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Wireless LANs

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|  |  |  |  |  |

Abstract

This document contains proposed resolutions for comment CID 655 in the MRG category from LB164.

**3. Definitions**

***Insert new definitions 3.aa11and 3.aa12 retaining the alphabetic ordering:***

3.aa11. Groupcast transmitter/receiver: A STA with groupcast data to send is referred to as the groupcast transmitter and the STAs which are receivers of that data are reffered to as the groupcast receivers. In a BSS, the AP only can play the role of the groupcast transmitter while a non-AP STA associated to this AP can be the groupcast receiver. In an MBSS, any mesh STA can play the role of the groupcast transmitter and any its peer mesh STAs can be the groupcast receiver.

***Change clause 5.2.12.2 in 802.11aa\_D1.02 as follows:***

**5.2.12.2 More Reliable Groupcast**

The More Reliable Groupcast Service allows a ~~non-AP STA~~ groupcast receiver to request greater reliability for one or more group addressed streams that the ~~non-APa STA~~ groupcast receiver receives. Greater reliability is provided via transmission as individually addressed frames, unsolicited retries, or the Block Ack mechanism. The ~~non-AP STA~~ groupcast receiver may also request reduced delivery latency, so that the ~~AP~~ groupcast transmitter transmits the frames via EDCA within regular Service Periods.

***Change clause 5.2.13.3 in 802.11aa\_D7 as follows:***

**5.2.13.3 Mesh STA**

A STA that belongs to a mesh BSS is termed a mesh station (mesh STA). Mesh STAs are QoS STAs that support mesh services, i.e., they participate in interoperable formation and operation of a Mesh Basic Ser-vice Set (MBSS). A mesh STA implements a subset of the QoS functionality.This subset is as follows:

 — Use of QoS frame format, EDCA (as a part of MCF), Block Acknowledgement (optional), and No Acknowledgement (optional).

The QoS functionality depending on a Hybrid Coordinator (HC) does not apply in a mesh BSS. In particular a mesh STA does not implement the following subset of the QoS functionality:

 — HCCA, traffic specification (TSPEC), traffic stream (TS) management, admission control, automatic power save delivery (APSD), and direct-link setup (DLS).

However, a mesh STA can use TSPEC, TCLAS, and TCLAS processing elements to establish DMS or MRG agreements.

***Change clause 7.4.12.25 in 802.11aa\_D1.02 as follows:***

**7.4.12.25 DMS Request frame format**

The DMS Request frame is sent by a ~~non-AP STA~~ groupcast receiver to the ~~AP~~ groupcast transmitter to define information about a DMS request to the ~~AP~~ groupcast transmitter. The format of the DMS Request frame is defined in Figure 7-101n30.

The Dialog Token field is a non-zero value chosen by the ~~non-AP STA~~ groupcast receiver sending the DMS Request frame to identify the request/response transaction.

**7.3.2.88 DMS Request element**

***Change paragraph 5 in 802.11v\_D14.0 as follows:***

The DMSID field is set to 0 when the Request Type field is "Add" as defined in Figure 7-43bc, otherwise

the DMSID field is set to the non-zero value assigned by the ~~AP STA~~ groupcast transmitter to identify the DMS traffic flow.

***Change paragraph 4 in 802.11aa\_D1.02 as follows:***

Each DMS Descriptor contains zero or one MRG Request subelements. If present and the Request Type field is set to ―”Add”or ―”Change”, the MRG Request subelement indicates a request by a ~~non-AP STA~~ groupcast receiver to its ~~associated AP~~ groupcast transmitter to respectively add or change the MRG service for a group address stream identified by the TCLAS information element or DMSID in the DMS Descriptor, respectively. The format of the MRG Request subelement is shown in Figure 7-aa3.

**7.3.2.89 DMS Response element**

***Change paragraph 5 in 802.11v\_D14.0 as follows:***

The DMSID field is assigned by the ~~AP~~ groupcast transmitter and provides a unique (for this groupcast trasmitter) identifier ~~within the BSS~~  for the DMS traffic flow identified by the TCLAS Elements, TCLAS Processing Element and TSPEC Element fields. The uniqueness of the identifier is independent of the ordering of the TCLAS elements.

***Change paragraph 1 in 802.11aa\_D1.02 as follows:***

The Response Type field indicates the response type returned by the ~~AP~~ groupcast transmitter responding to the ~~non-AP STA's~~ groupcast receiver’s request, as indicated in Table 7-43bd.

