



**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 2:
Enhanced Throughput for Operations in
License-exempt Bands above 45 GHz**

IEEE Computer Society

Developed by the
LAN/MAN Standards Committee

IEEE Std 802.11ay™-2021
(Amendment to IEEE Std 802.11™-2020
as amended by IEEE Std 802.11ax™-2021)

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Approved 25 March 2021
IEEE SA Standards Board

Abstract: In this amendment to IEEE Std 802.11-2020, standardized modifications to both the IEEE 802.11 physical layer (PHY) and the IEEE 802.11 medium access control (MAC) sublayer are defined to enable at least one mode of operation capable of supporting a maximum throughput of at least 20 gigabits per second (measured at the MAC data service access point), while maintaining or improving the power efficiency per station.

Keywords: 60 GHz, beamforming, directional multi-gigabit, EDMG, Extended DMG, IEEE 802.11™, IEEE 802.11ay™, millimeter-wave, MIMO, multiple input multiple output, variable channel widths

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Introduction

This introduction is not part of IEEE Std 802.11ay-2021, 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 2: Enhanced Throughput for Operation in License-exempt Bands above 45 GHz.

This amendment defines modifications to both the IEEE 802.11 physical layer (PHY) and the IEEE 802.11 medium access control (MAC) sublayer for enhanced throughput operation in license-exempt bands above 45 GHz.

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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 2:
Enhanced Throughput for Operation in
License-exempt Bands above 45 GHz**

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

3. Definitions, acronyms, and abbreviations

3.1 Definitions

Insert the following definitions into 3.1 in alphabetic order:

reassembly: The process of combining a set of segmented medium access control (MAC) protocol data units (MPDUs) into a larger medium access control (MAC) service data unit (MSDU).

segmentation: The process of partitioning a large medium access control (MAC) service data unit (MSDU) into a sequence of MAC protocol data units (MPDUs), each carrying an MSDU segment. The inverse process of combining a set of segmented MPDUs into an MSDU is known as reassembly.

single input, single output (SISO): A physical layer (PHY) configuration in which both transmitter and receiver use a single antenna.

3.2 Definitions specific to IEEE 802.11

Change the following definitions in 3.2 as shown:

destination directional multi-gigabit (DMG) station (STA): A DMG STA that is expected to receive during a time division duplex (TDD) slot, or a DMG STA identified by the destination association identifier (AID) field contained in a Grant frame or Extended Schedule element that caused the allocation of a service period (SP) or a contention based access period (CBAP).

directional multi-gigabit (DMG) frame: A frame transmitted or received within a DMG physical layer (PHY) protocol data unit (PPDU) or within an enhanced directional multi-gigabit (EDMG) PPDU.

non-high-throughput (non-HT): A modifier meaning neither high throughput (HT) nor very high throughput (VHT) nor directional multi-gigabit (DMG).

secondary channel: A 20 MHz channel associated with a primary channel used by high-throughput (HT) stations (STAs) for the purpose of creating a 40 MHz channel or used by very high throughput (VHT) STAs for the purpose of creating the primary 40 MHz channel. A 2.16 GHz channel associated with a primary channel used by enhanced directional multi-gigabit (EDMG) STAs for the purpose of creating a 4.32 GHz, 6.48 GHz, 8.64 GHz, 2.16+2.16 GHz, or 4.32+4.32 GHz channel.

source directional multi-gigabit (DMG) station (STA): A DMG STA that is expected to transmit during a time division duplex (TDD) slot, or a DMG STA identified by the source association identifier (AID) field contained in a Grant frame or Extended Schedule element that caused the allocation of a service period (SP) or contention based access period (CBAP).

Insert the following definitions into 3.2 in alphanumeric order:

2.16 GHz mask physical layer (PHY) protocol data unit (PPDU): One of the following PPDU transmitted using the transmit spectral mask defined in Clause 20: a) A directional multi-gigabit (DMG) PPDU; b) A 2.16 GHz enhanced directional multi-gigabit (EDMG) PPDU (TXVECTOR parameter FORMAT equal to EDMG) or a 2.16 GHz non-EDMG PPDU (TXVECTOR parameter FORMAT equal to NON_EDMG).

2.16 GHz physical layer (PHY) protocol data unit (PPDU): A Clause 20 directional multi-gigabit (DMG) 17 PPDU or a Clause 28 2.16-GHz enhanced directional multi-gigabit (EDMG) PPDU (TXVECTOR parameter 18 FORMAT equal to EDMG) or a Clause 28 2.16-GHz non-enhanced directional multi-gigabit (non-EDMG) 19 PPDU (TXVECTOR parameter FORMAT equal to NON_EDMG).

2.16+2.16 GHz mask physical layer (PHY) protocol data unit (PPDU): A PPDU that is transmitted using the 2.16+2.16 GHz transmit spectral mask defined in Clause 28 and that is one of the following: a) A 2.16+2.16 GHz enhanced directional multi-gigabit (EDMG) PPDU (TXVECTOR parameter FORMAT equal to EDMG); b) A 2.16+2.16 GHz non-EDMG PPDU (TXVECTOR parameter FORMAT equal to NON_EDMG).

