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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: MAC enhancements for robust audio video streaming (adoption of IEEE Std 802.11aa-2012)

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

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

AMENDEMENT 2: Améliorations du MAC pour une lecture en transit robuste de fichier sonore ou visuel (adoption de la norme IEEE Std 802.11aa-2012)

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29 May 2012

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Abstract: This amendment specifies enhancements to the IEEE 802.11 medium access control (MAC) for robust audio video (AV) streaming, while maintaining coexistence with other types of traffic.
Keywords: audio, IEEE 802.11aa, medium access control, video, wireless LAN

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This amendment defines enhancements to the IEEE 802.11 medium access control (MAC) to support robust audio video (AV) streaming.

The amendment specifies enhancements to the following standard and amendment to support robust AV streaming:

— IEEE Std 802.11-2012

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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: MAC Enhancements for Robust Audio Video Streaming

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(This amendment is based on IEEE Std 802.11™-2012, as amended by IEEE Std 802.11ae-2012.)

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 ~~strikethrough~~ (to remove old material) and underscore (to add new material). **Delete** removes existing material. **Insert** adds new material without disturbing the existing material. Deletions and 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]

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

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1. Overview

1.3 Supplementary information on purpose

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

— Defines mechanisms to improve audio video (AV) streaming quality of service (QoS) while maintaining data and voice performance.

2. Normative references

Insert the following reference into Clause 2 in alphanumeric order:

IEEE Std 802.1Q™-2011, IEEE Standard for Local and Metropolitan Area Networks: Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks.[2,3]

3. Definitions, acronyms, and abbreviations

3.1 Definitions

Change the definition of service period in 3.1 as follows:

service period (SP): A contiguous time during which one or more downlink unicast frames are transmitted to a quality of service (QoS) station (STA) and/or one or more transmission opportunities (TXOPs) are granted to the same STA. SPs can be scheduled or unscheduled. For a non-access point (non-AP) STA, there can be at most one nongroupcast with retries SP (non-GCR-SP) active at any time.

3.2 Definitions specific to IEEE 802.11

Insert the following definitions into 3.2 in alphabetic order:

advanced groupcast with retries (GCR): A set of features comprising the GCR block acknowledgment retransmission policy and the GCR service period (GCR-SP) delivery method.

concealed groupcast with retries (GCR) frame: A group addressed frame that is transmitted using the aggregate medium access control (MAC) service data unit (A-MSDU) frame format with the destination address (DA) field set to the GCR concealment address.

group addressed transmission service (GATS): A mechanism comprising directed multicast service (DMS) and groupcast with retries (GCR), for delivery of group addressed frames.

groupcast with retries (GCR) active (GCR-A) delivery: A delivery method for a group addressed stream subject to a GCR agreement wherein the frames may be transmitted without regard to the power state of non-access point (non-AP) stations (STAs).

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groupcast with retries (GCR) concealment address: A medium access control (MAC) address that is used to prevent group addressed frames transmitted via the GCR unsolicited retry or GCR Block Ack retransmission policies from being passed up the medium access control service access point (MAC_SAP) of GCR-incapable stations (STAs).

groupcast with retries (GCR) frame: A group addressed frame subject to a GCR agreement between the access point (AP) and at least one station (STA) within the infrastructure basic service set (BSS) or between peer mesh STAs in a mesh BSS.

groupcast with retries (GCR) group address: A group address subject to a GCR agreement between the access point (AP) and at least one station (STA) within the basic service set (BSS) or between peer mesh STAs in a mesh BSS.

groupcast with retries (GCR) service: A means for transmission and retransmission of medium access control (MAC) service data units (MSDUs) to a destination that is a group address. The GCR service provides greater reliability by using group addressed retransmissions, concealed from GCR-incapable stations (STAs).

groupcast with retries (GCR) service period (GCR-SP) aggregate medium access control (MAC) service data unit (A-MSDU): An A-MSDU subject to the GCR service with delivery method equal to GCR-SP.

groupcast with retries (GCR) service period (GCR-SP) frame: A frame subject to the GCR service when delivery method is GCR-SP.

groupcast with retries (GCR) service period (GCR-SP) medium access control (MAC) service data unit (MSDU): An MSDU subject to the GCR service with delivery method equal to GCR-SP.

groupcast with retries (GCR) transmission opportunity (TXOP): An interval of time when an access point (AP) or a mesh station (STA) has the right to initiate frame exchange sequences onto the wireless medium (WM) for the purpose of transmitting multiple frames that are subject to the GCR service.

no acknowledgment/no retry (No-Ack/No-Retry): A retransmission policy for group addressed frames in which each frame is transmitted once and without acknowledgment.

nonconcealed groupcast with retries (GCR) frame: A group addressed frame that is not transmitted to the GCR concealment address.

nongroupcast with retries (non-GCR): A method for delivering group addressed frames without using the GCR unsolicited retry retransmission policy, the GCR block acknowledgment retransmission policy, or the GCR service period (GCR-SP) delivery method.

nongroupcast with retries service period (non-GCR-SP): A method for the delivery of group addressed frames without the use of a GCR service period (GCR-SP).

3.3 Abbreviations and acronyms

Insert the following abbreviations into 3.3 in alphabetic order:

AV	audio visual
GATS	group addressed transmission service
GCR	groupcast with retries
GCR-SP	groupcast with retries service period

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DEI	drop eligibility indicator
QLDRC	QoS long drop-eligible retry counter
QSDRC	QoS short drop-eligible retry counter
SCS	stream classification service
SCSID	stream classification service identifier

4. General description

4.3 Components of the IEEE 802.11 architecture

4.3.15 Mesh BSS: IEEE 802.11 wireless mesh network

4.3.15.3 Mesh STA

Change 4.3.15.3 as follows:

A STA that belongs to a mesh BSS is termed a "mesh station" (mesh STA). Mesh STAs are QoS STAs that support mesh services, i.e., they participate in formation and operation of a mesh basic service set (MBSS). A mesh STA implements a subset of the QoS functionality. This subset is as follows:

— Use of QoS frame format
— EDCA (as a part of MCF)
— Block acknowledgment (optional)
— No acknowledgment (optional)
— Use of TSPEC, TCLAS, and TCLAS Processing elements to establish DMS or GCR agreements (optional)

A mesh BSS does not incorporate the full hybrid coordinator (HC) and BSS QoS functionality. MBSSs do not incorporate the following:

— HCCA
— ~~Traffic specification (TSPEC)~~
— Traffic stream (TS) management
— Admission control
— Automatic power save delivery (APSD)
— Direct-link setup (DLS)
— Tunneled direct-link setup (TDLS)

Insert the following subclauses, 4.3.16 to 4.3.16.5, after 4.3.15.3.13:

4.3.16 Robust audio video (AV) streaming

Robust AV streaming improves AV streaming performance when using IEEE 802.11 for consumer and enterprise applications.