The Status field indicates the status returned by the ~~AP~~ groupcast transmitter responding to the ~~non-AP STA's~~ groupcast receiver’s request or indicates the DMS Status is an advertisement by the ~~AP~~ groupcast transmitter of an existing MRG service in the BSS, as indicated in Table 7-43bd.

**Table 7-43be—Response Type field values**

|  |  |  |
| --- | --- | --- |
| Field value  | Description  | Notes |
| 0 | Accept | ~~AP~~ Groupcast transmitter accepts the DMS or MRG request |
| 1 | Denied | ~~AP~~ Groupcast transmitter rejects the DMS or MRG request |
| 2 | Terminate | ~~AP~~ Groupcast transmitter terminates the previously accepted DMS or MRG request |
| 3 | MRG Advertise | ~~AP~~ Groupcast transmitter advertises an existing MRG service ~~in the BSS~~ |

***Change paragraph 9 in 802.11v\_D14.0 as follows:***

When the Response Type field is “Terminate” and the Last Sequence Control field is supported, Bit 0 to Bit 3 of the Last Sequence Control field is 0, and Bit 4 to Bit 15 of the Last Sequence Control field contains the sequence number of the last group addressed frame that the ~~AP~~ groupcast transmitter converted to an individually addressed frame and sent successfully to the ~~non-AP STA~~ groupcast receiver, that is the receiver of the DMS Response Frame. If this last frame received by the ~~non-AP STA~~ groupcast receiver prior to DMS termination has not also been sent using a group addressed frame, the Last Sequence Control field is set to 65534.

***Change the paragraph after Table 7-43be:***

The MRG Response subelement contains a response by an ~~AP~~ groupcast transmitter to an MRG request by a ~~non-AP STA~~ groupcast receiver for MRG service for a group address, or an unsolicited(#572) advertisement for the parameters of a group addressed stream subject to the MRG service.

***Change paragraph 8 and 9 in 802.11aa\_D1.02 as follow:***

The MRG Ack Policy field is set to indicate the current MRG Ack policy selected by the ~~AP~~ groupcast transmitter for the group address for which the MRG service is requested. The values are shown in Table 7-aa4

The MRG Power Management Mode field is set to indicate the current MRG Power Management mode selected by the ~~AP~~ groupcast transmitter for the group address for which the MRG service is requested. The values are shown in Table 7-aa5.

**9.10.10 MRG Block Ack**

 This subclause extends the Block Ack mechanism to group addressed frames that are subject to the MRG Block-Ack Ack policy. In this subclause, the STA with data to send using the Block Ack mechanism is

referred to as the *originator*, and the receiver of that data as the *recipient*.

A protective mechanism (such as transmitting using HCCA, RTS/CTS, MCCA, or another mechanism described in 9.13) should be used to reduce the probability of other STAs transmitting during the MRG TXOP. If no protective mechanism is used, then the first frame that is sent as an MRG block should have a response frame that(#688) has the Duration field set based on the first frame, and the Duration fields in the first and response frames set the NAVs to appropriate values at all STAs in the BSS and OBSS(s) or at peer mesh STAs of the the originator and receivers in the MBSS. In BSS, if there is more than one STA in a MRG group, an AP may use the OBSS information reported by STAs to select the responding STA.

After an ~~AP~~ originator transmits between one and MRG Buffer Size MSDUs or A-MSDUs with RA set to an MRG group address when the Ack Policy for that group address is MRG-Block-Ack, the ~~AP~~ originator shall send a BlockAckReq to the group address. The BlockAckReq lists none, one, some or all of the MRG group members in the MRG BAR Information field. In BSS, If the source of the MRG group addressed stream is within the BSS, the AP shall not send a BlockAckReq listing the source STA.

NOTE-In one procedure, the ~~AP~~ originator sends a BlockAckReq listing one group member per MRG frame transmission. The ~~AP~~ originator begins with the first member of the MRG group and cycles through the members as the AP transmits each subsequent MRG frame.

