IEEE P802.11
Wireless LANs

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| Combining Service Hashes |
| Date: July 25, 2016 |
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 Abstract

Proposed resolution to technical CIDs 4026, 4027, 4044, 4007.

Another revision may also be able to address CID 4033, 4044 (editorial).

Comments and changes are related to Service Hash element and Service Hash Request ANQP-element.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Comment** | **Category** | **Subclause** | **Proposed Change** |
| 4027 | Service Hash element is used to both seek and advertise services (e.g., to advertise a few common services instead of using the Service Hint element). Reflect the dual use in the element definition. | Technical | 9.4.2.217 | Make the following changes to 9.4.2.217,- P13L30: Rename the ""Number of Requested Services"" field to ""Number of Requested/Available Services"" and update all references to the field- P13L43: Change the paragraph to ""A value of r for the Number of Requested/Available Services field indicates that the transmitting STA is either searching for STAs that provide at least r services among those specified by the service hashes included in the element, or is providing at most r services among those specified by the service hashes included in the element. Any value of the Number of Requested/Available Services field that is equal to or greater than the value of the Number of Included Services field indicates search for STAs that provide all the services included in the element, or availability of all the services included in the element. The field is set to 0 only when service combinations cannot be described by an “any r-of-n” format."-P13L52: Delete the informational NOTE." |
| 4026 | There is also an ANQP-element on the request side (Service Hash Request ANQP-element), and specifically for Solicited PAD; can this element appear in frames other than Probe Request? And is this element supposed to co-exist with Service Hash element or replace it? There is no need to have two variations it seems. | Technical | 9.4.5.27 | If performing the same function, merge Service Hash Request ANQP-element and Service Hash element, by bringing the extra fields and text from Service Hash element (9.4.2.217) to its ANQP-element equivalent (9.4.5.28); unify names throughout the text. Note the intention behind extending Service Hash element with combination fields is to improve the solicited PAD efficiency. |

**Revision History**

R0: Initial revision

**Discussion**

Application of Service Hash element seems to have evolved from a dual use (search, advertising) to advertising only, and the search function of the element seems to have shifted to Service Hash Request ANQP-element. Reflect the proper use of Service Combination in each of these two elements, specifically, add the Service Combination field to Service Hash Request ANQP-element, and clarify the Service Combination field in Service Has Request element denotes the combination of available services.

**9.4.2.218 Service Hash element**

The Service Hash element contains one or more service hashes and a logical function to interpret the combination of service hashes. The format of the Service Hash element is shown in Figure 9-586m (Service Hash element format).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Element ID Extension | Flags | Service Hashes | Service Combination |
| Octets: | 1 | 1 | 1 | 2 | variable | variable |

**Figure 8-586co—Service Hash element format**

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

The Flags field is defined in Figure 8-xxx (Flags field format).

|  |  |  |  |
| --- | --- | --- | --- |
|  | B0 B5 | B6 B11 | B12 B15 |
|  | Number of Included Services | Number ofAvailable Services | Reserved |
| Bits: | 6 | 6 | 4 |

**Figure 8-xxx—Flags field format**

The Number of Included Services field indicates the number of service hashes that are included in the element. This field is set to a nonzero value.

A value of *r* for the Number of Available Services field indicates availability of at most *r* services among those specified by the service hashes included in the element. Any value of the Number of Available Services field that is equal to or greater than the value of the Number of Included Services field indicates availability of all the services included in the element. The field is set to 0 only when providing a combination of services included in the element that cannot be described by an “any *r*-of-*n*” format.

The Service Hashes field contains one or more 6-octet service hash values. See 10.26.6 (Service hash procedures) for procedures for generating a service hash used in the Service Hash element.

