

GRACE SENSE™

The Four Keys to a Successful IIoT Solution for Predictive Maintenance

Andy Zimmerman, CTO



Introduction

Why is IIoT important to you?

1. You spend your time dealing with industrial controls, safety, maintenance, and/or reliability
2. You see the potential for connected smart devices (IIoT) to improve reliability, maintenance, or safety practices
3. You are concerned or uncertain about what happens when new and legacy technologies collide

Introduction

How does Grace approach IIoT?

1. Grace approaches IoT from the industrial perspective

- Founded in 1991 by Phil Allen
- 2nd Generation Family Business (Drew Allen, CEO)
- 25+ years as a Rockwell Encompass Partner
- Industry leader in electrical safety
- Global distribution



BRONZE
Technology Partner
A ROCKWELL AUTOMATION PARTNER

EtherNet/IP™
ODVA

BBB
Torch Awards
for Ethics™
SERVING OUR CUSTOMERS
2018 Recipient

 **GRACE**
SENSE™

Introduction

How does Grace approach IIoT?

2. Grace approaches IoT from the application perspective

- Our core IoT technology developed with funds from:
 - DoD (ONR, Air Force)
 - NSF
 - DHS
 - USDOT (Union Pacific)
- Our core IoT technology has been applied to:
 - Long-span bridges
 - Wind turbines
 - Burning or damaged structures
 - Industrial equipment



Why do you need IIoT?

What is IIoT?

IIoT (aka Industrial Internet of Things)

Industrial Internet of Things can be defined as a network of machines, computers and people enabling intelligent industrial operations using advanced data analytics for transformational business outcomes.

An ecosystem that is comprised of:

- a. Machines
- b. Computers
- c. People & Processes

All three working in Harmony towards a common goal!



Other fancy names include:
Big Data, Digital Transformation, Digital Experience, Digital Journey, Digital Disruption, Industry 4.0, etc.

Why do you need IIoT?

Why is IIoT attractive right now?



1. IIoT promises to reduce plant downtime



- In most verticals, downtime is incredibly costly (~\$20B in process industries)
- Legacy equipment is often old and in need of constant maintenance
- Route-based inspections cannot be done daily, IIoT offers route prioritization

2. IIoT can replace or augment skilled maintenance personnel



- Skilled maintenance workforce is retiring
- College graduates focused on innovation over maintenance
- IIoT can allow expertise to be stored and transferred

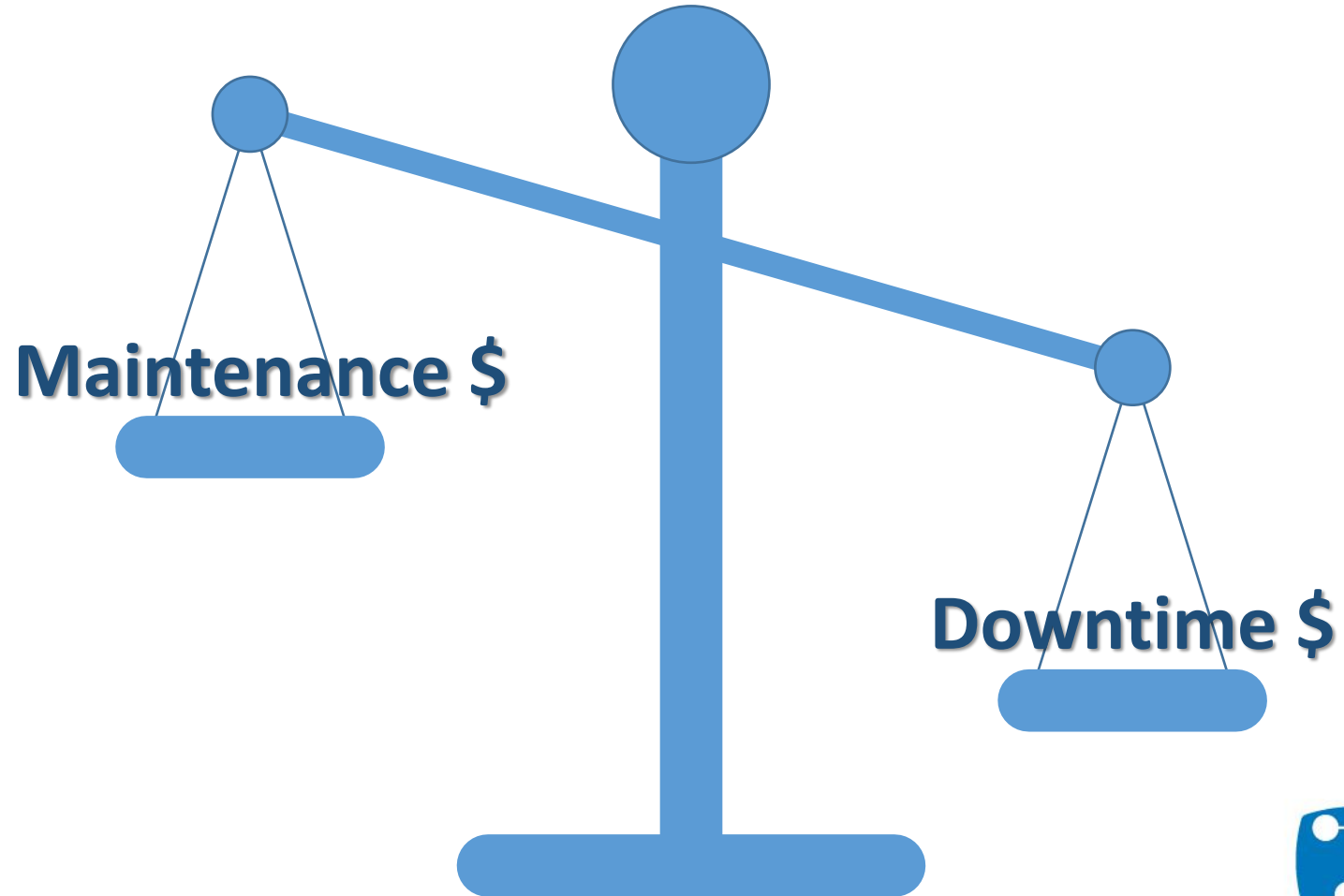
3. Underlying IIoT technologies are ready for prime-time



- Easy-to-deploy sensors are available and affordable
- Wireless and network communication options are robust
- Cloud hosting is pervasive, affordable, and trusted

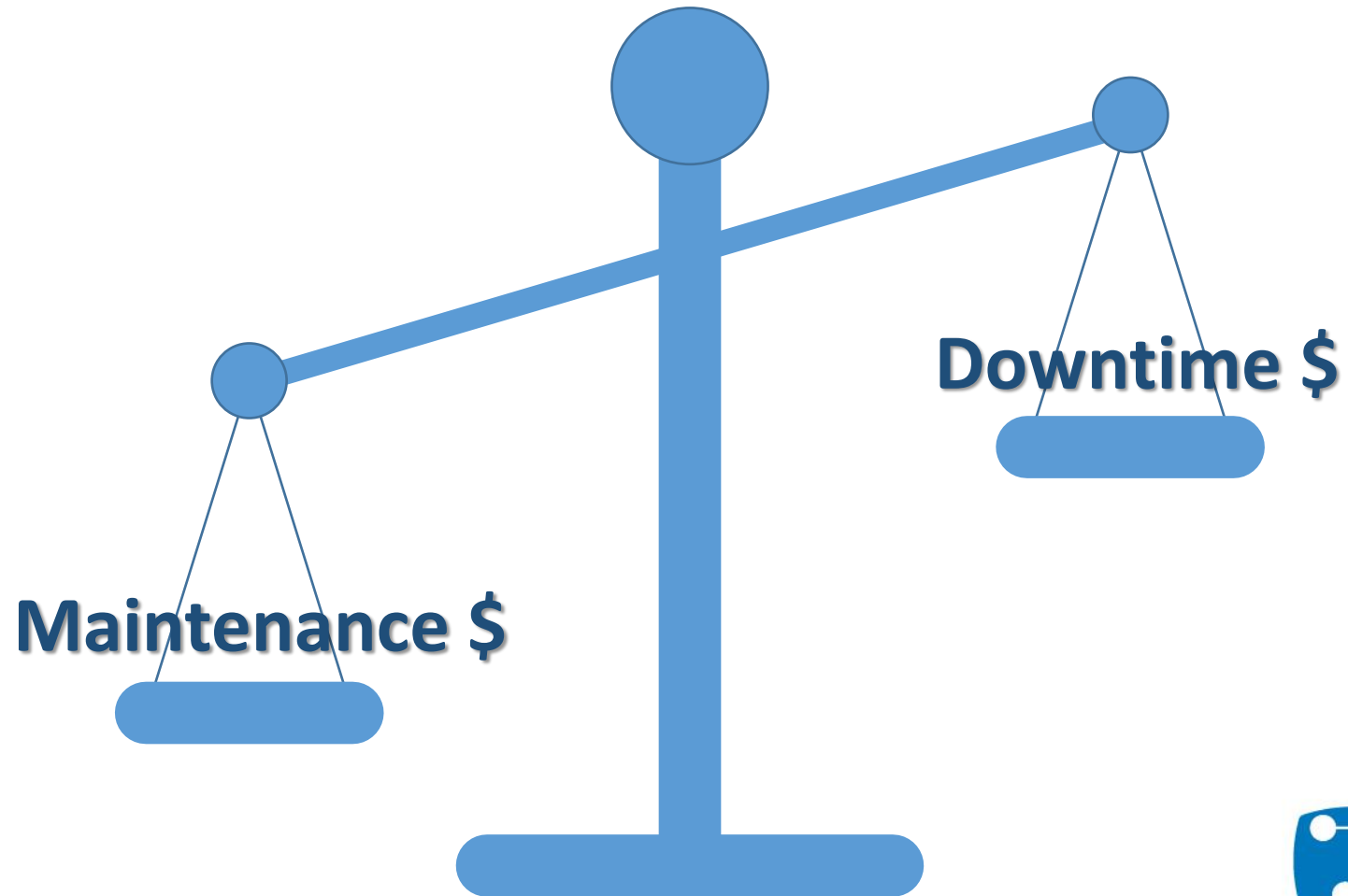
Why do you need IIoT?

