CONNECT

CONNECT

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EXTEND AND WITH MEASUREMENT FRAMEWORK

Wednesday, May 25th, 10:15am

JOHN BONGAARTS

DANIEL DOMENE

In This Talk

- Defining electronics test
- Creating and using custom test systems
- NI Measurement Framework
- NI Measurement SDK
- Roadmap
- Future vision
- Lead User Partner Program

Let's talk about electronics test

A brief review

NI CONNECT

NI Software Portfolio

Differentiated Software-Connected Solutions That Help Our Customers Digitally Transform Engineering and Manufacturing and Ensures Product Performance Through Product Analytics and Automated Test

PRODUCT ANALYTICS

Quality & Reliability
Improve quality and reliability

Scrap Avoidance
Avoid waste in the production process

NPI Ramp
Accelerate product introduction

Efficiency Analysis
Streamline manufacturing processes

TEST OPERATIONS

Test Station Management
Qualification | Health | Configuration | Utilization

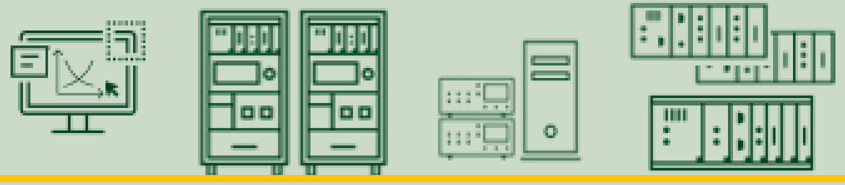
Test Execution Performance
Monitoring | Live KPIs | Process Control

Test Data Operations
Ingestion | Search | Transform | Process

TEST SYSTEM SOFTWARE AND HARDWARE

Configuration-Based Software

Domain-Specific IP



Development Tools

Driver Software

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NI's Test System Software Application Areas

Embedded Software Test	Verification and validation of embedded software throughout the development process, spanning modeling, simulation, replay, and "in the loop" testing (MIL/SIL/HIL).
Physical Test	Verification, validation, and production testing of electromechanical devices and systems through the collection and analysis of sensor and electrical-based measurements.
Electronic Test	Verification, validation, and production testing of electronic devices, spanning semiconductors, boards, modules and systems, and encompassing interactive and automated measurement.
Wireless Test	Rapid prototyping of communication technologies and verification, validation, and production testing of wireless devices including RF measurements and standards such as 5G, 802.11x, NFC and wireless charging.

These are the applications we can serve with the "Electronics Test Workflow"

User Persona

Test & Measurement Architect

Their role is to create measurement IP and infrastructure to scale productivity of validation and test engineers. They are savvy with instrumentation, measurement methodologies, software engineering tools and best practices.

Their mindset is to think beyond individual projects and focus on efficiency of the processes of validation or production test. They focus on creating reusable components infrastructure that others need for every project.

These users often are parts of small teams responsible for supporting many users with differing measurement requirements. In many cases, this role is served by NI Systems R&D, AE/IES/MCS teams, or NI Partners.

Environment and Day-to-day Work

- At larger companies, they may be in a centralized organization serving BUs or Product Lines with infrastructure to standardize development processes and data collection
- At smaller companies, they may also be the validation or production test engineer.

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This user implements measurement IP that is then used by others. They write the low-level automation code so that others can use higher-level tools to create test sequences without having to program at the instrument level. This user is savvy with their programming language of choice, understands instrumentation and measurement science, and usually has knowledge of the categories measurement IP they are developing.

User Persona

Validation Engineer

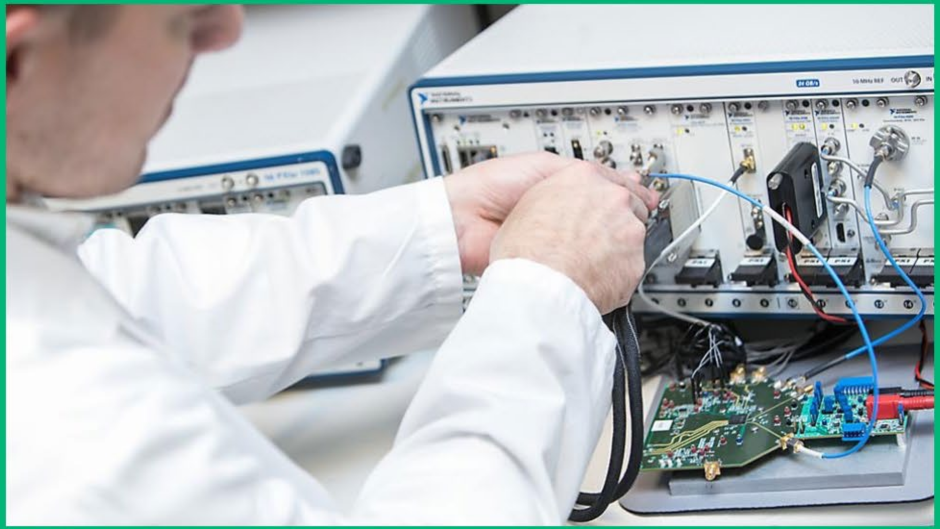
Their role is to validate the design of a new product by comparing its design specifications to its actual performance in the real world.

Their mindset is to assume the product design is flawed and try to find all the ways in which the design does not meet its specifications.

They feed this information back to the design team to fix bugs and iterate on the product design.

Environment and Day-to-day Work

- Lab environments with a mix of equipment from many different vendors and a lot of ad hoc setups and sophisticated interfaces to the device under test
- Perform manual tests on a small sample of prototype or pre-production units to validate their basic functionality ("smoke tests")
- Automate more robust characterization tests of these sample units across various conditions (e.g., temperature, frequency, power, voltage, device modes, etc) to validate that the unit performance meets specifications under these conditions.
- Collected data is reviewed with the product development team to determine any design iterations that need to be made before finalizing a design for production.
- Often challenged by novel and frequently changing measurement requirements, increasing DUT complexity, short project timelines, and limited budgets.



Production Test Engineer

Their role is to test products as they are mass produced in manufacturing to identify and isolate all defects to ensure customers receive quality products while adding as little costs to the process as possible.

Their mindset is to assume the products are correctly designed but that defects due to imperfections in the manufacturing process will occur and must be detected and sorted out before products are packaged for shipment to customers or integration into a larger system.

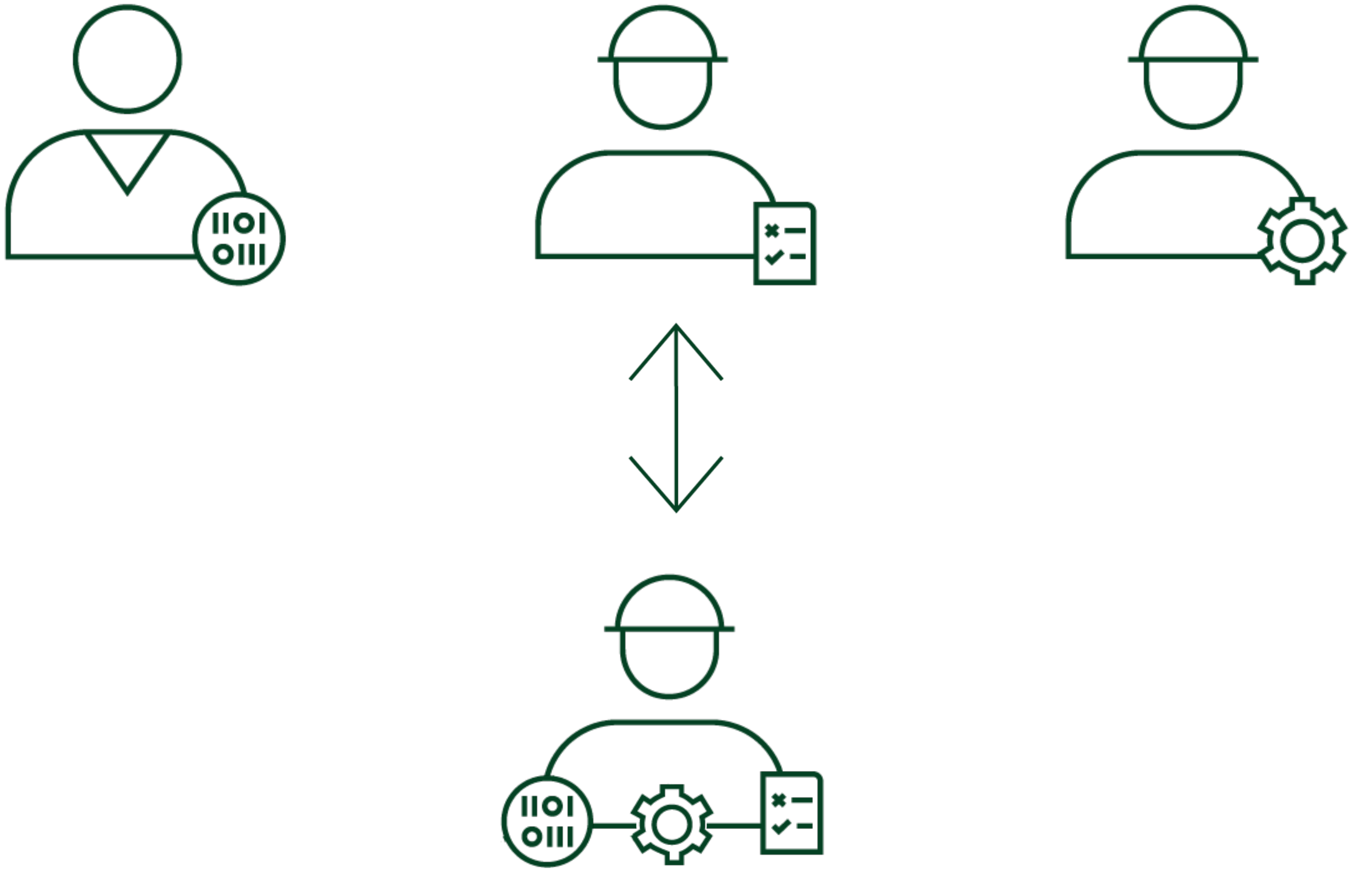
Data analytics techniques can be used on the test data produced to find manufacturing process flaws that cause yield loss (failures) and resolve them. **Optimal+** software does this kind of analytics in the Semiconductor and Transportation industries.

Environment and Day-to-day Work

- Do test program development, typically with an offline simulated tester during early development and automated test systems (ATE) in a pre-production engineering lab to validate the program with real product.
- Primary focus is test automation but use interactive debugging tools heavily during development.
- Maximizing test throughput is a key metric for them because it directly impacts the cost of production. Test time reduction and parallel testing are common tactics they use to do this.
- They often design mechanical and electrical interfaces to the device under test and this may need to mate with automated device handling equipment on the production line.
- May travel to the manufacturing facility to ensure a new test program is able to run correctly in mass production, especially for a new product type or tester platform.
- The production engineering team at the factory eventually operates the test system, running test programs without the test engineer's ongoing support.

On the Production Floor

Different Companies, Different Structure, Same Needs



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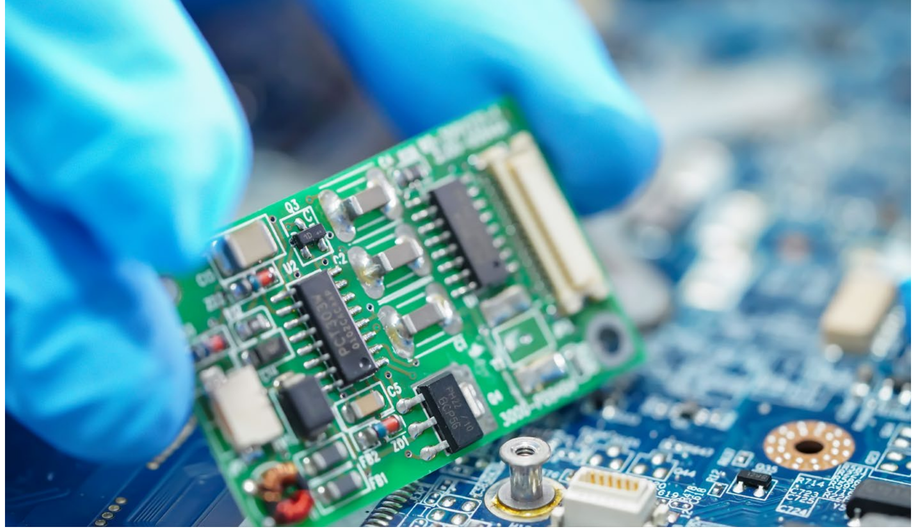
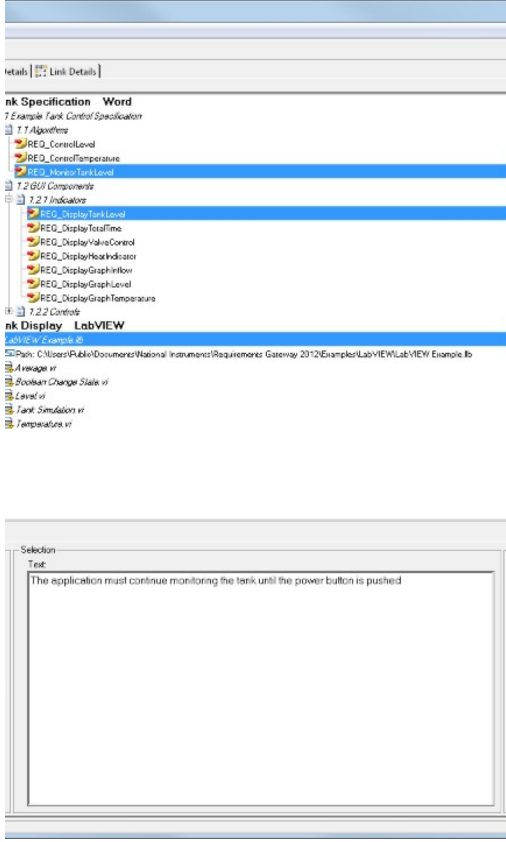
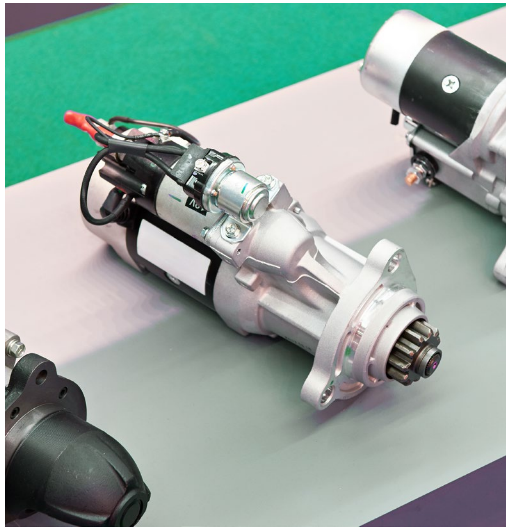
Test System Upkeep

Common Challenges

- DUT changes
- Requirements change
- Obsolescence
- Test Architect staffing
- Integrating code from multiple sources
- Too many projects at once







Ideal Outcomes

Maximize	Minimize
• Automated test throughput • Test Architect impact • Ability of Test Engineer to do their job with minimal Test Architect help	• Time to set up test system • Time to bring up DUT • Interruptions & bottlenecks • User errors • Time spent debugging • Amount of new code • Required training

Desired Solution

- Program in my preferred language
- Mix and match software modules from different sources
- Low-code / interactive experience for Test Engineer
- Less code / more reuse for Test Architect
- Easier debugging

- DUT centric
- Streamlined workflow & simplified mental model
- Forward compatibility for custom IP
- Connects with my enterprise data and asset management platform

NI Measurement Framework

An architecture for open extensibility

NI CONNECT

Measurement Framework and SDK

Application Software

Measurement SDK

Measurement Framework

Measurement Framework and SDK

Application Software

InstrumentStudio

TestStand

Custom application

Measurement Framework and SDK

Measurement SDK

User Interface

- LabVIEW-based
- Measurement UI

State Management

- Data caching for monitoring

Business Logic

- Distributable micro-service architecture
- Multiple language support
  - Python
  - LabVIEW
  - Any language that supports gRPC
- Parallelizable