4.3.16.1 Groupcast with retries (GCR)

The GCR service allows a STA to request greater reliability for one or more group addressed streams that the STA receives. Greater reliability is provided via unsolicited retries or the Block Ack mechanism. A non-AP STA may request delivery so that the AP transmits the frames via EDCA within GCR service periods when all associated non-AP STAs are in active mode or the Awake state of the PS mode.

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4.3.16.2 Stream classification service (SCS)

SCS enables the establishment of a classification using layer 2 and/or layer 3 signaling to match incoming unicast MSDUs. Once classified, unicast MSDUs matching the classification are assigned to an access category and are tagged with their drop eligibility. When intra-access category prioritization is enabled (see 4.3.16.5), SCS allows MSDUs matching the classification to be assigned to the primary or alternate transmit queues so that finer grained prioritization can be applied.

4.3.16.3 Overlapping BSS (OBSS) management

The objective of OBSS management is to facilitate cooperative sharing of the medium between APs that operate in the same channel and that are able to receive or obtain frames from each other, including Beacon frames. These frames might be received directly or via associated STAs that support the Beacon request capability (see 10.11.10).

OBSS management provides the means to

— Provide additional information for channel selection
— Extend the admission control mechanism to a distributed environment
— Enable the coordination of scheduled TXOPs between OBSSs

OBSS management enables stationary and portable APs to provide to neighboring APs information for the selection of a channel and for the cooperative sharing of that channel. The main component of OBSS management is the QLoad report that provides information on

— The reporting AP's overlap situation
— The reporting AP's QoS traffic load
— The total QoS traffic load of BSSs directly overlapping the reporting AP's BSS

This information might be used to aid an AP when searching for a channel and also when sharing a channel in an overlap situation.

To coordinate the TXOPs of overlapping HCCA APs, OBSS management provides a means for an AP to advertise its TXOP allocations so another AP might schedule its own TXOPs to avoid those already scheduled.

4.3.16.4 Interworking with IEEE 802.1Q Stream Reservation Protocol (SRP)

Support for SRP from IEEE Std 802.1Q-2011 enables integration of the TSPEC ADDTS request/response protocol with IEEE 802.1Q SRP to enable end-to-end SRP reservations when one or more IEEE 802.11 links are part of a path from IEEE 802.1Q Talker to IEEE 802.1Q Listener.

4.3.16.5 Intra-access category prioritization

Intra-access category prioritization provides six transmit queues that map to four enhanced distributed channel access functions (EDCAFs) to enable differentiation between traffic streams that are in the same access category in order for finer grained prioritization to be applied between individual AV streams or voice streams.

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5. MAC service definition

5.1 Overview of MAC services

5.1.1 Data service

5.1.1.2 Determination of UP

Change 5.1.1.2 as follows:

The QoS facility supports eight priority values, referred to as UPs. The values a UP may take are the integer values from 0 to 7 and are identical to the IEEE 802.1D priority tags. An MSDU with a particular UP is said to belong to a traffic category (TC) with that UP. The UP is provided with each MSDU at the medium access control service access point (MAC_SAP) either directly, in the UP parameter, or indirectly, in a TSPEC or SCS Descriptor element designated by the UP parameter.

5.1.1.5 Interpretation of service class parameter in MAC service primitives in a STA

Change 5.1.1.5 as follows:

In QoS STAs, the value of the service class parameter in the MAC service primitive (see 5.2) may be a noninteger value of QoSAck or QoSNoAck.

When an MSDU is received from the MAC_SAP and the recipient STA is a QoS STA with the service class set to

— QoSAck, the MSDU is transmitted using a QoS data frame with the Ack Policy subfield in the QoS Control field set to either Normal Ack (normal acknowledgment) or Block Ack.

— QoSNoAck, the MSDU is transmitted using a QoS data frame with the Ack Policy subfield in the QoS Control field set to No Ack (no acknowledgment). ~~If the sender STA is contained within an AP and the frame has a group DA, then the MSDU is buffered for transmission and is also sent to the DS.~~

If the sender STA is an AP and the frame has a group DA that is not the GCR concealment address, then the MSDU is buffered for transmission and is also sent to the DS.

When an MSDU is received from the MAC_SAP and the recipient STA is not a QoS STA, the MSDU is transmitted using a non-QoS data frame.

When a QoS data frame is received from another STA, the service class parameter in the MA-UNITDATA.indication primitive is set to

— QoSAck, if the frame is a QoS data frame with the Ack Policy subfield in the QoS Control field equal to either Normal Ack or Block Ack.

— QoSAck, if the frame was delivered via the DMS or the GCR Block Ack retransmission policy.

— QoSNoAck, if the frame is a QoS data frame with the Ack Policy subfield in the QoS Control field equal to No Ack. This service class is also used ~~where~~ when the DA parameter is a group address unless the frame was delivered via DMS or the GCR Block Ack retransmission policy.

When a non-QoS data frame is received from a STA, the service class parameter in the MA-UNITDATA.indication primitive is set to

— QoSAck, if the frame is an individually addressed frame and is acknowledged by the STA.

— QoSNoAck, if the frame is a group addressed frame and is not acknowledged by the STA.

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Note that the group addressed frames sent by a non-QoS STA are not acknowledged regardless of the value of the service class parameter in the MA-UNITDATA.indication primitive.

NOTE—GCR frames are transmitted only by an AP for which dot11GCRActivated is true or by a mesh STA for which dot11MeshGCRActivated is true.

