IEEE P802.11
Wireless LANs

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| TGaq –Pre-association Service Discovery Protocol |
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|  |  |  |  |  |

Abstract

This document describes the Pre-association Service Discovery protocol

1. Definitions, acronyms and abbreviations
	1. **Definitions**

***Insert new definitions retaining alphabetic order as follows:***

Pre-Association Discovery (PAD): Discovery of service information for a pre-associated STA

Service Hash: Short identifier (48 bits) of a unique service identifier (USID)

Service Transaction Protocol (STP): The protocol for service transactions transported by generic advertisement service (GAS) Public Action frames.

Upper Layer Protocol (ULP): An protocol which operates at a higher OSI layer than the MAC layer of IEEE 802.11

Unique Service Identifier (USID): A type of UUID which globally uniquely identifies a service.

[13/0478r2]4.5.9 Interworking with external networks

***Change text as follows:***

The interworking service allows non-AP STAs to access services provided by an external network according to the subscription or other characteristics of that external network. An IEEE 802.11 non-AP STA may have a subscription relationship with an external network, e.g., with an SSPN.

An overview of the interworking functions addressed in this standard is provided below:

— Network discovery and selection

— Discovery of suitable networks through the advertisement of access network type, roaming

consortium and venue information, via management frames

— Selection of a suitable IEEE 802.11 infrastructure using advertisement services (e.g., Access Network Query Protocol (ANQP) or an IEEE 802.21 Information Server) in the BSS or in an external network reachable via the BSS.

— Selection of an SSPN or external network with its corresponding IEEE 802.11 infrastructure

— Pre-Association Discovery

— Discovery of services offered by an infrastructure network in prior to association.

— Emergency services

— Emergency Call and Network Alert support at the link level

— QoS Map distribution

— SSPN interface service between the AP and the SSPN

***<TBD – add the PAD element to the Beacon and Probe Response management frames>***

**8.4.2.1 General**

***Insert the following row (ignoring the header row) in Table 8-54 after <preceding amendment last entry>***

|  |  |  |
| --- | --- | --- |
|  |  | Table 8-54 – Element IDs |
| Element | Element ID | Length of indicated element (in octets) | Extensible |
| Service Hint Information (see 8.4.2.122a) | <TBD> | <TBD> |  |
| Service Advertisement Information (see 8.4.2.122b) | <TBD> | <TBD> |  |
| Service Hash (see 8.4.2.122c) | <TBD> | <TBD> |  |

**8.4.2.95 Advertisement Protocol element**

***Insert the following row (ignoring the header row) in Table 8-175 after Registered location query protocol (RLQP):***

|  |
| --- |
| Table 8-175 - Advertisement protocol ID definitions |
| Name | Value |
| Pre-Association Discovery Protocol | <ANA. |

***Insert dashed list text after Registered location query protocol (RLQP) as follows:***

The Pre-association Discovery Protocol (PADP) supports service information retrieval. PADP is a protocol used by a requesting STA to query another STA (i.e., the receiving STA can respond to queries with and without proxying the query to a server in an external network). See 10.24 (WLAN interworking with external networks procedures) for information on PADP procedures.

***Insert the following new subclause after <TBD> at the end of 8.4.2.***

**8.4.2.122a Service Hint Information Element**

**Option 1: Note: With a length field of one octet and a maximum number of services of 512, the 512 services can be represented by m=253 octets with probability of false positive of 0.15***.*

The Service Hint Information element contains information identifying services that are supported by an AP. The Service Information element is transmitted in beacons and broadcast frames.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Bloom Filter Information | m-bit Service Hint Map | Service Hash #1(optional) | … | Service Hash #j(optional) |
| Octets | 1 | 1 | 2 | variable | 6 |  | 6 |

Figure 8-401aq –Service Hint Information element format

The Element ID field is set to the value given in Table 8-54.

