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AMENDMENT 5
2020-08

Telecommunications and exchange between information technology systems — Requirements for local and metropolitan area networks —

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

AMENDMENT 5: Preassociation discovery

Télécommunications et échange entre systèmes informatiques — Exigences pour les réseaux locaux et métropolitains —

Partie 11: Spécifications du contrôle d'accès du milieu sans fil (MAC) et de la couche physique (PHY)

AMENDEMENT 5: Découverte de pré-association

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as amended by IEEE Std 802.11ai™-2016,
IEEE Std 802.11ah™-2016,
IEEE Std 802.11aj™-2018,
and IEEE Std 802.11ak™-2018)

IEEE Standard for Information technology—
Telecommunications and information exchange between systems
Local and metropolitan area networks—
Specific requirements

Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications

Amendment 5: Preassociation Discovery

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Abstract: Modifications to IEEE Std 802.11™-2016, above the physical layer (PHY), to enable delivery of preassociation service discovery information to IEEE 802.11 stations (STAs) are defined in this amendment.

Keywords: amendment, bloom filter, hash function, IEEE 802.11™, IEEE 802.11aq™, preassociation, service discovery

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This introduction is not part of IEEE Std 802.11aq-2018, IEEE Standard for Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications—Amendment 5: Preassociation Discovery.

This amendment defines one medium access control (MAC) and several physical layer (PHY) specifications for wireless connectivity for fixed, portable, and moving stations (STAs) within a local area. It defines modifications to IEEE Std 802.11-2016, above the physical layer (PHY), to enable delivery of preassociation service discovery information to IEEE 802.11 stations (STAs).

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IEEE Standard for Information technology—
Telecommunications and information exchange between systems
Local and metropolitan area networks—
Specific requirements

Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications

Amendment 5: Preassociation Discovery

This amendment is based on IEEE Std 802.11™-2016 as amended by IEEE Std 802.11ai™-2016, IEEE Std 802.11ah™-2016, IEEE Std 802.11aj™-2018, and IEEE Std 802.11ak™-2018.

NOTE—The editing instructions contained in this amendment define how to merge the material contained therein into the existing base standard and its amendments to form the comprehensive standard.

The editing instructions are shown in ***bold italic***. Four editing instructions are used: ***change, delete, insert, and replace***. Change is used to make corrections in existing text or tables. The editing instructions specifies the location of the change and describes what is being changed by using ~~strike through~~ (to remove old material) and underscore (to add new material). ***Delete*** removes existing material. ***Insert*** adds new material without disturbing the existing material. Insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. ***Replace*** is used to make changes in figures or equations by removing the existing figure or equation and replacing it with a new one. Editorial notes will not be carried over into future editions because the changes will be incorporated into the base standard.[1]

1. Overview

1.3 Supplementary information on purpose

Insert the following item at the end of the dashed list in 1.3:

— Defines mechanisms to enable delivery of preassociation service discovery information to IEEE 802.11 stations (STAs).

[1] Notes in text, tables, and figures of a standard are given for information only and do not contain requirements needed to implement the standard.

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2. Normative references

Insert the following normative references into Clause 2 in alphanumeric order:

IEEE Std 802c™-2017, IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture Amendment 2: Local Medium Access Control (MAC) Address Usage.[1,2]

IETF RFC 6335, Internet Assigned Numbers Authority (IANA) Procedures for the Management of the Service Name and Transport Protocol Port Number Registry, August 2011.[3]

3. Definitions, acronyms, and abbreviations

3.1 Definitions

Insert the following definition into 3.1 in alphabetic order:

service hash: A value used for representing a service. This value is formed from a hash of the service name.

3.2 Definitions specific to IEEE Std 802.11

Insert the following definitions into 3.2 in alphabetic order:

service information client (SIC): A logical entity that initiates station (STA) service discovery.

service information registry (SIR): A logical entity that contains caches of information about services that are available via the basic service set (BSS).

3.4 Abbreviations and acronyms

Insert the following abbreviations into 3.4 in alphabetic order:

PAD	preassociation discovery
SIC	service information client
SIR	service information registry
SLAP	Structured Local Address Plan

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[2] The IEEE standards or products referred to in this clause are trademarks of The Institute of Electrical and Electronic Engineers, Inc.
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4. General description

4.5 Overview of the services

4.5.4 Access control and data confidentiality services

Insert the following subclause (4.5.4.10) after 4.5.4.9:

4.5.4.10 MAC privacy enhancements

When a non-AP STA searches for, and connects to, an infrastructure BSS, IBSS, or PBSS or attempts to discover services on a network preassociation, it defines the addressing of its MAC layer for the particular connection. If the STA uses a fixed MAC address it is trivial to track the STA. An MSDU transmitted by a STA is assigned a sequence number that, if never reset, can also be used to track a device irrespective of the MAC address. If OFDM is used, the PHY DATA scrambler used can enable tracking of a device irrespective of the MAC address if it is not reseeded. The dynamic nature of BSS membership combined with this tracking information allows for construction of a network of connections, locations, and behavior. This network can be used to glean private and sensitive information regarding the individual behind the device.

