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ISA-SP100.14 Call for Proposal

Wireless Network Optimized for Industrial Monitoring

14 July 2006

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Call for Proposals (CFP)

SP100.14 – Wireless Network Optimized for Industrial Monitoring

Revision History

<u>Revision</u>	<u>Version</u>	<u>Date</u>	<u>Description</u>
0	R6	14-July-06	First release of CFP

I – Summary

CFP RELEASE DATE: 14 July 2006

Candidate technical proposals are requested by the ISA SP100.14 work group (WG) to form the baseline for its draft standard that will address wireless networking for Industrial Monitoring. This document describes the process and requirements for responding to this call for proposals.

The SP100.14 Work Group is chartered to develop an ISA SP100 Standard that will define the OSI layer specifications (e.g. PHY, DLL, etc), security specifications, and management (including network and device configuration) specifications for wireless devices, optimized for classes 4 through 5 industrial device applications and with consideration for class 0-3 applications.

This CFP solicits proposals and data that will form the baseline of a draft standard that will fulfill the scope and purpose of SP100.14. Additionally, there are three (3) other documents that the proposer is advised to read: the Use Case Summaries, the Technical Requirements Document (TRD), and the Evaluation Criteria. All of these documents will be accessible on the SP100 committee web site subsequent to the release of this CFP. Please note that the target set of use cases has only been partially documented and therefore the technical requirements are subject to change.

CALL FOR INTENT: Due 1 August 2006

The Call for Intent is a process in which all interested parties are asked to identify their intention to submit proposals, with an abstract. The abstract should include a high level description of the scope of the proposal as well as the overall approach. **YOU MUST DECLARE YOUR INTENT.** You may decide later, if necessary, to retract your intent, but it must be declared. The purpose of this call is to enable scheduling for the optional preliminary Proposer Conference in September as well as assignment of document numbers.

The Intent to Propose is due on 1 August 2006. Send your notification of intent to ISASP10014CFP@isa.org. If your response is not acknowledged within two (2) business days please resend.

All submissions to the CFP shall be formatted as per the ISA format with a cover page. The cover page releases the submission for public use by the ISA. Rules for ISA submissions and formats for Microsoft Word and PowerPoint documents may be found on the SP100 web site.

The CFP process is described in more detail in the sections IX and X.

II – ISA-SP100.14 Call for Proposal Scope

ISA-SP100.14 is publishing this Call for Proposal in order to encourage a variety of experts to collaboratively create a networking standard for low-cost wireless industrial monitoring devices. During the evaluation process, preference will be given to proposals where sufficient data is readily

available to assess the validity of claims. The ISA-SP100.14 Working Group requests proposals that are targeted at ISA-SP100 Classes 4-5, including such applications as process monitoring, equipment monitoring, environmental monitoring, inventory monitoring, asset management, and validation. These applications may include tasks that are classified as non-critical control.

III – ISA-SP100.14 Background and Purpose

Founded in 1945, ISA is a leading, global, nonprofit organization that is setting the standard for automation by helping over 30,000 worldwide members and other professionals solve difficult problems. Based in Research Triangle Park, North Carolina, ISA develops standards; certifies industry professionals; provides education and training; publishes books and technical articles; and hosts the largest conference and exhibition for automation professionals in the Western Hemisphere.

The ISA-SP100 Committee will establish standards, recommended practices, technical reports, and related information that will define procedures for implementing wireless systems in the automation and control environment with a focus on the field level. Guidance is directed towards those responsible for the complete life cycle including the designing, implementing, on-going maintenance, scalability or managing manufacturing and control systems, and shall apply to users, system integrators, practitioners, and control systems manufacturers and vendors.

The Committee's focus is to improve the confidence, integrity, and availability of components or systems used for manufacturing or control, and provide criteria for procuring and implementing wireless technology in the control system environment. Compliance with the Committee's guidance will improve manufacturing and control system deployment, and will help identify vulnerabilities and address them, thereby reducing the risk of compromising or causing manufacturing control systems degradation or failure.