2.16+2.16 GHz physical layer (PHY) protocol data unit (PPDU): A Clause 28 2.16+2.16 GHz enhanced directional multi-gigabit (EDMG) PPDU (TXVECTOR parameter FORMAT equal to EDMG) or a Clause 28 2.16+2.16 GHz non-enhanced directional multi-gigabit (non-EDMG) PPDU (TXVECTOR parameter FORMAT equal to NON_EDMG).

4.32 GHz mask physical layer (PHY) protocol data unit (PPDU): A PPDU that is transmitted using the 4.32 GHz transmit spectral mask defined in Clause 28 and that is one of the following: a) A 4.32 GHz enhanced directional multi-gigabit (EDMG) PPDU (TXVECTOR parameter FORMAT equal to EDMG) or a 4.32 GHz non-EDMG PPDU (TXVECTOR parameter FORMAT equal to NON_EDMG); b) A 2.16 GHz EDMG PPDU (TXVECTOR parameter FORMAT equal to EDMG) or a 2.16 GHz non-EDMG PPDU (TXVECTOR parameter FORMAT equal to NON_EDMG).

4.32 GHz physical layer (PHY) protocol data unit (PPDU): A Clause 28 4.32-GHz enhanced directional multi-gigabit (EDMG) PPDU (TXVECTOR parameter FORMAT equal to EDMG) or a Clause 28 4.32-GHz non-enhanced directional multi-gigabit (non-EDMG) PPDU (TXVECTOR parameter FORMAT equal to NON_EDMG).

4.32+4.32 GHz mask physical layer (PHY) protocol data unit (PPDU): A PPDU that is transmitted using the 4.32+4.32 GHz transmit spectral mask defined in Clause 28 and that is one of the following: a) A 4.32+4.32 GHz enhanced directional multi-gigabit (EDMG) PPDU (TXVECTOR parameter FORMAT equal to EDMG); b) A 4.32+4.32 GHz non-EDMG PPDU (TXVECTOR parameter FORMAT equal to NON_EDMG).

4.32+4.32 GHz physical layer (PHY) protocol data unit (PPDU): A Clause 28 4.32+4.32 GHz enhanced directional multi-gigabit (EDMG) PPDU (TXVECTOR parameter FORMAT equal to EDMG) or a Clause 28 4.32+4.32 GHz non-enhanced directional multi-gigabit (non-EDMG) PPDU (TXVECTOR parameter FORMAT equal to NON_EDMG).

6.48 GHz mask physical layer (PHY) protocol data unit (PPDU): A PPDU that is transmitted using the 6.48 GHz transmit spectral mask defined in Clause 28 and that is one of the following: a) A 6.48 GHz enhanced directional multi-gigabit (EDMG) PPDU (TXVECTOR parameter FORMAT equal to EDMG) or a 6.48 GHz non-EDMG PPDU (TXVECTOR parameter FORMAT equal to NON_EDMG); b) A 4.32 GHz EDMG PPDU (TXVECTOR parameter FORMAT equal to EDMG) or a 4.32 GHz non-EDMG PPDU (TXVECTOR parameter FORMAT equal to NON_EDMG); c) A 2.16 GHz EDMG PPDU (TXVECTOR parameter FORMAT equal to EDMG) or a 2.16 GHz non-EDMG PPDU (TXVECTOR parameter FORMAT equal to NON_EDMG).

6.48 GHz physical layer (PHY) protocol data unit (PPDU): A Clause 28 6.48-GHz enhanced directional multi-gigabit (EDMG) PPDU (TXVECTOR parameter FORMAT equal to EDMG) or a Clause 28 6.48-GHz non-enhanced directional multi-gigabit (non-EDMG) PPDU (TXVECTOR parameter FORMAT equal to NON_EDMG).

8.64 GHz mask physical layer (PHY) protocol data unit (PPDU): A PPDU that is transmitted using the 8.64 GHz transmit spectral mask defined in Clause 28 and that is one of the following: a) An 8.64 GHz enhanced directional multi-gigabit (EDMG) PPDU (TXVECTOR parameter FORMAT equal to EDMG) or an 8.64 GHz non-EDMG PPDU (TXVECTOR parameter FORMAT equal to NON_EDMG); b) A 6.48 GHz enhanced directional multi-gigabit (EDMG) PPDU (TXVECTOR parameter FORMAT equal to EDMG) or a 6.48 GHz non-EDMG PPDU (TXVECTOR parameter FORMAT equal to NON_EDMG); c) A 4.32 GHz EDMG PPDU (TXVECTOR parameter FORMAT equal to EDMG) or a 4.32 GHz non-EDMG PPDU (TXVECTOR parameter FORMAT equal to NON_EDMG); d) A 2.16 GHz EDMG PPDU (TXVECTOR parameter FORMAT equal to EDMG) or a 2.16 GHz non-EDMG PPDU (TXVECTOR parameter FORMAT equal to NON_EDMG).

