IEEE P802.11  
Wireless LANs

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| --- | --- | --- | --- | --- |
| Proposed Resolutions for Comments on Replay Counter Signaling for Protected Sensing Frames | | | | |
| Date: 2024-08-01 | | | | |
| Author(s): | | | | |
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Abstract

This submission presents a proposed resolution for the following P802.11bf CIDs:

6016

6017

6186

regarding the signaling of the replay counter to be used for Protected Sensing frames.

The proposed changes are based on Draft P802.11bf\_D4.0.pdf and Draft P802.11REVme\_D7.0.pdf.

Revision history:

R0 – Initial version

R1 – Update AAD construction to include FTM/MARC bit; sync to REVme\_D7.0

## P802.11bf CIDs 6017, 6018 and 6186:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Page** | **Line** | **Comment** | **Proposed Change** | **Resolution** |
| 6016 | 12.5.4.4.4 | 205 | 21 | Since there is no indication in the GCMP header that a frame is a sensing frame vs. another type of action frame, the receiver cannot determine the correct replay counter before decryption and hence cannot perform replay detection before decryption. | Provide a mechanism in the GCMP header to identify the correct replay counter, in a manner that is extensible/usable by other future procedures. | ***Revised***  Add signalling in the CCMP and GCMP headers as described in this document. |
| 6017 | 12.5.2.4.4 | 204 | 46 | Since there is no indication in the CCMP header that a frame is a sensing frame vs. another type of action frame, the receiver cannot determine the correct replay counter before decryption and hence cannot perform replay detection before decryption (as explicitly allowed in the baseline 12.5.2.4.4, step (I)). | Provide a mechanism in the CCMP header to identify the correct replay counter, in a manner that is extensible/usable by other future procedures. | ***Revised***  Add signalling in the CCMP and GCMP headers as described in this document. |
| 6186 | 12.5.2.4.4 | 204 | 46 | The cited text indicates that the receiver needs to maintain a separate replay counter for sensing frames. Currently in the standard prior to P802.11bf, any type of frame that uses a separate reply counter is signalled in either the header or the CCMP header. Same issue for GCMP on p205.21 | Add signaling in either the 802.11 header or the CCMP/GCMP header to signal a protected sensing frame. | ***Revised***  Add signalling in the CCMP and GCMP headers as described in this document. |

## Discussion:

For Protected Sensing frames, 11bf requires the use of a special replay counter that is distinct from the QMF replay counters. Unlike FTM, 11bf does not add a bit in the CCMP or GCMP headers (or elswhere) to indicate that the frame is a Sensing frame vs. some other Action frame. This creates some issues and highlights underlying issues in the base standard:

No early discard of replayed protected Action frames:

Since there is no signaling of which replay counter to use, selection of the correct replay counter (the sensing-specific one vs. the regular QMF replay counter for the ACI of the frame) cannot be done until after the frame has been decrypted. However, the standard explicitly allows discard before decrypt (e.g. P802.11REVme\_D7.0 12.5.2.4.4). Discard before decrypt allows receiving STAs to save power by not decrypting frames that will be immediately discarded post-decrypt.

Liminted number of replay counters for QMFs:

For QMFs, one replay counter per ACI is specified, so only 4 replay counters are available. For QoS Data frames, there are up to 16 replay counters, one per TID.

Scalability:

One bit of the few remaining in the CCMP Header and GCMP Header were already consumed for FTM. Adding another bit for Protected Sensing frames would chip away at the remaining reserved bits, and is not scalable to future services that need similar functionality. A multipurpose approach should be used that can be used by multiple services without individually allocating bits in the CCMP Header and GCMP Header for each service.

This proposal defines a multipurpose alternate replay counter (MARC) solution which adds four alternative counters which can be used in addition to the existing four ACI replay counter for robust IQMFs.

The RSNXE includes signaling of MARC capability. When a PTK is derived, MARC is enabled for robust IQMFs protected with that PTK if both devices support MARC.

When MARC is not enabled for a PTK, the legacy behavior is used for robust IQMFs including FTM. When MARC is enabled for a PTK, the CCMP/GCMP headers are modified to include a MARC flag and replay counter index. When MARC is enabled for a PTK, the MARC Index is included in the AAD for both CCMP and GCMP.

