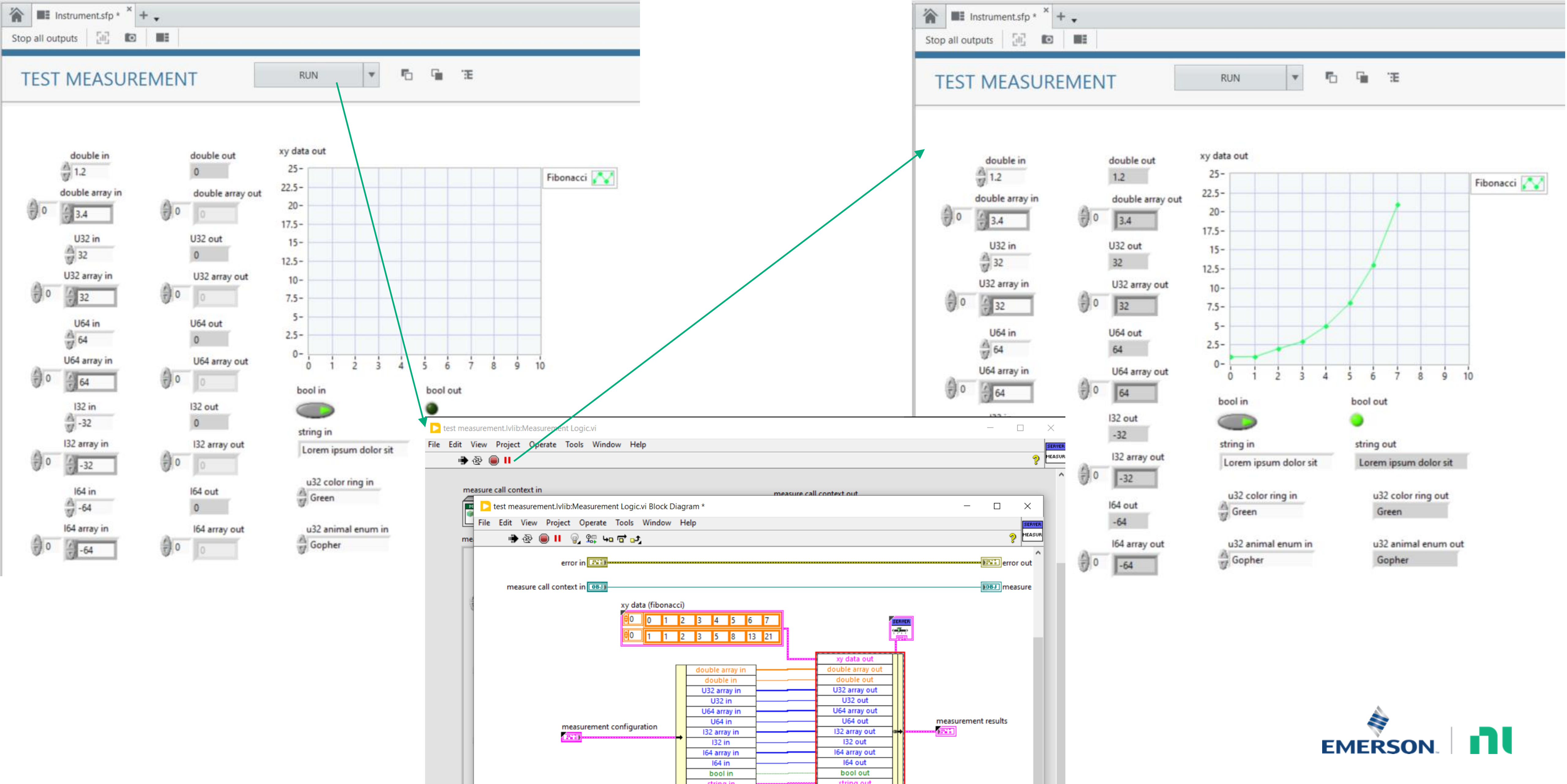
TEST MEASUREMENT

RUN

double in: 1.2
double out: 0
double array in: 0 | 3.4
double array out: 0 | 0
U32 in: 32
U32 out: 0
U32 array in: 0 | 32
U32 array out: 0 | 0
U64 in: 64
U64 out: 0
U64 array in: 0 | 64
U64 array out: 0 | 0

xy data out

Debugging a Plug-in



Before (left front panel):

double in: 1.2
double out: 0
double array in: 0 | 3.4
double array out: 0 | 0
U32 in: 32
U32 out: 0
U32 array in: 0 | 32
U32 array out: 0 | 0
U64 in: 64
U64 out: 0
U64 array in: 0 | 64
U64 array out: 0 | 0
I32 in: -32
I32 out: 0
I32 array in: 0 | -32
I32 array out: 0 | 0
I64 in: -64
I64 out: 0
I64 array in: 0 | -64
I64 array out: 0 | 0
bool in
bool out
string in: Lorem ipsum dolor sit
u32 color ring in: Green
u32 animal enum in: Gopher

Block diagram:

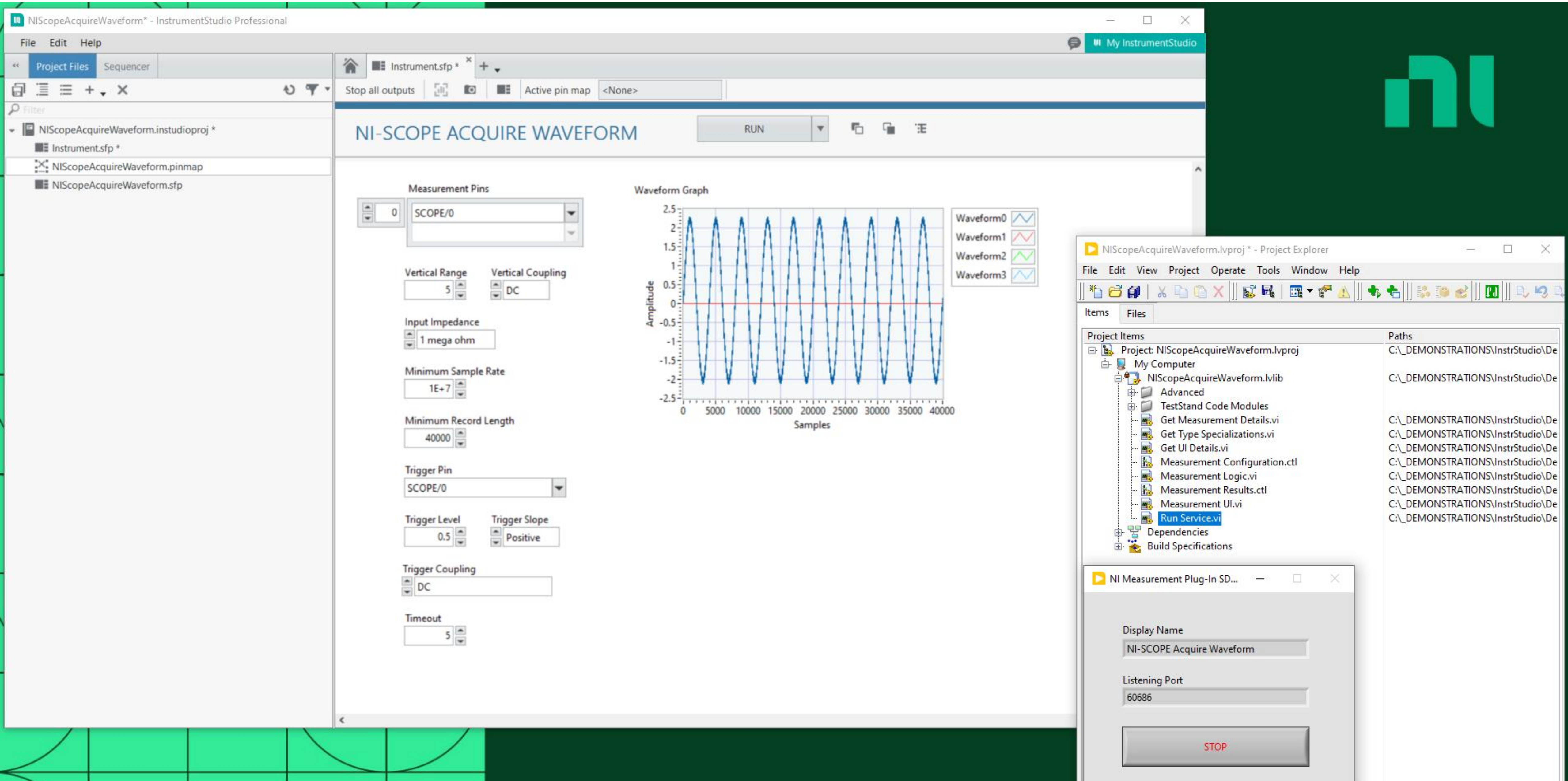
xy data (fibonacci): 0 1 2 3 4 5 6 7 / 1 1 2 3 5 8 13 21

Inputs	Outputs
double array in	double array out
double in	double out
U32 array in	U32 array out
U32 in	U32 out
U64 array in	U64 array out
U64 in	U64 out
I32 array in	I32 array out
I32 in	I32 out
I64 array in	I64 array out
I64 in	I64 out
bool in	bool out

After (right front panel):

double in: 1.2
double out: 1.2
double array in: 0 | 3.4
double array out: 0 | 3.4
U32 in: 32
U32 out: 32
U32 array in: 0 | 32
U32 array out: 0 | 32
U64 in: 64
U64 out: 64
U64 array in: 0 | 64
U64 array out: 0 | 64
I32 out: -32
I32 array out: 0 | -32
I64 out: -64
I64 array out: 0 | -64
bool in
bool out
string in: Lorem ipsum dolor sit
string out: Lorem ipsum dolor sit
u32 color ring in: Green
u32 color ring out: Green
u32 animal enum in: Gopher
u32 animal enum out: Gopher

NI Scope WFM Acq Plug-in Example



NIScopeAcquireWaveform.instudioproj *
- Instrument.sfp *
- NIScopeAcquireWaveform.pinmap
- NIScopeAcquireWaveform.sfp