The value of the Length field is 2, plus the variable length m-bit service hint map, plus the number of optional 6-octets Service Hashes

The Bloom filter information field is a 2-octet field representing the settings of the Bloom filter. The format of the Bloom filter information is shown in Figure 8-402aq.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Number of services | Number of Hash fucntions | Reserved |
| Bit: | 0-8 | 9-12 | 13-15 |

Figure 8-402aq – Bloom filter information format

The number of services field is used to indicate the maximum number of services, n that can be offered by the AP. The maximum number of services are 512

The number of Hash functions field is used to indicate the number of hash functions, k (out of maximum of 16) used by the Bloom filter. e.g. 0001 means the first 2 Hash functions (i.e. H1 and H2 as specified in section XYZ) will be used

The Service Hash field is an optional field formed from the value of service name by using the first 6 octets of the SHA-256 algorithm hashing of the value of the service name

**Option 2: Note: With a length field of two octets and a maximum number of services of 4096, the 4096 services can be represented by m=2022 octets with probability of false positive of 0.15. This option allows more than 512 services to be advertised though no necessary used all the times.**

The Service Hint Information element contains information identifying services that are supported by an AP. The Service Information element is transmitted in beacons and broadcast frames.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Bloom Filter Information | m-bit Service Hint Map | Service Hash #1(optional) | … | Service Hash #n(optional) |
| Octets | 1 | 2 | 2 | variable | 6 |  | 6 |

Figure 8-401aq –Service Hint Information element format

The Element ID field is set to the value given in Table 8-54.

The value of the Length field is 2, plus the variable length m-bit service hint map, plus the number of optional 6-octets Service Hashes

The Bloom filter information field is a 2-octet field representing the settings of the Bloom filter. The format of the Bloom filter information is shown in Figure 8-402aq.

|  |  |  |
| --- | --- | --- |
|  | Number of services | Number of Hash fucntions |
| Bit: | 0-11 | 12-15 |

Figure 8-402aq – Bloom filter information format

The number of services field is used to indicate the maximum number of services, n that can be offered by the AP. The maximum number of services are 4096

The number of Hash functions field is used to indicate the number of hash functions, k (out of maximum of 16) used by the Bloom filter. e.g. 0001 means the first 2 Hash functions (i.e. H1 and H2 as specified in Section XYZ) will be used.

The length of the Service Hint Map plus Bloom filter information plus Service Hash may not fit into a single element and therefore the data following the length field of a Service Hash (if present) or Service Hint Map, a fragmentation using Fragment elements as specified in 11ai section XYZ.

The Service Hash field is an optional field formed from the value of service name by using the first 6 octets of the SHA-256 algorithm hashing of the value of the service name

**8.4.2.122b Service Advertisment Information (SAI) Element**

The Service Advertisement Information (SAI) element identifies a service advertised by an AP.

The SAI element is included in the Probe Response by the AP, in response to a Probe Request from a non-AP STA that has one or more matching Service Hashes. For each matching Service Hash, the AP includes a corresponding basic service descriptor.

The format of the SAI element is shown in Figure 8-403aq.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Basic Service Information Descriptor #1 | Basic Service Information Descriptor #2 | … | Basic Service Information Descriptor #j |
| Octets | 1 | 2 | variable  | variable |  | varaible |

**Figure 8-403aq – Service Advertisement Information element format**

The Element ID field is set to the value given in Table 8-54.

The value of the Length field is 2, plus the total length of all the basic service information descriptors. The format of the basic service information descriptor is shown in Figure 8-404aq.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Advertisement ID | Service Name Length | Service Name | ServiceStatus |
| Octets: | 4 | 1 | Variable | 1 |

**Figure 8-404aq – Basic Service Information Descriptor format**

The service status field is a 1 octet field indicating the current status of the service as shown in Table 8-4xxaq.

|  |  |
| --- | --- |
| Service Status Value | Description |
| 0 | Not available |
| 1 | Available |
| 2-255 | Reserved  |

**Table 8-4xxaq – Service status value**

The advertisement ID field is a 4-octet unsigned integer assigned by the AP when advertising a service. Service Name is an UTF-8 encoded string with maximum length of 64 bytes. Service Name may be an official IANA registered name as defined in RFC 6335 or developer specified name.

**8.4.2.122c Service Hash Element**

The Service Hash element is a Hash value derived by taking the first 6-octet of the SHA-256 alogrithm hashing of the value of the Service Name. Service Hash may be included in the Probe Request.

The format of the Service Hash element is shown in Figure 8-405aq.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Service Hash #1 | Service Hash #2 | … | Service Hash #j |
| Octets | 1 | 2 | 6 | 6 |  | 6 |

**Figure 8-405aq – Service Hash element format**

***Insert the following new subclause 8.4.6.***

**8.4.6 Pre Association Discovery Protocol elements**

PADP provides a means to exchange additional service discovery information between STAs. The elements support multiple service discovery protocols.

