



# ISA100 WCI Webinar

Webinar date: 20 May 2020.

The presentation will begin at 11:00 New York Time (UTC-4)

## Speed Up ISA100 Wireless Product Development with the WCI Rapid Development Kit

Presenter: **Robert Assimiti**  
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# Agenda

1. About the speaker
2. Developing and Marketing a Wireless Instrument
3. Why ISA100
4. Current Status Quo
5. ISA100 Wireless RDK Highlights
6. WCI RDK Training Course Highlights
7. Summary
8. Q&A



# About the Speaker



## Robert Assimiti

Member of the WCI  
Technical Steering and  
Strategy committees

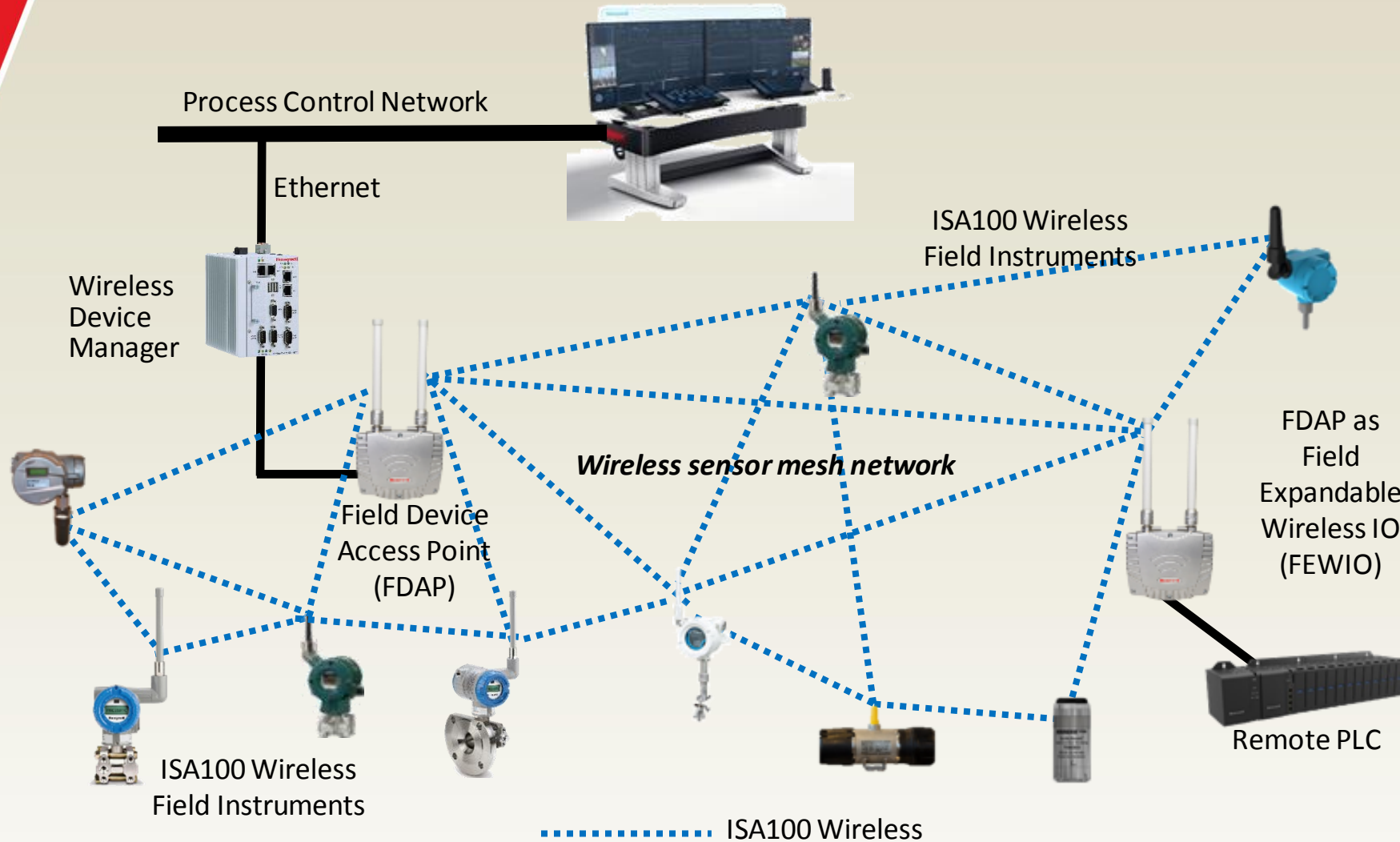


Co-Founder and CEO  
Centero



Robert Assimiti has over 15 years of technical leadership in the wireless arena. He has architected and developed several highly-scalable, mesh based wireless product lines for the last 15 years for both commercial and industrial wireless markets. He manages a team of technologists focused on the creation of new technologies, standardization and generation of novel intellectual property. He has also authored and co-authored several patents. Robert defines Centero's current and future technical strategic market position. He also oversees strategic partnerships, the integration of new business models, the incubation of new technologies and the cultivation of world-class talent. Robert is also an active member of the WCI Technical Steering and Strategy committees. He holds a Bachelor Degree in Computer Engineering from the Georgia Institute of Technology.

