



ISA100 WCI Webinar

Webinar date: October 25th, 2023.

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



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About the Speaker



Robert Assimiti

WCI Governing Board Member

Member of the WCI Technical Steering and Committee

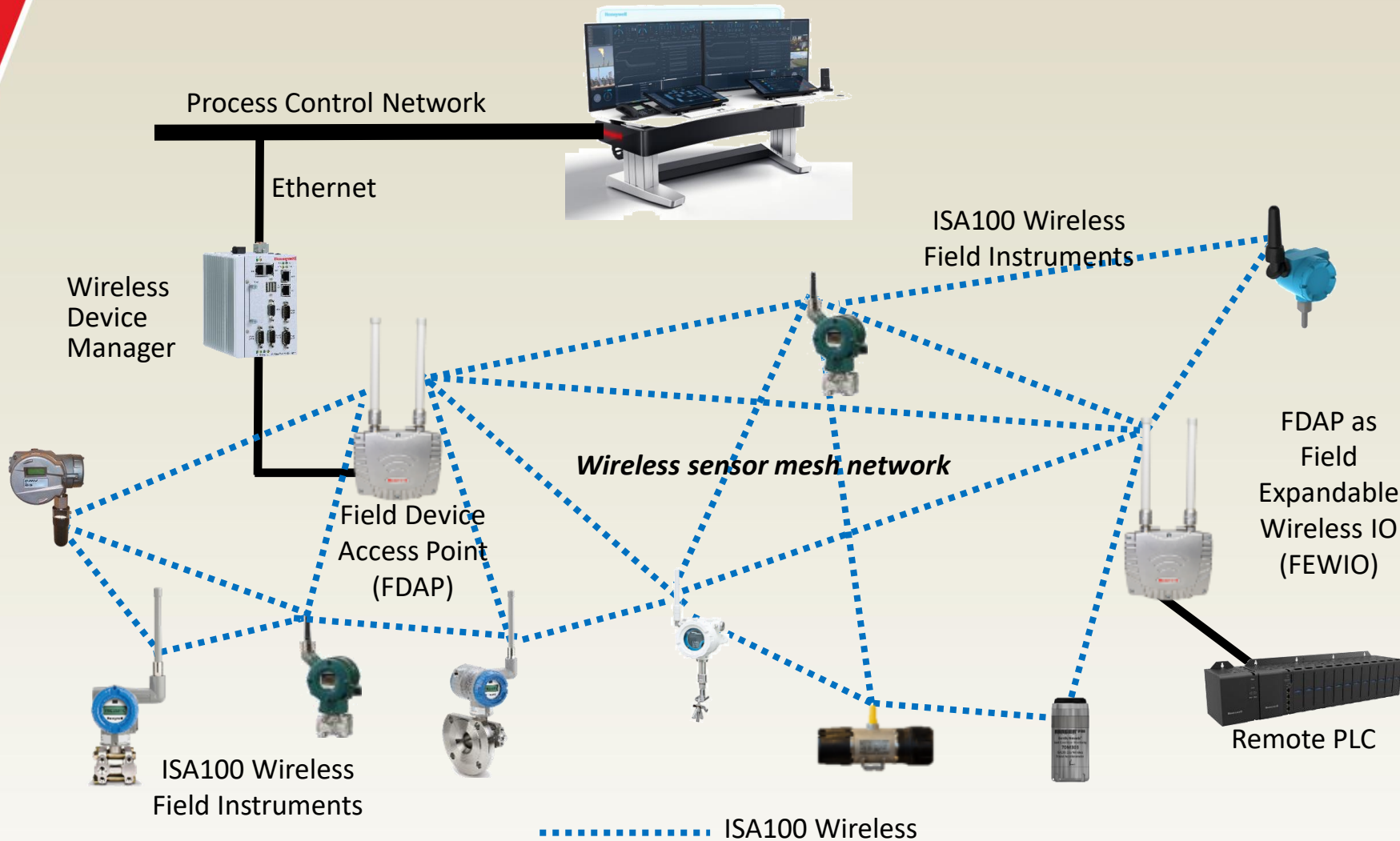
Co-Founder and CEO

Centero



Robert Assimiti has over 20 years of technical leadership in the wireless arena. He has architected and developed several highly-scalable, mesh based wireless product lines for both commercial and industrial wireless applications. 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 Governing Board and the Technical Steering committee. 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">• Up to 90% of installed cost of conventional measurement technology can be for cable conduit and related construction• Typically: 1/2 the costs, 1/5 of the time• New and scaled applications are now economically feasible
Improved Reliability	<ul style="list-style-type: none">• Wired sensors may be prone to failure in difficult environment• Wireless can add redundancy to a wired solution
Improved Visibility	<ul style="list-style-type: none">• Condition monitoring of secondary and remote equipment• Process monitoring, fast additional data for trouble shooting
Improved Control	<ul style="list-style-type: none">• Add wireless to existing processes for more optimal control
Improved Safety	<ul style="list-style-type: none">• Safety related alarms - end to end SIL2 certifiable



ISA100 Wireless Product Portfolio

Infrastructure





Independent Gateway

- Honeywell, Yokogawa


Access Point (AP)