The overall CFP process as defined by the ISA SP100 Committee is included in this document as Annex C. The major steps in the CFP process are listed in Annex D.

The ISA-SP100.14 Working Group was created by ISA-SP100 in April 2006, with the mission of recommending a wireless communication standard for industrial monitoring. Example applications include process monitoring, equipment monitoring, environmental monitoring, inventory monitoring, asset management, validation, and potentially slow non-critical control.

ISA-SP100.14 Purpose

To provide a wireless connectivity standard for class 4 (alerting) and class 5 (logging and downloading/uploading) applications (see Table 1 – Usage classes). The intent is that this standard will allow compliant devices that are relatively low complexity, reasonable cost, and low power consumption to allow long battery life where needed. The communication data rate must be sufficient to satisfy a set of generic needs such as alerting, logging, and downloading/uploading. The standard must also address the specific needs of sensors and automation in the industrial environment such as coexistence, robustness to interference, interoperability with plant infrastructure networks, etc.

ISA-SP100.14 Working Group Scope

This project will define the required and optional OSI layer specifications (e.g. PHY, DLL, etc), security specifications, and management (including network and device configuration) specifications for wireless devices serving the Class 4 and Class 5 industrial applications operating within a facility. Fixed or moving devices will operate with very limited power consumption. Handheld HMI devices will operate with variable latency and throughput requirements. Since this industrial environment could include high power interference sources the standard will also address the network's robustness. It is the intent of this project to address appropriate levels of coexistence with other wireless devices anticipated in the industrial work space, such as 802.11x, 802.16x, cell phones, et al. It is also the intent of

this project to address appropriate levels of interoperability with communication networks and field busses anticipated in the industrial work space, such as 802.3, 802.11x, 802.16x, HART, et al.

ISA-SP100.14 Working Group Role

The ISA-SP100.14 committee's role is to develop a draft standard. The ultimate decision of whether or not to adopt and promote the standard will be made by ISA-SP100's parent organization, ISA. The working group may be disbanded or restarted at the discretion of ISA without prior notice.

On completion of the SP100.14 standard, it will be made available to other standards organizations such as IEC as a baseline for other standards initiatives.

The approach used by the ISA-SP100.14 group will be open and collaborative, with the goal of achieving consensus when possible. Each participating company will get a single vote, with voting rights based on participation. The ISA-SP100 voting membership is by election and the rules are set by the ISA parent organization.

IV – ISA-SP100 Usage Classes

Analysis of the applications of inter-device industrial wireless communications resulted in a partitioning of those communications into six classes. These classes were introduced in ISA-SP100 and are summarized in tabular form in Table 1.

Table 1 – Usage classes

Category	Class	Application	Description	Importance of message timeliness increases ↑
Safety	0	Emergency action	<i>(always critical)</i>	
Control	1	Closed loop regulatory control	<i>(often critical)</i>	
	2	Closed loop supervisory control	<i>(usually non-critical)</i>	
	3	Open loop control	<i>(human in the loop)</i>	
Monitoring	4	Alerting	<i>Short-term operational consequence (e.g., event-based maintenance)</i>	
	5	Logging and downloading/uploading	<i>No immediate operational consequence (e.g., history collection, sequence-of-events, preventive maintenance)</i>	

Alarms and communications with wireless workers are within the scope of SP100.14. Alarms can be of any class; they may require either human or an automated response. The communications of wireless workers fall into classes 3 - 5.

Batch levels 3 and 4 (as defined by ISA S88, where L3 = “unit” and L4 = “process cell”) can be of Class 2, Class 1, or even Class 0, depending on their function.

ISA-SP100.14 focuses on Class 4 and 5 applications. The last digit of “ISA-SP100.14” is intended to indicate classes 4 and 5 inclusively.

ISA-SP100 has identified examples of the wireless automation classes in Table 1:

Class 5: Monitoring without immediate operational consequences

This class includes items without strong timeliness requirements. Some, like sequence-of-events logs, require high reliability; others, like reports of slowly-changing information of low economic value, need not be so reliable since loss of a few consecutive samples may be unimportant.