Measurement Framework and SDK

Measurement Framework

Session Management

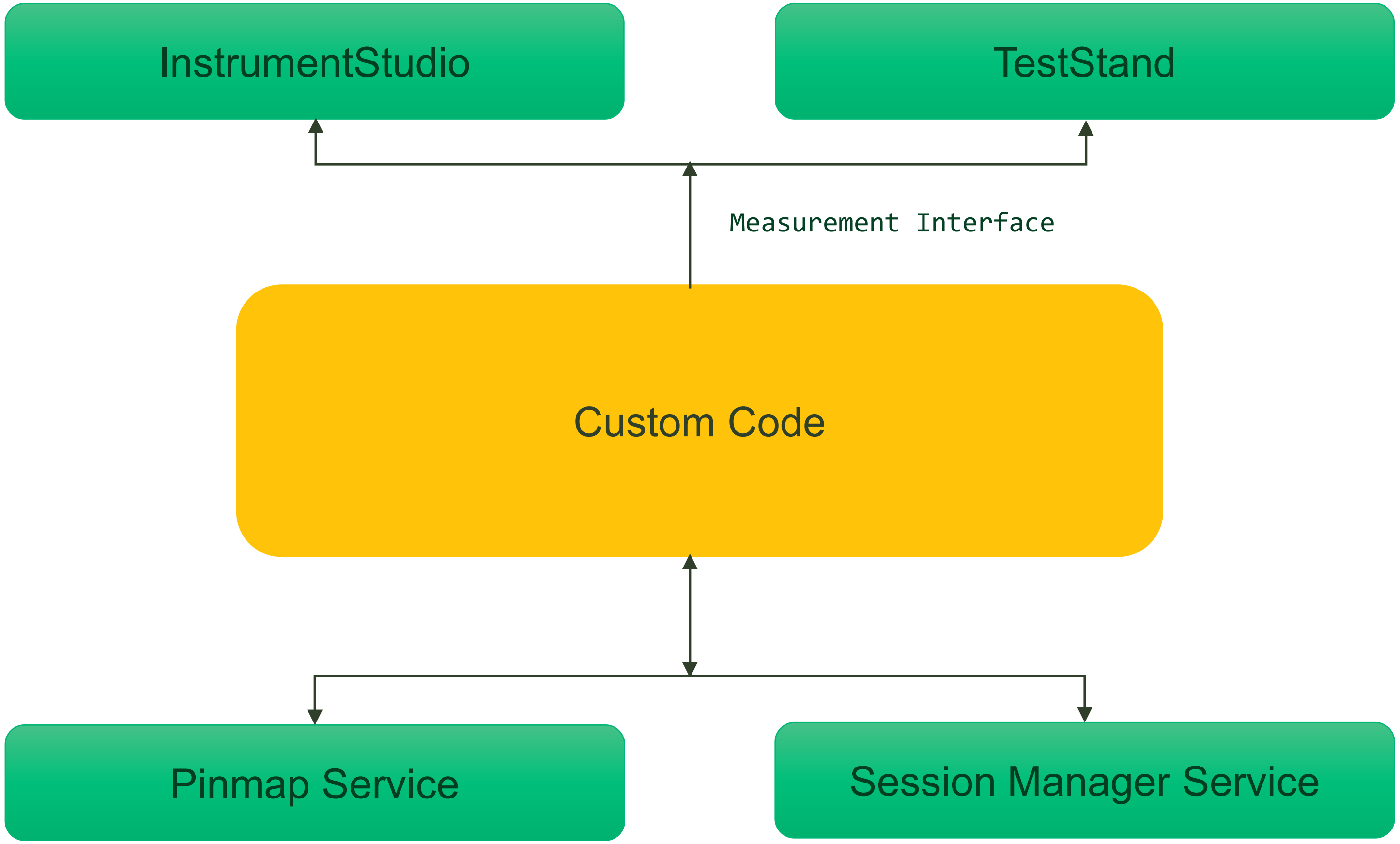
- Auto-initialize all sessions
- Pin-centric access

Pin Mapping

- DUT centric workflow for custom measurements
- Portable measurement configuration

Future Services

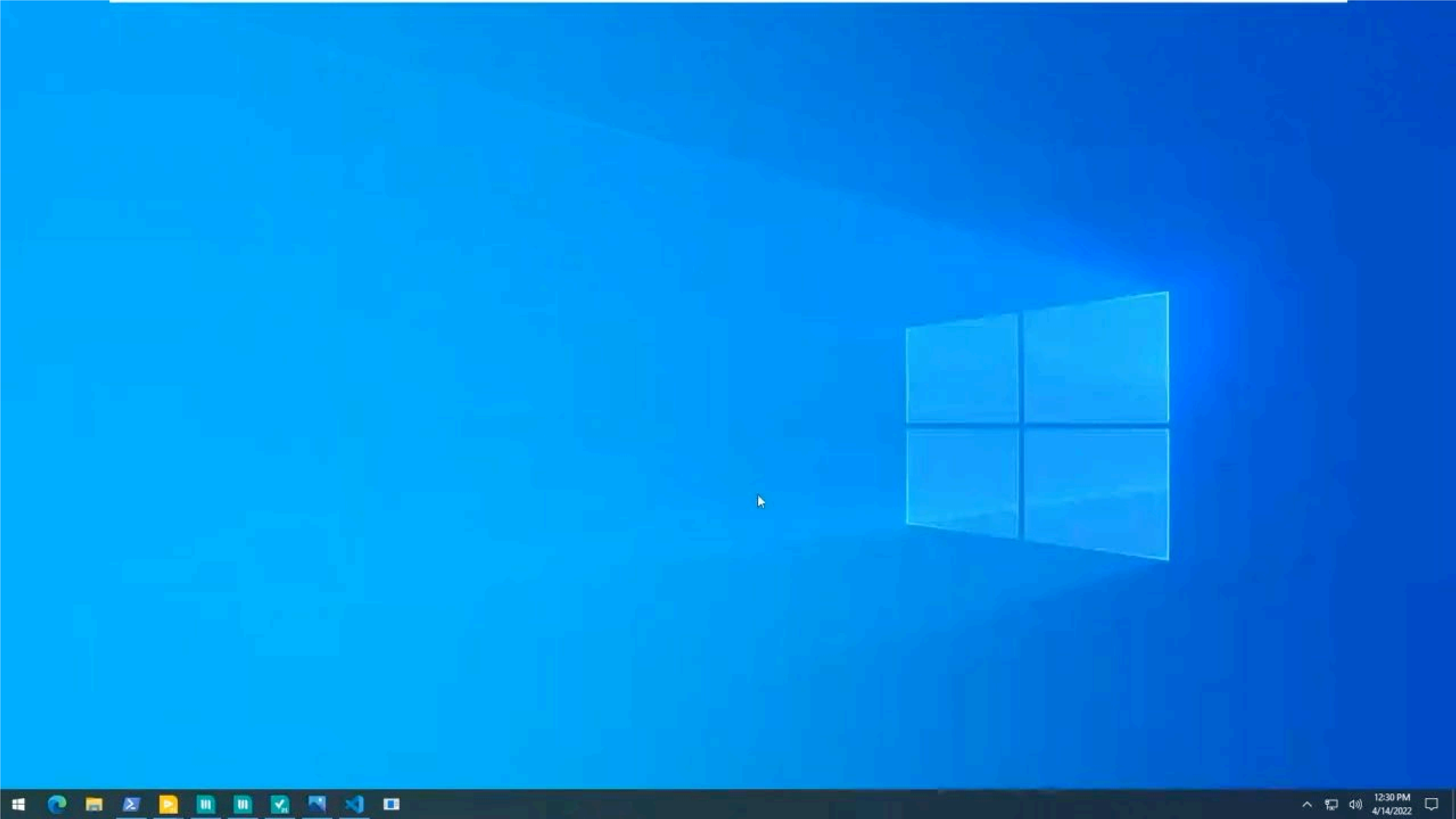
- Functional Abstraction
- Data logging
- Etc...


InstrumentStudio
TestStand
Measurement Interface
Custom Code
Pinmap Service
Session Manager Service

NI Measurement SDK

Demo

NI CONNECT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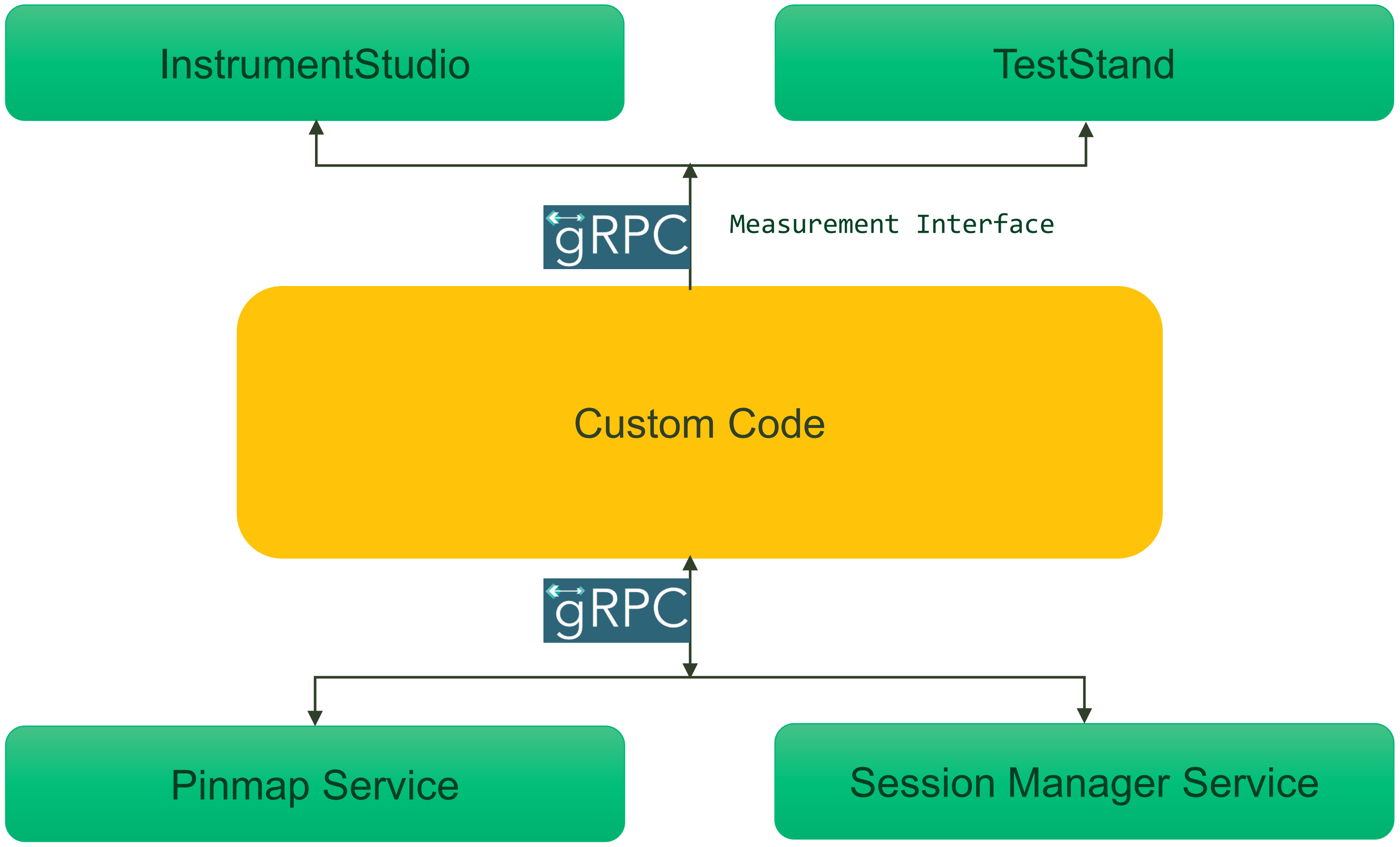


gRPC is a modern open-source high performance Remote Procedure Call (RPC) framework. It is an open protocol that will simplify adding your IP across your workflow and interoperate with other open systems

Measurement Framework Products

Measurement Framework
(Usage License)

Measurement framework microservices called from measurement IP (via APIs) at runtime to execute.

Available with Test Workflow Standard or Enterprise Agreements

Measurement SDK
(Dev License)

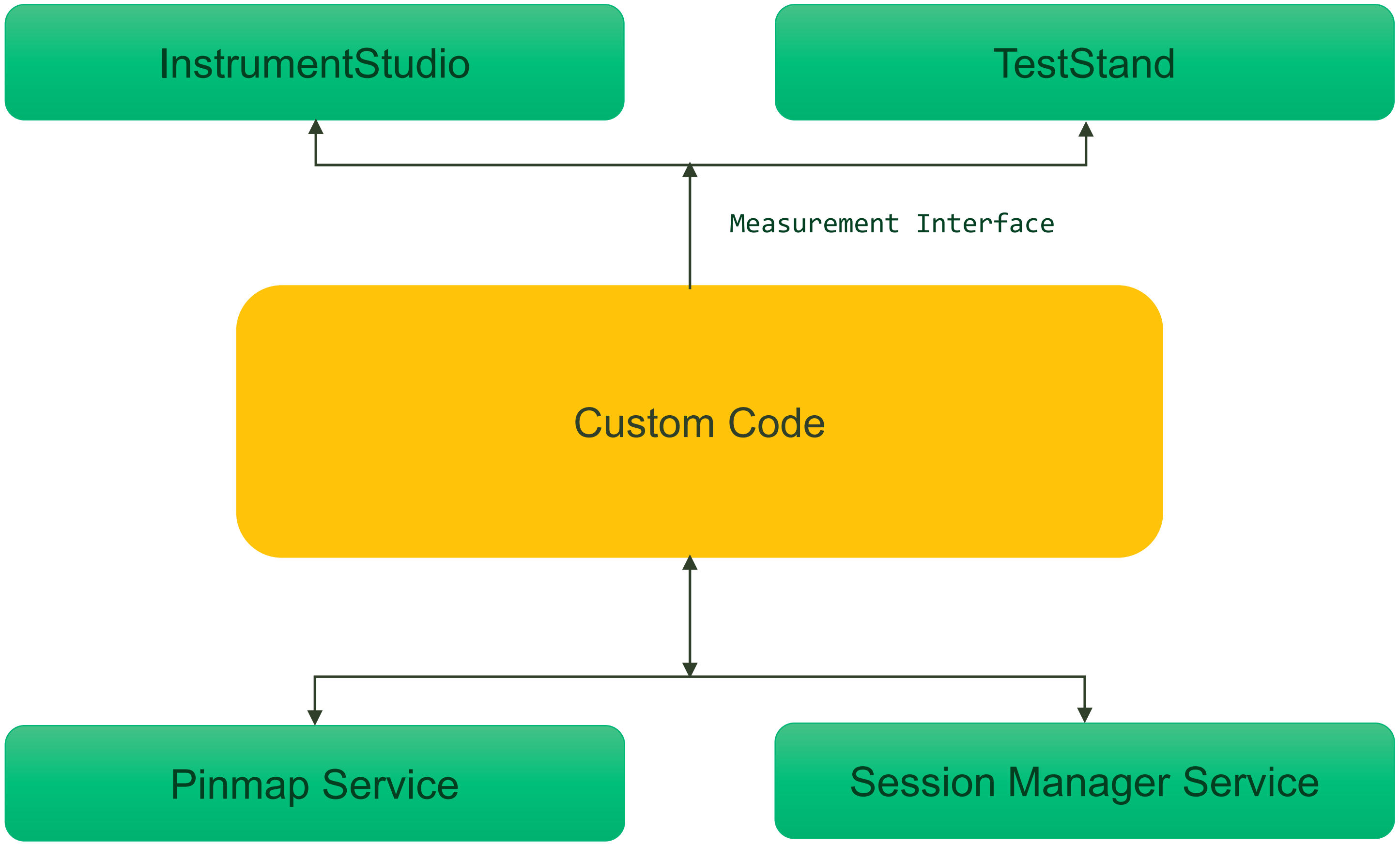
APIs, UI Editor, Templates, Documentation for development of measurement IP that uses the measurement framework