- Honeywell, Yokogawa


Integrated Gateway/AP

- Honeywell, Yokogawa, Centero, CDS




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

Online Resources

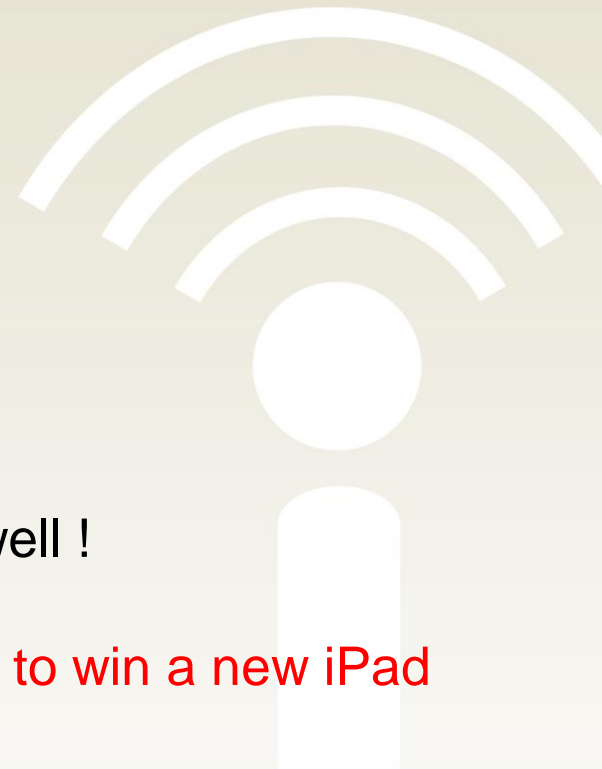


www.isa100wci.org

- 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
- 1200 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 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!



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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

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



Infrastructure

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



Operational

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

Note: Devices typically incorporate multiple logical roles.

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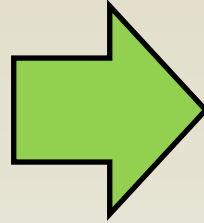


Problem Statement

- 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

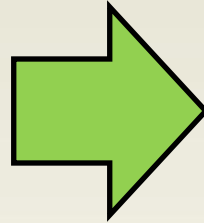
WCI ISA100 Wireless RDK - Benefits

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

Development and Certification Process



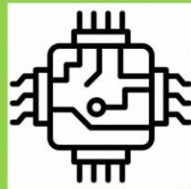
Product Definition, Architecture and Project Planning

- Formulate product requirements and create field device architecture
- Estimate product battery life
- Identify project requirements and costs



Develop Functional Prototype

- Purchase WCI ISA100 Wireless RDK (Rapid Development) KSet up development environment
- Tailor application processor source code provided to burst dynamic variables of interest
- See field instrument specific data being reported in the Gateway



Hardware and Firmware Development

- Select hardware components and design hardware
- Firmware integration of Centero's WISA module with the application processor



Development and Certification Process



Software System Integration

- Develop and generate Device Descriptor and Configuration files (DD/CFF)
- End-to-end system integration tests with ISA100 Wireless Gateways and DCS/PCS of your choice



WCI Field Device Certification

- Join the Wireless Compliance Institute (WCI) as member and purchase Device Test Kit (DTK)
- Run internal certification tests using the Device Test Kit (DTK)
- Go through WCI certification process and obtain certificate

