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IEEE Standard for Ubiquitous Green Community Control Network: Security

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IEEE Standard for Ubiquitous Green Community Control Network: Security

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Abstract: The enhanced security management function for the protocol defined in IEEE 1888™, “Ubiquitous Green Community Control Network Protocol,” is described in this standard. Security requirements, system security architecture definitions, and a standardized description of authentication and authorization, along with security procedures and protocols, are specified. This standard can help avoid unintended data disclosure to the public and unauthorized access to resources, while providing enhanced integrity and confidentiality of transmitted data in the ubiquitous green community control network.

Keywords: access control, authorization, certificate, confidentiality, IEEE 1888™, IEEE 1888.3™, integrity, mutual authentication, security

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Introduction

This introduction is not part of IEEE Std 1888.3-2013, IEEE Standard for Ubiquitous Green Community Control Network: Security.

This standard describes the enhanced security management function for the protocol defined in IEEE Std 1888™, IEEE Standard for Ubiquitous Green Community Control Network Protocol, specifies security requirements, defines system security architecture, gives a standardized description of authentication and authorization, along with security procedures and protocols. This standard can help avoid unintended data disclosure to the public and unauthorized access to resources, while providing enhanced integrity and confidentiality of transmitted data in the ubiquitous green community control network.

The purpose of this standard is to define a security management function in the ubiquitous green community control network that provides an interoperable, high-quality, and secure applications operation platform. As an open system, a ubiquitous green community control network assumes multi-domain operation and public access from other system components. In this context, security considerations are needed for operation of the IEEE 1888 protocol.

This specification defines the architecture and framework that provides security for IEEE 1888 systems. As an interactive monitoring and control system based on sensor-actuator networks, IEEE 1888 systems without security suffer from some potential security threats. For example, unintended users or systems may capture sensor readings and control HVAC or lights easily, or information exchanged and data stored may be overwritten by unauthorized users or components. This standard specifies a security framework to protect the message exchange path of both the data plane and the control plane of an IEEE 1888 system from such security threats, providing mutual authentication, access control, message integrity, data confidentiality, and so on.

The IEEE 1888 protocol is bound to simple object access protocol (SOAP) and normally takes hypertext transfer protocol (HTTP) for the transportation of its SOAP messages. To meet the security requirements and protect from security threats, HTTP over TLS (HTTPS) shall be adopted. This is because HTTPS has been widely used and can satisfy the security requirements with small implementation cost.

This document distinguishes system reliability issues from security issues. For example, service tolerance against heavy requests from clients and communication tolerance against temporal physical link failure are out of the scope of this document.

This document is organized as follows:

- Clause 4 specifies security requirements and design principles.
- Clause 5 describes security system architecture.
- Clause 6 defines security protocols, including communication sequence, software interface, and identifier (ID) system.

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IEEE Standard for Ubiquitous Green Community Control Network: Security

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1. Overview

1.1 Scope

This specification provides security service enhancements for the protocol defined in IEEE Std 1888™[1], IEEE Standard for Ubiquitous Green Community Control Network Protocol. This standard describes security requirements for the ubiquitous green community control network and specifies the system security architecture along with security procedures and protocols.

1.2 Purpose

The purpose of this standard is to define a security management function in the ubiquitous green community control network that provides an interoperable, high-quality, and secure applications operation platform. Use of this standard helps avoid unintended data disclosure to the public and unauthorized access to resources, while providing enhanced integrity and confidentiality of transmitted data in the ubiquitous green community control network.

[1] Information on references can be found in Clause 2.

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2. References

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The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

IEEE Std 1888™, IEEE Standard for Ubiquitous Green Community Control Network Protocol.[2, 3]

RFC 791, Internet Protocol, J. Postel, Ed., September 1981.[4]

RFC 1035, Domain Names—Implementation and Specification, P. Mockapetris, November 1987.

RFC 2459, Internet X.509 Public Key Infrastructure Certificate and CRL Profile, R. Housley, W. Ford, W. Polk, and D. Solo, January 1999.

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RFC 5280, Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile, D. Cooper, S. Santesson, S. Farrell, S. Boeyen, R. Housley, and W. Polk, May 2008.

RFC 5322, Internet Message Format, P. Resnick, Ed., October 2008.

RFC 6066, Transport Layer Security (TLS) Extensions: Extension Definitions, D. Eastlake, III, January 2011.

2.2 Additional references

RFC 6277, “Online Certificate Status Protocol Algorithm Agility,” S. Santesson and P. Hallam-Baker, June 2011.

The OpenSSL Project website.[5]

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3. Definitions, abbreviations, and acronyms

3.1 Definitions

For the purposes of this document, the following terms and definitions apply. The *IEEE Standards Dictionary Online* should be consulted for terms not defined in this clause. [6]

access control: The prevention of unauthorized use of a resource, including the prevention of use of a resource in an unauthorized manner.

binding information: The association of the identifier (ID) of a client-role certificate of the responder with an access uniform resource identifier (URI) for the responder along with the remaining lifetime of that association.

confidentiality: The property that information is not made available or disclosed to unauthorized individuals, entities, or processes.

data integrity: The property that data has not been altered or destroyed in an unauthorized manner without detection or awareness.

digital signature: Data appended to, or a cryptographic transformation of, a data unit that allows a recipient of the data unit to verify the source and integrity of the data unit and protect against forgery.

3.2 Abbreviations and acronyms

AAA	authentication, authorization, and accounting
ACL	access control list
ACM	access control manager
AM	authentication manager
APP	application
CA	certificate authority
CV	certificate verification
DNS	domain-name system
DoS	denial of service
DDoS	distributed denial of service
FQDN	fully qualified domain name
GW	gateway

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