The Service Combination field is present only if the Number of Available Services field is set to 0. If present,

denoting the number of service hashes in the element by *n*, the Service Combination field carries a service combination bitmap that is 2*n* bits in length and is organized into ⎡2*n*/8⎤ octets such that bit number *b* (0 ≤ *b* < 2*n*) in the bitmap corresponds to bit number (*b* mod 8) in octet number ⎣*b*/8⎦, where the low order bit of each octet is bit number 0, and the high order bit is bit number 7. The service combination bitmap is the sum-of-products representation of a boolean function of *n* boolean variables x1,....,*xn* where *xi* (*i* = 1,...,*n*) indicates search for the service corresponding to the *i*-th service hash included in the element. Specifically, bit *b* (0 ≤ *b* < 2*n*) in the bitmap corresponds to minterm *mb* in a sum-of-products representation.

NOTE—To illustrate the Service Combination field format consider a STA that provides service S1 or service S2 or both services S3 and S4, where services S1, S2, S3 and S4 appear in the Service Hash element in that order. The provided service combination can be represented by the boolean function x1 + x2 + x3.x4, or the sum of minterms m1, m2, m3, m5, m6, m7, m9, m10, m11, m12, m13, m14, and m15 using the sum-of-product representation. The resulting bitmap is 1111111011101110 binary, and the value of the Service Combination field is 0xFEEE.

**9.4.5.27 Service Hash Request ANQP-element**

The Service Hash Request ANQP-element contains a request to discover information concerning services that are available to STAs that are already associated with the BSS, relating to the given service hash.

The format of the Service Hash Request ANQP-element is shown in Figure 9-622f (Service Hash Request ANQP-element format).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Info ID | Length | Flags | Service Hashes | Service Combination |
| Octets: | 2 | 2 | 2 | variable | variable |

**Figure 9-622f—Service Hash Request ANQP-element format**

The Info ID and Length fields are defined in 9.4.5.1 (General).

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

|  |  |  |  |
| --- | --- | --- | --- |
|  | B0 B5 | B6 B11 | B12 B15 |
|  | Number of Included Services | Number ofRequested Services | Reserved |
| Bits: | 6 | 6 | 4 |

**Figure 9-xxx—Flags field format**

The Number of Included Services field indicates the number of service hashes that are included in the element. This field is set to a nonzero value.

A value of *r* for the Number of Requested Services field indicates search for STAs that provide at least *r* services among those specified by the service hashes included in the element. Any value of the Number of Requested Services field that is equal to or greater than the value of the Number of Included Services field indicates search for STAs that provide all the services included in the element. The field is set to 0 only when searching for STAs that provide a combination of services included in the element that cannot be described by an “any *r*-of-*n*” format.

NOTE—Searching for STAs that provide any (i.e., at least one), or all of the services included in the Service Hash element can be described by “any *r*-of-*n*” format.

The Service Hashes field contains one or more 6-octet service hash values. See 11.25a.4 (Service hash procedures) for procedures for generating a service hash used in the Service Hash Request ANQP-element.

The Service Combination field is present only if the Number of Requested Services field is set to 0. If present, denoting the number of service hashes in the element by *n*, the Service Combination field carries a service combination bitmap that is 2*n* bits in length and is organized into ⎡2*n*/8⎤ octets such that bit number *b* (0 ≤ *b* < 2*n*) in the bitmap corresponds to bit number (*b* mod 8) in octet number ⎣*b*/8⎦, where the low order bit of each octet is bit number 0, and the high order bit is bit number 7. The service combination bitmap is the sum-of-products representation of a boolean function of *n* boolean variables x1,....,*xn* where *xi* (*i* = 1,...,*n*) indicates search for the service corresponding to the *i*-th service hash included in the element. Specifically, bit *b* (0 ≤ *b* < 2*n*) in the bitmap corresponds to minterm *mb* in a sum-of-products representation.

NOTE—To illustrate the Service Combination field format consider a search for STAs that provide service S1 or service S2 or both services S3 and S4, where services S1, S2, S3 and S4 appear in the Service Hash element in that order. The service combination of interest can be represented by the boolean function x1 + x2 + x3.x4, or the sum of minterms m1, m2, m3, m5, m6, m7, m9, m10, m11, m12, m13, m14, and m15 using the sum-of-product representation. The resulting bitmap is 1111111011101110 binary, and the value of the Service Combination field is 0xFEEE.