8.64 GHz physical layer (PHY) protocol data unit (PPDU): A Clause 28 8.64-GHz enhanced directional multi-gigabit (EDMG) PPDU (TXVECTOR parameter FORMAT equal to EDMG) or a Clause 28 8.64-GHz non-enhanced directional multi-gigabit (non-EDMG) PPDU (TXVECTOR parameter FORMAT equal to NON_EDMG).

aggregate physical layer (PHY) protocol data unit (A-PPDU): A sequence of two or more PPDU(s) transmitted without an interframe space (IFS). The PPDU(s) transmitted following the first PPDU in the sequence do not contain PHY preamble(s), only PHY header(s) and PHY service data unit(s) (PSDU(s)).

directional multi-gigabit (DMG) aggregate physical layer (PHY) protocol data unit (A-PPDU): An A-PPDU where all constituent PPDU(s) are DMG PPDU(s).

enhanced directional multi-gigabit (EDMG): Pertaining to an enhanced feature operation in directional multi-gigabit (DMG).

enhanced directional multi-gigabit (EDMG) aggregate physical layer (PHY) protocol data unit (A-PPDU): An A-PPDU where all constituent PPDU(s) are EDMG PPDU(s).

enhanced directional multi-gigabit (EDMG) basic service set (BSS): A directional multi-gigabit (DMG) BSS in which a DMG Beacon frame transmitted by an EDMG station (STA) has the EDMG Supported field equal to 1.

enhanced directional multi-gigabit (EDMG) physical layer (PHY) protocol data unit (PPDU): A Clause 28 PPDU transmitted with the TXVECTOR parameter FORMAT equal to EDMG.

non-directional multi-gigabit (non-DMG): A modifier meaning not directional multi-gigabit (DMG), not enhanced directional multi-gigabit (EDMG), and not China directional multi-gigabit (CDMG).

non-enhanced directional multi-gigabit (non-EDMG): A modifier meaning directional multi-gigabit (DMG) and that includes neither EDMG enhancement nor CDMG enhancements.

non-enhanced directional multi-gigabit (non-EDMG) duplicate transmission format: A transmission format of the physical layer (PHY) that duplicates a 2.16 GHz non-EDMG transmission in two or more 2.16 GHz channels and allows a station (STA) in a DMG basic service set (BSS) on any one of the 2.16 GHz channels to receive the transmission. A non-EDMG duplicate format is one of the following:

- 4.32 GHz non-EDMG duplicate transmission format: A transmission format of the PHY that replicates a 2.16 GHz non-EDMG transmission in two adjacent 2.16 GHz channels.
- 6.48 GHz non-EDMG duplicate transmission format: A transmission format of the PHY that replicates a 2.16 GHz non-EDMG transmission in three adjacent 2.16 GHz channels.
- 8.64 GHz non-EDMG duplicate transmission format: A transmission format of the PHY that replicates a 2.16 GHz non-EDMG transmission in four adjacent 2.16 GHz channels.
- 2.16+2.16 GHz non-EDMG duplicate transmission format: A transmission format of the PHY that replicates a 2.16 GHz non-EDMG transmission in two, not necessarily adjacent, 2.16 GHz channels.
- 4.32+4.32 GHz non-EDMG duplicate transmission format: A transmission format of the PHY that replicates a 2.16 GHz non-EDMG transmission in two frequency segments of two adjacent 2.16 GHz channels where the two frequency segments of channels are not necessarily adjacent.

secondary1 channel: A 2.16 GHz channel associated with a primary channel and a secondary channel used by enhanced directional multi-gigabit (EDMG) stations (STAs) for the purpose of creating a 6.48 GHz, 8.64 GHz, 2.16+2.16 GHz, or 4.32+4.32 GHz channel.

secondary2 channel: A 2.16 GHz channel associated with a primary channel, a secondary channel, and a secondary1 channel used by enhanced directional multi-gigabit (EDMG) stations (STAs) for the purpose of creating an 8.64 GHz channel, 2.16+2.16 GHz, or 4.32+4.32 GHz channel.

NOTE—For the assignment and relationship of EDMG primary, secondary, secondary1, and secondary2 channels, refer to Table 8-5a and Figure 8-6.

short sector sweep (SSW) PPDU: A directional multi-gigabit (DMG) control mode physical layer (PHY) protocol data unit (PPDU) that has the Length field in the PHY header equal to 6 and the PPDU Type subfield within the Short SSW Payload field equal to 0.

single input, single output (SISO) identifier (ID) subset: A tuple comprising the values of the AWW feedback ID, TX antenna ID, RX antenna ID and BRP CDOWN subfields.

time division duplex (TDD) service period (SP): An SP that uses the TDD channel access within the SP.

NOTE—TDD channel access is defined in 10.39.6.2.2.