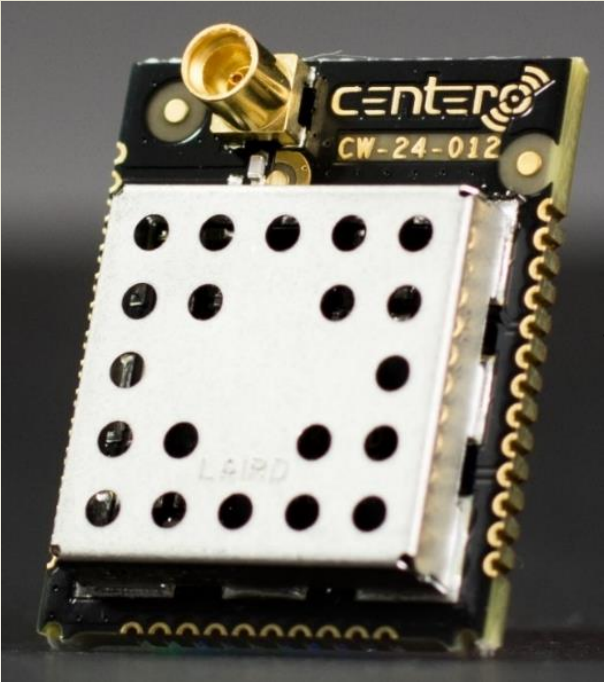


Regulatory Compliance and Certification

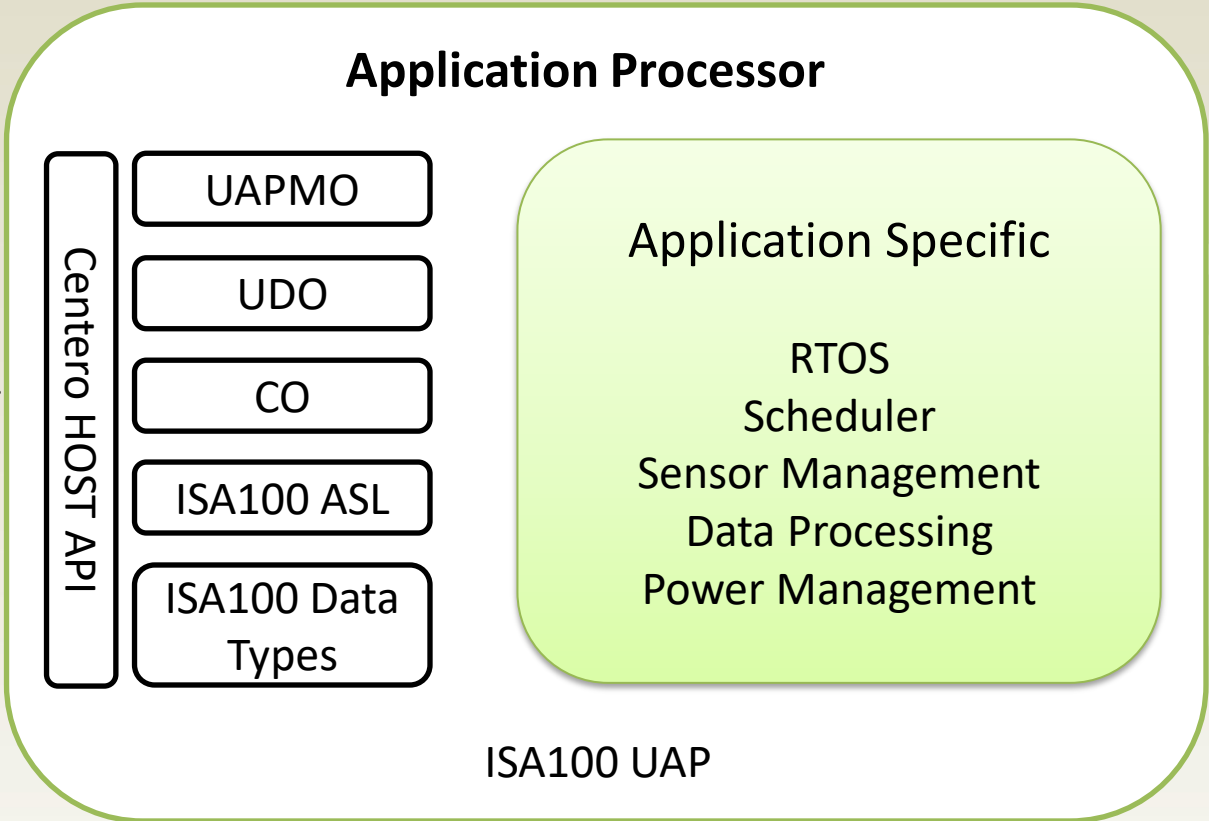
- Compliance and certifications for operation in hazardous areas
- Wireless compliance and certification tests and other EMC, Emissions/RFI, ESD and safety testing



ISA100 Wireless Field Device Architecture

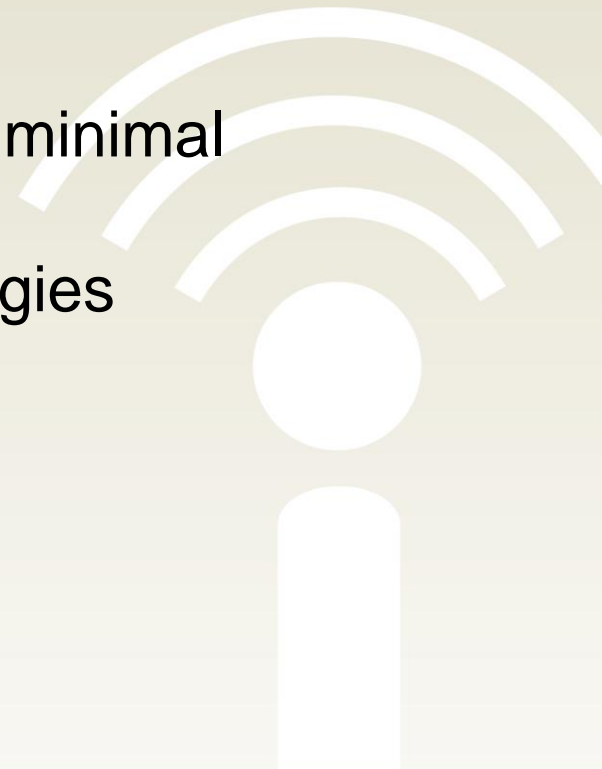


UART



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



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

Rapid Development Kit (RDK) Components



ISA100 Wireless Gateway (Quantity: 1)



SPiN Field Development Board (Quantity: 2)



