IEEE P802.11
Wireless LANs

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| Discussion about the communication from the WFA Hotspot Task Group re: ANQP |
| Date: 2021-06-11 |
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Abstract

This document discusses the email communication received from the Wi-Fi Alliance (WFA) Hotspot Marketing Task Group re: the IEEE 802.11 defined Access Network Query Protocol (ANQP) contained in document 11-21-0787r0.

Proposed resolutions for CIDs 92 and 96.

**Discussion**

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Several questions regarding the design of ANQP are asked in the communication from the Wi-Fi Alliance (WFA) (see final page of this document for a copy of the original email, also contained in document 11-21-0787r0).

To be able to effectively answer some of these questions, this document attempts to add some more detail to the questions with proposed solutions.

***We*** *(i.e. the WFA)* ***would like to express our support of clarifications and enhancements in clauses that concern ANQP, and request the following areas be investigated:***

1. ***If an ANQP request includes a request for elements that the non-AP STA does not actually need;***

Explanation:

It was observed in the field that in some implementations, the STA queries multiple elements that seem to overlap with each other, for example AP geospatial location AND AP Civic Location AND AP Location Public Identifier URI/FQDN. Other implementations query all elements announced in the Advertisement Protocol element in the beacon or Probe Response frame, even when the STA does not seem to use many of the requested elements. The standard does not clarify that the STA does not need to query all these advertised elements.

It may be useful to clarify that a STA should not request all the elements, or all the elements of a given category, but only the elements it needs for its operation.

Potential Solution and proposed resolution for CID 92:

“Revised: Incorporate the changes in <this>.”

Change the initial paragraph of 11.22.3.3.2 as follows:

“The Query List ANQP-element is used by a requesting STA to perform an ANQP request using the procedures defined in 11.22.3.3.1. The requesting STA may include Info IDs in the Query List ANQP-element that have the sole ANQP-element type of S as shown in Table 11-14; the STA shall not include other Info IDs. The requesting STA should only request the ANQP-elements it needs for its operation.”

1. ***If an ANQP response includes ANQP elements beyond those that were requested;***

Explanation:

It was observed in the field that in some implementations, the AP replies to any ANQP specific query with all the elements that the AP supports (i.e., all the elements advertised in the Advertisement Protocol element in the AP beacons and Probe Responses), regardless of which element(s) was/were queried. The standard does not express that the AP should not send ‘all the elements it supports’, although this context may be implied by the ANQP clause.

At the same time, 11.22.3.3.1 states that “A STA that encounters an unknown or reserved ANQP Info ID value in a GAS frame (see 9-364) received without error shall ignore that ANQP Info ID and shall parse any remaining ANQP Info IDs. A STA that encounters an unknown vendor-specific OI field or subfield in a GAS frame (see 9-364) received without error shall ignore that field or subfield respectively, and shall parse any remaining fields or subfields for additional information with recognizable field or subfield values.“, which conveys the impression that it is normal for an AP to respond with elements that the STA did not ask for.

It may be useful to clarify that the AP only needs to respond to the requested elements, and should not send all the supported elements (including those that were not asked for).

Potential Solution:

Change paragraph 11.22.3.3.1 with a clarification as discussed above. The complete change is shown below in answer to question 4).

1. ***If an ANQP response does not carry all vendor-specific responses appropriate to the vendor-specific requests, if any;***

Explanation:

The design of ANQP is that a STA sends an ANQP vendor-specific request to a peer STA. The peer STA responds with the corresponding ANQP vendor specific elements, if the peer STA has any available. However, the standard does not clarify that the AP should answer with all the elements it has.

This leads to wasted overhead, with dialogs in the following (e.g.,) form:

Non-AP STA: request VS 1, VS 2, Venue Name, NAI Realm.

AP STA : response VS 2, Venue Name.

Non-AP STA: request VS 1, NAI Realm.

AP STA response : VS 1, NAI Realm.

It would be useful to clarify that the response is expected to carry the elements that the AP has an immediate answer for, with a provision for the GAS comeback procedure to provide subsequent answers for the other elements.

Potential Solution:

Change paragraph 11.22.3.3.1 with a clarification as discussed above. The complete change is shown below in answer to question 4).

1. ***How to interpret an ANQP response that contains elements with overlapping semantics. For example, FQDN, realm, RCOI and/or MNC/MCC lists***

Explanation:

The current design of ANQP utilises separate ANQP-elements for these network identifiers:

* NAI Realm ANQP-element (clause 9.4.5.10) for the realm.
* 3GPP Cellular Network ANQP-element (clause 9.4.5.11) for the MNC/MCC.
* AP Location Public Identifier URI/FQDN ANQP-element (clause 9.4.5.14) for the FQDN
* There is no ANQP-element for the RCOI.