3.4 Acronyms and abbreviations

Insert the following abbreviations into 3.4 in alphabetic order:

A-PPDU	aggregate physical layer protocol data unit
DCM	dual carrier modulation
EDMG	enhanced directional multi-gigabit
NUC	nonuniform constellation
SAR	segmentation and reassembly
SISO	single input, single output
SMBT	single user multiple input, multiple output beamforming training
TDD	time division duplex

4. General description

4.3 Components of the IEEE Std 802.11 architecture

4.3.22 DMG STA

Change the third paragraph of 4.3.22 as follows:

A DMG STA supports MAC features that provide channel access in an environment in which transmissions use a directional antenna pattern. ~~The MAC entity of a A-DMG STA provides has MAC features that include~~ frame aggregation, block acknowledgment features, service periods, contention based access periods, DMG protected period, AP or PCP clustering, dynamic channel time management (see 10.39.7, 10.39.8, and 10.39.9), reverse direction, spatial sharing, beamforming, discovery assistance, TDD channel access, and operation (fast session transfer) in a multi-band device. A DMG STA is not a mesh STA. A DMG STA does not use any of the following: HCCA, power save multi-poll (PSMP), TDLS, GCR.

Insert the following subclause (4.3.30) after 4.3.29:

4.3.30 EDMG STA

The IEEE 802.11 enhanced directional multi-gigabit (EDMG) STA is a DMG STA that provides PHY and MAC features that can support a throughput of at least 20 Gb/s, as measured at the MAC data service access point (SAP). An EDMG STA supports DMG and EDMG features as identified in Clause 10, Clause 11, Clause 12, Clause 20, and Clause 28. An EDMG STA supports transmission and reception of frames that are compliant with PHY specifications as defined in Clause 20 and Clause 28.

The main features in an EDMG STA that are not present in a DMG STA are the following:

- Mandatory support of the EDMG format (transmit and receive) using SC modulation.
- Mandatory support of 4.32 GHz channel width.
- Mandatory support of single spatial stream (transmit and receive) in all supported channel widths.
- Mandatory support of non-EDMG duplicate format transmission of non-EDMG portion of EDMG format preamble.
- Mandatory support of the BRP transmit sector sweep.
- Mandatory support of the Short SSW PPDU.
- Mandatory support of the EDMG power save enhancements.
- Optional support of EDMG SU PPDU (transmit and receive) using OFDM modulation.
- Optional support of two or more spatial streams (transmit and receive) using SC or OFDM modulations.
- Optional support of EDMG MU PPDU (transmit and receive) using SC or OFDM modulations.
- Optional support of 2.16+2.16 GHz channel width.
- Optional support of 4.32+4.32 GHz channel width.
- Optional support of 6.48 GHz channel width.
- Optional support of 8.64 GHz channel width.
- Optional support of a 64-point nonuniform constellation.
- Optional support for 8-PSK using SC modulation.
- Optional support of the beamforming for asymmetric links.

- Optional support of the first path beamforming.
- Optional support of the EDMG multi-TID aggregation.

An EDMG STA is equipped with one or more DMG antennas. When the STA is equipped with more than one DMG antenna, each DMG antenna can be configured to cover overlapping or nonoverlapping spatial sectors (i.e., DMG antennas can be sectorized). Therefore, transmissions from different DMG antennas can reach different sets of STAs. Under the control of the MAC sublayer, transmissions from each DMG antenna can be synchronized to, for example, achieve MIMO communication (see 10.39.12.4).

4.9 Reference model

4.9.4 Reference model for multi-band operation

Insert the following paragraph into 4.9.4 after the seventh paragraph (“By using the”):

By using the discovery assistance feature described in 11.31.7, the SME of a multi-band capable device can trigger one of its MLMEs to start the discovery assistance procedure for its operating band upon reception of a multi-band discovery assistance request from another MLME of the same multi-band capable device. The multi-band discovery assistance request is an FST Setup Request frame including the DMG Discovery Assistance element. The SME of a multi-band capable device can trigger one of its MLMEs to start scanning its operating band upon reception of a multi-band discovery assistance response from another MLME of the same multi-band capable device. The multi-band discovery assistance response is an FST Setup Response frame including the DMG Discovery Assistance element. This enables multi-band capable devices to trigger the discovery assistance and scanning procedure on one band upon receiving the DMG Discovery Assistance element on another band. The multi-band discovery assistance procedure can be used to expedite the scanning procedure of a multi-band capable device that includes a DMG STA (see 11.31.1).

Insert the following subclause (4.9.5, including Figure 4-29a) after 4.9.4:

4.9.5 Reference model for co-channel coordinated management operation

The reference model for a device that uses the co-channel coordinated management operation is shown in Figure 4-29a. The reference model for co-channel coordinated management operation allows a device to operate on the same channel with more than one STA, where each STA is associated with a different antenna or DMG antenna configuration. Each STA can have its own PHY and MAC sublayer for channel access and MPDU processing.

The co-channel coordinated management operation reference model can be used by a device to provide TDD channel access as defined in 11.54 and in 10.39.6.2.2.

The SME of a device that uses the co-channel coordinated management operation contains a coordinated management entity that is responsible for coordinating the setup, configuration, time synchronization and scheduling of STAs belonging to the device.

