IEEE P802.11
Wireless LANs

|  |
| --- |
| GAS Query Request Fragmentation |
| Date: 2024-01-04 |
| Author(s): |
| Name | Company | Address | Phone | email |
| Stephen McCann | Huawei Technologies Co., Ltd | Southampton, UK |  | stephen.mccann@ieee.org  |

Abstract

This submission provides a suggested comment resolution to 802.11REVme SA Ballot #1 CID 6058.

***Editor: Please insert the following row towards the end of Table 9-78 with an appropriate value***

* Status Code field

|  |
| --- |
| * Status codes
 |
| Status code | Name | Meaning |
| 0 | SUCCESS | Successful. |
| … | … | … |
| 129 | TCLAS\_PROCESSING\_TERMINATED\_POLICY\_CONFLICT | Requested TCLAS processing has been terminated by the AP due to conflict with higher layer QoS policies. |
| <ANA> | GAS\_QUERY\_REQUEST\_TOO\_ LARGE | GAS query request is larger than the dot11GASQueryRequestLengthLimit value. |
| 131–65 535 |  | Reserved. |

***Editor: Please make the following changes to the paragraphs below.***

* GAS Query Fragment ID field

A GAS Query Fragment ID field is used by the STA to indicate when the Query Request or Query Response field spans multiple MMPDUs. STAs responding to the GAS query request use this field to inform the requesting STA of the GAS fragment number of the transmitted frames as well as identifying the last GAS fragment of the Query Response field. Requesting STAs use this field to determine if any fragments of the GAS query request or response are missing. The maximum value permitted in the GAS Query Fragment ID is 127.

The More GAS Fragments field is set to 1 in GAS Comeback Request Fragment or GAS Comeback Response frames, if another GAS fragment of the current GAS query request or GAS query response to follow; otherwise, it is set to 0. The format of GAS Query Fragment ID is shown in Figure 9-163 (GAS Query Fragment ID field format(#2306)).

|  |  |  |  |
| --- | --- | --- | --- |
|  | B0 | B6 | B7 |
|  | GAS Query Fragment ID | More GAS Fragments |
| Bits: | 7 | 1 |
| * GAS Query Fragment ID field format(#2306)
 |

***Editor: Please insert the following row towards the end of Table 9-190 with an appropriate value***

* Extended Capabilities element

|  |
| --- |
| * Extended Capabilities field
 |
| Bit | Information | Notes |
| 0 | 20/40 BSS Coexistence Management Support | The 20/40 BSS Coexistence Management Support field indicates support for the 20/40 BSS Coexistence Management frame and its use. The 20/40 BSS Coexistence Management Support field is set to 1 to indicate support for the communication of STA information through the transmission and reception of the 20/40 BSS Coexistence Management frame. The 20/40 BSS Coexistence Management Support field is set to 0 to indicate a lack of support for the communication of STA information through the transmission and reception of the 20/40 BSS Coexistence Management frame. |
| … | … | … |
| 102(#4069) | Known STA Identification Enabled | Set to 1 to indicate that the AP has enabled use of Known STA Identification element. Set to 0 otherwise. This field is reserved for a non-AP STA. |
| <ANA> | GAS Query Request Fragmentation | When dot11GASQueryRequestFragmentationActivated is true, the GAS Query Request Fragmentation field is set to 1 to indicate the STA supports GAS query request fragmentation as described in 11.22.3.2 (GAS Protocol). When dot11GASQueryRequestFragmentationActivated is false, the GAS Query Request Fragmentation field is set to 0 to indicate the STA does not support this capability. |
| 88, 90–99, (#4091)103–*n* | Reserved |  |

***Editor: Please make the following changes to the paragraphs below.***

* GAS Extension element

The GAS Extension element is defined in 9-852 (GAS Extension element format). When present in a GAS frame, the GAS Extension element indicates whether the STA is capable of:

* Transmitting and receiving group addressed GAS frames
* Retransmitting a GAS query request or GAS query response fragment
* Indicating the size of the GAS query request or GAS query response in octets
* Establishing a maximum time to wait for a response to a GAS query request.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Element ID Extension | GAS Flags | Maximum Channel Time | Fragment ID | Number of Response Map Duples | Response Map Duples | GAS Query Size |
| Octets: | 1 | 1 | 1 | 0 or 1 | 0 or 1 | 0 or 1 | 0 or 1 | variable | 0 or 2 |
| * GAS Extension element format
 |  |

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

The GAS Flags field is defined in Figure 9-853 (GAS Flags field format).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 | B4 | B5 | B6            B7 |
|  | Group Addressed(#1293) GAS | Fragment Retransmission | Maximum Channel Time Flag | Fragment ID Flag | Response Map Flag | GAS Query SizeFlag | Reserved |
| Bits: | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| * GAS Flags field format
 |

The (#1293)Group Addressed GAS subfield is set to 1 to indicate that the STA is capable of receiving Group Addressed GAS Request and Group Addressed GAS Response frames and is set to 0 otherwise.

The Fragment Retransmission subfield, when present in a GAS Initial Request or GAS Initial Response frame, is set to 1 to indicate that the responding STA is capable of retransmitting a Query Request or Query Response fragment upon request and is set to 0 otherwise.

The Maximum Channel Time Flag subfield is set to 1 to indicate that the Maximum Channel Time field is present in the element and is set to 0 otherwise.

The Fragment ID Flag subfield is set to 1 to indicate that Fragment ID field is present in the element and is set to 0 otherwise.

The Response Map Flag subfield is set to 1 to indicate that the Number of Response Map Duples field and the Response Map Duples field are present in the element and is set to 0 otherwise.

The GAS Query Size Flag subfield is set to 1 to indicate that the GAS Query Size field is present in the element and is set to 0 otherwise.

The Maximum Channel Time field indicates the maximum duration the STA will, or needs to, remain on the channel to receive a GAS Initial Response, a GAS Comeback Response, or Group Addressed GAS Response frame, expressed as a multiple of 10 TUs beginning from the end of the PPDU carrying this element. The field has a valid range of 1–255.

