Webinar

Developing an ISA100 Wireless Certified Product

Jay Werb – WCI
Ryuhei Nakai – Murata

Presentation will begin at 11:05am EDT (GMT - 6)

Access voice using the telecon number:
+1 832 551 5100
Pin: 100717#

VoIP/International numbers are not available at this time
ISA100 Wireless Fast Facts

- International standard IEC 62734 since 2014
- Complies with ETSI EN 300 320 v1.8.1 (LBT)
- ISA100 Wireless Device Portfolio exceeds 44 devices
- Certified ISA100 Wireless Devices exceeds 25 devices
- April 2015 GasSecure GS-01 gas detector achieves a world first with SIL-2 Certification in Wireless Gas Detection
- Focus on Certification to Ensure Interoperability and best-in-class solutions
- Availability of ISA100 Wireless Modules / Stacks (see contact details on www.isa100wci.org)

1. Nivis
2. Murata
3. Yokogawa
4. Honeywell
<table>
<thead>
<tr>
<th>Device Type / Manufacturer</th>
<th>Certified</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Yokogawa Stack</td>
<td>Yes</td>
</tr>
<tr>
<td>2  Yokogawa Adapter</td>
<td>Yes</td>
</tr>
<tr>
<td>3  Yokogawa Adapter</td>
<td>Yes</td>
</tr>
<tr>
<td>4  TLV Steam Trap</td>
<td>Yes</td>
</tr>
<tr>
<td>5  TLV Steam Trap</td>
<td>Yes</td>
</tr>
<tr>
<td>6  Armstrong Steam Trap</td>
<td>Yes</td>
</tr>
<tr>
<td>7  Spirax-Sarco Steam Trap</td>
<td>Yes</td>
</tr>
<tr>
<td>8  Cosasco Corrosion Sensor</td>
<td>Yes</td>
</tr>
<tr>
<td>9  Scott Safety Gas Detector</td>
<td>Q4 2015</td>
</tr>
<tr>
<td>10 Flowserve Valve Positioner</td>
<td>Q4 2015</td>
</tr>
<tr>
<td>11 SKF Vibration Sensor</td>
<td>Q4 2015</td>
</tr>
<tr>
<td>12 CDS Vibration Sensor</td>
<td>Q4 2015</td>
</tr>
<tr>
<td>13 Murata Comm. Module</td>
<td>Q4 2015</td>
</tr>
<tr>
<td>14 Bitherm Steam Trap Monitor</td>
<td>Q4 2015</td>
</tr>
<tr>
<td>15 Nexcom ISA100 to WIFI bridge</td>
<td></td>
</tr>
</tbody>
</table>
Visit the ISA100 Wireless Website

• ISA100 Wireless Whitepaper available for download from website authored by Jay Werb, Technical Director

• News and details about the ISA100 Wireless Demo at the June 2015 Achema exposition in Frankfurt
  – 3 live networks with 36 devices from 17 vendors

• Full list of certified/registered ISA100 Wireless devices

• Use cases and customer stories

• ISA100 WCI website receiving over 20,000 web views per month

www.isa100wci.org
Presenters Today

Jay Werb
Technical Director
ISA100 Wireless Compliance Institute

Ryuhei Nakai
Senior Application Engineer
Murata Manufacturing Co., Ltd.
Developing an ISA100 Wireless Certified Product

Webinar Overview

• Development Process
• Available Technologies
  – Case Study from Murata
• WCI Certification
• WCI Marketing Programs
• Q & A
Development Process

Development phase
- Research Review
- Development Design
- Certification
- Introduction to Market

ISA100WCI support
- Technical seminar
- Product demo
- Implementation specifications
- Technical support
- Test tools certification service
- Promotion Exhibition

Development activities
- Research and review of specifications/requirements
- Hardware and software design
- Testing for certification and registration to ISA100WCI
- Completion of development

Module vendors
- Demo kit
- Technical support
- ISA100 Wireless module
- Development tools
- ISA100WCI certified protocol stack
- Delivery of ISA100 Wireless module

21 October 2015
Typical Field Device Technologies

- Antenna
- Power Supply
- Encryption key Provisioning Infrared

Compliance with laws and regulations including EMC regulations

Buy
- Certified ISA100 Wireless Module
- Device Application (UAP)

Build
ISA100 Wireless User Application Process (UAP) Publication

User Application Process (UAP)

Analog Input Object (Temperature)

Analog Input Object (Pressure)

Digital Input Object (Contact)