Receiver processing of IQMFs can be summarised as:

if MARC not enabled (legacy behavior):

use legacy AAD construction

if FTM signalled in header

use FTM replay counter

else

use replay counter selected by ACI

else (MARC enabled):

use MARC AAD construction

if MARC signaled in header

use replay counter selected by MARC Index

else

use replay counter selected by ACI

## Proposed Resolution for CIDs 6016, 6017, and 6186:

REVISED. Request the TGme editor to apply the changes below:

### 3.4 Acronyms and abbreviations

Add the following acronym:

MARC Multipurpose Alternate Replay Counters

### 9.4.2.240 RSNXE

Add the following entry to Table 9-373 and update the Reserved bits as needed:

**Table 9-373—Extended RSN Capabilities field**

|  |  |  |
| --- | --- | --- |
| <ANA> | MARC | A STA sets the MARC field to 1 if dot11MultipurposeAlternateReplayCountersActivated is true. Otherwise, it sets the field to 0. See 11.24.X. |

Insert a new subclause at the end of clause 11.24:

### 11.24.X Multipurpose Alternate Replay Counters (MARC)

A STA with dot11MultipurposeAlternateReplayCountersActivated set to true shall set the MARC field to 1 in any transmitted RSNXE.

When a pair of STAs establish a PTKSA, if the MARC field is set to 1 in the RXNSEs from both STAs, MARC shall be enabled for the resulting PTK.

### 11.55.1.2 Dependencies and timing related parameters

Insert the following text as the second paragraph in 11.55.1.2 (Dependencies and timing-related parameters):

A sensing STA shall support MARC. A sensing STA shall set shall set dot11MultipurposeAlternateReplayCountersActivated to true.

### 11.55.1.5.1 General

Insert the following text at the end of 11.55.1.5.1 (General):

A sensing STA shall use MARC for Protected Sensing frames. A sensing STA shall set the FTM/MARC bit in the CCMP header or GCMP header of transmitted Protected Sensing frames. A sensing STA shall use the same MARC Index for all transmitted Protected Sensing frames in a Sensing measurement exchange.

NOTE 6 – The sensing STA may select any MARC Index to use for the Protected Sensing frames that it transmits in a Sensing measurement exchange, subject to the reordering rules in 12.5.2.3.7 (CCM originator processing) and 12.5.4.3.6 (GCM originator processing). The sensing STA does not need to use the same MARC Index across multiple Sensing measurement exchanges.

NOTE 7 – For the Protected Sensing frames that it transmits, a sensing responder may use a different MARC Index than is being used by the sensing initiator.

### 12.5.2.2 CCMP MPDU format

Change the text and Figure 12-15 as shown:

Figure 12-15 (Expanded CCMP MPDU) depicts the MPDU when using CCMP.

**B0 B1 B2 B3 B4 B5 B6 B7**

**MAC Header**

**CCMP Header**

8 octets

**Data (PDU)**

≥ 1 octet

**FCS**

4 octets

**MIC**

variable

**PN0**

**PN1**

**Rsvd**

**Rsvd**

**FTM/MARC**

**Ext**

**IV**

**Key**

**ID**

**PN2**

**PN3**

**PN4**

**PN5**

Key ID octet

Encrypted

**MARC Index**

Figure 12-15—Expanded CCMP MPDU

For secure PV0 MPDUs, CCMP-128 processing expands the original MPDU size by 16 octets, 8 octets for the CCMP Header field and 8 octets for the MIC field. CCMP-256 processing expands the original MPDU size by 24 octets, 8 octets for the CCMP Header field, and 16 octets for the MIC field. The CCMP Header field is constructed from the PN, ExtIV, and Key ID subfields. PN is a 48-bit PN represented as an array of 6 octets. PN5 is the most significant octet of the PN, and PN0 is the least significant.

The third octet of the CCMP Header field is reserved.

The ExtIV subfield (bit 5) of the Key ID octet is always set to 1 for CCMP.