# Introduction to Industrial Wireless



## Applications examples

- Machine health monitoring
- Basic process control
- Monitoring of well heads
- Remote process monitoring
- Leak detection monitoring
- Diagnosis of field devices
- Condition monitoring of equipment
- Environmental monitoring
- Tank level monitoring
- Gas detection
- Fuel tank gauging
- Steam trap monitoring
- Open loop control
- Stranded data capture
- And more

# ISA100 Wireless Fast Facts

- International standard IEC 62734 since 2014
- Complies with ETSI EN 300 320 v1.8.1 (LBT)
- End-User Driven Standard - meeting all current and future industrial needs
- Sensor routing or field routers for best performance – Freedom of choice
- Broad Multi-Vendor Portfolio of ISA100 Wireless Devices
- ISA100 Wireless enables SIL-2 Certification
- Ensured Interoperability - best-in-class solutions from best-in-class suppliers
- Readily available ISA100 Wireless Modules and Stacks
- Enable fast-track development and go to market

# Benefits of ISA100 Wireless Instrumentation

Cost Savings	<ul style="list-style-type: none"><li>• Up to 90% of installed cos of conventional measurement technology can be for cable conduit and related construction</li><li>• Typically: 1/2 the costs, 1/5 of the time</li><li>• New and scaled applications are now economically feasible</li></ul>
Improved Reliability	<ul style="list-style-type: none"><li>• Wired sensors may be prone to failure in difficult environment</li><li>• Wireless can add redundancy to a wired solution</li></ul>
Improved Visibility	<ul style="list-style-type: none"><li>• Condition monitoring of secondary and remote equipment</li><li>• Process monitoring, fast additional data for trouble shooting</li></ul>
Improved Control	<ul style="list-style-type: none"><li>• Add wireless to existing processes for more optimal control</li></ul>
Improved Safety	<ul style="list-style-type: none"><li>• Safety related alarms - end to end SIL2 certifiable</li></ul>

# ISA100 Wireless Product Portfolio

## Infrastructure



### Independent Gateway

- Honeywell, Yokogawa



### Access Point (AP)

- Honeywell, Yokogawa



### Integrated Gateway/AP

- Honeywell, Yokogawa, CDS, Nexcom



### GW/AP + Recorder

- Yokogawa



### Adapter (HART, etc.)

- Honeywell, Yokogawa



## Measurement & Control



### Temperature

- Honeywell, Yokogawa



### Pressure / Flow

- Honeywell, Yokogawa



### Level

- Honeywell, Yokogawa



### DI/DO, AI

- Honeywell, Yokogawa



### Valve Position

- Eltav, Flowserve, Honeywell



## HSE + Life cycle



### Corrosion

- RCS, Honeywell



### Steam Trap

- Spirax Sarco, TLV, Armstrong, Bitherm



### Vibration

- GE's Bently Nevada, Divigraph



### Gas

- GasSecure, Scott Safety, New Cosmos, Riken Keiki



### pH

- Honeywell, Yokogawa



# ISA100 Wireless Adoption Development Eco-system

## WCI ISA100 Wireless Rapid Development Kit

- Everything you need to develop an ISA100 Wireless (IEC 62734) connected field instrument
- Develop ISA100 Wireless (IEC 62734) compliant and certifiable field instruments with minimal effort using application layer code provided
- Includes reference hardware design for ISA100 Wireless (IEC 62734) field instrument implementation
- Certified WISA modules run ISA100 Wireless communication stack
- User friendly SPiN development board includes OLED display and a large variety of sensors



<https://centerotech.com/product/wci-isa100-rapid-development-kit/>



# Online Resources



[www.isa100wci.org](http://www.isa100wci.org)

- Learning Center with White Papers
- Articles, End-user stories, Forum
- Receiving over 20,000 web views per month
- Full list of certified/registered ISA100 Wireless devices
- And more useful content for you and your business

**LinkedIn** [ISA100 Wireless Interest Group](#)

- Latest news, end-user and expert discussions, insights
- 800 members and growing; please join and invite your peers to join as well !
- Receiving over 5,000 web views per month
- **Limited Time Offer: Join the group and you will be entered in a prize draw to win a new iPad**

# ISA100 Wireless Linked Interest Group

## Limited Time Promotion



Scan the QR code and join the ISA100 Wireless LinkedIn group. If you join during our limited time offer, you will be entered in a prize draw to win a new iPad!



# Agenda

1. About the speaker
2. Developing and Marketing a Wireless Instrument
3. Why ISA100
4. Current Status Quo
5. ISA100 Wireless RDK Highlights
6. WCI RDK Training Course Highlights
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8. Q&A



# Why Develop and Market a Wireless Instrument?

- The process automation market has traditionally been conservative and slow to adopt new technologies
- Today, wireless is pervasive and ubiquitous
- The benefits of offering a wireless connected field instrument are simply to attractive
  - Swift ROI – significantly reduced installation costs compared to wired
  - Touch-free maintenance – remote over-the-air provisioning, instrument configuration and upgrades

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# Why ISA100 Wireless – User Driven Technology

- The ISA100.11a standard was architected based on end user's requirements and feedback
- ISA100 Wireless Certified devices and systems incorporate the required underlying technology, architecture and features that address end user desired capabilities and features





# End User's Wireless Adoption Considerations

- For end users to deploy wireless sensor networks in industrial applications the wireless network must be characterized by
  - Highly reliable data communications
  - Ease of deployment and utilization
  - Extensible in the future
  - Vendor interoperability - standards based
  - Sound security
  - Prolonged battery life
  - IP addressability
  - Solution needs to operate in a single plant network



# Technical Primer – Logical Roles



## Field Network

<b>I/O Device</b>	Sources or consumes data. Does not route.
<b>Router</b>	Routes messages for other devices operating in the wireless subnet.