Class 4: Monitoring with short-term operational consequences

This class includes high-limit and low-limit alarms and other information that might instigate further checking or dispatch of a maintenance technician. Timeliness for this class of information is typically low (slow), measured in minutes or even hours.

Class 3: Open loop control

This class includes actions where an operator, rather than a machine, “closes the loop” between input and output. Such actions could include taking a unit offline when conditions so indicate. Timeliness for this class of action is human scale, measured in seconds to minutes.

Class 2: Closed loop supervisory control

This class of closed-loop control usually has long time constants, with timeliness of communications measured in seconds to minutes. Examples are batch unit and equipment selection.

Class 1: Closed loop regulatory control

This class includes motor and axis control as well as primary flow and pressure control.

Class 0: Emergency action

This class includes safety-related actions that are critical to both personnel and plant. Most safety functions are, and will be, performed through dedicated wired networks to limit both failure modes and susceptibility to external events or attack. Examples are safety interlock, emergency shutdown, and fire control.

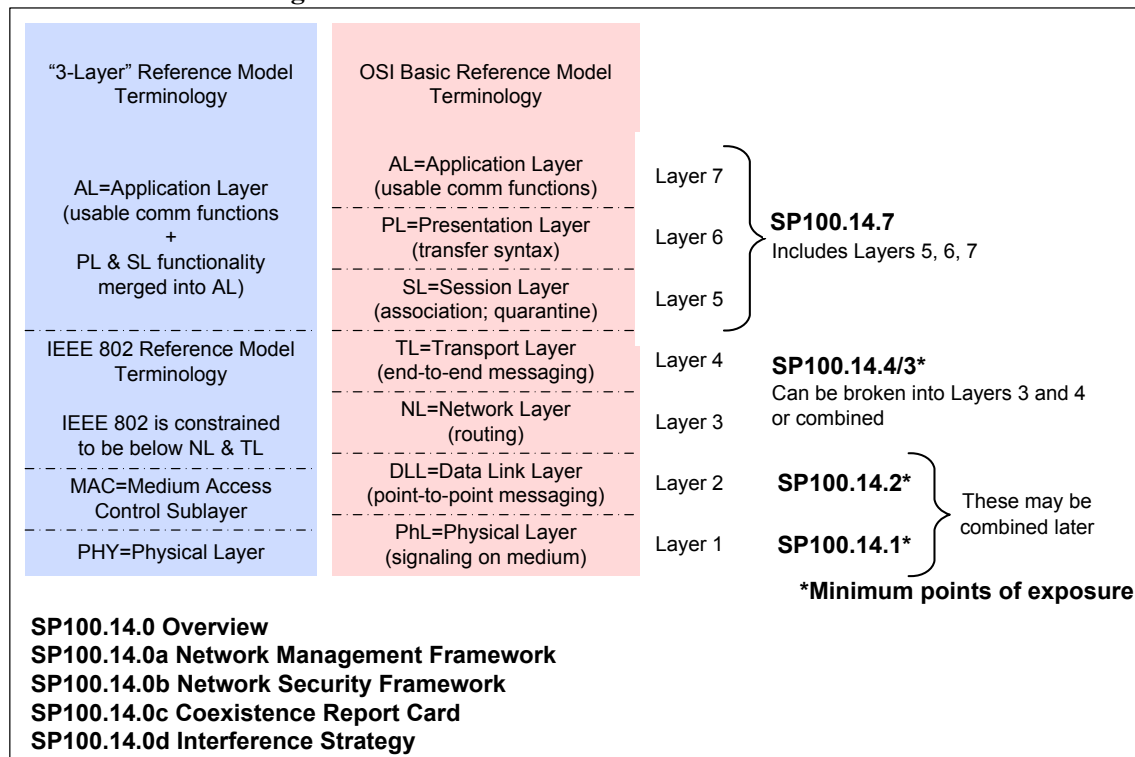
V – Relationship of ISA-SP100.14 to ISA-SP100.11

The ISA-SP100.11 Working Group was formed at the same time as ISA-SP100.14. The two efforts are intended to be complementary.