Bits 6–7 of the Key ID octet are for the Key ID subfield. ~~The remaining bits of the Key ID octet are reserved.~~

In a protected individually addressed Action frame when MARC is not enabled for the PTK, bit 4 of the Key ID octet equals 1 if the frame is a Protected Fine Timing frame—see Table 9-~~51~~81 (Category values). In a robust IQMF when MARC is enabled for the PTK, bit 4 of the Key ID octet equals 1 if an alternate replay counter is used for the frame and set to 0 otherwise. Bits 2 and 3 of the Key ID octet are the MARC Index and are set to the index of the alternate replay counter if one is used for the frame and set to 0 otherwise. In other protected individually addressed frames, and in all protected group addressed frames, bits 2 to 4 are reserved.

The remaining bits of the Key ID octet are reserved.

The CCMP header is not included in secure PV1 MPDUs, but constructed locally at the STA as defined in 12.5.2.3.6 (Construct CCMP header for transmitted PV1 MPDUs and 12.5.2.4.5 (Construct CCMP header for received PV1 MPDUs). For secure PV1 MPDUs, CCMP-128 processing expands the original MPDU size by 8 octets for the MIC field. CCMP-256 processing expands the original MPDU size by 16 octets for the MIC field. Figure 12-16 (Expanded PV1 CCMP MPDU) depicts the PV1 MPDU when using CCMP.

PV1 MAC Header

Data (PDU)

≥ 1 octet

MIC

FCS

Encrypted

Figure 12-16—Expanded PV1 CCMP MPDU

### 12.5.2.3.3 Construct AAD

Change the first paragraph as shown:

The AAD is constructed as follows:

1. For PV0 MPDUs, the format of the AAD is shown in Figure 12-18 (AAD construction for PV0 MPDUs). The length of the AAD for PV0 varies depending on the presence or absence of the QC/MARC and A4 fields and is shown in Table 12-3 (AAD length for PV0 MPDUs).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | FC | A1 | A2 | A3 | SC | A4 | QC/MARC |
| Octets: | 2 | 6 | 6 | 6 | 2 | 6 | 2 |
| Figure 12-18—AAD construction for PV0 MPDUs | | | | | | | |

|  |  |  |
| --- | --- | --- |
| Table 12-3—AAD length for PV0 MPDUs | | |
| QC/MARC field | A4 field | AAD length (octets) |
| Absent | Absent | 22 |
| Present | Absent | 24 |
| Absent | Present | 28 |
| Present | Present | 30 |

Change step (a)(7) as shown:

1. QC/MARC – For robust IQMFs when MARC is not enabled for the PTK, this field is not present. For robust IQMFs when MARC is enabled for the PTK, bit 0 is set to the value of the FTM/MARC bit of the Key ID octet in the CCMP Header or GCMP Header of the frame, bits 1 to 2 are set to the MARC Index value of the Key ID octet in the CCMP Header or GCMP Header of the frame, and the remaining bits shall be set to zero. Otherwise, MDPU QoS Control field contains the MSDU priority, if present. The QC TID is used in the construction of the AAD. When in a non-DMG BSS, if both the STA and its peer have their SPP A-MSDU Capable subfields (see 9.4.2.240 (RSNXE)) equal to 1, the A-MSDU Present field is also used in the construction of the AAD. When in a DMG BSS, the A-MSDU Present field and A-MSDU Type field are also used in the construction of the AAD. The remaining QC fields are not used and are masked out for the AAD calculation (for a non-DMG BSS, bits 4 to 6, bits 8 to 15, and bit 7 when either the STA or its peer has the SPP A-MSDU Capable field equal to 0; for a DMG BSS, bits 4 to 6 and bits 9 to 15). When in a DMG BSS, the A-MSDU Present bit 7 and A-MSDU Type bit 8 are used in the construction of the AAD, and the remaining QC fields are masked out for the AAD calculation (bits 4 to 6, bits 9 to 15).