Concentrator Object

Periodic Publication

ISA100 Wireless Module

ISA100 Wireless Network

Gateway

Host

Buy

Build

(Sample code available)

21 October 2015
ISA100 Wireless Stack Technologies

<table>
<thead>
<tr>
<th>Source</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nivis (CDS, Centero)</td>
<td>Certified in 2010. Modules used in many ISA100 Wireless devices.</td>
</tr>
<tr>
<td>Honeywell</td>
<td>Certified in 2010. Reference design used in Honeywell products.</td>
</tr>
<tr>
<td>Yokogawa</td>
<td>Certified in 2015. Integrated stack and antenna.</td>
</tr>
<tr>
<td>Murata</td>
<td>New. Module developed in collaboration with Yokogawa.</td>
</tr>
<tr>
<td>Others</td>
<td>At least 3 additional stacks are under development.</td>
</tr>
</tbody>
</table>

Murata case study follows on next 11 slides.
Introduction
Murata
ISA100 Wireless module

Presented by: Ryuhei Nakai
r.nakai@murata.com
Oct 21, 2015
About Murata

Our Business
We are worldwide leaders in the design, manufacture and supply of electronic components and solutions.
We are Innovators in Electronics.

Our Strengths
• Advanced materials technology and expertise
• Broad product portfolio
• Extensive global manufacturing and sales network

Our Figures
• Net sales 1,043,542 million JPY*
• Employees 51,794*
• Number of subsidiaries 105*
  (31 in Japan, 74 overseas)
• Established in 1944
Murata Strength in Wireless module

**HW / RF Design**
- [ ] Driver Porting
- [ ] Debug w/ System Level

**SW / Cert. Support**
- [ ] Certification supports

**Global Network**
- Asia (14) - Indonesia, Malaysia, Philippines, Vietnam
- Europe (13) - Russia, France, Germany, Switzerland, UK
- Middle East (16) - Bahrain, Egypt, Israel, Saudi Arabia
- Americas (14) - Brazil, Canada, Mexico, USA

**Market Share**
- Murata: 58%

**Supply Capability**
- (Flexible / Multi Factory locations)
- 30+Mu/mo.
Murata wireless modules
Coverage for IoT

- 900MHz
- 433MHz
- Proprietary
- 100kbps
- 1Mbps
- 10Mbps
- 100Mbps
- 1Gbps
- 10Gbps

21 October 2015
Murata-Yokogawa Alliance for development of ISA100 Wireless module

Murata has a solid record in developing wireless communication modules.

Yokogawa has developed a number of leading-edge technologies for use with ISA100 Wireless devices and systems.

Murata and Yokogawa have reached an agreement whereby they will cooperate in the development of communication modules for field wireless devices used in plants.
Overview of ISA100 wireless module

The LBBA0ZZ1EU is a 2.4GHz wireless module featuring a highly-integrated and low power radio design. All components relating to wireless function are integrated into this module. This module has “ISA stack” software to support ISA100 Wireless. The ISA stack includes MAC, Data Link, Network, Transport, Application sub-layer and DMAP.

Appearance

![Image of LBBA0ZZ1EU module]

HW Block Diagram

The LBBA0ZZ1EU support customers who develop ISA100 Wireless products regarding minimization of the design cost and development period.
## Spec of ISA100 wireless module

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module Length (Typical)</td>
<td>31.0 mm</td>
</tr>
<tr>
<td>Module Width (Typical)</td>
<td>21.0 mm</td>
</tr>
<tr>
<td>Module Height (Max)</td>
<td>6.1 mm</td>
</tr>
<tr>
<td>Package</td>
<td>LGA</td>
</tr>
<tr>
<td>Pad size (Typical)</td>
<td>1.4 x 1.6 mm</td>
</tr>
<tr>
<td>Number of pad</td>
<td>60</td>
</tr>
<tr>
<td>Mounting Type</td>
<td>SMT (Surface mount technology)</td>
</tr>
<tr>
<td>Antenna</td>
<td>External</td>
</tr>
<tr>
<td>System Clock</td>
<td>Internal (32MHz)</td>
</tr>
<tr>
<td>MSL</td>
<td>Level3</td>
</tr>
<tr>
<td>Protocol</td>
<td>ISA100 Wireless (W2-00)</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40degC ~ +85degC</td>
</tr>
<tr>
<td>Supply Voltage with Internal LDO</td>
<td>3.2V ~ 5.5V</td>
</tr>
<tr>
<td>Supply Voltage without Internal LDO</td>
<td>2.4V ~ 3.0V</td>
</tr>
<tr>
<td>Transmit power</td>
<td>+10dBm Max</td>
</tr>
<tr>
<td>Receiver Sensitivity at 10% PER</td>
<td>-98.5dBm Typical</td>
</tr>
<tr>
<td>Transmit Mode Current</td>
<td>40mA Typical</td>
</tr>
<tr>
<td>Receive Mode Current</td>
<td>18.5mA Typical</td>
</tr>
<tr>
<td>Sleep Mode Current</td>
<td>10uA Typical</td>
</tr>
<tr>
<td>Host Interface</td>
<td>UART or SPI</td>
</tr>
<tr>
<td>RoHS Compliant</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Evaluation tool