NI-SCOPE ACQUIRE WAVEFORM

Measurement Pins: 0 SCOPE/0

Vertical Range: 5

Vertical Coupling: DC

Input Impedance: 1 mega ohm

Minimum Sample Rate: 1E+7

Minimum Record Length: 40000

Trigger Pin: SCOPE/0

Trigger Level: 0.5

Trigger Slope: Positive

Trigger Coupling: DC

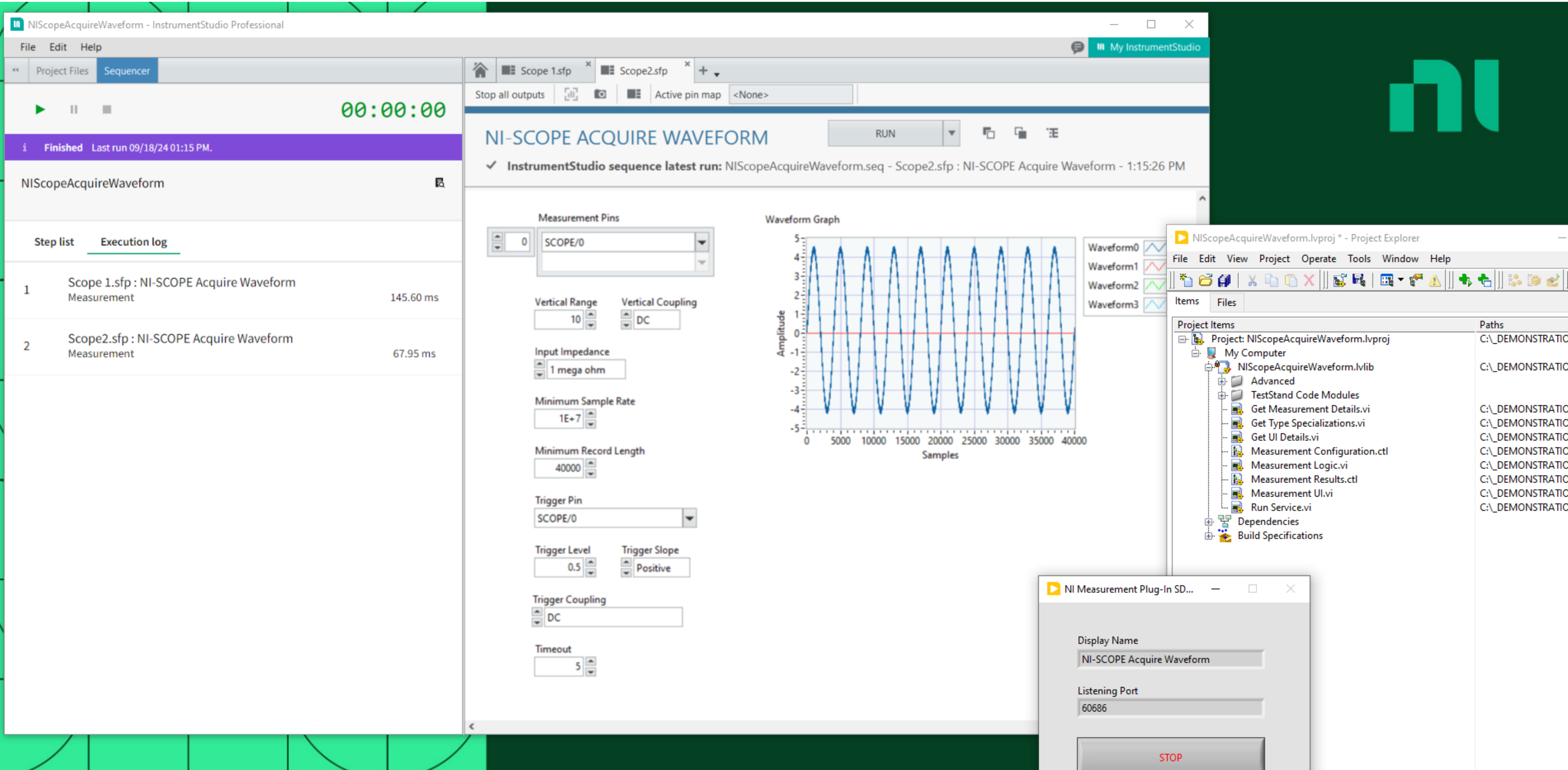
Timeout: 5

Project Items	Paths
Project: NIScopeAcquireWaveform.lvproj	C:_DEMONSTRATIONS\InstrStudio\De
My Computer	
NIScopeAcquireWaveform.lvlib	C:_DEMONSTRATIONS\InstrStudio\De
Advanced	
TestStand Code Modules	
Get Measurement Details.vi	C:_DEMONSTRATIONS\InstrStudio\De
Get Type Specializations.vi	C:_DEMONSTRATIONS\InstrStudio\De
Get UI Details.vi	C:_DEMONSTRATIONS\InstrStudio\De
Measurement Configuration.ctl	C:_DEMONSTRATIONS\InstrStudio\De
Measurement Logic.vi	C:_DEMONSTRATIONS\InstrStudio\De
Measurement Results.ctl	C:_DEMONSTRATIONS\InstrStudio\De
Measurement UI.vi	C:_DEMONSTRATIONS\InstrStudio\De
Run Service.vi	C:_DEMONSTRATIONS\InstrStudio\De
Dependencies	
Build Specifications	

Display Name: NI-SCOPE Acquire Waveform

Listening Port: 60686

NI Scope WFM Acq Plug-in Example with IS Pro Sequencing



00:00:00

Finished Last run 09/18/24 01:15 PM.

NIScopeAcquireWaveform

1 Scope 1.sfp : NI-SCOPE Acquire Waveform
Measurement 145.60 ms

2 Scope2.sfp : NI-SCOPE Acquire Waveform
Measurement 67.95 ms

Active pin map <None>

NI-SCOPE ACQUIRE WAVEFORM

✓ InstrumentStudio sequence latest run: NIScopeAcquireWaveform.seq - Scope2.sfp : NI-SCOPE Acquire Waveform - 1:15:26 PM

Measurement Pins: 0 SCOPE/0

Vertical Range: 10

Vertical Coupling: DC

Input Impedance: 1 mega ohm

Minimum Sample Rate: 1E+7

Minimum Record Length: 40000

Trigger Pin: SCOPE/0

Trigger Level: 0.5

Trigger Slope: Positive

Trigger Coupling: DC

Timeout: 5

Waveform Graph

Project Items	Paths
Project: NIScopeAcquireWaveform.lvproj	C:_DEMONSTRATIC
My Computer	
NIScopeAcquireWaveform.lvlib	C:_DEMONSTRATIC
Advanced	
TestStand Code Modules	
Get Measurement Details.vi	C:_DEMONSTRATIC
Get Type Specializations.vi	C:_DEMONSTRATIC
Get UI Details.vi	C:_DEMONSTRATIC
Measurement Configuration.ctl	C:_DEMONSTRATIC
Measurement Logic.vi	C:_DEMONSTRATIC
Measurement Results.ctl	C:_DEMONSTRATIC
Measurement UI.vi	C:_DEMONSTRATIC
Run Service.vi	C:_DEMONSTRATIC
Dependencies	
Build Specifications	

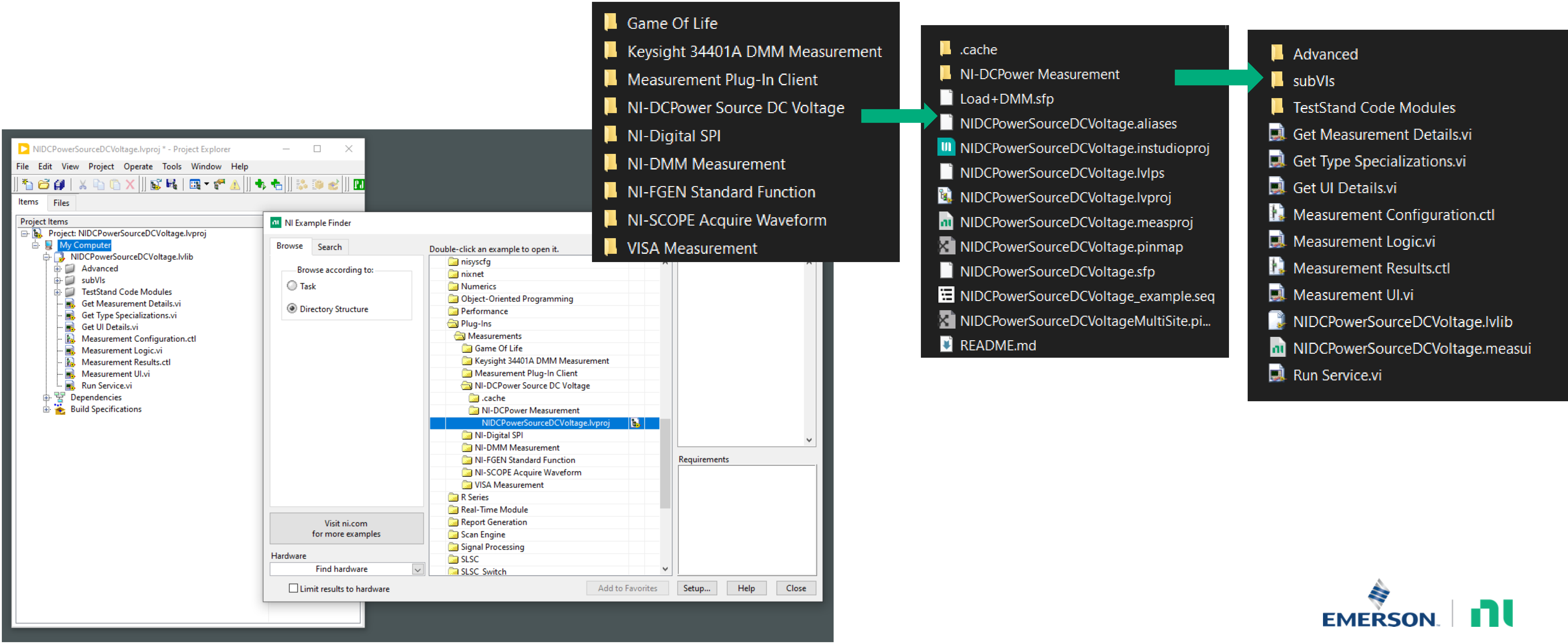
Display Name: NI-SCOPE Acquire Waveform

Listening Port: 60686

Plug-in Examples

Location: *C:\Program Files\National Instruments\LabVIEW 2024\examples\Plug-Ins\Measurements*

