



Battery Cell Quality Test

New Offering for Electronic, Life Sciences, and Transportation Applications

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Solutions Marketer, Production Test

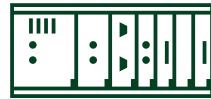


Agenda

- Review the Battery Manufacturing Process
- Introduction and Demo of NI Solution
- Trends happening in Industry
- Hardware and Software
- Benefits

Battery Manufacturing Process

- Open Circuit Voltage (OCV)
- AC Internal Resistance (AC-IR)
- Electrochemical Impedance Spectroscopy (EIS)
- Leakage
- Capacity



BATTERY MANUFACTURER



Battery Pack
Integration Test

BATTERY-POWERED
DEVICE MANUFACTURER



Battery Cell Test Types



OCV (Open-Circuit Voltage)

- Measure cell voltage when not connected to a load to screen basic defects
- Sometimes performed over time to detect defects (OCV decreases over time)



AC-IR (AC Internal Resistance)

- Stimulate the cell with sinusoidal I_{AC} and measure V_{AC} to verify internal resistance is within spec.
- Typically performed to evaluate battery performance or as a quality gate in manufacturing (reliability)



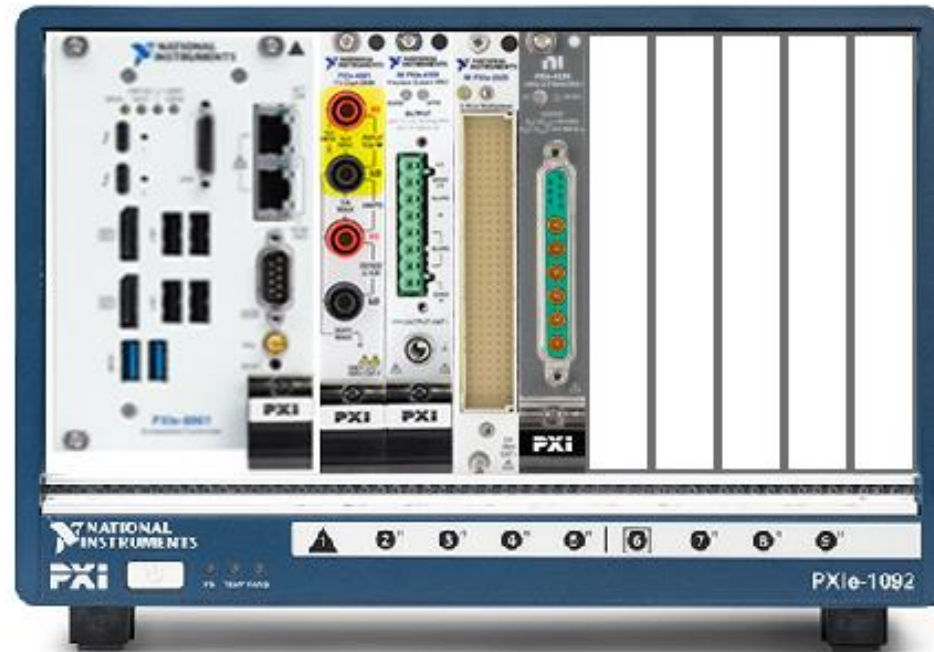
Capacity

- Verify total cell capacity over charge cycle
- Static: Measure total discharge current (mA-h) from 100% to 0% state-of-charge (SOC)
- Pulsed: Sequence through I-V steps for various time intervals

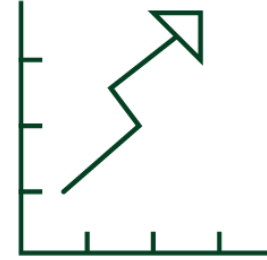
Increasing Measurement Complexity and Test Time



