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2024 AUSTIN



Aero Test Cell Facility Monitoring

Steve Summers

Offering Manager, Aerospace/Defense/Government

Chris Solan

Offering Manager, Product Analytics

Tuesday, May 21 10:15 AM

Aerospace Test Cell Facility Monitoring

Tuesday, May 21 | 10:15 AM - 11:15 AM

Main Track: Aerospace & Defense

Description:

To ensure maximum uptime for large test facilities, we'll explore a new NI offering that uses SystemLink™ software to monitor facility assets and provide a view of test system readiness and predictive maintenance.



The challenge:

Reduce expensive downtime due to facility failures by tracking facility test readiness.

Target Facilities:

- Wind tunnels
- Engine test facilities
- Thermal/Vac chambers
- Mechanical test facilities

Facility Health Monitoring

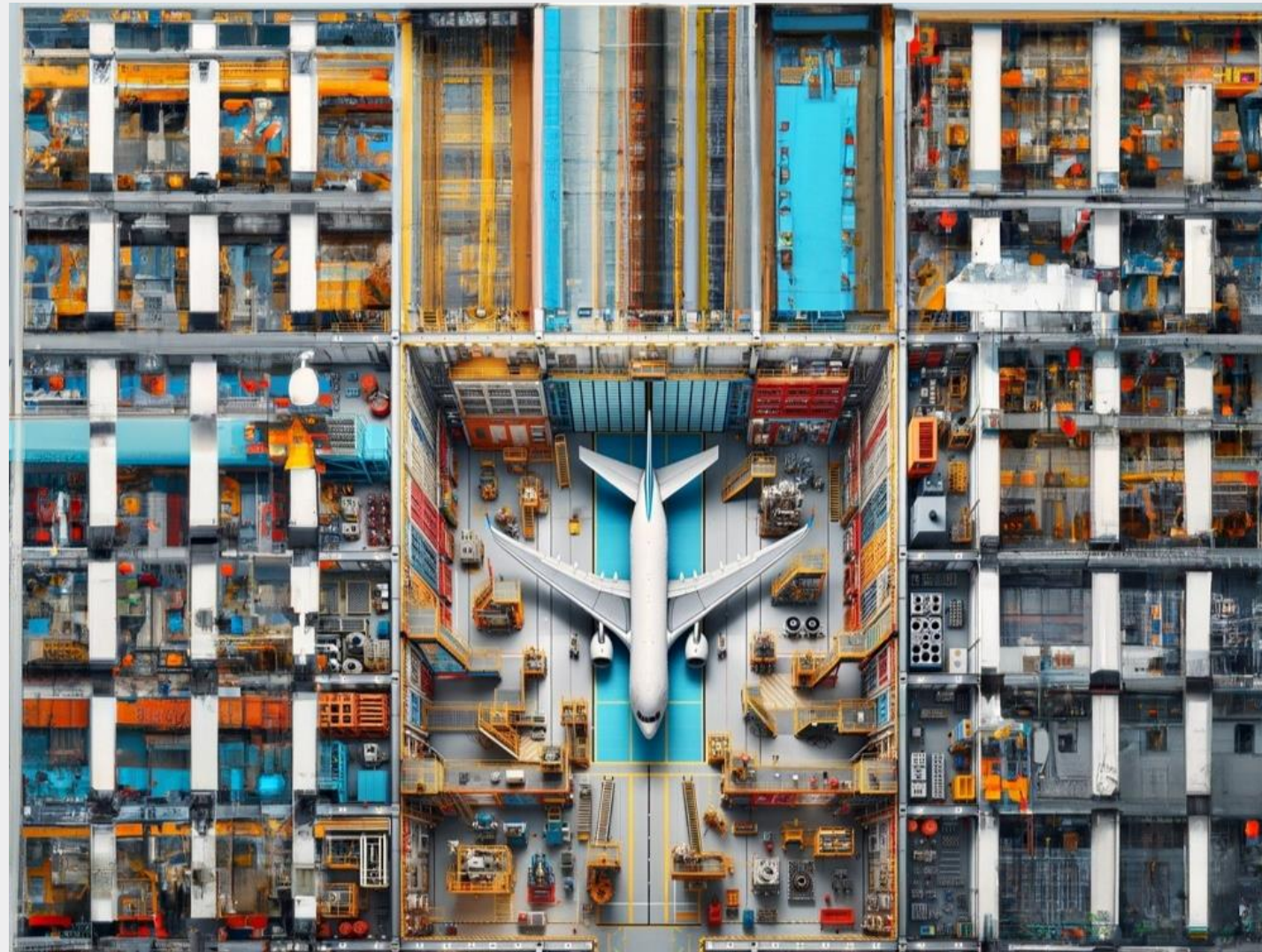
Are all controls running properly – valves, pumps, motors?

Are any systems drawing unusual amounts of power?

Are fluid distribution systems likely to fail soon?

Are facility systems functioning properly – doors, platforms, lifts, etc.?

Are all safety systems locked out before starting a test?



Is the test system calibrated and running the right software versions?

Is there enough disk space, CPU performance, and network bandwidth to handle the test?

Are there any fluid leaks?

Is the facility operating at the proper temperature and humidity?

Is our equipment usage efficiency improving?