6. Layer management

6.3 MLME SAP interface

6.3.3 Scan

6.3.3.3 MLME-SCAN.confirm

6.3.3.3.2 Semantics of the service primitive

Insert the following row at the end of the untitled table describing BSSDescriptions in 6.3.3.3.2 (note that the entire table is not shown here):

Name	Type	Valid range	Description	IBSS adoption
QLoad Report	As defined in frame format	As defined in 8.4.2.125	The values from the QLoad Report element if such an element was present in the probe response frame, else null.	Do not adopt.

6.3.26 TS management interface

6.3.26.1 General

Change Table 6-1 as follows:

Table 6-1—Supported TS management primitives

Primitive	Request	Confirm	Indication	Response
ADDTS	non-AP QoS STA	non-AP QoS STA	HC	HC
DELTS	non-AP QoS STA and HC	non-AP QoS STA and HC	non-AP QoS STA and HC	—
ADDTSRESERVE	HC	HC	non-AP QoS STA	non-AP QoS STA

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6.3.26.2 MLME-ADDTS.request

6.3.26.2.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.26.2.2 as follows:

The primitive parameters are as follows:

MLME-ADDTS.request(
DialogToken,
TSPEC,
TCLAS,
TCLASProcessing,
ADDTSFailureTimeout,
U-APSD Coexistence,
EBR,
IntraAccessCategoryPriority,
HigherLayerStreamID,
VendorSpecificInfo
)

Insert the following rows before the VendorSpecificInfo row of the untitled table in 6.3.26.2.2 (note that the entire table is not shown here):

Name	Type	Valid range	Description
IntraAccessCategoryPriority	Intra-Access Category Priority element	As defined in 8.4.2.123	Specifies the intra-AC priorities the STA should use.
HigherLayerStreamID	Higher Layer Stream ID element	As defined in 8.4.2.127	Identifies the higher layer stream.

6.3.26.3 MLME-ADDTS.confirm

6.3.26.3.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.26.3.2 as follows:

The primitive parameters are as follows:

MLME-ADDTS.confirm(
ResultCode,
DialogToken,
TSDelay,
TSPEC,
Schedule,
TCLAS,
TCLASProcessing,
EBR,
HigherLayerStreamID,
VendorSpecificInfo
)

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Insert the following row before the VendorSpecificInfo row of the untitled table in 6.3.26.3.2 (note that the entire table is not shown here):

Name	Type	Valid range	Description
HigherLayerStreamID	Higher Layer Stream ID element	As defined in 8.4.2.127	Identifies the higher layer stream.

6.3.26.4 MLME-ADDTS.indication

6.3.26.4.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.26.4.2 as follows:

The primitive parameters are as follows:

```
MLME-ADDTS.indication (
                        DialogToken,
                        STAAddress,
                        TSPEC,
                        TCLAS,
                        TCLASProcessing,
                        U-APSD Coexistence,
                        EBR,
                        IntraAccessCategoryPriority,
                        HigherLayerStreamID,
                        VendorSpecificInfo
                        )
```

Insert the following rows before the VendorSpecificInfo row of the untitled table in 6.3.26.4.2 (note that the entire table is not shown here):

Name	Type	Valid range	Description
IntraAccessCategoryPriority	Intra-Access Category Priority element	As defined in 8.4.2.123	Specifies the intra-AC priorities the STA should use.
HigherLayerStreamID	Higher Layer Stream ID element	As defined in 8.4.2.127	Identifies the higher layer stream.

6.3.26.5 MLME-ADDTS.response

6.3.26.5.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.26.5.2 as follows:

The primitive parameters are as follows:

```
MLME-ADDTS.response (
                        ResultCode,
                        DialogToken,
                        STAAddress,
                        TSDelay,
```

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TSPEC,
Schedule,
TCLAS,
TCLASProcessing,
EBR,
HigherLayerStreamID,
VendorSpecificInfo
)

Insert the following row before the VendorSpecificInfo row in the untitled table in 6.3.26.5.2 (note that the entire table is not shown here):

Name	Type	Valid range	Description
HigherLayerStreamID	Higher Layer Stream ID element	As defined in 8.4.2.127	Identifies the higher layer stream.

Insert the following subclauses, 6.3.26.8 to 6.3.26.11.4, after 6.3.26.7.4:

6.3.26.8 MLME-ADDTSRESERVE.request

6.3.26.8.1 Function

This primitive request is used by the SME at the AP to start the AP-initiated TS setup procedure.

6.3.26.8.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-ADDTSRESERVE.request (
TSPEC,
HigherLayerStreamID,
Schedule,
VendorSpecificInfo
)

Name	Type	Valid range	Description
TSPEC	TSPEC element	As defined in 8.4.2.32	Specifies the QoS parameters of the TS.
HigherLayerStreamID	Higher Layer Stream ID element	As defined in 8.4.2.127	Stream identifier assigned by a higher layer protocol.
Schedule	Schedule element	As defined in 8.4.2.36	Specifies the schedule information, service start time, SI, and the specification interval.
VendorSpecificInfo	A set of elements	As defined in 8.4.2.28	Zero or more elements.

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6.3.26.8.3 When generated

This primitive is generated by the SME at the AP to start the AP-initiated TS setup procedure. If the parameter validation on the parameters used in this primitive succeeds, an ADDTS Reserve Request action frame is transmitted from the AP to a non-AP STA.

6.3.26.8.4 Effect of receipt

The STA operates according to the procedures defined in 10.4.4.3.

6.3.26.9 MLME-ADDTSRESERVE.confirm

6.3.26.9.1 Function

This primitive is an indication to the SME that is generated by the MLME as a result of receiving an ADDTS Reserve Response action frame from the non-AP STA to which the AP sent a corresponding ADDTS Reserve Request action frame.

6.3.26.9.2 Semantics of the service primitive

The primitive parameters are as follows:

```
MLME-ADDTSRESERVE.confirm (
                                    ResultCode,
                                    StreamID
                                    )
```

Name	Type	Valid range	Description
ResultCode	Enumeration	SUCCESS, FAILURE	Indicates the results of the corresponding MLME-ADDTSReserve.request primitive.
StreamID	Higher Layer Stream ID element	As defined in 8.4.2.127	Stream identifier specified in the corresponding MLME-ADDTSReserve.request primitive.

