The ISA100 Standards

Overview & Status

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Agenda

• Why Develop Global Industrial Wireless Standards?
• What is the ISA100 Committee?
• What is the ISA100.11a Standard?
• What are the Other Activities in ISA100?
• Summary
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Why Develop Global Industrial Wireless Standards?

Because I always know where my signals are going!

Because routing is never an issue

Because somebody will always invent an adapter.
This is The Wireless Landscape -
Lots of Choices
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What is the ISA100 Committee?

- The ISA100 committee is part of ISA and was formed in 2005 to establish standards and related information that will define procedures for implementing wireless systems in the automation and control environment with a focus on the field level.

- The committee is made up of:
  - Over 400 automation professionals
  - From nearly 250 companies around the world,
  - Representing end users, wireless suppliers, DCS suppliers, instrument suppliers, PLC suppliers, technology suppliers, system integrators, research firms, consultants, government agencies, and consortiums,
  - Lending their expertise from a variety of industrial backgrounds

A Large, Diverse Group of Professionals Designing Industrial Wireless Standards with and for End Users
ISA100 Overview

• Backed by ISA Expertise, Heritage and History
  – Nearly 30,000 Members with 140 Standards Committees using an Open Standards Development Process Accredited by ANSI
  – Estimated at ~1 Billion Products Using ISA Standards Technologies
  – ISA 100 Designed by Experts in Wireless, Security, and Instrumentation Technologies with Direct End Users Involvement on Committee

• Family of Standards: Single-Stop Standardization Effort
  – Designed to Accommodate all your Plant Needs
  – Areas of Coverage Identified to Date; Process Automation (Process Focus), Factory Automation (Discrete Focus), Transmission and Distribution (Long Distance Focus), RFID (Industrial Tagging Focus)

• Multi-Protocol Capability: The Power of a Single Network
  – Allows Deployment of a Single, Integrated Wireless Network
  – Bring Simplicity to your Work with:
    o Single Technology to Learn, Maintain and Operate
    o Single Security System to Manage
    o Single Set of Infrastructures

• Co-Existence: Providing Peace of Mind
  – Designed with Co-existence features
  – Ensures Best Possible Performance

Wireless Systems for Industrial Automation
Developing a Reliable Family of Wireless Standards
ISA100 Overview

A Complimentary Family of Standards that Accommodate your Plant-wide Needs
Small Sample of Supporting Companies

Lots of Industry Expertise & Support for the ISA100 Standard
The Standard for Industrial Wireless (ISA100) was developed by ISA to address all aspects of wireless technologies in a plant.

**Industrial Wireless is the next major technology transition in plant automation.**

*ISA100 is the Next “4-20ma Standard” for Your Plant
It Combines the Simplicity of 4-20ma with the Digital Communications of Multiple Fieldbuses – ISA100.11a is Just the Beginning*
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What is the ISA100.11a Standard?

Scope of this standard

This standard defines all specifications including security and management; for wireless devices serving application classes 1 through 5 for fixed, portable and moving devices.

The ISA100.11a standard addresses performance needs for periodic monitoring and process control where latencies on the order of 100 ms can be tolerated with optional behavior for shorter latency.
ISA100.11a Working Group Charter

This has addressed:

- **Low energy** consumption devices, with the **ability to scale** to address large installations
- **Wireless infrastructure, interfaces to legacy** infrastructure and applications, **security, and network management** requirements in a functionally scalable manner
- **Robustness in the presence of interference** found in harsh industrial environments and with legacy systems
- **Coexistence** with other wireless devices anticipated in the industrial work space
- **Interoperability** of ISA100 devices
## ISA100 Usage Classes

A Standard Addressing Most of an Industrial Plant’s Field Device Applications

<table>
<thead>
<tr>
<th>Category</th>
<th>Class</th>
<th>Application</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>0</td>
<td>Emergency action</td>
<td>(always critical)</td>
</tr>
<tr>
<td>Control</td>
<td>1</td>
<td>Closed loop regulatory control</td>
<td>(often critical)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Closed loop supervisory control</td>
<td>(usually non-critical)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Open loop control</td>
<td>(human in the loop)</td>
</tr>
<tr>
<td>Monitoring</td>
<td>4</td>
<td>Alerting</td>
<td>Short-term operational consequence (e.g., event-based maintenance)</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Logging and downloading/uploading</td>
<td>No immediate operational consequence (e.g., history collection, sequence-of-events, preventive maintenance)</td>
</tr>
</tbody>
</table>
ISA100.11a Release 1

An open standard for anyone to implement and deploy

- No need to join any group
- Easily available via the internet
- No restrictions on downloads (other than copyrights)

Simple to use and deploy for end users

- Written in a clear and concise manner
- Easy to navigate through the standard
- Address needs of users ranging from unsophisticated to networking experts

Assures multi-vendor device interoperability

- Standardize the necessary interfaces while leaving other aspects for vendor customization

A Standard that is Open, Easy, and Interoperable
ISA100.11a Release 1

Focused on:

• serving process industry applications
  – Focus for release 1 is on process industrial applications
  – Architecture of ISA100.11a will support factory automation

• in-plant/near-plant
  – Focus on Local Area Networks (LANs) rather than Metropolitan Area Networks (MANs) or Wide Area Networks (WANs)

• global deployment
  – Choose radio bands and security techniques that are deployable throughout the world

• technology to address Class 1 (non-critical) to Class 5 applications such as monitoring
  – Critical and extremely time sensitive applications will be served in later releases

A Standard that is Global for Process Plant Usage
ISA100.11a Scope for Release 1

Provide simple, flexible, and scaleable security addressing major industrial threats leveraging 802.15.4-2006 security