Available with Test Workflow Pro or Enterprise Agreements

First releases in H2 2022

NI Measurement Framework

Future Vision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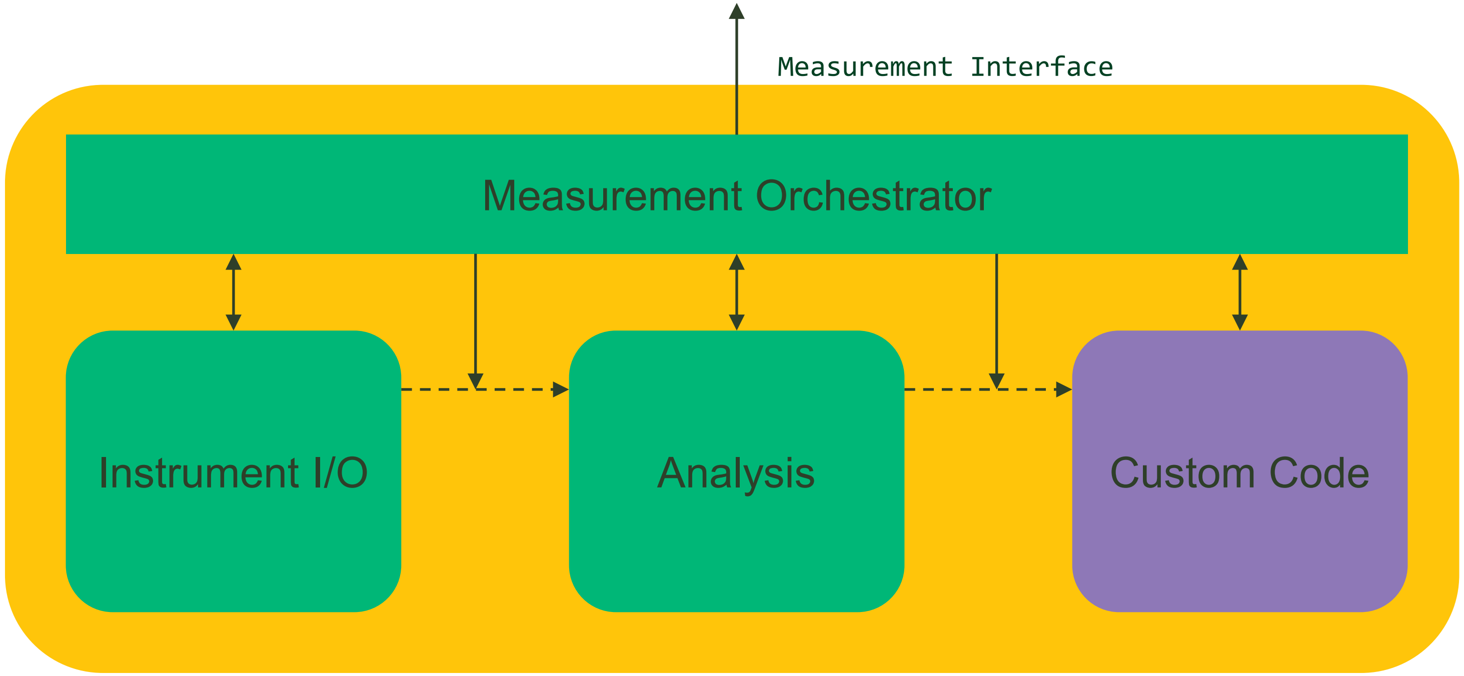
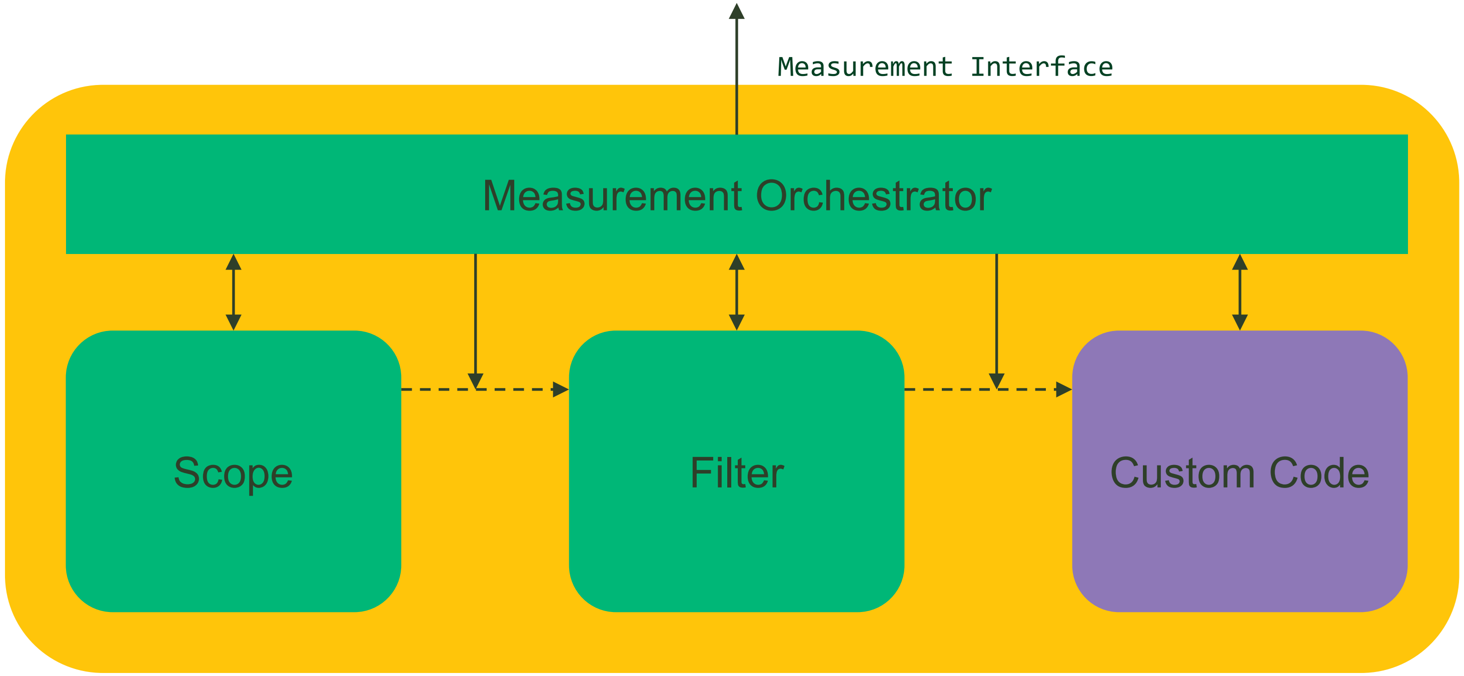


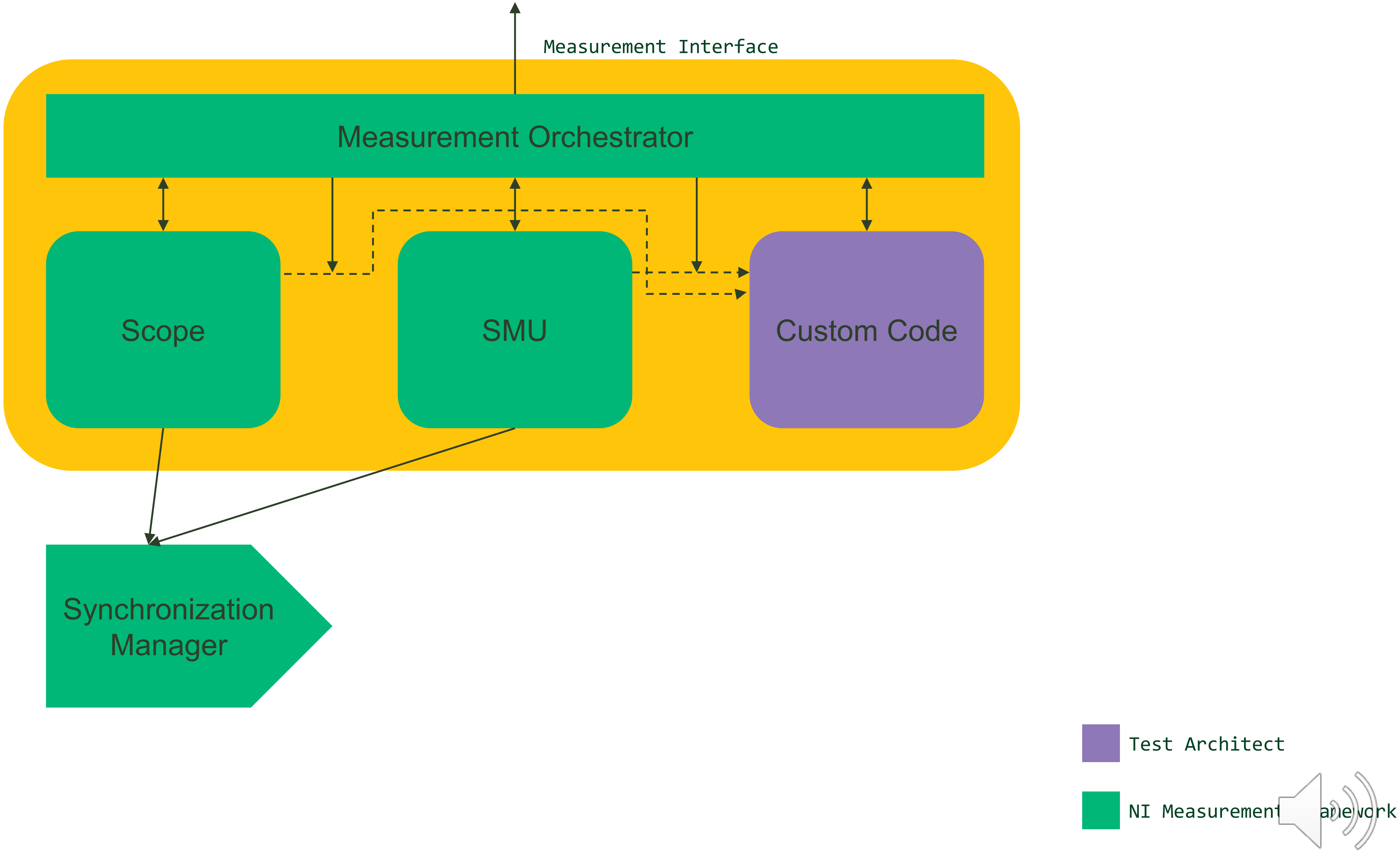
Test Architect

NI Measurement



Test Architect

NI Measurement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Custom Code
Synchronization Manager
Test Architect
NI Measurement
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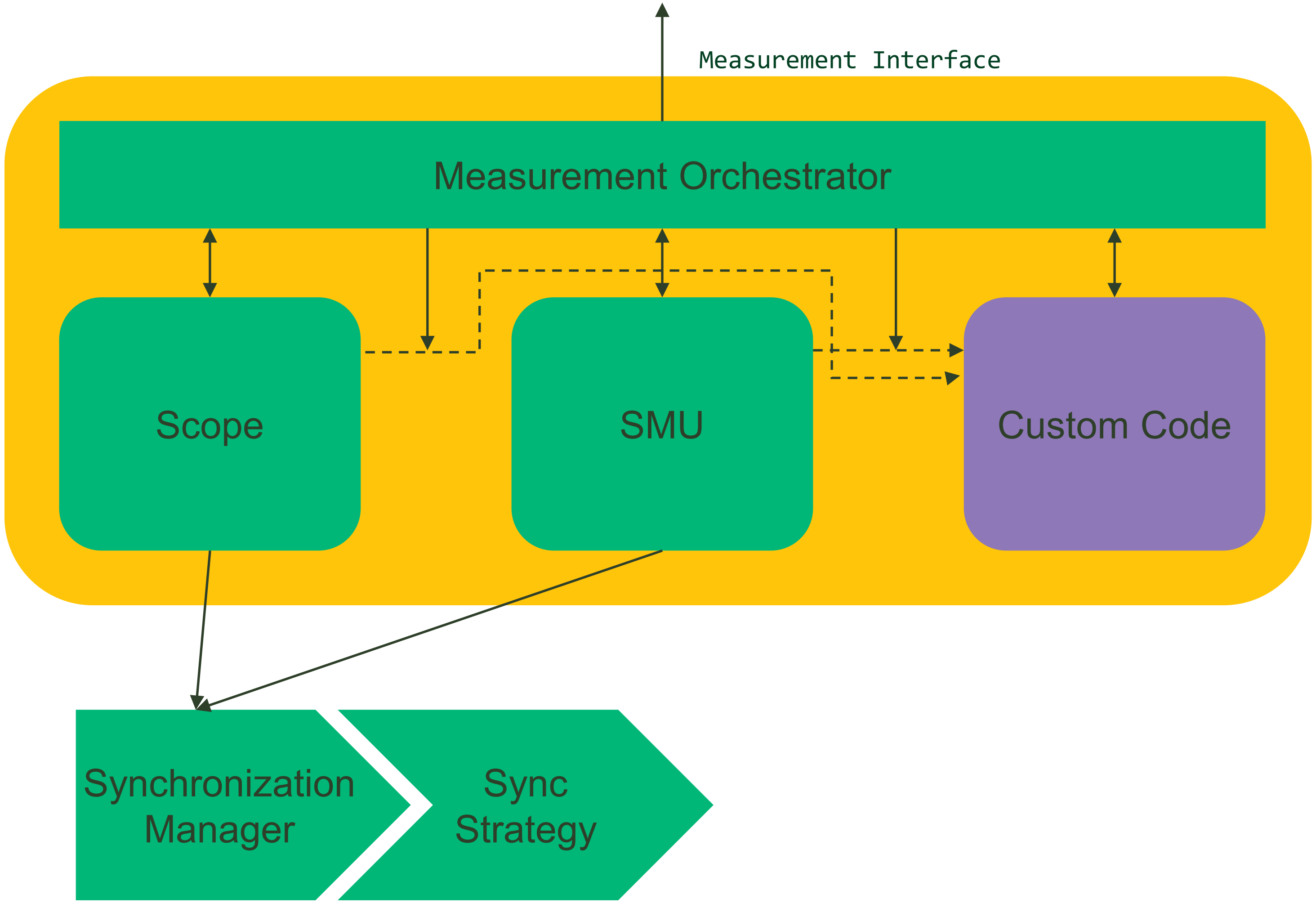
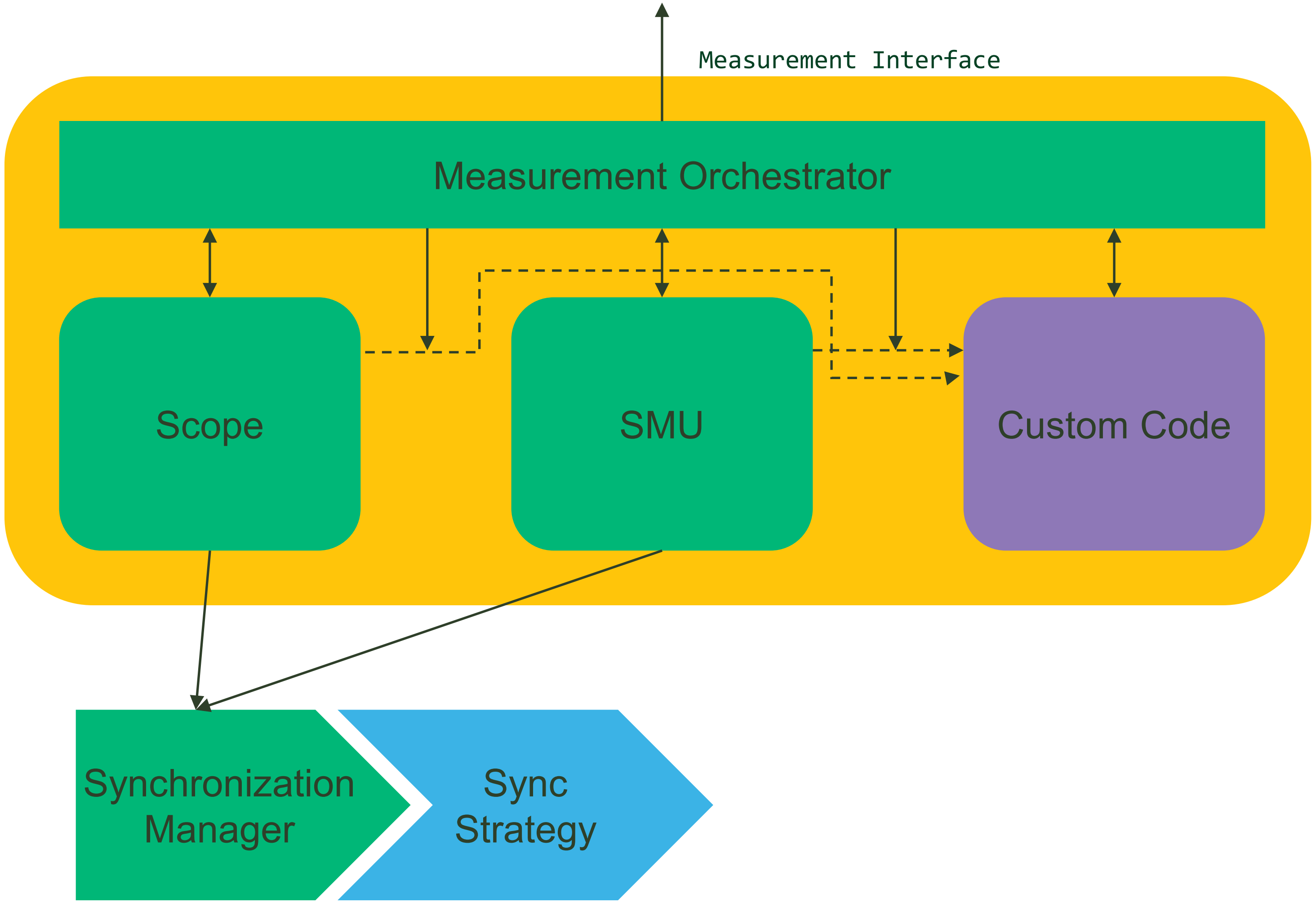