Not enough maintenance budget...



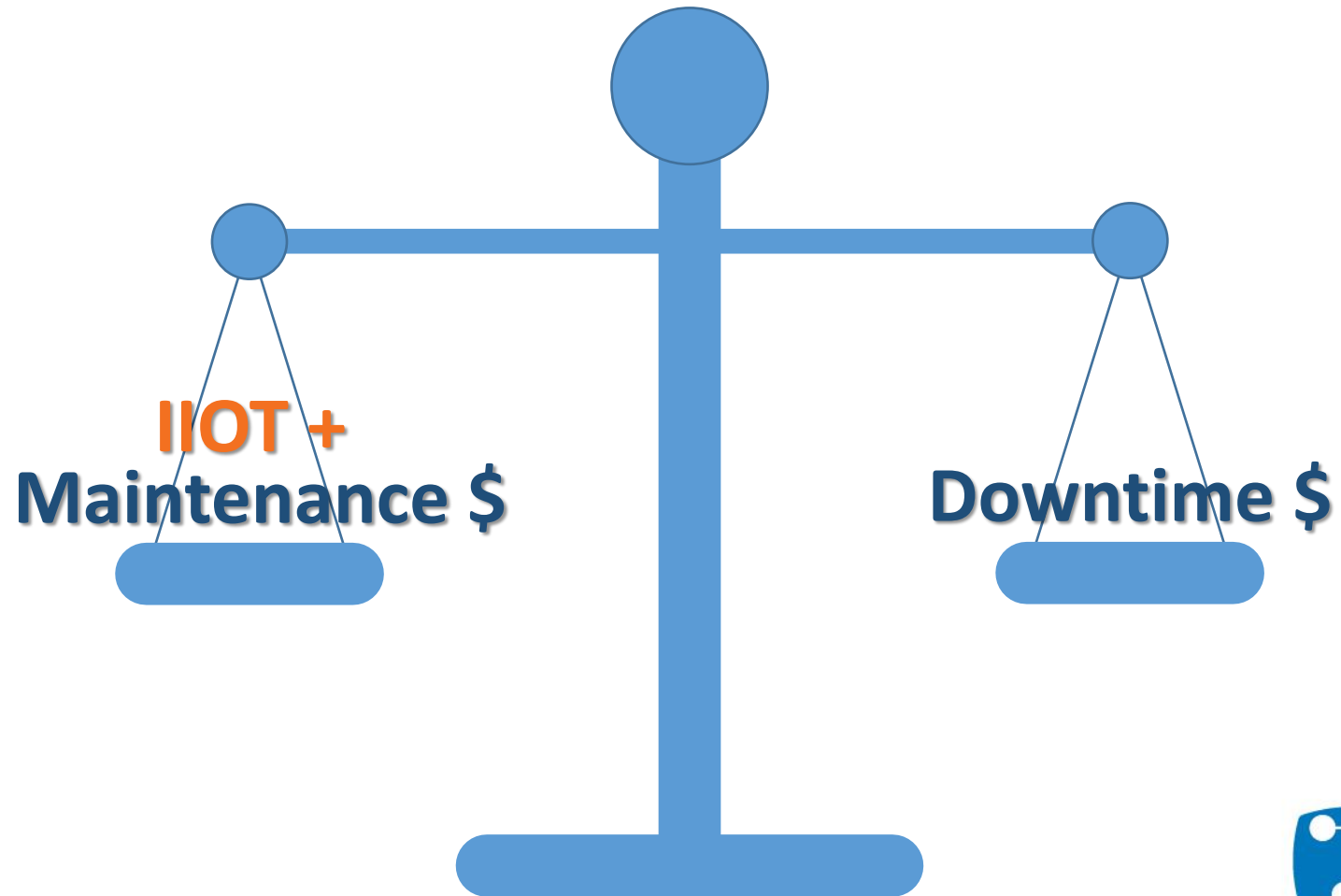
Why do you need IIoT?

Wasteful maintenance spend...



Why do you need IIoT?

Optimizing your maintenance dollars



Why do you need IIoT?

The bottom line #1

\$20 Billion

The cost of unplanned downtime in process industries per year

Why do you need IIoT?

The bottom line #2



70% of All Workplace Injuries Happen During Reactive Maintenance

Recent data (Figure 2), presented by Wim Vancauwenbergh [1] of the Belgian Maintenance Association (BEMAS) at last year's SMRP (Society for Maintenance and Reliability Professionals) annual conference shows the jobs on the rate of accidents with injuries; and subsequent reduction in injuries as the percentage of planned work increases.

The IIoT Challenge

Why do so many IIoT projects fail?

- 74% of all IoT projects fail to meet expectations
 - 2017 Cisco survey of 1,845 decision makers
- Three reasons why Industrial IoT projects fail:
 1. Solutions often solve single-issue problems in isolation
 2. Solutions often lack scalability
 3. Solutions often fail to integrate with legacy systems or networks



The IIoT Challenge

Challenge 1: Solutions often solve problems in isolation

- Many IIoT systems are designed to solve one problem
 - Vibration analysis, for example
 - Often, a second system is required to solve a second problem
- This leads to user confusion and poor adoption
 - Too many different dashboards, no unified data architecture
- IIoT needs systems that can ingest data from a wide variety of sources and reliably and seamlessly share data & analysis with a wide variety of new *and* legacy systems



The IIoT Challenge

Challenge 2: Solutions often lack scalability

- Many IIoT systems make it easy to do a simple proof of concept, but difficult to scale to a plant-wide rollout
- Spiraling and confusing cost structures, IT concerns, and inability to address multiple applications impede scaling
- IIoT needs systems that can quickly and easily scale from proof of concept to full-plant rollout by using existing and trusted methods to connect devices in-plant



The IIoT Challenge

Challenge 3: Solutions don't integrate with legacy systems

- Many IIoT systems require users to learn new methods for collecting, processing, and displaying data and information
- Most facilities have millions of dollars invested in legacy automation equipment (PLC, SCADA, HMI, etc.)
- IIoT needs systems that can natively integrate with control systems in both new and old facilities



The IIoT Challenge

Solution: Flexible Data + Intelligence + Seamless Integration



- A successful IIoT solution will hinge on:
 - Data that's easy to gather
 - Analysis that makes for easy decisions
 - Technology that is easily integrated with legacy systems
- What this solution can bring to your facility:
 1. Ability to tackle almost any application
 2. Ability to scale as sensing needs or business drivers change
 3. Ability to integrate with both legacy and cutting-edge systems

The IIoT Solution

GraceSense™ Predictive Maintenance



We enable asset managers to monitor critical equipment:

- Robust wireless sensor hardware handles nearly all industrial applications
- Cloud-based data storage, analysis, and visualization
- Real-time alerts contain customizable remediation instructions

We save our customers money by minimizing unplanned downtime and enabling optimal maintenance budget allocation

The IIoT Solution

GraceSense™ Predictive Maintenance

Hot Spot Monitor

Non-conductive
temperature



Field Mount

Vibration &
Temperature



Panel Mount

Customizable nodes
and gateways



Maintenance Hub

Data visualization,
analysis, and alerting



The IIoT Solution

How can sensor technology drive better maintenance?



