IEEE P802.11
Wireless LANs

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| PDT MAC UHR on operating mode and parameter updates (generic enablement/disablement) |
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 Abstract

This submission proposes draft text for operating mode and parameter updates (i.e., the generic enablement/disablement) of UHR features

**Revisions:**

* Rev 0: Initial version of the document.
* Rev 1: Modifications based on offline feedback. Changed paragraphs highlighted.
	+ Changed the Note on page 6 that describes updates to multiple mode(s) and STA(s) to a normative statement (“may”).
	+ Some updates to the text on contents of OMP request and OMP response for clarity.
* Rev 2: Updated the affiliations and emails for the co-authors.
	+ No other technical or editorial changes.
* Rev 3: Following updates:
	+ Added transition timeout
	+ Removed DBE and DSO
	+ Editorial changes

**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 TGbn Draft. The abstract, revision information, introduction, explanation of the proposed changes and references sections are not part of the adopted material.

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

**Text to be adopted begins here:**

**9.4.2.aa2 UHR Capabilities element**

**9.4.2.aa2.2 UHR MAC Capabilities Information field**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B4 | B5 | B6 | B7 B10  | B11 Bx |
|  | DPS Support | DPS Assisting AP | Multi-Link Power Management | NPCA Supported | BSR Enhancement Support | Additional Mapped TID Support | UHR Operating Mode Timeout | Reserved |
| Bits: | 1 | 1 | 1 | 1 | 1 |  | 4 | x |

**Figure 9-aa5 – UHR MAC Capabilities Information field format**

When the UHR Operating Mode Timeout subfield is included in a frame sent by an AP affiliated with an AP MLD, the UHR Operating Mode Timeout subfield is set as defined in Table 9-XYZ1 (Encoding of the UHR Operating Mode Timeout subfield). When the UHR Operating Mode Timeout subfield is included in a frame sent by a non-AP STA affiliated with a non-AP MLD, the UHR Operating Mode Timeout subfield is reserved.

**Table 9-XYZ1— Encoding of the UHR Operating Mode Timeout subfield**

|  |  |
| --- | --- |
| **UHR Operating Mode Timeout subfield value** | **UHR Operating Mode Timeout** |
| 0 | 0 TUs |
| 1 | 128 us |
| 2 | 256 us |
| 3 | 512 us |
| 4 | 1 TU |
| 5 | 2 TUs |
| 6 | 4 TUs |
| 7 | 8 TUs |
| 8 | 16 TUs |
| 9 | 32 TUs |
| 10 | 64 TUs |
| 11 | 128 TUs |
| 12-15 | Reserved |

**37.2 Prioritized EDCA**

***TGbn editor: please add the following paragraphs as shown below.***

A UHR non-AP STA that supports the P-EDCA mode and that intends to enable or disable the P-EDCA mode shall follow the procedure defined in 37.X (Procedure for operating mode and parameter updates). The associated AP shall accept the request and follow the procedure defined in 37.X (Procedure for operating mode and parameter updates).

Note – For a non-AP STA to enable the P-EDCA mode, the associated AP must support P-EDCA and must have P-EDCA enabled for the BSS.

**37.10 Power Management**

**37.10.1 Dynamic power save (DPS) operation**

***TGbn editor: please update the following paragraphs as shown below.***

A UHR non-AP STA that supports the DPS mode and that intends to enable, disable or update the parameters of the DPS mode shall follow the procedure defined in 37.X (Procedure for operating mode and parameter updates). In the OMP request sent to enable or update the parameters of the DPS mode for the non-AP STA, the non-AP STA shall include the DPS Operation Parameter field. The associated AP shall accept the request and follow the procedure defined in 37.X (Procedure for operating mode and parameter updates).

Note – For a non-AP STA to enable the DPS mode, the associated AP must be a DPS assisting AP.

**37.11 Non-primary channel access (NPCA)**

***TGbn editor: please update the following paragraph as shown below.***

A STA that supports NPCA operation is called an NPCA STA. An AP that supports NPCA operation is called an NPCA AP. A non-AP NPCA STA shall set the NPCA Supported field of the UHR MAC Capabilities Information field of the UHR Capabilities element to 1. A non-AP NPCA STA may enable the NPCA mode only if it is associated with an NPCA AP.

***TGbn editor: please update the following paragraph as shown below.***

A UHR non-AP STA that supports the NPCA mode and that intends to enable, disable or update the parameters of the NPCA mode shall follow the procedure defined in 37.X (Procedure for operating mode and parameter updates). In the OMP request sent to enable or update the parameters of the NPCA mode for the non-AP STA, the non-AP STA shall include the following:

* NPCA Switching Delay field,
* NPCA Switch Back Delay field.