Best practice shown in the NI-DCPower Source DC Voltage



Game Of Life
Keysight 34401A DMM Measurement
Measurement Plug-In Client
NI-DCPower Source DC Voltage
NI-Digital SPI
NI-DMM Measurement
NI-FGEN Standard Function
NI-SCOPE Acquire Waveform
VISA Measurement

.cache
NI-DCPower Measurement
Load+DMM.sfp
NIDCPowerSourceDCVoltage.aliases
NIDCPowerSourceDCVoltage.instudioproj
NIDCPowerSourceDCVoltage.lvlps
NIDCPowerSourceDCVoltage.lvproj
NIDCPowerSourceDCVoltage.measproj
NIDCPowerSourceDCVoltage.pinmap
NIDCPowerSourceDCVoltage.sfp
NIDCPowerSourceDCVoltage_example.seq
NIDCPowerSourceDCVoltageMultiSite.pi...
README.md

Advanced
subVIs
TestStand Code Modules
Get Measurement Details.vi
Get Type Specializations.vi
Get UI Details.vi
Measurement Configuration.ctl
Measurement Logic.vi
Measurement Results.ctl
Measurement UI.vi
NIDCPowerSourceDCVoltage.lvlib
NIDCPowerSourceDCVoltage.measui
Run Service.vi

NIDCPowerSourceDCVoltage.lvproj * - Project Explorer

File Edit View Project Operate Tools Window Help

Items Files

Project Items
Project: NIDCPowerSourceDCVoltage.lvproj
My Computer
NIDCPowerSourceDCVoltage.lvlib
Advanced
subVIs
TestStand Code Modules
Get Measurement Details.vi
Get Type Specializations.vi
Get UI Details.vi
Measurement Configuration.ctl
Measurement Logic.vi
Measurement Results.ctl
Measurement UI.vi
Run Service.vi
Dependencies
Build Specifications

NI Example Finder

Browse Search

Browse according to:
○ Task
● Directory Structure

Visit ni.com
for more examples

Hardware
Find hardware

□ Limit results to hardware

Double-click an example to open it.

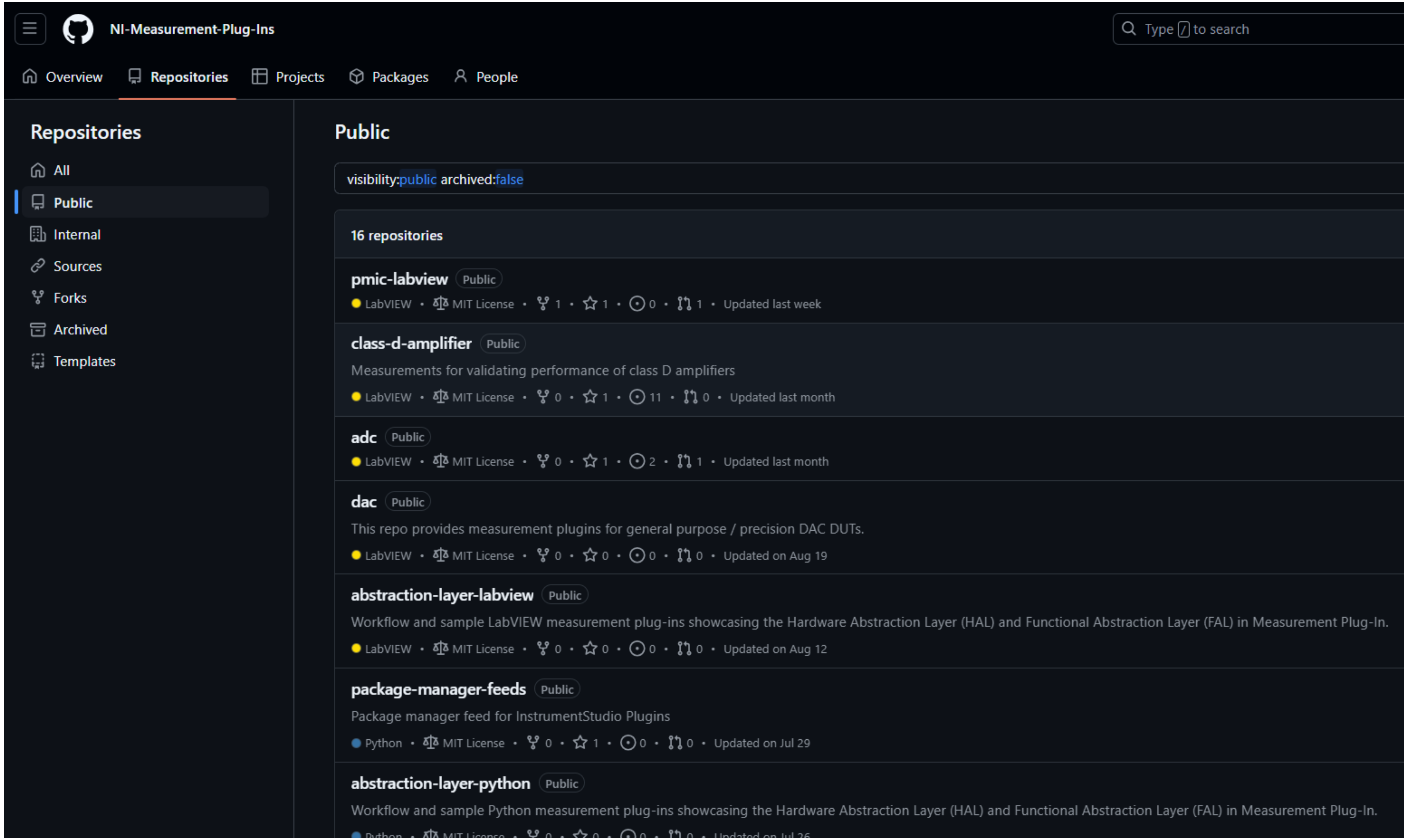
nisyscfg
nixnet
Numerics
Object-Oriented Programming
Performance
Plug-Ins
Measurements
Game Of Life
Keysight 34401A DMM Measurement
Measurement Plug-In Client
NI-DCPower Source DC Voltage
.cache
NI-DCPower Measurement
NIDCPowerSourceDCVoltage.lvproj
NI-Digital SPI
NI-DMM Measurement
NI-FGEN Standard Function
NI-SCOPE Acquire Waveform
VISA Measurement
R Series
Real-Time Module
Report Generation
Scan Engine
Signal Processing
SLSC
SLSC Switch

Requirements

Add to Favorites Setup... Help Close

https://github.com/NI-Measurement-Plug-Ins

Plug-in Repo on GitHub



Public

visibility:public archived:false

16 repositories

pmic-labview Public
LabVIEW • MIT License • 1 • 1 • 0 • 1 • Updated last week

class-d-amplifier Public
Measurements for validating performance of class D amplifiers
LabVIEW • MIT License • 0 • 1 • 11 • 0 • Updated last month

adc Public
LabVIEW • MIT License • 0 • 1 • 2 • 1 • Updated last month

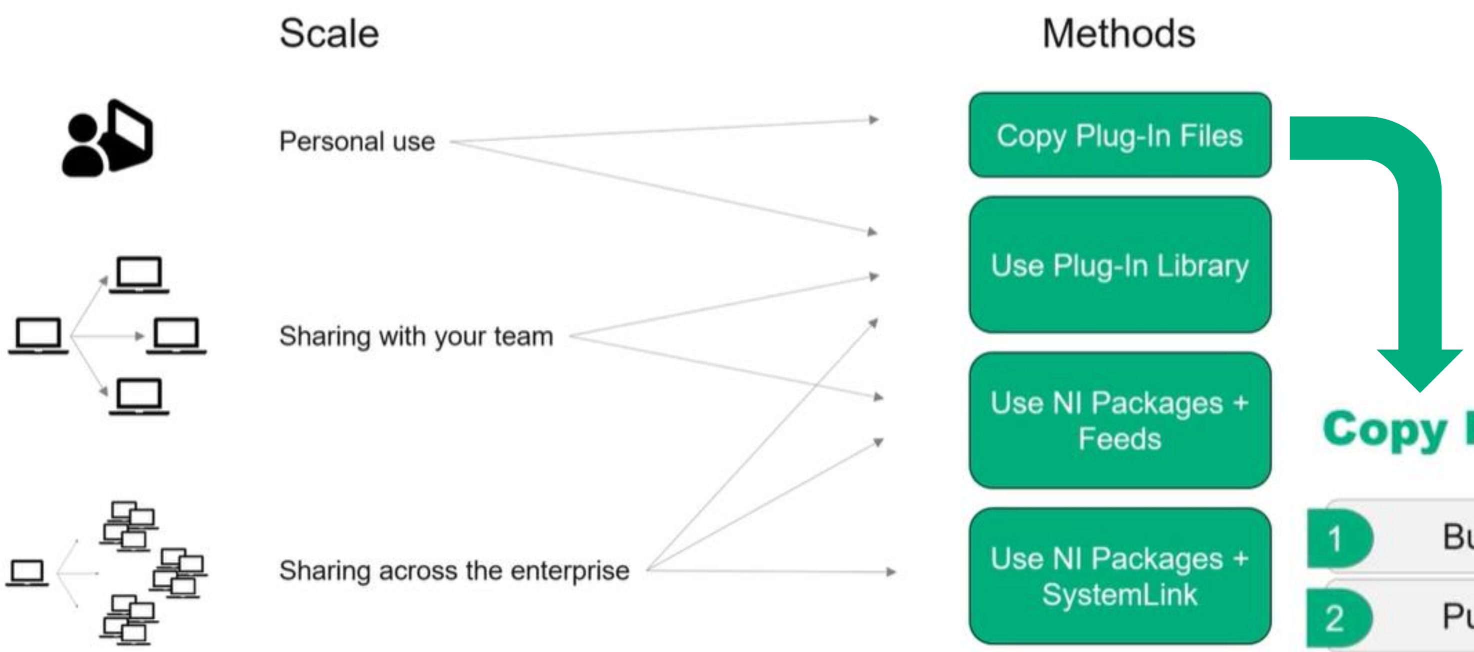
dac Public
This repo provides measurement plugins for general purpose / precision DAC DUTs.
LabVIEW • MIT License • 0 • 0 • 0 • 0 • Updated on Aug 19

abstraction-layer-labview Public
Workflow and sample LabVIEW measurement plug-ins showcasing the Hardware Abstraction Layer (HAL) and Functional Abstraction Layer (FAL) in Measurement Plug-In.
LabVIEW • MIT License • 0 • 0 • 0 • 0 • Updated on Aug 12

package-manager-feeds Public
Package manager feed for InstrumentStudio Plugins
Python • MIT License • 0 • 1 • 0 • 0 • Updated on Jul 29