The Fragment ID field, when present in the GAS Comeback Request Fragment or the GAS Comeback Response frames, indicates the fragment the STA is requesting. If it is present in the GAS Initial Request frame, it indicates that the GAS query request will be transmitted using GAS Comeback Request Fragment and GAS Comeback Response frames that support GAS fragmentation. It is present only when the Fragment ID Flag subfield is set to 1 in the GAS Flags field.

The Number of Response Map Duples field indicates the number of Response Map Duple subfields contained in the Response Map Duples field. It is present only when the Response Map Flag subfield is set to 1 in the GAS Flags field. When present, the Number of Response Map Duples field is set to a nonzero value and the value of zero is reserved.

The Response Map Duples field is present only when the Number of Response Map Duples field is present and contains a nonzero value. The Response Map Duples field, when present, contains one or more Response Map Duple subfields as indicated by the Number of Response Map Duples field. The format of the Response Map Duple subfield is shown in Figure 9-854 (Response Map Duple subfield format). The Response Map Duples field is included in a Group Addressed GAS Response frame.

|  |  |  |
| --- | --- | --- |
|  | Requester MAC Address | Requester Dialog Token |
| Octets: | 6 | 1 |
| * Response Map Duple subfield format
 |

The Response Map Duple subfield contains a Requester MAC Address subfield and a Requester Dialog Token subfield. An AP or PCP includes one or more Response Map Duple subfields in a Group Addressed GAS Response frame.

The GAS Query Size subfield contains the size of the GAS query request or GAS query response in octets.

***Editor: Please add a new row to Table 9-450 as shown below.***

* Public Action frame details(#3729)
* Public Action field(#3729)

The Public Action frame is defined to allow the following:

* Inter-BSS and AP to unassociated-STA communications
* Intra-BSS communication
* GAS

A Public Action field, in the octet immediately after the Category field, differentiates the Public Action frame formats. The defined Public Action frames are listed in Table 9-450 (Public Action field values).

|  |
| --- |
| * Public Action field values
 |
| Public Action field value  | Description |
| 0 | 20/40 BSS Coexistence Management |
| …. | … |
| 46 | DMG STA Directional Transmit Activity Report |
| <ANA> | GAS Comeback Request Fragment |
| <ANA+1>–255 | Reserved |

***Editor: Please add the new paragraph below.***

9.6.7.14a GAS Comeback Request Fragment frame format

The GAS Comeback Request Fragment frame is transmitted by a requesting STA to a responding STA. The format of the GAS Comeback Request Fragment frame Action field is shown in Table 9-458a (GAS Comeback Request Fragment frame Action field format(#4092)).

|  |
| --- |
| Table 9-458a - GAS Comeback Request Fragment frame Action field format(#4092) |
| Order | Information |
| 0 | Category |
| 1 | Public Action |
| 2 | Dialog Token |
| 3 | Status Code |
| 4 | GAS Query Fragment ID |
| 5 | Query Request Length |
| 6 | Query Request |
| 7 | Multi-band (optional) |
| 8 | GAS Extension (optional) |

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

The Public Action field is defined in 9.6.7.1 (Public Action field(#3729)).

(#417)The Dialog Token field is defined in 9.4.1.12 (Dialog Token field). It is copied from the corresponding GAS Initial Request frame. The same value of the Dialog Token field is present in all fragments of a multi-fragment query request.

The Status Code field values are defined in Table 9-78 (Status codes).

The GAS Query Fragment ID field is defined in 9.4.1.31 (GAS Query Fragment ID field). When there is more than one Query Request fragment, the requesting STA sets the GAS Query Fragment ID field to 0 for the initial fragment and increments it by 1 for each subsequent fragment in a multi-fragment query request. The More GAS Fragments field is set to 0 whenever the final fragment of a GAS query request is being transmitted. A GAS Query Fragment ID field having a nonzero Fragment ID field and the More GAS Fragments field set to 1 indicates to the responding STA that another GAS Comeback Request and GAS Comeback Response frame exchange should be performed to continue the retrieval of the GAS query request.

The Query Request Length field is defined in 9.6.7.12.

The Query Request field is defined in 9.6.7.12.

When present in a GAS Comeback Request Fragment frame, the Multi-band element indicates the frequency band, operating class, and channel number to which the GAS Comeback Request Fragment frame applies.

***Editor: Please make the following changes to the paragraphs below***

* GAS Comeback Response frame format

The GAS Comeback Response frame is transmitted by a responding STA to a requesting STA. The format of the GAS Comeback Response frame Action field is shown in Table 9-459 (GAS Comeback Response frame Action field format).

|  |
| --- |
| * GAS Comeback Response frame Action field format
 |
| Order | Information |
| 0 | Category |
| 1 | Public Action |
| 2 | Dialog Token |
| 3 | Status Code |
| 4 | GAS Query Fragment ID |
| 5 | GAS Comeback Delay |
| 6 | Advertisement Protocol element |
| 7 | Query Response Length |
| 8 | Query Response (optional) |
| 9 | Multi-band (optional) |
| 10 | GAS Extension (optional) |

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

The Public Action field is defined in 9.6.7.1 (Public Action field(#3729)).

(#417)The Dialog Token field is defined in 9.4.1.12 (Dialog Token field). It is copied from the Dialog Token field of the corresponding GAS Comeback Request or GAS Comeback Request Fragment frame. The same value of the Dialog Token field is present in all fragments of a multi-fragment GAS query response.

(#3326)The Status Code field values are defined in Table 9-78 (Status codes). The same status code value is present in all fragments of a multi-fragment query response.

The GAS Query Fragment ID field is defined in 9.4.1.31 (GAS Query Fragment ID field). If the responding STA has not received a response to the query that it posted on behalf of a requesting STA, then the responding STA sets the GAS Query Fragment ID field to 0. When there is more than one query response fragment, the responding STA sets the GAS Query Fragment ID field to 0 for the initial fragment and increments it by 1 for each subsequent fragment in a multi-fragment query response. The More GAS Fragments field is set to 0 whenever the final fragment of a query response is being transmitted. A GAS Query Fragment ID field having a nonzero Fragment ID field and the More GAS Fragments field set to 1 indicates to the requesting STA that another GAS Comeback Request and GAS Comeback Response frame exchange should be performed to continue the retrieval of the query response.

