IEEE P802.11
Wireless LANs

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| Resolution for CID 1466 |
| Date: 2022-06-25 |
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Abstract

This document provides a resolution to a comment received during IEEE 802.11 Working Group Letter Ballot #258. The resolution addresses the comment with CID 1466.

***Instruct the editor to modify [1] as follows:***

* MCCAOP Setup Reply element

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| * MCCA Reply Code field values
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| MCCA reply code | Meaning |
| 0 | Accept |
| 1 | Reject: MCCAOP reservation conflict |
| 2 | Reject: MAF limit exceeded |
| 3 | Reject: MCCA track limit (dot11MCCATrackStatesCapable) exceeded |
| 4–255 | Reserved |

[…]

* Mesh coordination function (MCF)

[…]

* MCCAOP reservations

An MCCAOP reservation specifies a schedule for frame transmissions. The time periods scheduled for frame transmissions in the reservation are called *MCCAOPs*. The schedule is set up between an MCCAOP owner and one (for individually addressed frames) or more (for group addressed frames) MCCAOP responders. MCCAOPs are set up by means of the procedure defined in 10.24.3.6 (MCCAOP setup procedure). Once an MCCAOP reservation is set:

* Access to the channel by MCCA enabled mesh STAs is governed by the procedures in 10.24.3.9 (Access during MCCAOPs).
* The MCCAOP reservation is advertised according to the procedures in 10.24.3.7 (MCCAOP advertisement).

The schedule is defined by means of the MCCAOP Reservation field defined in 9.4.2.105.2 (MCCAOP Reservation field). An MCCAOP reservation schedules a series of MCCAOPs with a common duration given in the MCCAOP Duration subfield of the MCCAOP Reservation field. This series is started after the first DTIM Beacon following the successful completion of the MCCAOP setup procedure and terminated when the MCCAOP reservation is torn down.

The reservation defines a regular schedule of MCCAOPs in the DTIM interval of the MCCAOP owner. The number of MCCAOPs in the DTIM interval is given by the value of the MCCAOP Periodicity subfield of the MCCAOP Reservation field. The MCCAOP Offset subfield specifies the offset of the first scheduled MCCAOP of the transmission schedule relative to the beginning of the DTIM interval of the MCCAOP owner. The following MCCAOPs are separated by a time interval with a duration equal to the length of the DTIM period divided by the value in the MCCAOP Periodicity subfield.

An example of an MCCAOP reservation schedule is shown in Figure 10-39 (Example MCCAOP reservation with MCCAOP Periodicity equal to 2). In this example, the MCCAOP Periodicity equals two, so that there are two MCCAOPs in each DTIM interval. As further illustrated in the figure, the MCCAOP Offset value indicates the beginning of the first MCCAOP in each DTIM interval.

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| * Example MCCAOP reservation with MCCAOP Periodicity equal to 2
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If a mesh STA adjusts its TBTT, e.g., in response to a TBTT adjustment request, it shall adjust the MCCAOP reservations by modifying the MCCAOP Offset of each MCCAOP reservation.

An MCCAOP reservation is identified by an MCCAOP reservation ID. The MCCAOP owner shall select an MCCAOP reservation ID that is unique among all of its MCCAOP reservations. The MCCAOP reservation ID and MAC address of the MCCAOP owner uniquely identify the MCCAOP reservation in the mesh BSS. The MCCAOP reservation ID is an 8-bit unsigned integer and included in the MCCAOP Reservation ID field of an MCCAOP Setup Request element. If this MCCAOP setup request is for an individually addressed transmission, the MCCAOP Reservation ID is between 0 and 127. If this MCCAOP setup request is for a group addressed transmission, the MCCAOP Reservation ID is between 128 and 254. The value 255 is not used to identify a specific MCCAOP reservation but is reserved for usage in the MCCAOP teardown procedure as described in 10.24.3.8 (MCCAOP teardown).