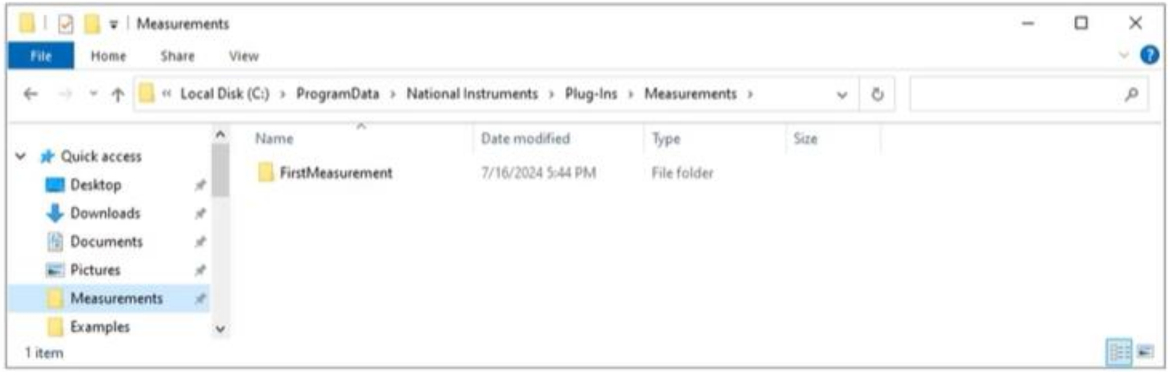
abstraction-layer-python Public
Workflow and sample Python measurement plug-ins showcasing the Hardware Abstraction Layer (HAL) and Functional Abstraction Layer (FAL) in Measurement Plug-In.
Python • MIT License • 0 • 0 • 0 • 0 • Updated on Jul 26

Sharing Plug-ins



Copy Plug-In Files

1. Build a plug-in using plug-in development instructions.
2. Publish by copying to location on disk.
3. No installation required.

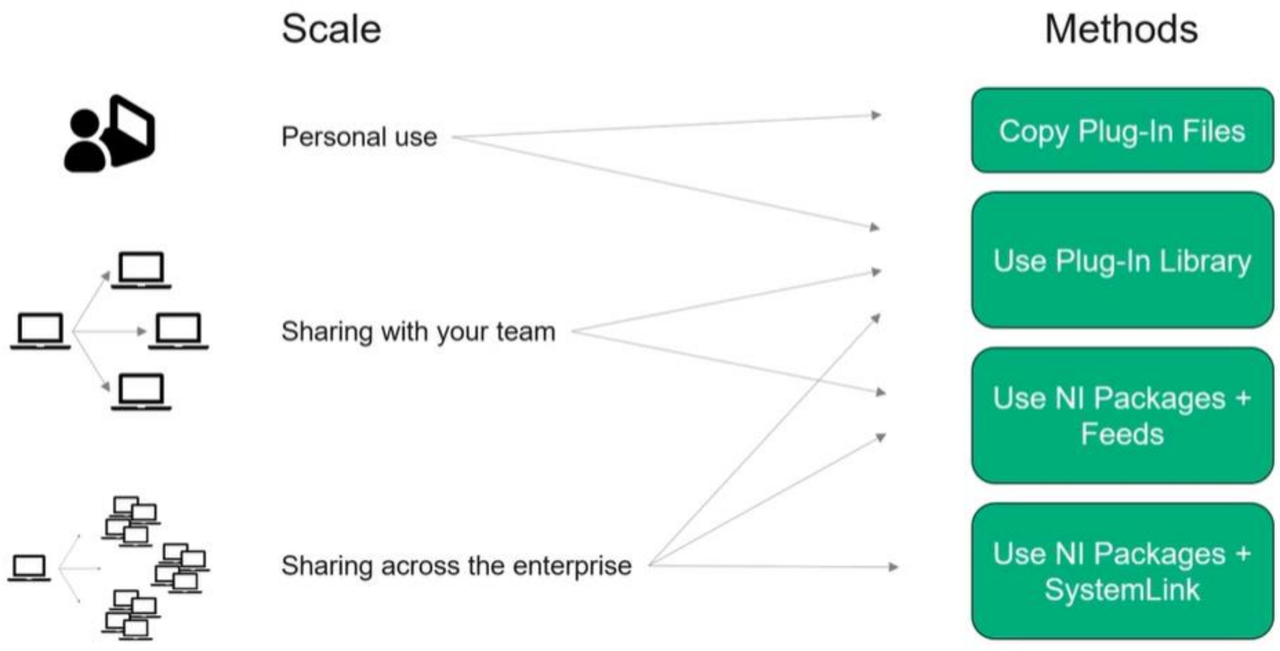


« Local Disk (C:) › ProgramData › National Instruments › Plug-Ins › Measurements ›

Name	Date modified	Type	Size
FirstMeasurement	7/16/2024 5:44 PM	File folder	

Disk location: C:\ProgramData\National Instruments\Plug-Ins\Measurements

Sharing Plug-ins

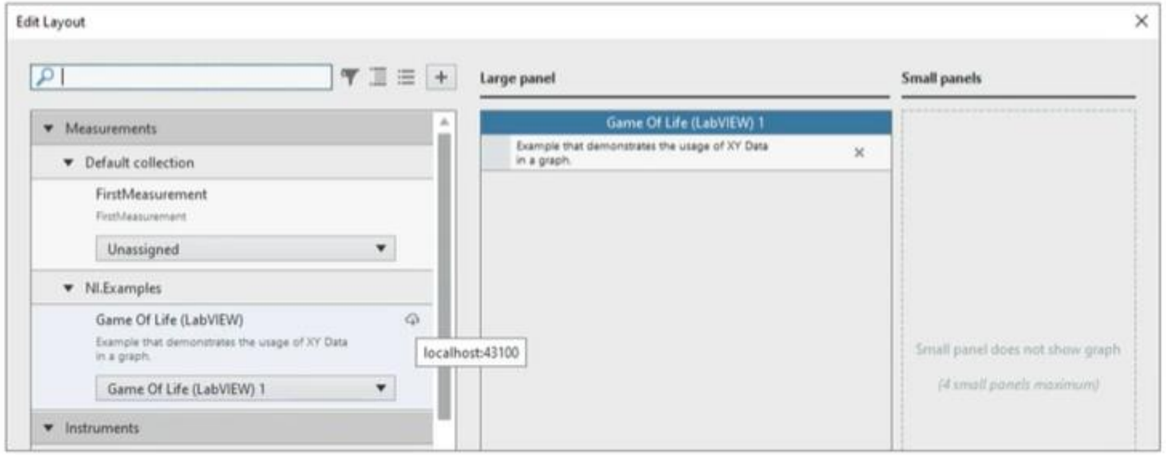


Plug-In Library

1 Build a plug-in using plug-in development instructions.

2 Publish to a plug-in library using the command line tool.

3 Install using InstrumentStudio or TestStand.



Example that demonstrates the usage of XY Data in a graph.

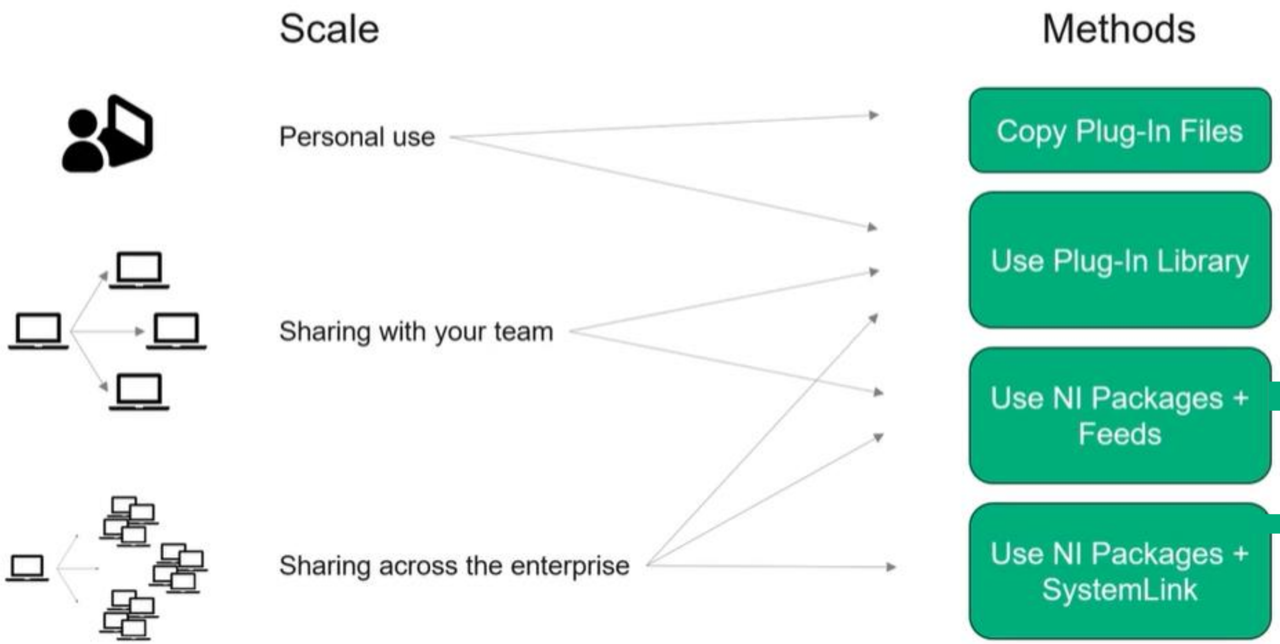
Example that demonstrates the usage of XY Data in a graph.

