WIRELESS COMPLIANCE INSTITUTE

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

ISA100 Devices Added Jan – Sept 2015

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

ISA100 WIRELESS COMPLIANCE INSTITUTE

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
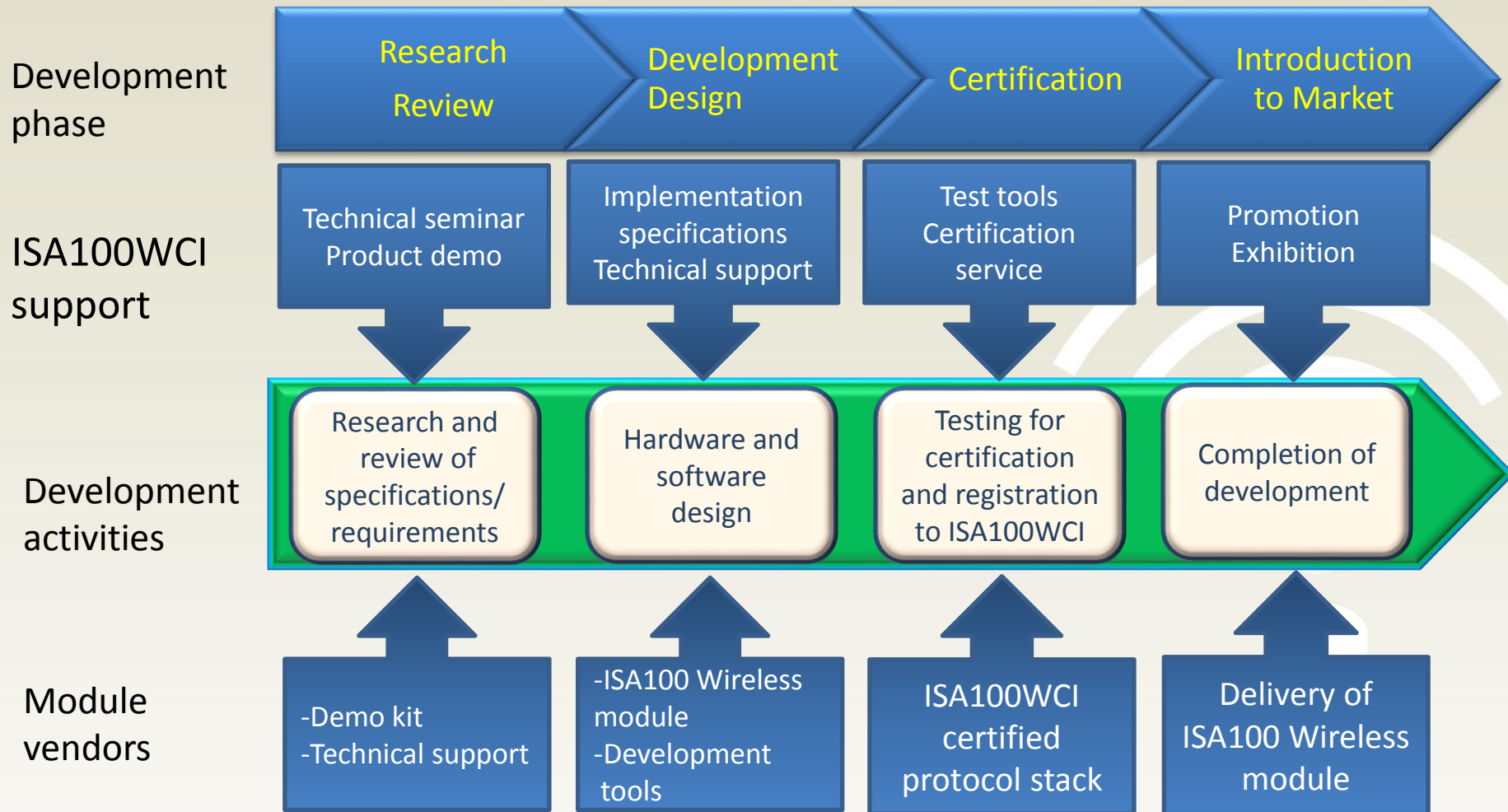Senior Application Engineer
Murata Manufacturing Co.,Ltd.

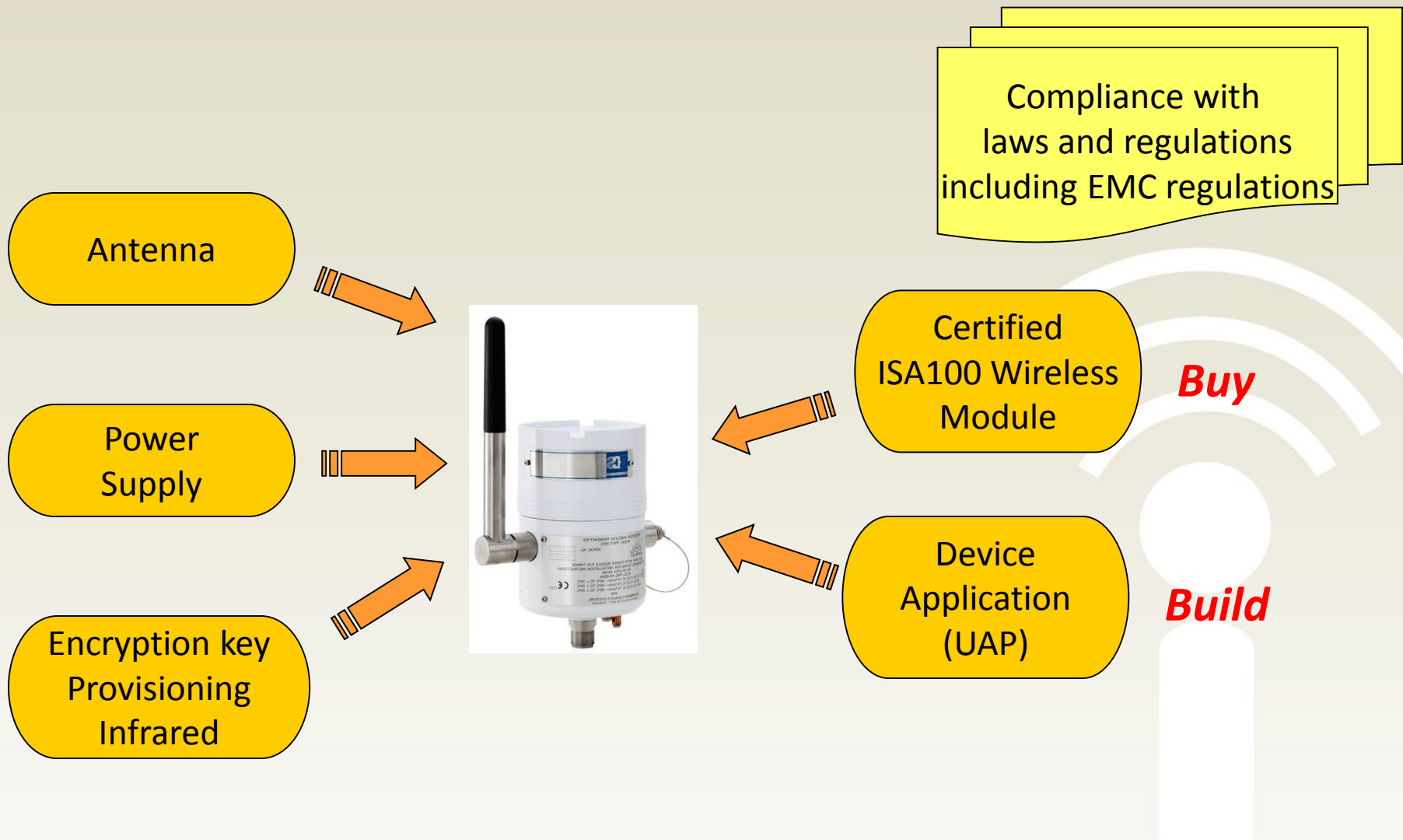# Developing an ISA100 Wireless Certified Product