The GAS Comeback Delay field format is shown in Figure 9-1107 (GAS Comeback Delay field format). A nonzero GAS Comeback Delay field(#4356) is returned by the responding STA in this frame to indicate that the GAS query request being carried out on behalf of the requesting STA is still in progress.

* A nonzero value indicates to the requesting STA that another GAS Comeback Request and GAS Comeback Response frame exchange should be performed after the expiration of the GAS comeback delay(#4356) timer in order to retrieve the query response.
* This field is set to 0 for all GAS Comeback Response frames containing a query response or a fragment of a multi-fragment query response.

The Advertisement Protocol element is defined in 9.4.2.91 (Advertisement Protocol element). The Advertisement Protocol element includes exactly one advertisement protocol ID.

The Query Response Length field is defined in Figure 9-1108 (Query Response Length field format). The Query Response Length field is set to the total number of octets in the Query Response field. If the Query Response Length field is set to 0, then there is no Query Response field included in this Action frame.

The Query Response field is defined in Figure 9-1109 (Query Response field format). The Query Response field is a generic container dependent on the advertisement protocol specified in the Advertisement Protocol element and the query itself. In a multi-fragment GAS query response, the response to the GAS query request posted on behalf of a requesting STA is fragmented such that each fragment to be transmitted fits within the MMPDU size limitation.

When present in a GAS Comeback Response frame, the Multi-band element indicates the frequency band, operating class, and channel number to which the GAS Comeback Response frame applies.

***Editor: Please add a new row to Table 9-501 as shown below.***

* + 1. Protected Dual of Public Action frame details

|  |
| --- |
| Table 9-501—Public Action field values defined for Protected Dual of Public Action frames  |
| Public Action field value | Description | Defined in |
| 0 | Reserved |  |
| …. | … |  |
| 32 | Protected DMG STA Directional Transmit ActivityReport | 9.6.7.48 (DMG STA Directional Transmit Activity Report frame format) |
| <ANA> | Protected GAS Comeback Request Fragment | 9.6.7.14a (GAS Comeback Request Fragment frame format) |
| <ANA+1>–255 | Reserved |  |

***Editor: Please make the following changes to the paragraphs below.***

* Interworking procedures: generic advertisement service (GAS)
* Introduction

This subclause describes the actions and procedures that are used to invoke GAS. GAS may be used to enable network selection or service discovery for STAs when dot11InterworkingServiceActivated is true. GAS provides transport mechanisms for advertisement services while STAs are in the unassociated state as well as the associated state. This is accomplished via the use of Public Action frames, which are (#1463)Class 1 frames. GAS information shall be transmitted using Public Action frames. When management frame protection is negotiated, stations shall use individually addressed Protected Dual of Public Action frames instead of Public Action frames.

A GAS frame exchange may take place between two STAs; one STA transmits a GAS query request and the other STA transmits the GAS query response as described in 11.22.3.2 (GAS Protocol). The advertisement protocol transported by the GAS is one of the query protocols in Table 9-275 (Advertisement protocol ID definitions).

A STA may transmit a group addressed GAS query request. Multiple STAs that receive a group addressed GAS query request may send an individually addressed or group addressed GAS query response.

A STA that receives multiple, similar GAS query requests from multiple STAs that require the same GAS query response may aggregate the response and transmit a group addressed GAS query response.

A STA that receives a group addressed GAS query response may process the GAS query response information without transmitting a GAS query request.

GAS shall be supported by a STA when dot11InterworkingServiceActivated is true. ANQP shall be supported by a STA when dot11InterworkingServiceActivated is true. Other advertisement protocols shall be supported when the corresponding dot11GASAdvertisementID is present.

GAS query request fragmentation shall be supported by a STA when dot11GASQueryRequestFragmentationActivated is true.

A STA shall not transmit a GAS query request for any advertisement protocol unless that advertisement protocol ID is included in the Advertisement Protocol element in a Beacon or Probe Response frame. The Advertisement Protocol element specifies the advertisement protocols that a STA may use to communicate with advertisement servers(#571), which may be (#2210)colocated with a STA or in an external network. The advertisement protocol identifies the query language used by the advertisement server. The GAS protocol, which is used to transport GAS query requests and GAS query responses, is transparent to the advertisement protocol.

* GAS Protocol
* General

The presence of the Interworking element in Beacon or Probe Response frames indicates support for the GAS protocol. The additional presence of the GAS Extension element with the (#1293)Group Addressed GAS subfield in the GAS Extension element set to true in a GAS Initial Request frame or group addressed GAS frames indicates support for the use of group addressed GAS frames. The presence of the Advertisement Protocol element in Beacon or Probe Response frames indicates the advertisement protocol IDs supported in the BSS or IBSS.

A STA transmits a GAS query request in either a GAS Initial Request, GAS Comeback Request, GAS Comeback Request Fragment or Group Addressed GAS Request frame and the responding STA provides a GAS query response or information on how to receive the GAS query response in a GAS Initial Response, GAS Comeback Response or Group Addressed GAS Response frame.

The GAS query request or GAS query response shall be delivered in a single GAS Initial Request or GAS Initial Response frame, in a Group Addressed GAS Request or Group Addressed GAS Response frame, or in one or more GAS Comeback Request, GAS Comeback Request Fragment or GAS Comeback Response frames. The GAS Initial Request or Response frame shall not include a fragment.