6.3.26.9.3 When generated

This primitive is generated by the MLME as a result of receiving an ADDTS Reserve Response action frame from the non-AP STA to which the AP sent a corresponding ADDTS Reserve Request action.

6.3.26.9.4 Effect of receipt

The SME is notified of the results of the AP-initiated TS setup procedure.

6.3.26.10 MLME-ADDTSRESERVE.indication

6.3.26.10.1 Function

This primitive reports to the non-AP STA's SME the initiation of AP-initiated TS setup procedure.

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6.3.26.10.2 Semantics of the service primitive

The primitive parameters are as follows:

```
MLME-ADDTSRESERVE.indication (
                                APAddress,
                                TSPEC,
                                Schedule,
                                HigherLayerStreamID,
                                VendorSpecificInfo
                                )
```

Name	Type	Valid range	Description
APAddress	MAC Address	—	Contains the MAC address of the AP initiating the TS setup procedure.
TSPEC	TSPEC element	As defined in 8.4.2.32	Specifies the QoS parameters of the TS.
Schedule	Schedule element	As defined in 8.4.2.36	Specifies the schedule information, service start time, SI, and the specification interval.
HigherLayerStreamID	Higher Layer Stream ID element	As defined in 8.4.2.127	Stream identifier in the received ADDTS Reserve Request action frame.
VendorSpecificInfo	A set of elements	As defined in 8.4.2.28	Zero or more elements.

6.3.26.10.3 When generated

This primitive is generated by the MLME at the non-AP STA as a result of the receipt of an ADDTS Reserve Request action frame from the AP to which the non-AP STA is associated.

6.3.26.10.4 Effect of receipt

The SME is notified of the receipt of the ADDTS Reserve Request action frame from the AP. This primitive solicits the SME to participate in the AP-initiated TS setup procedure.

The SME should operate according to the procedures defined in 10.4.4.3.

6.3.26.11 MLME-ADDTSRESERVE.response

6.3.26.11.1 Function

This primitive is used by a non-AP STA to indicate to the HC the completion of an AP-initiated TS setup procedure.

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6.3.26.11.2 Semantics of the service primitive

The primitive parameters are as follows:

```
MLME-ADDTSRESERVE.response (
                                    HigherLayerStreamID,
                                    ResultCode,
                                    VendorSpecificInfo
                                    )
```

Name	Type	Valid range	Description
HigherLayerStreamID	Higher Layer Stream ID element	As defined in 8.4.2.127	Stream identifier specified in the corresponding MLME-ADDTSReserve.indication primitive.
ResultCode	Enumeration	0 or 1 (as defined in Table 8-37)	Indicates the result of the AP-initiated TS setup procedure.
VendorSpecificInfo	A set of elements	As defined in 8.4.2.28	Zero or more elements.

6.3.26.11.3 When generated

This primitive is generated by the SME at the non-AP STA to indicate to a HC that the non-AP STA has setup a TS in response to a higher layer protocol.

6.3.26.11.4 Effect of receipt

The STA operates according to the procedures defined in 10.4.4.3.

6.3.29 Block Ack

6.3.29.2 MLME-ADDBA.request

6.3.29.2.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.29.2.2 as follows:

The primitive parameters are as follows:

```
MLME-ADDBA.request(
                                    PeerSTAAddress,
                                    DialogToken,
                                    TID,
                                    BlockAckPolicy,
                                    BufferSize,
                                    BlockAckTimeout,
                                    ADDBAFailureTimeout,
                                    BlockAckStartingSequenceControl,
                                    GCRGroupAddress,
                                    VendorSpecificInfo
                                    )
```

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Insert the following row before the VendorSpecificInfo row in the untitled table in 6.3.29.2.2 (note that the entire table is not shown here):

Name	Type	Valid range	Description
GCRGroupAddress	GCR Group Address element	As defined in 8.4.2.128	Specifies the group address for which a Block Ack agreement is requested. If the element is present, a GCR Group Address element is included in the transmitted ADDBA Request frame.

6.3.29.3 MLME-ADDBA.confirm

6.3.29.3.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.29.3.2 as follows:

The primitive parameters are as follows:

```
MLME-ADDBA.confirm(
                    PeerSTAAddress,
                    DialogToken,
                    TID,
                    ResultCode,
                    BlockAckPolicy,
                    BufferSize,
                    BlockAckTimeout,
                    GCRGroupAddress,
                    VendorSpecificInfo
                    )
```

Insert the following row before the VendorSpecificInfo row in the untitled table in 6.3.29.3.2 (note that the entire table is not shown here):

Name	Type	Valid range	Description
GCRGroupAddress	GCR Group Address element	As defined in 8.4.2.128	Specifies the group address for which a Block Ack agreement was requested.

6.3.29.4 MLME-ADDBA.indication

6.3.29.4.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.29.4.2 as follows:

The primitive parameters are as follows:

```
MLME-ADDBA.indication(
                    PeerSTAAddress,
                    DialogToken,
                    TID,
```


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BlockAckPolicy,
BufferSize,
BlockAckTimeout,
GCRGroupAddress,
VendorSpecificInfo
)

Insert the following row before the VendorSpecificInfo row in the untitled table in 6.3.29.4.2 (note that the entire table is not shown here):

Name	Type	Valid range	Description
GCRGroupAddress	GCR Group Address element	As defined in 8.4.2.128	Specifies the group address for which a Block Ack agreement is requested. This element is present if a GCR Group Address element was included in the transmitted ADDBA Request frame.

6.3.29.5 MLME-ADDBA.response

6.3.29.5.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.29.5.2 as follows:

The primitive parameters are as follows:
MLME-ADDBA.response(
PeerSTAAddress,
DialogToken,
TID,
ResultCode,
BlockAckPolicy,
BufferSize,
BlockAckTimeout,
GCRGroupAddress,
VendorSpecificInfo
)

Insert the following row before the VendorSpecificInfo row in the untitled table in 6.3.29.5.2 (note that the entire table is not shown here):

Name	Type	Valid range	Description
GCRGroupAddress	GCR Group Address element	As defined in 8.4.2.128	Specifies the group address for which a Block Ack agreement was requested.