### 12.5.2.3.7 CCM originator processing

Change the text starting at the 8th paragraph as shown:

The transmitter shall preserve the order of protected robust Management frames that are transmitted to the same ~~DA~~RA without the QMF service. When the QMF service is used when MARC is not enabled for the PTK, the transmitter shall not reorder robust IQMFs within an AC when the frames are transmitted to the same RA. When the QMF service is used when MARC is enabled for the PTK, the transmitter shall not reorder robust IQMFs that are transmitted to the same RA within a replay counter (either an AC-specific replay counter or an alternate replay counter), but may reorder frames across replay counters.

NOTE —The transmitter may use the alternate replay counters to support various features, such as Fine Timing Measurement. Alternate replay counters are not statically mapped to any specific features, and the transmitter may select any alternate replay counter for use as needed, as long as the re-ordering restrictions above are satisfied.

A CCMP protected individually addressed robust Management frame shall be protected using the same TK as a Data frame.

### 12.5.2.4.4 PN and replay detection

Replace the current changes in Draft P802.11bf\_D4.0.pdf with the following changes as shown:

To effect replay detection, the receiver extracts the PN from the CCMP header.

NOTE 1—The CCMP header is not present in secure PV1 MPDUs, but constructed locally at the STA as defined in 12.5.2.4.5 (Construct CCMP header for PV1 MPDUs).

See 12.5.2.2 (CCMP MPDU format) for a description of how the PN is encoded in the CCMP header. The following processing rules are used to detect replay:

1. The receiver shall maintain a separate set of replay counters for each PTKSA, TPKSA, GTKSA, mesh PTKSA, and mesh GTKSA. The receiver initializes these replay counters to 0 when it resets the TK, TPK-TK or MTK for a peer, and to the value indicated by the peer when it sets the GTK or MGTK. The replay counter is set to the PN value of accepted CCMP MPDUs.
2. For each PTKSA, TPKSA, GTKSA, mesh PTKSA, and mesh GTKSA, the receiver shall maintain a separate replay counter for each TID, subject to the limitation of the number of supported replay counters indicated in the RSN Capabilities field (see 9.4.2.23 (RSNE)). In the case of a TPKSA, this shall for both the TDLS initiator STA and the TDLS responder STA be the number indicated by the TDLS initiator STA in the PTKSA Replay Counter field in the TDLS Setup Request frame.

NOTE 2—The number indicated by the TDLS responder STA (if a TDLS Discovery Response frame is sent) is ignored, as are the GTKSA Replay Counter and Extended Key ID For Individually Addressed Frames fields in the TDLS Setup Request frame and any TDLS Discovery Response frame.

NOTE 3—For the purpose of replay detection, non-QoS Data frames are treated as having TID 0, and use the replay counter corresponding to MSDU priority 0.

1. For each PTKSA, i~~I~~f management frame protection ~~is~~has been negotiated, the receiver ~~shall set the MFPC bit on a given link to 1, it~~ shall maintain a single replay counter for received individually addressed robust PV0 Management frames ~~except Protected Fine Timing frames (see 9.6.34 (Protected Fine Timing frame details))~~ that are received with the To DS subfield equal to 0 except Protected Fine Timing frames (see 9.6.34 (Protected Fine Timing frame details)), and (S1G STA only) a single replay counter for received individually addressed robust PV1 Management frames except Protected Fine Timing frames (see 9.6.34 (Protected Fine Timing frame details)).
2. ~~If dot11RSNAProtectedManagementFramesActivated is true~~For each PTKSA, if management frame protection has been negotiated and dot11QMFActivated is also true, the receiver shall maintain an additional replay counter for each ACI for received individually addressed robust PV0 Management frames ~~except Protected Fine Timing frames (see 9.6.34 (Protected Fine Timing frame details))~~ that are received with the To DS subfield equal to 1 except Protected Fine Timing frames (see 9.6.34 (Protected Fine Timing frame details)).

NOTE 4—Separate replay counters for PV0 and PV1 Management frames allow for reordering between the two types. However, S1G STAs are required to use PV1 Management frames for individually addressed Action (and Action No Ack) frames when the peer is known to support them (see 10.57 (Generation of PV1 MPDUs and header compression procedure)), so there is no issue with PV0 Action (and Action No Ack) frames. The other robust Management frames are Deauthentication and Disassociation frames, but reordering of a PV1 Action frame and a Deauthentication/Disassociation frame is not of much concern since the Action frame is not valid after deauthentication/disassociation.