Different MAC SAPs are presented to higher layers if different MAC addresses are used by each STA. Each MAC SAP is controlled by a separate and independent RSNA key management entity. The coordinated management entity is responsible for coordinating with each of the SMEs if a single IEEE 802.1X entity of the IEEE 802.1X Authenticator/Supplicant is shared among the MACs.

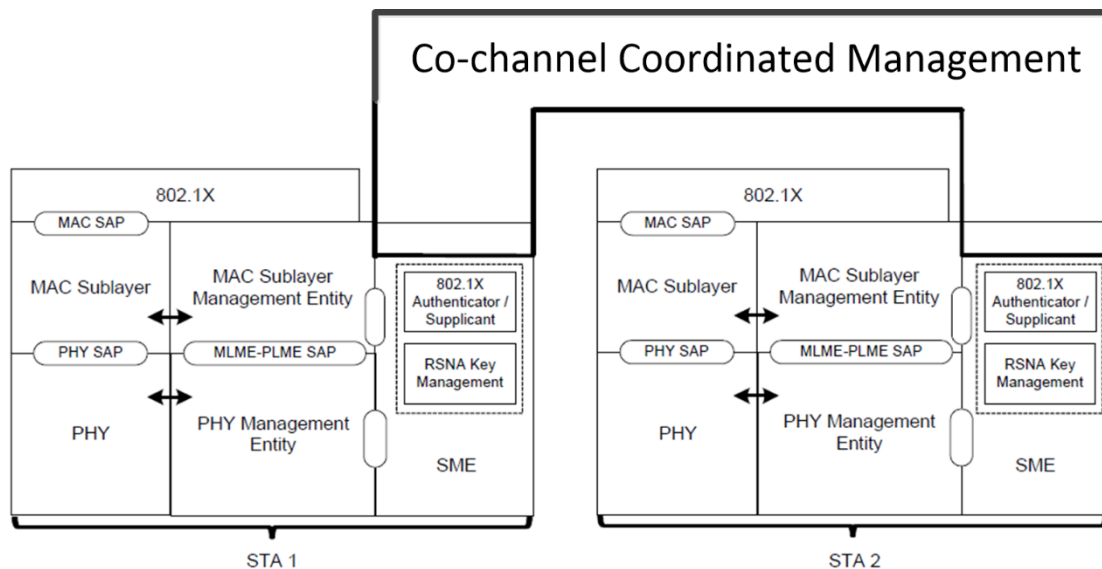


Figure 4-29a—Reference model for co-channel coordinated management operation

5. MAC service definition

5.1 Overview of MAC services

5.1.5 MAC data service architecture

5.1.5.1 General

Replace Figure 5-1 and Figure 5-2 with the following figures, which have been modified to integrate the “Segmentation (TX)/Reassembly (RX)” module introduced in 10.69:

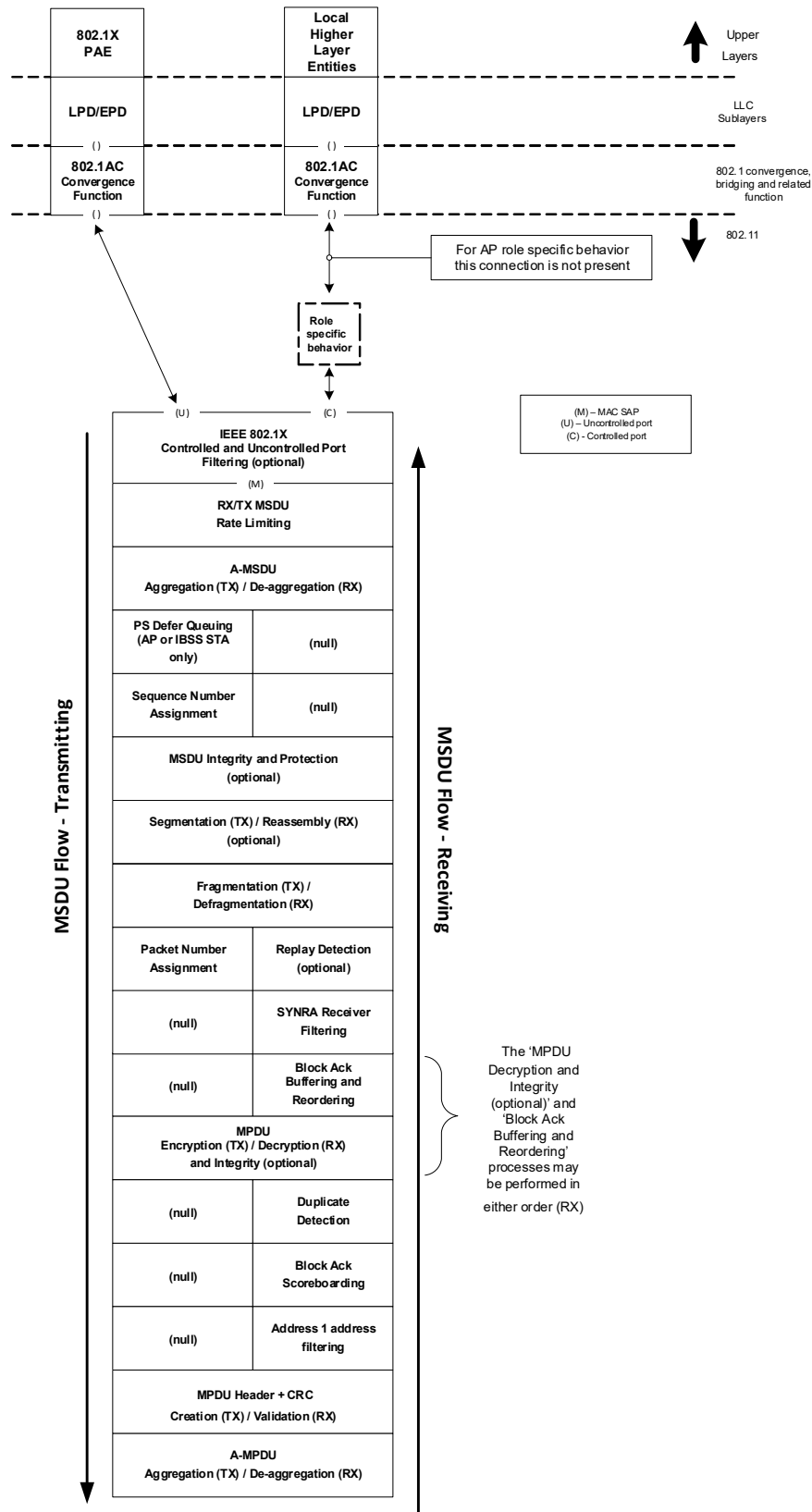


Figure 5-1—MAC data plane architecture

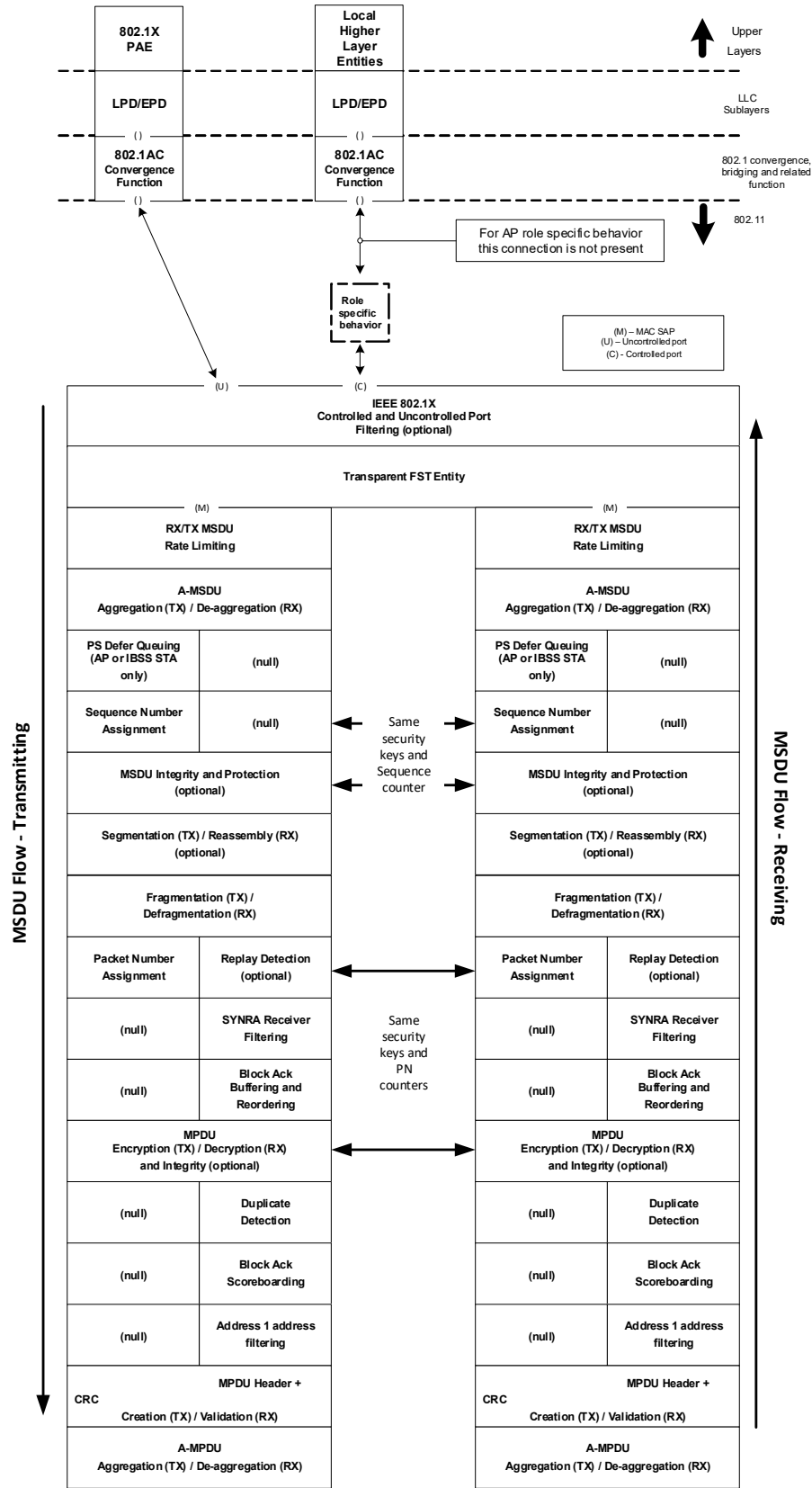


Figure 5-2—MAC data plane architecture (transparent FST)

