IEEE P802.11  
Wireless LANs

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| Aligning 11aq to Upper Layer SD | | | | |
| Date: 2016-05-07 | | | | |
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| SK Yong | Apple Inc |  |  |  |
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Abstract

This document provides proposed comment resolutions for follow comments:

CID #

*Instruction to Editor:*

*Update Subclause 4.5.9.2.2 as follows*

**4.5.9.2.2 Service information entities**

The SIC and SIR are used to exchange service information ~~(e.g. a service name)~~ between higher layer entities above both the STAs. The PAD procedures operate between the SIC and SIR.

*Instruction to Editor:*

*Update Subclause 9.4.5.1 as follows*

**9.4.5 Access Network Query Protocol (ANQP) elements**

**9.4.5.1 General**

**Table 9-271—ANQP-element definitions**

|  |  |  |
| --- | --- | --- |
| **ANQP-element name** | **Info ID** | **ANQP-element (subclause)** |
| ~~Service Hash Request~~ | ~~288~~ | [~~9.4.5.27~~](#bookmark16) |
| Service Information Request | 288 ~~289~~ | [9.4.5.28](#bookmark20) |
| Service Information Response | 289 ~~290~~ | [9.4.5.29](#bookmark24) |
| ~~Service Hash Response~~ | ~~291~~ | ~~9.4.5.30~~ |

*Instruction to Editor:*

*Remove Subclause 9.4.5.27 Service Hash Request ANQP-element*

*Remove Subclause 9.4.5.30 Service Hash Response ANQP-element*

*Instruction to Editor:*

*Update Subclause 9.4.5.28 Service Information Request ANQP-element as follows:*

**9.4.5.28 Service Information Request ANQP-element**

The Service Information Request ANQP-element contains a generic request ~~the request~~ for service information associated with the ~~service name or~~ service hash provided~~, and with the instance name, if it is also provided. Additional information can also be provided to refine the request.~~

The format of the Service Information Request ANQP-element is shown in [Figure 9-625h](#bookmark22).

|  |  |  |
| --- | --- | --- |
| Info ID | Length | Service Information Request Duples |

Octets: 2 2 variable

#### Figure 9-625h—Service Information Request ANQP-element format

The Info ID and Length fields are defined in [9.4.5.1.](#bookmark15)

The Service Information Request ~~Tuple~~Duples field contains one or more Service Information Request ~~Tuple~~Duple sub- fields. The format of the Service Information Request ~~Tuple~~Duple subfield is shown in [Figure 9-625](#bookmark23)i.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ~~Service Name Length~~ | ~~Ser- vice Name~~ | ~~Instance Name Length~~ | ~~Instance Name~~ | ~~Service Informa- tion Query Request Length~~ | ~~Service Informa- tion Query Request~~ |

~~Octets: 1 variable 1 variable 2 variable~~

|  |  |
| --- | --- |
| Service Hash | Service Information Request Key |

Octets: 6 variable

#### Figure 9-625i—Service Information Request ~~Tuple~~Duple subfield format

~~The Service Name Length subfield is set to either 0 or the length of the Service Name subfield, in octets. If the Service Name Length is not equal to 0, the Service Name subfield contains a UTF-8 encoded string as defined in IETF RFC 6335. For example, a service name for a print service is “\_ipp.\_tcp”. If the Service Name Length subfield is equal to 0, the Service Name subfield contains a 6-octet service hash value (see~~ [~~11.25a.4).~~](#bookmark46)

~~The Instance Name Length subfield contains the length of the Instance Name subfield, in octets. The Instance Name is an instance of service associated with the service name. The Instance Name subfield con- tains a UTF-8 encoded string with a maximum length of 63 octets as defined in IETF RFC 6763. An exam- ple of an instance name is “John Home Printer”. If the Instance Name Length subfield is equal to 0, the Instance Name subfield is not included in the Service Information Request Tuple subfield.~~

~~The Service Information Query Request Length subfield is the length of the Service Information Query Request subfield, in octets. If the Service Information Query Request Length subfield is equal to 0, the Ser- vice Information Query Request subfield is not included.~~

The Service Information ~~Query~~ Request Key subfield contains service-specific query. The value of this subfield is out of scope of this standard.

*Instruction to Editor:*

*Update Subclause 9.4.5.29 Service Information Response ANQP-element as follows:*

**9.4.5.29 Service Information Response ANQP-element**

The Service Information Response ANQP-element contains the detailed service information in response to a Service Information Request ANQP-element.

The format of the Service Information Response ANQP-element is shown in [Figure 9-625j](#bookmark26).

|  |  |  |
| --- | --- | --- |
| Info ID | Length | Service Information Response ~~Tuple~~Duples |

Octets: 2 2 variable

#### Figure 9-625j—Service Information Response ANQP-element format

The Info ID and Length fields are defined in [9.4.5.1.](#bookmark15)

The Service Information Response ~~Tuple~~Duples field contains zero or more Service Information Response ~~Tuple~~Duple subfields.