Test Architect

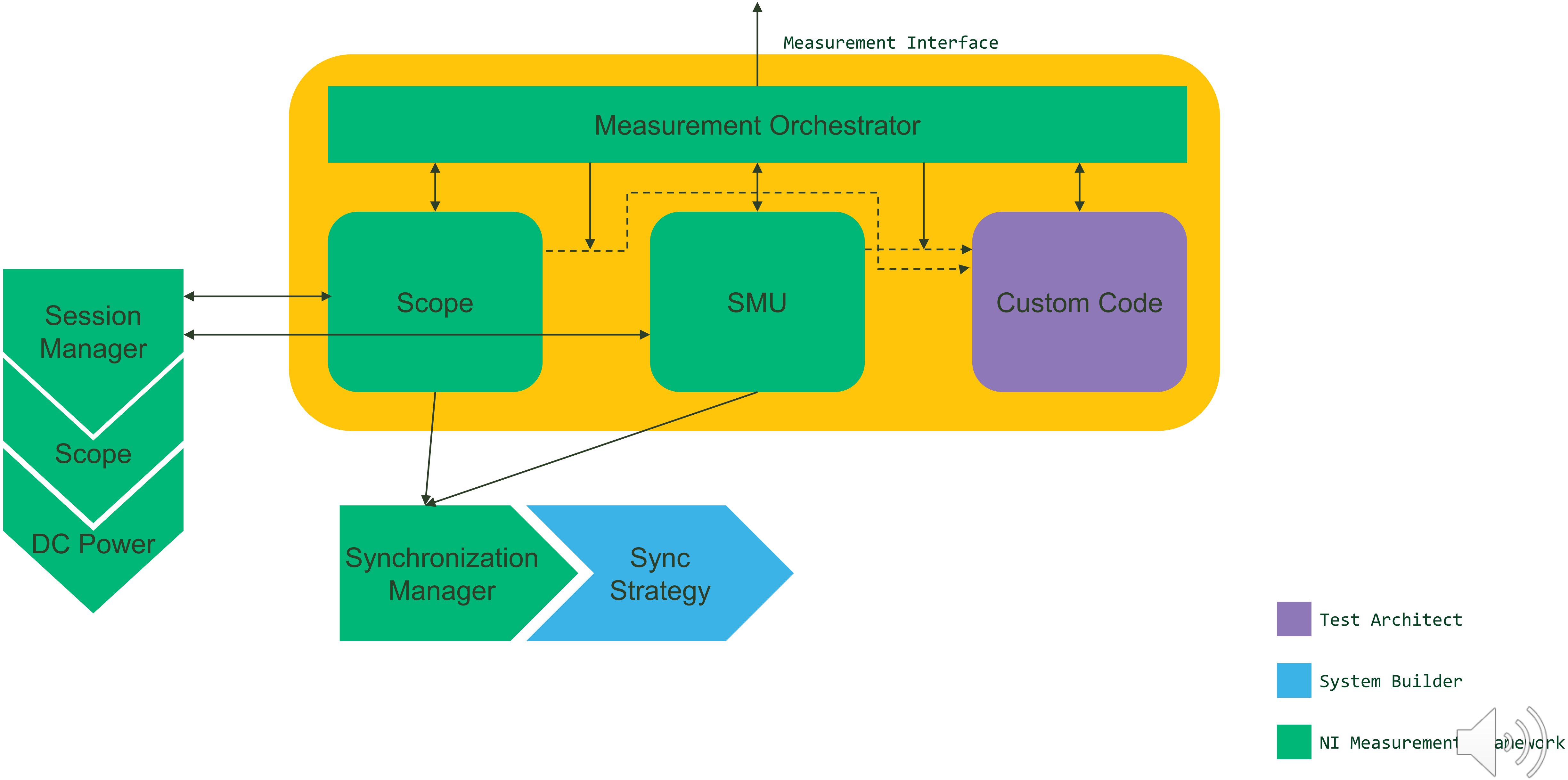
NI Measurement



Test Architect

System Builder

NI Measurement Framework



Measurement Interface
Measurement Orchestrator
Scope
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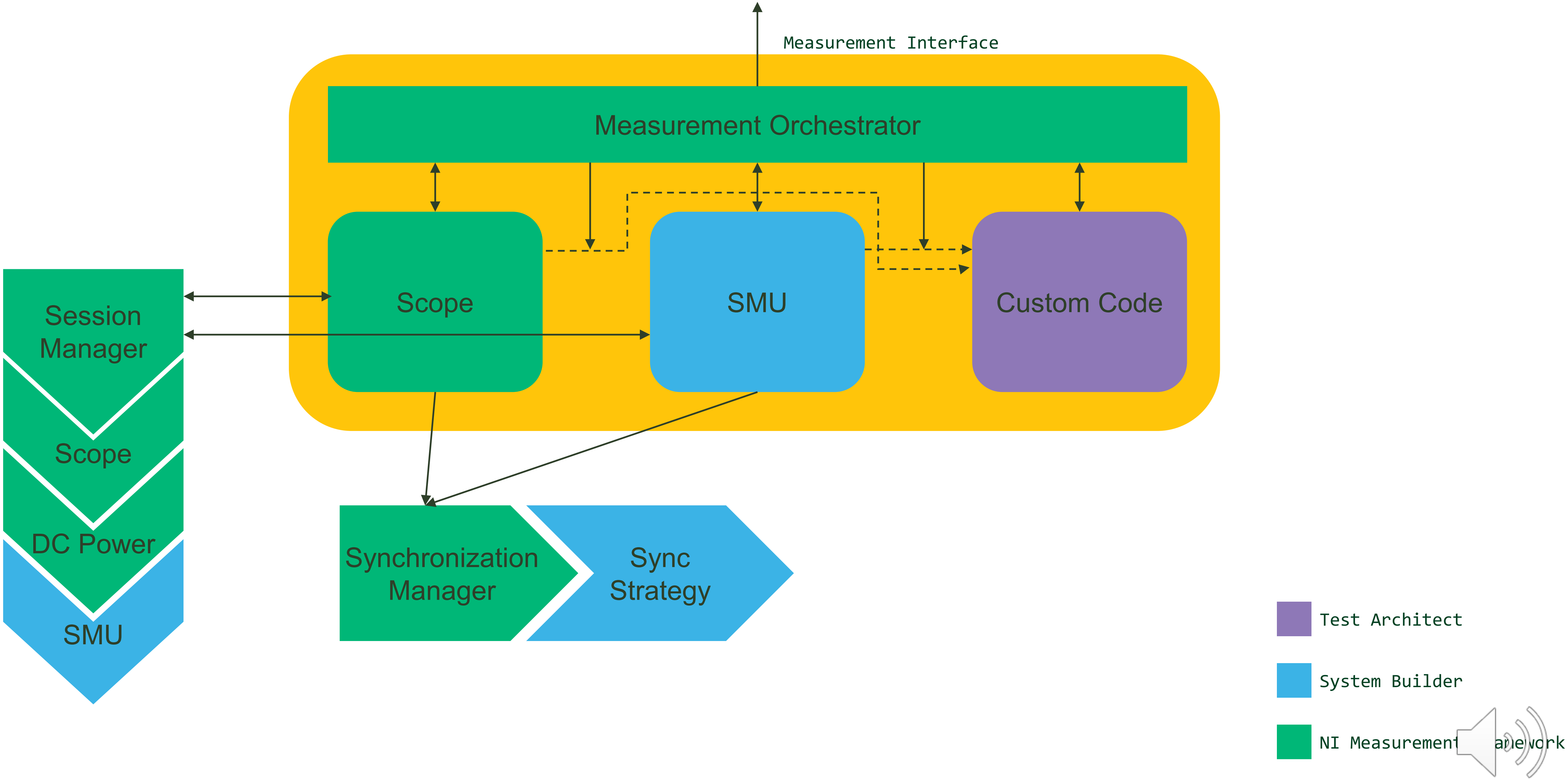
Session Manager
Scope
DC Power
Synchronization Manager
Sync Strategy
Test Architect
System Builder
NI Measurement



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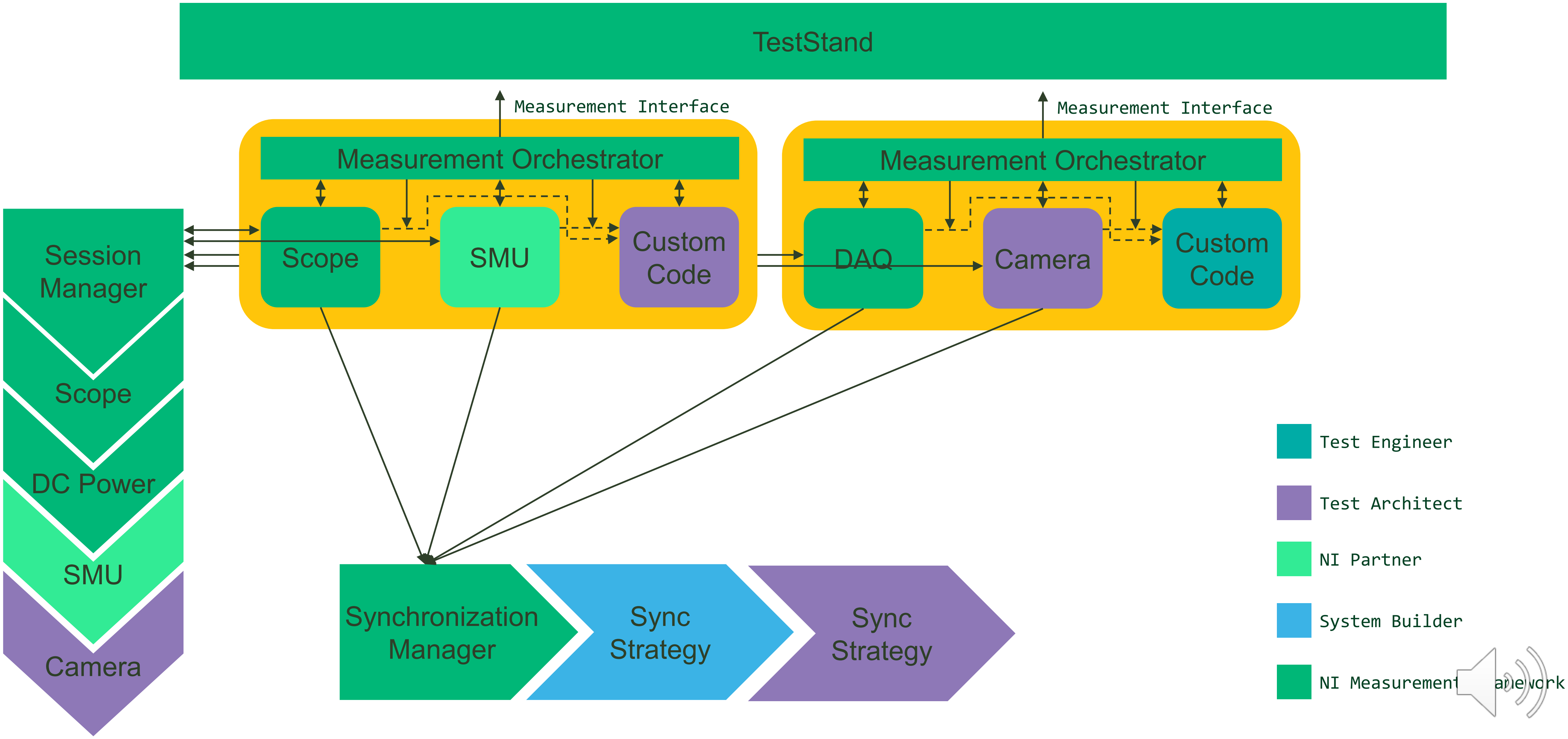
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Measurement Interface
Measurement Orchestrator
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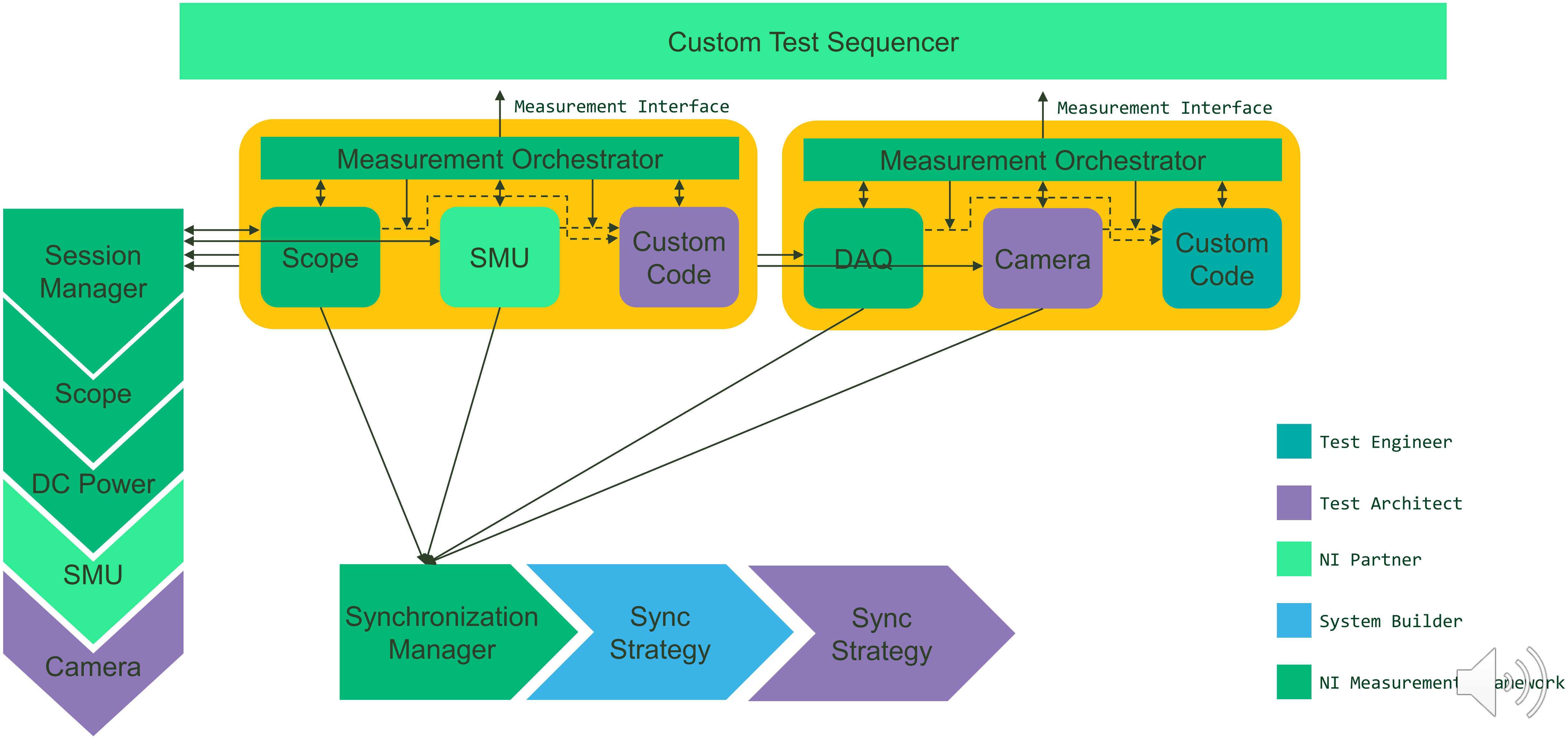
Synchronization Manager
Sync Strategy
Sync Strategy
Test Engineer
Test Architect
NI Partner
System Builder
NI Measurement