Small panel does not show graph

(4 small panels maximum)

https://www.ni.com/docs/en-US/bundle/measurementplugins/page/plugin-libs.html

Sharing Plug-ins



Scale

Personal use

Sharing with your team

Sharing across the enterprise

Methods

Copy Plug-In Files

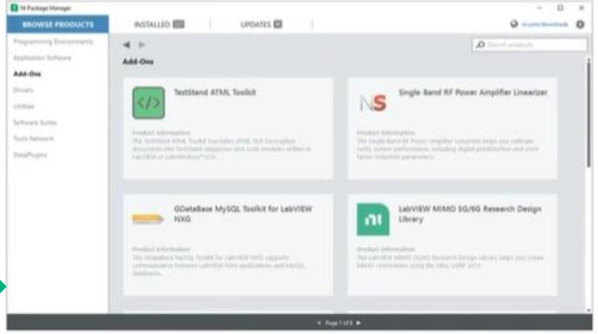
Use Plug-In Library

Use NI Packages + Feeds

Use NI Packages + SystemLink

Sharing Plug-Ins with NI Packages and Feeds

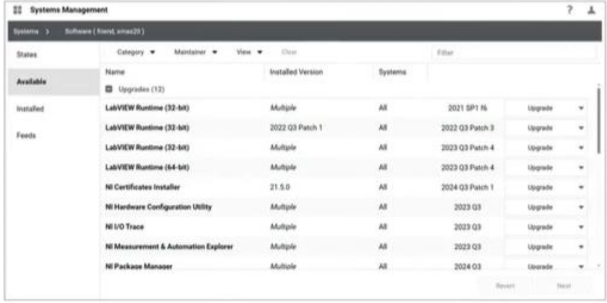
1. Build a package using `nipkg.exe` or Package Builder.
2. Publish to a feed (if networked).
3. Install using NI Package Manager.



Disk location: C:\ProgramData\National Instruments\Plug-Ins\Measurements

Sharing Plug-Ins with NI Packages and SystemLink

1. Build a package using `nipkg.exe` or Package Builder.
2. Publish by uploading to SystemLink Package Repository.
3. Install using SystemLink Systems Management.



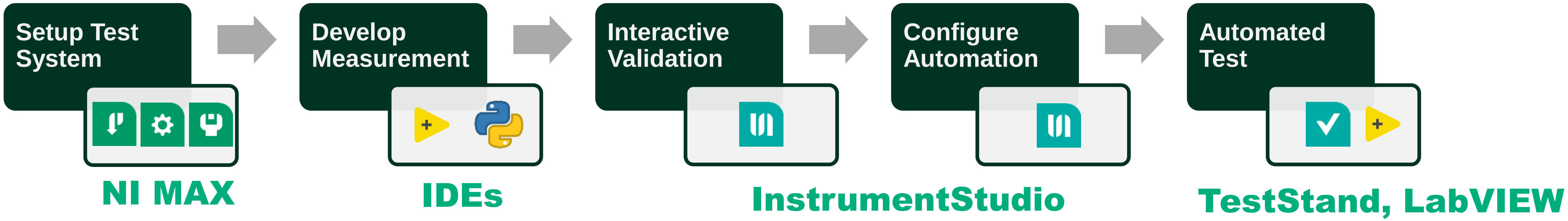
Name	Installed Version	Systems		
LabVIEW Runtime (32-bit)	Multiple	All	2021 SP1 f6	Upgrade
LabVIEW Runtime (32-bit)	2022 Q3 Patch 1	All	2022 Q3 Patch 3	Upgrade
LabVIEW Runtime (32-bit)	Multiple	All	2023 Q3 Patch 4	Upgrade
LabVIEW Runtime (64-bit)	Multiple	All	2023 Q3 Patch 4	Upgrade
NI Certificates Installer	21.5.0	All	2024 Q3 Patch 1	Upgrade
NI Hardware Configuration Utility	Multiple	All	2023 Q3	Upgrade
NI I/O Trace	Multiple	All	2023 Q3	Upgrade
NI Measurement & Automation Explorer	Multiple	All	2023 Q3	Upgrade
NI Package Manager	Multiple	All	2024 Q3	Upgrade

Disk location: C:\ProgramData\National Instruments\Plug-Ins\Measurements

https://www.ni.com/docs/en-US/bundle/measurementplugins/page/plugin-libs.html

Standardized Workflow with Instrument Plug-ins

From setting up the device to Automated Test



Setup Test System → Develop Measurement → Interactive Validation → Configure Automation → Automated Test

NI MAX

IDEs

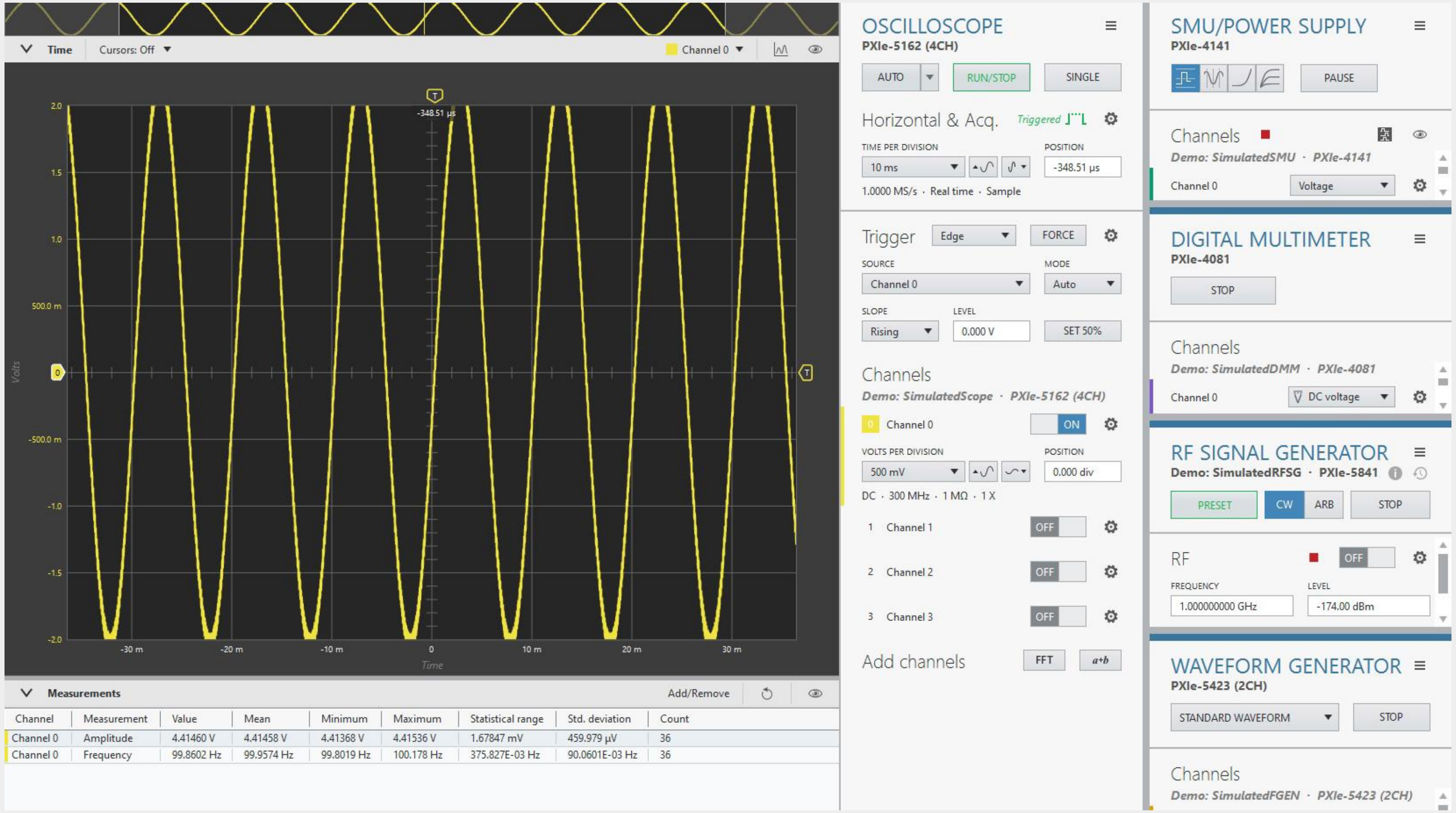
InstrumentStudio

TestStand, LabVIEW

Benefits of Standardized Workflow

- Reduce Time to First Measurements
- Reduce Time Spent Developing Duplicate Measurement IP
- Reuse Code Across Projects, Teams, and Sites

Set Up



Measurements

Channel	Measurement	Value	Mean	Minimum	Maximum	Statistical range	Std. deviation	Count
Channel 0	Amplitude	4.41460 V	4.41458 V	4.41368 V	4.41536 V	1.67847 mV	459.979 µV	36
Channel 0	Frequency	99.8602 Hz	99.9574 Hz	99.8019 Hz	100.178 Hz	375.827E-03 Hz	90.0601E-03 Hz	36

OSCILLOSCOPE
PXIe-5162 (4CH)

Horizontal & Acq. Triggered
TIME PER DIVISION 10 ms
POSITION -348.51 µs
1.0000 MS/s · Real time · Sample

Trigger Edge
SOURCE Channel 0
MODE Auto
SLOPE Rising
LEVEL 0.000 V

Channels
Demo: SimulatedScope · PXIe-5162 (4CH)
0 Channel 0 ON
VOLTS PER DIVISION 500 mV
POSITION 0.000 div
DC · 300 MHz · 1 MΩ · 1 X
1 Channel 1 OFF
2 Channel 2 OFF
3 Channel 3 OFF
Add channels

SMU/POWER SUPPLY
PXIe-4141
Channels
Demo: SimulatedSMU · PXIe-4141
Channel 0 Voltage