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Change the title of 6.3.67 as follows:

6.3.67 DMS or GCR request and response procedure

6.3.67.1 General

Change the first paragraph of 6.3.67.1 as follows:

The following MLME primitives support the signaling of DMS or GCR request and response procedure. The informative diagram shown in Figure 6-25 depicts the DMS or GCR request and response process and is not meant to be exhaustive of all possible protocol uses.

Change Figure 6-25 as follows:

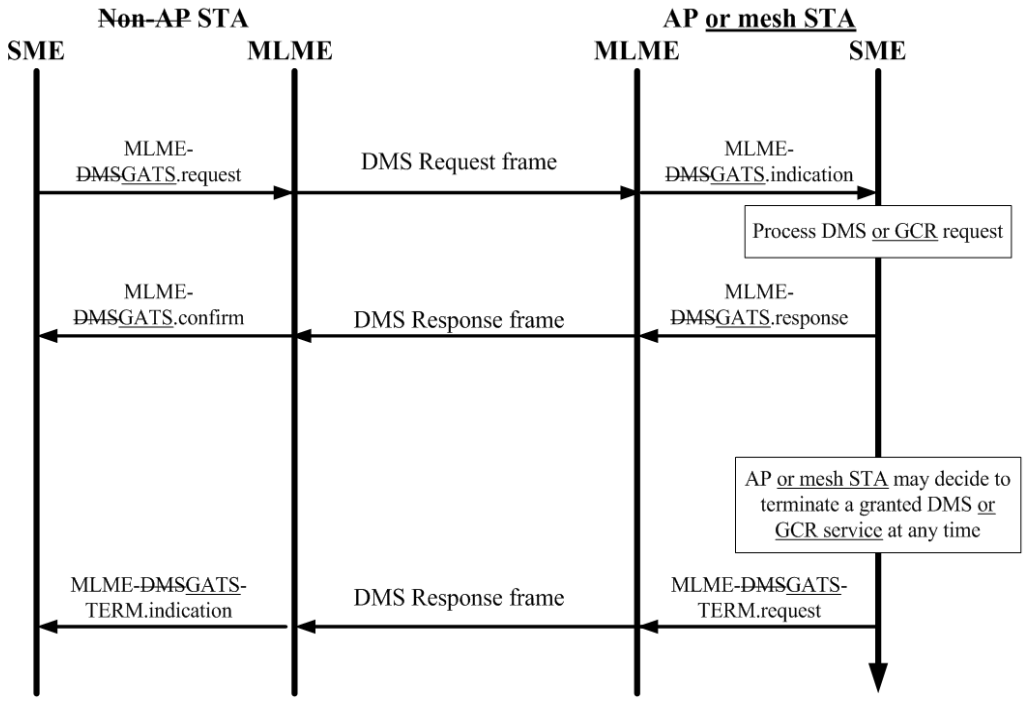

Figure 6-25—DMS or GCR setup protocol exchange

Change the title of 6.3.67.2 as follows:

6.3.67.2 MLME-~~DMS~~GATS.request

6.3.67.2.2 Semantics of the service primitive

Change 6.3.67.2.2 as follows:

The primitive parameters are as follows:

```
MLME-~~DMS~~GATS.request(
                    PeerSTAAddress,
                    Dialog Token,
                    DMSRequest
                    )
```


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Name	Type	Valid range	Description
PeerSTAAddress	MAC Address	Any valid individual MAC address	Specifies the address of the peer MAC entity with which to perform the DMS or GCR process.
Dialog Token	Integer	1–255	The Dialog Token to identify the DMS or GCR request and response transaction.
DMSRequest	DMS Request element	As defined in 8.4.2.90	Specifies group addressed frames and parameters for the requested DMS or GCR stream.

Change the title of 6.3.67.3 as follows:

6.3.67.3 MLME-~~DMS~~GATS.confirm

6.3.67.3.1 Function

Change 6.3.67.3.1 as follows:

This primitive reports the result of a DMS or GCR procedure.

6.3.67.3.2 Semantics of the service primitive

Change 6.3.67.3.2 as follows:

The primitive parameters are as follows:

MLME-~~DMS~~GATS.confirm(
PeerSTAAddress,
Dialog Token,
DMSResponse
)

Name	Type	Valid range	Description
PeerSTAAddress	MAC Address	Any valid individual MAC address	Specifies the address of the peer MAC entity with which to perform the DMS or GCR process.
Dialog Token	Integer	1–255	The Dialog Token to identify the DMS or GCR request and response transaction.
DMSResponse	DMS Response element	As defined in 8.4.2.91	Specifies the status returned by the AP responding to the STA's requested DMS or GCR stream.

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6.3.67.3.3 When generated

Change 6.3.67.3.3 as follows:

This primitive is generated by the MLME as a result of an MLME-~~DMS~~GATS.request and indicates the results of the request.

This primitive is generated when the MLME-~~DMS~~GATS.request contains invalid parameters, when a timeout or failure occurs, or when the STA receives a DMS Response frame from the AP.

Change the title of 6.3.67.4 as follows:

6.3.67.4 MLME-~~DMS~~GATS.indication

6.3.67.4.2 Semantics of the service primitive

Change 6.3.67.4.2 as follows:

The primitive parameters are as follows:

```
MLME-~~DMS~~GATS.indication(
                    PeerSTAAddress,
                    DialogToken,
                    DMSRequest
                    )
```

Name	Type	Valid range	Description
PeerSTAAddress	MACAddress	Any valid individual MAC address	The address of the non-AP STA MAC entity from which a DMS Request frame was received.
DialogToken	Integer	1–255	The Dialog Token to identify the DMS or GCR request and response transaction.
DMSRequest	DMS Request element	As defined in 8.4.2.90	Specifies group addressed frames for the requested DMS or GCR stream.

Change the title of 6.3.67.5 as follows:

6.3.67.5 MLME-~~DMS~~GATS.response

6.3.67.5.1 Function

Change 6.3.67.5.1 as follows:

This primitive is generated in response to an MLME-~~DMS~~GATS.indication requesting a DMS Response frame be sent to a non-AP STA.