Webinar Overview

- Development Process
- Available Technologies
  - *Case Study from Murata*
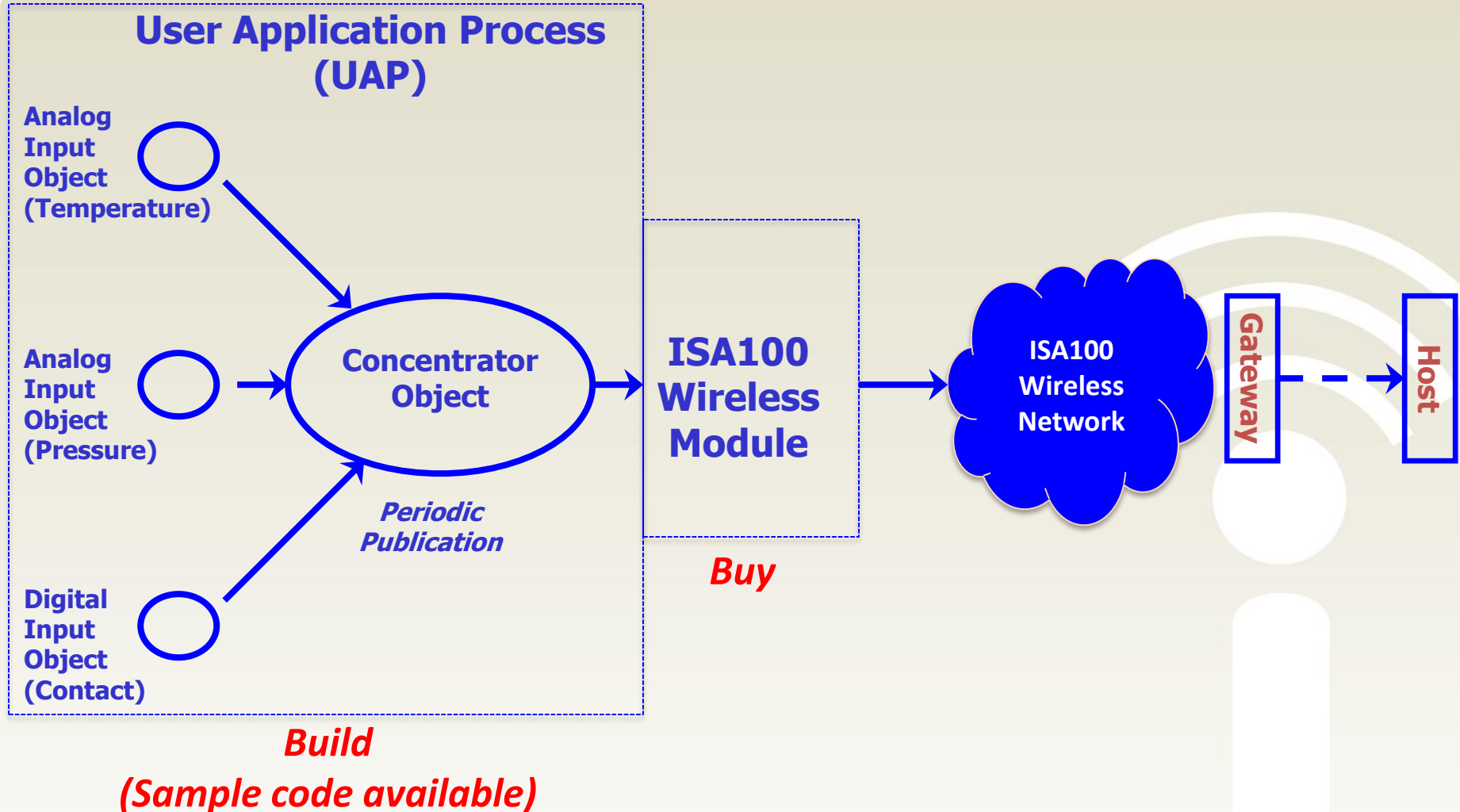- WCI Certification
- WCI Marketing Programs
- Q & A

ISA100 WIRELESS COMPLIANCE INSTITUTE

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

Typical Field Device Technologies

Antenna

Power Supply

Encryption key Provisioning Infrared

Certified ISA100 Wireless Module

Buy

Device Application (UAP)

Build

Compliance with laws and regulations including EMC regulations

ISA 100 WIRELESS COMPLIANCE INSTITUTE

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

Buy

ISA100 Wireless Network

Gateway

Host

Build
(Sample code available)

ISA100 WIRELESS COMPLIANCE INSTITUTE

ISA100 Wireless Stack Technologies

Source	Description
Nivis (CDS, Centero)	Certified in 2010. Modules used in many ISA100 Wireless devices.
Honeywell	Certified in 2010. Reference design used in Honeywell products.
Yokogawa	Certified in 2015. Integrated stack and antenna.
Murata	New. Module developed in collaboration with Yokogawa.
Open Source	Uncertified version of Nivis stack, intended for R&D, 2013.
Others	At least 3 additional stacks are under development.

