IEEE P802.11
Wireless LANs

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| Enhancements to Protected Association |
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Abstract

This submission is related to the presentation 11-25-1098r0 on faster association.

This submission defines means to start data transmissions faster after the association. The encrypted association request and response frames are safe and private frames to carry IP address and BA setup signaling.

Encapsulating more signaling to the setup frames reduces the number of transmitted setup frames which eliminates setup delays and reduces signaling overheads.

**9.3.3.5 Association Request frame format**

*Instructions to the Editor: Please make the following changes*

|  |  |  |
| --- | --- | --- |
| **Order**  | **Information**  | **Notes** |
| 27 | FILS HLP Container | One or more FILS HLP Container elements are optionally present if association response frame is protected or dot11FILSActivated is true; otherwise not present. |
| … | … | … |
| Last Assigned +3 | Combined BA Setup | The Combined BA Setup element is optionally present if association request frame is protected; otherwise not present. |

**9.3.3.6 Association Response frame format**

*Instructions to the Editor: Please make the following changes*

|  |  |  |
| --- | --- | --- |
| **Order**  | **Information**  | **Notes** |
| 36 | FILS HLP Container | One or more FILS HLP Container elements are optionally present if association response frame is protected or dot11FILSActivated is true; otherwise not present. |
| … | … | … |
| Last Assigned +2 | Combined BA Setup | The Combined BA Setup element is optionally present if association response frame is protected; otherwise not present. |

**9.3.3.7 Reassociation Request frame format**

*Instructions to the Editor: Please make the following changes*

|  |  |  |
| --- | --- | --- |
| **Order**  | **Information**  | **Notes** |
| 32 | FILS HLP Container | One or more FILS HLP Container elements are optionally present if reassociation response frame is protected or dot11FILSActivated is true; otherwise not present. |
| … | … | … |
| Last Assigned +3 | Combined BA Setup | The Combined BA Setup element is optionally present if reassociation request frame is protected; otherwise not present. |

**9.3.3.8 Reassociation Response frame format**

*Instructions to the Editor: Please make the following changes*

|  |  |  |
| --- | --- | --- |
| **Order**  | **Information**  | **Notes** |
| 39 | FILS HLP Container | One or more FILS HLP Container elements are optionally present if reassociation response frame is protected or dot11FILSActivated is true; otherwise not present. |
| … | … | … |
| Last Assigned +2 | Combined BA Setup | The Combined BA Setup element is optionally present if reassociation response frame is protected; otherwise not present. |

**9.4.2.25 Extended Capabilities element**

*Instructions to the Editor: Please add the following new fields before the reserved fields to Table 9-192.*

**Table 9-192—Extended Capabilities field**

|  |  |  |
| --- | --- | --- |
| **Bit** | **Information** | **Notes** |
| <ANA> | IPv4 Address Check | In an AP, set to 1 to indicate that the AP is capable to check whether the IPv4 address of previous association is still assigned to the STA. In a STA, set to 1 to indicate that the STA requests AP to perform ARP Query or DHCP Request Operation as carried in the FILS HLP element.  |
| <ANA> | IPv6 Router Advertisement | In an AP, set to 1 to indicate that the AP is capable to provide the latest one or more router advertisements in a protected (re)association response frame. In a STA, set to 1 to indicate that the STA requests AP to include the latest router advertisement to the (re)association response frame.  |
| <ANA> | Combined BA  | Set to 1 to indicate that the STA is capable to setup the block acknowledgements by using Combined BA Setup elements.  |

**9.4.2.xxx Combined BA Setup element**

*Instructions to the Editor: Please add the new element.*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Element Id | Length | Element Id Extension | Dialog Token | Block Ack Action | TID Bitmap | Per UP BA Parameters |
| 1 | 1 | 1 | 1 | 1 | 2 | 8 – 64 |

**Figure – 9-xxx Combined BA Setup element format.**

The Element ID, Length and Element ID Extension fields are defined in 9.4.2.1 (General).

The Dialog Token field is defined in 9.4.1.12(Dialog Token field).

The Block Ack Action field is defined in 9.6.4.1(Block Ack Action field).