The associated AP shall accept the request and follow the procedure defined in 37.X (Procedure for operating mode and parameter updates).

Note – For a non-AP STA to enable the NPCA mode, the associated AP must support NPCA and must have NPCA enabled for the BSS.

**37.12.2 Dynamic Unavailability Operation (DUO) mode**

***TGbn editor: please update the following paragraphs as shown below.***

A UHR non-AP STA that supports the DUO mode and that intends to enable or disable the DUO mode shall follow the procedure defined in 37.X (Procedure for operating mode and parameter updates). The associated AP shall accept the request and follow the procedure defined in 37.X (Procedure for operating mode and parameter updates).

Note – For a non-AP STA to enable the DUO mode, the associated AP must be a DUO assisting AP.

**37.12.5 Non-AP STA Parameter Update mechanism**

***TGbn editor: please update the following paragraphs as shown below.***

A UHR non-AP STA that supports LOM and that intends to enable, disable or update the parameters of LOM shall follow the procedure defined in 37.X (Procedure for operating mode and parameter updates).

In the OMP request sent to enable or update the parameters of LOM for the non-AP STA, the non-AP STA shall include the following:

* a Maximum PPDU Duration subfield that indicates the maximum PPDU duration, in microseconds, that is supported by the STA in transmit and/or receive when the non-AP STA is in LOM mode.
* a Maximum MCS subfield that indicates the maximum MCS that is supported by the STA in transmit and/or receive when the non-AP STA is in LOM mode.
* An LDPC Mode subfield that indicates whether LDPC is supported by the STA in transmit and/or receive when the non-AP STA is in LOM mode.
* An HT-Immediate BA Mode subfield that indicates whether all HT-immediate BA agreements are active or suspended when the non-AP STA is in LOM mode.
* A Disabled Subchannel Bitmap subfield that indicates whether one or more of the 20 MHz subchannels that lie within the BSS bandwidth are enabled or disabled when the non-AP STA is in LOM mode. The Disabled Subchannel Bitmap subfield is a bitmap where the lowest numbered bit corresponds to the 20 MHz subchannel that lies within the BSS bandwidth and is the lowest in frequency of the set of all 20 MHz subchannels within the BSS bandwidth. Each successive bit in the bitmap corresponds to the next higher frequency 20 MHz subchannel. A bit in the bitmap that lies within the BSS bandwidth is set to 1 to indicate that the corresponding 20 MHz subchannel is punctured and is set to 0 to indicate that the corresponding 20 MHz subchannel is not punctured. A bit in the bitmap that falls outside the BSS bandwidth is reserved.
* Whether there are other fields is TBD.

The associated AP shall accept the request and follow the procedure defined in 37.X (Procedure for operating mode and parameter updates).

Note – For a non-AP STA to enable LOM, the associated AP must be a LOM assisting AP.

**37.17 Low Latency Indication**

**37.17.1 General**

***TGbn editor: please add the following paragraphs as shown below.***

A UHR non-AP STA that supports the LLI mode and that intends to enable or disable the LLI mode shall follow the procedure defined in 37.X (Procedure for operating mode and parameter updates).

The associated AP shall accept the request and follow the procedure defined in 37.X (Procedure for operating mode and parameter updates).

Note – For a non-AP STA to enable the LLI mode, the associated AP must support LLI.

**3.1 Definitions**

***TGbn editor: Insert the following definitions (maintaining alphabetical order) in subclause 3.1 (Definitions):***

Operating mode and parameters (OMP) request: A UHR Link Reconfiguration Request frame of Category UHR protected (a Protected UHR Action frame) with the Type field in the frame set to 2 that is transmitted by a non-AP MLD to an AP MLD to enable or disable a mode of operation or update the parameters of an enabled mode of operation.

OMP response: A UHR Link Reconfiguration Notify frame of Category UHR protected (a Protected UHR Action frame) with the Type field in the frame set to 2 that is transmitted by an AP MLD to a non-AP MLD as a response to the OMP request.

***TGbn editor: please add the following subclause as shown below.***

**9.6.X.Y UHR Link Reconfiguration Notify frame format**

The UHR Link Reconfiguration Notify frame is used by an AP MLD in response to the UHR Link Reconfiguration Request frame sent by a non-AP MLD to enable or disable a mode or to update the parameters associated with a mode.

The UHR Link Reconfiguration Notify frame is an Action frame of category Protected UHR. The Action field of a Link Reconfiguration Notify frame contains the information shown in Table 9-XYZ2 (UHR Link Reconfiguration Notify frame Action field format).