Evaluation board

Outline of Evaluation board

RF test tool

Usage of Evaluation board

① Operate Type1EU from external Host via serial interface.
② Check the functionality of Type1EU by utilizing “UAP sample” on Application Processor in Evaluation Board.
User Application Process (UAP) Sample

UAP sample is designed to work without Operating System. Therefore, processing is executed by a single thread.
List of Technical documentations

SP-ZZ1EU   Type1EU datasheet
AN-ZZ1EU-001 Type1EU Hardware Integration Guide
AN-ZZ1EU-002 Type1EU Serial Interface Specification
AN-ZZ1EU-003 Type1EU First Step Guide for Evaluation Board
AN-ZZ1EU-004 Type1EU UAP Service Guide
AN-ZZ1EU-005 Type1EU Wireless Test Mode Specification
AN-ZZ1EU-006 Type1EU Radio Silence Mode
AN-ZZ1EU-007 Type1EU EVB Manual for Reset to Factory Default
AN-ZZ1EU-008 Type1EU Operation Manual for writing UAP Sample
AN-ZZ1EU-009 Type1EU Explanation of UAP Sample

✓ Related to test our evaluation board, please refer to AN-ZZ1EU-003/005/006/007.
✓ Related to hardware development with our ISA100 wireless module, please refer to SP-ZZ1EU and AN-ZZ1EU-001.
✓ Related to application software development for our ISA100 Wireless module, please refer to AN-ZZ1EU-002/004/008/009.
For more information

URL:

Contact address:
isa100.11a-support@murata.com
ISA100 Wireless User Application Process (UAP) Publication

User Application Process

Analog Input Object (Temperature)
Analog Input Object (Pressure)
Binary Input Object (Contact)

Concentrator Object

Periodic Publication

ISA100 Wireless Module

ISA100 Wireless Network

Gateways

Host

Build (Sample code available)

Buy

21 October 2015
VersaNode 210 Wireless Modem
- OEM Radio module running a WCI certified ISA100.11a communication stack
- Integrated into the field instruments of several major industrial vendors (Yokogawa)

VersaNode 310 Wireless Modem
- OEM Radio module running a WCI certified ISA100.11a communication stack
- Integrated into the field instruments of several major industrial vendors (GE, 3ETI, Tyco, and others)

VersaRouter 800 Gateway
- ISA100.11a compliant System Manager, Gateway and Backbone Router
- OEM router integrated into the Gateway of several major industrial vendors (Yokogawa, Apprion, GE Energy (Bently), and others)

VersaRouter 900 Gateway
- ISA100.11a compliant System Manager, Gateway and Backbone Router
- ATEX Zone 2 certified for installation in hazardous industrial settings

“Nivis” platform. Available from CDS and Centero.

http://www.cds.ro

http://centerotech.com
ISA100.11a Development Kit
• Allows customers to evaluate the performance of a ISA100.11a wireless network
• The kit is designed to allows customers to swiftly integrate Centero’s ISA100.11a OEM components into their product line

Field Tool
• Handheld tool, allows customers to provision and configure field instruments installed in industrial settings
• Supports OTA and infrared based provisioning

ISA100.11a ‘Enterprise’ Source Code
• Source code for all ISA100.11a network components, including the certified ISA100.11a field device stack, Backbone Router, Gateway and System Manager
• Allows vendors to customize their implementation and build royalty free products

ISA100.11a VersaAPP Software Development Kit
• Complete ISA100.11a development kit that speeds development of wireless industrial field instruments
• Application layer code available as a library or source code

“Nivis” platform. Available from CDS and Centero.

Nivis Modules and System (Slide 2 of 2)

http://www.cds.ro

http://centerotech.com
Yokogawa antenna module simplifies wireless sensor development.