## Infrastructure

<b>Backbone Router</b>	Routes data over the backbone infrastructure.
<b>System Manager</b>	Provides policy-controlled management for all network devices.
<b>Security Manager</b>	Enables, controls and supervises the secure operation of all devices.
<b>Gateway</b>	Provides an application interface between the wireless and the plant network.



## Operational

<b>Provisioning</b>	Provisions devices with configurations required for network operation.
<b>System Time Source</b>	Responsible for maintaining the master time source of the network.

***Note: Devices typically incorporate multiple logical roles.***

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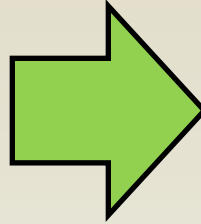


# Problem Statement

- Developing an ISA100 Wireless compliant and certified field instrument used to be a complex undertaking that requires
  - In-depth knowledge of ISA100 application layer concepts and constructs – steep learning curve
  - Significant effort for developing the instrument specific code that resides on the application processor
- This results in slow market adoption and hinders the growth of ISA100 Wireless compliant/certified ecosystem of field instruments

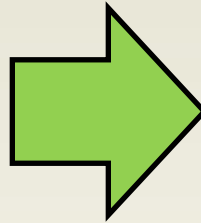
# WCI ISA100 Wireless RDK - Benefits

Includes all Components Needed  
to Develop an ISA100 Wireless  
Instrument



Simplified, user friendly field instrument  
development – minimal ISA100  
knowledge needed

Includes WCI Compliant  
Application Processor Code



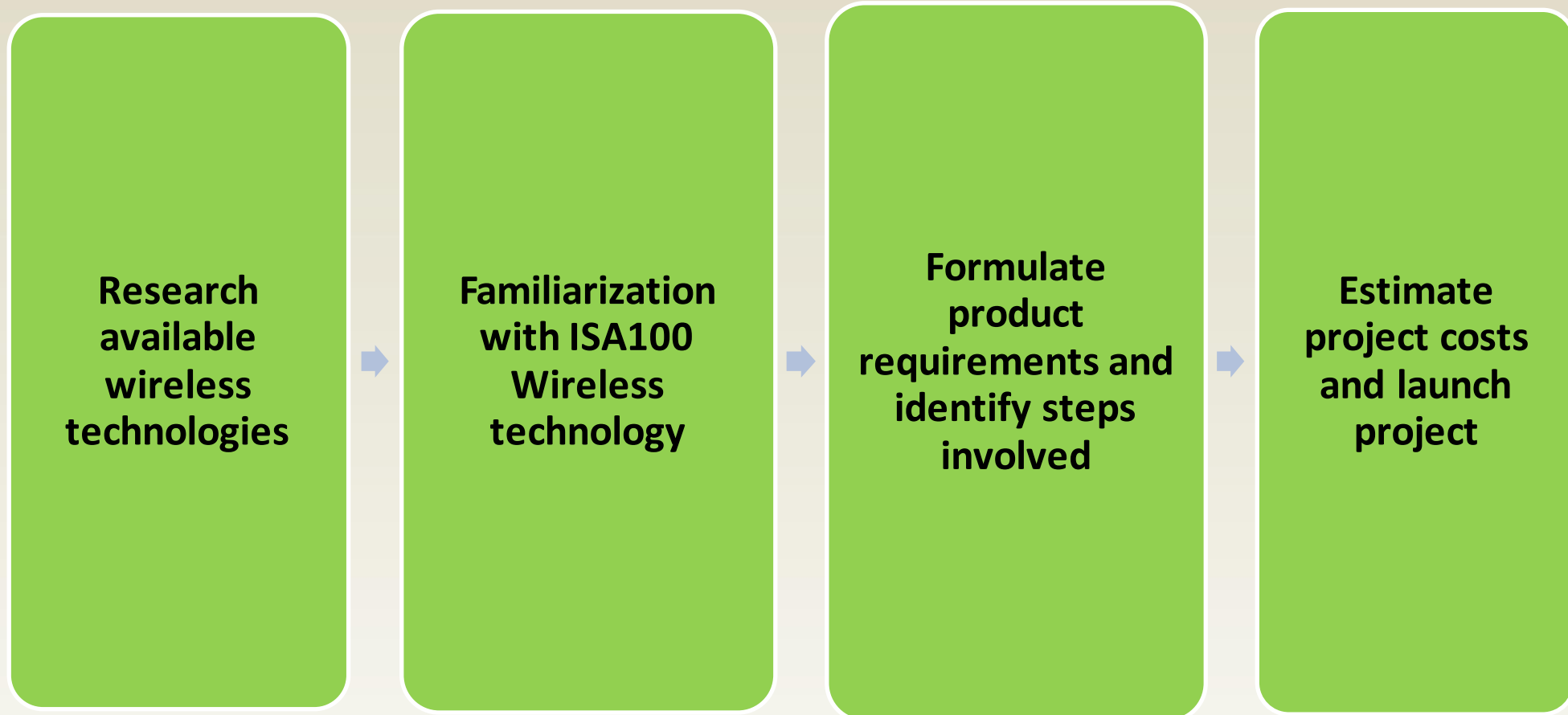
Significantly reduce time-to-market, just  
add sensor/actuator specific  
functionality. Application processor  
source code is license free.