When a ~~non-AP STA~~ recipient receives a BlockAckReq with an RA equal to an MRG group address with the ~~non-AP STA‘s~~ recipient’s AID listed in the MRG BAR Information field, the ~~non-AP STA~~ recipient shall determine the number of order, *n*, in which it is listed in the BlockAckReq with the lowest AID in the list as 0, and shall transmit a BlockAck frame at a delay of (*n*+1)\*SIFS + *n*\*TXTIME(BlockAck) after the BlockAckReq. The BlockAck acknowledges the listed ~~STA‘s~~ recipient’s receiving status of the block of group addressed frames requested by the BlockAckReq frame. The receive buffer operation, the selection of BlockAck and BlockAckReq variants, and the BlockAck generation shall follow the rules in 9.10.4, 9.10.6, and 9.10.7.

MRG group members that are not identified in the MRG BAR Information field of the BlockAckReq shall not respond to the BlockAckReq yet shall still use the Block Ack Starting Sequence Control to update the first MPDU in the block for which an acknowledgment is expected. The BlockAckReq may list zero MRG group members from whom a BlockAck is requested. This shall have the effect of updating the receiving MRG group members with a new first Block Ack Starting Sequence Control. A typical frame exchange sequence using the MRG-Block-Ack Ack policy for a single TID is shown in Figure 9-aa1.

BlockAckReq and BlockAck frames may be lost or incorrectly received by the intended Block Ack recipients. If an ~~AP~~ originator transmits an MRG BlockAckReq including a list of MRG group members in the MRG BAR Information field yet does not successfully receive BlockAck frames from all the listed STAs, then the ~~AP~~ originator may retransmit, in a new TXOP, a BlockAckReq with STAs from whom the AP has not received a BlockAck listed in the MRG BAR Information field.

The process of sending additional BlockAckReq frames for outstanding STAs is repeated until terminated by the ~~AP~~ Block Ack originator or no outstanding STAs remain. The process may be restarted by the ~~AP~~ originator transmitting an updated BlockAckReq with a new Block Ack Starting Sequence Control field if the data MSDUs requested for acknowledgement in the BlockAckReq have reached their lifetime limit. The ~~AP~~ originator shall not transmit a BlockAckReq listing a member of an MRG group when the ~~AP~~ originator has already received from the group member an acknowledgement of all outstanding frames in the MRG stream.

NOTE-In one procedure, the ~~AP~~ originator sends a BlockAckReq listing one group member per MRG frame transmission. The ~~AP~~ originator begins with the first member of the MRG group and cycles through the members as the ~~AP~~ originator transmits each subsequent MRG frame.

After completing the BlockAckReq and BlockAck frame exchanges, the ~~AP~~ originator determines from the information provided in the BlockAck bitmap and from the missing BlockAcks which, if any, MSDUs or A-MSDUs that (#679) need to be retransmitted.

 An ~~AP~~ originator adopting the MRG-Block-Ack policy for an MRG group address chooses a lifetime limit for the group address. The ~~AP~~ originator may vary the lifetime limit for the group address at any time, and may use different lifetime limits for different MRG group addresses. The ~~AP~~ originator transmits and retries each MSDU or A-MSDU until to the appropriate lifetime limit, or whenever received by all group members, whichever occurs first.

An ~~AP~~ originator may regularly send a BlockAckReq with Address 1 set to the MRG group address and the Block Ack Starting Sequence Control set to the sequence control field of the earliest non-expired MSDU or A-MSDU of the MRG stream, for MRG streams with Ack policy equal to MRG-Block-Ack, if there exist management frames, QoS data frames with another group address in the Address 1 field or non-QoS data frames transmitted with sequence numbers higher (modulo-4096) than the sequence number within the Block Ack Starting Sequence Control of the last transmitted BlockAckReq sent with Address 1 set to the MRG group address, in order to minimize buffering latency at receivers in the MRG group.

NOTE-This is because an ~~AP~~ originator may transmit management frames, QoS data frames with a group address in the Address 1 field (including different MRG streams), and non-QoS data frames intermingled. Since these are transmitted using a single sequence counter, missing frames or frames sent to group addresses absent from a ~~receiving STA‘s~~ recipient’s dot11GroupAddresses table complicates receiver processing for MRG streams witha MRG-Block-Ack Ack policy since the(#326) cause of a hole in a receiver‘s Block Ack bitmap is ambiguous: it is due either to an MPDU being lost from the MRG stream or to transmissions of MPDUs using the same sequence number counter yet from other than the MRG stream.