(#181)A mesh STA with dot11MCCAActivated equal to true shall support tracking of at least dot11MCCATrackStatesCapable MCCAOP reservations, including its own reservations. A mesh STA shall record the number of MCCAOP reservations that the mesh STA tracks as dot11MCCATrackStateActive. (#181)If dot11MCCATrackStateActive is less than dot11MCCATrackStatesCapable, the mesh STA shall support tracking, setting up, and accepting additional reservations. In this case, the mesh STA shall set the Accept Reservations subfield in the Flags field to 1 in the MCCAOP Advertisement Overview elements it transmits.

If dot11MCCATrackStateActive is greater than or equal to dot11MCCATrackStatesCapable, the mesh STA shall not track, set up, or accept additional reservations. In this case, the mesh STA shall set the Accept Reservations subfield in the Flags field to 0 in the MCCAOP Advertisement Overview elements it transmits. Moreover, it shall reply to MCCA Setup Request frames with an MCCA Setup Reply frame with the MCCA Reply Code field in the MCCAOP Setup Reply element equal to 3: Reject: MCCAOP track limit exceeded.

The tracked MCCAOP reservations are advertised as described in 10.24.3.7 (MCCAOP advertisement). How to access the medium during the tracked MCCAOP reservations is specified in 10.24.3.9 (Access during MCCAOPs).

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* MCCAOP setup procedure

The setup of an MCCAOP reservation is initiated by the MCCAOP owner and is accepted or rejected by the MCCAOP responder. The setup procedure for an MCCAOP reservation is as follows:

* The MCCAOP owner shall build a map of the neighborhood MCCAOP periods in the DTIM interval after hearing advertisements from all of its neighbor mesh STAs with the MCCA Enabled subfield of the Mesh Capability field in the Mesh Configuration element equal to 1. It shall request an MCCAOP advertisement, as described in 10.24.3.7.8 (MCCAOP advertisement request procedure), from each neighbor mesh STA from which no advertisement was heard in the last dot11MCCAAdvertPeriodMax DTIM intervals.
* The MCCAOP owner shall determine the MCCAOP reservation. The MCCAOP parameters shall be chosen in such a way that they satisfy the following conditions:
* The reservation shall not overlap with the neighborhood MCCAOP periods of the MCCAOP owner.
* The reservation shall not overlap with the interference periods of the intended MCCAOP responder or responders.
* The reservation shall not cause the MAF limit to be exceeded for either itself or its neighbor mesh STAs.
* The Accept Reservations subfield of the Flags field equals 1 in the most recent MCCAOP Advertisement Overview element received from all intended MCCAOP responders.
* If the conditions in item b) are satisfied, the MCCAOP owner shall transmit an MCCAOP Setup Request element to the intended MCCAOP responder with the chosen MCCAOP parameters.
* The MCCAOP responder shall verify the following conditions:
* The reservation does not overlap with its neighborhood MCCAOP periods.
* The reservation does not cause the MAF limit to be exceeded for itself or its neighbor mesh STAs.
* The reservation does not cause dot11MCCATrackStateActive to exceed dot11MCCATrackStatesCapable.
* If the conditions in item d) are satisfied, the responder shall send an MCCA Setup Reply frame to the MCCAOP owner with the MCCA Reply Code field in the MCCAOP Setup Reply element equal to 0: Accept, as defined in Table 9-282 (MCCA Reply Code field values).
* If the conditions in item d) are satisfied and the MCCAOP request has been intended for group addressed transmissions, the responder shall include the reservation in its MCCAOP advertisement only after the MCCAOP advertisement from the MCCAOP owner is received.
* If not all of the conditions in item d) are satisfied and the MCCAOP request is intended for individually addressed transmissions, the responder shall transmit to the MCCAOP owner an MCCA Setup Reply frame that is constructed as follows:
* If the condition in item d)1) is not satisfied and both conditions in item d)2) and item d)3) are satisfied, the responder may calculate an alternative MCCAOP reservation and include it in the MCCAOP Reservation field of the MCCAOP Setup Reply element. It shall set the MCCA Reply Code field of the MCCAOP Setup Reply element to 1: Reject: MCCAOP reservation conflict, as defined in Table 9-282 (MCCA Reply Code field values).
* If the condition in item d)2) is not satisfied, it shall set the MCCA Reply Code field of the MCCAOP Setup Reply element to 2: Reject: MAF limit exceeded, as defined in Table 9-282 (MCCA Reply Code field values).
* If the condition in item d)2) is satisfied and the condition in item d)3) is not satisfied, it shall set the MCCA Reply Code field of the MCCAOP Setup Reply element to 3: Reject: MCCAOP track limit exceeded, as defined in Table 9-282 (MCCA Reply Code field values).
* If not all of the conditions in item d) are satisfied and the MCCAOP request is intended for group addressed transmissions, the responder shall send an MCCA Setup Reply frame to the MCCAOP owner with the MCCA Reply Code field in the MCCAOP Setup Reply element equal to 1: Reject: MCCAOP reservation conflict.
* If the MCCAOP owner receives an MCCA Setup Reply frame with MCCA Reply Code equal to Accept, the MCCAOP reservation is established. Otherwise, the mesh STA may repeat the MCCAOP setup procedure using a modified MCCAOP Setup Request. If an alternative MCCAOP reservation is included in the MCCAOP Setup Reply element, the mesh STA may consider this alternative in its modified MCCAOP Setup Request.