ISA100 Wireless Certified Wireless  
Module and Application Processor  
Code



Minimize WCI ISA100 Wireless  
Certification Effort

# Streamlined Development Process– Step 1: Initiation





# Step 2: Development and Certification

## Firmware and Software Track

### Firmware Integration

- Integration of third-party stack via API
- **ISA100 Wireless compliant APP layer implementation**

### Software Integration

- Integration with third party vendor's Gateway (DD/CFF)
- Integration plant network (DCS, client apps)

### WCI Certification

- Compliance testing for device profiles, extensions etc.

## Hardware Track

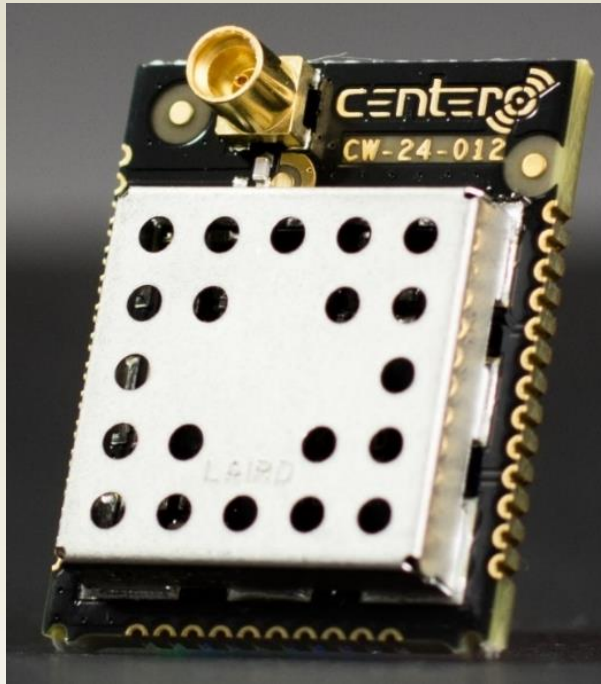
### Hardware Design and Integration

- Integration of third-party wireless module
- Schematics, layout, enclosure, fab files
- Manufacturing, engineering validation