6. Layer management

6.3 MLME SAP interface

6.3.3 Scan

6.3.3.2 MLME-SCAN.request

6.3.3.2.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.3.2.2 as follows:

The primitive parameters are as follows:

```
MLME-SCAN.request(  

    ...,  

    ScanAntennaSectorList,  

    SectorDwellTime,  

    EDMG Capabilities,  

    Unsolicited Block Ack Extension,  

    VendorSpecificInfo  

)
```

Change the following row in the untitled table in 6.3.3.3.2 as follows:

Name	Type	Valid range	Description
ScanType	Enumeration	ACTIVE, PASSIVE, <u>TDD</u> <u>PASSIVE</u>	Indicates ~~either active, or passive, or~~ <u>TDD passive</u> scanning.

Insert the following rows into the untitled table in 6.3.3.2.2 before the "VendorSpecificInfo" row:

Name	Type	Valid range	Description
ScanAntennaSectorID List	List of DMG antenna and sector configurations	Each DMG antenna and sector configuration is a valid configuration for the scanning STA.	Present if dot11TDDOptionImplemented is true and absent otherwise. Contains an ordered list of DMG antennas and sector configurations to be used during the scan using TDD beamforming (see 11.36.2).
SectorDwellTime	Integer	N/A	Present if dot11TDDOptionImplemented is true and absent otherwise. The time (in microseconds) to dwell on each sector during TDD beamforming (see 11.36.2).
EDMG Capabilities	EDMG Capabilities element	As defined in 9.4.2.265	Specifies the parameters within the EDMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11EDMGOptionImplemented is true and is absent otherwise.

Name	Type	Valid range	Description
Unsolicited Block Ack Extension	Unsolicited Block Ack Extension element	As defined in 9.4.2.279	Specifies the parameters within the Unsolicited Block Ack Extension element that are supported by the MAC entity. Optionally present if dot11UnsolicitedBAAActivated is true and is absent otherwise.

6.3.4 Synchronization

6.3.4.2 MLME-JOIN.request

6.3.4.2.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.4.2.2 as follows:

The primitive parameters are as follows:

```
MLME-JOIN.request(
    ...,
    EDMG Capabilities,
    VendorSpecificInfo
)
```

Insert the following row into the untitled table in 6.3.4.2.2 before the "VendorSpecificInfo" row:

Name	Type	Valid range	Description
EDMG Capabilities	EDMG Capabilities element	As defined in 9.4.2.265	Specifies the parameters within the EDMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11EDMGOptionImplemented is true and is absent otherwise.

6.3.7 Associate

6.3.7.2 MLME-ASSOCIATE.request

6.3.7.2.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.7.2.2 as follows:

The primitive parameters are as follows:

```
MLME-ASSOCIATE.request(  
    ...,  
    EDMG Capabilities,  
    QoS Triggered Unscheduled,  
    Unsolicited Block Ack Extension,  
    TDD Slot Schedule,  
    VendorSpecificInfo  
)
```

Insert the following rows into the untitled table in 6.3.7.2.2 before the "VendorSpecificInfo" row:

Name	Type	Valid range	Description
EDMG Capabilities	EDMG Capabilities element	As defined in 9.4.2.265	Specifies the parameters within the EDMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11EDMGOptionImplemented is true and is absent otherwise.
QoS Triggered Unscheduled	QoS Triggered Unscheduled element	As defined in 9.4.2.278	Specifies the parameters within the QoS Triggered Unscheduled element that are supported by the MAC entity. The parameter is present if dot11EDMGOptionImplemented is true and is absent otherwise.
Unsolicited Block Ack Extension	Unsolicited Block Ack Extension element	As defined in 9.4.2.279	Specifies the parameters within the Unsolicited Block Ack Extension element that are supported by the MAC entity. Optionally present if dot11UnsolicitedBAActivated is true and is absent otherwise.
TDD Slot Schedule	TDD Slot Schedule element	As defined in 9.4.2.282	Present if dot11TDDOptionImplemented is true and absent otherwise. Specifies the TDD slot availability of the STA.