Demo Presentation



Pressures on Device Manufacturer



Increasing demand



Emphasis on reliability and
accuracy



High design
variability

Manufacturer Constraints



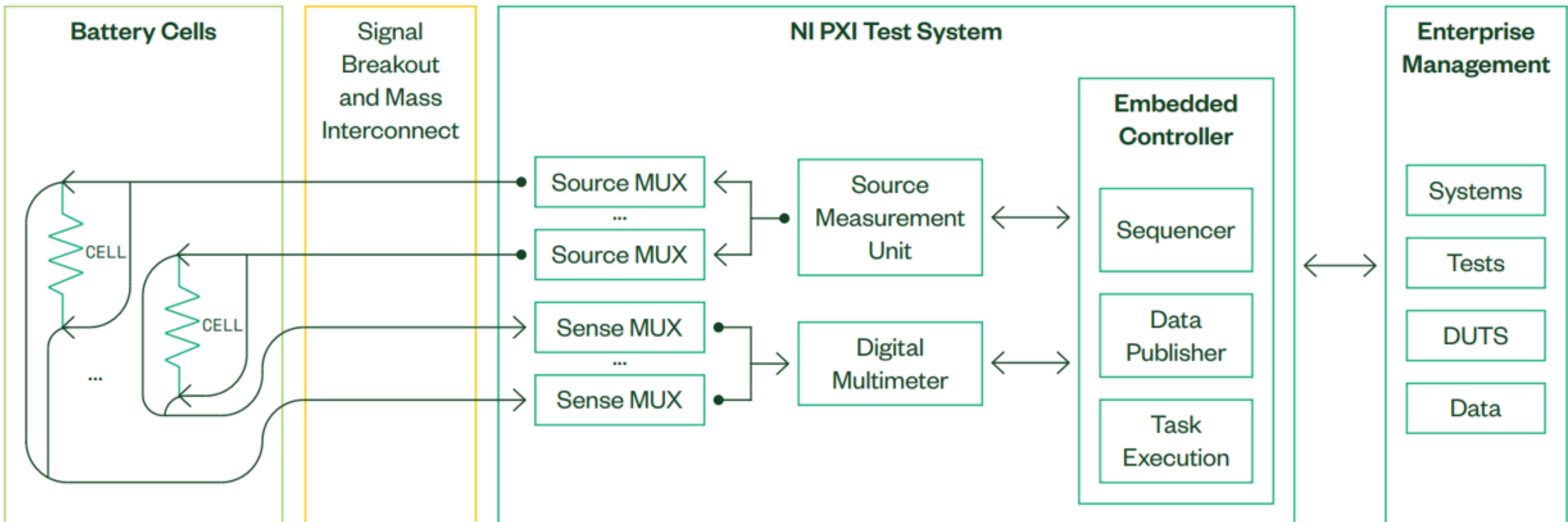
Test strategies must adapt to change



Defects can be difficult to detect



Data must quickly find trends and outliers



NI SUPPLIED
 CUSTOMER SUPPLIED
 PARTNER SUPPLIED

BENEFITS

Cycle Times

Repeatability

Scalability

Footprint



Battery Cell Quality Test Hardware

Model: PXIe-1092
PXI Chassis



Model: PXIe-8861
PXI Controller



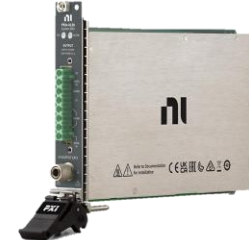
Model: PXIe-4139
SMU



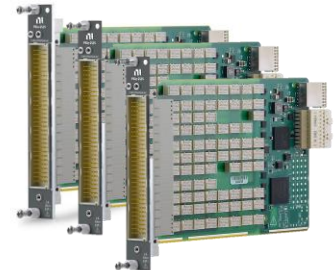
Model: PXIe-4081
DMM



Model: PXIe-4190
LCR Meter



Model: PXIe-2525
Switch Module

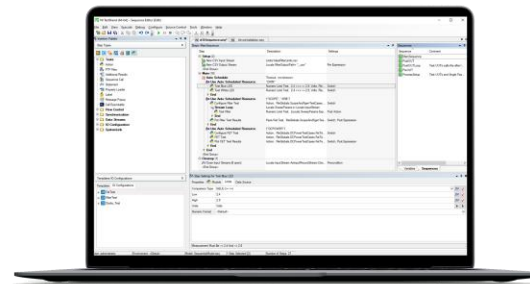


Key NI Software Products



LabVIEW
Test Development

- Test Step Development
- Algorithm Development
- DUT & Instrument Control
- FPGA embedded code
- UI & Web Interface Development