Murata case study follows on next 11 slides.

ISA100 WIRELESS COMPLIANCE INSTITUTE

Introduction
Murata
ISA100 Wireless module
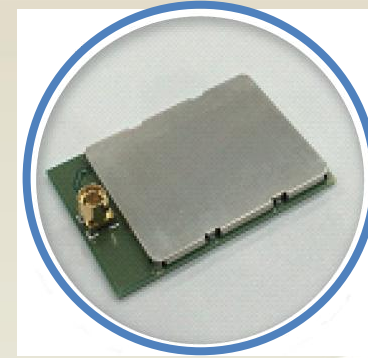
Presented by: Ryuhei Nakai

r.nakai@murata.com

Oct 21, 2015

22 October 2015

About Murata

muRata
INNOVATOR IN ELECTRONICS

Our Business

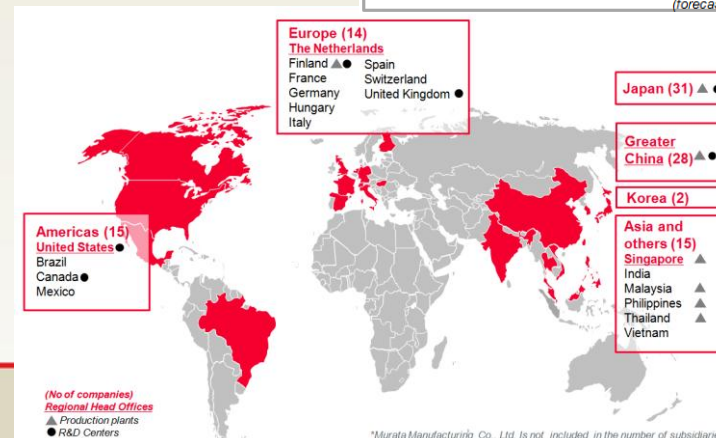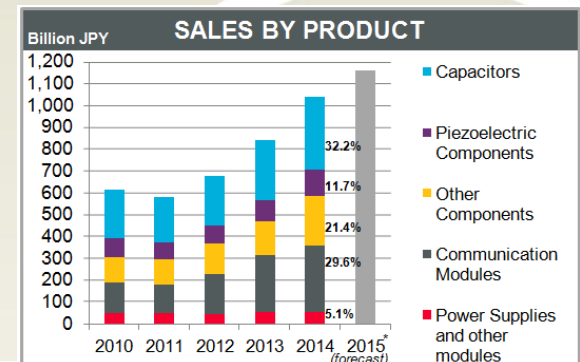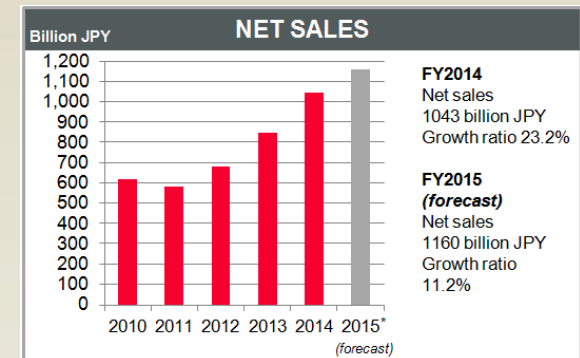We are worldwide leaders in the design, manufacture and supply of electronic components and solutions.
We are Innovators in Electronics.

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*
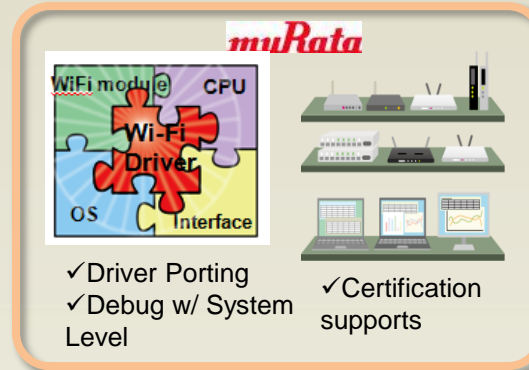 (31 in Japan, 74 overseas)
- Established in 1944

NET SALES (Billion JPY)

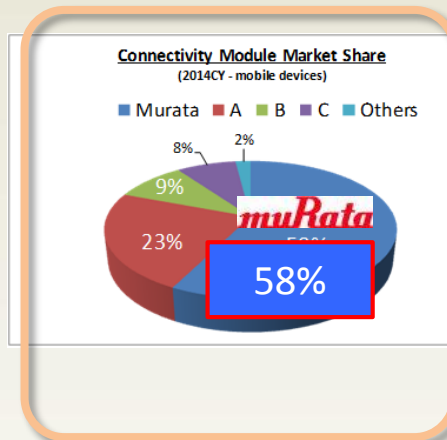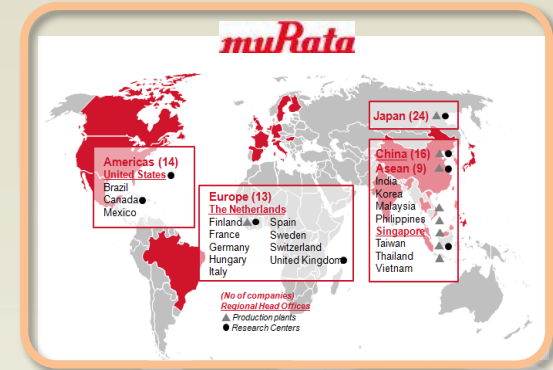FY2014
Net sales
1043 billion JPY
Growth ratio 23.2%

FY2015
(forecast)
Net sales
1160 billion JPY
Growth ratio
11.2%

SALES BY PRODUCT (Billion JPY)
- Capacitors
- Piezoelectric Components
- Other Components
- Communication Modules
- Power Supplies and other modules

Europe (14)
The Netherlands
Finland ▲● Spain
France Switzerland
Germany United Kingdom ●
Hungary
Italy

Japan (31) ▲●

Greater China (28) ▲●

Korea (2)

Americas (15)
United States ●
Brazil
Canada ●
Mexico

Asia and others (15)
Singapore ▲
India
Malaysia ▲
Philippines ▲
Thailand ▲
Vietnam