The format of the Service Information Response ~~Tuple~~Duple subfield is shown in [Figure 9-625k.](#bookmark27)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ~~Service Name Length~~ | ~~Service Name~~ | ~~Instance Name Length~~ | ~~Instance Name~~ | ~~Service Infor- mation Query Response Length~~ | ~~Service Informa- tion Query Response~~ |

~~Octets: 1 variable 1 variable 2 variable~~

|  |  |
| --- | --- |
| Service Hash | Service Information Response Key-Value |

Octets: 6 variable

#### Figure 9-625k— Service Information Response ~~Tuple~~Duple subfield format

~~The Service Name Length subfield and the Service Name subfield are defined in~~ [~~9.4.5.28.~~](#bookmark20)

~~The Instance Name Length subfield and the Instance Name subfield are defined in~~ [~~9.4.5.2~~](#bookmark20)~~8. The Instance Name Length subfield contains a nonzero value.~~

~~The Service Information Query Response Length subfield is the length of the Service Information Query Response subfield. If the Service Information Query Response Length subfield is equal to 0, the Service Information Query Response subfield is not included.~~

The content of the Service Information Response Key-Value ~~Query Response~~ subfield is service-specific based on the corresponding ~~requested~~ Service Information Request Key subfield in the Service Information Request Duples of the Service Information Response ANQP-element as described in 9.4.5.27. ~~service information as specified in [11.25a.3.](#bookmark43) The value of this subfield is out of scope of this standard.~~

*Instruction to Editor:*

*Update Subclause 11.25.3.2.1 General*

**11.25.3.2 ANQP procedures**

**11.25.3.2.1 General**

**Table 11-15—ANQP usage**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | | **BSS** | | **IBSS** |
| **ANQP-element name** | **ANQP-element (subclause)** | **ANQP-**  **element type** | **AP** | **Non-AP and non- PCP STA** | **STA** |
| ~~Service Hash Request~~ | [~~9.4.5.27~~](#bookmark17) | ~~Q~~ | ~~R, G~~ | ~~T, G~~ | ~~—~~ |
| Service Information Request | [9.4.5.28](#bookmark21) | Q | R, G | T, G | — |
| Service Information Response | [9.4.5.29](#bookmark25) | S | T, G | R, G | — |
| ~~Service Hash Response~~ | [~~9.4.5.30~~](#bookmark28) | ~~S~~ | ~~T, G~~ | ~~R, G~~ | ~~—~~ |
| **Symbols**  Q element is an ANQP request   1. element is an ANQP response 2. ANQP-element may be transmitted by MAC entity R ANQP-element may be received by MAC entity   G Group addressed ANQP request/response may be transmitted and received by a MAC entity  — ANQP-element is neither transmitted nor received by MAC entity | | | | | |

*Instruction to Editor:*

*Update Subclause 11.25a.3 as follows:*

**11.25a.3 Solicited PAD procedure**

When dot11SolicitedPADActivated is true, a non-AP and non-PCP STA may transmit to an AP or PCP

~~either a Service Hash Request ANQP-element or~~ a Service Information Request ANQP-element, to request

information from the SIR about services reachable via the BSS. A non-~~P~~AP and non-PCP STA may use the

Interworking and PAD fields of the ~~e~~Extended Capabilities element received from the AP or PCP to determine

whether that AP or PCP supports Solicited PAD.

NOTE—The Interworking field value of 1 implies support for ANQP.

*Instruction to Editor:*

*Remove Subclause 11.25a.3.2 Service Hash Request and Response*

*Instruction to Editor:*

*Update Subclause 11.25a.3.3 Service Information Request and Response as follows:*

**11.25a.3.3 Service Information Request and Response**

The Service Information Request ANQP-element is used by a non-AP and non-PCP STA to request ~~more~~

detailed information about services reachable via the BSS. ~~A service name or a service hash generated from the service name identifying a service, is placed within the Service Information Request ANQP-element,~~ see examples illustrated in W.1.

When dot11SolicitedPADActivated is true, a non-AP and non-PCP STA may send a Service Information

Request ANQP-element (see 9.4.5.28) to obtain information about a matching service. The Service Information Request ANQP-element shall include one or more Service Information Request ~~Tuple~~Duple subfields. Each Service Information Request ~~Tuple~~Duple subfield shall include ~~either a service name or~~ a service hash within the Service Hash ~~Name~~ subfield, ~~may include an Instance Name subfield,~~ and ~~may include~~ a Service Information Request Key ~~Query Request~~ subfield that is service specific request.