TestStand
Execution Framework

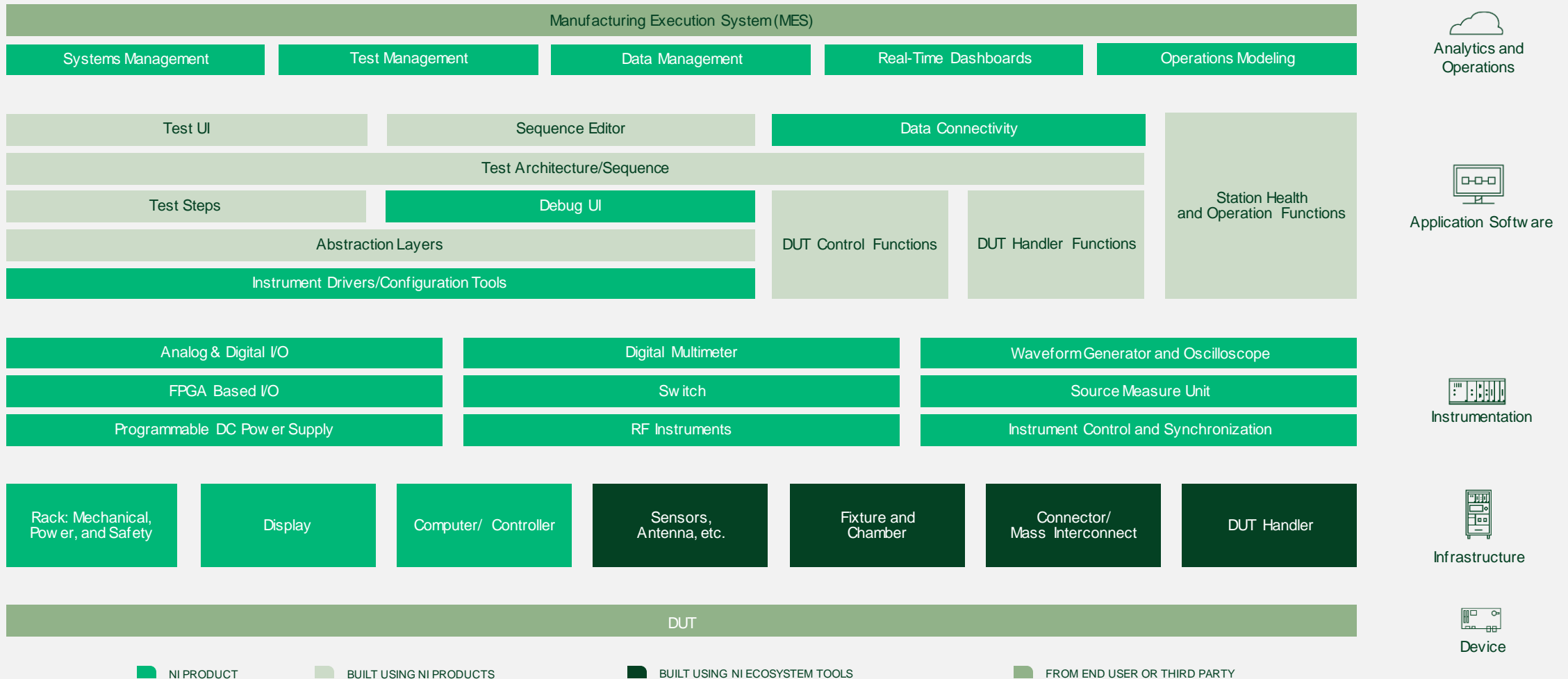
- Test Sequencing
- Parallel Test Configuration
- Report Generation
- Operator Interface Configuration



SystemLink
System & Data Management

- System Management
- Test Asset Management
- Test Monitoring & Results Management
- Measurement Data Management