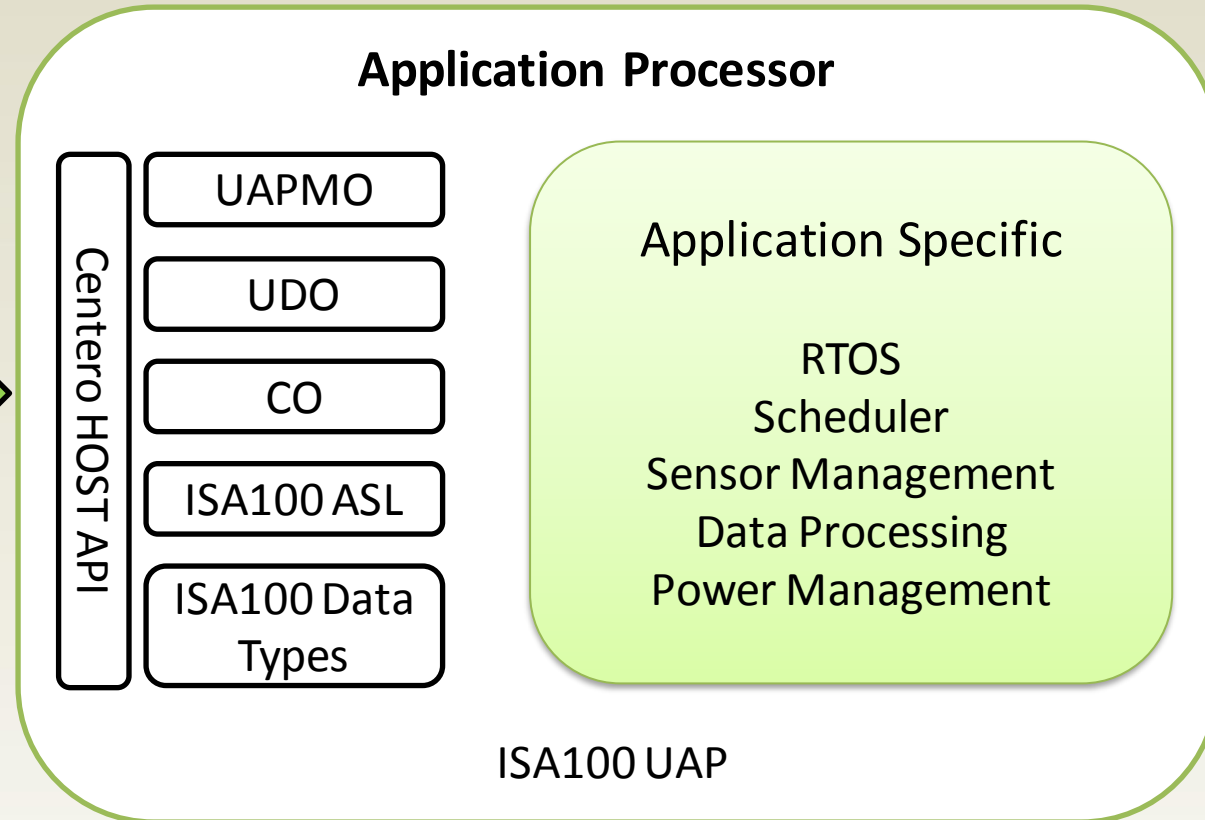
### Certification

- Wireless compliance: FCC, IC, ARIB, ETSI etc.
- Safety: UL, ATEX, etc.

# ISA100 Wireless Field Device Architecture

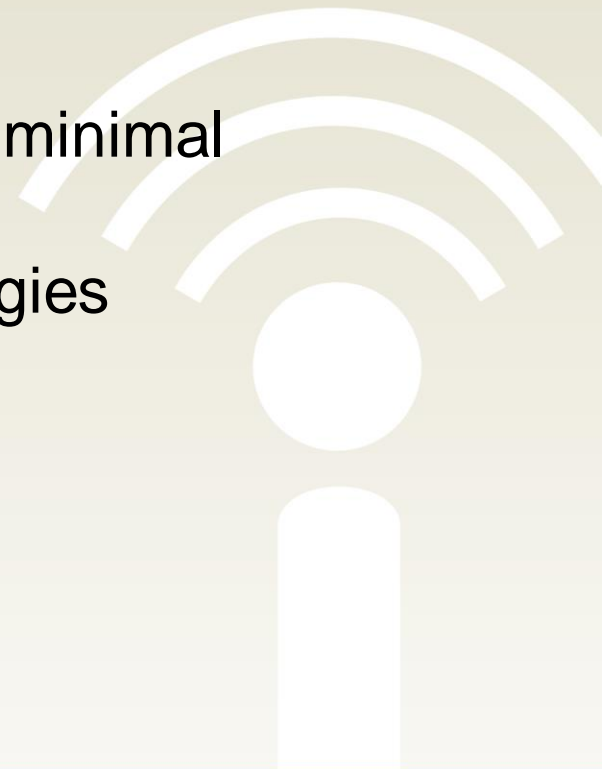


UART



# Goals for Rapid Development Kit

- Streamline development process and reduce time-to-market
- User friendly – intuitive interfaces and great out-of-box experience
- Reduce learning curve associated with novel ISA100 technology
- KEY: Minimize application processor development effort
- Offer certifiable field instrument implementation that requires minimal tailoring to the customer's specific needs
- Competitively priced with other kits for industrial IoT technologies (WirelessHART, LoRa, Bluetooth Mesh etc)



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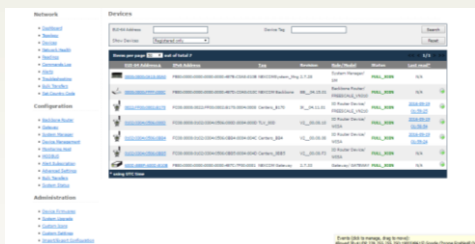
# ISA100 Wireless RDK Highlights

Includes 10 Hours of  
Engineering Support

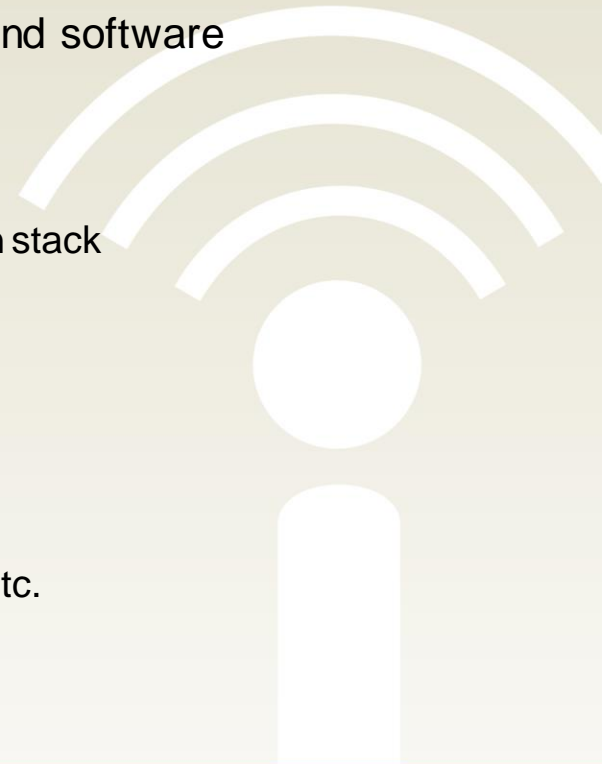
- Develop ISA100 Wireless (IEC 62734) compliant and certifiable field instruments with minimal effort using application layer code provided
- WISA wireless modules included run ISA100 Wireless communication stack
- Gateway boasts feature rich web-based Network Operation and Management System
- User friendly SPiN development board includes OLED display and a large variety of sensors
- Connect external processors, sensors or actuators via Arduino and Freedom form factor connector
- All firmware and software components are remotely upgradeable



