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IEEE Standard for a Convergent Digital Home Network for Heterogeneous Technologies

IEEE Communications Society

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Power Line Communications Standards Committee

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IEEE Standard for a Convergent Digital Home Network for Heterogeneous Technologies

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Abstract: An abstraction layer for multiple home networking technologies that provides a common interface to widely deployed home networking technologies is defined in this standard: IEEE 1901 over power lines, IEEE 802.11 for wireless, Ethernet over twisted pair cable, and MoCA 1.1 over coax. Connectivity selection for transmission of packets arriving from any interface or application is supported by the 1905.1 abstraction layer. Modification to the underlying home networking technologies is not required by the 1905.1 layer, and hence it does not change the behavior or implementation of existing home networking technologies. Introduced by the 1905.1 specification is a layer between layers 2 and 3 that abstracts the individual details of each interface, aggregates available bandwidth, and facilitates seamless integration. The 1905.1 also facilitates end−to−end quality of service (QoS) while simplifying the introduction of new devices to the network, establishing secure connections, extending network coverage, and facilitating advanced network management features including discovery, path selection, autoconfiguration, and quality of service (QoS) negotiation.
Keywords: abstraction layer, access point (AP) autoconfiguration, data models, fragmentation and reassembly, IEEE 802.1 bridge discovery, IEEE 802.11™, IEEE 1901™, IEEE 1905.1™, MoCA, pairwise master key, push button, registration, security, topology discovery protocol, wireless fidelity (Wi-Fi)

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The Working Group gratefully acknowledges the contributions of the following entities and participants. Without their assistance and dedication, this standard would not have been completed.

The following entities submitted technical contributions or commented on the standard at various stages of the project development.

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Introduction

This introduction is not part of IEEE Std 1905.1-2013, IEEE Standard for a Convergent Digital Home Network for Heterogeneous Technologies.

Among the home networking technologies, wireless networks offer mobility and wired technologies offer extensive bandwidth or outlet ubiquity for data communications. Wired and wireless technologies complement each other to provide full home coverage.

To address the wide variety of applications, regions, environments, and topologies, multiple connectivity technologies are needed. Each of these different technologies has a unique interface to higher layer entities, thus, leading to software and hardware design complexities in multiconnectivity devices. This complexity must be reduced and new features/functions must be enabled that can take advantage of the multiple paths available between devices.

IEEE Std 1905.1 addresses these requirement by defining an abstraction layer for multiple home networking technologies that provides a common interface to widely deployed home networking technologies: IEEE Std 1901™-2010 over power lines, IEEE Std 802.11™-2012 for wireless, Ethernet over twisted pair cable, and MoCA® 1.1 over coax.[a,b]

[a] Information on references can be found in Clause 2.
[b] MoCA is a registered trademark in the U.S. Patent & Trademark Office, owned by the Multimedia over Coax Alliance.

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1. Overview

1.1 Scope

This standard defines an abstraction layer for multiple home network technologies. The abstraction layer provides a common data and control service access point to the heterogeneous home network technologies described in the following specifications: IEEE Std 1901™-2010, IEEE Std 802.11™-2012, IEEE Std 802.3™-2008, and MoCA® 1.1.[1,2] This standard is extensible to work with other home network technologies.

The abstraction layer supports a dynamic interface selection for transmission of packets arriving from any interface (upper protocol layers or underlying network technologies). End-to-end quality of service (QoS) is enabled in an IEEE 1905.1 network.

Also specified are procedures, protocols, and guidelines to provide a simplified user experience to add devices to the network, to set up encryption keys, to extend the network coverage, and to provide network management features to address issues related to neighbor discovery, topology discovery, interface selection, QoS negotiation, and network control and management.

[1] Information on references can be found in Clause 2.
[2] MoCA is a registered trademark in the U.S. Patent & Trademark Office, owned by the Multimedia over Coax Alliance.