When dot11SolicitedPADActivated is true, an SIR shall use the information from the Service Information Request ANQP-element to determine if the requested service(s) ~~or combination of services~~ are reachable via the BSS. If matching services are found, corresponding to the Service Hash subfield, the SIR shall respond by requesting the AP or PCP to transmit a Service Information Response ANQP-element that contains a Service Information Response ~~Tuple~~Duple subfield for each service that satisfies the request. The Service Information Response ANQP-element contains detailed information about the services. When there is no matching service, corresponding to the Service Hash subfield, the SIR ~~shall~~ may respond by requesting the AP or PCP to transmit a Service Information Response ANQP-element containing zero Service Information Response ~~Tuple~~Duple subfields.

The SIC receives service information from the contents of the Service Information Response ANQP-ele- ment. The non-AP and non-PCP STA might proceed with the authentication and association procedure (see 11.3) (see examples illustrated in W.1).

*Instruction to Editor:*

*Update Subclause 11.25a.4 Service Hash Procedures as follows:*

**11.25a.4 Service hash procedures**

A service hash is generated from a service name after all single octet uppercase alphabetic characters in the service name are converted into corresponding lowercase characters;  A service name is defined in IETF RFC 6335.

~~service name is defined as the UTF-8 encoded lower case version of the service name.~~

A service hash contained in the Service Hash subfield of the Service Hash element, or ~~in the Service Hash~~

~~Request ANQP-element,~~ in the Service Information Request ANQP-elemen, or in the Service Information Response ANQP-element, or when the service hash is used to map into the Bloom Filter Bit Array is generated as follows:

service hash = L(SHA-256(service name), 0, 48).

~~A service hash contained in a Service Name subfield of the Service Hash Response ANQP-element or Service Information Response ANQP-element is generated as follows:~~

~~service hash = L(SHA-256(service name), 48, 48).~~

For example, , to create a service hash for the service name of "\_ipp.\_tcp":

1) The service hash contained in the Service Hash subfield of the Service Hash element, ~~the Service~~

~~Hash Request ANQP-element, and~~ the Service Information Request ANQP-element and the Service Information Response ANQP-element is "bfd39037d25c", and the service hash used to map into the Bloom Filter Bit Array field is "0xbfd39037d25c"~~; and~~

~~2) The service hash contained in a Service Name subfield of the Service Hash Response ANQP-element~~

~~and the Service Information Response ANQP-element is "b99322def844".~~

*Instruction to Editor:*

*Update Subclause B.4.30 Pre-association discovery extensions as follows:*

**B.4.30 Pre-association discovery extensions**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Protocol Capability** | **References** | **Status** | **Support** |
| \*PAD1 | Unsolicited PAD procedure | [11.25a.2](#bookmark41) | CFPAD:M | Yes No N/A   Yes No N/A   Yes No N/A  |
| PAD1.1 | Service Hint element | [9.4.2.217](#bookmark4) | PAD1:M |
| PAD1.2 | Service Hash element | [9.4.2.219](#bookmark12) | PAD1:M |
| \*PAD2 | Solicited PAD procedure | [11.25a.3](#bookmark43) | (CFPAD AND IW2.2.2):M | Yes No N/A  |
| ~~PAD2.1~~ | ~~Service Hash request~~ | [~~9.4.5.27~~](#bookmark17) | ~~PAD2:M~~ | ~~Yes No N/A ~~ |
| ~~PAD2.2~~ | ~~Service Hash response~~ | [~~9.4.5.30~~](#bookmark28) | ~~PAD2:M~~ | ~~Yes No N/A ~~ |
| PAD2.1~~3~~ | Service Information Request | [9.4.5.28](#bookmark21) | PAD2:M | Yes No N/A  |
| PAD2.2~~4~~ | Service Information Response | [9.4.5.29](#bookmark25) | PAD2:M | Yes No N/A  |

*Instruction to Editor:*

*Update Subclause W.1.1 Backgroud Search as follows:*

**W.1.1 Background Search**

Applications that run in the background (e.g., automatically receiving sales coupons within messages trans- mitted from a BSS, that a user has previously signed up for) might not require immediate discovery results to be presented to the user. It may be appropriate to prevent non-AP and non-PCP STAs, running such back- ground applications, from performing a solicited PAD search.

Solicited PAD has the potential to introduce network congestion and it is recommended that STAs limit the use of solicited PAD to cases requiring an active search for services. In those cases, it is more effective to perform an unsolicited PAD search, in which an AP or PCP advertises multiple services known to the SIR, while non-AP and non-PCP STAs need respond only if there is a matched service.

