IEEE P802.11
Wireless LANs

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| DMG Triggered unscheduled PS CID 7165 |
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Abstract

Resolution to CID7165 proposes an extension to DMG unscheduled power management mechanism that allows non-AP and non-PCP STA extracting BU from AP or PCP still keeping doze state.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 7165 | 1576.33 | 11.2.2.5.1 |  |  | U-APSD mechanism provides fine granularity of power management for non-AP STA that is not provided by any power management mechanism in DMG network. | Provide changes to the U-APSD definitions that makes it applicable for DMG networks |

*Discussion:*

A comment is solved by providing an extension to DMG unscheduled power management mechanism that allows non-AP and non-PCP STA extracting BU from AP or PCP while in doze state. A Reversed direction protocol is used by the non-AP, non-PCP STA to extract BU for AP and PCP. This extension is optional and is supported if an AP/PCP is capable of the extension and if both the non-AP, non-PCP STA and AP/PCP are capable to support RD protocol. Following figure illustrates the proposed extension.



*Editor change as follows*

**9.2.4.5 QoS Control field**

P586L1

Editor change the figure Table 9-7 as follows

**Table 9-7—QoS Control field for frames transmitted within a DMG PPDU**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Applicable frame (sub-)types | Bits 0-3 | Bit 4 | Bits 5-6 | Bit 7 | Bit 8 | Bit 9 | Bits 10-13 | Bit 14 | Bit 15 |
| QoS Data  | TID | EOSP | Ack Policy | A-MSDU present  | A-MSDU type  | RDG/MorePPDU | Buffered AC | Reserved | AC Constrain |
| QoS Null | TID | EOSP | Ack Policy | Reserved | Reserved | RDG/MorePPDU | Buffered AC | Reserved  | AC Constrain |

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*Editor insert new subclause*

**9.2.4.5.16 Buffered AC**

The Buffered AC subfield is a 4-bit bitmap that indicates buffered traffic for four ACs as defined in Figure 9-xyz, in which bit numbering is related to the QoS Control field. At least one BU for the indicated AC is buffered if the related subfield is set to 1. The Buffered AC subfield is present in QoS Data frames and QoS null frames sent by a DMG AP and PCP. A non-AP and non-PCP STA can use information contained in the Buffered AC subfield to determine the ACs for which BU are buffered for it.

**Figure 9-xyz Buffered AC subfield**

|  |  |  |  |
| --- | --- | --- | --- |
| Bit 10 | Bit 11 | Bit 12 | Bit 13 |
| BU for AC\_VO | BU for AC\_VI | BU for AC\_BE | BU for AC\_BK |

**9.4.1.4 Capability Information field**

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Editor change the figure 9-68 as follows

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | B0 B7 | B8 | B9 | B10 B11 | B12 | B13 B15 |
|  | DMG parameters | Spectrum Management | Triggered Unscheduled PS | Reserved | Radio Measurement  | Reserved |
| Bits | 8 | 1 | 1 | 2 | 1 | 3 |

**Figure 9-68—Capability Information field (DMG STA)**

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* In DMG BSS an AP or PCP sets the Triggered Unscheduled PS subfield to 1 within the Capability Information field (DMG STA) when the AP or PCP transmits a DMG STA Capability Information field in which the Reverse Direction subfield is equal to 1 and is capable of delivering a BU as an RD responder on receipt of a PPDU containing an RDG MPDU with the Power Management subfield set to 1 from a non-AP and non-PCP STA and sets it to 0 otherwise. A non-AP and non-PCP STA sets this subfield to 0.

**11.2.6.2.2 (#6816)Non-AP and non-PCP STA operation without a wakeup schedule(11ad)**

P1641L48

 (#6816)A non-AP and non-PCP STA in doze state shall limit the frames it transmits to the following:

— A Management, Extension or Data frame that triggers an Ack or a BlockAck frame from the AP or

PCP, with the Power Management subfield in the Frame Control field of the frame set to 0, i.e., a frame to indicate the STA intent to transition out of unscheduled PS mode

— Management, Extension or Data frame that triggers an Ack or a BlockAck frame from the AP or PCP, plus any response frames (e.g., Ack and Block Ack) that respond to the frames sent by the AP or PCP during the reverse direction grant, if the following conditions apply:

* the Power Management subfield in the Frame Control field is set to 1
* the AP or PCP has transmitted a Capability Information field in which the Triggered Unscheduled PS subfield is equal to 1
* the non-AP and non-PCP STA has transmitted a DMG STA Capability Information field in which the Reverse Direction subfield is equal to 1

— An RTS, DMG CTS-to-self, CF-End, Grant, SSW or SSW-Feedback frame.

NOTE—A DMG STA in doze state may need to perform beamforming to restore its links with other DMG

STAs.(#6816)

**11.2.6.4 ATIM frame usage for power management of non-AP STAs**

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A non-PCP and non-AP STA that has used unscheduled power save to enter doze state may offer an RDG to its AP or PC if the following conditions apply:

* the AP or PCP has transmitted a Capabilty Information field in which the Triggered Unscheduled PS field is equal to 1
* the non-AP and non-PCP has transmitted a DMG STA Capability Information field in which the the Reverse Direction subfield is equal to 1
* the non-PCP and non-AP STA has received an ATIM indicating BUs are buffered for it or is aware of buffered BUs from the Buffered AC subfield of the QoS Control field of a Data frame last received from the AP or PCP

The AP or the PCP may use the offered RDG to transmit one or more BUs to the non-PCP and non-AP STA using the Reverse direction protocol defined in 10.28 (Reverse direction protocol).

The non-PCP and non-AP STA should continue to offer an RDG to the AP or to the PCP within the current TXOP while the Buffered AC subfield of the QoS Control field in frames transmitted by the AP or by the PCP indicates that one or more BUs are buffered for the AC for which the TXOP was gained.

**References:**

1. IEEE P802.11-REVmc/D5.3, April 2016