Custom Test Sequencer
Measurement Interface
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Custom Code
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DAQ
Camera
Custom Code
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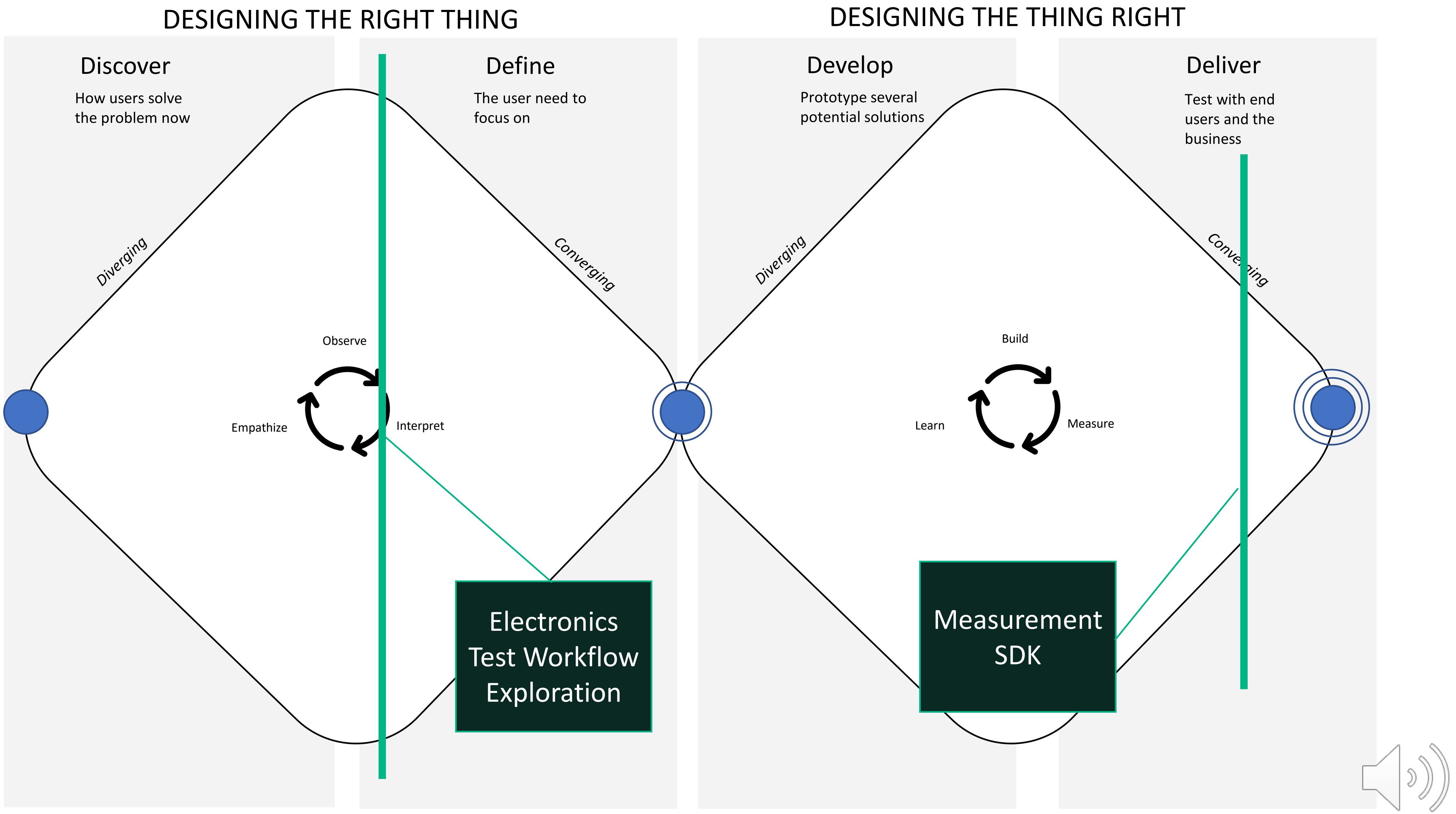
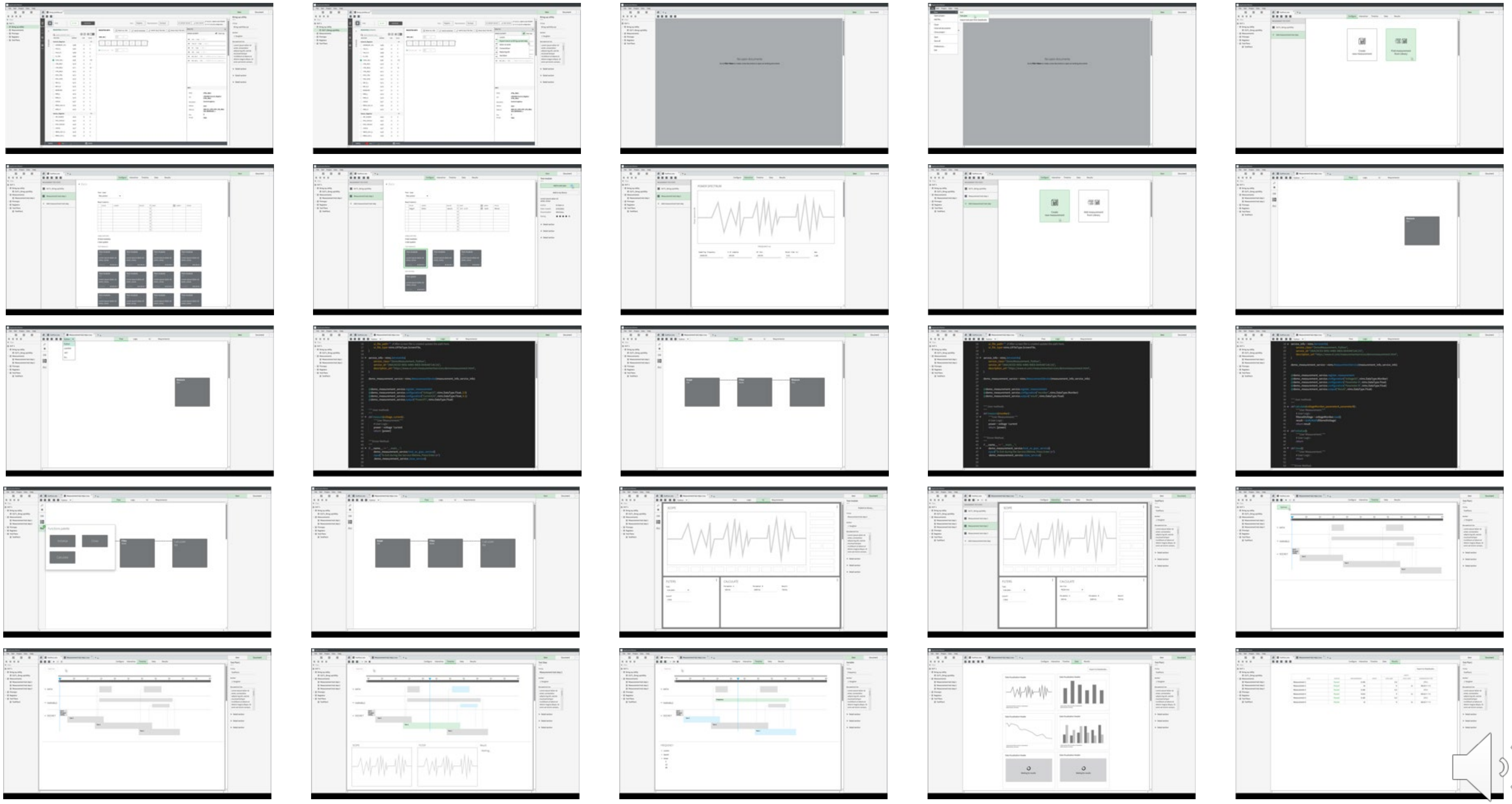
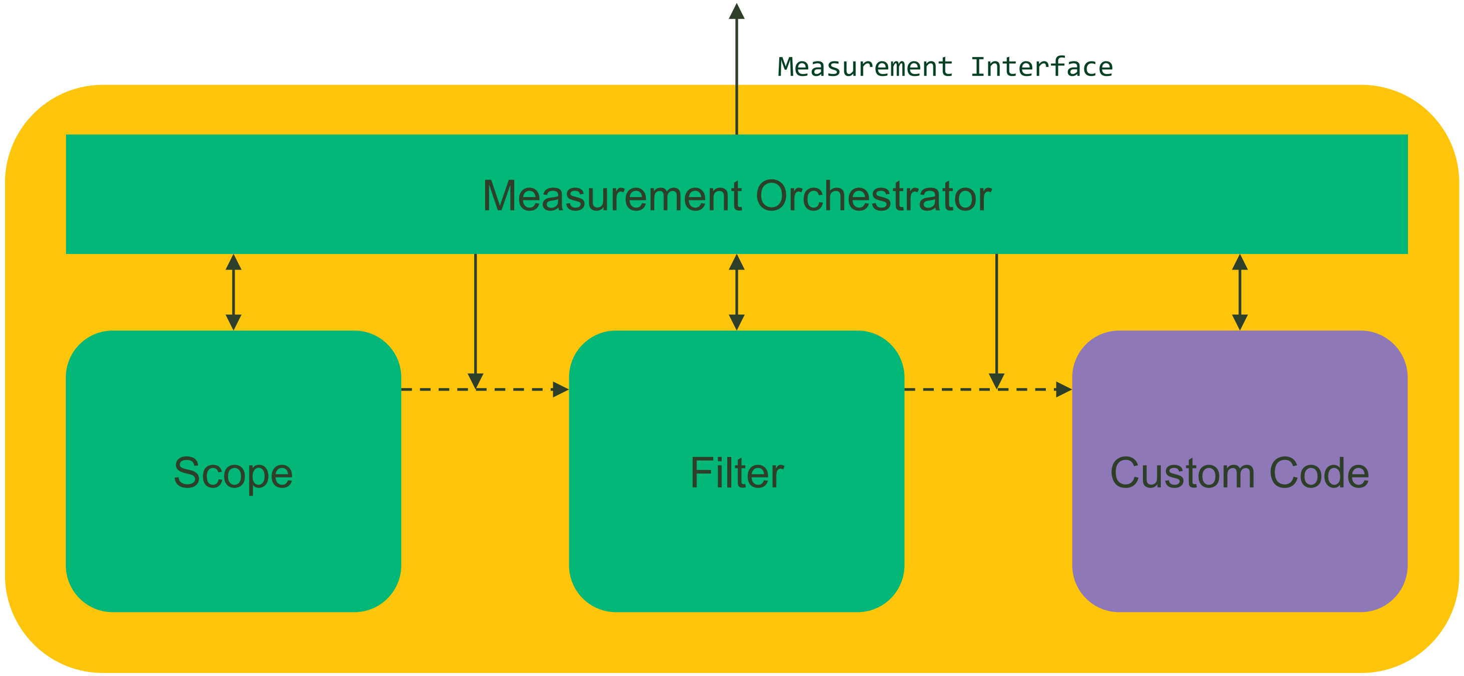
Sync Strategy
Test Engineer
Test Architect
NI Partner
System Builder

Electronics Test Workflow

A seamless user experience exploration


DESIGNING THE RIGHT THING
DESIGNING THE THING RIGHT
Discover
How users solve the problem now
Define
The user need to focus on
Develop
Prototype several potential solutions
Deliver
Test with end users and the business
Diverging
Converging
Diverging
Converging
Observe
Empathize
Interpret
Build
Learn
Measure
Electronics Test Workflow Exploration
Measurement SDK





Test Architect

NI Measurement

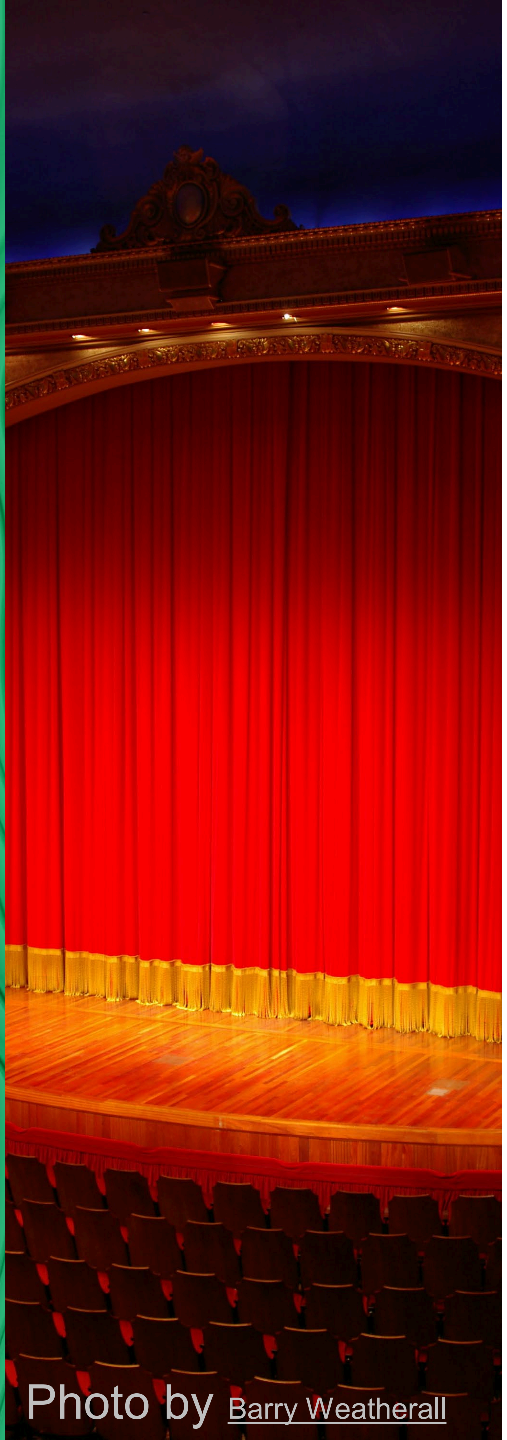


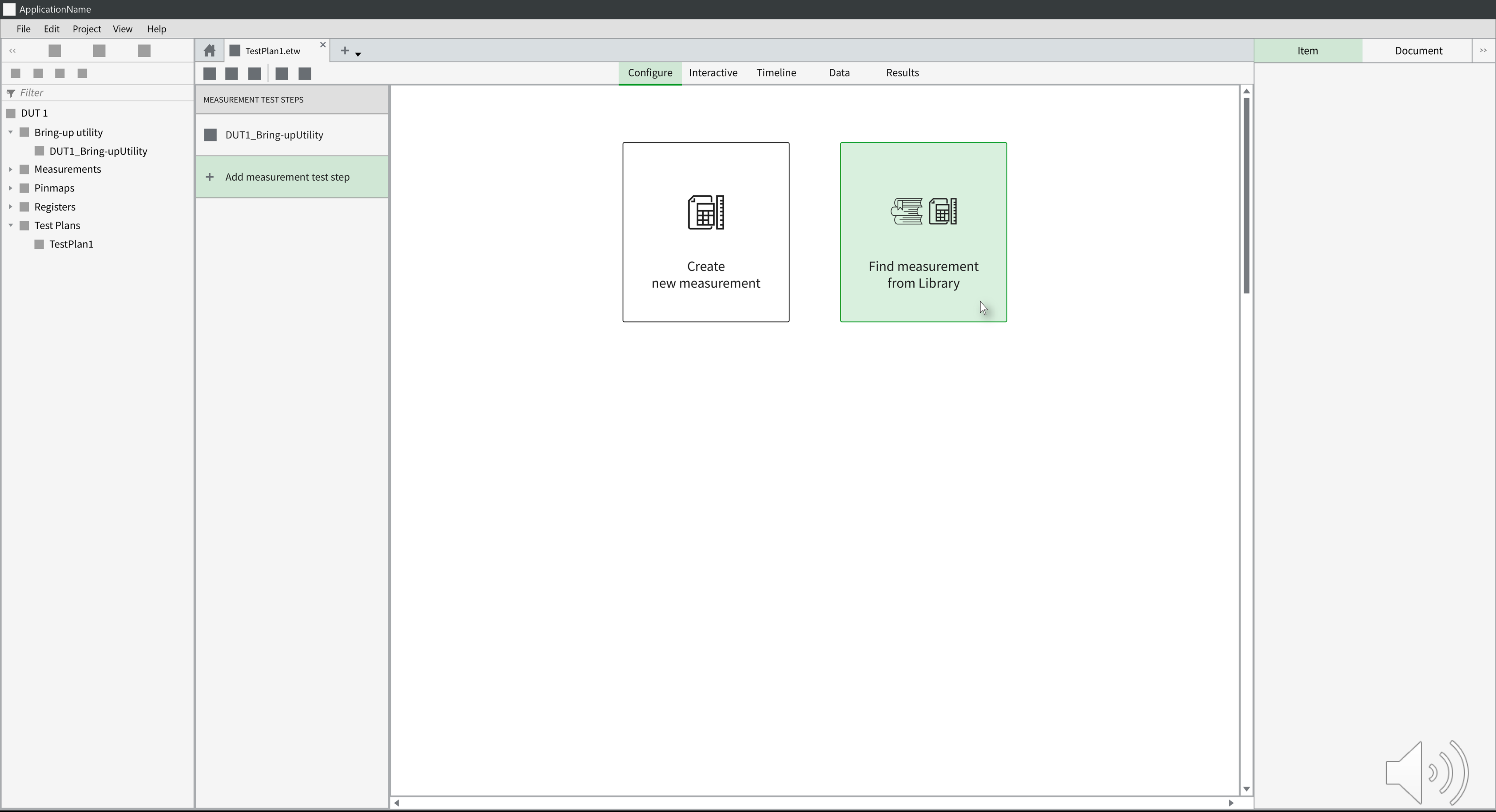
Photo by Barry Weatherall

Setting The Stage

A Validation Engineer has received a project to test a new part.