The GAS message sequence diagrams are shown in Figure 11-43 (GAS frame exchange(#109) with dot11GASPauseForServerResponse equal to true(#571)), Figure 11-44 (Group addressed GAS frame exchange with a response discard(#3683)(#109)), Figure 11-45 (GAS frame exchange(#109) with GAS fragmentation and dot11GASPauseForServerResponse equal to true(#571)), Figure 11-46 (GAS frame exchange(#109) with GAS fragmentation and dot11GASPauseForServerResponse equal to false(#571)), Figure 11-47 (Group addressed GAS frame exchange with a timer(#109)), Figure 11-48 (Group addressed GAS frame exchange for a specific fragment(#3683)(#109)(#571)), Figure 11-48a, and Figure 11-49 (GAS frame exchange (#109)using CAG Version(#571)).(Ed)

***Editor: Please insert the following paragraph and Figure immediately after Figure 11-48***

Figure 11-48a describes the GAS frame exchange when the GAS query request is too large to fit in one MMPDU and GAS fragmentation is used for delivery. The number of GAS Comeback Request Fragment and GAS Comeback Response frames depends on the number of GAS fragments required for delivery of the GAS query request.



**Figure 11-48a GAS frame exchange with query request fragmentation**

***Editor: Please make the following changes to the paragraphs below.***

* STA procedures to transmit a GAS Query Request

Upon receipt of an MLME-GAS.request primitive, the requesting STA shall engage in the following procedure to transmit a query:

* If GAMode in the primitive is null or set to false, the requesting STA sends a GAS query request by transmitting a GAS Initial Request frame containing a Dialog Token field, an Advertisement Protocol element containing an Advertisement Protocol ID field and GAS query request in the Query Request field. If the GAS Initial Request frame requests information relating to a frequency band different from the frequency band in which the frame is transmitted, the STA shall include a Multi-band element in the GAS Initial Request frame with the Band ID, Operating Class, and Channel Number fields set to indicate to which frequency band the GAS Initial Request frame applies, with other fields in the Multi-band element being reserved. If the frame requests information relating to the frequency band in which the frame is transmitted, a Multi-band element shall not be included in the frame. If the GAS Initial Request frame requests information that the requesting STA has a cached version of a previous query response and the associated CAG Version, the requesting STA may include the cached CAG Version and the associated CAG Information Type in a CAG Number element in the GAS Initial Request frame. If GAMode in the primitive is(M118) true, the requesting STA transmits a Group Addressed GAS Request frame including a GAS Extensions element with the Maximum Channel Time field set to the value of the dot11GASResponseTimeout divided by 10, rounded to the nearest integer, and limited to a value of 255. The GAS protocol supports query requests whose length is greater than the maximum MMPDU size by the STA’s use of the GAS Query Fragment ID field in a GAS Comeback Request Fragment frame, subsequent to a GAS Initial Request frame. The GAS Query Fragment ID shall be set to 0 for the initial fragment and incremented by 1 for each subsequent fragment in a multi-fragment query request. The STA shall transmit all fragments that belong to the same query request until all fragments are exhausted. The STA shall set the More GAS Fragments field of the GAS Query Fragment ID to 0 when the transmitted fragment is the final fragment.
* Upon transmission of the GAS Initial Request, Group Addressed GAS Request or GAS Comeback Request Fragment frame, the STA shall set a timer, referred to as the *dot11GASResponseTimer*, equal to dot11GASResponseTimeout or the QueryFailureTimeout parameter provided in the MLME-GAS.request primitive. If both values are present, the timer shall be set to the lesser of the two values.
* If the requesting STA is not in the associated state, it shall remain in active mode until the receipt of a GAS Initial Response, Group Addressed GAS Response or GAS Comeback Response frame with the same value of the Dialog Token field as in the GAS Initial Request frame or until the expiration of the timer, whichever occurs first. If the requesting STA is in the associated state, it may go into power save state until the GAS Initial Response, Group Addressed GAS Response or GAS Comeback Response frame, is available for receipt or the timer expiration, whichever occurs first.
* If the dot11GASResponseTimer expires before a GAS Initial Response, Group Addressed GAS Response or GAS Comeback Response frame is received, the GAS query request was not successful and the MLME shall issue an MLME-GAS.confirm primitive with the ResultCode field set to GAS\_QUERY\_TIMEOUT and shall set the Query Response Length field to 0.

***Editor: Please add the following paragraphs.***

11.22.3.2.2a STA procedures to transmit a GAS Query Request Fragment

The Fragment ID field in the GAS Extension element, when present in a GAS Initial Request frame, indicates that the query request will be transmitted using GAS Comeback Request Fragment and GAS Comeback Response frames that support GAS fragmentation.

The GAS Query Size subfield in the GAS Extension element, when present in a GAS Initial Request frame, indicates the size of the GAS query request in octets.

If a GAS Query Fragment ID field is present in a GAS Comeback Request Fragment frame the receiving STA shall buffer the query request for a minimum of dot11GASRequestBufferingTime or until the GAS query request is delivered. If the receiving STA does not receive a GAS Comeback Request Fragment frame whose source address and dialog token match the source address and value of the Dialog Token field respectively of the corresponding GAS Initial Response frame within this time, it may discard the query request. If the query request received from the requesting STA, is larger than dot11GASQueryRequestLengthLimit for the matching dot11GASAdvertisementID or is larger than the value of the Query Request Length Limit field received from the requesting STA, the responding STA shall discard the request and instead return a status code of GAS\_QUERY\_REQUEST\_TOO\_LARGE in the GAS Comeback Response frame. This behavior helps to prevent abuses of the medium that may be caused by an overly large GAS query request.

 If the GAS query request received from the requesting STA is greater than the maximum MMPDU size, then the GAS Query Fragment ID shall be set to 0 if this is the first fragment of the query request transmitted; otherwise it shall be incremented by 1; the More GAS Fragments field in the GAS Query Fragment ID shall be set to 1 if there are more fragments of the query request to be transmitted; otherwise it shall be set to 0 (i.e., this fragment is the last fragment of the query request). If a requesting STA receives a GAS Comeback Response that includes the GAS Extension element with the Fragment ID field set to a valid Fragment ID the requesting STA shall transmit a GAS Comeback Request Fragment frame that includes the fragment corresponding to the received Fragment ID.