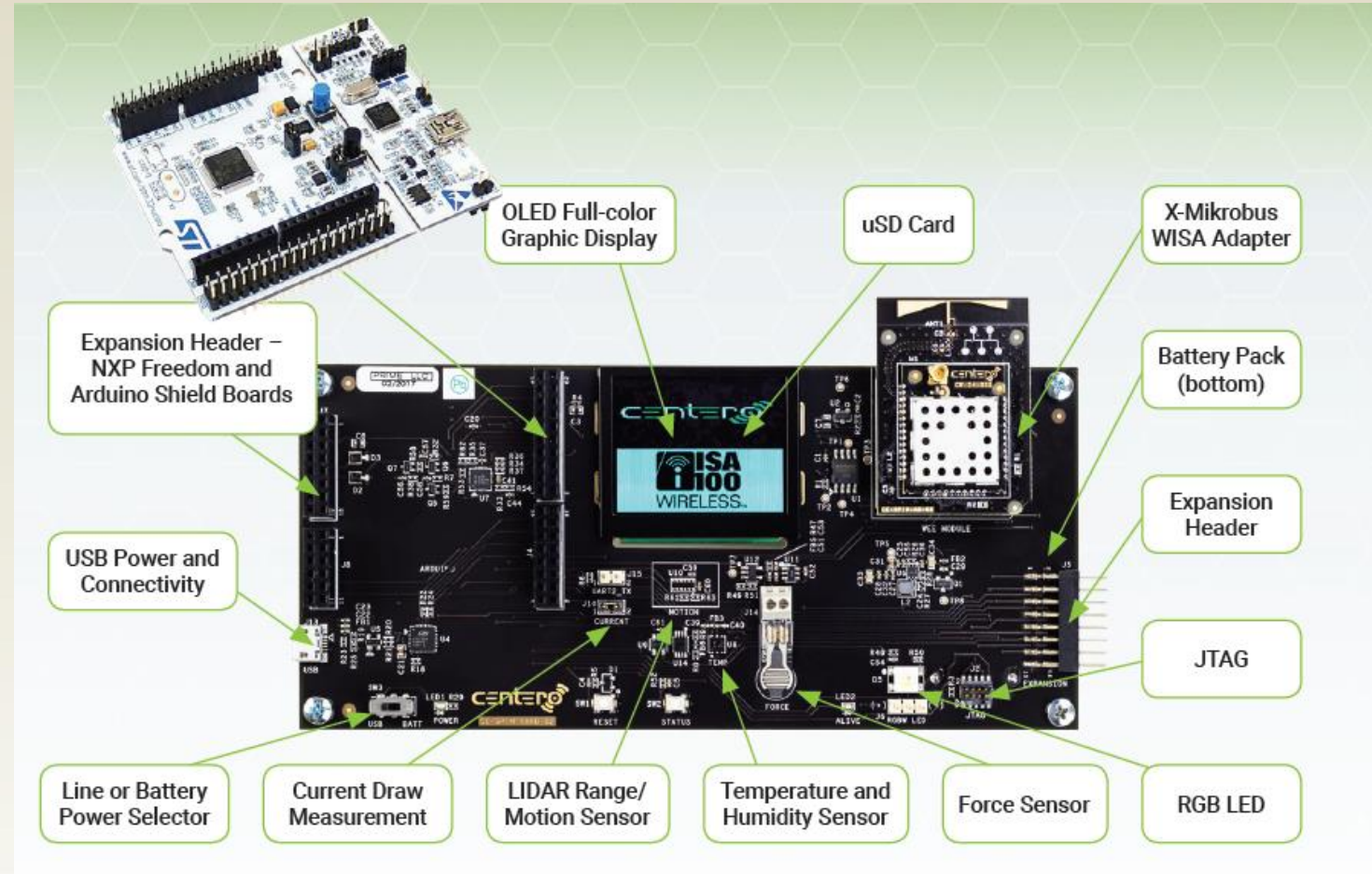
Engineering Utility Software (Quantity: 1)



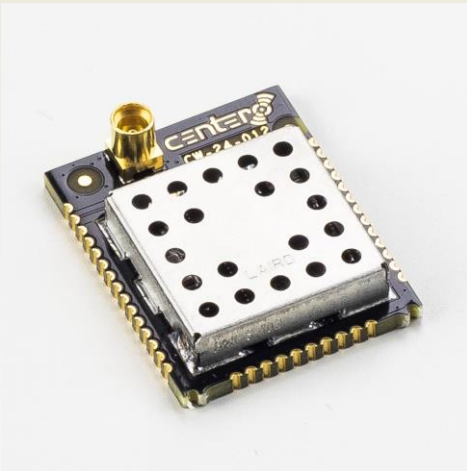
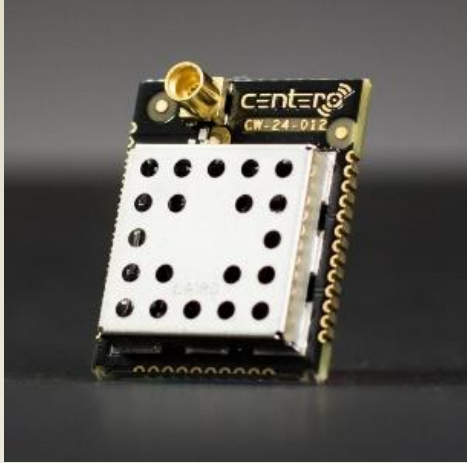
Documentation Package (Quantity: 1)

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 Centero's UNISON, Yokogawa's YFGW710 and Honeywell WDM 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