DIGITAL MULTIMETER
PXIe-4081
Channels
Demo: SimulatedDMM · PXIe-4081
Channel 0 DC voltage

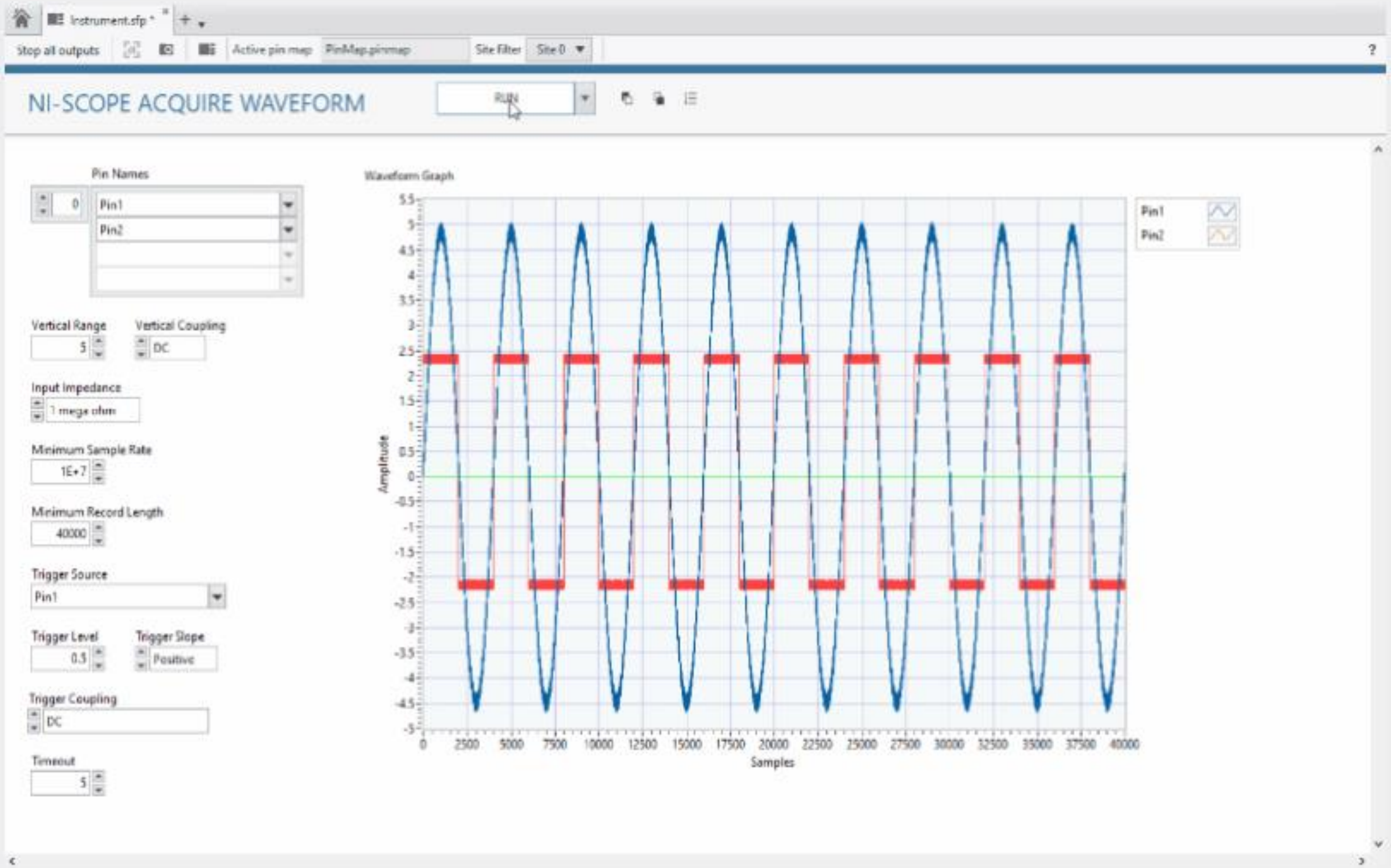
RF SIGNAL GENERATOR
Demo: SimulatedRFSG · PXIe-5841
RF OFF
FREQUENCY 1.000000000 GHz
LEVEL -174.00 dBm

WAVEFORM GENERATOR
PXIe-5423 (2CH)
STANDARD WAVEFORM
Channels
Demo: SimulatedFGEN · PXIe-5423 (2CH)

Configuration Environment for PXI Instruments

- Connect a wide range of DC, analog, digital, RF, and NI instruments
- Customize panels for multiple instruments
- Create pin maps for DUT centric set up
- Save layouts and configuration as a projects for instant repeatability
- Capture data to share with colleagues

Measure



NI-SCOPE ACQUIRE WAVEFORM

Pin Names: Pin1, Pin2

Vertical Range: 5

Vertical Coupling: DC

Input Impedance: 1 mega ohm

Minimum Sample Rate: 1E+7

Minimum Record Length: 40000

Trigger Source: Pin1

Trigger Level: 0.5

Trigger Slope: Positive

Trigger Coupling: DC

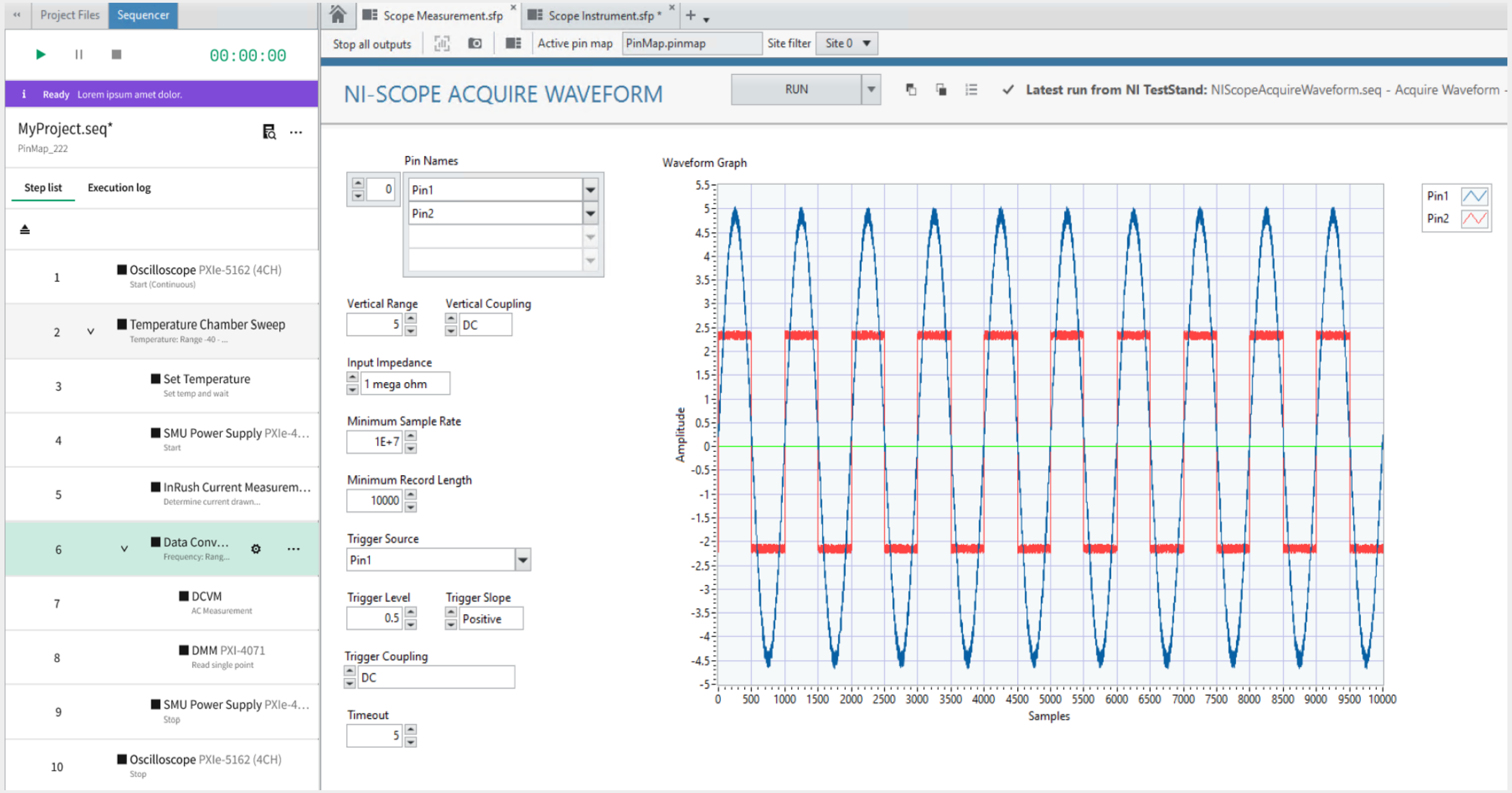
Timeout: 5

Measurement Plug-Ins

- One environment for measurements and instruments
- Integrate measurement plug-ins with LabVIEW or Python
- Capture multi-instrument measurements
- Use measurements plug-ins from NI libraries and build your own
- Extend for non-NI instruments

Automate – Option 1

InstrumentStudio In-App Sequencing



Ready Lorem ipsum amet dolor.