- RF circuit and ISA100 stack are implemented.
- The antenna module will be certified for the major radio laws
  - FCC, RT&T and Giteki
- The antenna module designed to comply with intrinsic safety.
- Sensor makers can focus on sensor development.
- Accelerates development of wireless sensor
- Reduces development time

Contact Yokogawa directly for more information
ISA100 HART Adapter
(Multiple sources)
NEXCOM Infrastructure

- **NIO200IDG**
  ISA100.11a Distributed Gateway

- **NIO210IAG**
  ISA100.11a All-in-One Gateway

- **NIO200IWR**
  ISA100.11a Wi-Fi backbone router

- **NIO200IER**
  ISA100.11a Ethernet backbone router

- **NIO20I**
  ISA100.11a Adapter

**Available 2016**

Future Product

http://www.nexcom.com

Slide provided by NEXCOM
Application Integration

From WCI Webinar
ISA100 Wireless – Application Integration
June 2011

WCI Extensions

- Device Information
  - Certification
  - NAMUR 107 Diagnostics

- Data Modeling
  - Filter/Hysteresis
  - Alarms

- Profiles
  - Temperature
  - Pressure
  - More...

Native Application Layer

- User Data
  - Analog
  - Binary
  - Blocks

- Services
  - Publication
  - Alerts

Field Device

- WCI Extensions
- ISA100.11a Application
- UDP / IP OSI Stack

Gateway

- General Client Interface
- ISA100.11a Gateway
- UDP / IP OSI Stack

End User Application

Device Description

Application Data

Security

Service Contracts

21-October-2015
Certification
# Categories of ISA100 Wireless Field Devices

As of October-2015

<table>
<thead>
<tr>
<th>Category</th>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Module</td>
<td>Gas Detection</td>
</tr>
<tr>
<td>Analog Transmitter</td>
<td></td>
</tr>
<tr>
<td>Digital I/O</td>
<td></td>
</tr>
<tr>
<td>Wired HART to ISA100 Wireless Adapter</td>
<td></td>
</tr>
<tr>
<td>Temperature Transmitter</td>
<td></td>
</tr>
<tr>
<td>Pressure Transmitter</td>
<td></td>
</tr>
<tr>
<td>Condition Monitoring (Vibration)</td>
<td></td>
</tr>
<tr>
<td>Corrosion Monitoring</td>
<td></td>
</tr>
<tr>
<td>Steam Trap Monitoring</td>
<td></td>
</tr>
<tr>
<td>Position Sensor</td>
<td></td>
</tr>
<tr>
<td>Limit Switch</td>
<td></td>
</tr>
<tr>
<td>Radar Tank Gauge</td>
<td></td>
</tr>
<tr>
<td>Valve Positioner</td>
<td></td>
</tr>
</tbody>
</table>
Wireless Compliance Institute
Validation Strategy

Certification Testing
- One device at a time
- One supplier at a time
- One emulated (XML) system manager
- One emulated (XML) gateway
- Comprehensive test

Validates the device

Live Network Interoperability Test
- Multiple devices in a network
- Multiple suppliers in a network
- Multiple system managers
- Multiple gateways
- Compatibility trial

Validates the certification

The two approaches, together, ensure interoperability.
Device Certification Overview

Device Supplier

Device Test Kit

ISA100 WCI

Stack Supplier

Device Supplier

Stack Test Kit (STK)

Device Test Kit (DTK)

WCI Test Kits

Registation at WCI Web site

Pretest

Device Supplier

Device Test Kit

ISA100 WCI

Stack Supplier

Device Supplier

Stack Test Kit (STK)

Device Test Kit (DTK)
For more information about WCI Certification

URL:

Contact address:
mbrazda@isa.org
Development Process (Review)

Development phase

Research and review of specifications/requirements
Implementation specifications
Technical seminar products
Technical support
Development design
Hardware and software design
Technical seminar products
Technical support
certification
Completion of development
testing for certification and registration to ISA100WCI
Certificate service
Introduction to Market
Promotion Exhibition

ISA100WCI support

Research and review of specifications/requirements
Hardware and software design
Testing for certification and registration to ISA100WCI
Completion of development
ISA100WCI complies with protocol stack
Delivery of ISA100 Wireless module

Development activities

Module vendors

-Demo kit
-Technical support
-ISA100 Wireless module
-Development tools
WCI Marketing Programs
WCI Marketing Programs

1. Host webinars
2. ISA100WCI.org website
3. ISA Insights – monthly
4. Joint press releases
5. Industry events-Achema, JEMIMA, and regional events