6.3.7.3 MLME-ASSOCIATE.confirm

6.3.7.3.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.7.3.2 as follows:

The primitive parameters are as follows:

```
MLME-ASSOCIATE.confirm(
    ...,
    EDMG Capabilities,
    EDMG Operation,
    QoS Triggered Unscheduled,
    Unsolicited Block Ack Extension,
    TDD Slot Structure,
    TDD Slot Schedule,
    VendorSpecificInfo
)
```

Insert the following rows into the untitled table in 6.3.7.3.2 before the "VendorSpecificInfo" row:

Name	Type	Valid range	Description
EDMG Capabilities	EDMG Capabilities element	As defined in 9.4.2.265	Specifies the parameters within the EDMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11EDMGOptionImplemented is true and is absent otherwise.
EDMG Operation	EDMG Operation element	As defined in 9.4.2.266	Specifies the parameters within the EDMG Operation element that are used in the BSS. The parameter is present if dot11EDMGOptionImplemented is true and is absent otherwise.
QoS Triggered Unscheduled	QoS Triggered Unscheduled element	As defined in 9.4.2.278	Specifies the parameters within the QoS Triggered Unscheduled element that are supported by the MAC entity. The parameter is present if dot11EDMGOptionImplemented is true and is absent otherwise.
Unsolicited Block Ack Extension	Unsolicited Block Ack Extension element	As defined in 9.4.2.279	Specifies the parameters within the Unsolicited Block Ack Extension element that are supported by the MAC entity. Optionally present if dot11UnsolicitedBAAActivated is true and is absent otherwise.
TDD Slot Structure	TDD Slot Structure element	As defined in 9.4.2.281	Present if dot11TDDOptionImplemented is true and absent otherwise. Specifies the parameters within the TDD Slot Structure element corresponding to a target STA.
TDD Slot Schedule	TDD Slot Schedule element	As defined in 9.4.2.282	Present if dot11TDDOptionImplemented is true and absent otherwise. Specifies the TDD slot schedule of the STA.

6.3.7.4 MLME-ASSOCIATE.indication

6.3.7.4.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.7.4.2 as follows:

The primitive parameters are as follows:

```
MLME-ASSOCIATE.indication(
    ...,
    EDMG Capabilities,
    QoS Triggered Unscheduled,
    Unsolicited Block Ack Extension,
    TDD Slot Schedule,
    VendorSpecificInfo
)
```

Insert the following rows into the untitled table in 6.3.7.4.2 before the "VendorSpecificInfo" row:

Name	Type	Valid range	Description
EDMG Capabilities	EDMG Capabilities element	As defined in 9.4.2.265	Specifies the parameters within the EDMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11EDMGOptionImplemented is true and is absent otherwise.
QoS Triggered Unscheduled	QoS Triggered Unscheduled element	As defined in 9.4.2.278	Specifies the parameters within the QoS Triggered Unscheduled element that are supported by the MAC entity. The parameter is present if dot11EDMGOptionImplemented is true and is absent otherwise.
Unsolicited Block Ack Extension	Unsolicited Block Ack Extension element	As defined in 9.4.2.279	Specifies the parameters within the Unsolicited Block Ack Extension element that are supported by the MAC entity. Optionally present if dot11UnsolicitedBAActivated is true and is absent otherwise.
TDD Slot Schedule	TDD Slot Schedule element	As defined in 9.4.2.282	Present if dot11TDDOptionImplemented is true and absent otherwise. Specifies the TDD slot schedule of the STA.

6.3.7.5 MLME-ASSOCIATE.response

6.3.7.5.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.7.5.2 as follows:

The primitive parameters are as follows:

```
MLME-ASSOCIATE.response(
    ...,
    EDMG Capabilities,
    EDMG Operation,
    QoS Triggered Unscheduled,
    Unsolicited Block Ack Extension,
    TDDSlotStructure,
    TDD Slot Schedule,
    VendorSpecificInfo
)
```

Insert the following rows into the untitled table in 6.3.7.5.2 before the "VendorSpecificInfo" row:

Name	Type	Valid range	Description
EDMG Capabilities	EDMG Capabilities element	As defined in 9.4.2.265	Specifies the parameters within the EDMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11EDMGOptionImplemented is true and is absent otherwise.
EDMG Operation	EDMG Operation element	As defined in 9.4.2.266	Specifies the parameters within the EDMG Operation element that are used in the BSS. The parameter is present if dot11EDMGOptionImplemented is true and is absent otherwise.
QoS Triggered Unscheduled	QoS Triggered Unscheduled element	As defined in 9.4.2.278	Specifies the parameters within the QoS Triggered Unscheduled element that are supported by the MAC entity. The parameter is present if dot11EDMGOptionImplemented is true and is absent otherwise.
Unsolicited Block Ack Extension	Unsolicited Block Ack Extension	As defined in 9.4.2.279	Specifies the parameters within the Unsolicited Block Ack Extension element that are supported by the MAC entity. Optionally present if dot11UnsolicitedBAAActivated is true and is absent otherwise.
TDDSlotStructure	TDD Slot Structure element	As defined in 9.4.2.281	Present if dot11TDDOptionImplemented is true and absent otherwise. Specifies the parameters within the TDD Slot Structure element corresponding to a target STA.
TDD Slot Schedule	TDD Slot Schedule element	As defined in 9.4.2.282	Present if dot11TDDOptionImplemented is true and absent otherwise. Specifies the TDD slot schedule of the STA.