Centero's UNISON ISA100 Wireless Field Gateway



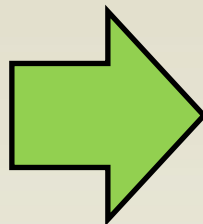
- ISA100 Wireless and WiFi Mesh+ high throughput backbone connectivity
- Supports highly scalable deployments in multiple topologies
- Monitoring and advanced control features
- Over-the-air provisioning with advanced security features
- Advanced diagnostics – NAMUR, wireless health and battery life
- Native support for DD/CF files
- Long-range ISA100 Wireless connectivity - 1.2 miles (2 km) LoS
- Multiple plant connectivity interfaces: MODBUS, OPC-UA, GCI
- Multiple models for deployments in hazardous as well as non-hazardous areas
- Can be privately labeled by interested parties



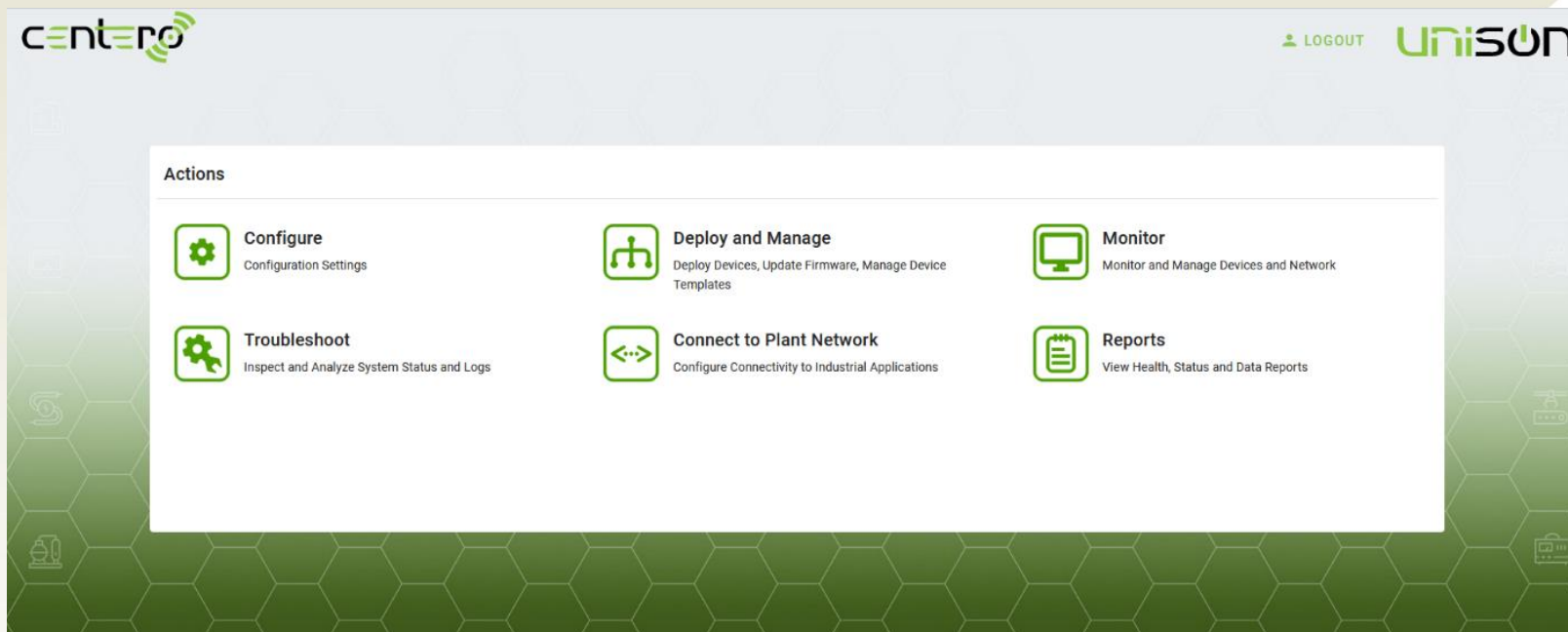
unison

UNISON Monitoring and Control Application

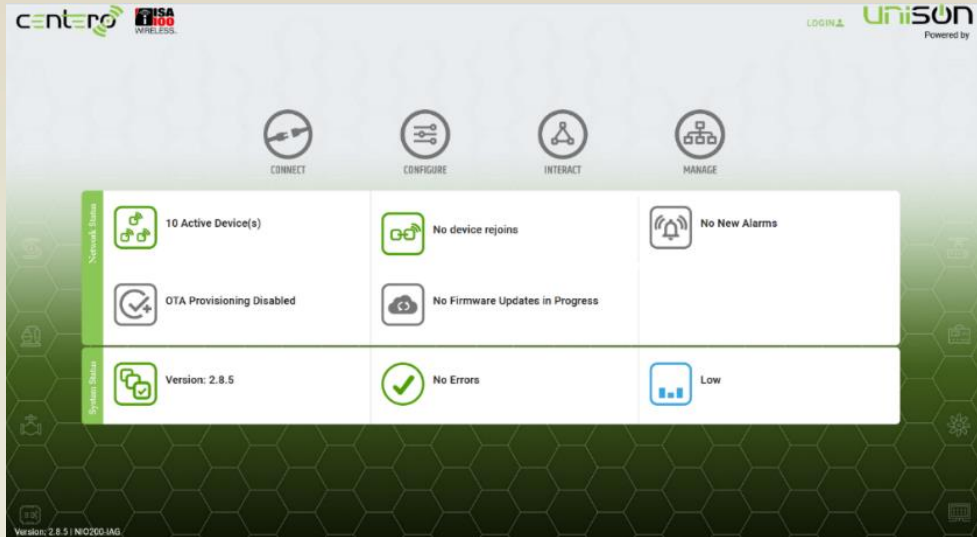
Suite of “Apps” modeled after field device life-cycle



