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IEEE Standard for Local Area Network/Wide Area Network (LAN/WAN) Node Communication Protocol to Complement the Utility Industry End Device Data Tables

Sponsored by the
IEEE Standards Coordinating Committee 31 on
Automatic Meter Reading and Energy Management

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3 Park Avenue
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29 June 2012

IEEE Std 1703™-2012

IEEE Standard for Local Area Network/Wide Area Network (LAN/WAN) Node Communication Protocol to Complement the Utility Industry End Device Data Tables

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Approved 29 March 2012

IEEE-SA Standards Board

Abstract: A set of application layer messaging services are provided in this standard that are applicable for the enterprise and End Device ends of an Advanced Metering Infrastructure (AMI). The application services include those useful for managing the AMI network assets defined by this standard. These messages may be transported over a wide range of underlying network transports such as TCP/IP, UDP, IEEE 802.11, IEEE 802.15.4 IEEE 802.16, PLC, and SMS over GSM, over a wide range of physical media. Additionally, interfaces are defined for a Communication Module and a Local Port (e.g., an IEEE 1701 optical port).The described protocol is tailored for, but not limited to, the transport of IEEE 1377 Table data.Also, a means by which information can be sent in a secure manner using AES-128 and the EAX′ mode is provided in this standard. This standard was developed jointly with ANSI (published as ANSI C12.22) and Measurement Canada (published as MC12.22).

Keywords: ACSE, ANSI C12.22, C12.19 Device, Communication Module, End Device, IEEE 1703

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PDF: ISBN 978-0-7381-7234-7 STD97221
Print: ISBN 978-0-7381-7248-4 STDPD97221

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Introduction

This introduction is not part of IEEE Std 1703-2012, IEEE Standard for Local Area Network/Wide Area Network (LAN/WAN) Node Communication Protocol to Complement the Utility Industry End Device Data Tables.

This standard is intended to accommodate the network messaging requirements of an advanced metering infrastructure such as that identified by the Office of Electricity Delivery and Energy Reliability of the U.S. Department of Energy; the Smart Metering Initiative of the Ontario Ministry of Energy (Canada) and the stated requirements of Measurement Canada for the approval of a metering device for use in Canada.

This standard describes four different but related communication modes of operation. One is the operation of an End Device (node) over any network, a feature that all IEEE 1703 compliant nodes need to implement. The second is an exposed point-to-point interface between an IEEE 1703 Device, e.g., a meter, and an IEEE 1703 Communication Module, e.g., a network adaptor. The third is the capture, translation and transmission of one-way messages (blurts). The fourth is communication with the End Device over a dedicated IEEE 1701 ANSI Type 2 optical local port.

This standard assigns roles to all Utility AMI network assets to enable the automated deployment and configuration of network nodes in a distributed AMI enterprise system. The roles provide for Relays, Master Relays, and Gateways; simple Hosts, Authentication Hosts, and Notification Hosts; and sensory End Devices. These devices work together to realize a Utility enterprise network in a manner that provides for a universal application framework that can operate any compliant appliance so that it may be deployed, accessed and communicated with seamlessly over any network infrastructure, hardware and available bandwidth. This is accomplished through the provision of well-defined network management services (e.g., trace, resolve, register, and de-register), data access service (e.g., read and write), session management (e.g., logon, logoff, terminate, and disconnect), message segmentation and assembly, message playback rejection, security and privacy.

The protocol is well suited for two-way and one-way communications using an extremely wide network address space (using ApTitles). It implements subscription and node discovery services so that any Utility enterprise (e.g., MDMS, DA, DR, or any other willing network appliance, such as a home energy monitoring system or a thermostat) can register themselves as Notification Hosts so that they can receive advisory messages and alerts about network asset changes or changes in the state of the network. Network subscription services may be managed through distributed Authentication Hosts.

Altogether, this standard was designed to be simple and small. Therefore it can meet the requirements of the smallest of AMI networks, while providing well-defined capacities that can grow and adapt to the largest of enterprise AMI networks and operations as needed. As such, this standard together with IEEE Std 1377™-2012 addresses the end-to-end distributed AMI network needs from the smallest to the largest of enterprise AMI systems.

The body of this standard was developed jointly with ANSI C12.22 and MC12.22. The joint agreement calls for the standards and regulatory organizations IEEE, ANSI and MC to maintain the body of this standard in step as they publish versions and revisions of the standard. A number of editorial errors and errors of omission were discovered after the publication of ANSI C12.22-2008, just before the acceptance of IEEE Std 1703-2012. These errors are listed in Annex K - Listing of Editorial Errors and Errors of Omission in ANSI C12.22-2008. All reported errors were identified in the body of this standard and highlighted to indicate that the text was in error and was corrected. In addition, errors of omission were corrected in the body of this document and similarly highlighted.

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IEEE Standard for Local Area Network/Wide Area Network (LAN/WAN) Node Communication Protocol to Complement the Utility Industry End Device Data Tables

1 Overview

1.1 Introduction

This standard *defines* network Application Services for the exchange of Table data and control elements. These services need to be implemented by all C12.22 Nodes, including "back-office" or "Head-end" systems.

1.2 Scope

Initially, communications with electronic devices consisted of transporting memory data via proprietary protocols that were unique to each manufacturer. The desire for interoperability and support for multiple manufacturers by reading and programming systems created a need for standardization of data formats and transport protocols.

The first step was to standardize data formats. Internal data was abstracted as a set of Tables. A set of standard Table contents and formats were defined in ANSI C12.19/MC12.19/IEEE 1377, "Utility Industry End Device Data Tables."[1]

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