**Table 9-XYZ2—UHR Link Reconfiguration Notify frame Action field format**

|  |  |
| --- | --- |
| **Order** | **Meaning** |
| 1 | Category |
| 2 | Protected UHR Action |
| 3 | Dialog Token |
| 4 | Type |

The Category field is defined in 9.4.1.11 (Action field) and is set to Protected UHR.

The Protected UHR Action field is defined in 9.6.38.1 (Protected UHR Action field).

The Dialog Token field is set to the value of the Dialog Token field from the corresponding UHR Link Reconfiguration Request frame.

The Type field has the same definition as the Type field in the UHR Link Reconfiguration Request frame (see 9.6.x.y (UHR Link Reconfiguration Request frame format) and is set to the value of the Type field from the corre-sponding UHR Link Reconfiguration Request frame.

***TGbn editor: please add the following subclause as shown below.***

**37.X Procedure for operating mode and parameter updates**

The procedure defined in this subclause allows a non-AP MLD to enable or disable one or more UHR modes (see 37.2, 37.10.1, 37.11, 37.12.2, 37.12.5, 37.17.1, 37.19) of operation or update the parameters associated with those mode(s) for its affiliated non-AP STA(s) operating on any enabled link that is setup between the non-AP MLD and its associated AP MLD.

A non-AP MLD shall transmit, via an affiliated non-AP STA, to its associated AP MLD, an OMP request to enable or disable one or more UHR modes of operation for one or more affiliated non-AP STAs operating on enabled link(s). If a UHR mode of operation is not supported by an AP affiliated with the AP MLD, then the non-AP MLD shall not request to enable that mode for the non-AP STA operating on the corresponding AP’s link.

A non-AP MLD may update the parameters associated with one or more enabled UHR modes for one or more of its affiliated non-AP STAs by transmitting an OMP request.

In the same OMP request, the non-AP MLD may request the enablement/disablement and update of parameters for multiple mode(s) and for multiple non-AP STA(s) that are affiliated with the same non-AP MLD.

The OMP request shall be a UHR Link Reconfiguration Request frame with the Type field in the frame set to 2.

In an OMP request to enable or update the parameters of the UHR mode(s), the non-AP MLD shall indicate, for each non-AP STA and each UHR mode, the following:

* the link of the affiliated non-AP STA for which the request applies, corresponding to the mode, and
* the mode that is requested to be enabled or the mode for which a parameter update is requested, and
* the corresponding parameters (if applicable) of the mode as described in the subclause corresponding to that mode.

Note – See 37.10.1 (Dynamic power save (DPS) operation), 37.11 (Non-primary channel access), 37.12.2 (Dynamic Unavailability Operation (DUO) mode), 37.12.5 (Non-AP STA Parameter Update mechanism), 37.19 (Dynamic Subband Operation) and 37.X (Dynamic Bandwidth Expansion) for details on whether there are parameters associated with the modes and if so, the set of parameters that are included by the non-AP STA in the OMP request.

In an OMP request to disable UHR mode(s), the non-AP MLD shall indicate, for each non-AP STA and each UHR mode, the following:

* the link of the affiliated non-AP STA for which the request applies, corresponding to the mode, and
* the mode that is requested to be disabled.

An AP MLD that receives, via an affiliated AP, the OMP request from its associated non-AP MLD to enable, disable or update the parameters of one or more UHR modes should successfully transmit the OMP response on an enabled link where the corresponding non-AP STA affiliated with the non-AP MLD is in awake state:

* after all applicable AP(s) affiliated with the AP MLD is (are) ready to serve their associated non-AP STA(s) affiliated with that non-AP MLD in the requested mode(s) of operation and the requested parameters (if any), and
* within a timeout interval that starts at the end of the PPDU carrying the acknowledgment to the OMP request and that is initialized to the value carried in the UHR Operating Mode Timeout field of the UHR Capabilities element.

The OMP response shall be a UHR Link Reconfiguration Notify frame with the Type field in the frame set to 2.

A non-AP MLD that sends an OMP request to enable, disable, or update the parameters of UHR mode(s) for its affiliated non-AP STA(s) shall have its affiliated non-AP STA(s) start operating with the mode(s) as indicated in the OMP request on the corresponding link(s) with the indicated parameters (if applicable) immediately after sending an acknowledgement to the OMP response received from the associated AP MLD or at the expiration of the transition timeout, whichever comes first.

An AP MLD that receives an OMP request to enable, disable, or update the parameters of UHR mode(s) for the affiliated non-AP STA(s) of an associated non-AP MLD shall have its affiliated AP(s) start serving the non-AP STA(s) with the mode(s) as indicated in the OMP request on the corresponding link(s) with the indicated parameters (if applicable) immediately after receiving an acknowledgement to the OMP response transmitted by the associated AP MLD or at the expiration of the transition timeout, whichever comes first.