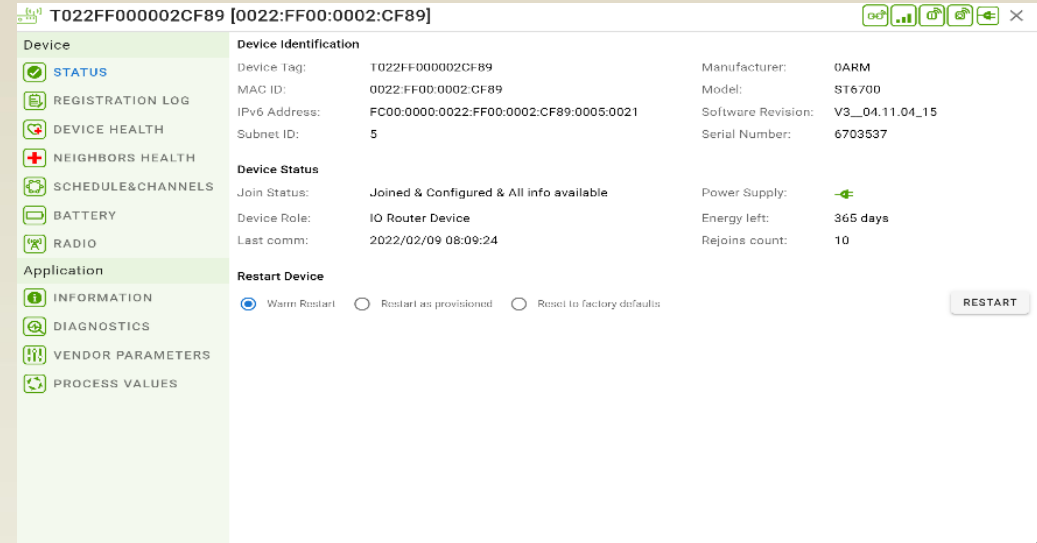
Clear functional segregation
User friendly and intuitive
Minimum training for plant personnel



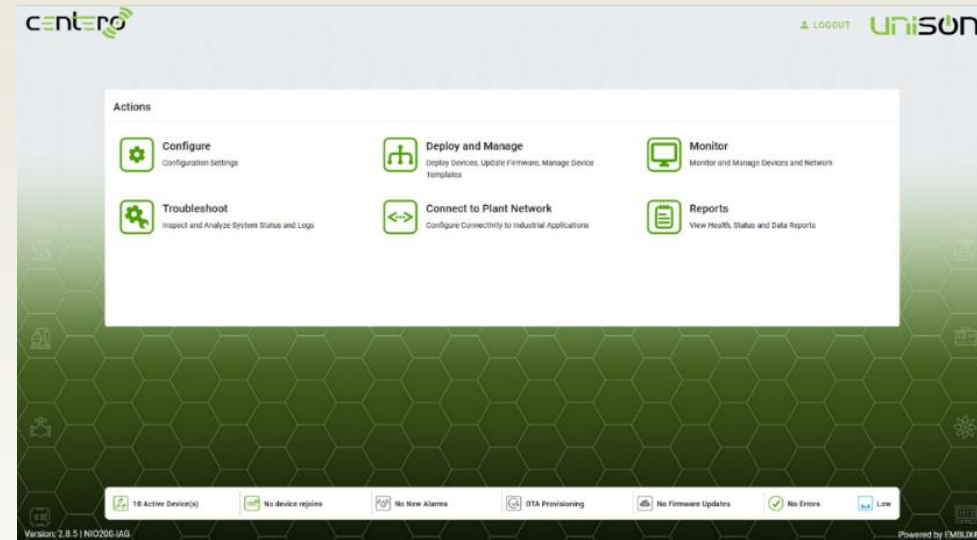
UNISON Monitoring and Control Application