If the responding STA supports the GAS extension, and the responding STA is unable to receive a GAS query request fragment, then the following procedures apply:

* If the Fragment Retransmission subfield in the GAS Extension element in the corresponding GAS Initial Request frame is equal to 1, the responding STA may transmit a GAS Comeback Response frame, including the GAS Extension element with the Fragment ID subfield of the GAS Flags field set to the fragment ID of the query request to be retransmitted. Upon receiving the GAS Comeback Response, the requesting STA shall transmit a GAS Comeback Request Fragment frame that includes the query request fragment corresponding to the value received in the Fragment ID field and with the GAS Query Fragment ID subfield in GAS Query Request Fragment field set to the value received in the Fragment ID field. If the Query Request fragment is not available, the requesting STA shall respond with a GAS Comeback Request Fragment frame with a status code set to GAS\_FRAGMENT\_NOT\_AVAILABLE.
* If the corresponding GAS Initial Request frame does not contain a GAS Extension element or the Fragment Retransmission subfield in the GAS Extension element is equal to 0, the responding STA shall not request the retransmission of a query request fragment using a GAS Comeback Response frame.

If a responding STA receives a GAS Comeback Request Fragment frame with status equal to SUCCESS and the More GAS Fragments field in the GAS Query Fragment ID equal to:

- 1, it shall transmit another GAS Comeback Response frame in order to retrieve the next GAS fragment of a multi-fragment query request.

- 0, the responding STA’s MLME shall determine that all fragments have been received by confirming that all fragment IDs from 0 to the value in the GAS Query Fragment ID when the More GAS Fragments field was equal to 0 have been received. Upon receipt of the first GAS Comeback Request Fragment frame and every GAS Comeback Request Fragment frame thereafter, the dot11GASRequestTimer shall be reset.

If all of the query request fragments were received before the expiration of the dot11GASRequestTimer, then the MLME shall issue an MLME-GAS.confirm primitive with result code set to SUCCESS along with the query request.

If not all of the query request fragments were received before the expiration of the dot11GASRequestTimer, then the MLME shall issue an MLME-GAS.confirm primitive with the ResultCode field set to GAS\_QUERY\_TIMEOUT and shall set the Query Request Length field to 0.

If a requesting STA receives a GAS Comeback Request frame with a Status Code field equal to either: GAS\_QUERY\_REQUEST\_TOO\_ LARGE then the MLME shall issue an MLME-GAS.confirm primitive with the ResultCode field set to the value of the Status Code field and shall set the Query Request Length field to 0.

After a responding STA receives the first GAS fragment of a multi-fragment query request, it shall continue retrieving the query request until all GAS fragments are received or until a transmission failure is detected; the responding STA shall not commence the reception of another query request from the same STA until all GAS fragments are received or until a transmission failure is detected on the first quest request.

***Editor: Please make the following changes to the paragraphs below.***

* STA procedures to post a GAS Query Request to an advertisement server(#571)

Upon receipt of a GAS Initial Request, Group Addressed GAS Request or GAS Comeback Request Fragment frame, an MLME-GAS.indication primitive shall be issued to the STA’s SME. Upon receipt of an MLME-GAS.indication primitive indicating the receipt of a GAS Initial Request, Group Addressed GAS Request or GAS Comeback Request Fragment frame, the STA shall transmit a GAS Initial Response, Group Addressed GAS Response or GAS Comeback Response frame to the requesting STA according to the following procedures. If the requesting STA is in the associated state and in the power save mode, the responding STA shall buffer the MMPDU for transmission according to the procedures in 11.2.3 (Power management in a non-DMG infrastructure network); otherwise the STA shall queue the MMPDU for transmission as follows:

* If the Advertisement Protocol ID field in the Advertisement Protocol element does not equal the value contained in any dot11GASAdvertisementID, then the STA shall not post the query request to an advertisement server(#571). The STA shall transmit an individually addressed GAS Initial Response frame to the requesting STA containing a dialog token whose value is identical to the dialog token in the GAS Initial Request frame, a Status Code field(#3326) equal to GAS\_ADVERTISEMENT\_PROTOCOL\_NOT\_SUPPORTED (see Table 9-78 (Status codes)), an Advertisement Protocol element containing the Advertisement Protocol ID field used in the GAS Initial Request frame and GAS Comeback Delay and Query Response Length fields both set to 0.(#3326)(#4356)
* If the query request corresponds to an advertisement protocol whose server is currently unreachable, the responding STA shall transmit an individually addressed GAS Initial Response frame to the requesting STA containing a dialog token whose value is identical to the dialog token in the GAS Initial Request frame, a Status Code equal to SERVER\_UNREACHABLE, an Advertisement Protocol element containing an Advertisement Protocol ID field equal to the advertisement protocol ID contained in the GAS Initial Request frame and (#4356)GAS Comeback Delay and Query Response Length fields(#4356) both set to 0. The method used by the AP to determine the server is unreachable is out of scope of this standard. A STA receiving a status code indicating SERVER\_UNREACHABLE should wait at least 1 minute before transmitting any further queries using the same advertisement protocol ID to the responding STA.
* If the GAS Initial Request frame includes a CAG Number element and all the CAG Versions in the CAG Number element match a valid CAG Version that the STA receives from the associated advertisement server(#571), which is identified by the CAG Information Type subfield within the same CAG Tuple field as the CAG Version subfield, then the STA may transmit an individually addressed GAS Initial Response frame to the requesting STA containing a dialog token whose value is identical to the dialog token in the GAS Initial Request frame, a Status Code equal to SUCCESS\_CAG\_VERSIONS\_MATCH, an Advertisement Protocol element containing the Advertisement Protocol ID field used in the GAS Initial Request frame, and GAS Comeback Delay and Query Response Length fields(#4356) both set to 0, without posting the query to an advertisement server(#571). This completes the GAS query request and GAS query response exchange.
* If the Advertisement Protocol ID field in the Advertisement Protocol element equals the value contained in any dot11GASAdvertisementID, then the STA shall initialize a timer, referred to as the *PostReplyTimer*, to the value of the Maximum Channel Time field times 10, if received in the GAS Initial Request or Group Addressed GAS Request frame, or otherwise, to the value in dot11GASResponseTimeout. The STA posts the query to the advertisement server identified by the advertisement protocol ID.
1. If the GAMode associated with the Query Request is true, the STA includes the GAMode parameter, the GAS extension information, the MAC Address, and the Dialog token when it posts the query to the advertisement server(#571) for processing. The methods and protocols the STA uses to post the query are outside the scope of this standard.
* If the GAMode associated with the Query Request is true and the advertisement server(#571) has no response to the Query Request, the advertisement server(#571) may (#3683)ignore the request.
* If the advertisement server(#571) receives multiple GAS query requests resulting in the same response, the advertisement server(#571) may aggregate these responses into a single GAS query response. The advertisement server(#571) responds to the STA including the aggregated responses as described in 11.22.3.2.5 (Group addressed GAS procedures).
1. If dot11GASPauseForServerResponse is false, the responding STA shall transmit an individually addressed GAS Initial Response frame to the requesting STA containing a dialog token whose value is identical to the dialog token in the GAS Initial Request frame, a Status Code field(#3326) set to SUCCESS, an Advertisement Protocol element containing the Advertisement Protocol ID field used in the GAS Initial Request frame, a GAS Comeback Delay field(#3326) set to the value in dot11GASComebackDelay for this advertisement protocol and a Query Response Length field(#3326) set to 0.
2. If dot11GASPauseForServerResponse is true, the GAS query response is delivered as defined in 11.22.3.2.4 (STA procedures for transmitting the GAS Query Response).