Therefore the STA sends an ANQP request for each required identifier type, or list of similar identifier types, and the ANQP response should not return other ANQP-elements of other identifiers.

However, the AP may return elements in similar forms, for example:

NAI: wlan.mncXXX.mccYYY.3gppnetwork.org

NAI: wlan.mnc*AAA*.mcc*BBB*.3gppnetwork.org

Realm: wlan.mncCCC.mccDDD.3gppnetwork.org (or another Realm value that translates to the same information).

Similarly, the AP can return other overlapping elements, such as the AP Geospatial Location and AP Civic Location. IEEE 802.11 specifies the order in which those elements shall be returned:

“The ANQP response should consist of ANQP-elements having Info IDs present in the Query List ANQP- element response (if present) plus zero or more responses to other query elements; these ANQP-elements shall be chosen from among those listed in Table 9-331 having an element type of S in Table 11-14 and shall be ordered by nondecreasing Info ID. (11.22.3.3.1)“.

However, it does not say if this means that the order has any significance.

Clarify that although the standard mandates to order the elements in the response, this order has no special significance for the way the STA should interpret the elements in the response (i.e. the STA is free to interpret element 2 before element 1, this is implementation-dependent).

Potential Solution and proposed resolution for CID 96:

“Revised: Incorporate the changes in <this>.”

Change the 4th paragraph of 11.22.3.3.1 to read:

“The ANQP response is transported in the Query Response field of GAS Response frames. The AP should include in the ANQP response the ANQP-elements requested by the non-AP STA (in the Query List ANQP-element of the ANQP request) that are available at the AP, using the procedure described in 11.22.3.2.4. The AP should provide the ANQP-elements requested by the non-AP STA that are not available at the AP at the time of the request but can be obtained by the AP from an advertisement server, using the comeback procedure described in 11.22.3.2. The AP shall not include an ANQP-element in the ANQP response that was not requested by the non-AP STA. ANQP-elements in the ANQP response shall have an ANQP-element type of S in Table 11-14 and shall be ordered by nondecreasing Info ID. The non-AP STA may interpret ANQP-elements in any order. The interpretation of ANQP-elements whose semantics overlap is implementation dependent.”

1. ***If an ANQP response can be in the same GAS frame that carries non-ANQP GAS elements.***

Explanation:

The current design of GAS enables it to carry one Advertisement Protocol (e.g. ANQP) payload within its frames (this is true for requests and for responses). However, there are scenarios where multiple GAS requests can be replied to with a group addressed query response (11-42).

Although the standard is clear that the GAS response can only carry one advertisement protocol, it would be useful to clarify that the dialog cannot be a bundle (e.g. STA 1 asks for A, STA 2 asks for A’, STA 3 asks for B, then the AP responds with the elements A and A’ to 1,2,3 and then element B to 1,2,3).

Potential Solution:

No action is needed as the above changes to questions 1 – 4 clarifies that an AP cannot respond with information that the non-AP STA did not ask for.

Clause 9.6.7.12 states that for a GAS Initial Request frame: “The Advertisement Protocol element includes exactly one advertisement protocol ID”. This is echoed in clauses 9.6.7.13 (GAS Initial Response frame format) and 9.6.7.15 (GAS Comeback Response frame format).

In other words, a GAS request can only contain request for a single advertisement protocol, such as ANQP and a GAS response can only contain responses for a single advertisement protocol. Therefore, ANQP and non-ANQP-elements cannot be requested within the same GAS request or be contained in a GAS response.

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| **Susan Silveira** <ssilveira@wi-fi.org> | Thu, Apr 29, 2021 at 5:21 PM |
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| subject: | IEEE Std 802.11™-2020 ANQP features |

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| Dear Dorothy, Wi-Fi Alliance member companies implement multiple features that use IEEE 802.11 Working Group defined ANQP signaling. We have found that some ANQP exchanges could be ambiguous, not fully expressing the expectations of the limit of a message or its response. We also found that additional messages could be used to express quantities that were not envisioned in the original design of ANQP. We know that the IEEE 802.11 Working Group is developing a maintenance revision of IEEE Std 802.11™-2020 in the P802.11REVme project. We would like to express our support of clarifications and enhancements in clauses that concern ANQP, and request the following areas be investigated: ·         If an ANQP request includes a request for elements that the non-AP STA does not actually need;·         If an ANQP response includes ANQP elements beyond those that were requested;·         If an ANQP response does not carry all vendor-specific responses appropriate to the vendor-specific requests, if any;·         How to interpret an ANQP response that contains elements with overlapping semantics. For example, FQDN, realm, RCOI and/or MNC/MCC lists; and ·         If an ANQP response can be in the same GAS frame that carries non-ANQP GAS elements.  Thank you for your consideration, Hotspot 2.0 Marketing Task GroupWi-Fi Alliance |

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