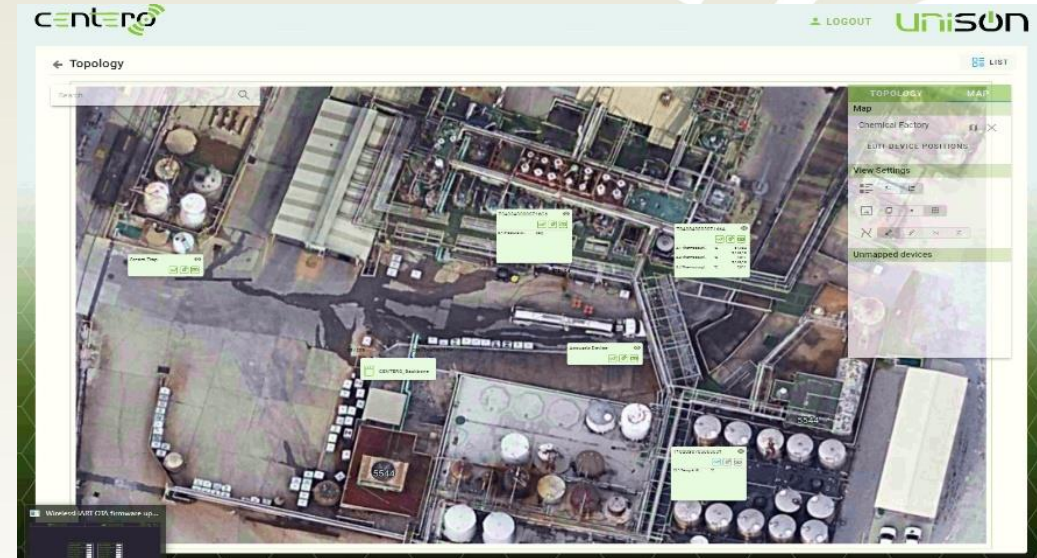
The dashboard features a top navigation bar with 'centero' and 'ISA 100 WIRELESS' logos on the left, and 'UNISON Powered by' on the right. Below the navigation are four main action buttons: CONNECT, CONFIGURE, INTERACT, and MANAGE. The main content area is divided into two sections: 'Network Status' and 'System Status'. 'Network Status' includes: 10 Active Device(s), No device rejoins, No New Alarms, OTA Provisioning Disabled, and No Firmware Updates in Progress. 'System Status' includes: Version: 2.8.5, No Errors, and Low. A status bar at the bottom repeats these key metrics.



This view shows details for device T022FF000002CF89 [0022:FF00:0002:CF89]. It includes a left-hand menu with categories like STATUS, REGISTRATION LOG, DEVICE HEALTH, and APPLICATION. The main area is split into 'Device Identification' (Manufacturer: 0ARM, Model: ST6700, etc.), 'Device Status' (Join Status: Jointed & Configured & All info available), and 'Restart Device' options (Warm Restart, Restart as provisioned, Reset to factory defaults). A 'RESTART' button is located at the bottom right.

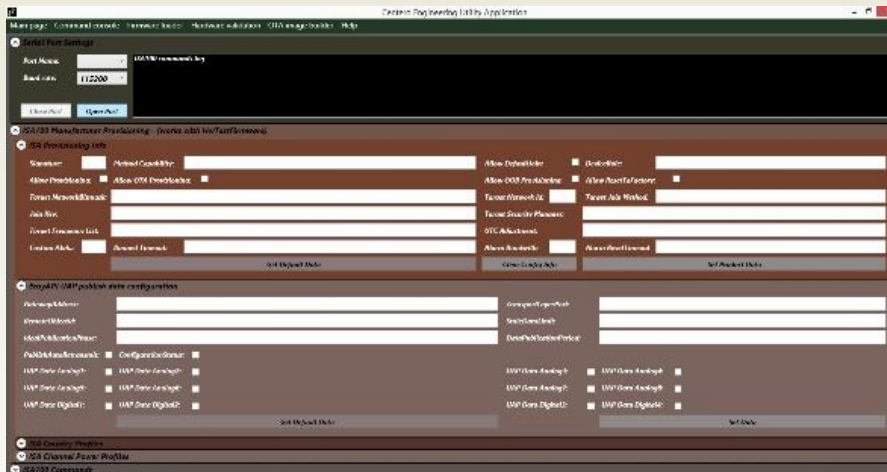


The 'Actions' menu is presented in a grid format. It includes: 'Configure' (Configuration Settings), 'Deploy and Manage' (Deploy Devices, Update Firmware, Manage Device Templates), 'Monitor' (Monitor and Manage Devices and Network), 'Troubleshoot' (Inspect and Analyze System Status and Logs), 'Connect to Plant Network' (Configure Connectivity to Industrial Applications), and 'Reports' (View Health, Status and Data Reports). A status bar at the bottom shows system metrics like '10 Active Device(s)' and 'No Errors'.

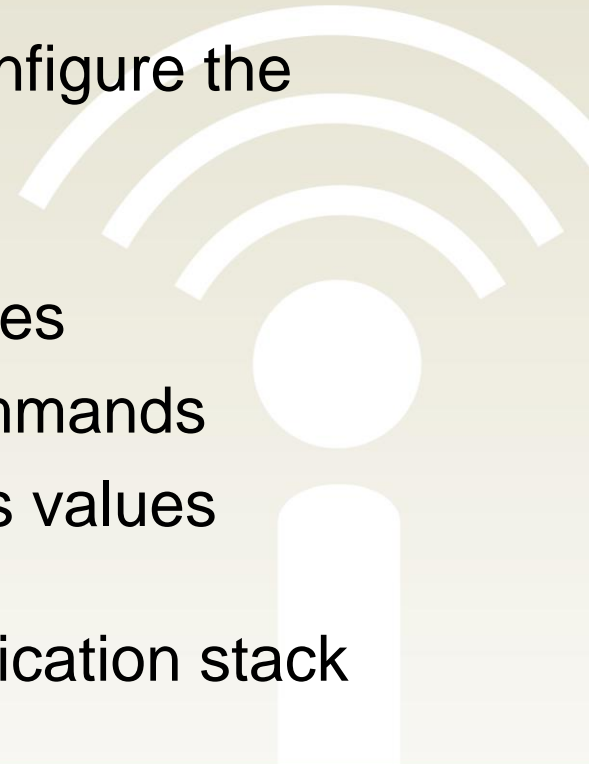


The 'Topology' view displays an aerial map of an industrial facility with various equipment and structures. A search bar is at the top left. On the right, a 'TOPOLOGY MAP' sidebar allows for map manipulation and shows 'Unmapped devices'. The map contains several green callout boxes with device information.