NOTE 5—QMF is not supported for PV1 Management frames (see 11.24.1.1 (Overview)).

1. ~~If dot11RSNAProtectedManagementFramesActivated is true~~For each PTKSA, if management frame protection has been negotiated, MARC has not been enabled, and at least one of dot11FineTimingMsmtRespActivated or dot11FineTimingMsmtInitActivated are true, the ~~recipient~~receiver shall maintain a separate replay counter for received~~ing~~ individually addressed Protected Fine Timing frames (see 9.6.34 (Protected Fine Timing frame details)) ~~and shall use the PN from the received frame to detect replays~~.
2. For each PTKSA, if management frame protection has been negotiated and MARC has been enabled, the receiver shall maintain an alternate replay counter for each MARC Index for received robust IQMFs that have the FTM/MARC bit set to 1 in the CCMP Header.
3. The receiver shall discard any Data frame that is received with its PN less than or equal to the value of the replay counter that is associated with the TA, RA (individual or group address; not if TDLS) and priority value of the received MPDU. The receiver shall discard fragmented MSDUs, A-MSDUs and MMPDUs whose constituent MPDU PN values are not incrementing in steps of 1. If management frame protection is negotiated, the receiver ~~shall set the MFPC bit on a given link to 1, it~~ shall discard any individually addressed robust Management frame that is received with its PN less than or equal to the value of the replay counter associated with the TA, (QMF receiver of an individually addressed robust PV0 Management frame with the To DS subfield equal to 1 only) ACI, (QMF receiver of a robust IQMF with FTM/MARC bit set to 1 in the CCMP Header only) MARC Index, and (S1G STA only) Protocol Version subfield of that individually addressed Management frame. The receiver should discard received protected Management frames if the associated replay counter does not exist.
4. When discarding a frame, the receiver shall increment by 1 dot11RSNAStatsCCMPReplays for Data frames or dot11RSNAStatsRobustMgmtCCMPReplays for robust Management frames.
5. For MSDUs or A-MSDUs sent using the block ack feature, reordering of received MSDUs or A-MSDUs according to the block ack receiver operation is performed prior to replay detection
6. If the receiver performs replay detection prior to decryption, then the receiver shall ~~check that the replay counter used to detect replays is correct and discard the frame if incorrect~~discard the frame if the PN of the received frame is less than or equal to the corresponding replay counter specified in rule (g). ~~In particular, the separate replay counter for individually addressed Protected Fine Timing frames shall be used if the FTM subfield of CCMP Header (Figure 12-15 (Expanded CCMP MPDU)) signals that the management PDU is a Protected Fine Timing frame; it shall not be used otherwise.~~The replay counter shall not be updated unless the decryption is successful and the frame is accepted.

### 12.5.4.2 GCMP MPDU format

Change the text and Figure 12-28 as shown:

Figure 12-28 (Expanded GCMP MPDU) shows the MPDU format when using GCMP.

**B0 B1 B2 B3 B4 B5 B6 B7**

**MAC Header**

**GCMP Header**

8 octets

**Data (PDU)**

≥ 1 octet

**FCS**

4 octets

**MIC**

variable

**PN0**

**PN1**

**Rsvd**

**Rsvd**

**FTM/MARC**

**Ext**

**IV**

**Key**

**ID**

**PN2**

**PN3**

**PN4**

**PN5**

Key ID octet

Encrypted

**MARC Index**

Figure 12-28—Expanded GCMP MPDU

GCMP processing expands the original MPDU size by 24 octets, 8 octets for the GCMP Header field and 16 octets for the MIC field. The GCMP Header field is constructed from the PN and Key ID subfields. The 48-bit PN is represented as an array of 6 octets. PN5 is the most significant octet of the PN, and PN0 is the least significant.

The ExtIV subfield (bit 5) of the Key ID octet is always set to 1 for GCMP.

The third octet of the GCMP Header field is reserved.

Bits 6–7 of the Key ID octet are for the Key ID subfield.