MyProject.seq*
PinMap_222

1 Oscilloscope PXIe-5162 (4CH) — Start (Continuous)
2 Temperature Chamber Sweep — Temperature: Range -40 - ...
3 Set Temperature — Set temp and wait
4 SMU Power Supply PXIe-4... — Start
5 InRush Current Measurem... — Determine current drawn...
6 Data Conv... — Frequency: Rang...
7 DCVM — AC Measurement
8 DMM PXI-4071 — Read single point
9 SMU Power Supply PXIe-4... — Stop
10 Oscilloscope PXIe-5162 (4CH) — Stop

Active pin map PinMap.pinmap
Site filter Site 0

NI-SCOPE ACQUIRE WAVEFORM

✓ **Latest run from NI TestStand:** NIScopeAcquireWaveform.seq - Acquire Waveform -

Pin Names: 0 Pin1, Pin2
Vertical Range: 5
Vertical Coupling: DC
Input Impedance: 1 mega ohm
Minimum Sample Rate: 1E+7
Minimum Record Length: 10000
Trigger Source: Pin1
Trigger Level: 0.5
Trigger Slope: Positive
Trigger Coupling: DC
Timeout: 5

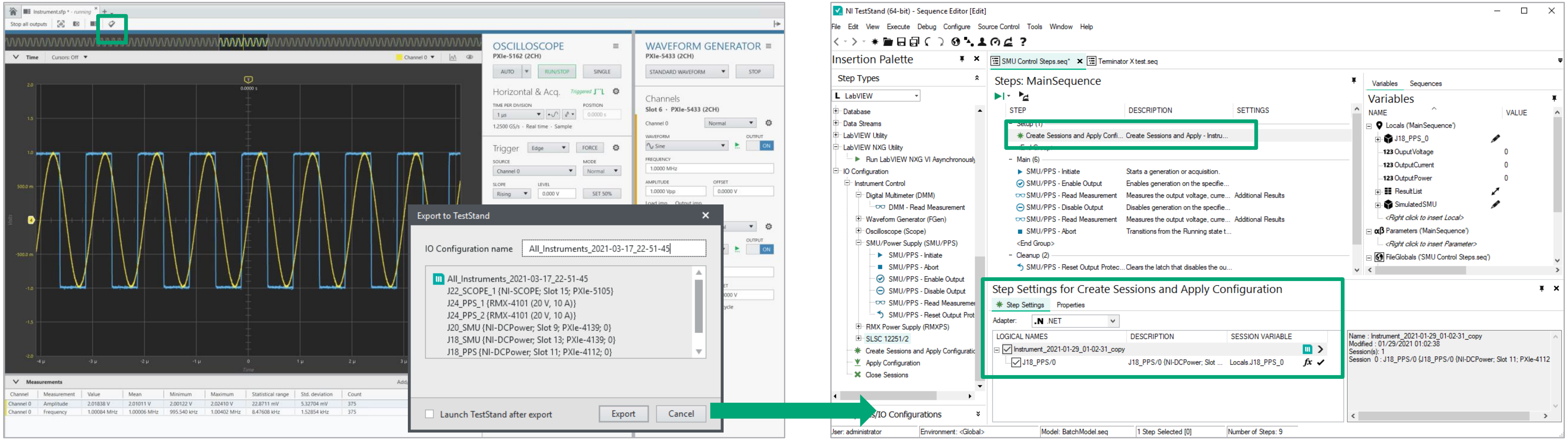
In-App Sequencing

- Sequence over interactive steps
- Automate parametric sweeps
- Interactively debug automation
- Generate reports
- Copy-paste measurements to TestStand for advanced automation

Automate - Option 2

Reuse Instrument Configurations created in InstrumentStudio in your TestStand sequences

- Configure the instruments in InstrumentStudio
- Check the result of your configuration by running the instruments (change if needed)
- Click the **Export** to TestStand button to save the configuration and use it in TestStand
- **Create your automated Test Sequence in TestStand**



Measurements

Channel	Measurement	Value	Mean	Minimum	Maximum	Statistical range	Std. deviation	Count
Channel 0	Amplitude	2.01838 V	2.01011 V	2.00122 V	2.02410 V	22.8711 mV	5.32704 mV	375
Channel 0	Frequency	1.00084 MHz	1.00006 MHz	995.540 kHz	1.00402 MHz	8.47608 kHz	1.52854 kHz	375

Export to TestStand

IO Configuration name: All_Instruments_2021-03-17_22-51-45

All_Instruments_2021-03-17_22-51-45
J22_SCOPE_1 {NI-SCOPE; Slot 15; PXIe-5105}
J24_PPS_1 {RMX-4101 (20 V, 10 A)}
J24_PPS_2 {RMX-4101 (20 V, 10 A)}
J20_SMU {NI-DCPower; Slot 9; PXIe-4139; 0}
J18_SMU {NI-DCPower; Slot 13; PXIe-4139; 0}
J18_PPS {NI-DCPower; Slot 11; PXIe-4112; 0}

☐ Launch TestStand after export   Export   Cancel

SMU Control Steps.seq*   Terminator X test.seq

Steps: MainSequence

STEP	DESCRIPTION	SETTINGS
Setup (1)		
Create Sessions and Apply Confi...	Create Sessions and Apply - Instru...	
<End Group>		
Main (6)		
SMU/PPS - Initiate	Starts a generation or acquisition.	
SMU/PPS - Enable Output	Enables generation on the specifie...	
SMU/PPS - Read Measurement	Measures the output voltage, curre...	Additional Results
SMU/PPS - Disable Output	Disables generation on the specifie...	
SMU/PPS - Read Measurement	Measures the output voltage, curre...	Additional Results
SMU/PPS - Abort	Transitions from the Running state t...	
<End Group>		
Cleanup (2)		
SMU/PPS - Reset Output Protec...	Clears the latch that disables the ou...	

Step Settings for Create Sessions and Apply Configuration

Adapter: .NET

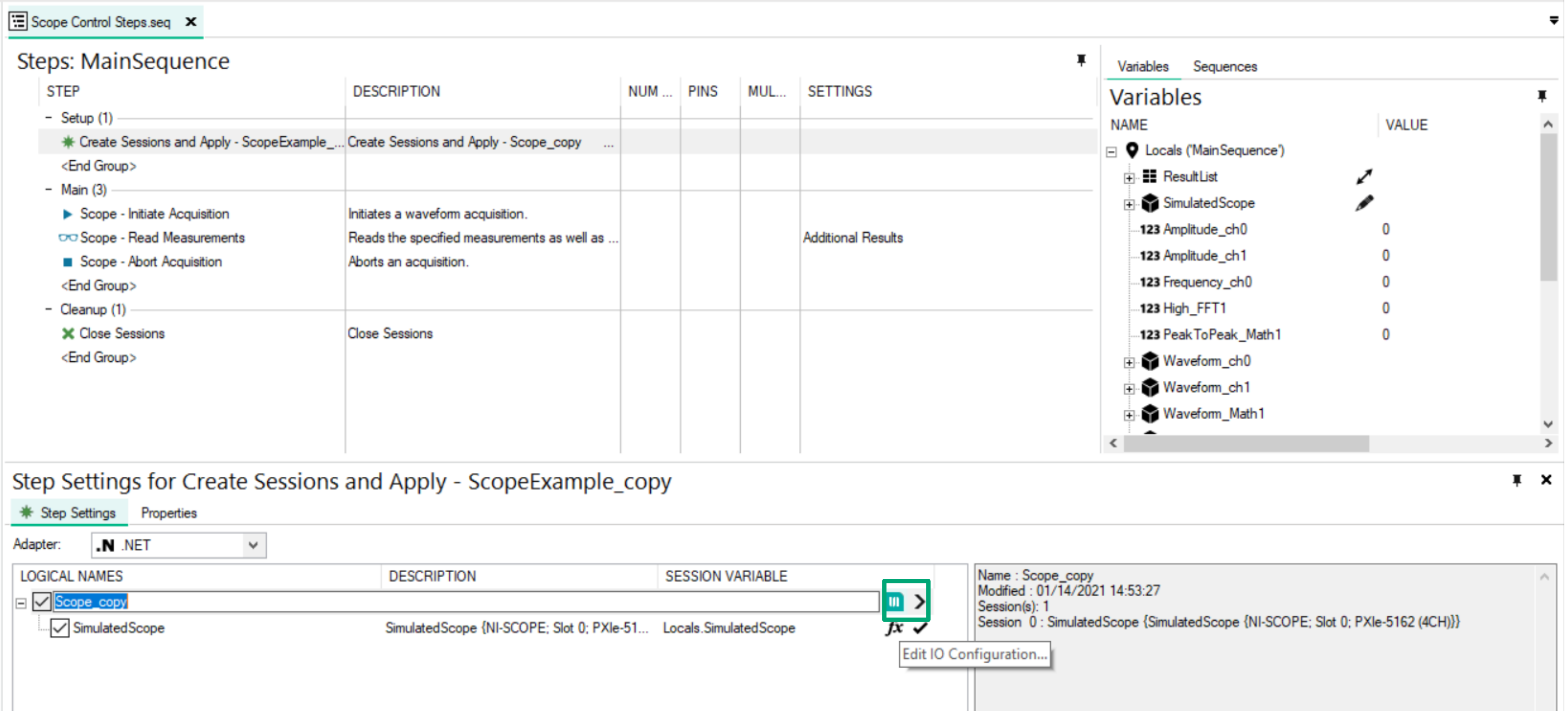
LOGICAL NAMES	DESCRIPTION	SESSION VARIABLE
☑ Instrument_2021-01-29_01-02-31_copy		
☑ J18_PPS/0	J18_PPS/0 {NI-DCPower; Slot ...	Locals.J18_PPS_0

Name : Instrument_2021-01-29_01-02-31_copy
Modified : 01/29/2021 01:02:38
Session(s): 1
Session 0 : J18_PPS/0 {J18_PPS/0 {NI-DCPower; Slot 11; PXIe-4112

Jser: administrator   Environment: <Global>   Model: BatchModel.seq   1 Step Selected [0]   Number of Steps: 9

Automate - Option 2

Modify instrument settings any time directly in TestStand using InstrumentStudio



Steps: MainSequence

STEP	DESCRIPTION	NUM ...	PINS	MUL...	SETTINGS
− Setup (1)					
Create Sessions and Apply - ScopeExample_...	Create Sessions and Apply - Scope_copy ...				
<End Group>					
− Main (3)					
▶ Scope - Initiate Acquisition	Initiates a waveform acquisition.				
Scope - Read Measurements	Reads the specified measurements as well as ...				Additional Results
■ Scope - Abort Acquisition	Aborts an acquisition.				
<End Group>					
− Cleanup (1)					
✖ Close Sessions	Close Sessions				
<End Group>					

Variables

NAME	VALUE
⊟ Locals ('MainSequence')	
⊞ ResultList	
⊞ SimulatedScope	
123 Amplitude_ch0	0
123 Amplitude_ch1	0
123 Frequency_ch0	0
123 High_FFT1	0
123 PeakToPeak_Math1	0
⊞ Waveform_ch0	
⊞ Waveform_ch1	
⊞ Waveform_Math1	