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



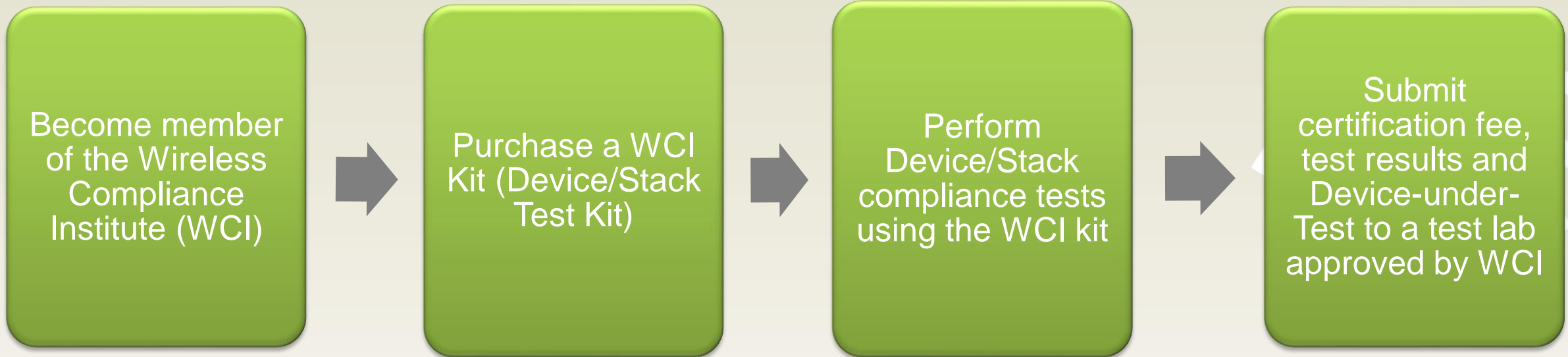
Documentation Package – Training Materials

Document or File Title	Description
ISA100 Wireless Nine - Part Training Course	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.
The Technology Behind ISA100 Wireless	A presentation that provides the compressed foundation of ISA100 compliant technologies.
White Paper - ISA100 Applications Technology and Systems	White paper that provides a technical foundation as well as industry practices related to ISA100 systems
ISA100 - Spectrum Management and Co-Existence	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
RDK User Guide	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.
Developing ISA100 Compliant Products - Training Course	Training course that provides a step-by-step approach on how to develop ISA100 Wireless compliant field instruments and products.
HOST API Manual	Firmware integration document that details the API.
WISA Radio Module - Hardware Integration Manual	Document contains all the information needed to integrate the WISA wireless module into a product – including reference design.
Hardware Engineering Package	Schematic symbol, layout footprint, mechanical drawings.
Engineering Utility Software - User Guide	Details the functionality and capabilities of the Engineering Utility software.
ISA100 Provisioning and Firmware Upgrade	Document describes the process of provisioning and upgrading the WISA ISA100 wireless module via various methods.
And much more.....	WISA Radio Module - Intrinsic Safety Analysis WISA Wireless Module Performance Evaluation - Application Note

WCI ISA100 Wireless Compliance Steps



ISA100 Wireless Field Instrument Certification Requirements

Test Requirements

Base Requirement: Field instrument includes an ISA100.11a-2011 WCI certified communication stack. Centero's ISA100 WISA communication stack is WCI certified.

Test	Description	Comments
WISA module wireless-PHY compliance	IEEE 802.15.4 compliance tests Wireless compliance test results (FCC, ETSI etc) Antenna radiation patterns	Provided by wireless module manufacturer (Centero) – except antenna radiation pattern
Device Test Kit	Full suite of ISA100.11-2011 compliance tests. Compliance tests mainly focused on the application layer and functionality of the field instrument. Tests also include a checkpoints that test connectivity and other features of the ISA100 communication stack running on the WISA wireless module.	Requires active WCI DTK GEN (Device Test Kit) license

WCI Device Test Kit



- Mandatory for obtaining WCI ISA100 Wireless® field instrument certification
- Certifies conformance to the ISA100.11a-2011 standard revision (IEC 62734)
- Excellent tool for troubleshooting, debugging, and regression testing of ISA100 Wireless® field instruments
- Includes the following components:
 - GEN 2 Script Server and software
 - Test script source code and technical documentation
 - Diagnostic Backbone Routers
 - Reference Device Under Test

To purchase the kit please visit:

www.centerotech.com/product/wci-isa100-rapid-development-kit

**THANK
YOU**

For Your Attention!



Questions?



Robert Assimiti

robert.assimiti@centerotech.com

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www.isa100wci.org



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1200+ members and growing; please join and invite your peers to join as well !