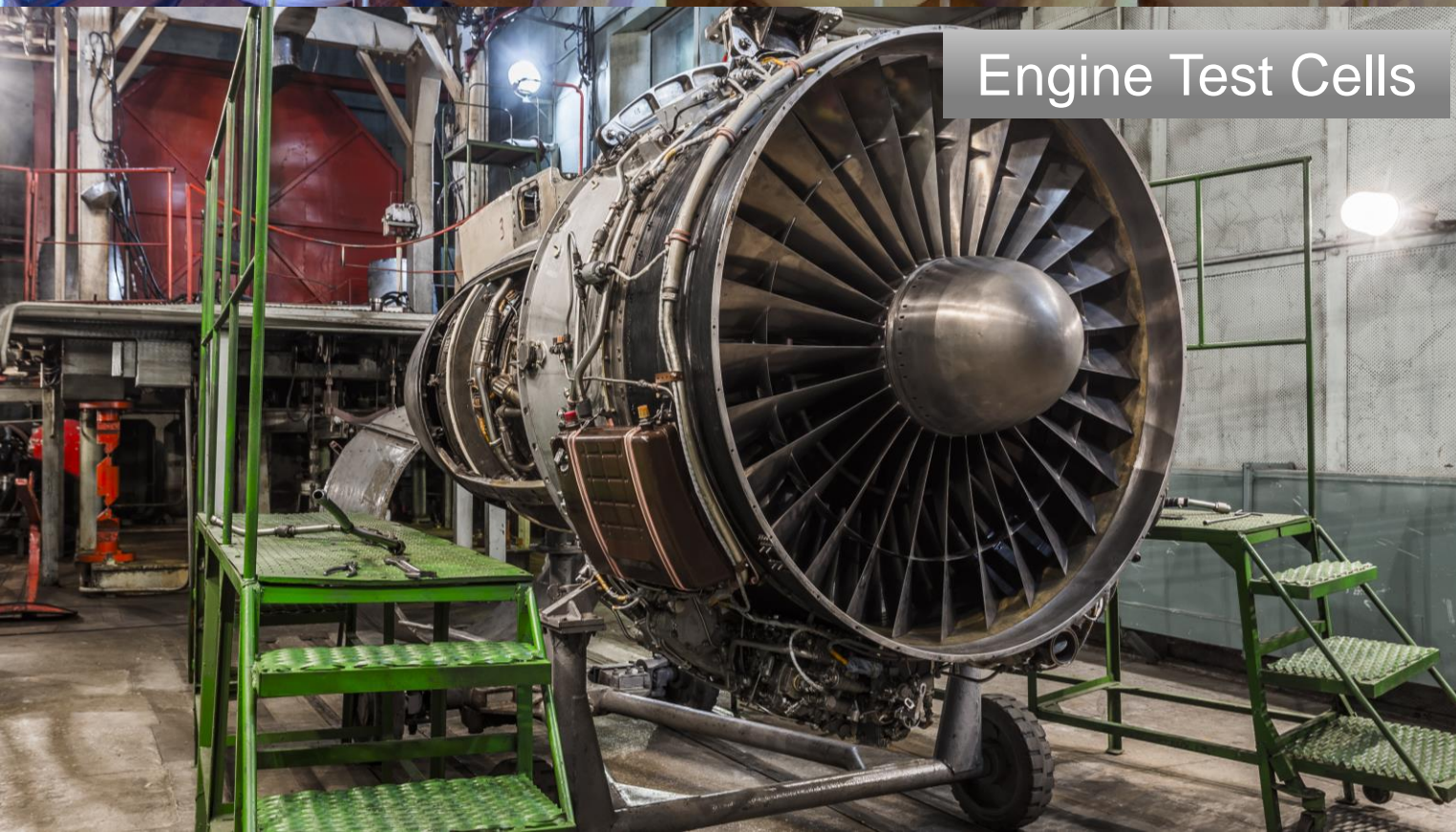
Tracking test readiness



Wind Tunnels



Mechanical Test



Engine Test Cells



TVAC Chambers

Software for Professional Test Workflows

Electronics Validation Test

Characterizing electronic prototypes to ensure quality and performance

Set-up & Configure

Measure & Automate

Analyze & Share



Electronics Production Test

Functional test ensuring manufactured products meet specifications

Set-up & Configure

Measure & Automate

Deploy & Maintain



Electromechanical Validation Test

Characterizing physical prototypes to ensure quality and performance

Build & Customize

Configure

Analyze & Share



Embedded Software Test

Testing deployed software for defects across wide parameter variations

Configure & Map

Test & Bring Up

Automate & Execute



Electromechanical Test | Areas of Investment

Accessible Automation

Speed system development with connected applications and easy-to-use sequencing.

Example features

- Connect FlexLogger measurements with automation in LabVIEW or TestStand
- Automate durability tests without programming in FlexLogger

Open Integration

Simplify integration of 3rd party hardware, custom algorithms, and control logic.

Example features

- Improve development and debugging of FlexLogger plugins
- Develop custom measurements in any language

Out-of-the-box Measurements

Hardware and software built together to deliver measurements in minutes.

Example features

- FlexLogger Lite included with every DAQ device
- Guided setup, reference material and pin layout accessible directly from the hardware

Modern Dev Practices

Improve collaborative tools in LabVIEW+ to ease large, complex application development.

Example features

- git integration for LabVIEW and TestStand
- Improve diff and merge to support CI/CD

System Security


Meet regulatory requirements for security, especially when maintaining long term system deployments.

Example features

- SBOMs and CVEs
- Linux RT Identity and Access Management

ni Architecture

SystemLink Server






Systems & Assets Management

OPC UA support


Data Management

Data Analysis and Visualization



SystemLink provides data management, visualizations, and connections to data analytics.

FlexLogger



Data acquisition & logging

Data transfer to SL

Alarm-based data logging

Event-based acquisition

Plugin based architecture

Machine Learning modules

Python based automation

Windows

FlexLogger collects and logs data from devices and serves that data to SystemLink.

FlexLogger Plugins perform edge-like analytics.


Data Acquisition

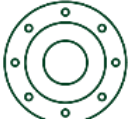



NI cDAQ devices provide distributed data acquisition throughout the facility.


OPC UA drivers provide data from PLCs.