The TID Bitmap position indicates a TID. Bit in position X set to 1 indicates that Per UP BA Parameters is set for this TID; otherwise, the bit is set to 0.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Status Code | Block Ack Parameter Set | Timeout | Block Ack Starting SN | ADDBA Capabilities |
| 0 or 1 | 2 | 2 | 2 | 1 |

**Figure – 9-xxx Per UP BA Parameters field**

The Status Code field is defined in 9.4.1.9 (Status Code field).

The Block Ack Parameter Set field is defined in 9.4.1.13 (Block Ack Parameter Set field).

The Block Ack Timeout Value field is defined in 9.4.1.14 (Block Ack Timeout Value field).

The Starting Sequence Number subfield of the Block Ack Starting Sequence Control field (see Figure 9-48(Block Ack Starting Sequence Control subfield format)) contains the sequence number of the first or next (in the case of a renegotiation of a block ack agreement) MSDU (not in an A-MSDU) or A-MSDU to be sent under this block ack agreement. The Fragment Number subfield is set to 0.

The ADDBA Capabilities field is defined in 9.4.2.138(ADDBA Extension element).

**9.6.42 EDP Action frame details**

*Instructions to the Editor: Please make the changes to the Table 9–658u as shown below.*

**Table 9-658u – EDP Action field values**

|  |  |
| --- | --- |
| **Value** | **Meaning** |
| … | … |
| 8 | BA Setup |
| ~~8~~9-255 | Reserved  |

**9.6.42.11 BA Setup frame format**

*Instructions to the Editor: Please include the new subclause as shown below.*

The BA Setup frame allows a STA to request or respond to a block ack setup of one or more TIDs. The Action field of the BA Setup frame contains the information shown in Table 9-658X (BA Setup frame Action field format).

**Table 9-658X – BA Setup frame Action field format**

|  |  |
| --- | --- |
| **Order** | **Meaning** |
| 0 | Category |
| 1 | EDP Action |
| 2 | Combined BA Setup |

The Category field is defined in 9.4.1.11 (Action field).

The EDP Action field is defined in 9.6.42.1 (EDP Action field).

The Combined BA Setup element is defined in 9.4.2.xxx (Combined BA Setup element).

**12.16.6.3 IPv4 Address Assignment in protected association**

*Instructions to the Editor: Please include the new subclause as shown below.*

An AP affiliated with an EDP AP MLD transmits Beacon and Probe Response frames with IPv4 Address Check field of the Extended Capabilities element set to 1 to indicate that the AP MLD is capable to check whether the STA’s IPv4 address of the previous association is still assigned to the associating STA.

A STA affiliated with a non-AP MLD that associates with the AP may set a IPv4 Address Check field of the Extended Capabilities element of a protected (Re)Association Request frame to 1 and include a FILS HLP element with either an individually addressed ARP Query message for the previously used IPV4 address or a broadcast DHCP Request message to renew the IPv4 address lease as specified in the RFC 4436. The transmission of FILS HLP element is described in 11.45.3.2(Higher layer protocol encapsulation).

The AP that receives such protected (Re)Association Request frame shall send the unicast APR Query to the router, or the broadcast the DHCP Request, carried in the FILS HLP element.

The AP includes the response it receives to the sent ARP Query or DHCP Request, in the FILS HLP element of the (Re)Association Response frame. The FILS HLP element is not included to the (Re)Association Response frame, if the AP has not received a response before it transmits the (Re)Association Response frame, but may send the received response as a data frame, as described in 11.45.3.2(Higher layer protocol encapsulation).

The non-AP MLD that receives the (Re)Association Response with the FILS HLP element may continue to operate with the IPv4 address as specified in the RFC 4436.

**12.16.6.3 IPv6 Router Advertisement Solicitation**

*Instructions to the Editor: Please include the new subclause as shown below.*

An AP affiliated with an EDP AP MLD transmits Beacon and Probe Response frames with IPv6 Router Advertisement field of the Extended Capabilities element set to 1 to indicate that the AP MLD is capable to include IPv6 Router Advertisement in the FILS HLP element of the protected (Re)Association Response frame.