***Editor: Please make the following changes to the paragraphs below.***

* STA procedures for transmitting the GAS Query Response

After receiving a query response from the advertisement server(#571), the responding STA shall buffer the query response for a minimum of dot11GASResponseBufferingTime after the expiration of the GAS comeback delay timer(#4356) or until the query response is delivered. If the responding STA does not receive a GAS Comeback Request frame whose source MAC address and dialog token match the source MAC address and value of the Dialog Token field respectively of the corresponding GAS Initial Response frame within this time, it may (#3683)discard the query response. If the query response received from the advertisement server(#571) is larger than dot11GASQueryResponseLengthLimit for the matching dot11GASAdvertisementID or is larger than the value of the Query Response Length Limit field received from the requesting STA, the responding STA shall discard the response and instead return a status code of GAS\_QUERY\_RESPONSE\_TOO\_ LARGE in the GAS Comeback Response frame. This behavior helps to prevent abuses of the medium that may be caused by overly general queries, which evoke a very large query response.

The GAS protocol supports Query Responses whose length is greater than the IEEE 802.11 maximum MMPDU size by the responding STA’s use of the GAS Query Fragment ID field in the GAS Comeback Response frame; the GAS Query Fragment ID shall be set to 0 for the initial fragment and incremented by 1 for each subsequent fragment in a multi-fragment query response. If the GAS query response is a multi-fragment response (i.e., contains more than 1 fragment), the STA shall transmit all fragments that belong to the same Query Response until all fragments are exhausted. The STA shall set the More GAS Fragments field of the GAS Query Fragment ID to 0 when the transmitted fragment is the final fragment.

The GAS Query Size subfield in the GAS Extension element, when present in a GAS Initial Response frame, indicates the size of the GAS query response in octets.

If the GAS Initial Request frame that initiated the GAS transaction contains a Multi-band element, but the GAS Initial Response frame transmitted as a response does not contain a copy of the same Multi-band element, the Status Code in the GAS Initial Response frame shall be set to REQUEST\_DECLINED. Otherwise, the requesting and responding STAs shall include a copy of the same Multi-band element in all subsequent GAS Initial Response, GAS Comeback Request, and GAS Comeback Response frames transmitted as part of the GAS transaction. Inclusion of the Multi-band element indicates to which frequency band the GAS transaction applies. If the GAS Initial Request frame that initiated the GAS transaction does not contain a Multi-band element, then none of the subsequent GAS Initial Response, GAS Comeback Request, and GAS Comeback Response frames transmitted as part of the GAS transaction shall include a Multi-band element.

The following procedures shall be used by the responding STA to deliver the query response to the requesting STA:

* If dot11GASPauseForServerResponse is true:
* If the query response is received from the advertisement server(#571) before the PostReplyTimer expires, and if the query response’s length is less than or equal to the maximum MMPDU size and the query response is not an aggregated response, the STA shall transmit an individually addressed GAS Initial Response frame to the requesting STA containing a dialog token whose value is identical to the dialog token in the GAS Initial Request frame, the Status Code field(#4356) set to SUCCESS, an Advertisement Protocol element containing the Advertisement Protocol ID field used in the GAS Initial Request frame or the Group Addressed Request frame, a GAS Comeback Delay field set to 0, a Query Response field and a Query Response Length field set to the query response length. This completes the GAS request and response exchange.(#4356)
* If the query response is received from the advertisement server(#571) before the PostReplyTimer expires, and if the query response’s length is less than or equal to the maximum MMPDU size and the query response is an aggregated response, the STA shall transmit a Group Addressed GAS Response frame containing a dialog token set to 0, the Status Code field(#4356) set to SUCCESS, an Advertisement Protocol element containing the Advertisement Protocol ID field used in the GAS Initial Request frame or the Group Addressed Request frame, a GAS Comeback Delay field set to 0, a Query Response field and a Query Response Length field set to the query response length, and a GAS Extension element containing a list of MAC Address/Dialog Token pairs in the Response Map Duples subfield of the GAS Extension element, identifying the requesting STAs and their Query Requests to which the Group Addressed GAS Response frame responds. This completes the (#4173)GAS query request and GAS query response frame exchange.
* If the PostReplyTimer expires before the query response is received from the advertisement server(#571) for responding to a GAS Initial Request frame, then the responding STA shall transmit an individually addressed GAS Initial Response frame to the requesting STA containing a dialog token whose value is identical to the dialog token in the GAS Initial Request frame, a Status Code field(#3326) set to GAS\_QUERY\_TIMEOUT (see Table 9-78 (Status codes)), an Advertisement Protocol element containing the Advertisement Protocol ID field used in the GAS Initial Request frame, (#3326) and GAS Comeback Delay and Query Response Length fields both set to 0. If the query response is subsequently received from the advertisement server(#571), it shall be (#3683)ignored by the responding STA.
* If the PostReplyTimer expires before the query response is received from the advertisement server(#571) for responding to a Group Addressed GAS Request frame, then the responding STA shall not transmit an individually addressed GAS Initial Response frame or a Group Addressed GAS Response frame to the requesting STA.

