IEEE P802.11
Wireless LANs

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| Max Number of MSDUs in an A-MSDU |
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Abstract

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# Comment

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| --- | --- | --- | --- | --- | --- |
| 6855 | 116.15 | 9.11 | There is no limit on the number of MSDUs that can be packed in an A-MSDU sent in a MPDU. Potentially the number of MSDUs can be very large. As an example, assuming small packets of 62Bytes (e.g. ~TCP ACK) an MPDU of 11454Bytes could include up to 184 MSDUs. For a max sized A-MPDU of 64 MPDUs this can potentially result in >11000 MSDUs. These numbers are exemplary to illustrate the problem. In general, processing a high and unpredictable number of MSDUs increases complexity of receiver | Add an optional indication for a receiver VHT STA to signal to a transmitter VHT STA that the number of MSDUs per MPDU shall be less than a given number; ability to limit the number of MSDUs in a MPDU to <= 16 is suggested. The indication can be in the form of a capability indication (TBD). The current operation mode (no limit) is also preserved; Restriction can only be signaled by a VHT STA to a VHT STA; restriction refers to number of MSDUs sent in any MPDU where A-MSDU is allowed. | REVISE. Adopt resolution as in DCN 12/0917r1 (this document) |

# Discussion

In the current specifications (D3.0 and 802.11-2012) there is no limit on the number of MSDUs that can be packed in an A-MSDU sent in a MPDU. Potentially the number of MSDUs can be very large. As an example, assuming small packets of 62Bytes (TCP Ack)



an MPDU of 11454Bytes could include up to 183 MSDUs.

Even worse, a rogue (but spec compliant) STA may send MPDUs with QoS control AMSDU set to 1, and rest of payload set to all 0s, which could be interpreted as series of 14bytes MSDUs (DA==SA==length all 0). In this case a 11454Byte MPDU may include up to 11454/14 = 818 MSDUs!

In general, the processing of a high and unpredictable number of MSDUs within a single MPDU implies increased complexity of receiver design. Note that in a MPDU there is only one FCS field at the end, which determines the correctness of all the MSDUs included in the MPDU; being the FCS at the end, by the time an error is detected a huge number of MSDUs may have been already processed, uselessly. The design though needs to account for the worst case, hence the increased memory requirement and processing complexity.

If we further consider that up to 64MPDUs can be aggregated, a PPDU could end up carrying thousands of MSDUs. Receiver design need also to take into account this total unpredictable number.

# Proposed resolution:

Add an optional indication for a receiver VHT STA to signal to a transmitter VHT STA that the number of MSDUs per A-MSDU (i.e. per MPDU) shall be less than a given number.

The limit refers to A-MSDUs sent within any type of PPDU/frame where A-MSDU is allowed.

Transmitters have to honor the limitation indicated by the receiving STA.

The preferred limitation can be indicated by one of the reserved bits of the Extended Capabilities element.

The limitation can be defined by using 2 bits as

* + 0 🡪 any A-MSDU shall carry no more than 16 MSDUs
	+ 1🡪 any A-MSDU shall carry no more than 32 MSDUs.
	+ 2🡪 any A-MSDU shall carry no more than 64 MSDUs.
	+ 3🡪 No limit in the number of MSDUs in an A-MSDU.

Note that the proposed limit is optional so that STAs that do not want to limit the number of A-MSDUs are free to preserve the operation with no limitations

Limiting the A-MSDU number to e.g. 16 has no or limited impact on the throughput.

In fact assuming typical MSDUs of 1500Bytes, a limit of e.g. 16 MSDUs per MPDU would already exceed the maximum MSDU size of 11454; in this case there is no impact to throughput.

For e.g. MSDUs of 500 Bytes, the limit of 16 MSDUs would result in ~8000Bytes A-MSDU i.e. it would not cause any throughput loss up to the maximum MPDUs size of 7991 Bytes, and it may cause some loss in case of max MPDU size of 11454 Bytes.

**Editing instructions**

**9.11 A-MSDU operation**

***Add the following paragraph at the end of the section***

A VHT STA shall not transmit to a recipient VHT STA an A-MSDU that includes a number of MSDUs greater than the number indicated by the Max Number of MSDUs in A-MSDU field in the Extended Capabilities element most recently received from the recipient STA.

* Extended Capabilities element

Insert new rows for bits 61- 64 as shown below in Table 8-103 and change the range of the reserved bits in the last row to exclude these bits:

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| * Capabilities field
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| Bit | Information | Description |
| 61 | TDLS Wider Bandwidth | The TDLS Wider Bandwidth subfield indicates whether the STA supports a wider bandwidth than the BSS bandwidth for a TDLS direct link on the base channel. The field is set to 1 to indicate that the STA supports a wider bandwidth on the base channel and to 0 to indicate that the STA does not support a wider bandwidth on the base channel. A 160 MHz bandwidth is defined to be identical to a 80+80 MHz bandwidth (i.e. one is not wider than the other).(#6312) |
| 62 | Operating Mode Notification | If dot11OperatingModeNotificationImplemented is true, the Operating Mode Notification field is set to 1 to indicate support for reception of the Operating Mode Notification element and the Operating Mode Notification frame.If dot11OperatingModeNotificationImplemented is false or not present, the Operating Mode Notification field is set to 0 to indicate lack of support for reception of the Operating Mode Notification element and the Operating Mode Notification frame. |
| 63-64 | Max Number of MSDUs in A-MSDU | Indicates the maximum number of MSDUs in an A-MSDU the STA is able to receive.Set to 0 for 16.Set to 1 for 32.Set to 2 for 64.Set to 3 for indicating that no limit applies.  |