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IEEE Standard for Smart Energy Profile Application Protocol

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Power Line Communications Committee

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USA

IEEE Std 2030.5™-2018
(Revision of
IEEE Std 2030.5-2013)

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IEEE-SA Standards Board

Abstract: The application layer with TCP/IP providing functions in the transport and Internet layers to enable utility management of the end user energy environment, including demand response, load control, time of day pricing, management of distributed generation, electric vehicles, etc. is defined in this standard. Depending on the physical layer in use (e.g., IEEE 802.15.4™, IEEE 802.11™, IEEE 1901™, IEEE 1901.2™), a variety of lower layer protocols may be involved in providing a complete solution. Generally, lower layer protocols are not discussed in this standard except where there is direct interaction with the application protocol. The mechanisms for exchanging application messages, the exact messages exchanged including error messages, and the security features used to protect the application messages are defined in this standard. With respect to the Open Systems Interconnection (OSI) network model, this standard is built using the four layer Internet stack model. The defined application profile sources elements from many existing standards, including IEC 61968 and IEC 61850, and follows a RESTful architecture (Fielding [B3]) using IETF protocols such as HTTP.

Keywords: adoption, application, application protocol, demand response, distributed energy resources, energy usage information, IEEE 2030.5™, load control, metering, plugin electric vehicles, prepayment, pricing communication, RESTful, SEP 2, smart energy, smart energy profile, Smart Energy Profile 2

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Robby Simpson, *Vice Chair*

Electric Power Research Institute, Inc.
General Electric
Itron, Inc.
KITU Systems
Landis+Gyr
Sensus
SunSpec Alliance
Wi-SUN Alliance

The following members of the entity balloting committee voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

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Panasonic Corporation of North America
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Sensus
Silver Spring Networks, Inc.
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Tim Godfrey
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Gordon Lum
Michael Stelts
Scott Willy
Michael Cowan
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Introduction

This introduction is not part of IEEE Std 2030.5-2018™, IEEE Standard for Smart Energy Profile Application Protocol.

The empowerment of consumers to manage their usage and generation of energy is a critical feature of the Smart Grid and is a basis of innovation for new products and services in energy management. To enable this capability, information flow between devices such as meters, smart appliances, plug-in electric vehicles, energy management systems, and distributed energy resources (including renewable energy and storage elements) must occur in an open, standardized, secure, and interoperable fashion. The following standard is intended to fulfill those needs.

The first publication of this standard (IEEE Std 2030.5-2013) was driven by, and sought to address the requirements of, many activities across the globe. Of note were the efforts within the United States by the National Institute of Standards and Technology (NIST) and the Smart Grid Interoperability Panel (SGIP) (in particular, Priority Action Plans 3, 9, 10, 11, and 18, with influence from many of the others) in fulfillment of the EISA 2007 legislation, the European Mandate on Smart Metering (M/441) (in particular, efforts within CEN/CENELEC and ETSI, and the Smart Meter Working Group), as well as similar efforts in Australia, the United Kingdom, Japan, and China, and electric vehicle standardization efforts (in particular, ISO/IEC JWG automotive EV standards and SAE EV standards), to name only a few.

This revision of IEEE Std 2030.5 was made with particular attention to the activities underway in California as part of the Rule 21 revision and the associated Smart Inverter Working Group as well as the revision of IEEE Std 1547™. This revision also seeks to address any errors and ambiguities discovered in the testing and deployment of the first publication.

This standard is also intended to enable communications that are link-layer agnostic and run over the Internet Protocol. Careful consideration was given to premises networks with various architectures, numbers of devices, and constraints, while maintaining flexibility, extensibility, and security.

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1. Overview

1.1 Scope

This standard defines the application layer with TCP/IP providing functions in the transport and Internet layers to enable utility management of the end user energy environment, including demand response, load control, time of day pricing, management of distributed generation, electric vehicles, etc. Depending on the physical layer in use (e.g., IEEE 802.15.4™, IEEE 802.11™, IEEE 1901™, IEEE 1901.2™), a variety of lower layer protocols may be involved in providing a complete solution. Generally, lower layer protocols are not discussed in this standard except where there is direct interaction with the application protocol. This standard defines the mechanisms for exchanging application messages, the exact messages exchanged including error messages, and the security features used to protect the application messages. With respect to the Open Systems Interconnection (OSI) network model, this standard is built using the four layer Internet stack model. The defined application profile sources elements from many existing standards, including IEC 61968 and IEC 61850, and follows a RESTful architecture (Fielding [B3]) using IETF protocols such as HTTP.

1.2 Purpose

The purpose of this document is to define the application protocol to enable utility management of the end user energy environment, including demand response, load control, time of day pricing, management of distributed generation, electric vehicles, etc. The defined application profile sources elements from many existing standards, including IEC 61968 and IEC 61850, and follows a RESTful architecture (Fielding [B3]) using IETF protocols such as HTTP.

1.3 Document organization

The following documents comprise the definition of IEEE 2030.5 and all IEEE 2030.5 devices will be required to maintain compliance to these documents:

- IEEE Std 2030.5 (this document)
- IEEE 2030.5 XML Schema Definition (XSD) (sep.xsd in the supplemental material of IEEE Std 2030.5)
- IEEE 2030.5 WADL (sep_wadl.xml in the supplemental material of IEEE Std 2030.5)