Sensor Inputs



Sound



Strain



Pressure



Load


Torque



Temperature



Vibration



Voltage & Current



Digital Sensors

Asset Types


Electrical Motors

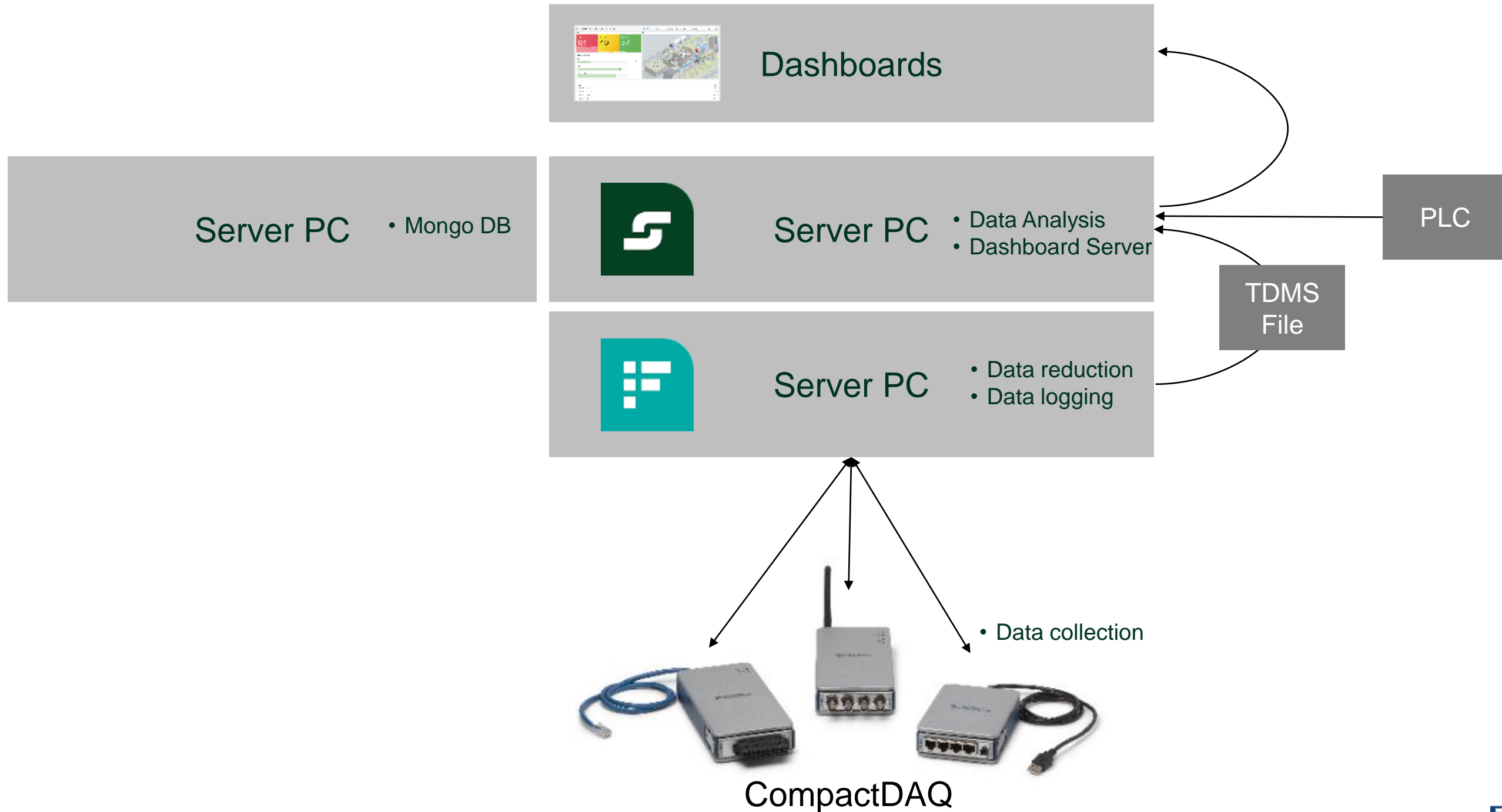

Mechanical Actuators


Pumps

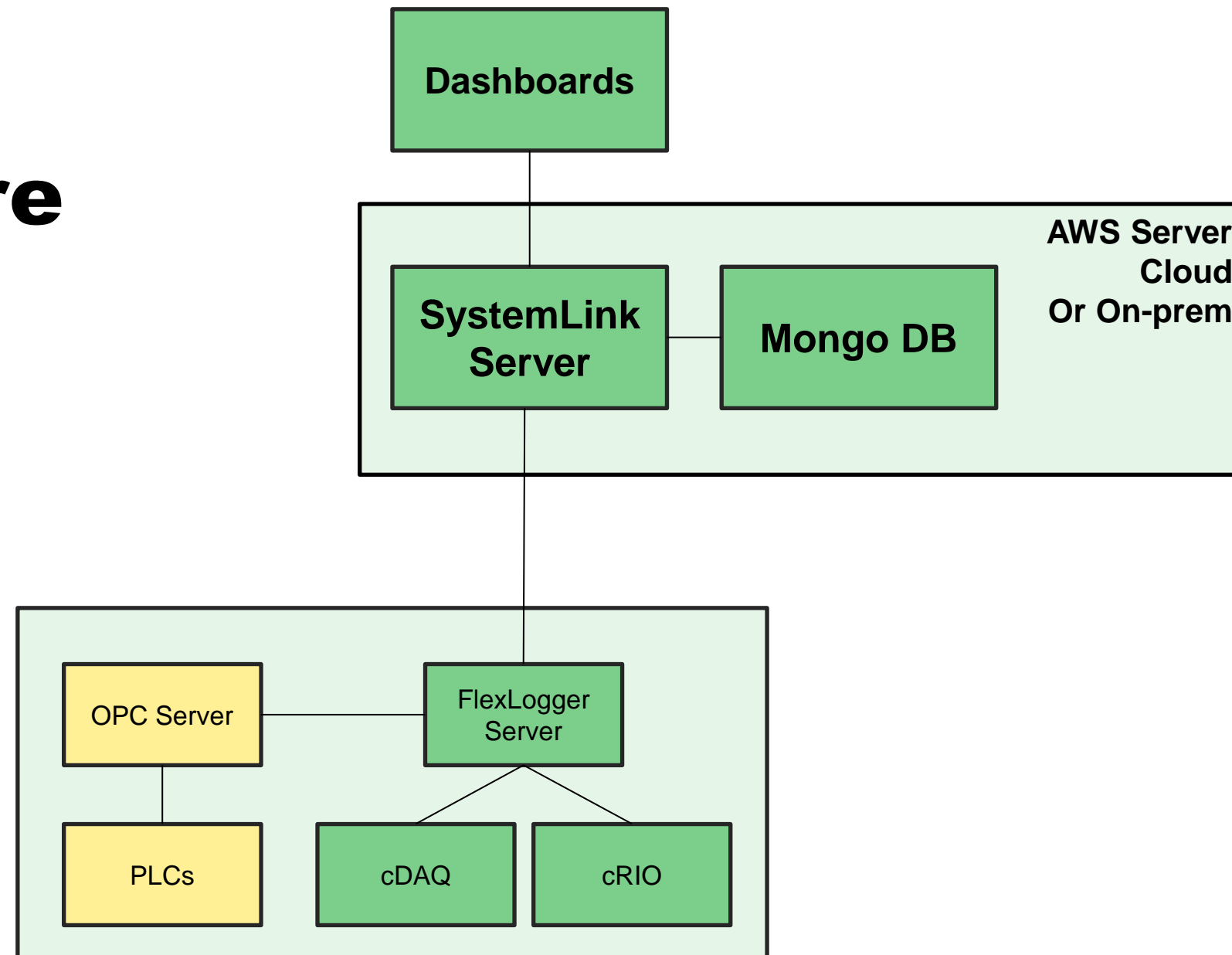

Test Facilities

Facility data is collected from a variety of systems, components, and sensors to provide a complete picture of facility health and readiness.