ISA-SP100.14 is optimized for Classes 4-5, and may meet some of the performance objectives of Classes 0-3. ISA-SP100.11 and ISA-SP100.14 have substantially overlapping members, and those individuals will identify common ground and assure integration of the two efforts.

VI – Structure of ISA-SP100.14 Standard

The overall structure envisioned for the ISA-SP100.14 standard is shown in Figure 1. It is expected that all sections shown, except for ISA-SP100.14.7 (application layer), will be covered in the first version of the standard.

Figure 1 – Overview of ISA-SP100.14 Standard

Proposals may focus on certain aspects of the total solution, such as physical layer, networking, or security. Proposals that only address certain aspects or layers must be structured such that they can be used as building blocks in a total solution; these will be considered for the appropriate aspects of the overall standard. Complete proposals should address all of the requirements and use cases, and it is recommended that complete proposals be structured so that portions can be used in combination with other proposals.

VII – Scope of ISA-SP100.14

Overview

The immediate goal of ISA-SP100.14 is to enable vendors to build compatible network devices, shown as Field, Routing, Handheld, and Gateway devices in Figure 2. Areas of initial focus are indicated by red ovals.

Figure 2 – Minimum scope of ISA-SP100.14 Standard

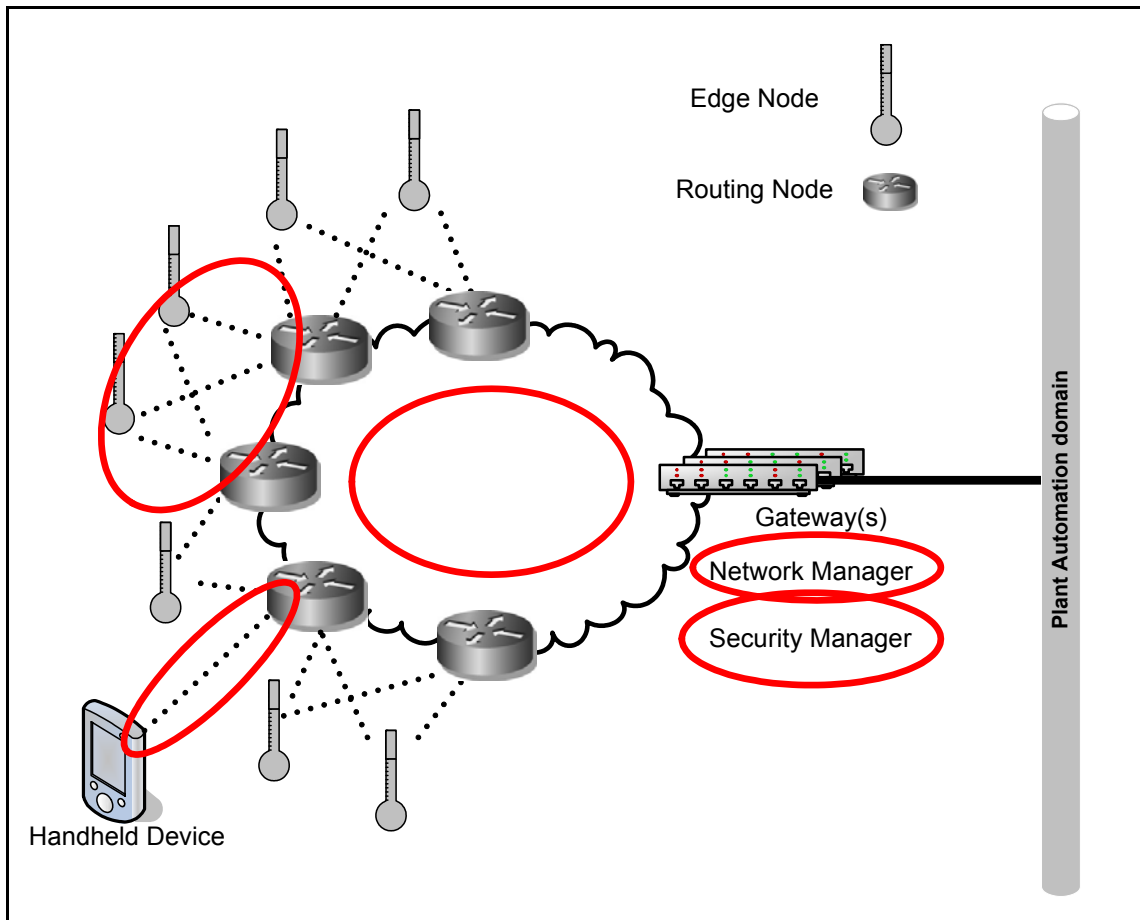


Figure 2 is intended to emphasize the key goal of a standardized link to Field Devices and Handheld Devices, with integrated Network Management and Security. This graphic is not intended to be precise or to constrain the creativity of proposals. For example:

- Field Devices may connect directly to Gateways even if this isn't explicitly shown in the graphic.
- The network cloud in Figure 2 is drawn so as to not limit proposals to specific network architectures. The red oval drawn inside the cloud indicates that the network is within the scope of SP100.14.
- The link drawn to handheld devices is not intended to prescribe a particular type of connection.

Field Devices may be sensors, actuators or I/O interfaces. They may also include “intelligent” field devices that already exist in a plant, but which lack connectivity to the Plant Network. These Field Edge nodes will connect to nearby Routing nodes, which will in turn provide connectivity to a Gateway. In this context, the current members of ISA-SP100.14 agreed on a minimum scope for the first standard, shown as red ovals in Figure 2. More detail will be provided in the Technical Requirements Document.

It is generally expected that Routing nodes will be stationary, while limited mobility should be supported for Edge nodes. For example, Field Devices may be used for sensors on an overhead crane. Performance tradeoffs related to mobility should be discussed in proposals. Some Field Devices are required to run for years on battery power.