If an ~~AP~~ originator senses a missing BlockAck frame in response to the ~~AP’s~~ originator’s BlockAckReq frame, the ~~AP~~ originator may perform error recovery by retransmitting a BlockAckReq frame PIFS after the previous BlockAckReq or BlockAck frame when the following conditions are met:

- (#562)The carrier (#107)sense mechanism (see 9.2.1) indicates that the medium is idle at the TxPIFS slot boundary (defined in 9.2.10) after the expected start of a BlockAck, and

- (#562)The Duration of the failed BlockAck is longer than the total time of the retransmitted MRG BlockAckReq plus one slot time.

The MRG BAR Information field in the retransmitted BlockAckReq shall only list STAs listed in the initial MRG BAR Information field that have higher AIDs than the STA with the failed BlockAck.

NOTE-The retransmitted BlockAckReq shall use the same rate and modulation mode as the original BlockAckReq.

If an ~~AP~~ originator senses a missing BlockAck frame in response to the ~~AP’s~~ originator’s BlockAckReq frame yet there is insufficient time to transmit a recovery frame, an ~~AP~~ originator may retransmit a BlockAckReq frame in a new TXOP in order to request BlockAcks from the STAs previously failing to respond with a BlockAck.

***Change clause 11.22.15.2 as follows:***

**11.22.15.2 MRG Procedures**

**11.22.15.2.1 Overview**

More Reliable Groupcast (MRG) is a flexible service to improve the delivery of group addressed frames while optimizing for a range of criteria. MRG is an enhanced yet constrained extension of DMS. In particular, a) an MRG agreement applies to a single group address whereas a DMS flow is defined by TCLAS information element(s) and an optional TCLAS Processing information element, ~~and~~ b) DMS offers multicast-to-unicast conversion only whereas MRG includes a superset of Ack policies and Power Management modes, and c) MRG can be used in both BSS and MBSS. MRG employs the DMS Request and DMS Response elements modified by MRG Request and Response subelements respectively for administering the set up and tear down of MRG services between an ~~AP~~ groupcast transmitter and ~~non-AP STAs~~ groupcast receivers. The DMS procedures and state machine of 11.22.15.1 shall apply to MRG with the extensions and constraints specific to MRG described below in 11.22.15.2.2 to 11.22.15.2.7. 24

MRG defines two additional Ack policies for group addressed frames, in addition to the mechanisms defined in 9.2.7 (labeled ―No-Ack/No-Retry, or ―non-MRG), and 11.22.15.2.1 (labeled MRG-DMS)

* MRG-Unsolicited-Retry
* MRG-Block-Ack

MRG-DMS allows the transmission of group addressed MSDUs as individually addressed A-MSDUs. It has low efficiency and scalability, and high delay (if multiple group members) and high reliability. MRG-Unsolicited-Retry allows unsolicited retries. It has moderate delay, efficiency and reliability, and high scalability. MRG-Block-Ack extends the BA mechanism to group addresses. MRG-Block-Ack has moderate delay, high efficiency, scalability, and reliability. Two Power Management modes for group addressed frames are defined in MRG:

— As per 11.2.1 (labeled ―All-Active/Any-PS‖) or FMS (see 11.2.1.4a) (collectively labeled ―non-38 MRG-SP)

— MRG-SP (see 11.22.15.2.7)

MRG-SP transmits MRG group addressed frames via EDCA at scheduled Service Periods. Compared to non-MRG-SP, MRG-SP has lower delay and jitter and moderate power savings.

**11.22.15.2.2 MRG Frame Exchange Procedures**

If an ~~AP~~ groupcast transmitter detects that a ~~non-AP STA~~ groupcast receiver with Robust AV Streaming set to 1 in the Extended Capabilities element in the non-AP STA‘s most recent (Re)Association Request or in mesh beacon is a member of one or more MRG groups and does not have an MRG agreement for the group(s), then the ~~AP~~ groupcast transmitter may alert the ~~non-AP STA~~ groupcast receiver by sending an unsolicited individually addressed DMS Response frame that contains one DMS Status field with an MRG Response subelement per group addressed stream. Each DMS Status field includes a TCLAS element to identify the MRG group address, the DMSID corresponding to this MRG traffic flow, and other associated parameters. The Status field of this DMS Status field shall be set to ―MRG Advertise. The ~~non-AP STA~~ groupcast receiver may choose to ignore the DMS Response frame, or to initiate an MRG agreement for one or more of the group addresses.

Note-Group membership detection may be achieved via IGMP snooping.