Furthermore, even without establishing a connection, a mobile or portable STA that gratuitously transmits Probe Request frames containing SSIDs of favored infrastructure BSS networks, or announces the existence of IBSS networks, can reveal potentially sensitive information about its location and location history.

To mitigate this sort of traffic analysis a STA can support the ability to periodically and randomly change its MAC addresses and reset counters and seeds prior to association. While discovering networks, a STA can refrain from gratuitously transmitting Probe Request frames containing SSIDs of favored BSS networks.

4.5.9 Interworking with external networks

Insert the following subclause heading (4.5.9.1), and change the text (originating from the former 4.5.9) of the now 4.5.9.1 as shown:

<u>4.5.9.1 General</u>

The interworking service allows non-AP STAs to access services provided by an external network according to the subscription or other characteristics of that external network. An IEEE Std 802.11 non-AP STA might have a subscription relationship with an external network, e.g., with an SSPN.

An overview of the interworking functions addressed in this standard is provided below:

- Network discovery and selection
  - Discovery of suitable networks through the advertisement of access network type, roaming consortium and venue information, via Management frames
  - Selection of a suitable IEEE 802.11 infrastructure using advertisement services (e.g., access network query protocol (ANQP) or an IEEE 802.21™ Information Server) in the BSS or in an external network reachable via the BSS.
  - Selection of an SSPN or external network with its corresponding IEEE 802.11 Infrastructure
- <u>Preassociation discovery (PAD)</u>
  - <u>Discovery of services offered by a BSS or an external network reachable via that BSS</u>

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— Emergency services
  — Emergency Call and Network Alert support at the link level
— QoS mapping distribution
— SSPN interface service between the AP and the SSPN

The generic advertisement service (GAS), described in 4.5.10, provides both support for a STA's network discovery and selection, and support for a conduit for communication by a non-AP STA with other information resources in a network before joining the wireless LAN.

The interworking service supports emergency services by providing methods for users to access emergency services via the IEEE 802.11 infrastructure, advertising that emergency services are supported (see 11.25.6) and identifying that a traffic stream is used for emergency services.

The interworking service provides QoS mapping for SSPNs and other external networks. Since each SSPN or other external network might have its own layer-3 end-to-end packet marking practice (e.g., differentiated services code point (DSCP) usage conventions), a means to remap the layer-3 service levels to a common over-the-air service level is necessary. The QoS Map service provides STAs a mapping of network-layer QoS packet marking to over-the-air QoS frame marking (i.e., user priority).

The SSPN Interface service supports service provisioning and transfer of user permissions from the SSPN to the AP. The method and protocol by which these permissions are transferred from the SSPN are outside the scope of this standard.

Insert the following subclause (4.5.9.2, including Figure 4-15a and Figure 4-15b) after 4.5.9.1:

4.5.9.2 Preassociation discovery (PAD)

4.5.9.2.1 Introduction

PAD is an interworking function provided by a BSS to allow a non-AP and non-PCP STA, prior to association, to discover information concerning services that might be available to the STA when it is associated with the BSS. PAD provides a method for the STA to gather information to aid in the decision to select a BSS with which to associate.

4.5.9.2.2 Architecture

Figure 4-15a and Figure 4-15b show the functional flow of MAC messaging and service information between a service information client (SIC) and a service information registry (SIR). These entities are described in 4.5.9.2.3, 4.5.9.2.4, and 4.5.9.2.5. The active components within the architecture differ depending upon whether unsolicited or solicited PAD is being used.

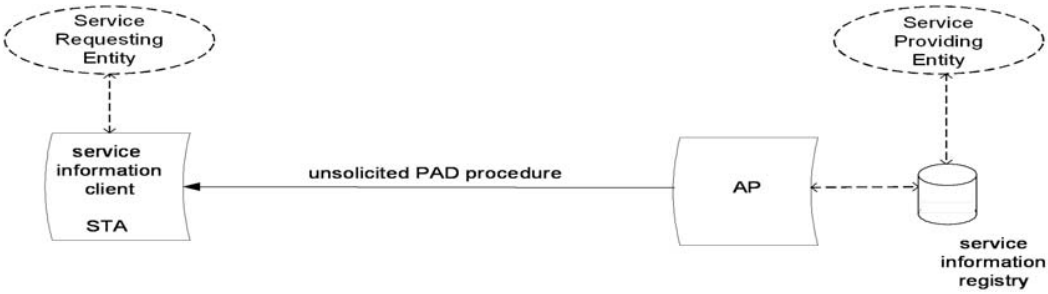

Figure 4-15a—Unsolicited PAD architecture

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