They want to set up the test system to perform bring-up and automated validation of the DUT.

They want to add a couple of custom measurements to the test system.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TestPlan1
MEASUREMENT TEST STEPS
DUT1_Bring-upUtility
Add measurement test step
Create
new measurement
Find measurement
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ApplicationName

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TestPlan1.etw

Configure | Interactive | Timeline | Data | Results

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MEASUREMENT TEST STEPS

- DUT1_Bring-upUtility
- Measurement test step 1
- + Add measurement test step

< Back

Test type

Max power

Requirements

	IPSUM	LOREM	DOLOR	AMET	LOREM	IPSUM

VIABLE MATCHES

15 test modules

1 test system

TEST MODULES

Test module
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Configure | Interactive | Timeline | Data | Results

MEASUREMENT TEST STEPS

DUT1_Bring-upUtility

Measurement test step 1

+ Add measurement test step

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Test type

Max power

Requirements

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VIABLE MATCHES

3 test modules

1 test system

TEST MODULES

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TEST SYSTEMS

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Test module

INFO

Add to test plan

Add to my library

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Author	G Clark Jr.
Date created	2/23/2022
Downloaded	444 times
Rating	★★★★☆

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Configure | Interactive | Timeline | Data | Results

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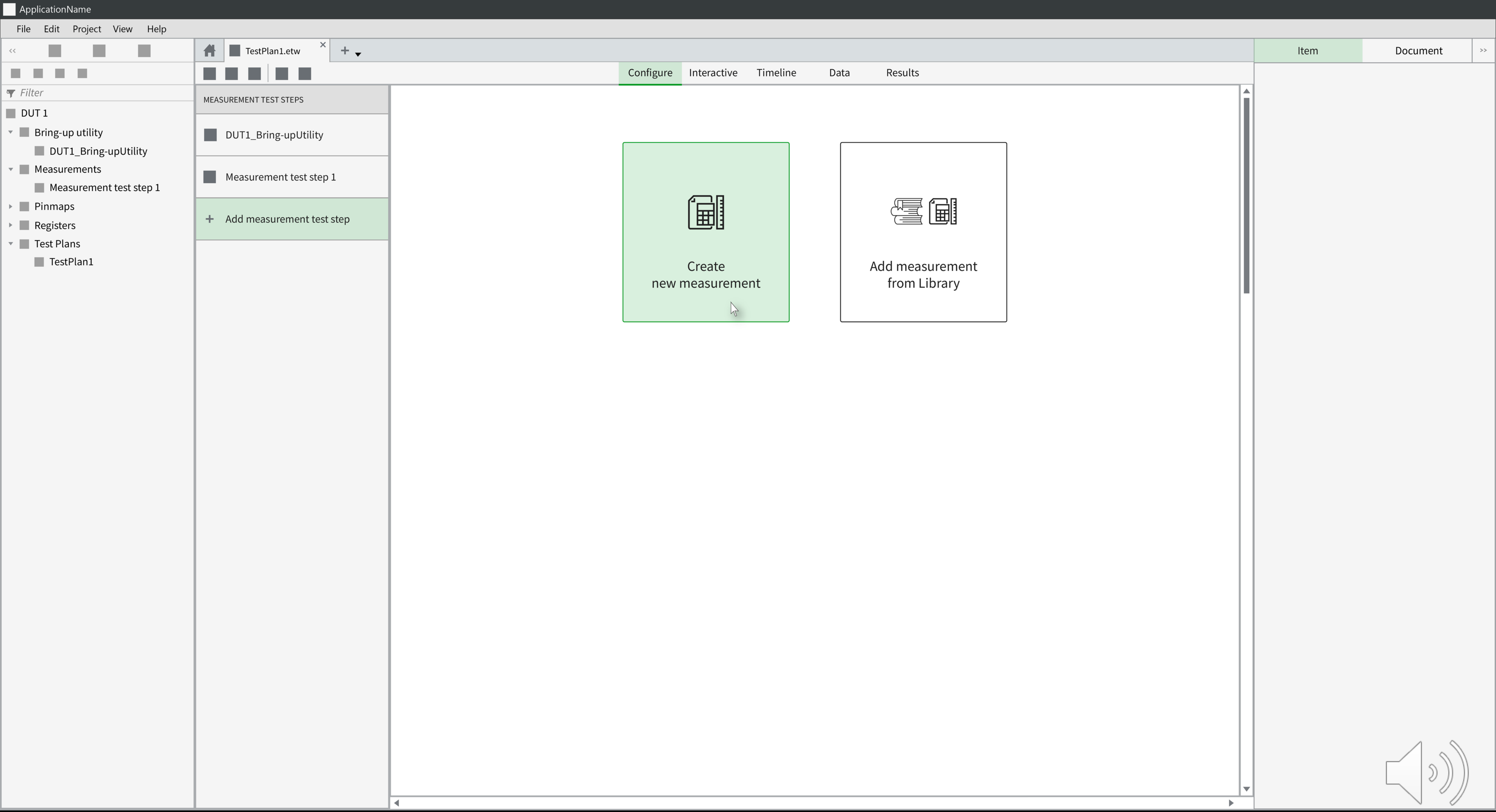
MEASUREMENT TEST STEPS

- DUT1_Bring-upUtility
- Measurement test step 1
- + Add measurement test step

POWER SPECTRUM

Sampling frequency	# of samples	df (Hz)	Block time (s)	MAX
10000.00	100.00	100.00	0.01	2 dB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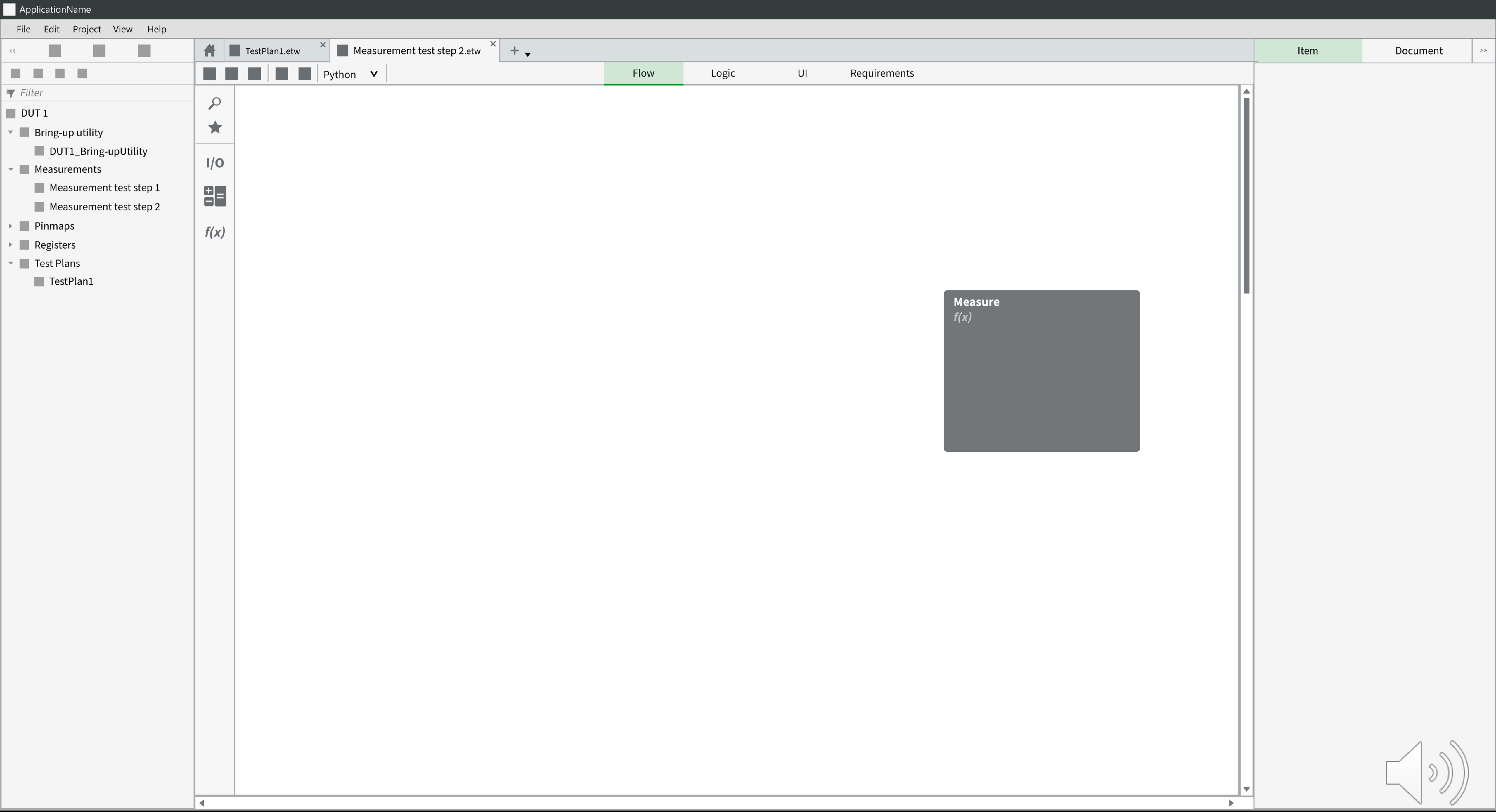
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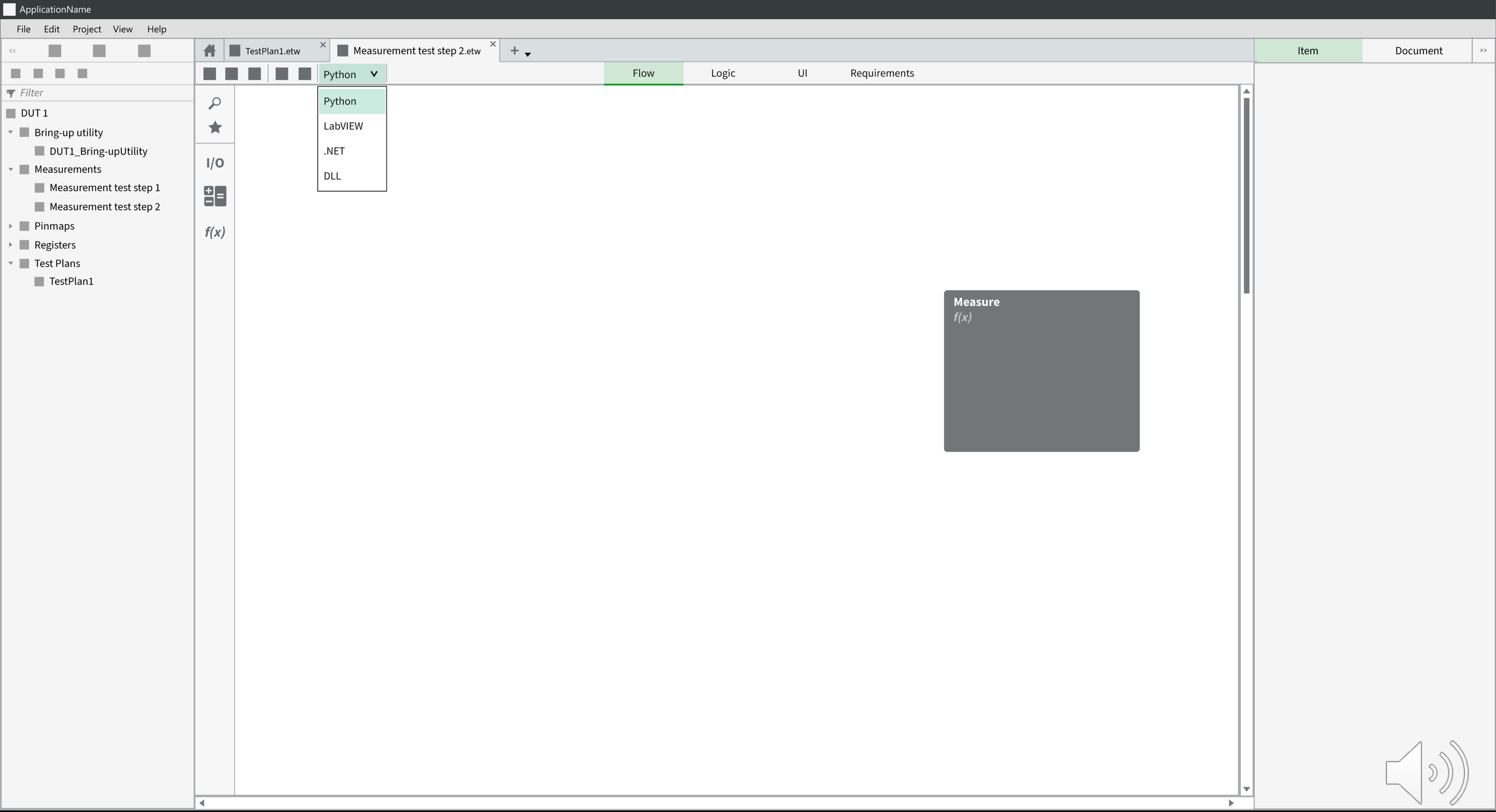
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f(x)
Python
LabVIEW
.NET
DLL
Measure
f(x)

ApplicationName

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TestPlan1.etw | Measurement test step 2.etw