- Four Keys to a Successful IIoT Solution:
 1. **Comprehensive** data collection capabilities
 2. Ability to produce **actionable** information
 3. Ability to deliver **meaningful** alarms and alerts
 4. **Seamless** integration with existing control systems

The IIoT Solution

Key #1: *Comprehensive* data collection capabilities



- Each asset requires a different sensing approach
 - Electrical systems: voltage, frequency, current, power quality
 - Rotating equipment: vibration, current, temperature
 - Structural systems (cranes/etc): strain, vibration
 - Air handlers: temperature, differential pressure, air flow
 - Conveyors, presses, robots, etc: sensors vary by application
- A single, flexible system creates best chance for success

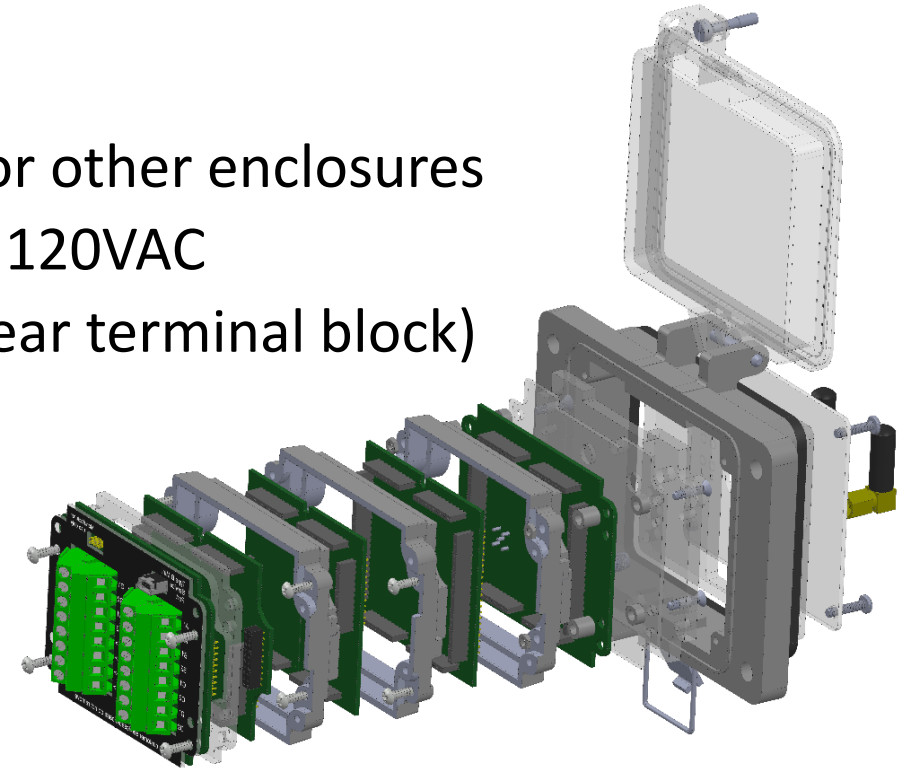
The IIoT Solution

Key #1: Comprehensive data collection capabilities



• Panel Mount Nodes

- Familiar, easy-to-install K size GracePort® housing or other enclosures
- Replaceable long-life battery (5+ year life), 24VDC, 120VAC
- Completely customizable transducer options (via rear terminal block)
 - Accelerometers, RTD, CT, Rogowski Coils, Flow, Pressure, Strain, Humidity, Fluid Level
- IP65, UL Type 4, 4X, 12 & 13



• Panel Mount Gateways

- Can add LTE, WiFi, EtherNet/IP, Modbus TCP/IP for data delivery

The IIoT Solution

Key #1: Comprehensive data collection capabilities



G-AA1DA0-W1W2-K3B1

Sensor Interface Option 1

Sensor Interface Option 2

Communication Interface Option 1

Communication Interface Option 2

Housing Option

Battery Type

Sensor Interface Options: (Choose up to two)	
CODE	OPTION
XX	No Application Interface (CloudGate only)
AA1	(2) 10kΩ inputs (thermistor) and (4) 0-10 VDC Inputs, 12 bit
AA2	(2) 10kΩ inputs (thermistor) and (4) 0-10 VDC Inputs, 16 bit
AB2	(4) 4-20 mA 16 bit
AC2	(4) 3-Wire RTD's 16 bit
AD2	(3) 4-Wire RTD's 16 bit
AE2	(6) Thermocouples, 16 bit
AF3	(2) Triaxial Accelerometers, 16 bit + Stream Processing
AG3	(4) Single Axis Accelerometers, 16 bit + Stream Processing
DA0	(1) I2C Port, (1) RS 485 Port, (1) SPI Port
EIP	EtherNet/IP™

Communication Interface Options: (Choose up to two)	
CODE	OPTION
XX	No Wireless Communication
W1	802.15.4 (Zigbee compatible)
W2	WiFi 802.11 b/g/n
E1	Ethernet
C1	AT&T® LTE (standard)
C2	Verizon® LTE

Housing Options: (Choose one)	
CODE	OPTION
K2	Type 4X, Panel-Mount Housing
K3	Type 4, Panel-Mount Housing
K4	Type 12, Panel-Mount Housing

Battery Type Options: (Choose one)	
CODE	OPTION
XX	No Battery
B1	2800mAh Non-Rechargeable Lithium Metal Battery



Multiple sensor procurement options available. Please call us at 1-800-280-9517 for details.

The IIoT Solution

Key #1: *Comprehensive* data collection capabilities

- **HotSpot Monitor (HSM)**

- Power is your most critical asset (no power = no motion)
- Non-conductive, fiber-optic temperature sensing
- Low / medium / high voltage systems
- Continuous monitoring
- Inaccessible locations
- Reduced risk
- Better maintenance planning



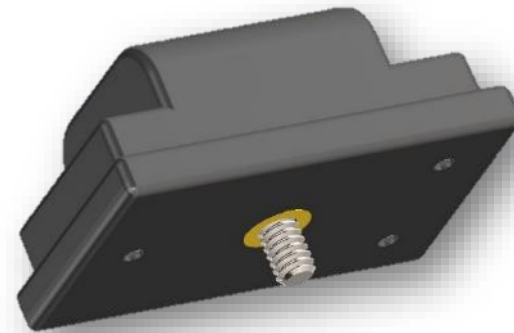
The IIoT Solution

Key #1: *Comprehensive* data collection capabilities

• **Wireless Vibration & Temperature Sensor (VBT1 & VBT2)**

- 3 axis acceleration and/or temperature
- Replaceable long-life battery (3-5 year life)
- ZigBee-compatible wireless connectivity
- Stud, epoxy, fin and magnetic mounts
- Wireless range - 30m LOS
- 1.5" x 1.5" x 2.5"

- **VBT1:** 800Hz bandwidth
- **VBT2:** 4.6kHz (X,Y), 2.2kHz (Z)



The IIoT Solution

Key #2: Ability to produce *actionable* information

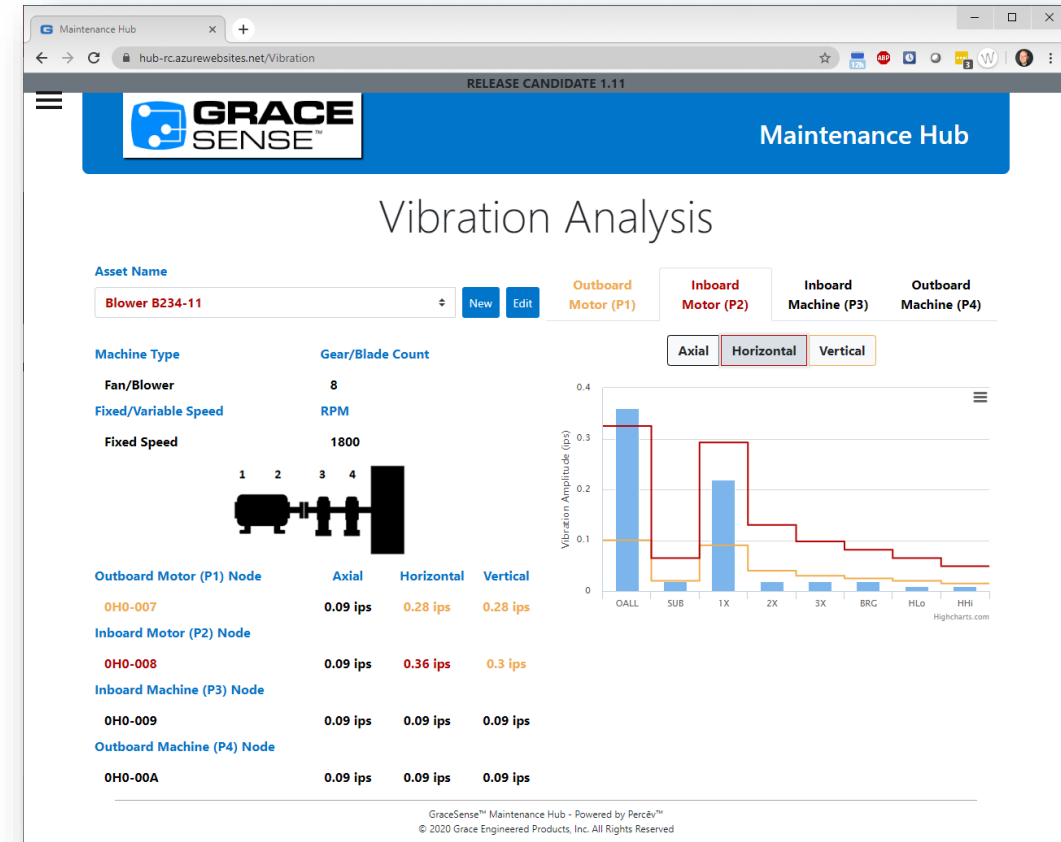


- Data often needs to be in one place to be actionable
 - We don't want separate systems for power monitoring, vibration monitoring, high value asset monitoring
 - Necessary to look at multiple data trends to make decision
- Data often needs to be processed to be actionable
 - Data glut can lead to system indifference or general distrust
 - Systems need to enhance raw sensor data with domain expertise