In a protected individually addressed ~~management~~ Action frame when MARC is not enabled for the PTK, bit 4 of the Key ID octet is set to 1 if the frame is a Protected Fine Timing frame—see Table 9-81 (Category values). In a robust IQMF when MARC is enabled for the PTK, bit 4 of the Key ID octet equals 1 if an alternate replay counter is used for the frame and set to 0 otherwise. Bits 2 and 3 of the Key ID octet are the MARC Index and are set to the index of the alternate replay counter if one is used for the frame and set to 0 otherwise. In other protected individually addressed frames, and in all protected group addressed frames, bits 2 to 4 are reserved.

The remaining bits of the Key ID octet are reserved.

### 12.5.4.3.6 GCM originator processing

Change the text starting at the 9th paragraph as shown:

When the QMF service is not used, the transmitter shall preserve the order of protected individually addressed robust Management frames that are transmitted to the same RA. When the QMF service is used when MARC is not enabled for the PTK, the transmitter shall preserve the order of protected robust IQMFs within an AC that are transmitted to the same RA. When the QMF service is used when MARC is enabled for the PTK, the transmitter shall not reorder robust IQMFs that are transmitted to the same RA within a replay counter (either an AC-specific replay counter or an alternate replay counter), but may reorder frames across replay counters.

NOTE —The transmitter may use the alternate replay counters to support various features, such as Fine Timing Measurement. Alternate replay counters are not statically mapped to any specific features, and the transmitter may select any alternate replay counter for use as needed, as long as the re-ordering restrictions above are satisfied.

A GCMP protected individually addressed robust Management frame shall be protected using the same TK as a Data frame.

### 12.5.4.4.4 PN and replay detection

Replace the current changes in Draft P802.11bf\_D4.0.pdf with following changes as shown:

To effect replay detection, the receiver extracts the PN from the GCMP header. See 12.5.4.2 (GCMP MPDU format) for a description of how the PN is encoded in the GCMP header. The following processing rules are used to detect replay:

1. The receiver shall maintain a separate set of replay counters for each PTKSA, TPKSA, GTKSA, mesh PTKSA, and mesh GTKSA. The receiver initializes these replay counters to 0 when it resets the temporal key for a peer. The replay counter is set to the PN value of accepted GCMP MPDUs.
2. For each PTKSA, TPKSA, GTKSA, mesh PTKSA, and mesh GTKSA, the receiver shall maintain a separate replay counter for each TID, subject to the limitation of the number of supported replay counters indicated in the RSN Capabilities field (see 9.4.2.23 (RSNE)). In the case of a TPKSA, this shall for both the TDLS initiator STA and the TDLS responder STA be the number indicated by the TDLS initiator STA in the PTKSA Replay Counter field in the TDLS Setup Request frame.

NOTE 1—The number indicated by the TDLS responder STA (if a TDLS Discovery Response frame is sent) is ignored, as are the GTKSA Replay Counter and Extended Key ID For Individually Addressed

Frames fields in the TDLS Setup Request frame and any TDLS Discovery Response frame.

NOTE 2—For the purpose of replay detection, non-QoS Data frames are treated as having TID 0, and use the replay counter corresponding to MSDU priority 0.

1. For each PTKSA, i~~I~~f management frame protection ~~is~~has been negotiated, the receiver ~~shall set the MFPC bit on a given link to 1, it~~ shall maintain a single replay counter for received individually addressed robust PV0 Management frames ~~except Protected Fine Timing frames (see 9.6.34 (Protected Fine Timing frame details))~~ that are received with the To DS subfield equal to 0 except Protected Fine Timing frames (see 9.6.34 (Protected Fine Timing frame details)), ~~and a single replay counter for received individually addressed robust PV1 Management frames except PV1 Protected Fine Timing frames (see 9.6.34 (Protected Fine Timing frame details))~~.
2. I~~f dot11RSNAProtectedManagementFramesActivated is true~~For each PTKSA, if management frame protection has been negotiated and dot11QMFActivated is also true, the receiver shall maintain an additional replay counter for each ACI for received individually addressed robust PV0 Management frames that are received with the To DS subfield equal to 1 except Protected Fine Timing frames (see 9.6.34 (Protected Fine Timing frame details)) ~~and robust PV1 Management frames except Protected Fine Timing frames (see 9.6.34 (Protected Fine Timing frame details)) that are received with the To DS subfield equal to 1~~.