A ~~non-AP STA~~ groupcast receiver may request use of the MRG service for a group address by sending a DMS Descriptor, as described in 11.22.15.1 with the following modifications: (#742)

— (#562)The DMS Descriptor shall contain one TCLAS element with Frame classifier type equal to 0 (Ethernet parameters), zero TCLAS processing elements, one TSPEC element and one MRG Request subelement.

— (#562)The TSID subfield within the TS Info field of the TSPEC element shall be reserved. Since the ~~AP~~ groupcast transmitter may choose a Power Management mode of MRG-SP, the ~~non-AP~~ STA should set the Minimum Service Interval, Maximum Service Interval and Service Start Time fields in the TSPEC to indicate the STA‘s preferred wake-up schedule.

— (#562)The MRG Request subelement specifies the Ack policy and a Power Management mode requested by the ~~non-AP STA~~ groupcast receiver for the group addressed stream.

A ~~non-AP STA~~ groupcast receiver shall not request simultaneous transmission of an MRG group address stream via both MRG and DMS.

An ~~AP~~ groupcast transmitter accepts an MRG request by sending a DMS Status field with the Status field set to ―Accept as described in 11.22.15.1 with the following modifications:

* (#562)The DMS Status field shall include an MRG Response subelement indicating the Ack policy and Power Management mode for the group addressed stream.
* (#562)If the MRG group address stream is subject to the MRG-SP Power Management mode, then the ~~AP~~ groupcast transmitter shall also include a Schedule element in the DMS Status field indicating the wake-up schedule for the group address stream.

For each MRG Request subelement, the ~~AP~~ groupcast transmitter may adopt the requested Ack policy and Power Management mode, maintain its existing Ack policy and Power Management mode, select an alternate Ack policy and Power Management mode or deny MRG service for the group addressed stream. The Ack policy shall not be MRG-Block-Ack for an MRG group address while the ~~AP~~ groupcast transmitter has an MRG agreement for the group address with a ~~non-AP STA~~ groupcast receiver that(#688) had the Advanced MRG field set to 0 in the Extended Capabilities element. ~~in the (Re)Association Request most recently received by the AP.~~

An ~~AP~~ groupcast transmitter denies an MRG request by sending a DMS Status field with the Status field set to ―Deny as described in 11.22.15.1 with the following modifications:

* (#562)The DMS Status field shall include an empty MRG Response subelement

The ~~AP~~ groupcast transmitter shall not reject a Reassociation Request for the reason that one or more MRG Service requests are denied. If the ~~non-AP STA~~  groupcast receiver determines that one or more MRG Response subelements are unacceptable, then the ~~non-AP STA~~ groupcast receiver shall discard any received ADDBA request frames for the unacceptable MRG streams and the ~~non-AP STA~~ groupcast receiver shall send a new DMS Request frame containing a DMS Request element with one DMS Descriptor for each unacceptable MRG stream. The DMSID fields shall be set to the DMSIDs of the unacceptable streams and the Request Type field shall be set to ―Remove.

The ~~AP~~ groupcast transmitter may update the Ack policy, Power Management mode, and Schedule as the size of the group changes, the capabilities of the members of the group change, MRG Request subelements for the group are received, Multicast Diagnostics or for any other reason. The ~~AP~~ groupcast transmitter advertises the current settings upon a change and periodically by either:

* Transmitting an unsolicited DMS Response frame with the current settings addressed to the broadcast address. This DMS Response frame shall be scheduled for delivery at the appropriate DTIM interval or SP where all ~~non-AP STAs~~ groupcast receivers ~~within the group~~ are awake to receive the frame. One TCLAS element, one TSPEC element and one MRG Subselement shall be included per DMS Descriptor in the DMS Response element of the DMS Response frame to identify each MRG stream. The DMSID that identifies the MRG stream shall be included the DMS Descriptor. Each Status field in the DMS Status fields included in the frame shall be set to MRG Advertise.
* Transmitting an unsolicited DMS Response frame with the current settings addressed to the MRG group address. This DMS Response frame shall be scheduled for delivery at the appropriate DTIM interval or SP where all ~~non-AP STAs within the group~~ groupcast receivers are awake to receive the frame. One TCLAS element, one TSPEC element and one MRG Subselement shall be included per DMS Descriptor in the DMS Response element of the DMS Response frame to identify each MRG stream. The DMSID that identifies the MRG stream shall be included the DMS Descriptor. Each Status field in the DMS Status fields included in the frame shall be set to MRG Advertise.
* Transmitting unsolicited DMS Response frames with the current settings individually addressed to each MRG group member. The DMSID shall be included in per DMS Descriptor in the DMS Response element of the DMS Response frame to identify each MRG stream. No TCLAS element, no TSPEC element and no MRG Subselement shall be included in these DMS Descriptors. Each Status field in the DMS Status fields included in the frame shall be set to MRG Advertise.