NI Test Architecture



Quickly Deploy and Modify your System



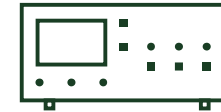
Fully Customized System

Increased time to Deployment
Costly Upkeep
Reliance on Fixed Parts



Open Platform-Based System

Integrated Hardware/Software
Open, Variable Ecosystem
Extensive Partner Network
Leverage Battery Experts



Closed Turnkey System

Unadaptable to Change
Fixed Functionality
Closed Ecosystem



Our Comprehensive System Can:



Save Development Time



Provide Comprehensive Data



Verify Lifespan Performance

Maximize Channel Count



Small Form Factor

Promote Scalability



Next Steps

[Battery Cell Quality Solutions Page](#)

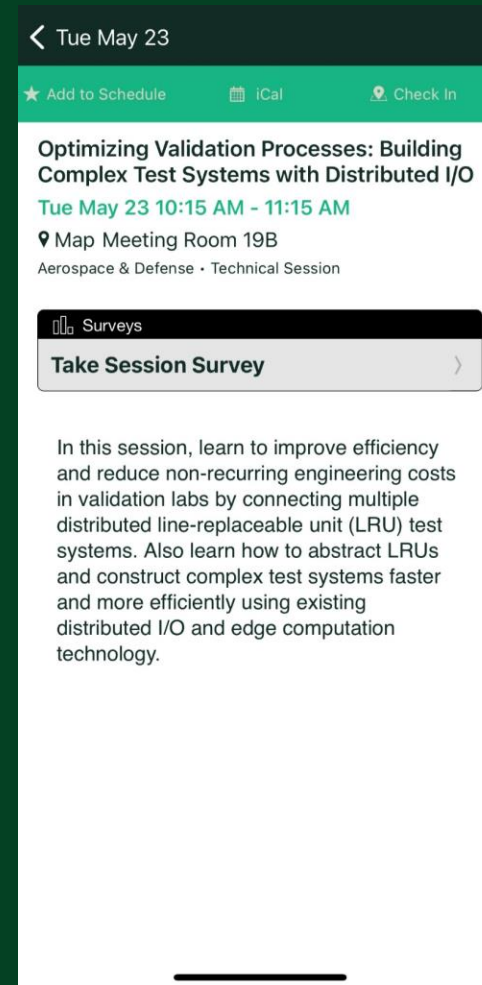
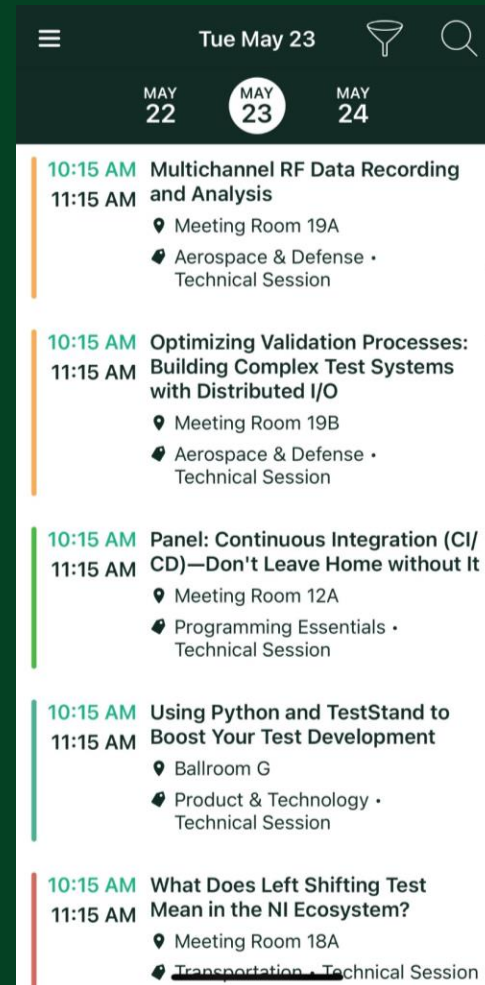
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