STANDARD

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Wireless systems for industrial automation: Process control and related applications

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INTRODUCTION

0.1 General

The ISA100 Committee was established by ISA to address wireless manufacturing and control systems in areas including:

- The environment in which the wireless technology is deployed;
- Technology and life cycle for wireless equipment and systems; and
- The application of wireless technology.

The Committee's focus is to improve the confidence in, integrity of, and availability of components or systems used for manufacturing or control, and to 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.

This ISA standard is intended to provide reliable and secure wireless operation for non-critical monitoring, alerting, supervisory control, open loop control, and closed loop control applications. This standard defines the protocol suite, system management, gateway, and security specifications for low-data-rate wireless connectivity with fixed, portable, and moving devices supporting very limited power consumption requirements. The application focus is to address the performance needs of applications such as monitoring and process control where latencies on the order of 100 ms can be tolerated, with optional behavior for shorter latency.

To meet the needs of industrial wireless users and operators, this standard provides robustness in the presence of interference found in harsh industrial environments and with legacy non-ISA100 compliant wireless systems. As described in Clause 4, this standard addresses coexistence with other wireless devices anticipated in the industrial workspace, such as cell phones and devices based on IEEE 802.11x, IEEE 802.15x, IEEE 802.16x, and other relevant standards. Furthermore, this standard allows for interoperability of ISA100 devices, as described in Clause 5.

This standard does not define or specify plant infrastructure or its security or performance characteristics. However, it is important that the security of the plant infrastructure be assured by the end user.

0.2 Document structure

This standard is organized into clauses focused on unique network functions and protocol suite layers. The clauses describe system, system management, security management, physical layer, data link layer, network layer, transport layer, application layer, gateway, and provisioning. Each clause describes a functionality or protocol layer and dictates the behavior required for proper operation. When a clause describes behaviors related to another function or layer, a reference to the appropriate clause will be supplied for further information.

The following terms will be used in this document to describe device behavior:

- Mandatory: behavior or a protocol that is required for a device to state compliance with the standard (e.g., symmetrical keys).
- Optional: behavior or protocol defined in the standard that is not required for compliance to the standard but, if implemented, shall be compliant with the standard (e.g., asymmetrical keys).
- Configuration: setting of a parameter that will alter behavior and can be set by the system manager (e.g., network layer hop limit). Configurations where defaults are appropriate will state those defaults (e.g., network layer hop limit = 64).
- Capability: ability of device to perform to a specified level (e.g., number of children a router can support). Profiles will specify a minimum capability.
- Feature: notable characteristic of a device (e.g., battery powered).

Mandatory behavior (also referred to as normative behavior) is denoted by the use of the term “shall”. Non-mandatory behavior (also referred to as informative behavior) is denoted by the use of the terms “may” or “recommended”.

The mandatory and optional communication protocols defined by this standard are referred to as native protocols, while those protocols used by other networks such as legacy fieldbus or HART communication protocols are referred to as foreign protocols.

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REVISION HISTORY

ISA100.11a-2009		First approved version
ISA100.11a-rev		Revision of first approved version

ISA

ISA100.11a

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1 Scope

This project will define the OSI layer specifications (e.g., PhL, DL, etc.), security specifications, and management (including network and device configuration) specifications for wireless devices serving application classes 1 through 5 and optionally class 0 for fixed, portable, and moving devices.

NOTE Usage classes are described in Annex C.

The project's application focus will address 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.

This project will address:

- Low energy consumption devices, and also those applications that have latency and latency variability constraints, 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, such as IEEE 802.11x, IEEE 802.16x, cell phones, and other relevant standards; and
- Interoperability of ISA100 devices.

2 Normative references

The following standards and specifications contain provisions which, through references in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards and specifications are subject to revision and may be changed without notice, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the references listed below.

For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE See the bibliography for non-normative references.

ANSI X9.63-2001, *Public key cryptography for the financial services industry - Key agreement and key transport using elliptic curve cryptography*. American Bankers Association, November 20, 2001

FIPS 197, *Advanced encryption standard (AES)*, Federal Information Processing Standards Publication 197, US Department of Commerce/N.I.S.T, Springfield, Virginia, November 26, 2001

FIPS 198, *The keyed-hash message authentication code (HMAC)*, Federal Information Processing Standards Publication 198, US Department of Commerce/N.I.S.T., Springfield, Virginia, March 6, 2002

IEEE Std 802.15.4™:2006, *Wireless medium access control (MAC) and physical layer (PhL) specifications for low rate wireless personal area networks (WPANs)*