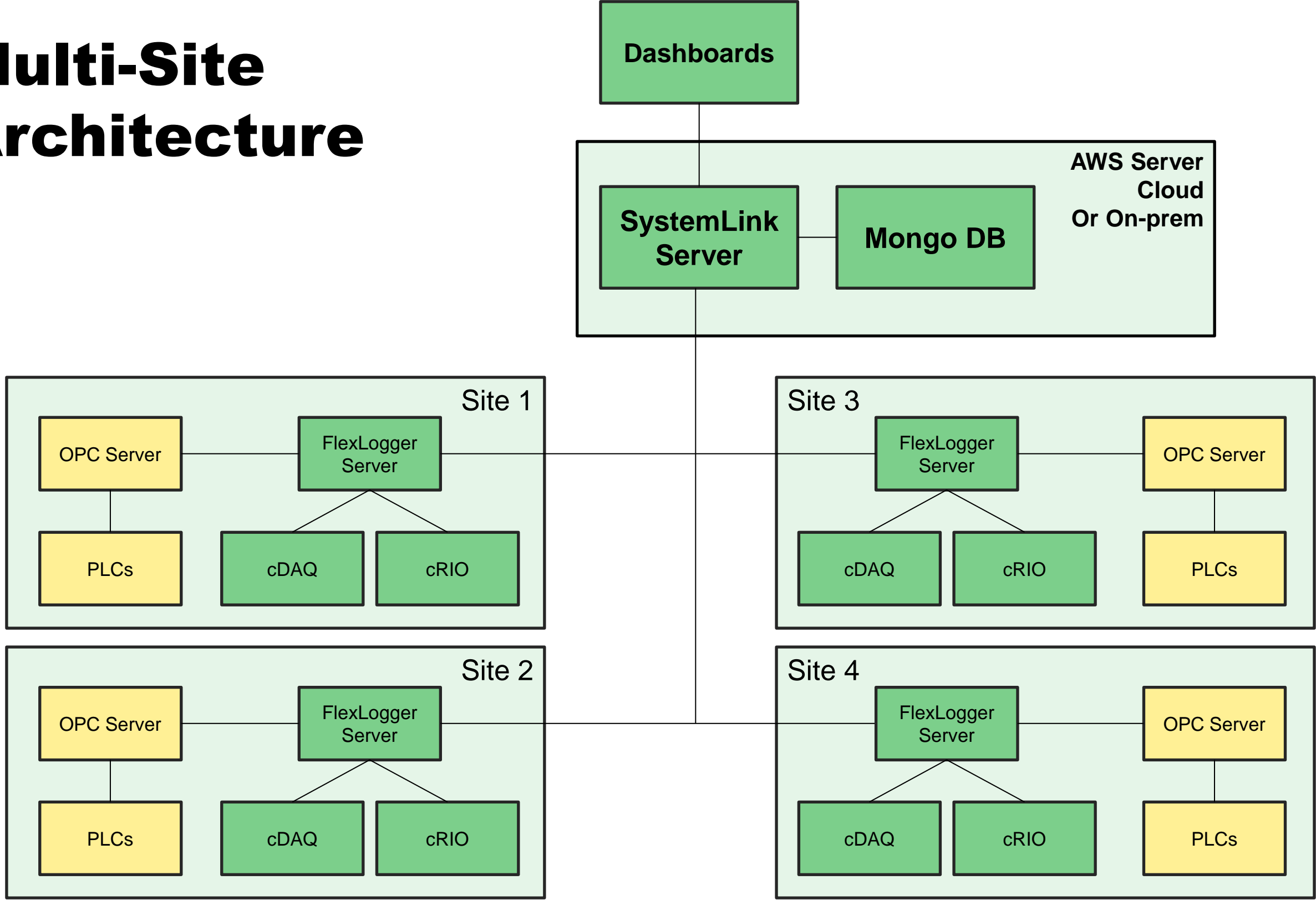
Architecture



Single-Site Architecture



Multi-Site Architecture

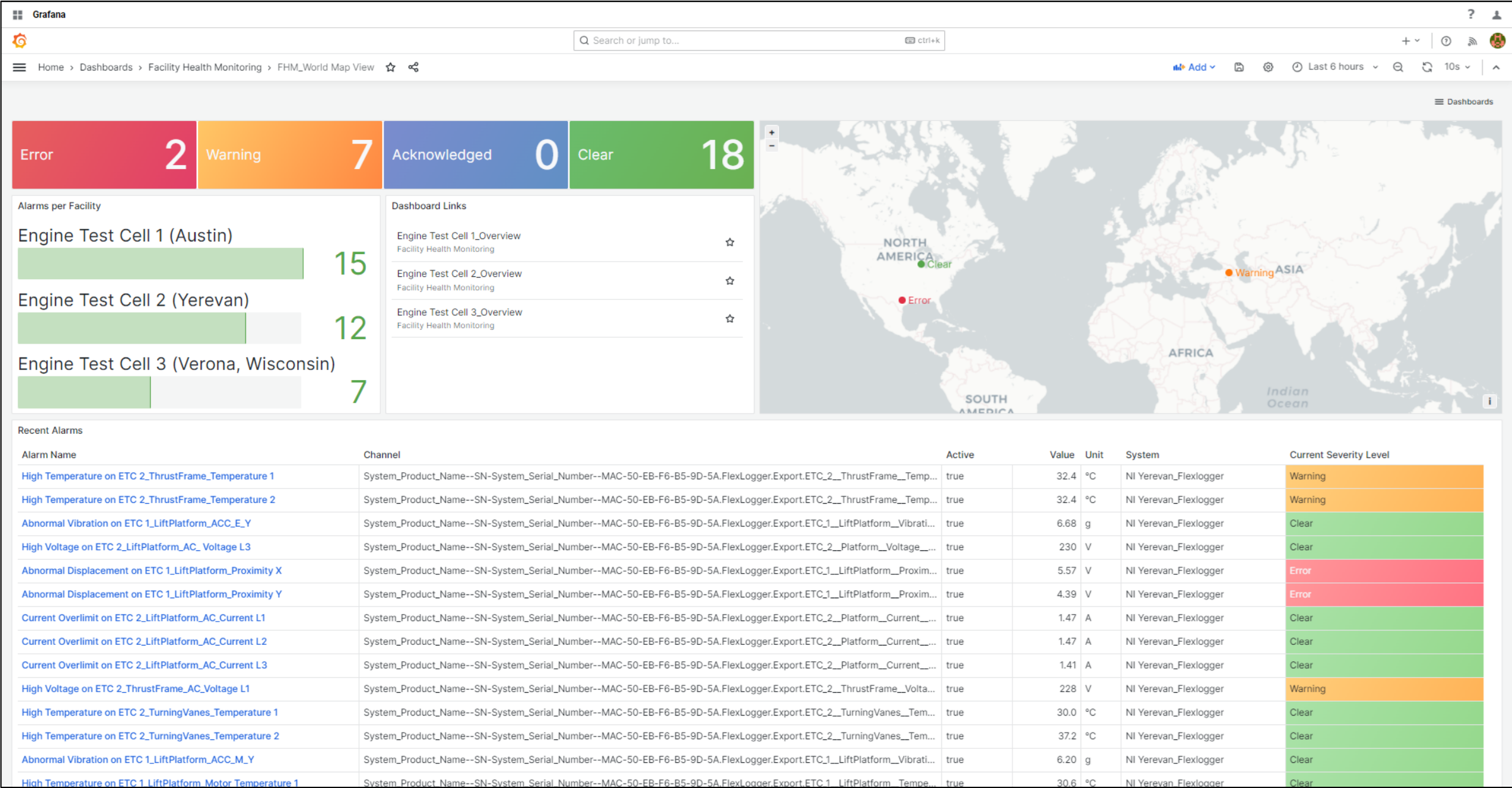


Facility Health Monitoring

Demo

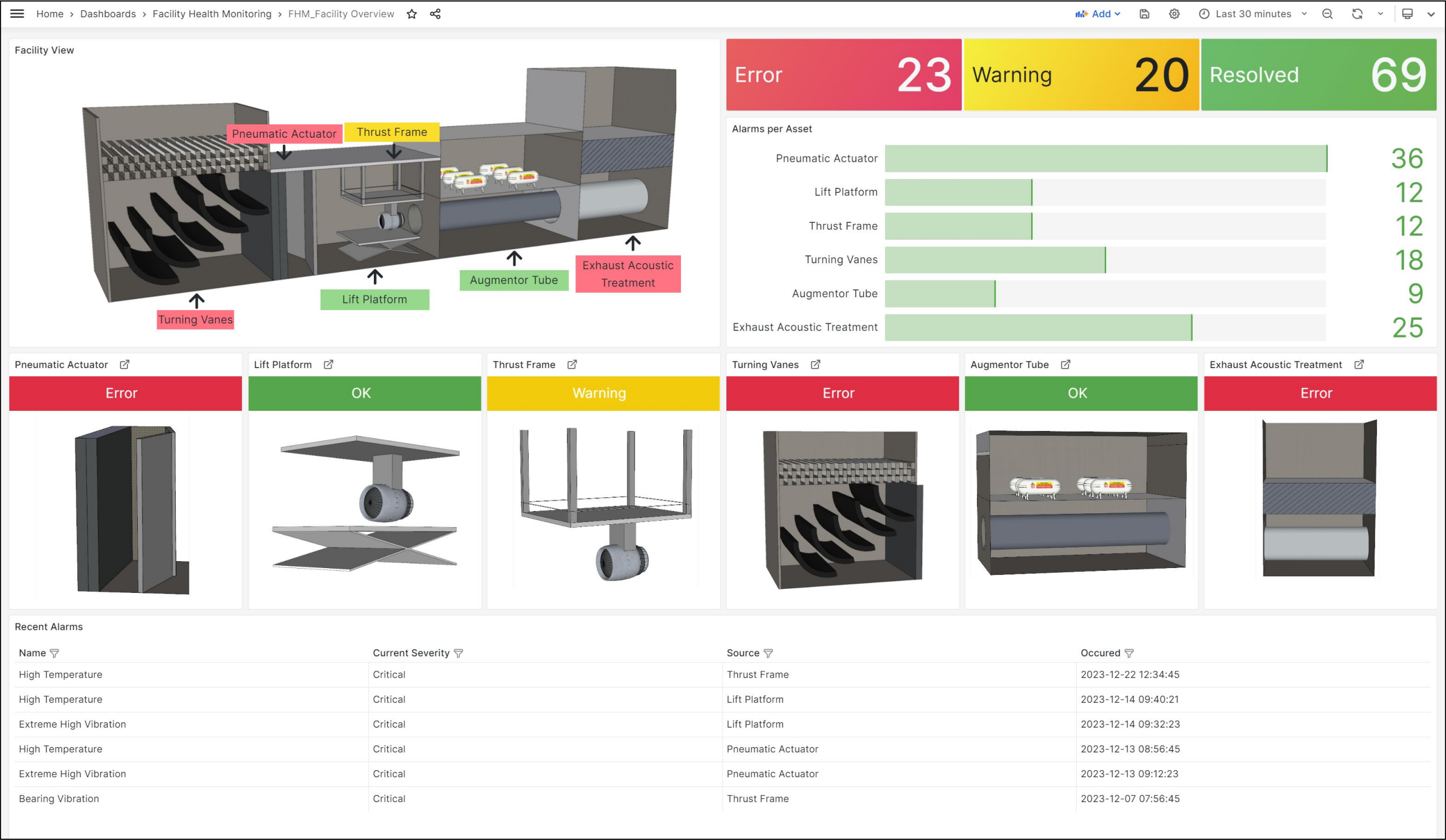


Dashboard for Engine Testbed – Plant View

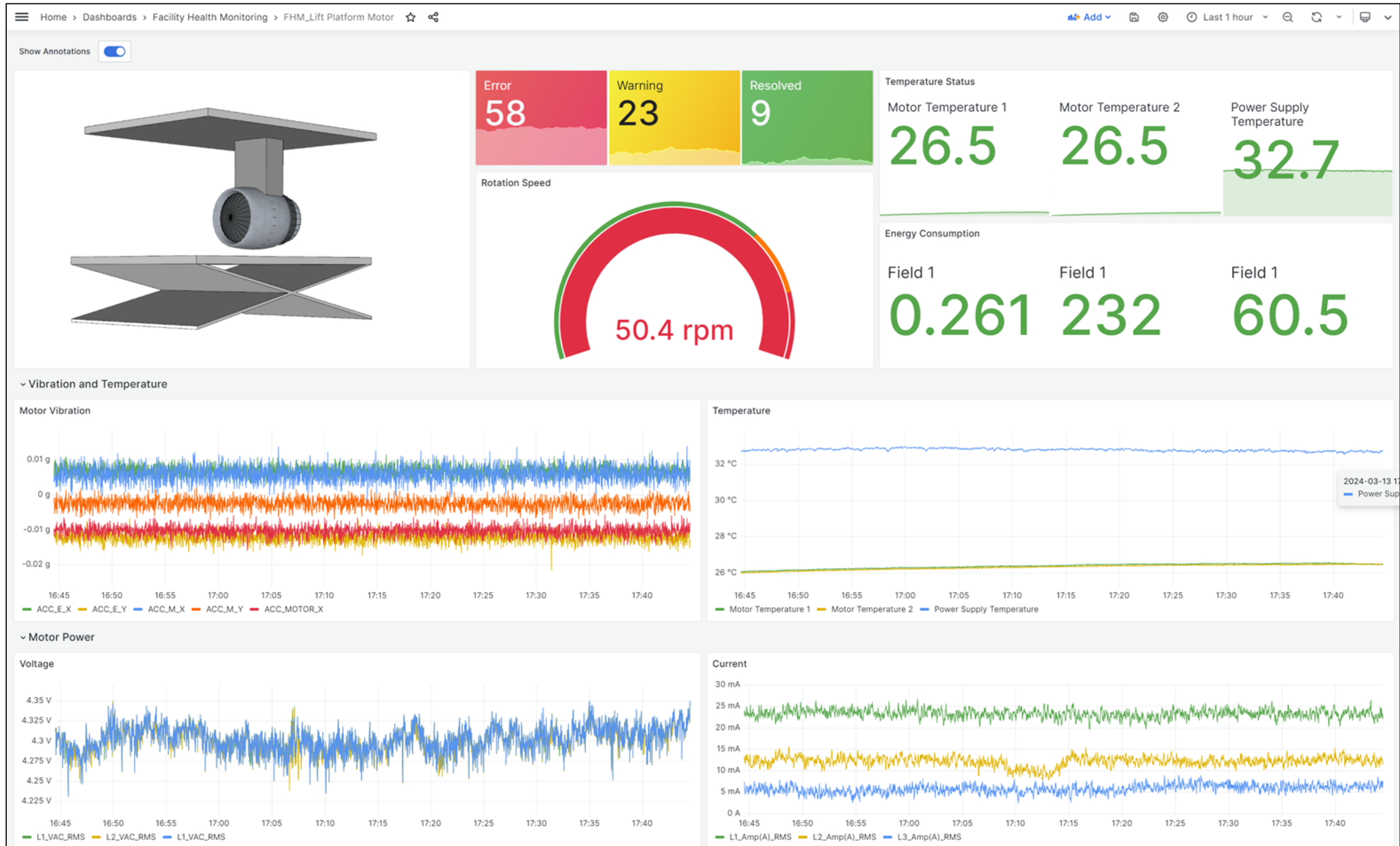




Dashboard for Engine Testbed – Facility View

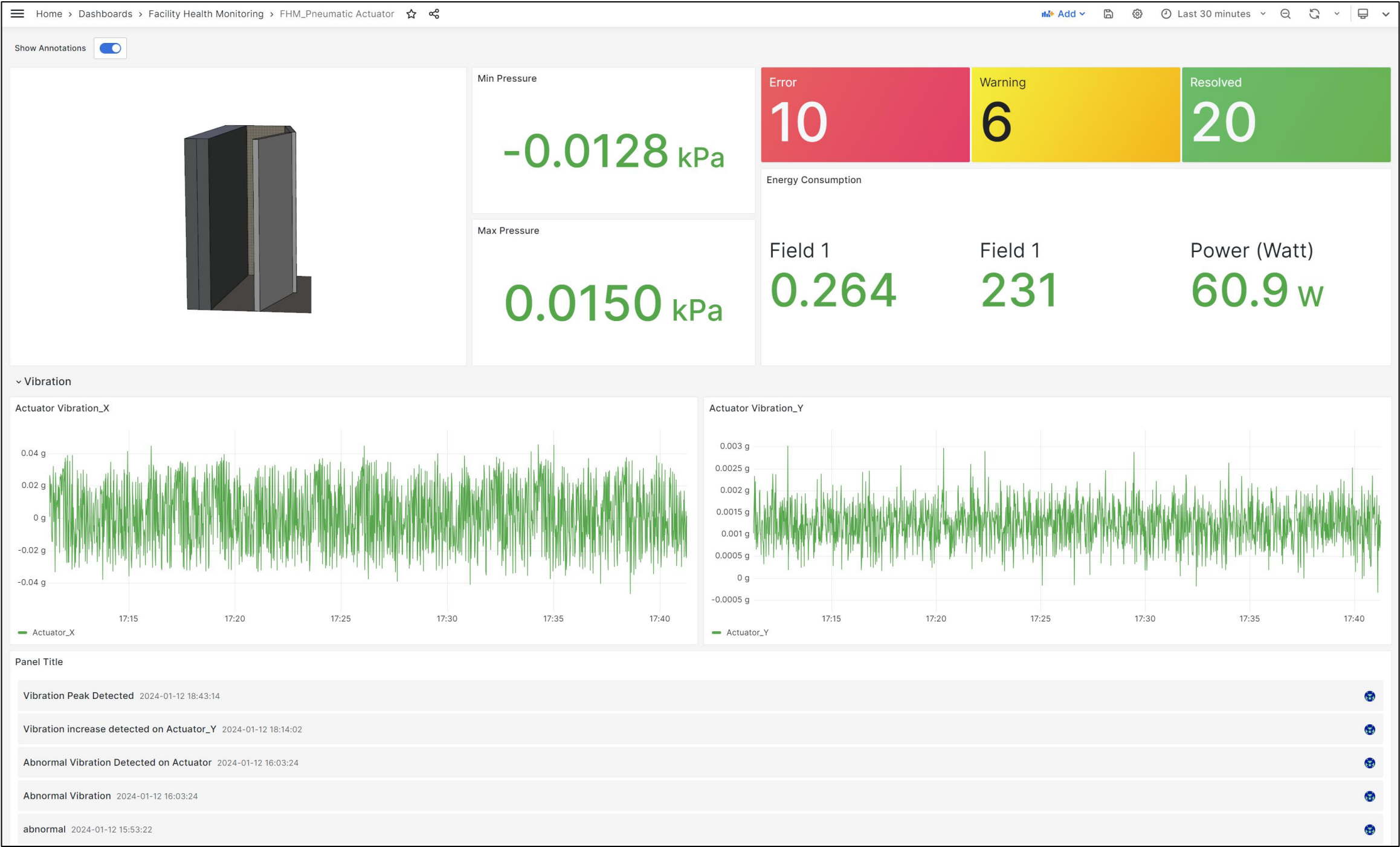


Dashboard for Engine Testbed – Asset View

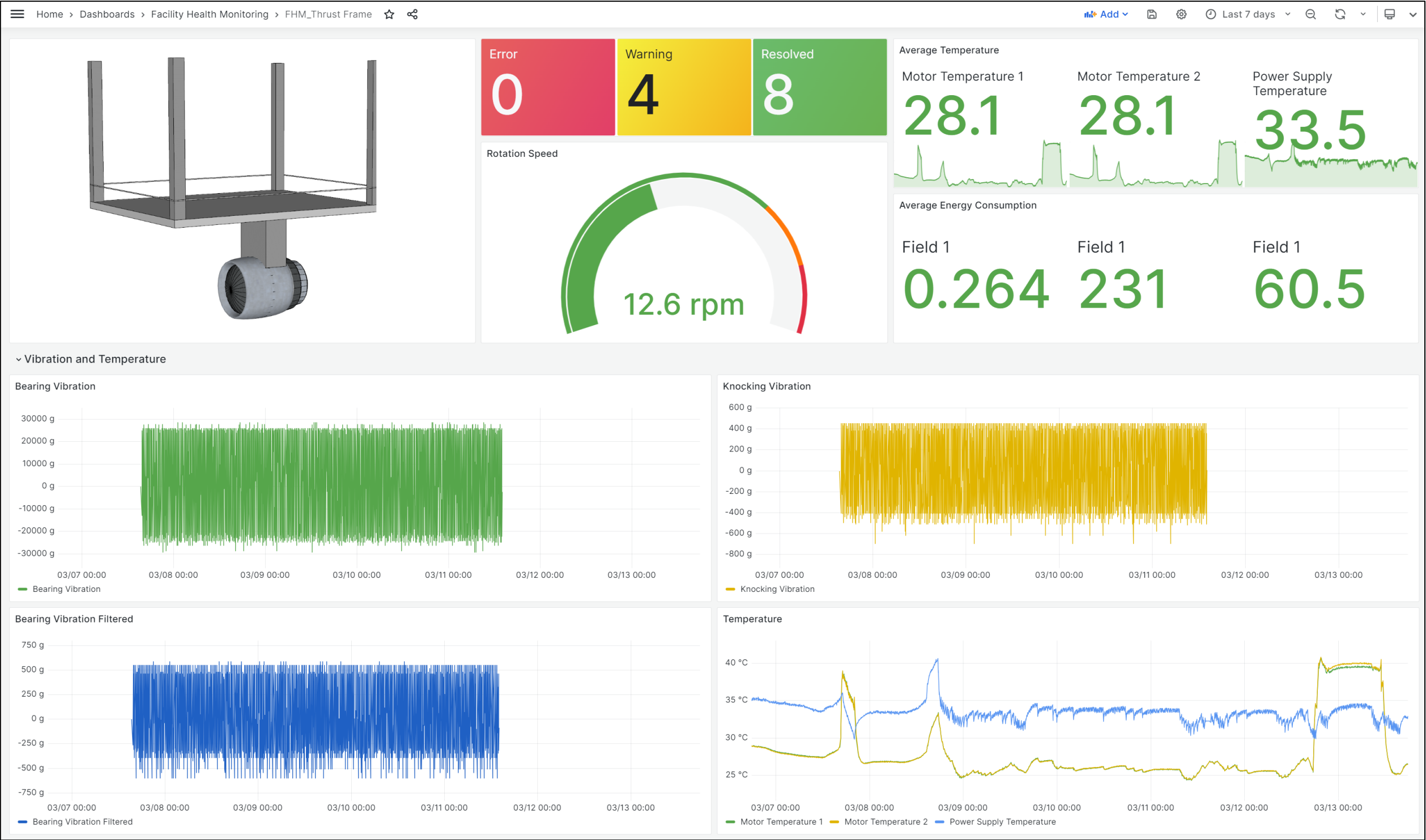




Dashboard for Engine Testbed – Asset View

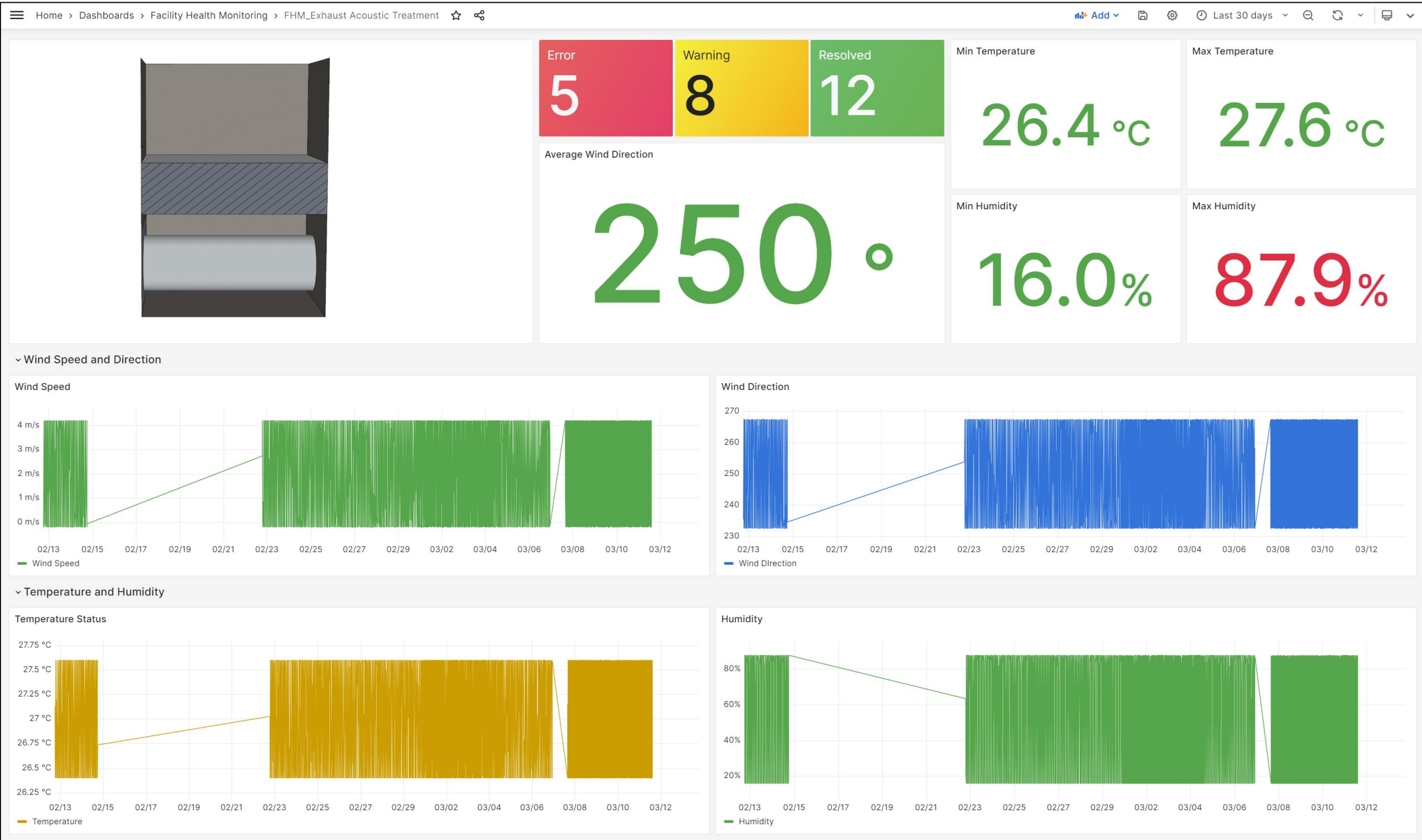


Dashboard for Engine Testbed – Asset View





Dashboard for Engine Testbed – Asset View



Monitoring Capabilities

Test Systems (PXI, PC, cRIO based) <ul style="list-style-type: none">• Calibration status• System utilization and pass/fail• Fan speed, storage space, CPU• Software stack management	Pumps, Motors <ul style="list-style-type: none">• Lifecycle analytics• Vibration• Power (current, voltage)• Rotational order tracking	Valves <ul style="list-style-type: none">• Lifecycle analytics• Vibration• Power (current, voltage)