Step Settings for Create Sessions and Apply - ScopeExample_copy

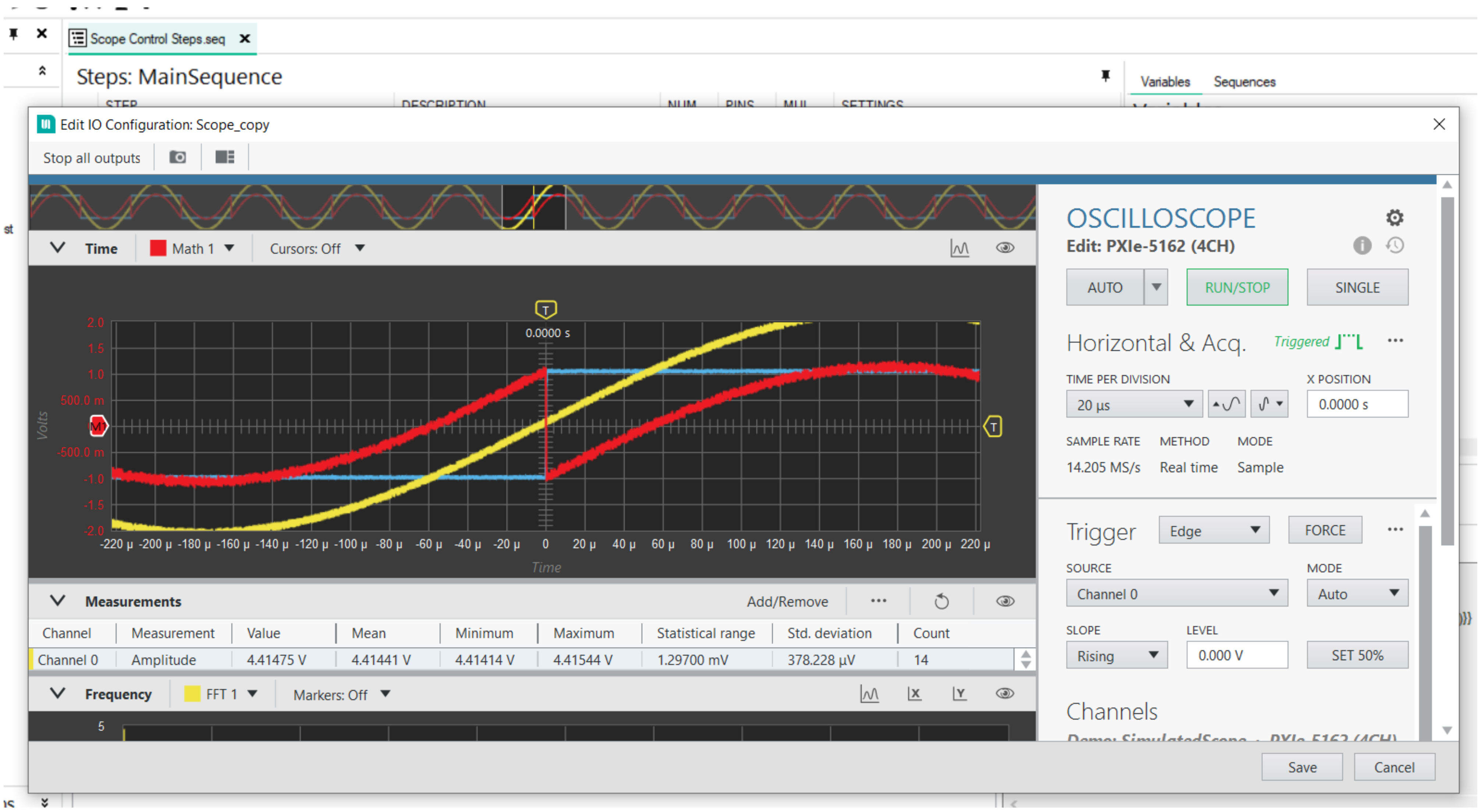
Adapter: .N .NET

LOGICAL NAMES	DESCRIPTION	SESSION VARIABLE
⊟ ☑ Scope_copy		
☑ SimulatedScope	SimulatedScope {NI-SCOPE; Slot 0; PXIe-51...	Locals.SimulatedScope

Name : Scope_copy
Modified : 01/14/2021 14:53:27
Session(s): 1
Session 0 : SimulatedScope {SimulatedScope {NI-SCOPE; Slot 0; PXIe-5162 (4CH)}}

Automate - Option 2

Modify instrument settings any time directly in TestStand using InstrumentStudio



Channel	Measurement	Value	Mean	Minimum	Maximum	Statistical range	Std. deviation	Count
Channel 0	Amplitude	4.41475 V	4.41441 V	4.41414 V	4.41544 V	1.29700 mV	378.228 µV	14

Horizontal & Acq.

TIME PER DIVISION: 20 µs

X POSITION: 0.0000 s

SAMPLE RATE: 14.205 MS/s

METHOD: Real time

MODE: Sample

Trigger: Edge

SOURCE: Channel 0

MODE: Auto

SLOPE: Rising

LEVEL: 0.000 V

Instrument Studio™ **Roadmap**

Short-term product focus

Cover broad range of electronics test validation and production debug operations

Allow basic automation of interactive operations

Allow the creation and sharing of custom panels

Deliver more out-of-the-box panel functionality

Long-term product focus

Support more advanced testing topologies

Increase data connectivity

Improve path to fully optimized production test

Streamline and improve customization capabilities

	Capability	Shipped	2024	2025+
	Panels			
	RFmx S-Parameter measurement workflows	2023 Q4		
	Support for electronic loads	2023 Q4		
Pro	Measurement-centric panels		✓	
Pro	Support for non-NI hardware		✓	
	Support for additional NI hardware			✓
	Workflow			
	Measurement organization and search	2023 Q4		
	Improved channel alias and pin map options		✓	✓
	Improved system configuration			✓
	Additional data logging options			✓
Pro	Additional remote-control support			✓
Pro	Additional parallelism support			✓
	Automation			
Pro	In-app sequencing and sweeping		✓	
Pro	Streamlined sequence creation			✓
	TestStand Semiconductor Module support			✓
	Extensibility			
	LabVIEW VISA gRPC driver APIs	2024 Q1		
	Simplified session management	2024 Q1		
Pro	Publish and share custom measurements		✓	
Pro	Additional datatypes and controls			✓
	Full C# support for custom measurements			✓

Roadmap Date: 2024 Q2

Next Release: 2024 Q3

Release Cadence: Quarterly

Roadmap is a snapshot and can change based on a variety of factors, including development execution and customer input.

EMERSON

Resources

Free InstrumentStudio Course on NI Learn

InstrumentStudio User Manual

InstrumentStudio Demo on Youtube

PXI 101 Video

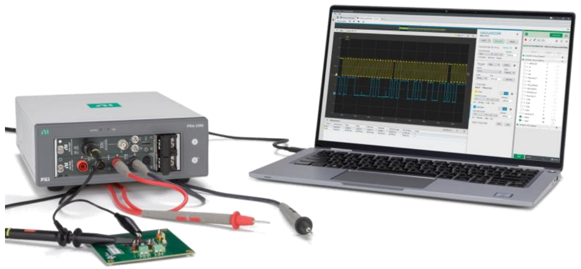
Plug-in repo on GitHub

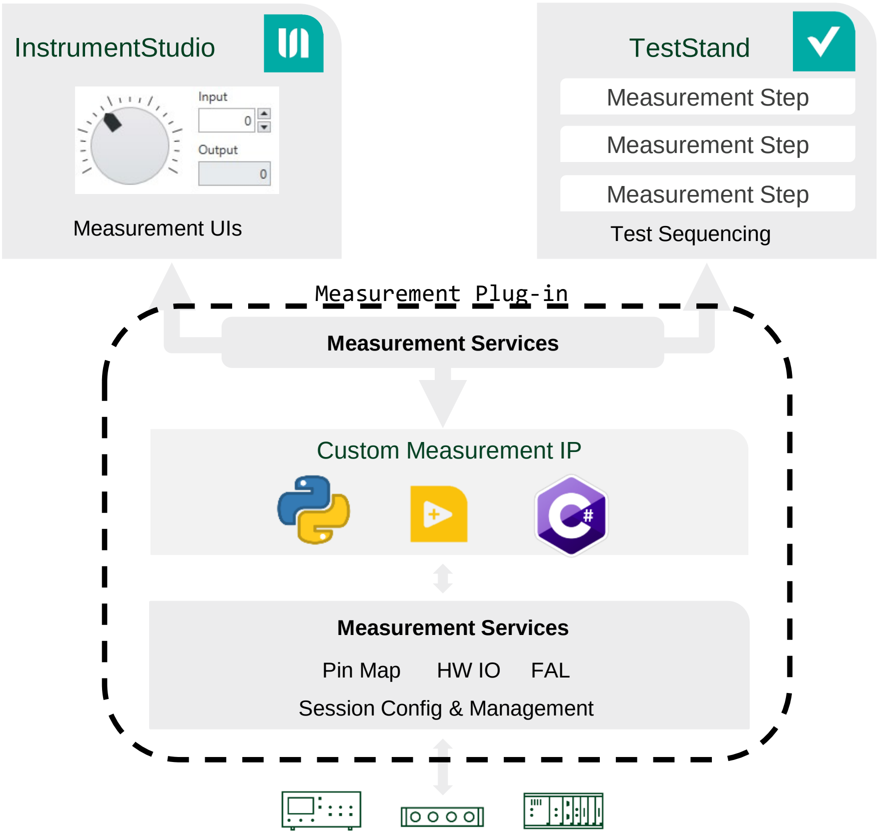
Creating Measurement Plug-Ins for InstrumentStudio On-Demand course

LabVIEW Measurement Development Dependencies

Python Measurement Development Dependencies

MeasurementLink has been merged into InstrumentStudio Pro as a feature Measurement Plug-In





InstrumentStudio

Measurement UIs

TestStand

Measurement Step

Measurement Step

Measurement Step

Test Sequencing

Measurement Plug-in

Measurement Services

Custom Measurement IP

Measurement Services

Pin Map HW IO FAL

Session Config & Management

EMERSON. | ni

NI is now part of Emerson.