The SIR can elect to advertise services through an AP or PCP, using the Service Hash element, and advertise remaining services using the Service Hint element, in the Beacon or DMG Beacon frame. Alternatively, the SIR can elect to advertise all of the services through an AP or PCP, using either the Service Hash or Service Hint

element in the Beacon or DMG Beacon. Upon receiving a Beacon or DMG Beacon frame, a non-AP and non-PCP STA processes the Service Hash and Service Hint elements to verify if there are any potential matching services. Figure W-1 and Figure W-2 show two cases where there is a matching service hint.

If the probability of false positives as indicated in the False Positive Probability Range field of the Service Hint element is considered relatively high by the non-AP and non-PCP STA (see Figure W-1) the non-AP and non-PCP STA can send a Service Information Request ~~Hash Request~~ ANQP-element containing Service Information Request-Key subfield to confirm if a service is reachable through the AP or PCP.

The SIR then responds through an AP or PCP, with a Service Information Response ~~Hash Response~~ ANQP-element ~~with Service Information Response Tuple subfield that~~ containing the ~~corresponding~~ ~~Service Name and~~ Service Information Response Key-Value subfield. ~~Instance Name subfields.~~

~~The non-AP and non-PCP STA can then send a Service Information Request ANQP-element containing the Service Name, Instance Name and specific Service Information Query to an AP or PCP to obtain more information about the service from the SIR. The SIR responds to the request through an AP or PCP, with the ANQP response with Service Information Response ANQP-element containing the Service Name, Instance Name and specific Service Information Query Response fields.~~

Following these service information exchanges, the non-AP and non-PCP STA might associate to the AP or PCP.



**Figure W-1—Example of a frame exchange for background search with Service Hint matching ~~high probability of false positive~~**

If the probability of false positive as indicated in False Positive Probability Range field of the Service Hint element is considered relatively low by the non-AP and non-PCP STA ~~(see [Figure W-2](#bookmark51))~~, the non-AP and non-PCP STA may choose to associate with the AP or PCP. The non-AP and non-PCP STA may choose to send a Service Information Request ANQP-element containing Service Information Request-Key subfield to confirm if a service is reachable through the AP or PCP as shown in Figure W-1. ~~can send a Service Information Query Request ANQP-element containing a service name and a specific service information query request to obtain more information about the service from the SIR.~~

~~The SIR responds to the ANQP request through the AP or PCP with a Service Information Response ANQP- element containing the service name and instance name. Following these service message exchanges the non-AP and non-AP STA can make an informed decision about choosing to associate with the AP or PCP.~~

***Note to Editor: remove Figrue W-2 and reorder the Figure numbering accordingly***

**~~Figure W-2—Example of a frame exchange for background search with low probability of false positive~~**

In a scenario where there is a matching service hash, the non-AP and non-PCP STA can ~~directly~~ send a Service Information Request ANQP-element containing Service Information Request Key subfield to the AP or PCP ~~containing the service name and a specific Ser- vice Information Query Request~~ to obtain more information about the service from the SIR as shown in Figure W-2~~3~~.

The SIR responds through the AP or PCP to the ANQP request with a Service Information Response ANQP-element containing the Service Information Response Key-Value subfield ~~service name, instance name and specific Service Information Query Response~~. Following these service message exchanges the non-AP and non-PCP STA might associate with the AP or PCP.

Alternatively, the non-AP and non-PCP STA might choose to associate based on the matching Service Hash element.



 Figure W-2~~3~~— Example of frame exchange for background search with matching Service Hash element

*Instruction to Editor:*

*Update Subclause W.1.2 Immediate Search as follows:*

**W.1.2 Immediate Search**

Applications that are initiated by users (e.g., a user is looking for a fast movie download service provided by a BSS) require immediate discovery results to be presented to the STA or a user so that network selection can be either performed by a STA or the user to obtain the desired service.

[Figure W-3](#bookmark53)~~[-4](#bookmark53)~~shows a non-AP and non-PCP STA perform a solicited PAD procedure, whereby the non-AP and non-PCP STA sends a Service Information ~~Hash~~ Request ANQP-element to query specific services immediately after user initiation of the service/application. The SIR responds through an AP or PCP with a Service Information ~~Hash~~ Response ANQP-element accordingly if there is a matched service.

~~When the Service Hash Request ANQP-element contains a service hash of the requested service, the SIR responds, through an AP or PCP with a Service Hash Response ANQP-element with a Service Information Response Tuple subfield containing the corresponding service name and instance name.~~

~~The non-AP and non-PCP STA can then send a Service Information Request ANQP-element containing the Service Name, Instance Name and specific Service Information Query to the AP or PCP to obtain more information about the service from the SIR. The SIR responds to the ANQP request through the AP or PCP, with the ANQP response with Service Information Response ANQP-element containing the Service Name, Instance Name and specific Service Information Query Response fields.~~ Following these service message exchanges the non-AP and non-AP STA can make an informed decision about choosing to associate to the AP or PCP.



 Figure W-3~~4~~—Example of frame exchange for immediate search