



**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 1: Operations with Randomized and Changing MAC Addresses

IEEE Computer Society

Developed by the
LAN/ MAN Standards Committee

IEEE Std 802.11bh™-2024
(Amendment to IEEE Std 802.11-2024)

**IEEE Standard for Information Technology—
Telecommunications and Information Exchange between Systems
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**Part 11: Wireless LAN Medium Access Control
(MAC) and Physical Layer (PHY) Specifications**

**Amendment 1: Operation with Randomized and
Changing MAC Addresses**

Developed by the
LAN/MAN Standards Committee
of the
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Approved 26 September 2024
IEEE SA Standards Board

Abstract: This amendment specifies modifications to the IEEE Std 802.11 medium access control (MAC) sublayer mechanisms to preserve the existing services that might otherwise be restricted in environments where STAs in extended service set (ESS) use randomized or changing MAC addresses, without affecting the privacy of the users corresponding to the STAs. User privacy includes exposure of trackable information to third parties or exposure of an individual's presence of behavior.

This amendment introduces mechanisms to enable session continuity in the absence of unique MAC address-to-STA mapping. For STAs in an ESS that use randomized or changing MAC addresses, this amendment preserves the ability to provide customer support, conduct network diagnostics and troubleshooting, and detect device arrival in a trusted environment.

Keywords: IEEE 802.11™, 802.11bh™, Randomized and Changing MAC Address (RCM)

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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 1: Operation with Randomized and Changing MAC Addresses

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 instruction 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. Editing instructions, change markings, and this NOTE will not be carried over into future editions because the changes will be incorporated into the base standard.

1. Overview

1.3 Supplementary information on purpose

Insert the following at the end of the list:

- Defines a mechanism to enable private (from third parties) device identification of IEEE 802.11 STAs that use randomized or changing MAC addresses.

3. Definitions, acronyms, and abbreviations

3.2 Definitions specific to IEEE Std 802.11

Insert the following definitions maintaining alphabetical order:

device identifier (ID): [device ID] An ID provided by an access point (AP) in an extended service set (ESS) to a non-access point (non-AP) station (STA) to allow the non-AP STA to identify itself to that same ESS during association at a future time.

identifiable random medium access control (MAC) address: [IRM] A random local MAC address provided by a non-access point (non-AP) station (STA) to identify itself to an extended service set (ESS).

measurement identifier (ID): [measurement ID] A transient device ID that an extended service set (ESS) can provide to a non-access point (non-AP) station (STA) to allow the non-AP STA to identify itself to another access point (AP) in the same ESS during a beacon report measurement procedure.

preassociation security negotiation identifier (ID): [PASN ID] A device ID that an extended service set (ESS) can provide to a non-access point (non-AP) station (STA) to allow the non-AP STA to identify itself to a known ESS during PASN authentication at a future time.

3.4 Abbreviations and acronyms

Insert the following acronym definition maintaining alphabetical order:

IRM identifiable random MAC address

4. General description

4.5 Overview of the services

4.5.4 Access control and data confidentiality services

4.5.4.10 MAC privacy enhancements

Change the last paragraph as follows.

To mitigate ~~this sort of~~ traffic analysis and tracking, a non-AP STA can support the ability to periodically and randomly change its MAC addresses and reset counters and seeds prior to association. Such a non-AP STA using the device ID mechanism, upon reconnecting to a network, can provide either a device ID or a

PASN ID previously provided by the network. Such a non-AP STA using the identifiable random MAC address (IRM) mechanism, upon reconnecting to the network can provide the IRM the STA previously provided to the network. Such a non-AP STA can use both device ID and IRM mechanisms concurrently. Such a STA can also use a measurement ID, previously provided by the network, to assist while performing beacon report measurement procedures. These mechanisms allow the network to recognize the STA while providing protection against third party tracking or traffic analysis. When the network can recognize the STA, it can map an already established shared identity state (see 12.2.12) to this STA, which can allow the network to provide network acquisition steering and selection, or allow the network to connect transactional information obtained preassociation or in a prior association to the device that is associating. While discovering networks, a non-AP STA can refrain from gratuitously transmitting Probe Request frames containing SSIDs of favored BSS networks.

6. Layer management

6.4 Table of MLME SAP interfaces

Insert the following row in Table 6-1 (header row shown for convenience).

Table 6-1—MLME SA interface

Service Name	MLME-XXX	Type	References	Comments
IRM Duplicate	IRMDUPLICATE	1	9.6.36 (IRM Action frame details)	See 12.2.13.2 (Identifiable random MAC address (IRM))

6.5 MLME SAP primitives

6.5.7 Associate

6.5.7.2 MLME-ASSOCIATE.request

6.5.7.2.2 Semantics of the service primitive

Change the primitive parameters list as follows (not all parameters are shown):

The primitive parameters are as follows:

```
MLME-ASSOCIATE.request(
    ...
    Device ID,
    IRM,
    VendorSpecificInfo
)
```

Insert the following rows to the parameter description table before the VendorSpecificInfo row (header row shown for convenience):