The IIoT Solution

Key #2: Ability to produce *actionable* information

- Patented Stream Processing Engine (SPE) for embedded analysis on the edge
 - Statistical Oversampling converts high-rate data into low bandwidth actionable information
 - Programmable edge processor can provide application specific intelligence (frequency analysis, damage identification, etc).
- Edge Processing = Longer battery life, lower bandwidth



The IIoT Solution

Key #3: Ability to deliver *meaningful* alarms and alerts



- Notifications need to do more than alert to a threshold crossing
 - Transfer asset-specific knowledge to recipient
 - Provide indication of actual problem with suggested solutions
- Needs to target labor and management in different ways
 - SMS / CMMS for those maintaining equipment
 - E-mail, visualizations, and high-level reports for managers
 - API availability for integration with existing maintenance software

The IIoT Solution

Key #3: Ability to deliver *meaningful* alarms and alerts

- **Maintenance Hub**

- Data Visualization
- Alerts/Alarming
- Secure Transmission
- Scalable Architecture
- Custom Dashboards
- RESTful API
- On-Premise Options

The screenshot displays the GraceSense Maintenance Hub interface. On the left, an alert is shown: "Warning: Class B Motor Overheating" with a summary stating "The motor is exceeding its rated operating temperature." The alert was triggered on 10/18/2018 at 5:36:52 PM and sent at 5:39:01 PM. The data channel is identified as "Grace Engineered Products: Router Room Temperature Probe" with a sensor reading of 132.8°C.

The main dashboard area shows a "Normal" system status and "0 / 2 Active Nodes". A tree view lists the following components and their status:

- Grace Engineered Products (22 nodes)
- Router Room (22 nodes)
- Vacuum Feeder (0249*) (6 nodes)
 - Battery Voltage: 3.809 V (green arrow)
 - Bootup Value: 3132 (green arrow)
 - Local Signal Strength: -84.00 dBm (green arrow)
 - On-Board Thermistor: 26.57 °C (green arrow)
 - Temperature Probe: 19.42 °C (green arrow)
 - WiFi Signal Strength: -87.00 dBm (green arrow)
- Vacuum Vibration (248) (16 nodes)

Below the tree view, a "Recommended Actions" section includes "Step 1: Visually inspect the motor to determine if anything is obstructing airflow or its ability to dissipate heat." An inset image shows a close-up of a motor with a red arrow pointing to a specific component.

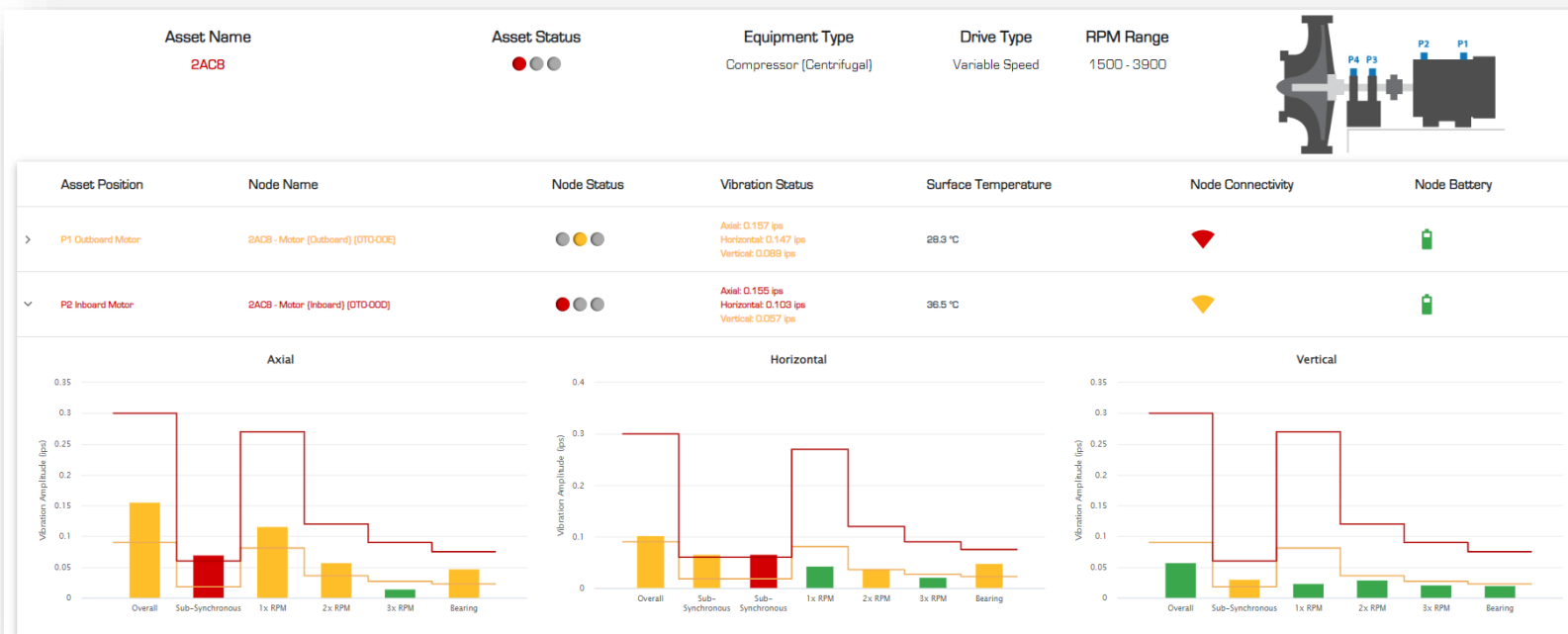
The bottom right of the dashboard features a "Maintenance Hub" section with a line graph showing "Temperature Probe" data for the "Vacuum Feeder (0249*)" from March to November. The graph shows a peak in temperature around July. Below the graph are "Export XLS" and "Export CSV" buttons.

The IIoT Solution

Key #3: Ability to deliver *meaningful* alarms and alerts

• Vibration Analysis

- Present data like a vibration analyst (but hourly not monthly)
- Tie alarms and alerts to physical assets (not individual sensors)
- Provide easy to decipher banded vibration plots