Python | Flow | Logic | UI | Requirements

Item | Document

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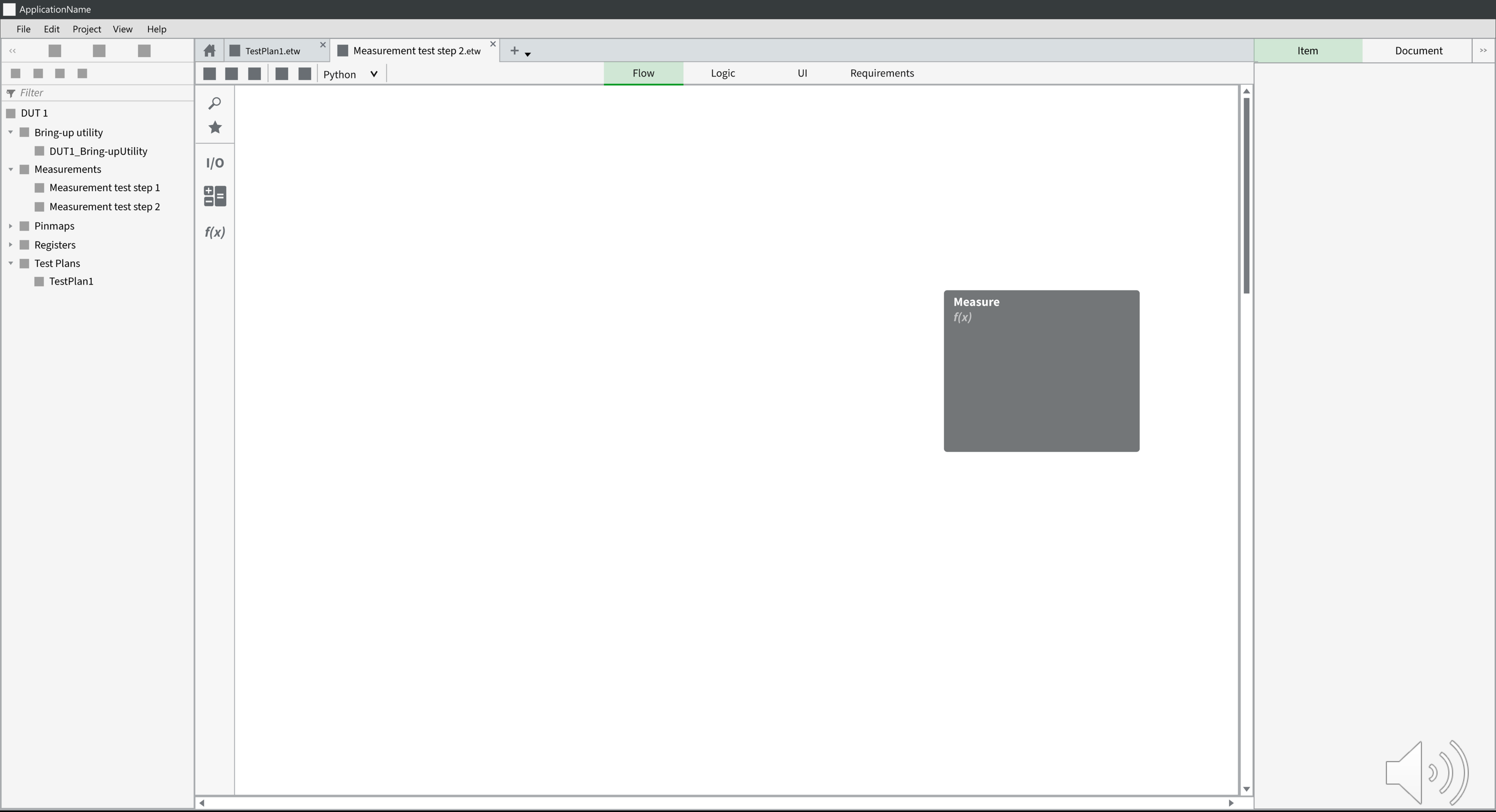
    - TestPlan1

```python
    ui_file_path="" ,# After screen file is created update the path here.
    ui_file_type=nims.UIFileType.ScreenFile,
)

service_info = nims.ServiceInfo(
    service_class="DemoMeasurement_Python",
    service_id="{40A19CED-9092-44B5-98E8-D0454871AC15}",
    description_url="https://www.ni.com/measurementservices/demomeasurement.html",
)

demo_measurement_service = nims.MeasurementService(measurement_info, service_info)


@demo_measurement_service.register_measurement
@demo_measurement_service.configuration("Voltage(V)", nims.DataType.Float, 3.5)
@demo_measurement_service.configuration("Current(A)", nims.DataType.Float, 0.1)
@demo_measurement_service.output("Power(P)", nims.DataType.Float)


""" User methods
"""
def measure(voltage, current) :
    """User Measurement."""
    # User Logic :
    power = voltage *current
    return  [power]


"""Driver Method.
"""
if __name__ == "__main__":
    demo_measurement_service.host_as_grpc_service()
    input("To Exit during the Service lifetime, Press Enter.\n")
     demo_measurement_service.close_service()
```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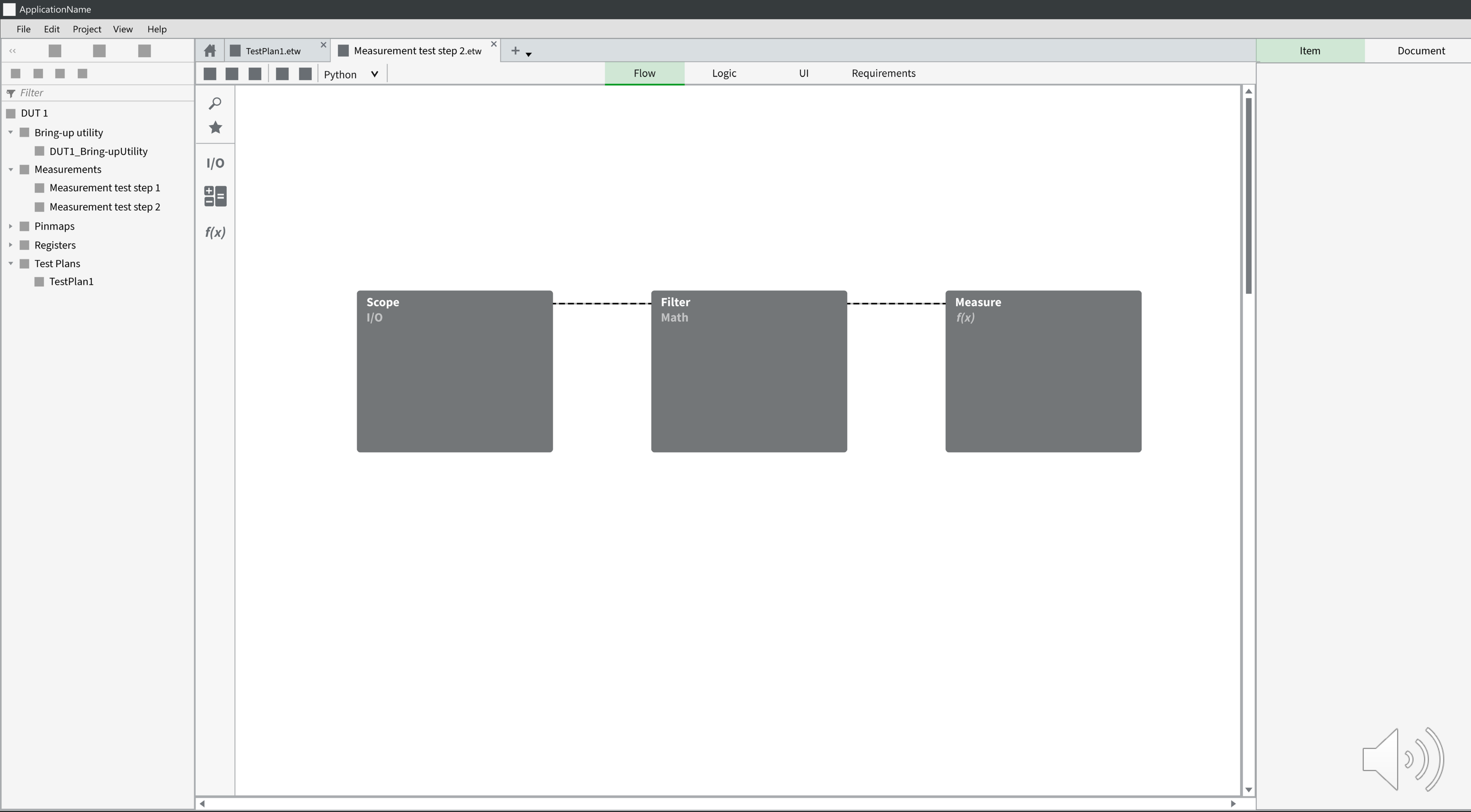
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Measurements
Measurement test step 1
Measurement test step 2
Pinmaps
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Measure
f(x)

ApplicationName

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    - DUT1_Bring-upUtility
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TestPlan1.etw | Measurement test step 2.etw

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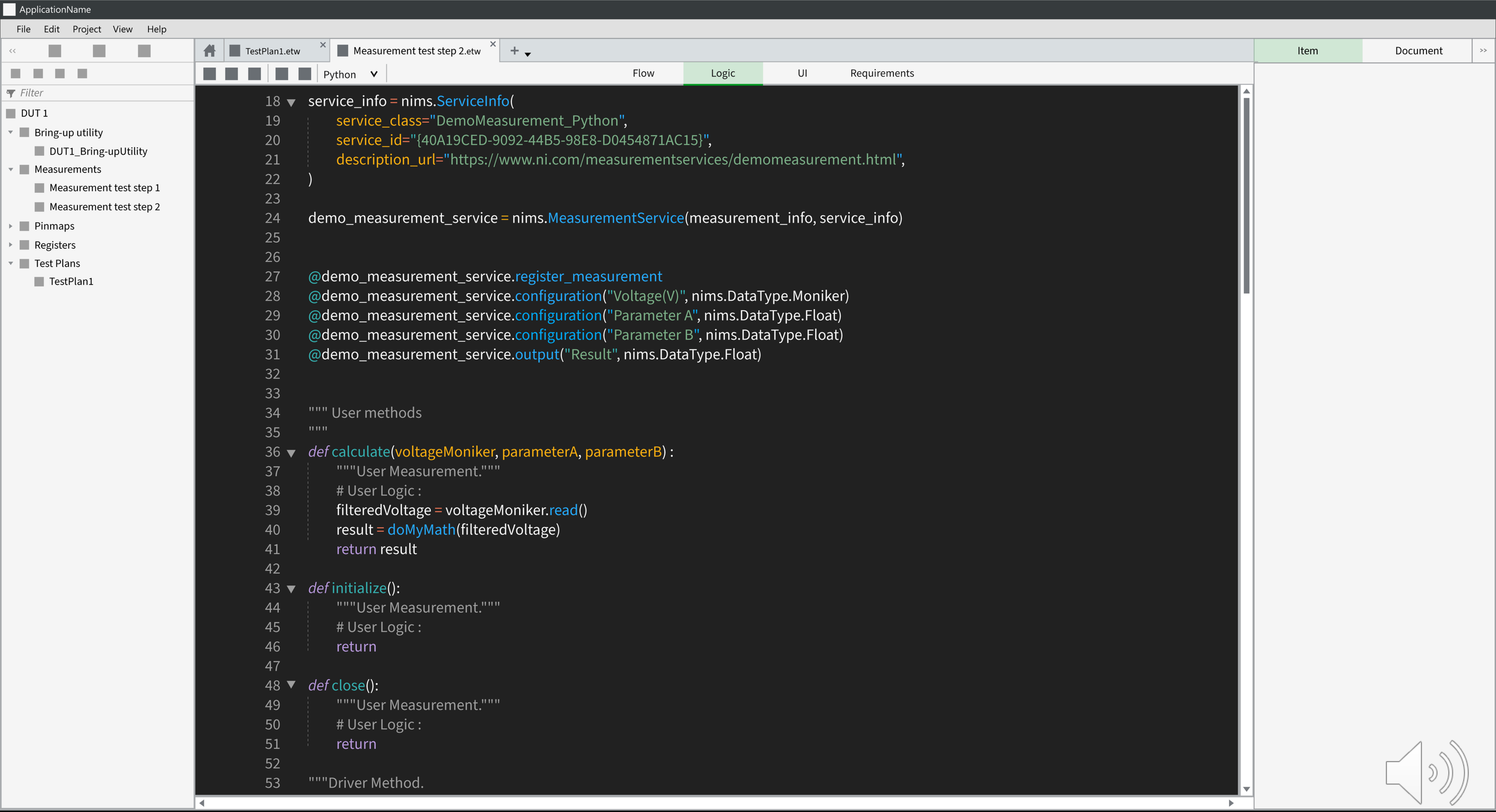
```python
    ui_file_path="" ,# After screen file is created update the path here.
    ui_file_type=nims.UIFileType.ScreenFile,
)

service_info = nims.ServiceInfo(
    service_class="DemoMeasurement_Python",
    service_id="{40A19CED-9092-44B5-98E8-D0454871AC15}",
    description_url="https://www.ni.com/measurementservices/demomeasurement.html",
)

demo_measurement_service = nims.MeasurementService(measurement_info, service_info)


@demo_measurement_service.register_measurement
@demo_measurement_service.configuration("moniker", nims.DataType.Moniker)
@demo_measurement_service.output("result", nims.DataType.Float)


""" User methods
"""
def measure(moniker) :
    """User Measurement."""
    # User Logic :
    power = voltage *current
    return [power]


"""Driver Method.
"""
if __name__ == "__main__":
    demo_measurement_service.host_as_grpc_service()
    input("To Exit during the Service lifetime, Press Enter.\n")
     demo_measurement_service.close_service()
```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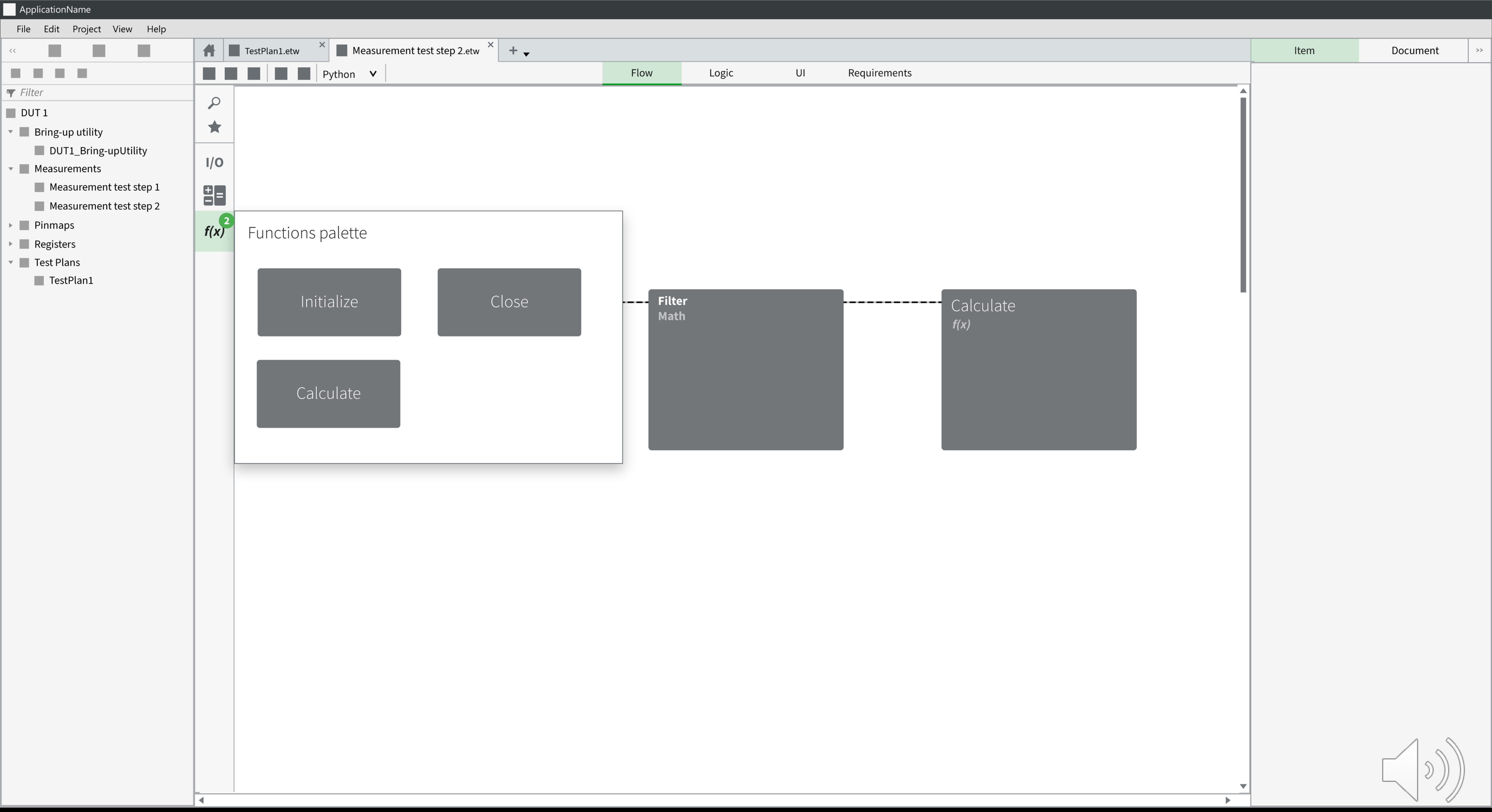
service_class="DemoMeasurement_Python",
service_id="{40A19CED-9092-44B5-98E8-D0454871AC15}",
description_url="https://www.ni.com/measurementservices/demomeasurement.html",
)
demo_measurement_service = nims.MeasurementService(measurement_info, service_info)
@demo_measurement_service.register_measurement
@demo_measurement_service.configuration("Voltage(V)", nims.DataType.Moniker)
@demo_measurement_service.configuration("Parameter A", nims.DataType.Float)
@demo_measurement_service.configuration("Parameter B", nims.DataType.Float)
@demo_measurement_service.output("Result", nims.DataType.Float)
""" User methods
"""
def calculate(voltageMoniker, parameterA, parameterB) :
"""User Measurement."""
# User Logic :
filteredVoltage = voltageMoniker.read()
result = doMyMath(filteredVoltage)
return result
def initialize():
"""User Measurement."""
User Logic :
return
def close():
"""User Measurement."""
User Logic :
return
"""Driver Method.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Functions palette
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Calculate
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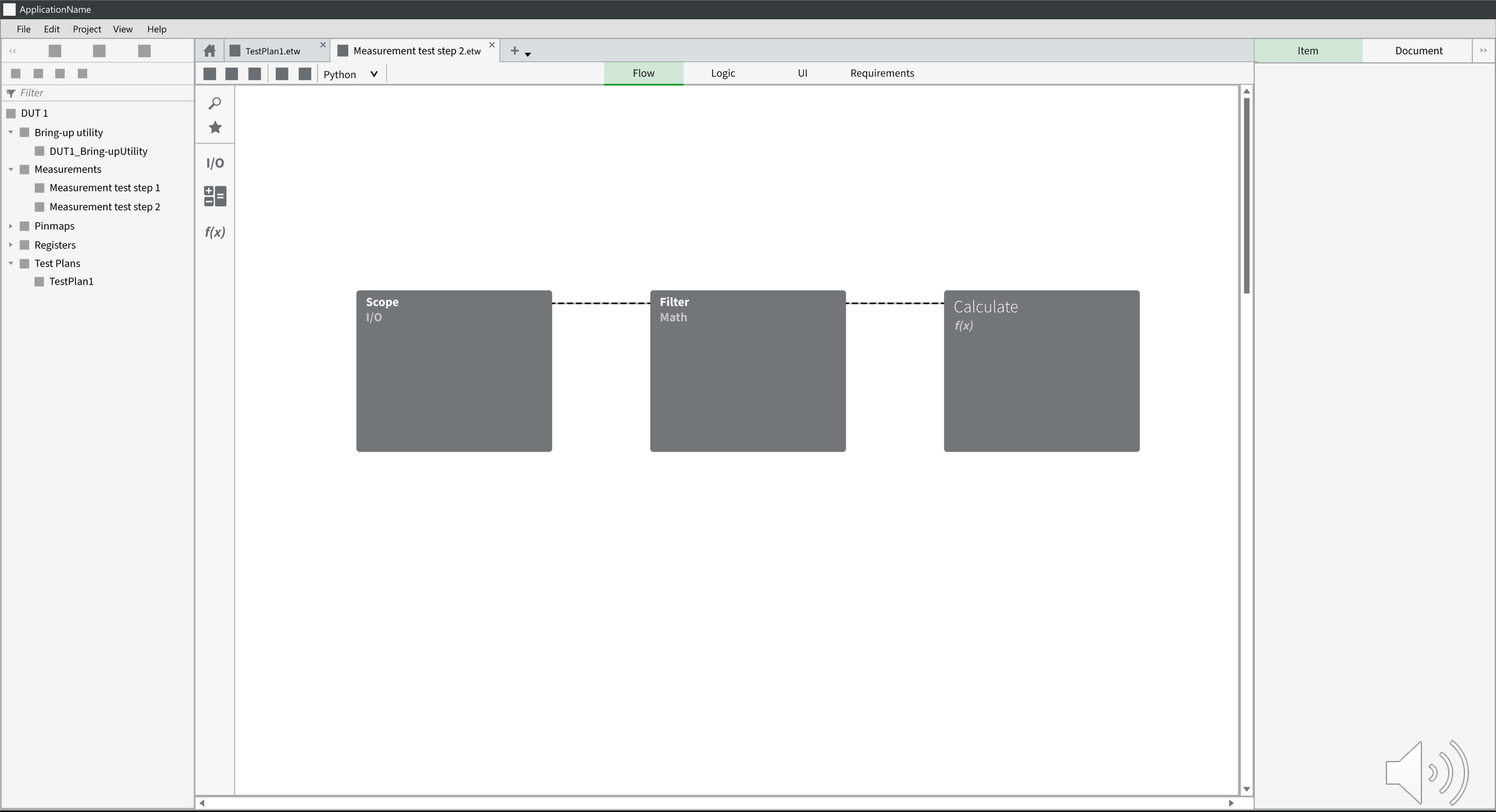
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Filter
Math
Calculate
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Python