Environmental Data <ul style="list-style-type: none">• Detect fluid leaks• Monitor ambient temperature• Monitor humidity	Actuators, Doors, Mechanical <ul style="list-style-type: none">• Lifecycle analytics• Action time variance	Pipes <ul style="list-style-type: none">• Lifecycle analytics• Vibration
Discrete mechanical systems <ul style="list-style-type: none">• Detect open doors• Track time on test mounts	Other analog signals <ul style="list-style-type: none">• 4-20 mA• 0-60 V	Electrical Power <ul style="list-style-type: none">• Current• Voltage• Power

Examples of assets monitored by the NI facility health monitoring software

Test-Based Insights

Test Systems (PXI, PC, cRIO based) <ul style="list-style-type: none">• How do we schedule calibrations?• What test systems are underutilized?• How can we deploy new software?	Pumps, Motors <ul style="list-style-type: none">• How do we minimize scheduled repair downtime?• How do we eliminate non-scheduled downtime?	Valves <ul style="list-style-type: none">• What valve configurations lead to the most stress on the system?
Environmental Data <ul style="list-style-type: none">• How do environmental conditions impact test results?	Actuators, Doors, Mechanical <ul style="list-style-type: none">• What conditions lead to mechanical failures?	Pipes <ul style="list-style-type: none">• What events led to a leak or pipe failure?
Discrete mechanical systems <ul style="list-style-type: none">• Are we monitoring the right systems before and during a test?	Other analog signals <ul style="list-style-type: none">• What are the test conditions that lead to failures?	Electrical Power <ul style="list-style-type: none">• Are we efficiently using available utilities?

Facility Health Monitoring Engagement Plan

Typical customer engagement:

Pre-site/Onsite Consulting

- NI engineers discuss concerns, risks, downtime causes