(No of companies)
Regional Head Offices
▲ Production plants
● R&D Centers

*Murata Manufacturing Co., Ltd. Is not included in the number of subsidiaries

ISA 100 WIRELESS COMPLIANCE INSTITUTE

Murata Strength in Wireless module

HW / RF Design

SW / Cert. Support

✓Driver Porting
✓Debug w/ System Level

✓Certification supports

Global Network

Americas (14)
United States
Brazil
Canada
Mexico

Europe (13)
The Netherlands
Finland Spain
France Sweden
Germany Switzerland
Hungary United Kingdom
Italy

Japan (24)

China (16)
Asean (9)
India
Korea
Malaysia
Philippines
Singapore
Taiwan
Thailand
Vietnam

(No of companies)
Regional Head Offices
▲ Production plants
● Research Centers

Connectivity Module Market Share
(2014CY - mobile devices)

■ Murata ■ A ■ B ■ C ■ Others

2%
8%
9%
23%

58%

Production Capacity
(Murata Connectivity Modules)

30+Mu/mo.

Kpcs/Month
40,000
30,000
20,000
10,000
0
2015C/Q1   Q2   Q3   Q4

Shenzhen

Komatsu

Market Share

Supply Capability
(Flexible / Multi Factory locations)

Murata wireless modules Coverage for IoT

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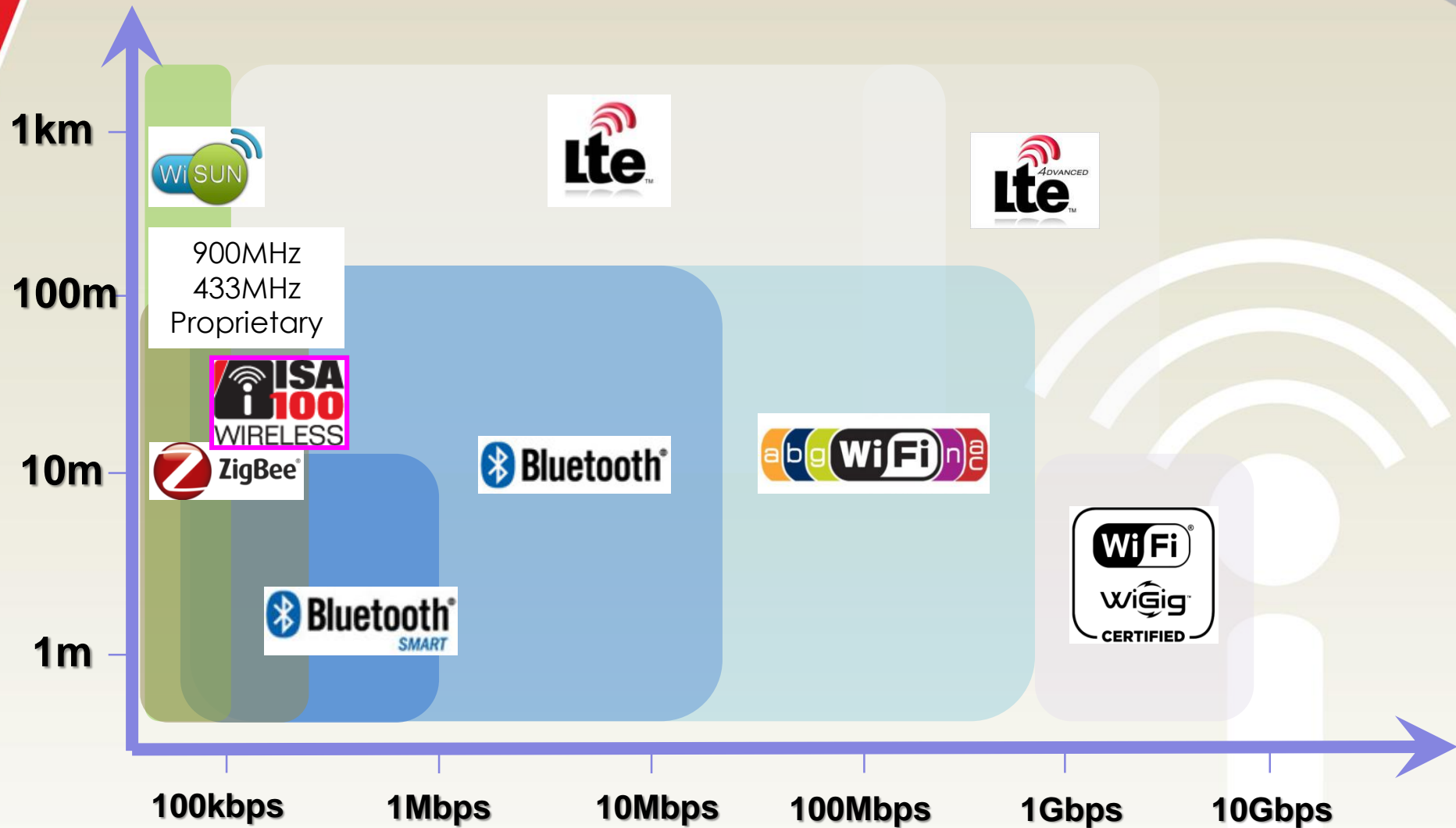
Murata-Yokogawa Alliance
for development of ISA100 Wireless module

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.
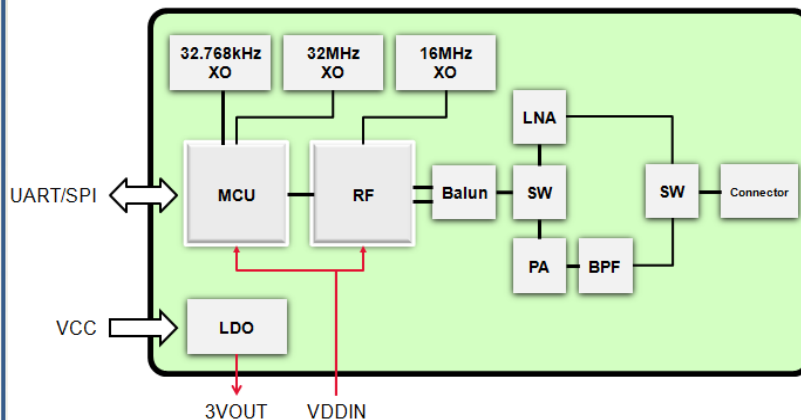
Overview of ISA100 wireless module