A STA affiliated with an EDP non-AP MLD transmits a protected (Re)Association Request frame with IPv6 Router Advertisement field in the Extended Capabilities element set to 1 to request IPv6 router advertisement to be included in the FILS HLP element of the (Re)Association Response frame. The transmission of FILS HLP element is described in 11.45.3.2(Higher layer protocol encapsulation).

The AP shall include a IPv6 router advertisement in the FILS HLP element of the (Re)Association Response frame, if the AP has received a (Re)Association Request frame with IPv6 Router Advertisement field in the Extended Capabilities element set to 1. Otherwise, the AP may add the router advertisement in the FILS HLP element of the frame.

**12.16.6.4 BA setup during protected association**

*Instructions to the Editor: Please include the new subclause as shown below.*

Currently, non-AP MLD and AP MLD may setup a block ack only by using ADDBA Request and ADDBA Response frames. The ADDBA frames are direction and UP specific, which adds a lot of management frames overhead.

The association request and response frames may setup block acknowledgements as described in 11.5.2(Setup and modification of the block ack parameters) with the following modifications:

* Combined BA Setup element aggregates ADDBA Request or ADDBA Response information of one or more TIDs.
* The Combined BA Setup element may be included in (re)association request, (re)association response and BA Setup frames.

An AP affiliated with an EDP AP MLD transmits Beacon and Probe Response frames with Combined BA field of the Extended Capabilities set to 1 to indicate that the AP is capable to receive (Re)Association Request frames with Combined BA Setup element.

An EDP non-AP MLD that transmits a (Re)Association Request frame to an AP affiliated with an EDP AP MLD that has set Combined BA field to 1 in a Beacon or Probe Response frames may include a Combined BA Setup element to the (Re)Association Request frame to request UL block acknowledgements setup with the following settings. The Block Ack Action field of the Combined BA Setup element is set to ADDBA Request. Value 1 in a bit of the TID Bitmap field indicates that a TID of the corresponding position of the bit within the TID Bitmap field shall have a Per UP BA Parameters fields included in the Combined BA Setup element. The Per UP BA Parameters fields are listed in the increases TID order in the Combined BA Setup element.

The AP that responds with a (Re)Association Response frame to a received (Re)Association Request frame with the Combined BA Setup element shall include a Combined BA Setup element to respond to the block acknowledgements setup request with the following settings. The Block Ack Action field of the Combined BA Setup element is set to ADDBA Response. Value 1 shall be set to the same bits as in the TID Bitmap field of the (Re)Association Request frame and the Per UP BA Parameters fields shall include the Combined BA Setup element for each included TID. The Per UP BA Parameters fields are listed in the increases TID order in the Combined BA Setup element.

The AP may include another Combined BA Setup element to the (Re)Association Response frame to request DL block acknowledgements setup with the following settings. The Block Ack Action field of the Combined BA Setup element is set to ADDBA Request. Value 1 in a bit of the TID Bitmap field indicates that a TID of the corresponding position of the bit within the TID Bitmap field shall have a Per UP BA Parameters fields included in the Combined BA Setup element. The Per UP BA Parameters fields are listed in the increases TID order in the Combined BA Setup element.

Associated STAs and AP MLDs may request and respond block acknowledgement setups with BA Setup frame. The Combined BA Setup element in the BA Setup frame may include ADDBA Request or ADDBA Response parameters to one or more TIDs.

If a STA affiliated with a non-AP MLD has received in (Re) Association Response frame a Combined BA Setup element that requests block acknowledgement setup to one or more TIDs, or the STA has received a BA Setup frame requesting block acknowledgements setup to one or more TIDs, then the STA shall respond with a BA Setup frame that includes a Combined BA Setup element with the following setting. The Block Ack Action field of the Combined BA Setup element is set to ADDBA Response. Value 1 shall be set to the same bits as in the TID Bitmap field of the (Re)Association Request frame and the Per UP BA Parameters fields shall include the Combined BA Setup element for each included TID. The Per UP BA Parameters fields are listed in the increases TID order in the Combined BA Setup element.