~~Non-AP STAs~~ Groupcast receiver shall recover from missing group addressed MRG Response frames that advertise a changed Ack policy or Power Management mode according to Table 11-aa1 or Table 11-aa2, respectively.

**Table 11-aa1: Non-AP STA recovery procedures for a changed Ack policy**

|  |  |  |
| --- | --- | --- |
| Assumed Ack policy | Actual Ack policy | Recovery procedure |
| MRG | No-Ack/No-Retry | A ~~non-AP STA~~ groupcast receiver shall infer that an MRG stream is deleted if a) if the assumed Power Management mode is Non-MRG-SP and the recovery procedure for a Power Management mode changing from Non-MRG-SP to MRG-SP fails and b) no frames for an MRG stream are received via the MRG service within a timeout value |
| MRG-DMS | MRG-Unsolicited-Retry or MRG-Block-Ack | A ~~non-AP STA~~ groupcast receiver shall infer that the current Ack Policy of a MRG stream is MRG-Unsolicited-Retry or MRG-Block-Ack upon receiving an MSDU for the MRG group address concealed via the MRG Concealment address. |
| MRG-Unsolicited-Retry or MRG-Block-Ack | MRG-DMS | A ~~non-AP STA~~ groupcast receiver shall infer that the current Ack Policy of a MRG stream is MRG-DMS upon receiving an MSDU for an MRG group address concealed via the ~~non-AP~~ STA‘s individual address. |
| MRG-Unsolicited-Retry | MRG-Block-Ack | A ~~non-AP STA~~ groupcast receiver shall infer that the current Ack Policy of a MRG stream is MRG-Block-Ack upon receiving a BlockAckReq frame for the MRG group address |
| MRG-Block-Ack | MRG-Unsolicited-Retry | A ~~non-AP STA~~ groupcast receiver shall infer that the current Ack Policy of a MRG stream is MRG-Unsolicited-Retry if MSDUs for the MRG group address concealed via the MRG Concealment address are being received yet no BlockAckReq frames for the MRG group address are received within a timeout value. |

**Table 11-aa2: Non-AP STA recovery procedures for a changed Power Management mode**

|  |  |  |
| --- | --- | --- |
| Assumed Power Management mode | Actual Power Management mode | Recovery procedure |
| Non-MRG-SP | MRG-SP | A ~~non-AP STA~~ groupcast receiver shall infer that the current Power Management mode of a MRG stream is MRG-SP if a) no frames with the More field set to 1 for the MRG stream are received within a timeout value, and b) at least one frame for the MRG stream with the More field set to 0 is received. Note: Upon detecting condition a), the STA should enter the Awake state in order to assist with detecting condition b). |
| MRG-SP | Non-MRG-SP | A ~~non-AP STA~~ groupcast receiver shall infer that the current Power Management mode of a MRG stream is Non-MRG-SP if a) no frames with the More field set to 0 for the MRG stream are received within a timeout value, and b) at least one frame for the MRG stream with the More field set to 1 is received |

For each group addressed stream requested by the ~~non-AP STA~~ groupcast receiver, the ~~AP~~ groupcast transmitter shall immediately initiate a Block Ack negotiation(Ed) if all the following conditions are true:

* (#562)The ~~AP~~ groupcast transmitter advertised an Advanced MRG field set to 1 in its Extended Capabilities element
* (#562)The ~~non-AP STA~~ groupcast receiver advertised an Advanced MRG field set to 1 in the Extended Capabilities element ~~in the Reassociation Request most recently received by the AP.~~

If all the above conditions are true(Ed) the ~~AP~~ groupcast transmitter shall immediately initiate a Block Ack negotiation by sending an ADDBA Request frame to the ~~non-AP STA~~ groupcast receiver that originated the MRG request. The Block Ack Policy field in the Block Ack Parameter field within the ADDBA frames shall not be set to 0 (for delayed Block Ack). ~~non-AP STA~~ groupcast receivers shall maintain this Block Agreement for the duration of their MRG agreement, irrespective of whether the MRG-Block-Ack is the current Ack policy or not. While the Ack policy of the MRG group address stream is MRG-DMS or MRG-Unsolicited-Retry Ack, the ~~non-AP STA~~ groupcast receiver shall suspend its Block Ack processing for the group addressed stream.

