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Part 1AR: Secure device identity

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseaux locaux et métropolitains —

Partie 1AR

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ISO/IEC/IEEE 8802 consists of the following parts, under the general title *Information technology — Telecommunications and information exchange between systems — Local and metropolitan area networks*:

— *Part 11: Wireless LAN medium access control (MAC) and physical layer (PHY) specifications*

— *Part 1X: Port-based network access control*

— *Part 1AB: Station and media access control connectivity discovery*

— *Part 1AE: Media access control (MAC) security*

— *Part 1AR: Secure device identity*

— *Part 1AS: Timing and synchronization for time-sensitive applications in bridged local area networks*

— *Part 15-4: Wireless medium access control (MAC) and physical layer (PHY) specifications for low-rate wireless personal area networks (WPANs)*

802.1AR™

IEEE

IEEE Standard for

Local and metropolitan area networks—

Secure Device Identity

IEEE Computer Society

Sponsored by the
LAN/MAN Standards Committee

IEEE
3 Park Avenue
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22 December 2009

IEEE Std 802.1AR™-2009

Abstract: A secure device identifier (DevID) is cryptographically bound to a device and supports authentication of the device's identity. Locally significant identities can be securely associated with an initial manufacturer-provisioned DevID and used in provisioning and authentication protocols to allow a network administrator to establish the trustworthiness of a device and select appropriate policies for transmission and reception of data and control protocols to and from the device.
Keywords: access control, authentication, authorization, certificate, LANs, local area networks, MAC security, MANs, metropolitan area networks, PKI, port-based network access control, secure association, secure device identifier, security, X.509

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Introduction

This introduction is not part of IEEE Std 802.1AR-2009, IEEE Standard for Local and metropolitan area networks—Secure Device Identity.

A secure device identifier (DevID) is a cryptographic identity bound to a device used for assertion of the device's identity. IEEE Std 802.1AR specifies

— globally unique per-device identifiers and the management and cryptographic binding of a device to its identifiers,
— the relationship between an initially installed identity and subsequent locally significant identities, and
— interfaces and methods for use of DevIDs with existing and new provisioning and authentication protocols.

IEEE Std 802.1AR can be used in conjunction with IEEE Std 802.1X™ [B2] and other IEEE and industry standards that require a secure identifier or credential as part of authentication and provisioning processes that establish trust in a device.[1]

This is the first edition of IEEE Std 802.1AR.

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IEEE Standard for
Local and metropolitan area networks—

Secure Device Identity

1. Overview

IEEE 802® Local Area Networks (LANs) are often deployed in networks that provide publicly accessible service access or that cannot be completely physically secured. The protocols that configure, manage, and regulate access to these networks and network-based services and applications typically run over the networks themselves. Secure and predictable operation of such networks depends on authenticating each device attached to and participating in the network, so that the degree of trust and authorization to be accorded to that device by its communicating peers can be determined.

Authentication of a human user, through a credential known to or possessed by that user, is often used to authenticate users of devices such as laptop personal computers. However many of the devices that compose a network are designed for unattended autonomous operation and might not support user authentication. These include the routers and bridges that interconnect and provide access to the LANs. Further, the previously common assumption that network access controls were to provide protection of the network against abuse through unauthenticated and unauthorized access, while offering no protection to the accessing devices, is now known not only to expose those devices but also the network itself. Failure to provide devices that access the network with the mutual guarantee that they are connected to legitimate network access points allows malicious devices to interpose themselves between the network and its authenticated and authorized users, and effectively make use of the credentials of the latter. For these reasons a secure device identifier, i.e., one that embodies an authentication credential that cannot be easily removed or copied for use in a device under the control of someone who wishes to gain unauthorized access to or attack the operation of a network, is highly desirable.

Protocols for configuring, managing and regulating access to a network depend on the existence of a device identifier or human authentication of initial access to associate a device with an authentication credential.

This results in a “chicken-and-egg” scenario, wherein these credentials often must be installed during an expensive “pre-provisioning” process before actual deployment. Even when device credentials are deployed in-place, the process is often interactive, involving a physically secured connection to the device being deployed and a knowledgeable system administrator.

Secure Device Identifiers (DevIDs) are designed to be used as interoperable secure device authentication credentials with Extensible Authentication Protocol (EAP) and other industry standard authentication and provisioning protocols. A standardized device identity facilitates interoperable secure device authentication that helps simplify and standardize secure deployment and management of devices. This standard will be of benefit to manufacturers of conformant LAN equipment, their customers, and users of LANs or LAN services that are based on such equipment.

A device with DevID capability incorporates a globally unique manufacturer provided Initial Device Identifier (IDevID), stored in a way that protects it from modification. The device may support the creation of Locally Significant Device Identifiers (LDevIDs) by a network administrator. Each LDevID is bound to the device in a way that makes it infeasible for it to be forged or transferred to a device with a different IDevID without knowledge of the private key used to effect the cryptographic binding. LDevIDs can incorporate, and fully protect, additional information specified by the network administrator to support local authorization conventions. LDevIDs may also be used as the sole identifier (by disabling the IDevID) to assure the privacy of the user of a DevID and the equipment in which it is installed.

1.1 Scope

This standard specifies unique per-device identifiers (DevID) and the management and cryptographic binding of a device to its identifiers, the relationship between an initially installed identity and subsequent locally significant identities, and interfaces and methods for use of DevIDs with existing and new provisioning and authentication protocols.

1.2 Purpose

This standard defines a standard identifier for IEEE 802 devices that is cryptographically bound to that device, and defines a standard mechanism to authenticate a device’s identity. A verifiable unique device identity allows establishment of the trustworthiness of devices. This facilitates secure device provisioning.

1.3 Relationship to other standards

The present work has been undertaken to provide an identifier that is generally useful across IEEE 802 networks. It draws on and is informed by other standards that have been developed elsewhere for different purposes. Where possible, this work attempts compatibility with the following standards:

a) Trusted Platform Module (TPM)

b) Worldwide Interoperability for Microwave Access (WiMAX)

c) Extensible Authentication Protocol-Transport Layer Security (EAP-TLS)

For other standards that have influenced the development of this standard or are of general interest see the bibliography (Annex D).

2. Normative references

The following referenced documents are indispensable for the application of this standard (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.

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[2]ANSI publications are available from the Sales Department, American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036, USA (http://www.ansi.org/).

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[4]ISO/IEC publications are available from the ISO Central Secretariat, Case Postale 56, 1 rue de Varembé, CH-1211, Genève 20, Switzerland/Suisse (http://www.iso.ch/). ISO/IEC publications are also available in the United States from Global Engineering Documents, 15 Inverness Way East, Englewood, Colorado 80112, USA (http://global.ihs.com/). Electronic copies are available in the United States from the American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036, USA (http://www.ansi.org/).

[5]NIST publications are available from the National Institute of Standards and Technology, NIST Public Inquiries, NIST, 100 Bureau Drive, Stop 3460, Gaithersburg, MD, 20899-3460, USA (www.nist.gov).

[6]This document is available at http://www.secg.org/collateral/sec1_final.pdf.