IEEE P802.11  
Wireless LANs

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| CR for Opportunistic power save | | | | |
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Abstract

This document provides CR for CIDs related to Opportunistic power save:

11046, 11047, 12034, 13513, 13724, 13186, 13187

1. **Introduction**

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGax Draft. The introduction and the explanation of the proposed changes are not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGax Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGax Editor: Editing instructions preceded by “TGax Editor” are instructions to the TGax editor to modify existing material in the TGax draft. As a result of adopting the changes, the TGax editor will execute the instructions rather than copy them to the TGax Draft.***

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| **CID** | **Commenter** | **Clause Number(C)** | **Page** | **Comment** | **Proposed Change** | **Resolution** |
| 11046 | Abhishek Patil | 27.14.3.1 | 313.50 | Add a sentence to indicate that an HE STA that support OPS shall set dot11TIMBroadcastImplemented and dot11TIMBroadcastActivated to true and shall have the TIM Broadcast field of Extended Capabilities element set to 1. | Add a paragraph after the 2nd paragraph as follows: "An HE STA that sets the OPS Support subfield in HE Capabilities element to 1 shall:  - shall set dot11TIMBroadcastImplemented to true,  - shall set dot11TIMBroadcastActivated to true and  - shall set the TIM Broadcast field of Extended Capabilities element to 1." | Revised – An OPS STA can support OPS and not support TIM BC, so OPS STA does not need the dot11TIMBroadcastActivated.  We however need to clarify that a STA that supports TIM BC does not try and establish TIM BC with an AP that does not support TIM BC.  Apply the changes as in doc 18-0090r0 |
| 11047 | Abhishek Patil | 27.14.3.1 | 314.15 | What does 'also operates with Broadcast TIM' mean? An OPS AP needs to ensure that it transmits either a FD frame or a TIM frame at the beginning of an OPS TWT SP. Since FD frame is conditionally included (i.e., only if it aligns with the start of OPS TWT SP), the fall-back is always a TIM frame. Therefore, it should be mandatory for an HE AP to transmit a TIM frame even if none of the associated STAs dhave made a request for TIM Broadcast (as specified in 11.2.3.17). | As in comment | Revised – the proposed description is true per the spec right now. The sentence mentioned in the comment is for APs that operate both with OPS and with TIM broadcast. In such case, there should be alignement of the TIM frame. If the comment mentions a mandatory support of the transmission of the TIM frame, this is correct and nothing needs to be added, if it is a mandatory transmission of TIM frames, this is not needed.  We however need to make sure that an OPS STA does not operate with TIM BC if the AP used TIM frames for OPS. Apply the changes described in 18-0090r0. |
| 12034 | Jarkko Kneckt | 27.14.3.2 | 314.08 | The power saving STAs should not be required to wakeup only to receive the OPS TWT, unless they desire to use the TWT SP to transmit data. The OPS is likely used in high congestion and it controls which STAs get transmission resources in the following OPS TWT SP. The power saving STAs that have not transmitted anything within the ongoing beacon interval should be allowed to sleep during the OPS TWT, if they do not desire to receive DL data or Trigger frame during the OPS SP. This saves transmission resources for other STAs and ensures good power save performance for the STAs. | Allow the STA to skip waking up for the OPS TWT SP, if it desires not to receive DL data or trigger frame during the OPS TWT SP. | Revised – agree with the commenter. This is the intention, but is not clear enough. Make the change as proposed in doc 18-0090r0. |
| 13513 | Simone Merlin | 27.14.3 | 314.18 | BC TWT is broadcast TWT | replace BC with broadcast | Revised – agree with the commenter. Apply the changes as in doc 18-0090r0. |
| 13724 | Woojin Ahn | 27.14.3.3 | 314.30 | If an OPS STA receives a TIM element where its corresponding bit is set to 0, it may not access using EDCA properly if its HEMUEDCATimer is nonzero for some ACs | If an OPS STA receives a TIM element where its corresponding bit is set to 0 may set its HEMUEDCATimer[AC] to 0 for all ACs | Rejected – this situation would be an indication that the medium is congested and that the AP will be fully scheduling other STAs for transmission before the next OPS TIM element. This is not the proper behavior. On top of that, the rules for MU EDCA are orthogonal to this and should stay orthogonal. |
| 13186 | Rajesh Kumar | 11.2.3.17 | 213.29 | HE STAs that support OPS would need to set dot11TIMBroadcastImplemented and dot11TIMBroadcastActivated to true. Further, such STAs would need to set the TIM Broadcast field of the Extended Capabilities to 1. See first paragraph of 11.2.3.17 in 802.11-2016 spec (pg 1621) for further details. | Add spec text either to section 11.2.3.17 or 27.14.3 to indicate that HE STAs that support OPS set dot11TIMBroadcastImplemented and dot11TIMBroadcastActivated to true and have the TIM Broadcast field of Extended Capabilities element set to 1. | Revised – See resolution of 11046. Apply the changes in doc 18-0090r0. |
| 13187 | Rajesh Kumar | 11.2.3.17 | 213.29 | What happens if FD or TIM broadcast frames don't align with the TWT SP (with Flow-ID=3)? Add spec text that an AP that sets up B-TWT for OPS shall send TIM Broadcast frames at the beginning of (OPS) B-TWT SPs without requiring any STAs to negotiate (i.e., exchange of Request / Response frames as described in 11.2.3.17 3rd paragraph 802.11-2016 P1621) to enable broadcast of TIM frames | Add spec text (either in 11.2.3.17 or 27.14.3) to clarifying the exception from OPS STAs. | Revised - See resolution of 11046. Apply the changes in doc 18-0090r0. |