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.
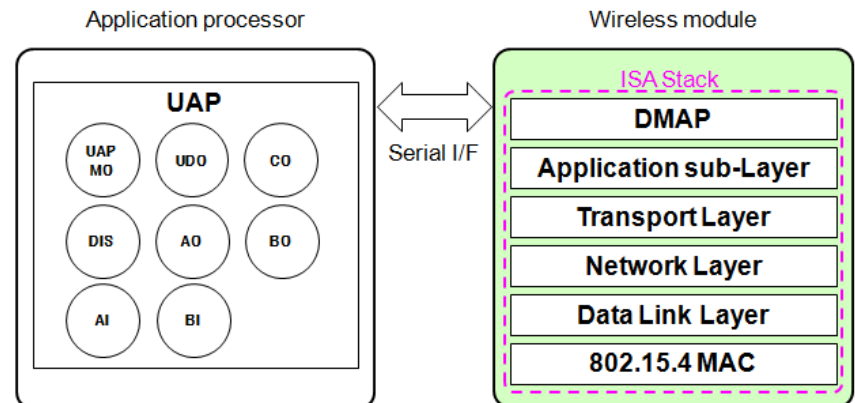
Appearance
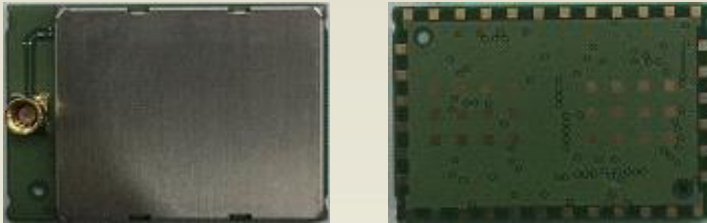
HW Block Diagram

SW Block Diagram

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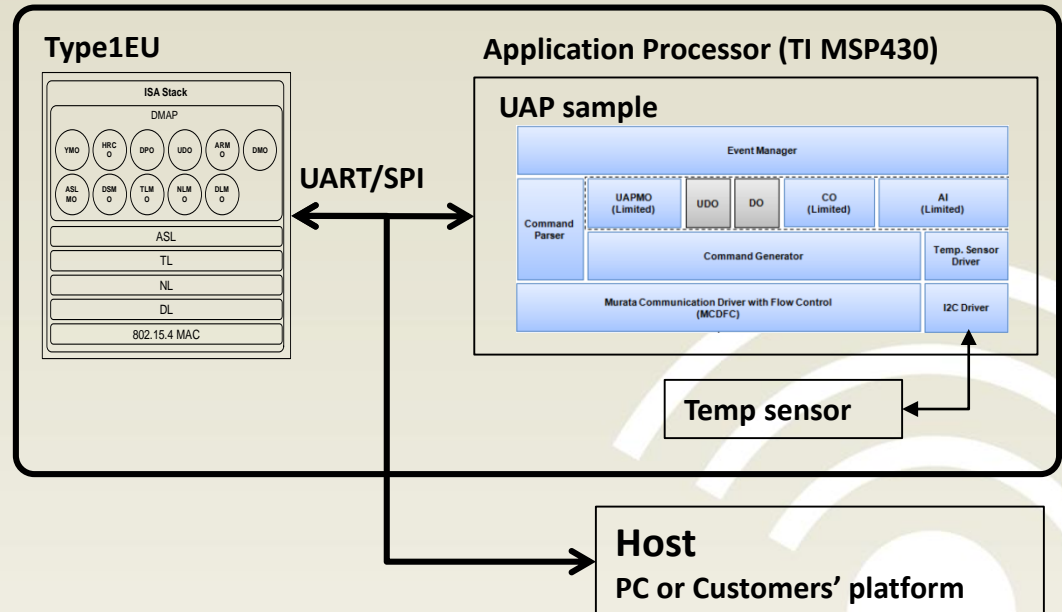
Spec of ISA100 wireless module

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

Evaluation tool

Evaluation board

Outline of Evaluation board

Type1EU

Application Processor (TI MSP430)