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6.3.67.5.2 Semantics of the service primitive

Change 6.3.67.5.2 as follows:

The primitive parameters are as follows:

MLME-~~DMS~~GATS.response(
PeerSTAAddress,
DialogToken,
DMSResponse
)

Name	Type	Valid range	Description
PeerSTAAddress	MACAddress	Any valid individual MAC address	The address of the non-AP STA MAC entity from which a DMS Request frame was received.
DialogToken	Integer	1–255	The Dialog Token to identify the DMS or GCR request and response transaction.
DMSResponse	DMS Response element	As defined in 8.4.2.91	Specifies the status returned by the AP responding to the STA's requested DMS or GCR stream.

6.3.67.5.3 When generated

Change 6.3.67.5.3 as follows:

This primitive is generated by the SME in response to an MLME-~~DMS~~GATS.indication requesting a DMS Response be sent to a non-AP STA.

Change the title of 6.3.67.6 as follows:

6.3.67.6 MLME-~~DMS~~GATS-TERM.request

6.3.67.6.1 Function

Change 6.3.67.6.1 as follows:

This primitive requests the transmission of a DMS Response frame to ~~non-AP~~ STAs to terminate a granted DMS or GCR service.

6.3.67.6.2 Semantics of the service primitive

Change 6.3.67.6.2 as follows:

The primitive parameters are as follows:

MLME-~~DMS~~GATS-TERM.request(
PeerSTAAddress,
DialogToken,
DMSResponse
)

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Name	Type	Valid range	Description
PeerSTAAddress	MACAddress	Any valid individual MAC address	The address of the non-AP STA MAC entity from which a DMS Request frame was received.
DialogToken	Integer	0	Set to 0 for an autonomous DMS Response frame.
DMSResponse	DMS Response element	As defined in 8.4.2.91	Specifies the requested DMS or GCR stream that is cancelled by the AP.

6.3.67.6.3 When generated

Change 6.3.67.6.3 as follows:

This primitive is generated by the SME to terminate DMS or GCR service.

Change the title of 6.3.67.7 as follows:

6.3.67.7 MLME-~~DMS~~GATS-TERM.indication

6.3.67.7.2 Semantics of the service primitive

Change 6.3.67.7.2 as follows:

The primitive parameters are as follows:

MLME-~~DMS~~GATS-TERM.indication(
PeerSTAAddress,
DialogToken,
DMSResponse
)

Name	Type	Valid range	Description
PeerSTAAddress	MAC Address	Any valid individual MAC address	Specifies the address of the peer MAC entity with which to perform the DMS or GCR process.
DialogToken	Integer	0	Set to 0 for an autonomous DMS Response frame.
DMSResponse	DMS Response element	As defined in 8.4.2.91	Specifies the requested DMS or GCR stream that is cancelled by the AP.

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6.3.72 QoS Map Set element management

6.3.72.2 MLME-QoSMap.request

6.3.72.2.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.72.2.2 as follows:

MLME-QoSMap.request (
Non-APSTAAddress,
QoSMapSet,
IntraAccessCategoryPriority
)

Insert the following row after the QoSMapSet row of the untitled table in 6.3.72.2.2 (note that entire table is not shown here):

Name	Type	Valid range	Description
IntraAccessCategoryPriority	Intra-Access Category Priority element	As defined in 8.4.2.123	Specifies the intra-AC priorities the STA should use. The parameter is present only if dot11SCSActivated is true.

6.3.72.3 MLME-QoSMap.indication

6.3.72.3.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.72.3.2 as follows:

MLME-QoSMap.indication (
QoSMapSet,
IntraAccessCategoryPriority
)

Insert the following row after the QoSMapSet row of the untitled table in 6.3.72.3.2 (note that the entire table is not shown here):

Name	Type	Valid range	Description
IntraAccessCategoryPriority	Intra-Access Category Priority element	As defined in 8.4.2.123	Specifies the intra-AC priorities the STA should use.

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Insert the following subclauses, 6.3.84 to 6.3.88.3.4 (including Figure 6-25a), after 6.3.83.8.4:

6.3.84 SCS request and response procedure

6.3.84.1 General

The following MLME primitives support the signaling of the SCS request and response procedure. The informative diagram shown in Figure 6-25a depicts the SCS request and response process and is not meant to be exhaustive of all possible protocol uses.

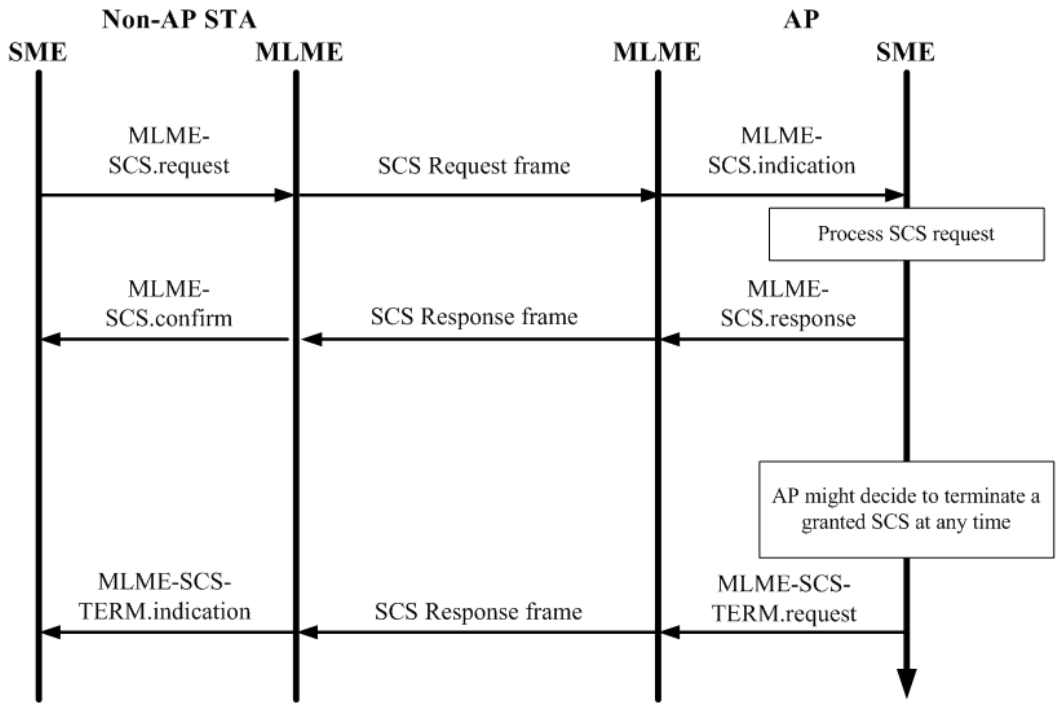

Figure 6-25a—Example SCS setup and termination protocol exchange

6.3.84.2 MLME-SCS.request

6.3.84.2.1 Function

This primitive requests transmission of an SCS Request frame to an AP.