1. **Proposed changes**

***11ax Editor: Modify 27.14.3 Opportunistic power save as follows:***

* Opportunistic power save(#6041)
* General

An OPS STA is a non-AP HE STA that sets the OPS Support subfield in the HE MAC Capabilities Information field of the HE Capabilities element to 1(#Ed).

An OPS AP is an AP HE STA that sets the OPS Support subfield in the HE MAC Capabilities Information field in HE Capabilities element to 1(#Ed).

Opportunistic power save mechanism has the objective to allow OPS STAs to opportunistically go to doze state for a defined period. To achieve this, an OPS AP splits a beacon interval into several periodic broadcast TWT SPs and provides, at the beginning of each SP, the scheduling information for all OPS STAs. Based on this information, the OPS STAs may opportunistically go to doze state until the next TWT SP.(#5509)

* AP operation for opportunistic power save

(#5509)To enable opportunistic power save, an OPS AP shall include a TWT element in beacons to set a periodic Broadcast TWT SP with the following information:

* The TWT flow identifier field set to 3
* The Broadcast TWT ID subfield is set to 0

At the beginning of these periodic TWT SPs with the TWT Flow Identified field set to 3, the AP shall transmit a TIM frame or a FILS Discovery frame that includes a TIM element (see 9.4.2.6 (TIM element)). The AP should transmit a FILS Discovery frame instead of a TIM frame if the TWT SP start time aligns with the transmission time of a FILS Discovery frame. If the OPS AP also operates with TIM Broadcast and uses TIM frames for Opportunistic power save mechanism, the OPS AP should align the transmission time of a TIM frame for TIM Broadcast, with the target time of the Broadcast TWT SP with the TWT flow identifier field set to 3.(#7594, #9959)

* STA operation for opportunistic power save

When an OPS STA in the awake state (#12034) with AID *N* receives a TIM element in TIM frame or FILS Discovery frame from the associated OPS AP within a broadcast TWT SP with the TWT Flow Identifier field set to 3, the STA may enter the doze state during the TWT SP and until the next TWT SP with the TWT flow identifier field set to 3, if the bit *N* in the traffic indication virtual bitmap field of the current TIM element is set to 0.

NOTE—The opportunistic power save protocol does not restrict the OPS STA's channel access. The OPS STA can always access the channel with EDCA.(#5674)

An OPS STA shall not operate with TIM broadcast procedure if its associated OPS AP uses TIM frames for opportunistic power save.

***11ax Editor: Modify 11.2.3.17 (TIM Broadcast) by adding the following sentence to the 3rd paragraph which is included below.***

A non-AP STA may activate the TIM broadcast service by including a TIM Broadcast Request element in a TIM Broadcast Request frame, Association Request frame or Reassociation Request frame that is transmitted to the AP, which specifies the requested interval between TIM frame transmissions (the TIM broadcast interval). On receipt of a properly formatted TIM Broadcast Request element in a TIM Broadcast Request frame, Association Request frame or Reassociation Request frame, the AP shall include a TIM Broadcast Response element in the corresponding TIM Broadcast Response frame, Association Response frame or Reassociation Response frame, when dot11TIMBroadcastActivated is true. A non-AP STA shall transmit a TIM Broadcast Request only if the associated AP has indicated support for TIM Broadcast by setting the TIM Broadcast field of the Extended Capabilities elements that it transmits to 1.

Note – An OPS enabled AP that transmits TIM frames as described in 27.14.3 (Opportunistic Power Save) is expected to encode the TIM bits such that an associated non-AP STA that does not support OPS operation can use the information received in the TIM frame as it would do when receiving a TIM frame transmitted following the TIM Broadcast procedure.