# ISA100 Wireless Rapid Development Kit



- Comprehensive end-to-end development platform
- Includes everything needed to
  - Swiftly develop ISA100 Wireless compliant field instruments and devices
  - Evaluate performance of ISA100 Wireless technology
- Includes integrated and pre-configured ISA100 hardware, firmware and software
  - Low-cost NIO200IAG Gateway
  - Two (2) SPiN development boards that include a wide gamut of sensors
  - Two WISA wireless module that run the ISA100 Wireless communication stack
  - Field provisioning and configuration software
- Feature-rich Monitoring and Controls System software
  - Configure and visualize process values received from field instruments
  - Network topology and health diagnostics
  - Device management including RF statistics, remote firmware upgrades etc.
  - MODBUS server configuration
  - All components are remotely upgradable





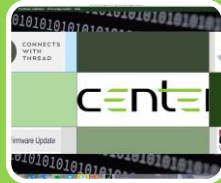
# Rapid Development Kit (RDK) Components



**ISA100 Wireless Gateway (Quantity: 1)**



**SPiN Field Development Board (Quantity: 2)**



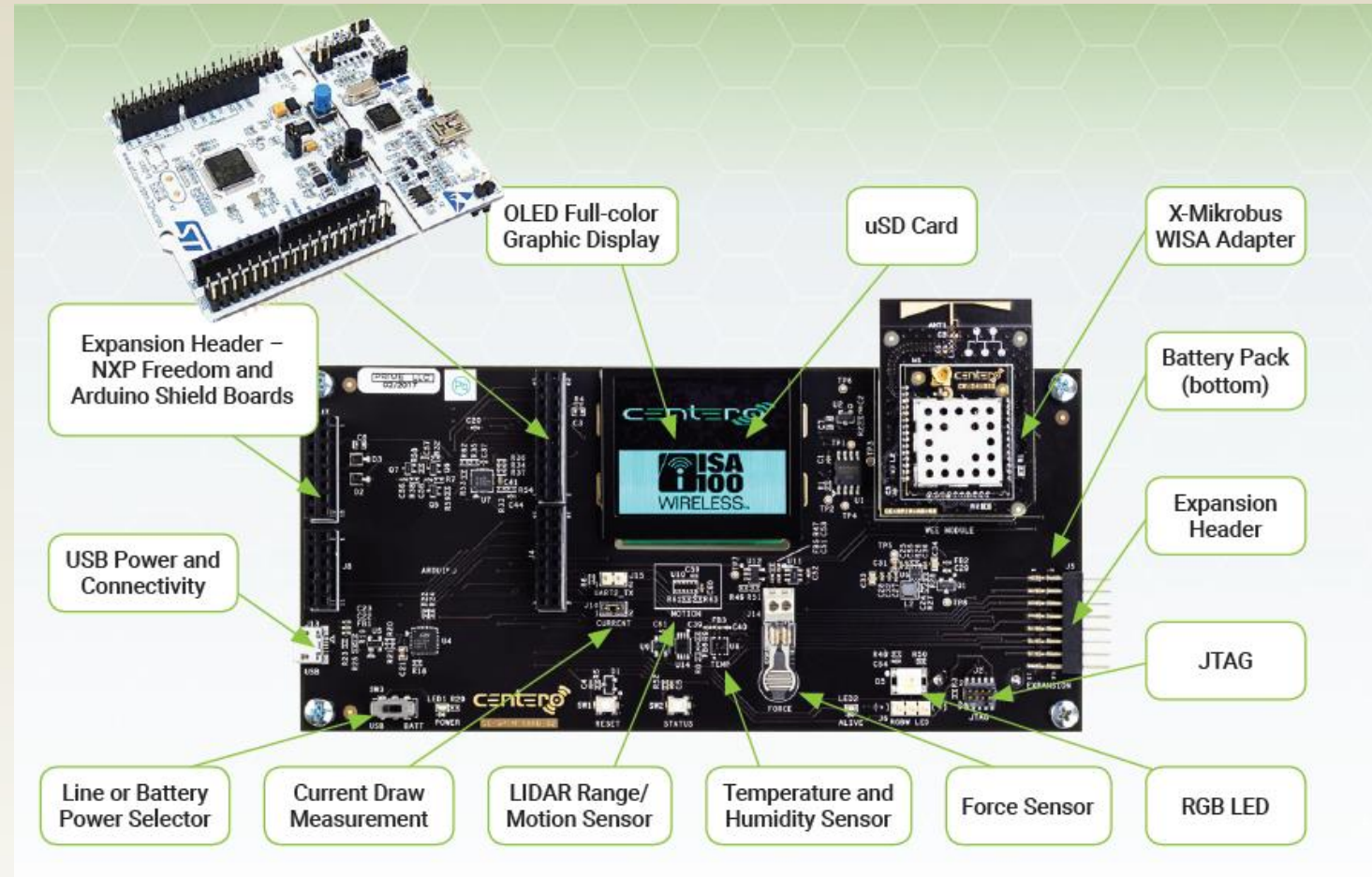
**Engineering Utility Software (Quantity: 1)**