NOTE-Having a Block Ack agreement with all members of an MRG group address allows the ~~AP~~ groupcast transmitter to change the MRG Ack policy dynamically irrespective of the current MRG Ack policy.

An MRG agreement between a ~~non-AP STA~~ groupcast receiver and an ~~AP~~ groupcast transmitter shall begin when the ~~AP~~ groupcast transmitter successfully transmits an individually addressed DMS Response frame with a DMS Response element containing a DMS Status field that has the Status field set to ―Accept as described in 11.22.15.1 with the following modification:

* (#562)The DMS Status field shall include an MRG Response subelement

An MRG agreement between a ~~non-AP STA~~ receiver and an ~~AP~~ groupcast transmitter shall end as described in 11.22.15.1 when:(Ed)

* (#562)The ~~AP~~ groupcast transmitter deauthenticates or disassociates the ~~non-AP STA~~ groupcast receiver.
* (#562)The ~~non-AP STA~~ groupcast receiver successfully transmits a DMS Request frame to the ~~AP~~ groupcast transmitter containing a DMS Request element that has a DMS Descriptor with the DMSID identifying the group addressed stream and the Request Type field set to ―Remove‖, or
* (#562)The ~~AP~~ groupcast transmitter successfully transmits an individually addressed DMS Response frame with a DMS Response element containing a DMS Status field with the DMSID identifying the group addressed stream that has the Status field set to ―Terminate

An MRG agreement between a ~~non-AP STA~~ groupcast receiver and an ~~AP~~ groupcast transmitter shall end(Ed) as described in 11.22.15.1 with the following modifications:

* (#562)The DMS Status field shall include an MRG Response subelement
* (#562)The DMS response frame may instead by transmitted to the broadcast or MRG group addresses

A cancellation of an MRG agreement shall also cause the Block Ack agreement to be cancelled for the MRG stream. An MRG-Block-Ack agreement exists between a ~~non-AP STA~~ groupcast receiver and an ~~AP~~ groupcast transmitter for a group addressed stream from when the ~~non-AP STA~~ groupcast receiver successfully transmits an ADDBA Response frame until either the ~~AP~~ groupcast transmitter or ~~non-AP STA~~ groupcast receiver successfully transmits a DELBA frame to the other party, or this MRG-Block-Ack agreement expires (see 9.10.5), or the MRG agreement no longer exists.

An ~~AP~~ groupcast transmitter may transmit a group address stream via the No-Ack/No-Retry (non-MRG; see 9.2.7) service and MRG service simultaneously. The ~~AP~~ groupcast transmitter shall transmit each frame via the No-Ack/No-Retry Ack policy before it transmits the frame via the MRG service. An ~~AP~~ groupcast transmitter shall transmit a frame belonging to a group address via the MRG service if an ~~associated~~ ~~non-AP STA~~ groupcast receiver has an MRG agreement for the group address, and otherwise does not transmit the frame via the MRG service. An ~~AP~~ groupcast transmitter shall transmit a frame belonging to a group address via the No-Ack/No-Retry service if:

* (#562)There is at least one ~~non-AP STA~~ groupcast receiver ~~within the BSS~~  with dot11RobustAVStreamingImplemented(#29) equal to false or without an MRG agreement for the group address, and
* (#562)Either
	+ (#562)The group address is the broadcast address or
	+ (#562)The group address is not the broadcast address and at least one of these ~~non-AP STA~~ groupcast receivers has been determined by the ~~AP~~ groupcast transmitter to be a member of the group address. How this determination is made is out of scope of this standard.

NOTE-IGMP snooping is commonly use to determine group address membership.

To avoid undetected retries being passed up at a ~~receiver‘s~~ groupcast receiver’s MAC-SAP, duplicate detection for group addressed frames is required in STAs with dot11RobustAVStreamingImplemented(#29) set to true (see 5 9.2.9).

MRG frames shall be QoS data frames (with QoS subfield of the Subtype field set to 1).

If the Block Ack agreement is successfully established for the group addressed stream and the Power Management mode for the group addressed stream is MRG-SP, then the ~~non-AP STA~~ groupcast receiver ensures it is awake for subsequent SPs (see 11.22.15.2.7).