UART/SPI

Temp sensor

Host
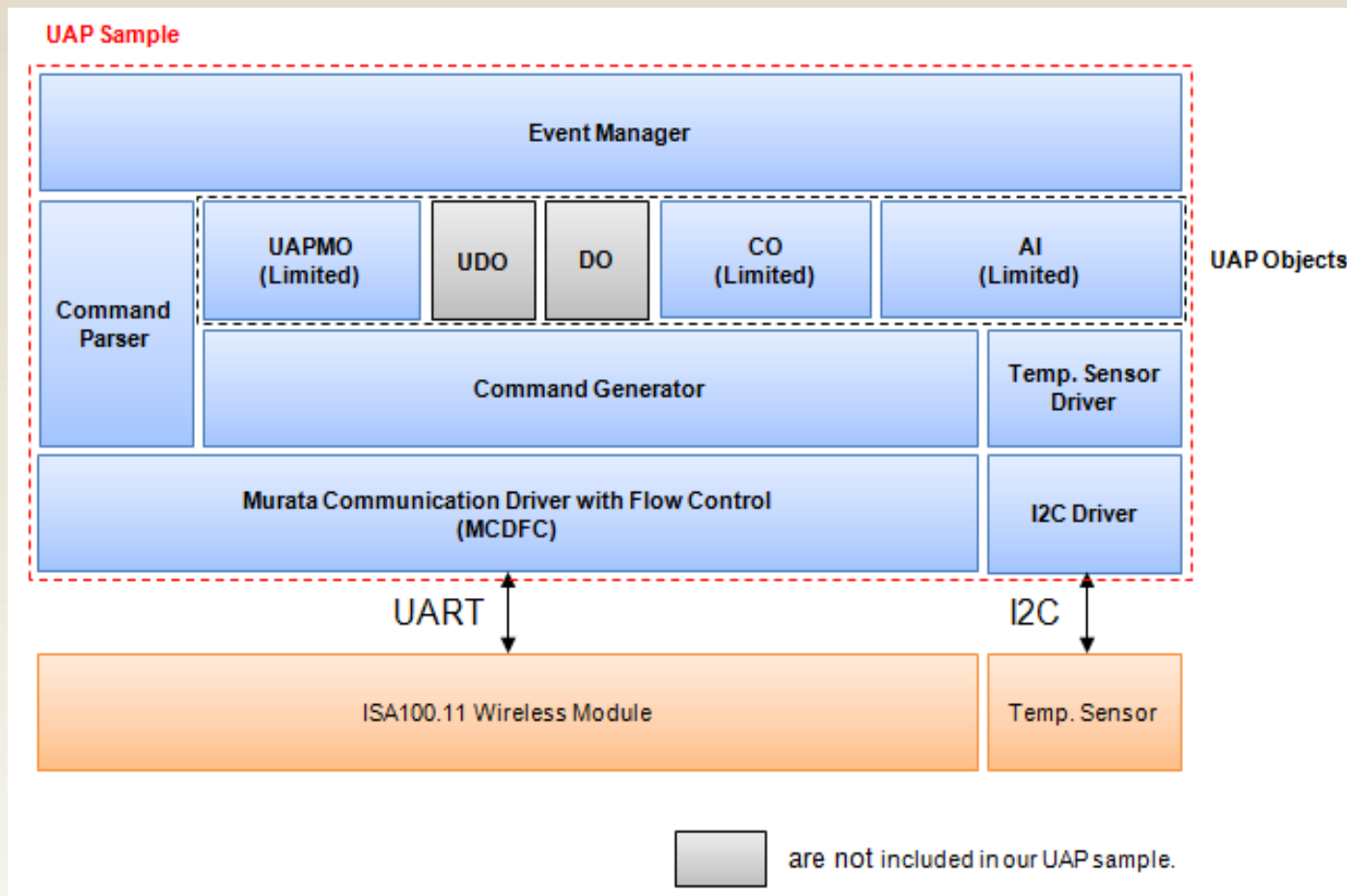**PC or Customers' platform**

RF test tool
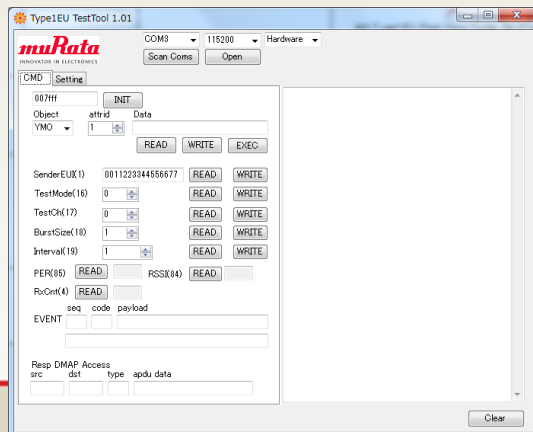
Usage of Evaluation board

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.
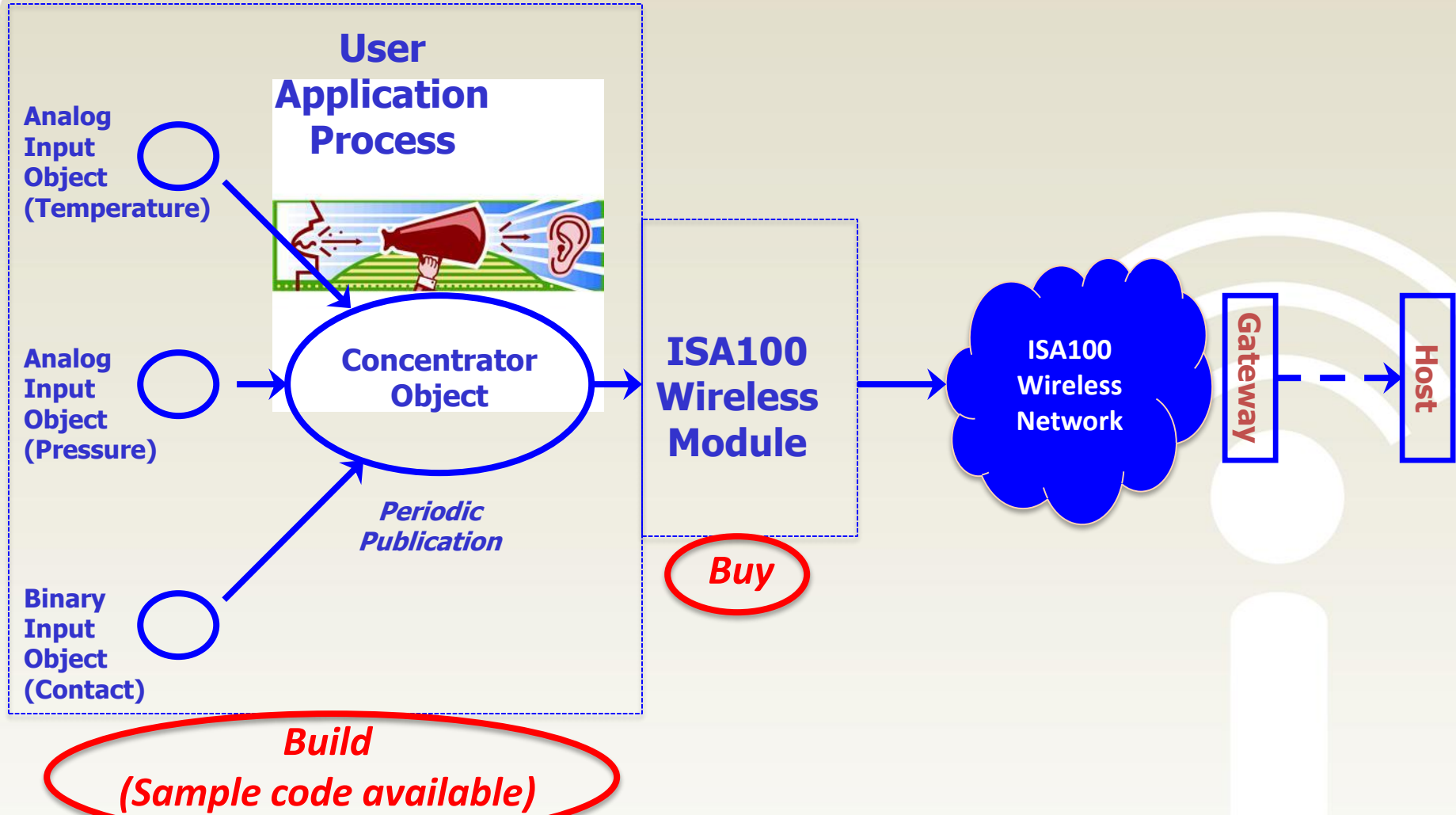
For more information