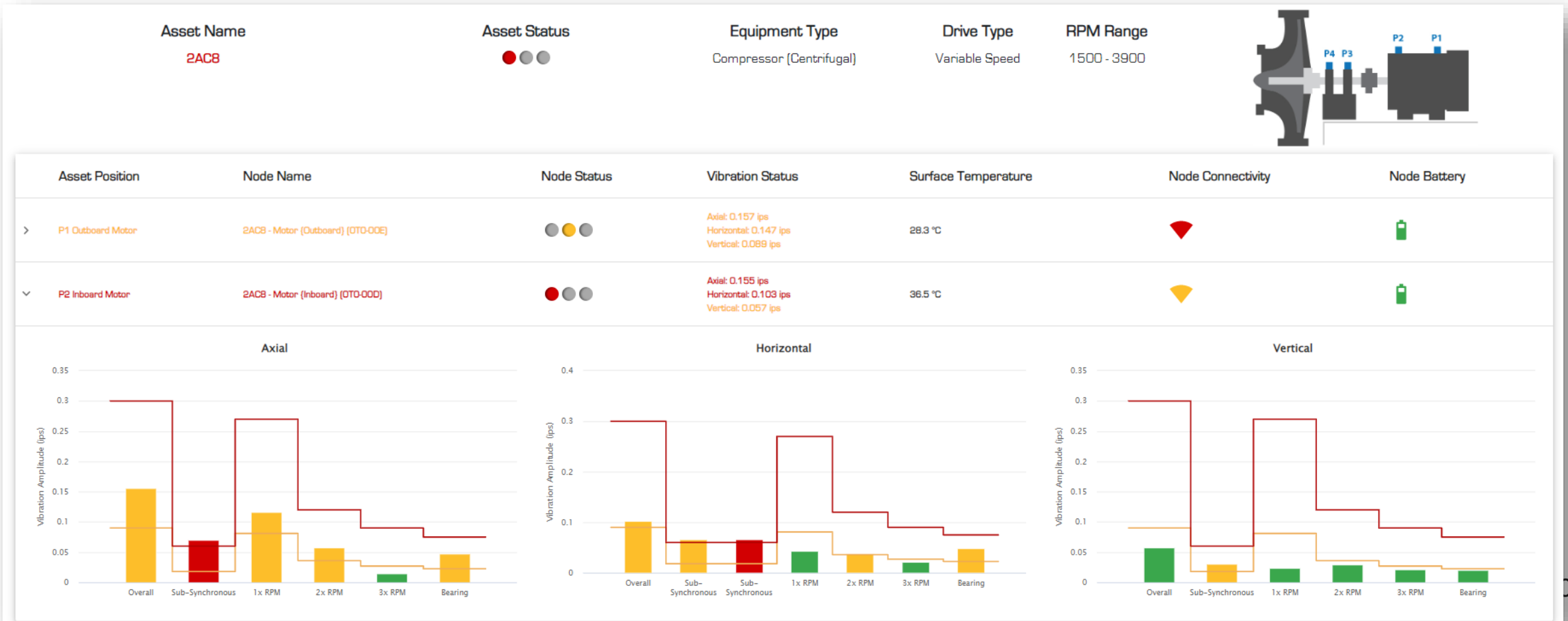


The IIoT Solution

Key #3: Ability to deliver *meaningful* alarms and alerts



• Vibration Analysis

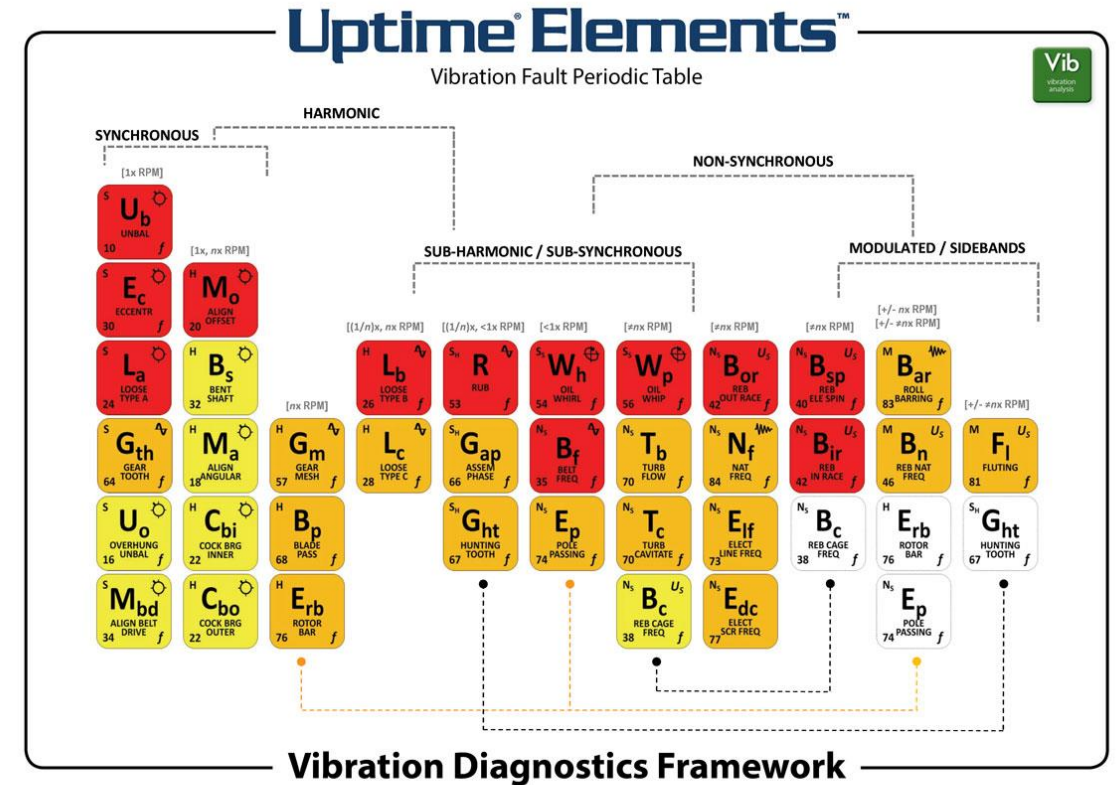


The IIoT Solution

Key #3: Ability to deliver *meaningful* alarms and alerts

• Defect Classification (Q2 2023)

- Present likely equipment faults that are causing alarming data trends
- Present alarm color first, defect expectation second, data third



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reliabilityweb.com • maintenance.org • reliabilityleadership.com

The IIoT Solution

Key #4: *Seamless* integration with existing control systems



- In the industrial market, 75%+ of IoT users want integration
 - Tremendous amount of legacy automation equipment
 - Enormous investment in existing PLC/SCADA/DCS systems
 - Comfort working with distributors and system integrators
 - Hesitancy to work with “disruptive” technologies