Flow | Logic | UI | Requirements

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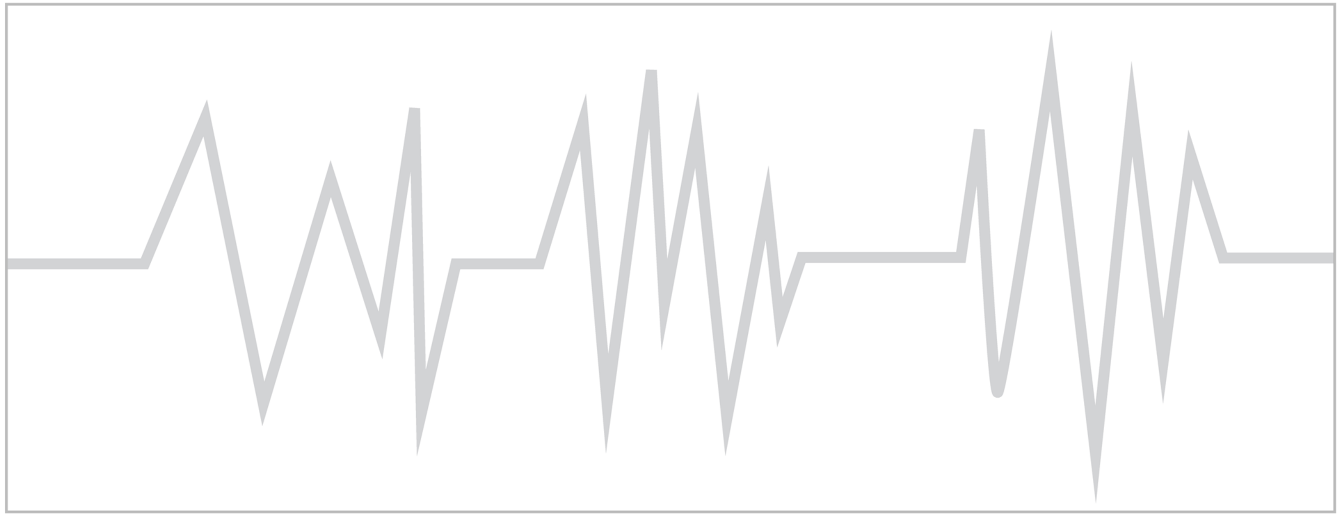
I/O

f(x)

SCOPE



FILTERS

Type

Low pass

Cutoff

1 KHz

CALCULATE

Parameter A	Parameter B	Result
500 Hz	1000 Hz	750 Hz

Item | Document

Test module

INFO

Publish to library...

Title

Measurement test step 2

Author

J. Vaughan

Documentation

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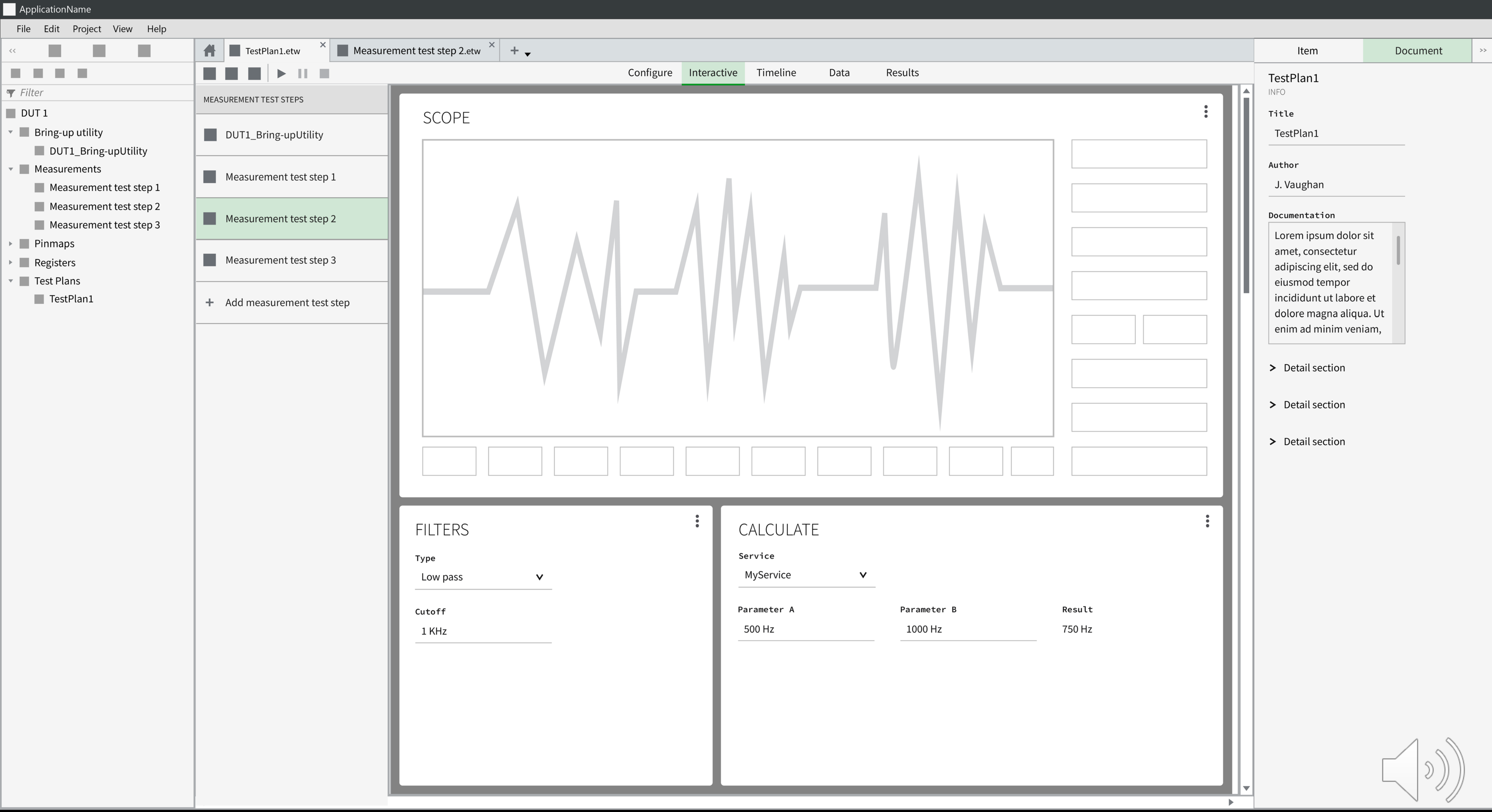
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TestPlan1
Author
J. Vaughan
Documentation
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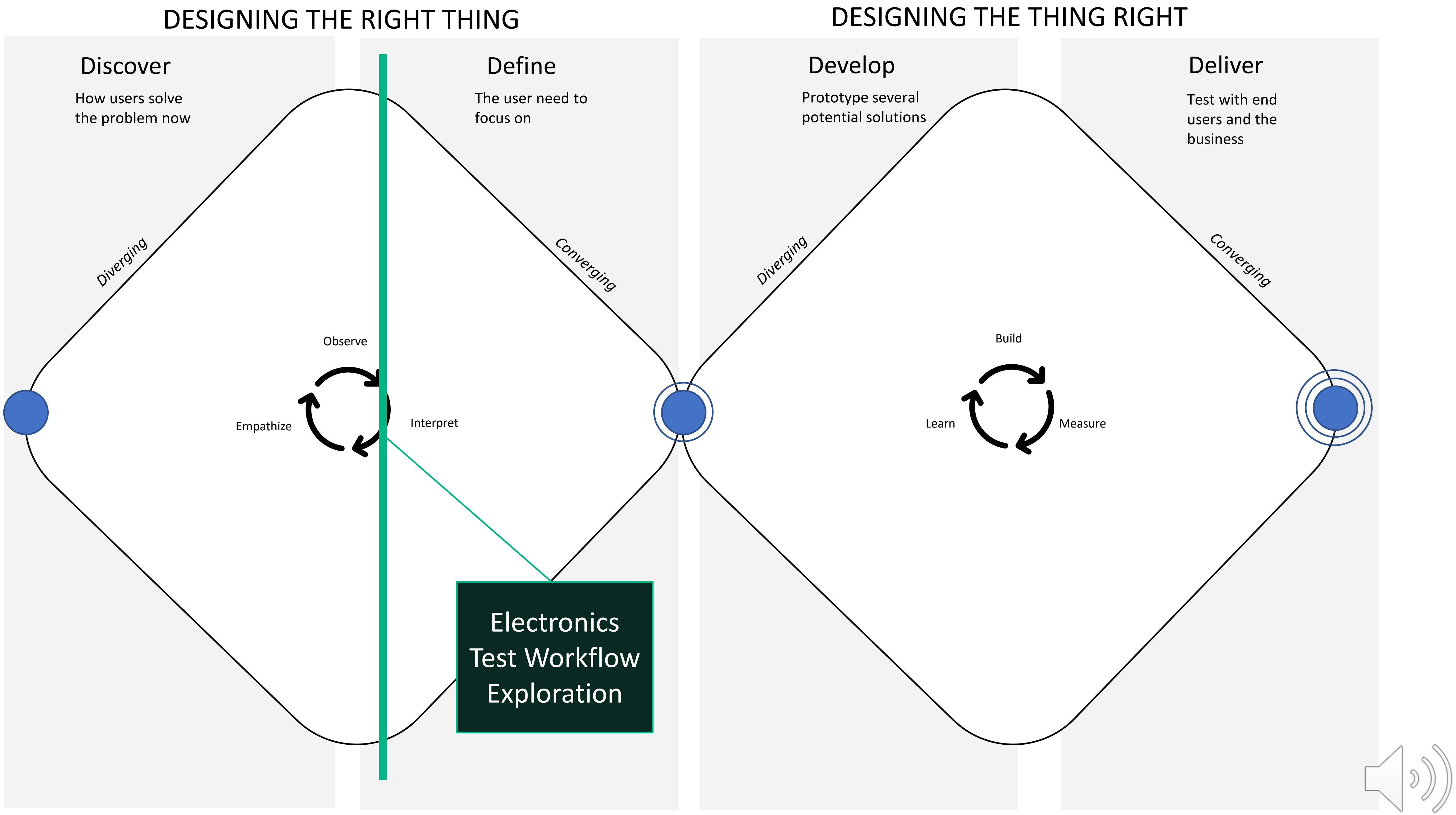

DESIGNING THE RIGHT THING
DESIGNING THE THING RIGHT
Discover
How users solve the problem now
Define
The user need to focus on
Develop
Prototype several potential solutions
Deliver
Test with end users and the business
Diverging
Converging
Diverging
Converging
Observe
Empathize
Interpret
Build
Learn
Measure
Electronics Test Workflow Exploration

Lead User Partner Program

Establishes a relationship between NI and its customers

- Open communication channel
- Partner in active engagements
- Influence our product roadmap
- Make sure our systems work for you

What are Active Engagements?

Field Studies

We visit you at your location and observe you working with NI products. Field studies generally last from one to two hours.

Interviews

Speak with us for 30 to 60 minutes at a prearranged time about your experience around a specific topic.

Usability Testing

We watch you interact with a prototype or product and ask you questions about your experience. The goal is to learn what does or doesn't work well.

Surveys

Participate in quick online research and feedback surveys. Most surveys takes approximately five to 20 minutes.

Co-Design

Participate in various co-design activities, where you can help shape the solutions that will ultimately make it into our test systems

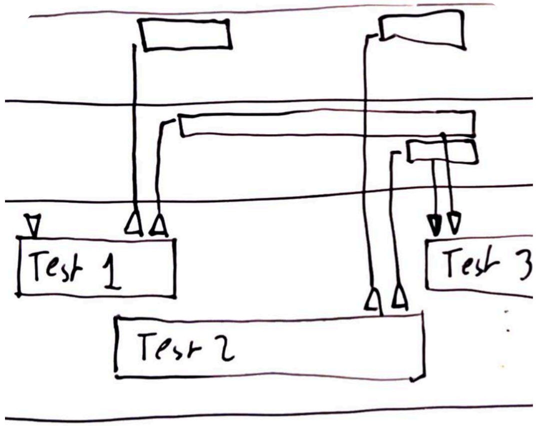
Concept Testing

Provide feedback on high-level ideas.

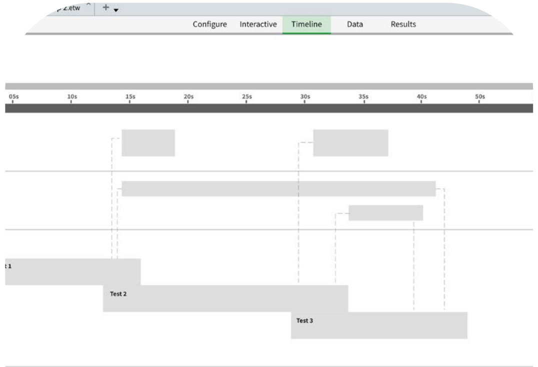
Building a Better Sequencer for a Validation Engineer

Video call

On-site visit



Co-design



Concept Testing

HOW TO SIGN UP

Fill Our Tiny Form

https://survey.sogosurvey.com/r/ETWLU

Expect an email from us in the next month with more information and our upcoming active engagements.

Your contact information will only be used to contact you about joining the Lead User Partner Prog
It will not be used for any sales or marketing activities.

QUESTIONS?

WELCOME TO AUSTIN