- NI proposes installation plan with asset list, sensor and measurement device layout, and software architecture

Measurement Installation

- NI technicians work with facility team to install hardware, sensors, servers
- NI programmers set up servers and dashboards

Analytics Programming

- NI data engineers review collected data, identify targets for predictive analytics
- NI data engineers configure analytics

← Data collection / monitoring →

← Data monitoring / Analytics →

Facility Health Monitoring Design Consulting Services

Location: Onsite and remote

Description:

NI engineers will meet with your test and facility teams to identify:

- Major downtime causes
- Highest priority for signal monitoring
- Sensing equipment placement
- Sensor selection
- Desired visualizations

Outcomes:

The engagement will result in:

- Documented plan for delivery and installation
- Data architecture recommendation
- Delivery quote and prices



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Facility Health Monitoring Post-Deployment Support

Resourcing Location: Remote

Entitlements:

- Ongoing tuning of analytic routines
- Improved SLAs for Super Users to address IT, product or customization issues
- Access to online knowledge portal and on-demand training
- Dedicated ticket system to contact NI support channels and quickly get routed to the team that can help best

Support Levels

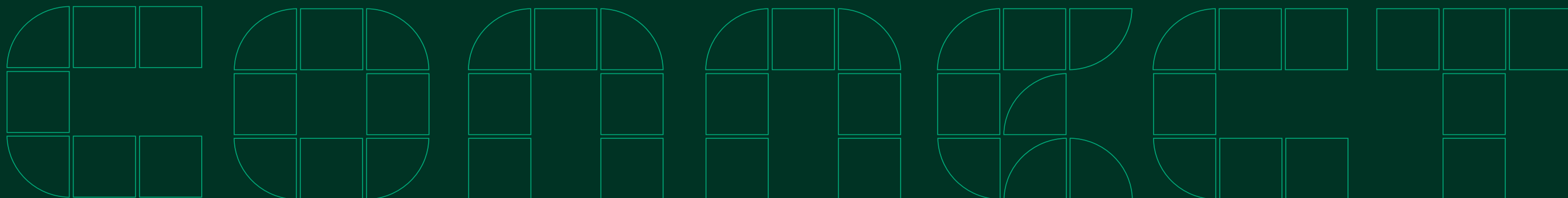
- Premium support offers 24x7 support to super users (12x5 for standard users) with SLAs based on severity level.





NI Solution Benefits

- Open hardware and software – connect to any signals in your facility
- Customer-owned hardware – one-time capitol expense
- Locally hosted solution – map to company's security and privacy policies
- Comprehensive premium support – ensured ongoing success
- Test focus – designed by a test company for test engineers



Steve Summers
ADG Offering Manager

Steve.summers@ni.com
ni.com/aerospace

Chris Solan
PA Offering Manager

Chris.solan@ni.com