• **Security is a major design facet of ISA100.11a**
  - Includes total life cycle such as configuration, operation, maintenance, etc

• **Security is considered throughout the whole system not just at the Phy layer or MAC sub-layer**
  - Leveraging security aspects of the IEEE 802.15.4-2006 standard allows for reduced costs, quicker implementations, and a broad consensus of security experts

A Standard that is Very Secure!
ISA100.11a Scope for Release 1

Adheres to a comprehensive coexistence strategy

• Coexistence is the ability of wireless networks to perform their tasks in an environment where there are other wireless networks that may or may not be based on the same standard
  – Examples of other wireless networks not based upon the ISA100.11a standard are WiFi/IEEE 802.11, Bluetooth, WirelessHART, etc.
• Coexistence strategy includes:
  – Listen before talk
  – Short messages
  – Low duty cycle
  – Adaptive frequency hopping by channel blacklisting
  – Low power operation

A Standard Developed with a Co-Existence Strategy
Uses a single application layer providing both native and tunneling protocol capability for broad usability

- ISA100.11a native device protocols allow efficient use of the bandwidth and provide for longer battery life of nodes
- Tunneling protocol allows the ISA100.11a network to carry existing protocols such as Fieldbus Foundation, HART, Profibus, Modbus, and others.
  - Allows existing installations to be easily converted to wireless

A Standard that Provides Communications to Legacy Plant Devices & Applications
ISA100.11a Multi-Protocol Capability

Support for Multiple Industrial Protocols at the Device and Application
ISA100.11a Architecture

A Robust, Flexible, and Scalable Architecture to Meet Various Plant Needs
What is unique about the ISA100.11a Standard?

For industrial companies that need a wireless network, the ISA100.11a standard, unlike other industrial wireless standards, provides users the following unique benefits.

• **Interoperable**
  – Device to gateway vendor independent communications
  – Device to device vendor independent communications

• **Scalable**
  – Supports a few to thousands of field devices in a single network and viewed and managed from a single network manager

• **Future proof**
  – Based on current and widely followed open industry standards
  – Modular technology building blocks, allowing easy updates as new technologies evolve such as radios, security and addressing

• **Designed for industrial performance**
  – Part of family of standards formed with input from end-users, customers and technical experts
Current Schedule for ISA100.11a

- September, 2009: the standard was approved
- June 2010: ISA100 compliance certification available
- Later in 2010: First commercial ISA100 compliant products available for sale
- Q1 2011: Expected IEC Approval of ISA100.11a
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There are many types of asset tracking technologies

- **GPS-based tracking**
- **Cellular-based tracking**
- **WiFi-Based tracking**
- **Geofencing**
- **“Classic” RFID**

Coverage (not resolution) comparison
Examine various Mathematics, Principles, Implementations

“Classic” RFID, portals, readers, tags, databases

Received Signal Strength Indicator-based location determination

Communication ranging techniques

System response

Time synchronization requirements for some Tracking technologies.
**ISA100.12: WirelessHART Convergence**

**Scope**

- Evaluate the WirelessHART specification and the ISA100.11a specification and provide a technical differential analysis with associated end user benefits.
- Identify and document user actions to allow successful coexistence options for both networks in a single plant environment.
- Gather user requirements, supported by use cases required by a converged standard.
- Identify, document, and recommend specifications that allow installed WirelessHART and ISA100.11a networks to be converged in the future when a converged standard is available.
• While preserving the user benefits of both WirelessHART and ISA100.11a, offer a phased converged specification recommending technical changes necessary to converge the WirelessHART specification and ISA100.11a Release 1 standard identifying the necessary changes to both technologies to assure compatibility and interoperability at the device level.

• Assure that the converged standard enables devices built to the WirelessHART and ISA100.11a pre-convergence standards to continue to work with networks built to the converged standard. (Backwards compatibility)

• Do this all without impacting schedules for other ISA100.11a standards
The ISA100 Wireless Backhaul Backbone Network Working Group focuses on:

- Define standard network common interfaces to enable interoperability between the backhaul backbone wireless networks and different field wireless networks
  - Sitting above the field wireless networks to allow access to the resources of underlying wireless networks, which includes but is not limited to ISA100.11a, WirelessHART, ZigBee, RFID, UWB, 802.11a/b/g/n, and other wireless standards
  - Sitting below the control application protocols to provide the clear common mechanisms to support variety of application protocol translation, which includes but is not limited to FOUNDATION™ fieldbus, HART®, and other application protocols
- Ensure Quality of Service (QoS) to prioritize a variety of applications
- Ensure Security
- Address network layer and up to ensure end-to-end interoperability
ISA100.15: Mission/Scope Illustration

Control Network

Network Common Interface

ISA100.11a
WirelessHART
RFID
UWB
Others
802.11a/b/g/n

Others
Cellular
WiMAX
Optical Wave
Satellite

T=Protocol Translator
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The ISA100 committee continues to be committed to rapid development to satisfy the expressed needs of the user community

- “Family of Standards” approach allows a succession of releases focused on the wireless needs of users
- Consensus among a balanced membership allows the committee to rise above special interests and do what is right for the industry
- Ultimate goal is quality standards that will stand the test of time by adapting to changes within the industrial environment

Delivering the Best Wireless Standards for the Industry
Thank you!

For More Information:

- A recording of this webinar will be posted on the www.isa100wci.org website on the 'Education' tab
- International Society of Automation: http://www.isa.org/isa100
- ISA100 Wireless Compliance Institute: www.isa100wci.org

Next Webinar Topic: May 4, 2010 at 11:00 am EDT

"The Technology Behind the ISA100.11a Standard"

Questions?