URL:
http://wireless.murata.com/eng/products/rf-modules-1/802-15-4/type-1eu.html

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

Gateway

Host

Buy

Build (Sample code available)

WIRELESS COMPLIANCE INSTITUTE

Nivis Modules and System
(Slide 1 of 2)

"Nivis" platform. Available from CDS and Centero.

http://www.cds.ro

http://centerotech.com

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 Modules and System
(Slide 2 of 2)

Slide provided by Centero

"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
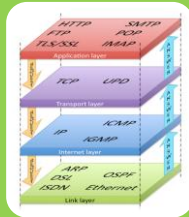
ISA100.11a 'Enterprise' Source Code

• 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
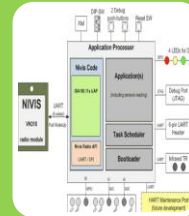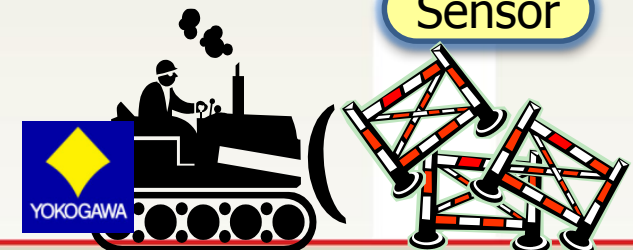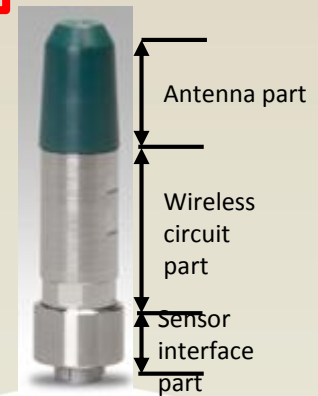
ISA100.11a VersaAPP Software Development Kit

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

21 October 2015   24

Yokogawa antenna

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

Antenna part

Wireless circuit part

Sensor interface part

I/F + Power

Sensor

ISA **WIRELESS COMPLIANCE INSTITUTE**

YOKOGAWA

ISA100 HART Adapter
(Multiple sources)
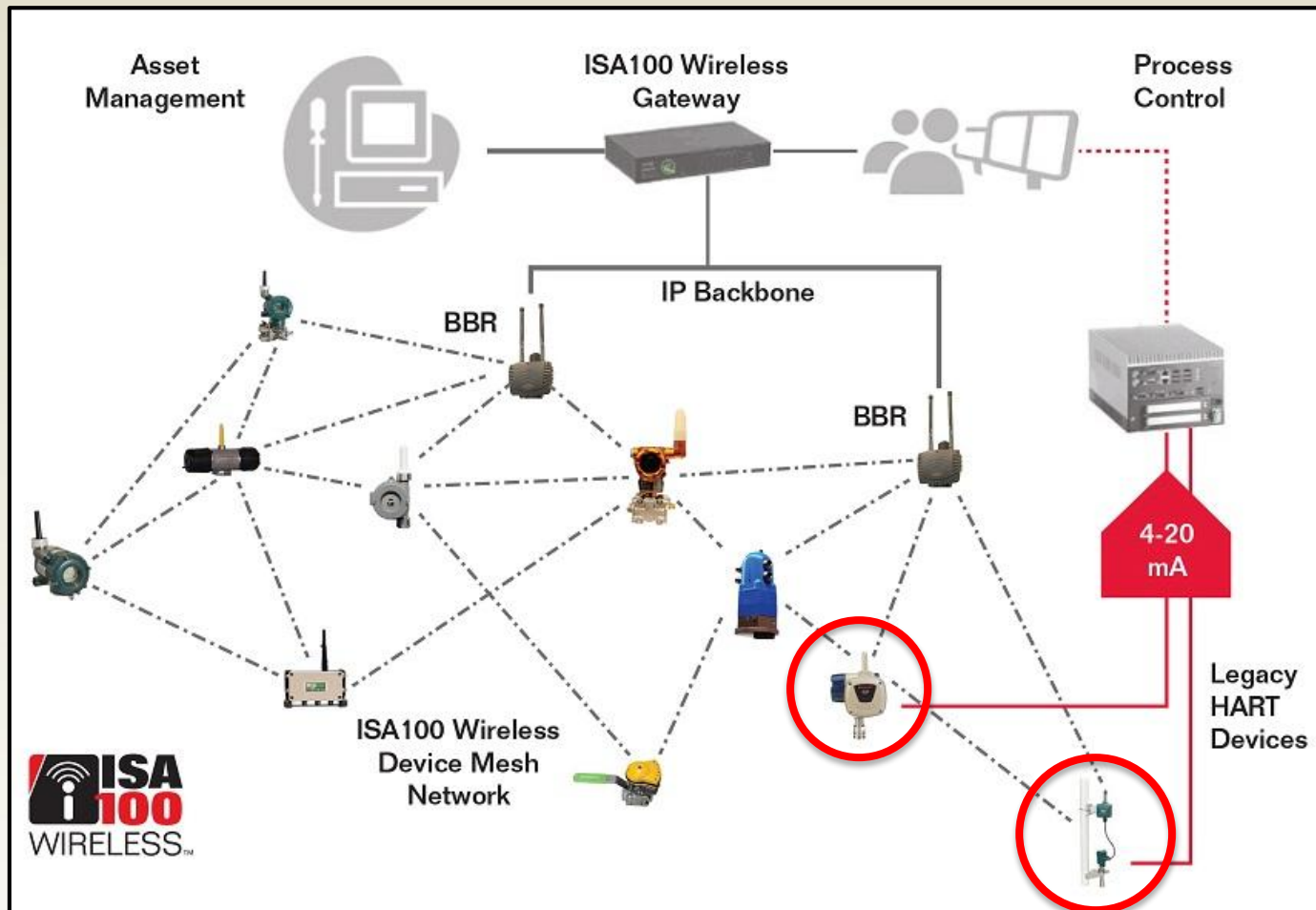
NEXCOM Infrastructure

Gateway

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

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

Backbone Router

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

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

Adapter

✓ **NIO20I**
ISA100.11a Adapter

Available 2016

http://www.nexcom.com

Future Product

ISA100.11a

ISA 100 WIRELESS COMPLIANCE INSTITUTE

Application Integration

WCI Extensions

Device Information ❹
◇ Certification
◇ NAMUR 107 Diagnostics

Data Modeling
◇ Filter/Hysteresis
◇ Alarms

Profiles
◇ Temperature
◇ Pressure
◇ More...