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* Construction of an MCCAOP advertisement set

The following terminology is used in this subclause:

* TX-RX report: an MCCAOP Reservation field contained in the TX-RX Periods Report field of an MCCAOP Advertisement element
* Broadcast report: an MCCAOP Reservation field contained in the Broadcast Periods Report field of an MCCAOP Advertisement element
* Interference report: an MCCAOP Reservation field contained in the Interference Periods Report field of an MCCAOP Advertisement element

Each MCCAOP reservation tracked by a mesh STA is one of the following types:

* TX-RX period:
* An MCCAOP reservation for individually addressed frames for which the mesh STA is the MCCAOP owner or the MCCAOP responder.
* Broadcast period:
* An MCCAOP reservation for group addressed frames for which the mesh STA is the MCCAOP owner or the MCCAOP responder.
* Optionally, known target beacon transmission times of Beacon frames for which the mesh STA is either the transmitter or the receiver.
* Optionally, a transmission or reception period of a STA that is collocated with the mesh STA, for example, beacon or HCCA times of a collocated AP.
* Interference period:
* A TX-RX or a broadcast period reported by a neighbor peer mesh STAs of the mesh STA excluding those periods for which this mesh STA is either the MCCAOP owner or the MCCAOP responder.
* Optionally, a TX-RX or a broadcast period reported by neighbor nonpeer mesh STAs of the mesh STA.

The MCCAOP reservations are grouped into the following sets:

* MCCAOP TX-RX advertisement set, which includes all TX-RX periods
* MCCAOP broadcast advertisement set, which includes all broadcast periods
* MCCAOP interference advertisement set, which includes all interference periods

These three sets constitute the MCCAOP advertisement set. The mesh STA uses the MCCAOP Overview element and MCCAOP Advertisement elements to advertise its MCCAOP advertisement set to its neighbor mesh STAs.

The mesh STA acts as follows to construct the MCCAOP Overview elements and the MCCAOP Advertisement elements:

* If the MCCAOP advertisement set is nonempty, the mesh STA constructs one or more MCCAOP reports according to the format described in 9.4.2.108.3 (MCCAOP Reservation Report field) as follows:
* If the MCCAOP TX-RX advertisement set is nonempty, the mesh STA constructs one or more TX-RX reports according to the format described in 9.4.2.108.3 (MCCAOP Reservation Report field) such that each reservation in the MCCAOP TX-RX advertisement set occurs exactly in one TX-RX report.
* If the MCCAOP broadcast advertisement set is nonempty, the mesh STA constructs one or more broadcast reports according to the format described in 9.4.2.108.3 (MCCAOP Reservation Report field) such that each reservation in the MCCAOP broadcast advertisement set occurs exactly in one broadcast report.
* If the MCCAOP interference advertisement set is nonempty, the mesh STA constructs one or more interference reports according to the format described in 9.4.2.108.3 (MCCAOP Reservation Report field) such that each reservation in the MCCAOP interference advertisement set occurs exactly in one interference report.
* If the MCCAOP advertisement set is nonempty, the mesh STA constructs one or more MCCAOP Advertisement elements as follows:
* The MCCAOP Advertisement Set Sequence Number field is set to the MCCAOP advertisement set sequence number as explained in 10.24.3.7.3 (Setting the MCCAOP advertisement set sequence number).
* The MCCAOP Advertisement Element Index subfield is set to an identifier that uniquely identifies the MCCAOP Advertisement element in the MCCAOP advertisement set.
* Each MCCAOP Advertisement element includes at least one of the TX-RX reports, broadcast reports, or interference reports. Moreover, it includes at most one of the TX-RX reports, at most one of the broadcast reports, and at most one of the interference reports. In case the MCCAOP Advertisement element contains a TX-RX report, the TX-RX Report Present subfield of the MCCAOP Advertisement Element Information field is set to 1; otherwise this subfield is set to 0. In case the MCCAOP Advertisement element contains a broadcast report, the Broadcast Report Present subfield of the MCCAOP Advertisement Element Information field is set to 1; otherwise this subfield is set to 0. In case the MCCAOP Advertisement element contains an interference report, the Interference Report Present subfield of the MCCAOP Advertisement Element Information field is set to 1; otherwise, this subfield is set to 0.
* Each report as constructed in step a) is present in exactly one MCCAOP Advertisement element.
* The mesh STA constructs one MCCAOP Advertisement Overview element such that
* The MCCAOP Advertisement Set Sequence Number field is set to the advertisement set sequence number as explained in 10.24.3.7.3 (Setting the MCCAOP advertisement set sequence number).
* The Medium Access Fraction field is set to the medium access fraction.
* The MAF limit field is set to dot11MAFlimit.
* The Accept Reservations field is set to 1 if dot11MCCATrackStatesActive is less than dot11MCCATrackStatesCapable, and set to 0 otherwise.
* Bit *i* of the Advertisement Elements Bitmap field is set to 1 if an MCCAOP Advertisement element with the MCCAOP Advertisement Element Index subfield equal to *i* is part of the representation of this MCCAOP advertisement set, and set to 0 otherwise.

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ASN.1 encoding of the MAC and PHY MIB

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-- \* dot11MeshSTAConfig TABLE

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dot11MCCATrackStatesCapable OBJECT-TYPE

 SYNTAX Unsigned32 (83..65535)

 MAX-ACCESS read-only

 STATUS current

 DESCRIPTION

 "This is a capability variable.

 Its value is determined by device capabilities.

 This attribute specifies the number of MCCAOP reservations that the MAC entity is able to track."

::= { dot11MeshSTAConfigEntry 35 }

dot11MCCATrackStatesActive OBJECT-TYPE

 SYNTAX Unsigned32 (0..65535)

 MAX-ACCESS read-write

 STATUS current

 DESCRIPTION

 "This is a control variable.

 It is written by an external management entity.

 Changes take effect as soon as practical in the implementation.

 The upper bound is given by the current value of dot11MCCATrackStatesCapable.

 This counter shall be incremented each time a STA begins tracking an MCCAOP reservation. This counter shall be decremented each time a STA stops tracking an MCCOP reservation.The upper bound is given by the current value of dot11MCCATrackStatesCapable."

 ::= { dot11MeshSTAConfigEntry 36 }

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-- \* End of dot11MeshSTAConfig TABLE

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**References:**

[1] IEEE P802.11-REVme™/D1.3, “Draft Standard for Information Technology—Telecommunications and Information Exchange between Systems Local and Metropolitan Area Networks—Specific Requirements/D1.3, June 2022—Part 11: Wireless LAN Medium Access Control

(MAC) and Physical Layer (PHY) Specifications,” June 2022.