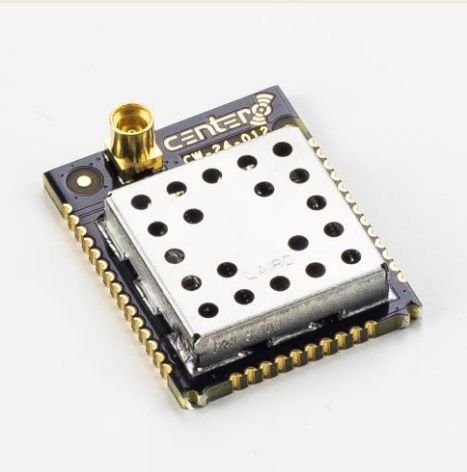
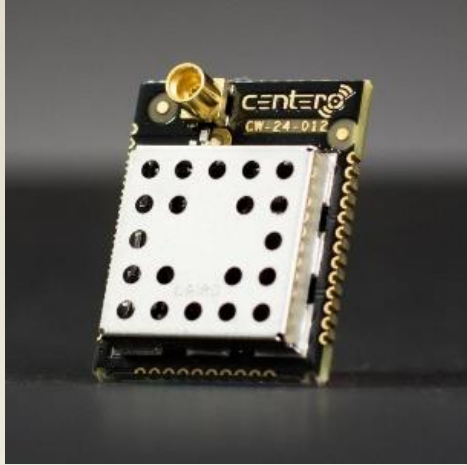
**Documentation Package (Quantity: 1)**

# SPiN Field Development Board

- Great out-of-box experience
- Hosts a wide gamut of sensors allowing out-of-box monitoring and control
- OLED sensor displays locally ISA100 parameters (role, join status, EUI-64, sensor data etc)
- Connects to Utility Software via USB – on-board USB bridge
- Expandable – hosts Arduino shield connector – user can stack own sensors or controls



# WISA ISA100 Wireless Module



- Runs an ISA100 Wireless certified communication stack
- Swift integration within products with minimal learning curve for complex IoT technologies
- Tested for interoperability with Honeywell's WDM, Yokogawa's YFGW710 and Centero's NIO200x Gateways
- Designed for integration in intrinsically safe instruments
- Onboard RF Front-end Module with adjustable output power of up to +14 dBm and selectable RX gain modes
- Market leading sensitivity of -108 dBm and link budget of 122 dB
- Suitable for real estate constrained products
- Wireless compliance certification for US/Canada, Japan, EU etc.

# Application Processor Implementation



- ST Micro NUCLEO-L073RZ Arduino development board
- Centered on the STM32L0 ARM Cortex-M0+ MCU 32-Bit
- Low-power application processor suitable for battery powered field instruments with extended battery life
- Firmware includes a full ISA100 Wireless application layer implementation
  - Mandatory structures and objects needed to obtain WCI's Field Instrument certification
  - Data models and mechanisms needed to periodically publish data, establish contracts as well as manage various aspects of the communication stack residing on the wireless module
  - ISA100 Wireless data types and application payload encoding





# Application Processor Implementation

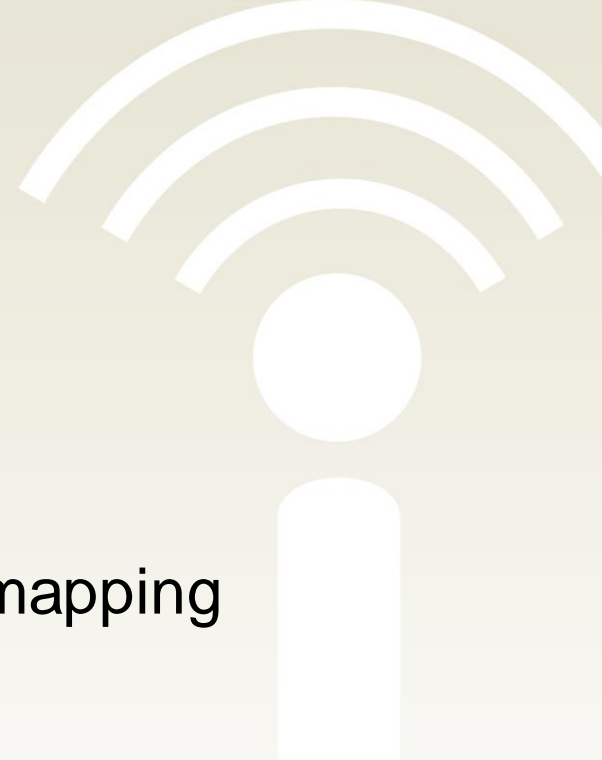


- Develop your own field instrument firmware using free Eclipse IDE
- Source code implemented in C++
- Source code offered under permissive, free licensing model
  - No license fees
  - User can create derivatives of work and commercialize field instruments
  - User does not have to make modified code available to the community
- WCI ISA100 Wireless certifiable implementation
  - Was tested with the WCI's Device Test Kit (used for field instrument certification)
  - Full instrument is certifiable assuming you use a WCI certified ISA100 Wireless communication stack