Native Application Layer

User Data ❷
◇ Analog
◇ Binary
◇ Blocks

Services
◇ Publication
◇ Alerts

Device Description ❺

End User Application

Field Device

WCI Extensions

ISA100.11a Application

❶ *Application Data*

Gateway

General Client Interface ❸

ISA100.11a Gateway

UDP / IP OSI Stack

UDP / IP OSI Stack

Security

Service Contracts

Certification

21-October-2015

29

Categories of ISA100 Wireless Field Devices
As of October-2015

Communication Module	Gas Detection
Analog Transmitter	
Digital I/O	
Wired HART to ISA100 Wireless Adapter	
Temperature Transmitter	
Pressure Transmitter	
Condition Monitoring (Vibration)	
Corrosion Monitoring	
Steam Trap Monitoring	
Position Sensor	
Limit Switch	
Radar Tank Gauge	
Valve Positioner	

ISA100 WIRELESS COMPLIANCE INSTITUTE

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**

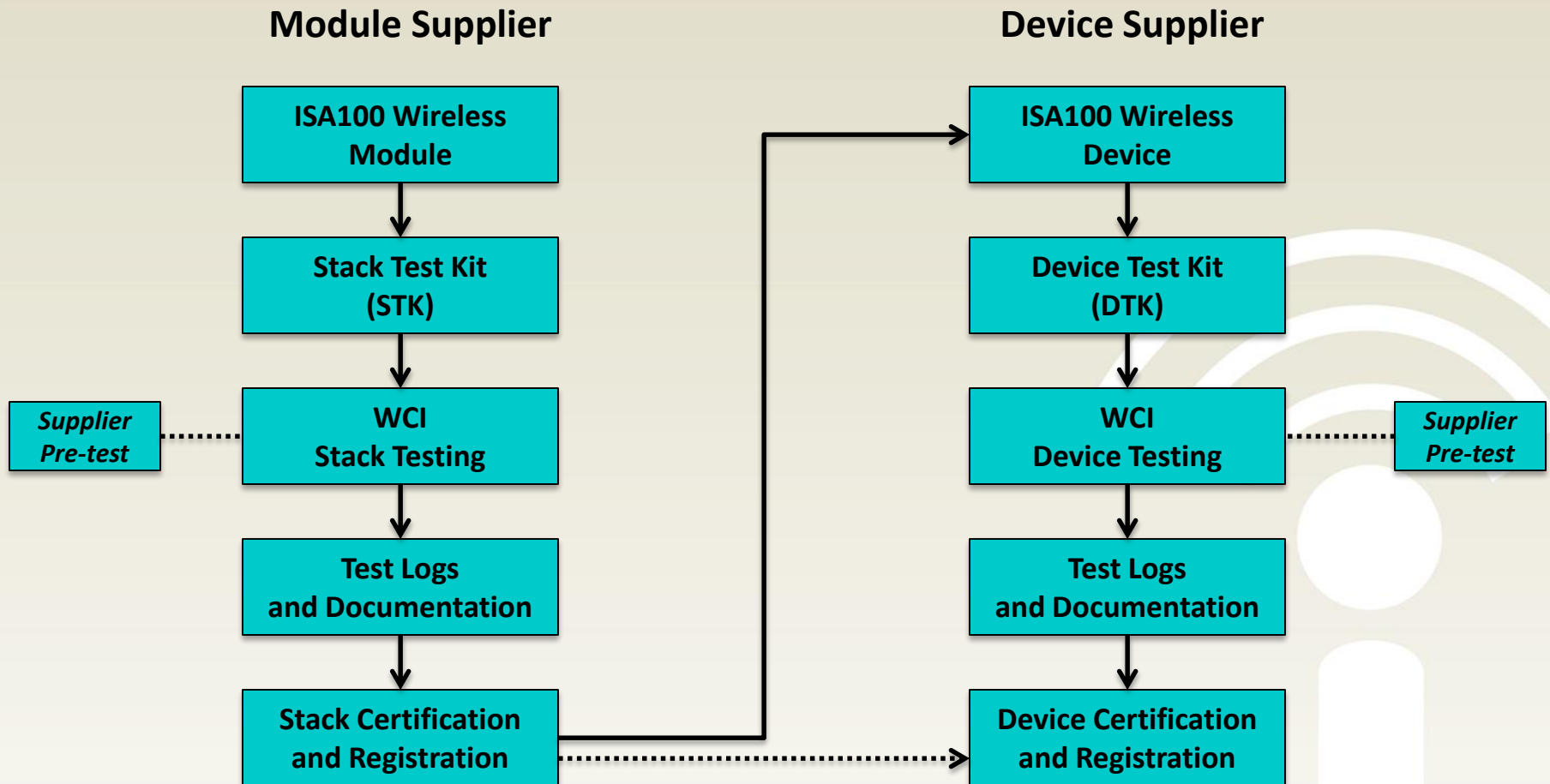✓ **Comprehensive test**

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.

ISA 100 WIRELESS COMPLIANCE INSTITUTE

Stack and Device Certifications

Module Supplier

Device Supplier

```
ISA100 Wireless          ISA100 Wireless
Module                   Device
     |                        |
     v                        v
Stack Test Kit           Device Test Kit
(STK)                    (DTK)
     |                        |
     v                        v
WCI                      WCI
Stack Testing            Device Testing
     |                        |
     v                        v
Test Logs                Test Logs
and Documentation        and Documentation
     |                        |
     v                        v
Stack Certification      Device Certification
and Registration         and Registration
```

Supplier Pre-test · · · · · (WCI Stack Testing)

Supplier Pre-test · · · · · (WCI Device Testing)

WIRELESS COMPLIANCE INSTITUTE

Device Certification Overview

Device Supplier

Device Test Kit

Pretest

ISA100 WCI

Stack Supplier   Device Supplier

Registration at WCI Web site

WCI Test Kits

Stack Test Kit (STK)

Device Test Kit (DTK)

For more information about WCI Certification

URL:
http://www.isa100wci.org/en-US/Supplier-Resources/Certification-Testing-Overview

Contact address:
mbrazda@isa.org

Development Process (Review)

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 compliant protocol stack	Delivery of ISA100 Wireless module

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