NOTE 3—PV1 frames are not supported with GCMP (see 12.5.4.1 (GCMP overview)).

1. ~~If dot11RSNAProtectedManagementFramesActivated is true~~For each PTKSA, if management frame protection has been negotiated, MARC has not been enabled, and at least one of dot11FineTimingMsmtRespActivated or dot11FineTimingMsmtInitActivated are true, the ~~recipient~~receiver shall maintain a separate replay counter for received individually addressed Protected Fine Timing frames (see 9.6.34 (Protected Fine Timing frame details)) ~~and shall use the PN from the received frame to detect replays~~.
2. For each PTKSA, if management frame protection has been negotiated and MARC has been enabled, the receiver shall maintain an alternate replay counter for each MARC Index for received robust IQMFs that have the FTM/MARC bit set to 1 in the GCMP Header.
3. The receiver shall discard any Data frame that is received with its PN less than or equal to the value of the replay counter that is associated with the TA, RA (individual or group address; not if TDLS) and priority value of the received MPDU. The receiver shall discard fragmented MSDUs, A-MSDUs and MMPDUs whose constituent MPDU PN values are not incrementing in steps of 1. If management frame protection is negotiated, the receiver ~~shall set the MFPC bit on a given link to 1, it~~ shall discard any individually addressed robust Management frame that is received with its PN less than or equal to the value of the replay counter associated with the TA, ~~and~~ (QMF receiver of an individually addressed robust Management frame with the To DS subfield equal to 1 only) ACI, (QMF receiver of a robust IQMF with FTM/MARC bit set to 1 in the GCMP Header only) MARC Index of that individually addressed Management frame.The receiver should discard received protected Management frames if the associated replay counter does not exist.
4. When discarding a frame, the receiver shall increment by 1 dot11RSNAStatsGCMPReplays for Data frames or dot11RSNAStatsRobustMgmtGCMPReplays for robust Management frames.
5. For MSDUs or A-MSDUs sent using the block ack feature, reordering of received MSDUs or A-MSDUs according to the block ack receiver operation is performed prior to replay detection.
6. If the receiver performs replay detection prior to decryption, then the receiver shall discard the frame if the PN of the received frame is less than or equal to the corresponding replay counter specified in rule (g). The replay counter shall not be updated unless the decryption is successful and the frame is accepted.

### C.3 MIB detail

Add the following entry to the end of the Dot11StationConfigEntry{} list:

dot11MultipurposeAlternateReplayCountersActivated TruthValue

Add the following new entry to the dot11StationConfig TABLE:

dot11MultipurposeAlternateReplayCountersActivated OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a control variable.

It is written by the SME or external management entity.

Changes take effect for the next MLME-START.request primitive or MLME-JOIN.request primitive.

The purpose of dot11MultipurposeAlternateReplayCountersActivated is to enable the use of alternate CCMP and GCMP replay counters for frame sequences that need to have replay detection handled separately from frame sequences that use the normal replay counters."

DEFVAL { false }

::= { dot11StationConfigEntry <ANA> }

Change the dot11QMFComplianceGroup as shown:

dot11QMFComplianceGroup OBJECT-GROUP

OBJECTS {

dot11QMFActivated,

dot11QMFReconfigurationActivated,

dot11QMFPolicyChangeTimeout,

dot11MultipurposeAlternateReplayCounters }

STATUS current

DESCRIPTION

"This object group provides the objects from the IEEE 802.11 MIB required

to manage QoS management Frame functionality."

::= { dot11Groups 63 }

# References:

[Draft P802.11bf\_D4.0.pdf](https://grouper.ieee.org/groups/802/11/private/Draft_Standards/11me/Draft%20P802.11REVme_D6.0.pdf)

[Draft P802.11REVme\_D7.0.pdf](https://grouper.ieee.org/groups/802/11/private/Draft_Standards/11me/Draft%20P802.11REVme_D7.0.pdf)