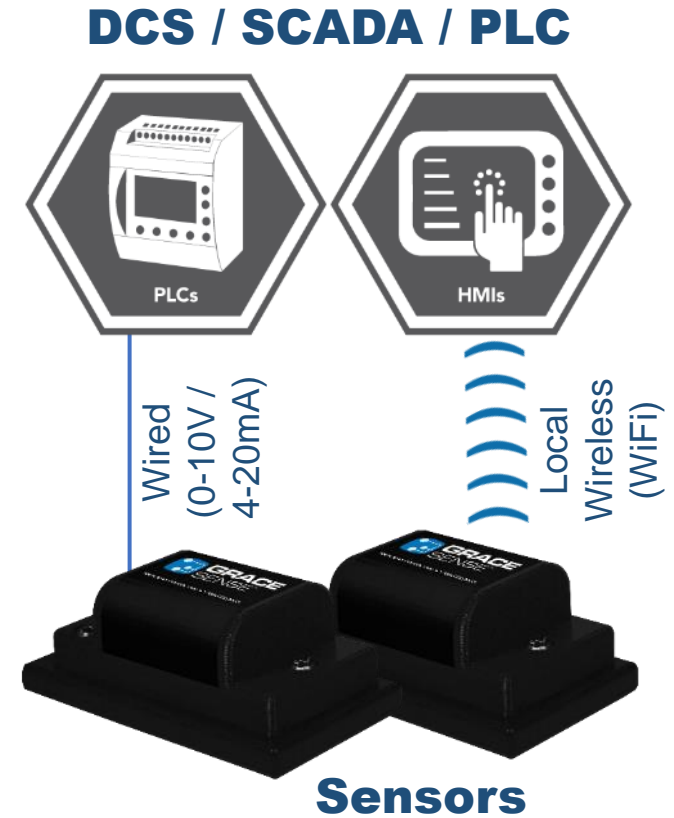
The IIoT Solution

Key #4: *Seamless* integration with existing control systems



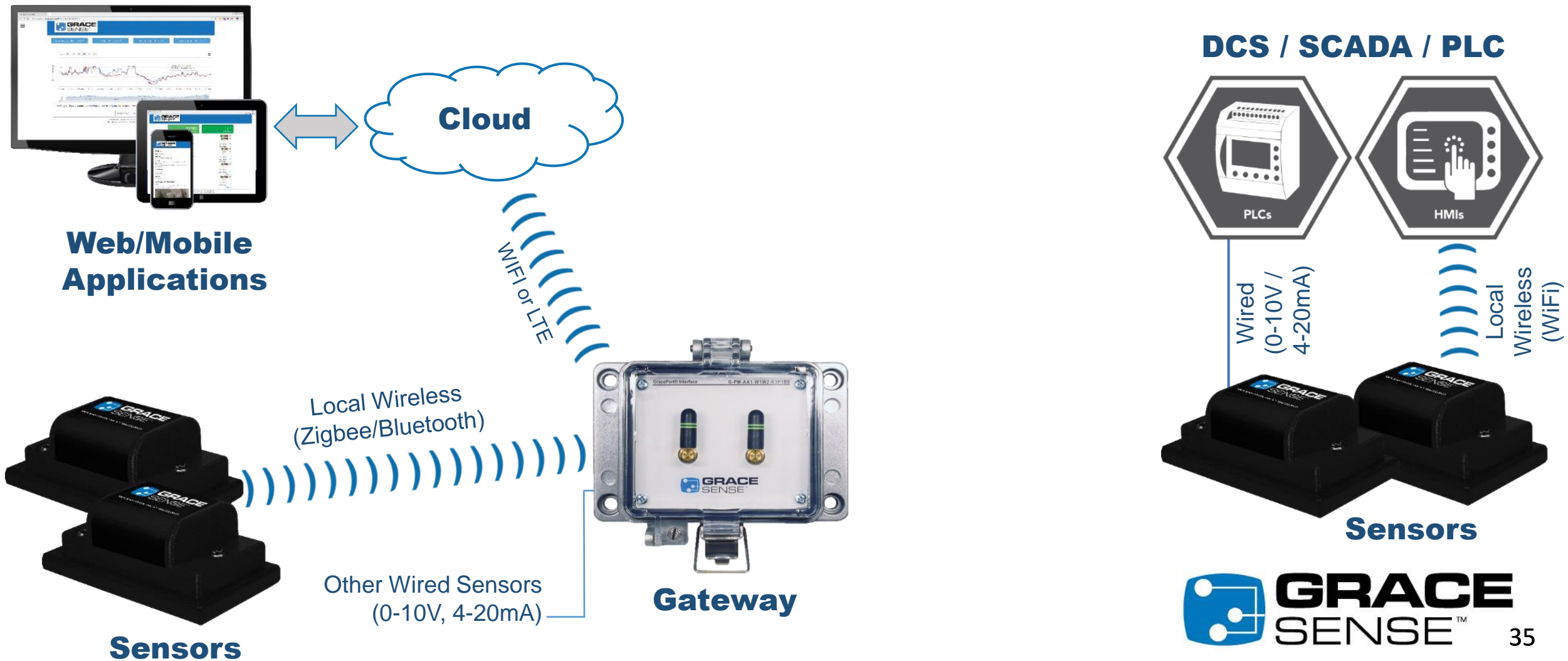
The IIoT Solution

Key #4: *Seamless* integration with existing control systems



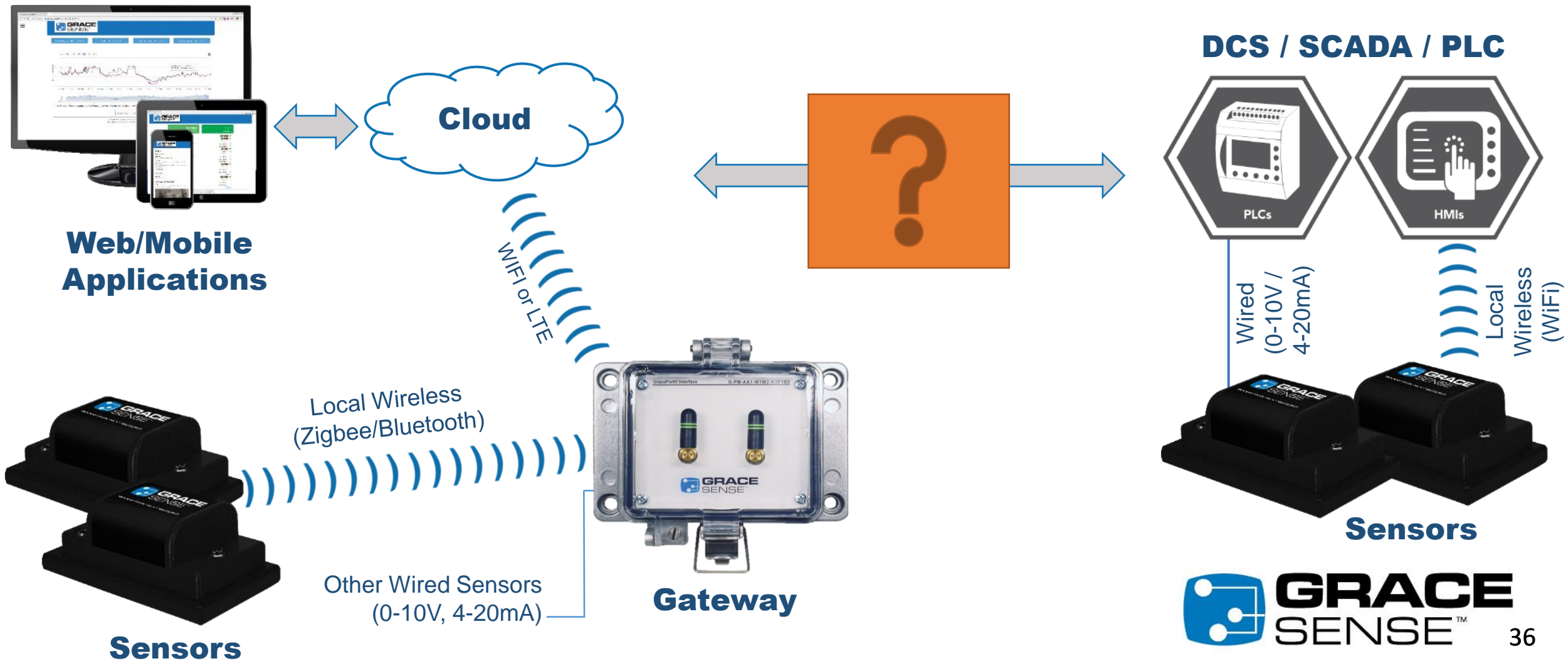
The IIoT Solution

Key #4: *Seamless* integration with existing control systems



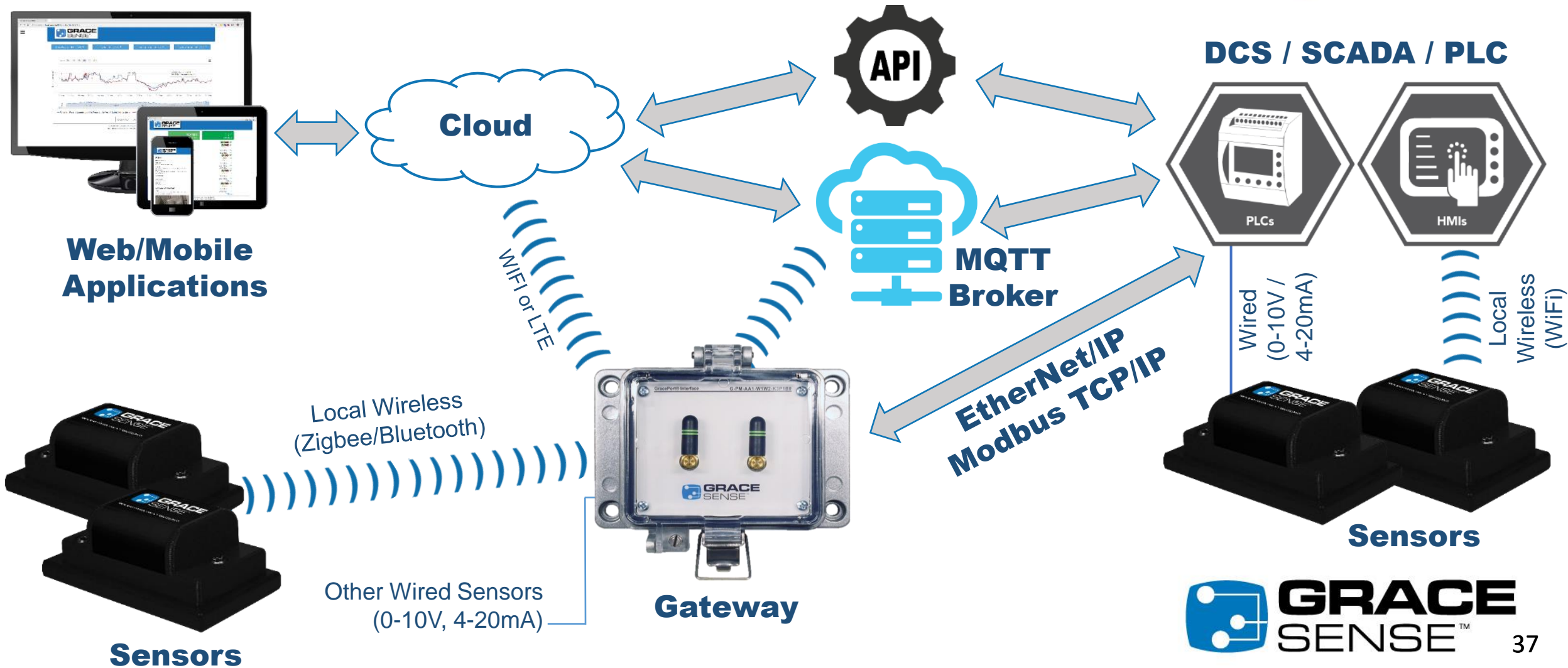
The IIoT Solution

Key #4: *Seamless* integration with existing control systems



The IIoT Solution

Key #4: *Seamless* integration with existing control systems



The IIoT Solution

Key #4: *Seamless* integration with existing control systems



Busbar Temperature



2-Wire
Modbus RTU



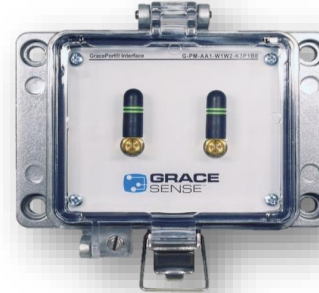
Ambient Temperature
Motor Current



Wireless
802.15.4 (Zigbee)



Wireless
802.11 (WiFi)



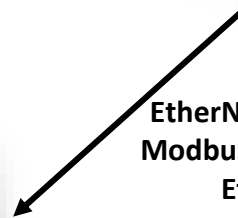
Wireless
802.15.4 (Zigbee)



Motor Temperature
Motor Vibration



EtherNet/IP™,
Modbus TCP/IP,
Etc.