NOTE—If there is no response to the Query Request, the advertisement server(#571) may (#3683)ignore the request.

* If the Query Response received from the advertisement server(#571) is larger than dot11GASQueryResponseLengthLimit or requires more than 128 fragments for transmission to the requesting STA, it shall be (#3683)ignored by the responding STA. Then the responding STA shall transmit an individually addressed GAS Initial Response frame to the requesting STA containing a dialog token whose value is identical to the dialog token in the GAS Initial Request frame, a Status Code field(#3326) set to GAS\_QUERY\_RESPONSE\_TOO\_ LARGE (see Table 9-78 (Status codes)), an Advertisement Protocol element containing the Advertisement Protocol ID field used in the GAS Initial Request frame, and GAS Comeback Delay and Query Response Length fields both set to 0.(#3326)
* If the query response’s length is larger than the maximum MMPDU size, the responding STA shall transmit an individually addressed GAS Initial Response frame to the requesting STA containing a dialog token whose value is identical to the dialog token in the GAS Initial Request frame, a Status Code field(#3326) set to SUCCESS, an Advertisement Protocol element containing the Advertisement Protocol ID field used in the GAS Initial Request frame, a GAS Comeback Delay field set to 1 (TU), and a Query Response Length field set to 0;(#4356) this indicates the query response will be transmitted using GAS Comeback Request and Response frames that support GAS fragmentation as follows. If the responding STA is capable of retransmitting a Query Response fragment upon request, the responding STA shall include, in the GAS Initial Response frame, a GAS Extension element with the Fragment Retransmission subfield of the GAS Flags field set to 1.
* If dot11GASPauseForServerResponse is false:
* If the PostReplyTimer expires before the GAS query response is received from the advertisement server(#571) then the responding STA shall buffer for transmission a GAS Comeback Response frame with (#3326)a Status Code field set to GAS\_QUERY\_TIMEOUT (see Table 9-78 (Status codes)). (#3683)If the query response is subsequently received from the advertisement server(#571), it shall be ignored by the STA.
* If the Query Response received from the advertisement server(#571) is larger than dot11GASQueryResponseLengthLimit, it shall be (#3683)ignored by the responding STA. Then the STA shall buffer for transmission a GAS Comeback Response frame with status code set to GAS\_QUERY\_RESPONSE\_TOO\_ LARGE.

c) If the Query Response is received before the expiration of the PostReplyTimer and its length is less than dot11GASQueryResponseLengthLimit, then the Query Response shall be buffered in one or more GAS Comeback Response frames with status code set to SUCCESS. The responding STA transmits one GAS Comeback Response frame in response to each GAS Comeback Request frame. If the Query Response received from the advertisement server(#571) is less than or equal to the maximum MMPDU size, then the GAS Query Fragment ID shall be set to 0 and the More GAS Fragments field in the GAS Query Fragment ID shall be set to 0. If the Query Response received from the advertisement server(#571) is greater than the maximum MMPDU size, then the GAS Query Fragment ID shall be set to 0 if this is the first fragment of the Query Response transmitted; otherwise it shall be incremented by 1; the More GAS Fragments field in the GAS Query Fragment ID shall be set to 1 if there are more fragments of the Query Response to be transmitted; otherwise it shall be set to 0 (i.e., this fragment is the last fragment of the Query Response). If a responding STA receives a GAS Comeback Request that includes the GAS Extension element with the Fragment ID field set to a valid Fragment ID the responding STA shall respond with a GAS Comeback Response frame that includes the fragment corresponding to the received Fragment ID.

* If a responding STA receives a GAS Comeback Request frame whose source MAC address and dialog token match the destination MAC address and value of the Dialog Token field respectively of an outstanding GAS Initial Response frame and the query response has not been received from the advertisement server(#571) and the PostReplyTimer has not expired, the responding STA shall transmit a GAS Comeback Response frame (#3326)with a Status Code field set to GAS\_RESPONSE\_NOT\_RECEIVED\_FROM\_SERVER (see Table 9-78 (Status codes)) and (#4356)a GAS Comeback Delay field set to the value in dot11GASComebackDelay for this advertisement protocol to indicate when the requesting STA should come back to obtain its Query Response.

e) If a responding STA receives a GAS Comeback Request frame whose source MAC address and Dialog Token do not match the destination MAC address and value of the Dialog Token field respectively of an outstanding GAS Initial Response frame, the STA should transmit a GAS Comeback Response frame with a status code equal to NO\_OUTSTANDING\_GAS\_REQUEST.

A requesting STA shall transmit a GAS Comeback Request frame including the Dialog Token (drawn from the corresponding GAS Initial Response frame) immediately after the expiration of the GAS Comeback Delay. In response, the responding STA provides the Query Response in one or more GAS Comeback Response frames with the corresponding Dialog Token.

If the requesting STA supports the GAS extension, and the requesting STA is unable to receive a GAS query response fragment, then the following procedures apply:

* If the Fragment Retransmission subfield in the GAS Extension element in the corresponding GAS Initial Response frame is equal to 1, the requesting STA may transmit a GAS Comeback Request frame, including the GAS Extension element with the Fragment ID subfield of the GAS Flags field set to the fragment ID of the Query Response to be retransmitted. Upon receiving the GAS Comeback Request frame, the responding STA shall transmit a GAS Comeback Response frame that includes the Query Response fragment corresponding to the value received in the Fragment ID field and with the GAS Query Fragment ID subfield in GAS Query Fragment field set to the value received in the Fragment ID field. If the Query Response fragment is not available, the responding STA shall respond with a GAS Comeback Response frame with a status code set to GAS\_FRAGMENT\_NOT\_AVAILABLE.
* If the corresponding GAS Initial Response frame does not contain a GAS Extension element or the Fragment Retransmission subfield in the GAS Extension element is equal to 0, the requesting STA shall not request the retransmission of a Query Response fragment using a GAS Comeback Request frame.