Device localization is not formally within the scope of SP100.14, but if a proposal has location capabilities this would be of interest. As a simple example, the protocol might enable a Field Device to transmit frequent beacons on command, enabling a Handheld user to find the device by signal strength methods.

While Edge nodes and Routing nodes are drawn separately, it is expected that (for at least some proposals) Field Devices might also be Routing nodes in a number of configurations and vice versa. Mechanisms used to form a network must be specified so that network devices are interoperable.

Proposals may support various architectures, adaptable based on application requirements. For example:

- Routing nodes may form a multihop network that directs data to and from a Gateway.
- Routing nodes may be zero or more hops away from a wired or wireless backbone, which may be used to tunnel messages to a Gateway.
- Devices may be installed in a cluster that is located remotely from a Gateway. In this case, the devices may be directly or indirectly connected to a wireless bridge that tunnels messages to and from the Gateway.
- Routing may support peer-to-peer communication.

These illustrative examples are not intended to be a complete set of use cases, or to constrain proposals. Use cases will provide a reference point for evaluation, but not a complete set of application scenarios.

Successful proposals will be scalable from tens to thousands of Field Devices, and from small clusters to a large outdoor plant. Initial installations may be limited in scope, potentially with a limited number of devices sparsely distributed through a facility. With expansion over time, there are realistic commercial scenarios for clusters of 10,000 devices actively participating in a network and reporting data periodically.

The network should be able to accommodate a heterogeneous mixture of devices utilizing a variety of power sources, ranging from primary cell batteries to line power. It is anticipated that some if not most proposals will support multihop routing. Such proposals should include plausible options for both line power and battery power for the Routing nodes. Battery-powered Routing nodes may have increased latency and reduced routing capacity. The option for a Routing node to be battery-powered should not be at the expense of router capacity and performance when power is freely available.

A handheld device is shown in Figure 2. It is intended primarily for configuring and monitoring the Field Devices either directly or through the infrastructure, with latencies that a human operator would find reasonable. Figure 2 shows a connection to a Routing node, which is not intended to preclude proposals capable of connecting directly with Edge nodes.