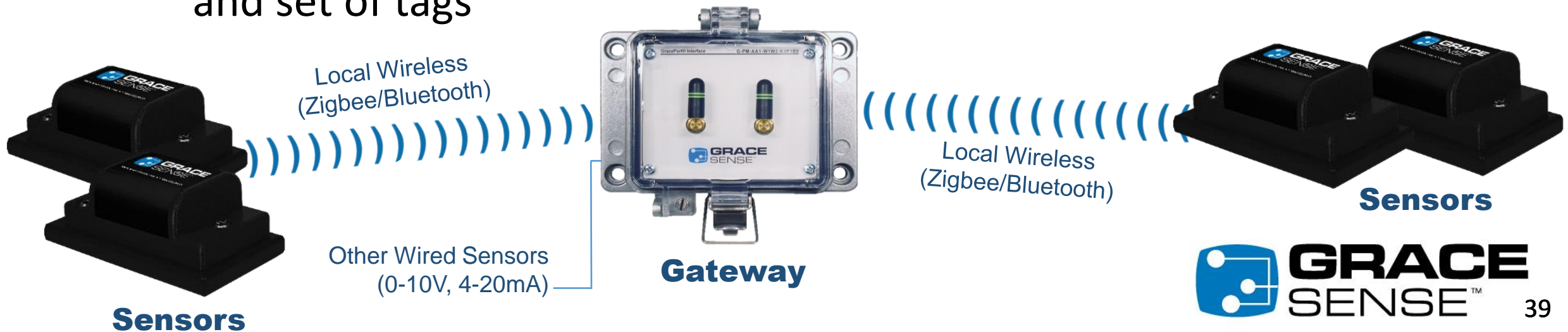
EtherNet/IP™,
Modbus TCP/IP,
Etc.



Integrating IIoT with your PLC

The EtherNet/IP Configuration Challenge

- IIoT Systems are by their very nature distributed and hard to describe with a standard memory map
 - The Gateway (EtherNet/IP device) needs to hold configuration and data for all connected sensors, even if sensor network changes
 - Each Gateway, therefore, must support a completely unique map and set of tags



Integrating IIoT with your PLC

The EtherNet/IP Configuration Challenge



- In the Rockwell Automation environment, configuration space is limited
 - CompactLogix™ PLCs only have 400 bytes of space per device
- Add-on Profile is one option
 - But a fully featured AOP is static and difficult to update for new IIoT features that are frequently brought online
- IIoT Systems must find a way to allow PLCs to host configurations & data without sacrificing IIoT modularity

Integrating IIoT with your PLC

The GraceSense™ Approach – Easy Cloud Configuration

- Step 1: Set up each vibration node

- Asset/Location Name
- X,Y,Z Axis Alignment
- Acceleration Range
- Sampling Rate
- Desired Analysis
 - Banded amplitudes, etc.

Rename Node

Old Name
Demo VFD System: VFD System - Near Bearing (OR0-006)

New Name
New Node Name

Close Save Changes

Configure

Axis Alignment
X: Axial, Y: Vertical, Z: Horizontal

Acceleration Range
±4g's

Vibration Sampling Rate
5 Minute

Analysis Type
Advanced Analysis

	OALL ?	SUB ?	1x ?	2x ?	3x ?	BRG ?	HLo ?	HHi ?
X Amplitude	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
X Frequency	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Y Amplitude	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Y Frequency	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Z Amplitude	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Z Frequency	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Phase	GBF x1	GBF x2	GBF x3				
X Axis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
Z Axis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
Y Axis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				

Close Save Changes

Integrating IIoT with your PLC

The GraceSense™ Approach – Easy Cloud Configuration



- Step 2: Map Vibration Nodes To Control Gateways
 - Drag and drop makes this step easy

Assigned

- ✓ Grace Technologies Onsite Deployments
 - ✓ Demo VFD System: G-EIP-W1C2-K3XX (0Q0-005)*
 - > Diagnostics
 - > Demo VFD System: VFD System - Inboard Motor (0R0-005)
 - > Demo VFD System: VFD System - Near Bearing (0R0-006)
 - ✓ Exhaust Fans: G-MIP-W1W2-K3XX (0R0-00E)*
 - > Diagnostics
 - > Exhaust Fans: Lower Exhaust Fan - Blower Housing (0R0-007)
 - > Exhaust Fans: Lower Exhaust Fan - Inboard Motor (0R0-008)
 - > Exhaust Fans: Upper Exhaust Fan - Blower Housing (0R0-009)
 - > Exhaust Fans: Upper Exhaust Fan - Inboard Motor (0R0-00A)

Unassigned

- ✓ Grace Technologies Onsite Deployments
 - ✓ Demo VFD System
 - G-AA1DA0-W1-K3B1 (0R0-00D)
 - G-AA1DA0-W1-K3B1 (0R0-00D)

Integrating IIoT with your PLC

The GraceSense™ Approach – Easy Cloud Configuration

- Step 3: Export Appropriate Files

- For Allen Bradley PLCs (Studio 5000), either AOP XML or EDS and L5X
- For other PLCs, Modbus TCP/IP memory map and config tool

GRACE SENSE™ Maintenance Hub

ControlGate Configuration (Beta)

Assigned

- Grace Technologies Onsite Deployments
 - Order # 20006508: G-EIP-W1W2-K3XX (010-004) Edit
 - Rename
 - Configure Node
 - Export EDS
 - Export L5X
 - Export AOP XML
 - Export Memory Map
 - Download Modbus TCP/IP Configuration Tool
 - Order # 21002637: G-MIP

Unassigned

- Grace Technologies Onsite Deployments
 - Order # 1
 - Order # 20006887
 - Order # 21002637

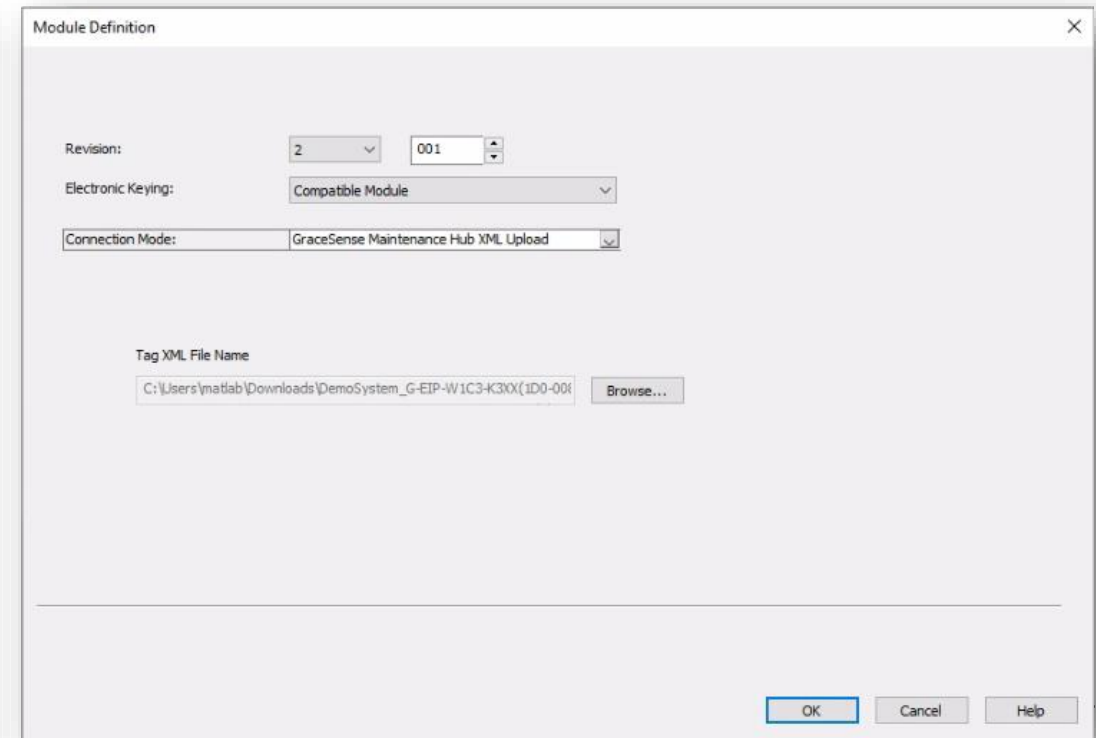
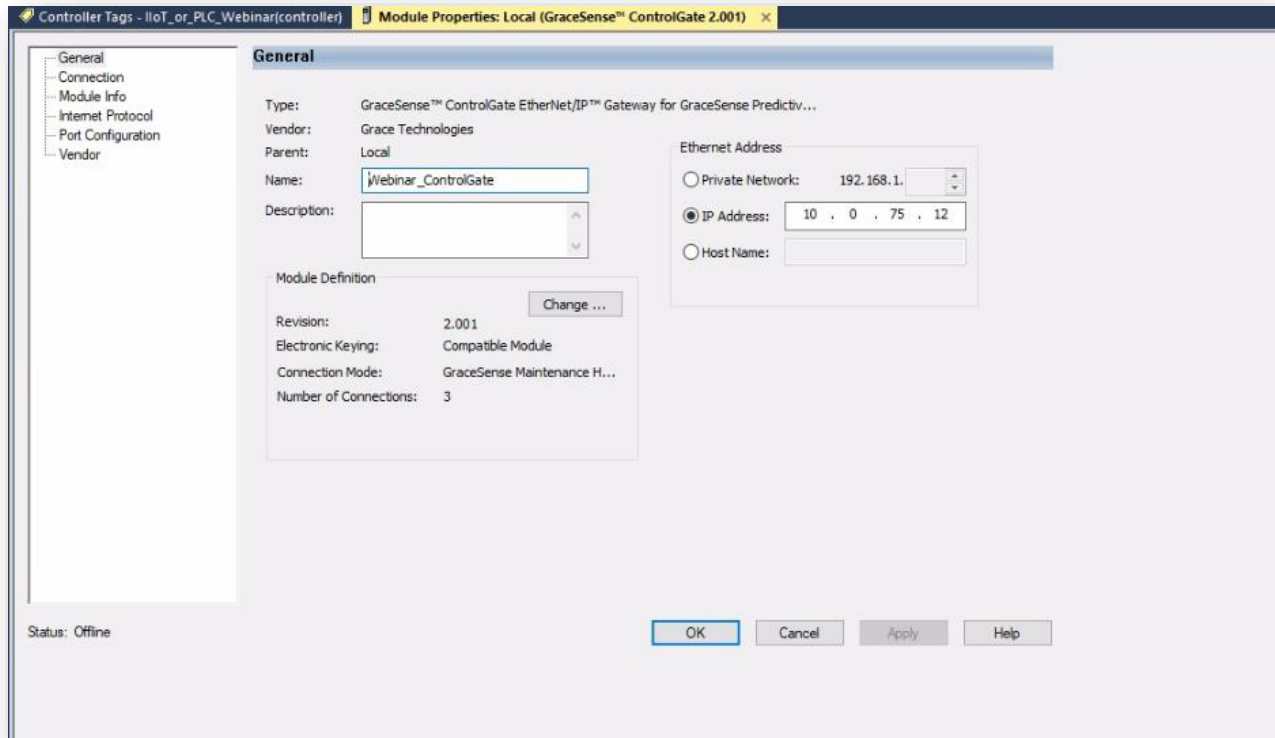
```
<?xml version="1.0" encoding="utf-8"?>
<RSLogix5000Content xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" SchemaRevision="1.0" SoftwareRevision="29.00"
TargetName="MainRoutine" TargetType="Routine" TargetSubType="RLL" ContainsContext="true" Owner="Windows User, Grace Engineered Products" ExportOptions="References
NoRawData L5KData DecoratedData Context Dependencies ForceProtectedEncoding AllProjDocTrans">
  <Controller Use="Context" Name="MainController">
    <DataTypes>
      <DataType Name="StatusInfo" Family="NoFamily" Class="User">
        <Description><![CDATA[Current Status]]></Description>
        <Members>
          <Member Name="StatusRegister" DataType="SINT" Dimension="0" Radix="Hex" Hidden="false" ExternalAccess="Read/Write" />
          <Member Name="ConnectionFaulted" DataType="BIT" Dimension="0" Radix="Decimal" Hidden="false" Target="StatusRegister" BitNumber="0" ExternalAccess=
            Read/Write />
          <Member Name="RESERVED1" DataType="BIT" Dimension="0" Radix="Decimal" Hidden="true" Target="StatusRegister" BitNumber="1" ExternalAccess="Read/Write" />
          <Member Name="RESERVED2" DataType="BIT" Dimension="0" Radix="Decimal" Hidden="true" Target="StatusRegister" BitNumber="2" ExternalAccess="Read/Write" />
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          <Member Name="RESERVED8" DataType="SINT" Dimension="0" Radix="Hex" Hidden="true" ExternalAccess="Read/Write" />
          <Member Name="ErrorCode" DataType="INT" Dimension="0" Radix="Decimal" Hidden="false" ExternalAccess="Read/Write" />
        </Members>
        <Dependencies />
      </DataType>
      <DataType Name="ConnectivityInfo" Family="NoFamily" Class="User">
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        <Dependencies />
      </DataType>
      <DataType Name="SystemConfig_080_006" Family="NoFamily" Class="User">
        <Description><![CDATA[System Configuration]]></Description>
      </DataType>
    </DataTypes>
  </Controller>
</RSLogix5000Content>
```