If a requesting STA receives a GAS Comeback Response frame with status equal to QUERY\_RESPONSE\_OUTSTANDING, the requesting STA shall wait for the expiration of the GAS comeback delay timer(#4356) from that frame and then, transmit another GAS Comeback Request frame. If the requesting STA’s dot11GASResponseTimer (set in 11.22.3.2.2 (STA procedures to transmit a GAS Query Request) step b) expires prior to receiving a GAS Comeback Response frame whose source MAC address and dialog token match those in the corresponding GAS Initial Response frame, the STA shall issue an MLME-GAS.confirm primitive with the ResultCode field set to GAS\_QUERY\_TIMEOUT and shall set the Query Response Length field to 0.

If a requesting STA receives a GAS Comeback Response frame with status equal to SUCCESS and the More GAS Fragments field in the GAS Query Fragment ID equal to:

- 1, it shall transmit another GAS Comeback Request frame in order to retrieve the next GAS fragment of a multi-fragment query response.

- 0, the requesting STA’s MLME shall determine that all fragments have been received by confirming that all fragment IDs from 0 to the value in the GAS Query Fragment ID when the More GAS Fragments field was equal to 0 have been received. Upon receipt of the first GAS Comeback Response frame and every GAS Comeback Response frame thereafter, the dot11GASResponseTimer shall be reset. If all of the query response fragments were received before the expiration of the dot11GASResponseTimer, then the MLME shall issue an MLME-GAS.confirm primitive with result code set to SUCCESS along with the query response. If not all of the query response fragments were received before the expiration of the dot11GASResponseTimer, then the MLME shall issue an MLME-GAS.confirm primitive with the ResultCode field set to GAS\_QUERY\_TIMEOUT and shall set the Query Response Length field to 0.

After a requesting STA receives the first GAS fragment of a multi-fragment query response, it shall continue retrieving the query response until all GAS fragments are received or until a transmission failure is detected; the requesting STA shall not commence the retrieval of another GAS query response from the same STA until all GAS fragments are received or until a transmission failure is detected on the first GAS query response.

If a requesting STA receives a GAS Comeback Response frame with a Status Code field equal to either: GAS\_QUERY\_TIMEOUT, GAS\_QUERY\_RESPONSE\_TOO\_ LARGE or NO\_OUTSTANDING\_GAS\_REQUEST, then the MLME shall issue an MLME-GAS.confirm primitive with the ResultCode field set to the value of the Status Code field and shall set the Query Response Length field to 0.

***Editor: Please make the following changes to the MIB with appropriate new values***

* MIB detail

Dot11StationConfigEntry ::= SEQUENCE

 {

 dot11StationID MacAddress,

 …

 (11ay)dot11UnsolicitedBAActivated TruthValue,

 dot11GASQueryRequestFragmentationActivated TruthValue

 }

dot11GASQueryRequestFragmentationActivated OBJECT-TYPE

 SYNTAX TruthValue

 MAX-ACCESS read-write

 STATUS current

 DESCRIPTION

 "This is a control variable.

 It is written by an external management entity or the SME. Changes take effect as soon as practical in the implementation.

 This attribute when true, indicates the capability of the STA to fragment GAS query requests is enabled. The capability is disabled otherwise."

 DEFVAL { false }

 ::= { dot11StationConfigEntry <ANA> }

Dot11GASAdvertisementEntry ::=

 SEQUENCE {

 dot11GASAdvertisementId Unsigned32,

 dot11GASPauseForServerResponse TruthValue,

 dot11GASResponseTimeout Unsigned32,

 dot11GASComebackDelay Unsigned32,

 dot11GASResponseBufferingTime Unsigned32,

 dot11GASQueryResponseLengthLimit Unsigned32,

 dot11GASQueries Counter32,

 dot11GASQueryRate Gauge32,

 dot11GASResponses Counter32,

 dot11GASResponseRate Gauge32,

 dot11GASNoRequestOutstanding Counter32,

 dot11GASResponsesDiscarded Counter32,

 dot11GASFailedResponses Counter32,

 dot11GASRequestBufferingTime Unsigned32,

 dot11GASQueryRequestLengthLimit Unsigned32

 }

dot11GASQueryResponseLengthLimit OBJECT-TYPE

 SYNTAX Unsigned32 (1..127)

 MAX-ACCESS read-write

 STATUS current

 DESCRIPTION

 "This is a control variable.

 It is written by an external management entity or the SME.

 Changes take effect as soon as practical in the implementation.

 This object indicates the maximum number of octets an AP will transmit in one or more Query Response fields contained within GAS Comeback Response frame(s). A value of 127 means the maximum limit enforced is contained by the maximum allowable number of fragments in the GAS Query Fragment ID."

 ::= { dot11GASAdvertisementEntry 6 }

dot11GASRequestBufferingTime OBJECT-TYPE

 SYNTAX Unsigned32 (0..65535)

 UNITS "TUs"

 MAX-ACCESS read-write

 STATUS current

 DESCRIPTION

 "This is a control variable.

 It is written by an external management entity or the SME.

 Changes take effect as soon as practical in the implementation.

 This object defines the time that a STA will buffer a query request. Upon expiration of this time, the STA may discard the query request."

 DEFVAL { 1000 }

 ::= { dot11GASAdvertisementEntry <ANA> }

 dot11GASQueryRequestLengthLimit OBJECT-TYPE

 SYNTAX Unsigned32 (1..127)

 MAX-ACCESS read-write

 STATUS current

 DESCRIPTION

 "This is a control variable.

 It is written by an external management entity or the SME.

 Changes take effect as soon as practical in the implementation.

 This object indicates the maximum number of octets a STA will transmit in one or more Query Request fields contained within GAS Comeback Request Fragment frame(s). A value of 127 means the maximum limit enforced is constrained by the maximum allowable number of fragments in the GAS Query Fragment ID."

 ::= { dot11GASAdvertisementEntry <ANA> }

 DEFVAL { 127 }