6.3.84.2.2 Semantics of the service primitive

The primitive parameters are as follows:

```
MLME-SCS.request(
                    PeerSTAAddress,
                    DialogToken,
                    SCSRequest
                    )
```


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Name	Type	Valid range	Description
PeerSTAAddress	MAC Address	Any valid individual MAC address	Specifies the address of the peer MAC entity with which to perform the SCS process.
DialogToken	Integer	1–255	The dialog token to identify the SCS request and response transaction.
SCSRequest	SCS Descriptor element	SCS Descriptor element, as defined in 8.4.2.124	Specifies frame classifiers and priority for the requested SCS stream.

6.3.84.2.3 When generated

This primitive is generated by the SME to request that a SCS Request frame be sent to the AP with which the STA is associated.

6.3.84.2.4 Effect of receipt

On receipt of this primitive, the MLME constructs a SCS Request action management frame. The STA then attempts to transmit this frame to the AP with which the STA is associated.

6.3.84.3 MLME-SCS.confirm

6.3.84.3.1 Function

This primitive reports the result of a SCS procedure.

6.3.84.3.2 Semantics of the service primitive

The primitive parameters are as follows:

```
MLME-SCS.confirm(
                    ResultCode,
                    PeerSTAAddress,
                    DialogToken,
                    SCSResponse
                    )
```

Name	Type	Valid range	Description
ResultCode	Enumeration	SUCCESS, DECLINED, TCLAS_PROCESSING_ NOT_ SUPPORTED, INSUFFICIENT_TCLAS_ PROCESSING, TIMEOUT	Reports the outcome of a request to send a SCS Request frame.
PeerSTAAddress	MAC Address	Any valid individual MAC address	Specifies the address of the peer MAC entity with which to perform the SCS process.

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Name	Type	Valid range	Description
DialogToken	Integer	1–255	The dialog token to identify the SCS request and response transaction.
SCSResponse	SCS Status duple	SCS Status duple, as defined in 8.5.19.3	Specifies the status returned by the AP responding to the STA's requested SCSID.

6.3.84.3.3 When generated

This primitive is generated by the MLME as a result of an MLME-SCS.request primitive and indicates the results of the request.

This primitive is generated when the MLME-SCS.request primitive contains invalid parameters, when a timeout or failure occurs, or when the STA receives a SCS Response frame from the AP.

6.3.84.3.4 Effect of receipt

On receipt of this primitive, the SME should operate according to the procedure in 10.26.2.

6.3.84.4 MLME-SCS.indication

6.3.84.4.1 Function

This primitive indicates that an SCS Request frame was received from a non-AP STA.

6.3.84.4.2 Semantics of the service primitive

The primitive parameters are as follows:

```
MLME-SCS.indication(
                    PeerSTAAddress,
                    DialogToken,
                    SCSRequest
                    )
```

Name	Type	Valid range	Description
PeerSTAAddress	MACAddress	Any valid individual MAC address	The address of the non-AP STA MAC entity from which an SCS Request frame was received.
DialogToken	Integer	1–255	The dialog token to identify the SCS request and response transaction.
SCSRequest	SCS Descriptor element	SCS Descriptor element, as defined in 8.4.2.124	Specifies frame classifiers and priority for the requested SCS stream.

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6.3.84.4.3 When generated

This primitive is generated by the MLME when a valid SCS Request frame is received.

6.3.84.4.4 Effect of receipt

On receipt of this primitive, the SME should operate according to the procedure in 10.26.2.

6.3.84.5 MLME-SCS.response

6.3.84.5.1 Function

This primitive is generated in response to an MLME-SCS.indication primitive requesting an SCS Response frame be sent to a non-AP STA.

6.3.84.5.2 Semantics of the service primitive

The primitive parameters are as follows:

```
MLME-SCS.response(
                    PeerSTAAddress,
                    DialogToken,
                    SCSResponse
                    )
```

Name	Type	Valid range	Description
PeerSTAAddress	MACAddress	Any valid individual MAC address	The address of the non-AP STA MAC entity from which a SCS Request frame was received.
DialogToken	Integer	1–255	The dialog token to identify the SCS request and response transaction.
SCSResponse	SCS Status duple	SCS Status duple, as defined in 8.5.19.3	Specifies the status returned by the AP responding to the STA's requested SCSID.

6.3.84.5.3 When generated

This primitive is generated by the SME in response to an MLME-SCS.indication primitive requesting an SCS Response frame be sent to a non-AP STA.

6.3.84.5.4 Effect of receipt

On receipt of this primitive, the MLME constructs a SCS Response frame. The STA then attempts to transmit this frame to the non-AP STA indicated by the PeerSTAAddress parameter.

6.3.84.6 MLME-SCS-TERM.request

6.3.84.6.1 Function

This primitive requests the transmission of a SCS Response frame to a non-AP STA to terminate an established SCS stream.

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6.3.84.6.2 Semantics of the service primitive

The primitive parameters are as follows:

```
MLME-SCS-TERM.request(
                        PeerSTAAddress,
                        DialogToken,
                        SCSResponse
                        )
```

Name	Type	Valid range	Description
PeerSTAAddress	MACAddress	Any valid individual MAC address	The address of the non-AP STA MAC entity to which the SCS Response frame is to be sent.
DialogToken	Integer	0	Set to 0 for an autonomous SCS Response frame.
SCSResponse	SCS Status duple	SCS Status duple, as defined in 8.5.19.3	Specifies the requested SCSID that is cancelled by the AP.