A ~~non-AP STA~~ groupcast receiver may request a change of MRG service for a grouped addressed stream by sending a DMS Descriptor with the DMSID identifying the group address and the Request Type set to ―Change as described in 11.22.15.1 with the following modifications:

* (#562)The DMS Descriptor shall contain zero TCLAS elements, zero TCLAS Processing elements, one TSPEC element and one MRG Request subelement.
* (#562)The TSPEC element and MRG Request subelement of this DMS Descriptor shall together contain at least one field that is different from the original TSPEC element and MRG Request subelement identified by the DMSID

**11.22.15.2.3 Concealment of MRG transmissions**

Concealment prevents group addressed frames transmitted via the MRG-Unsolicited-Retry or MRG-Block-Ack Ack policies from being passed up the MAC-SAP of MRG-incapable STAs. MRG group addresses MSDUs transmitted via the MRG-Unsolicited-Retry or MRG-Block-Ack Ack policies shall be sent in an A-MSDU frame format with the RA set to the MRG Concealment address: <To- be-assigned-by-ANA>. A STA with dot11RobustAVStreamingImplemented(#29) set to true shall not use the MRG Concealment address for any purpose other than the transmission of MRG streams. A STA with dot11RobustAVStreamingImplemented(#29) set to true and at least one MRG agreement shall add the MRG Concealment address to the STA‘s dot11GroupAddressesTable.

**11.22.15.2.4 MRG-DMS**

An ~~AP~~ groupcast transmitter may accept DMS requests from ~~non-AP STAs~~ groupcast receivers with Robust AV Streaming set to 0 in the Extended Capabilities element and MRG requests with Robust AV Streaming set to 1 in the Extended Capabilities element for the same group address stream, as long as the Ack Policy remains MRG-DMS and the Power Management mode is not MRG-SP for the MRG stream.

**11.22.15.2.5 MRG-Unsolicited-Retry**

A STA supports the MRG-Unsolicited-Retry Ack policy if dot11RobustAVStreamingImplemented(#29) is true; otherwise the STA does not support the MRG service with Ack policy equal to MRG-Unsolicited-Retry.

An ~~AP~~ groupcast transmitter adopting the MRG-Unsolicited Retry Ack policy for an MRG group address chooses a lifetime limit for the group address. The ~~AP~~ groupcast transmitter may vary the lifetime limit for the group address at any time, and may use lifetime limits for different MRG group addresses. An ~~AP~~ groupcast transmitter adopting the MRG-Unsolicited-Retry Ack policy for a MRG group address shall transmit each MSDU according to 11.22.15.2.3, subject to the lifetime limit. Transmission uses the backoff procedure described in 9.2.8.1. 2

**11.22.15.2.6 MRG-Block-Ack**

A STA supports the MRG-Block-Ack Ack policy if both dot11RobustAVStreamingImplemented(#29) and dot11MRGImplemented (#16) are true; otherwise the STA does not support the MRG service with Ack policy equal to MRG-Block-Ack.

MRG Buffer Size for a group address is defined to equal to the minimum Buffer Size field in the Block Ack Parameter Set field in the last received ADDBA.response for that group address across members of the 11 MRG group (see 9.10.10).

**11.22.15.2.7 MRG-SP**

A STA supports the MRG-SP power management mode if dot11RobustAVStreamingImplemented(#29) is true; otherwise the STA does not support the MRG service with Power Management mode equal to MRG-SP.

NOTE-Group addressed traffic transmitted at the end of a DTIM beacon can be an impediment to providing QoS for uplink transmissions and in overlapping BSSs. Therefore ~~AP~~ groupcast transmitters in an overlapped environment are advised to make use of MRG-SP for group address traffic that consumes appreciable medium time.

 A group address stream shall not be transmitted simultaneously via the MRG-SP Power Management policy and either the All-Active/Any-PS or FMS Power Management modes.

An ~~AP~~ groupcast transmitter advertises that a group address stream is subject to MRG-SP within an MRG Response subelement.

The subelement indicates the start of each Service Period. See 11.2.1.4. At every scheduled SP, the ~~AP~~ groupcast transmitter schedules for transmission buffered MRG-SP group addressed frames assigned to that particular group address. An ~~AP~~ groupcast transmitter shall only accept either an MRG-SP or an FMS agreement for a group address stream from a single ~~non-AP STA~~ groupcast receiver.