# ISA100 Wireless Gateway

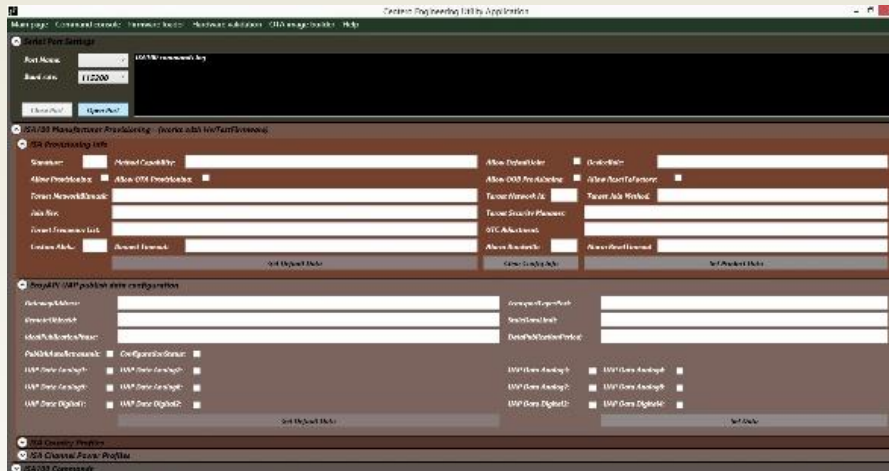


- Low-cost ISA100 Wireless compliant Network/Security Manager, Gateway and Access Point
- Allows user to swiftly evaluate the performance of ISA100 Wireless field network via rich sensor data set received from SPiN field development boards
- Hosts intuitive web-based interface for
  - Process data monitoring/control
  - Device management and configuration
  - Network topology and health status
  - Over-the-air upgrades of all components
- MODBUS server and intuitive process value mapping





# Engineering Utility Software



- Feature rich Engineering Utility Software can be installed on any PC
- Communicates with the SPiN board via USB/serial
- Allows user to provision and configure the ISA100 communication stack
  - Provisioning parameters
  - Country codes and RF profiles
- Full set of ISA100 Wireless commands
- Full configuration of the process values published
- Serial upgrades of the communication stack

# Documentation Package – Training Materials

Document or File Title	Description
<b>ISA100 Wireless Nine - Part Training Course</b>	A comprehensive training course provided by the WCI (Wireless Compliance Institute) which covers everything from ISA100 technical basics as well as the process to obtain ISA100 Wireless certification.
<b>The Technology Behind ISA100 Wireless</b>	A presentation that provides the compressed foundation of ISA100 compliant technologies.
<b>White Paper - ISA100 Applications Technology and Systems</b>	White paper that provides a technical foundation as well as industry practices related to ISA100 systems
<b>ISA100 - Spectrum Management and Co-Existence</b>	Presentation that explains ISA100 RF spectrum management features and also provides test results for co-existence with WiFi products.

# Documentation Package – Engineering Materials

Document or File Title	Description
<b>RDK User Guide</b>	User guide that describes the functionality of the RDK. It includes initial setup of an ISA100 compliant network as well as the steps needed to create an ISA100 field instrument demo.
<b>Developing ISA100 Compliant Products - Training Course</b>	Training course that provides a step-by-step approach on how to develop ISA100 Wireless compliant field instruments and products.
<b>EASY API Manual</b>	Firmware integration document that details the API and how to tailor the application processor firmware.
<b>Engineering Utility Software - User Guide</b>	Details the functionality and capabilities of the Engineering Utility software.
<b>WISA Radio Module - Hardware Integration Manual</b>	Document contains all the information needed to integrate the WISA wireless module into a product. This includes pinout, pin description, electrical specifications and mechanical drawings.
<b>ISA100 Provisioning and Firmware Upgrade Process</b>	Document describes the process of provisioning and upgrading the WISA ISA100 wireless module via various methods.

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# WCI RDK Training Course Highlights

- One (1) day hands-on training course
- Introduction ISA100 Wireless architecture, concepts and technology
- Hands-on training course centered on WCI's Rapid Development Kit (RDK)
- RDK included in the cost of the training – trainee keeps the kit
- Goal of the training is for trainee to have a good understanding of:
- ISA100 Wireless technology
- Development and certification process
- Build a first functional ISA100 Wireless Field Instrument prototype – sample process values mapped into various objects based



**To purchase the kit please visit:**

**[www.centerotech.com/product/wci-isa100-rapid-development-kit](http://www.centerotech.com/product/wci-isa100-rapid-development-kit)**

**THANK  
YOU**

**For Your Attention!**





# Questions?



[www.isa100wci.org](http://www.isa100wci.org)



[ISA100 Wireless Interest Group](#) **LinkedIn**

800+ members and growing; please join and invite your peers to join as well !

**Robert Assimiti**

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To purchase the kit please visit

[www.centerotech.com/product/wci-isa100-rapid-development-kit](http://www.centerotech.com/product/wci-isa100-rapid-development-kit)