Integrating IIoT with your PLC

The GraceSense™ Approach – Easy Cloud Configuration



- Step 4: Import downloaded files into Studio 5000
 - This will map the gateway memory map to vibration-specific tags, regardless of the network or node configurations



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- Step 5: Use custom tags in your program!

Name	Value	Force Mask	Style	Data Type	Description	Constant
Local:1:0	[...]	[...]	[...]	AB:Embedded_Discre...		<input type="checkbox"/>
Webinar_ControlGate:C	[...]	[...]	[...]	GT:GraceSense_DF538...		<input type="checkbox"/>
Webinar_ControlGate:1	[...]	[...]	[...]	GT:GraceSense_7CC1...		<input type="checkbox"/>
Webinar_ControlGate:1.ConnectionFaulted	0		Decimal	BOOL		
Webinar_ControlGate:1.GEIPW1C3K3XX1D0008	[...]	[...]	[...]	GT:NodeData1D0008,...	Node Data	
Webinar_ControlGate:1.GEIPW1C3K3XX1D0008.Status	[...]	[...]	[...]	GT:StatusInfo_96FA00...	Current Status	
Webinar_ControlGate:1.GEIPW1C3K3XX1D0008.Status.StatusRegister	16#00		Hex	SINT	Current Status	
Webinar_ControlGate:1.GEIPW1C3K3XX1D0008.Status.ConnectionFaulted	0		Decimal	BOOL	Current Status	
Webinar_ControlGate:1.GEIPW1C3K3XX1D0008.Status.ErrorCode	271		Decimal	INT	Current Status	
Webinar_ControlGate:1.GEIPW1C3K3XX1D0008.Status.BatteryVoltage	5.1004395		Float	REAL	Current Status	
Webinar_ControlGate:1.GEIPW1C3K3XX1D0008.Connectivity	[...]	[...]	[...]	GT:ConnectivityInfo_...	Wireless Data	
Webinar_ControlGate:2	[...]	[...]	[...]	GT:GraceSense_A36D...		<input type="checkbox"/>
Webinar_ControlGate:2.ConnectionFaulted	0		Decimal	BOOL		
Webinar_ControlGate:2.GFMVBT1D0007	[...]	[...]	[...]	GT:NodeType5Data_F...	Node Data	
Webinar_ControlGate:2.GFMVBT1D0007.Status	[...]	[...]	[...]	GT:StatusInfo_96FA00...	Current Status	
Webinar_ControlGate:2.GFMVBT1D0007.Connectivity	[...]	[...]	[...]	GT:ConnectivityInfo_...	Wireless Data	
Webinar_ControlGate:2.GFMVBT1D0007.SurfaceTemperature	22.289062		Float	REAL	Node Data	
Webinar_ControlGate:2.GFMVBT1D0007.DetectedRPM	1687.0		Float	REAL	Node Data	
Webinar_ControlGate:2.GFMVBT1D0007.XOverallAmplitude	5.18798828e-003		Float	REAL	Node Data	
Webinar_ControlGate:2.GFMVBT1D0007.XSubSynchronousAmplitude	0.003967285		Float	REAL	Node Data	
Webinar_ControlGate:2.GFMVBT1D0007.X1xRPMAmplitude	1.52587891e-003		Float	REAL	Node Data	
Webinar_ControlGate:2.GFMVBT1D0007.X2xRPMAmplitude	1.52587891e-003		Float	REAL	Node Data	
Webinar_ControlGate:2.GFMVBT1D0007.X3xRPMAmplitude	1.83105469e-003		Float	REAL	Node Data	
Webinar_ControlGate:2.GFMVBT1D0007.XBearingAmplitude	1.22070312e-003		Float	REAL	Node Data	
Webinar_ControlGate:2.GFMVBT1D0007.YOverallAmplitude	7.32421875e-003		Float	REAL	Node Data	
Webinar_ControlGate:2.GFMVBT1D0007.YSubSynchronousAmplitude	0.007019043		Float	REAL	Node Data	
Webinar_ControlGate:2.GFMVBT1D0007.Y1xRPMAmplitude	1.52587891e-003		Float	REAL	Node Data	
Webinar_ControlGate:2.GFMVBT1D0007.Y2xRPMAmplitude	1.22070312e-003		Float	REAL	Node Data	
Webinar_ControlGate:2.GFMVBT1D0007.Y3xRPMAmplitude	6.10351562e-004		Float	REAL	Node Data	
Webinar_ControlGate:2.GFMVBT1D0007.YBearingAmplitude	9.15527344e-004		Float	REAL	Node Data	
Webinar_ControlGate:2.GFMVBT1D0007.ZOverallAmplitude	0.007019043		Float	REAL	Node Data	
Webinar_ControlGate:2.GFMVBT1D0007.ZSubSynchronousAmplitude	6.40869141e-003		Float	REAL	Node Data	
Webinar_ControlGate:2.GFMVBT1D0007.Z1xRPMAmplitude	1.52587891e-003		Float	REAL	Node Data	

Conclusion

Presentation Summary

- IIoT has massive potential in the automation space
 - Augment the gap in the skilled maintenance
 - Help prevent the expense of unexpected downtime
- IIoT decisions are complex and multi-faceted
 - Poor integration with legacy systems may hinder project success
 - Reinforcing existing habits much easier than forming new ones
- Successful IIoT Systems must find a way to:
 - Flexibly collect data
 - Intelligently turn that data into information
 - Make that information available to the right people
 - Integrate seamlessly with existing technologies

Thank you!

Grace Technologies

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