6.3.84.6.3 When generated

This primitive is generated by the SME to terminate an SCS stream.

6.3.84.6.4 Effect of receipt

On receipt of this primitive, the MLME constructs an SCS Response frame. The STA then attempts to transmit this frame to the non-AP STA indicated by the PeerSTAAddress parameter.

6.3.84.7 MLME-SCS-TERM.indication

6.3.84.7.1 Function

This primitive is generated by the MLME when a valid unsolicited SCS Response frame is received.

6.3.84.7.2 Semantics of the service primitive

The primitive parameters are as follows:

```
MLME-SCS-TERM.indication(
                        ResultCode,
                        DialogToken,
                        SCSResponse
                        )
```


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Name	Type	Valid range	Description
ResultCode	Enumeration	SUCCESS, FAILURE	Indicates the result of the MLME-SCS-TERM.request primitive.
DialogToken	Integer	0	Set to 0 for an autonomous SCS Response frame.
SCSResponse	SCS Status duple	SCS Status duple, as defined in 8.5.19.3	Specifies the requested SCSID that is cancelled by the AP.

6.3.84.7.3 When generated

This primitive is generated when the STA receives an unsolicited SCS Response frame from the AP.

6.3.84.7.4 Effect of receipt

On receipt of this primitive, the SME should operate according to the procedure in 10.26.2.

6.3.85 QLoad report management

6.3.85.1 General

The QLoad report management primitives support the process of QLoad reporting between APs as described in 10.27.2.

6.3.85.2 MLME-QLOAD.request

6.3.85.2.1 Function

This primitive is used by an AP to transmit a QLoad Request frame to a specified AP.

6.3.85.2.2 Semantics of the service primitive

The primitive parameters are as follows:

```
MLME-QLOAD.request(
                    PeerMACAddress,
                    DialogToken,
                    Protected
                    )
```

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Name	Type	Valid range	Description
PeerMACAddress	MACAddress	Any valid individual MAC address	The address of the peer MAC entity to which the QLoad Request frame is sent.
DialogToken	Integer	1–255	Specifies a number unique to the MLME-QLOAD.request primitive.
Protected	Boolean	true, false	If true, the request is sent using the Protected QLoad Request frame. If false, the request is sent using the QLoad Request frame.

6.3.85.2.3 When generated

This primitive is generated by the SME at an AP to request the transmission of a QLoad Request frame to the AP indicated by the PeerMACAddress parameter.

6.3.85.2.4 Effect of receipt

On receipt of this primitive, the MLME constructs a QLoad Request action management frame if the Protected parameter is false or a Protected QLoad Request frame if the Protected parameter is true. The AP then attempts to transmit this frame to the AP indicated by the PeerMACAddress parameter.

6.3.85.3 MLME-QLOAD.confirm

6.3.85.3.1 Function

This primitive reports the result of a request to send a QLoad Request frame.

6.3.85.3.2 Semantics of the service primitive

The primitive parameters are as follows:

```
MLME-QLOAD.confirm(
                    ResultCode,
                    PeerMACAddress,
                    DialogToken,
                    Protected,
                    QLoadReport
                    )
```

Name	Type	Valid range	Description
ResultCode	Enumeration	SUCCESS, UNSPECIFIED_FAILURE	Reports the outcome of a QLoad request.
PeerMACAddress	MACAddress	Any valid individual MAC address	The address of the peer MAC entity to which the QLoad Request frame was sent.

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Name	Type	Valid range	Description
DialogToken	Integer	0–255	Specifies a number unique to the QLoad Report request and response transaction or 0 when an unsolicited report was sent.
Protected	Boolean	true, false	If true, the response was sent using the Protected QLoad Report frame. If false, the response was sent using the QLoad Report frame.
QLoadReport	Set of reports, each as defined in the QLoad Report element	Set of reports, each as defined in the QLoad Report element	Set of reports, each as defined in the QLoad Report element.

6.3.85.3.3 When generated

This primitive is generated by the MLME as a result of an MLME-QLOAD.request primitive indicating the results of that request. This primitive is generated when an MLME-QLOAD.request primitive contains invalid parameters or when the STA receives a response in the form of a QLoad Report frame in the corresponding Robust AV Streaming Action frame.

6.3.85.3.4 Effect of receipt

The SME is notified of the results of the QLoad request procedure.

The SME should operate according to the procedures defined in 10.27.2.

6.3.85.4 MLME-QLOAD.indication

6.3.85.4.1 Function

This primitive indicates that a QLoad Request frame has been received.

6.3.85.4.2 Semantics of the service primitive

The primitive parameters are as follows:

```
MLME-QLOAD.indication(
                        PeerMACAddress,
                        DialogToken,
                        Protected
                        )
```

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Name	Type	Valid range	Description
PeerMACAddress	MACAddress	Any valid individual MAC address	The address of the peer MAC entity from which the QLoad Request frame was received.
DialogToken	Integer	1–255	Specifies a number unique to the MLME-QLOAD.request primitive.
Protected	Boolean	true, false	If true, the request was sent using the Protected QLoad Request frame. If false, the request was sent using the QLoad Request frame.

6.3.85.4.3 When generated

This primitive is generated by the MLME when a valid (Protected) QLoad Request frame is received.

6.3.85.4.4 Effect of receipt

On receipt of this primitive, the SME either rejects the request or commences the transaction as described in 10.27.2.

6.3.85.5 MLME-QLOAD.response

6.3.85.5.1 Function

This primitive is used by an AP to transmit a QLoad Report frame to a specified AP in response to a QLoad Request frame.

6.3.85.5.2 Semantics of the service primitive

The primitive parameters are as follows:

```
MLME-QLOAD.response(
                    PeerMACAddress,
                    DialogToken,
                    Protected,
                    QLoadReport
                    )
```

Name	Type	Valid range	Description
PeerMACAddress	MACAddress	Any valid individual MAC address	The address of the peer MAC entity to which the QLoad Report frame is sent.
DialogToken	Integer	0–255	The dialog token of the matching MLME-QLOAD.indication primitive or 0 when sending an unsolicited report.

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