**8.4.6.1 General**

PADP-elements are defined to have a common format consisting of a 2-octet Info ID field, a 2-octet Length field, and a variable-length element-specific Information field. The PADP-element format is shown in Figure 8-406aq:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Info ID | Length | PADP Protocol-specific Information |
| Octets: | 2 | 2 | Variable |

**Figure 8-406aq – PADP-element format**

Each PADP-element in 8.4.6 is assigned a value of 276

The Length field is a 2-octet field that indicates the number of octets in the Information field and is encoded following the conventions given in 8.2.2 (Conventions).

The PADP Protocol-Specific Information field is a variable length field that contains a specific PADP element definition.

**8.4.6.2 PADP Service Information Request/Response**

The PADP Service Information Request/Response is a protocol for exchanging service specific information.

The PADP Protocol-Specific Information fields are defined as follows:

**8.4.6.2.1 Service Information Request element**

The Service Information Request element is used to request service information between STAs using the PADP Service Information Request/Response protocol. The Service Information Request element is included in a GAS Query Request and is sent by the non-AP STA to the AP.

The format of the Service Information Query Request is shown in Figure 8-407aq.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Service Name Length | Service Name | Service Information Query Request Length | Service Information Query Request |
| Octets: | 1 | variable | 1 | variable |

**Figure 8-407aq – Service Information Request element format**

The Service Information Query Request field contains service specific query such as key-value query.

**8.4.6.2.2 Service Information Response element**

The Service Information Response element is used to provide detailed service information between STAs using the GAS protocol in response to a Service Information Request element. The Service Information Response element is included in a GAS Query Response sent by the AP to the non-AP STA.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Detailed Service Information Descriptor #1 | … | Detailed Service Information Descriptor #j |
| Octets: | variable |  | variable  |

**Figure 8-408aq – Detailed Service Information Response element format**

The Service Information Descriptor field is a variable length field. The format of the Detailed Service Information Descriptor is shown in Figure 8-409aq.

|  |  |  |
| --- | --- | --- |
| Basic Service Information Descriptor | Service Information Query Response Length | Service Information Query Response |
| variable  | 2 | variable |

**Figure 8-409aq – Service Information Descriptor element format**

The Servce Information Query Response field is a variable length field. The format of the Service Information Qeury Response is service specific that contains requested service information

**10. MLME**

**10.24 WLAN interworking with external networks procedures**

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

***Insert new subclause 10.24.3.4 after the end of 10.24.3.3 as follows:***

**10.24.3.4 Pre-Association Discovery Protocol (PADP) procedures**

**10.24.3.4.1 General**

PADP provides functionality that enables STAs to discover the availability of services offered by an AP, before they associate with the wireless LAN. While the specification of service specific information is outside the scope of this standard, the AP can act as a proxy to the services offered by an external network or services offered by non-AP STAs associated with the AP.

There are two types of PAD namely unsolicited and solicited.

In the unsolicited PAD, basic service information is included in the Beacons and/or broadcast frames, transmitted by the AP. Upon receiving the Beacons and/or broadcast frames, the non-AP STAs can make an informed decision to associate with the AP, or query for more detailed service information using PADP as described in 8.4.6.2 before association.

In the solicited PAD, basic service information is included in the Probe Request transmitted by the non-AP STA. Upon receiving the Probe Request, the AP responds with a Probe Response only if there is a service match between the non-AP STA and the AP. The non-AP STAs can make an informed decision to associate with the AP or query for more detailed service information using PADP as described in 8.4.6.2 before association.

**10.24.3.4.1 Unsolicated PAD**

An AP having dot11UnsolictedPADActivated equals to true shall include a Service Hint Information element in Beacon and/or Broadcast frames.

A non-AP STA having dot11PADActivated equals to true shall listen for at least TBD beacon interval for Beacon and/or Broadcast frames.

The non-AP STA may associate to the AP based on the received Service Hint Information element or may use PADP Service Information Request to request more detailed information as defined in Table 8-175 (Advertisement protocol ID definitions) prior to association. The receiving AP shall respond to the PADP Service Information Request with PADP Service Information Response.

**10.24.3.4.2 Solicated PAD**

A non-AP STA having dot11PADActivated equals to true may send Probe Request containing Service Hash element

An AP having dot11SolictedPADActivated equals to true shall include Service Advertisement Information element in Probe Response frame, if there is one or more Service Hashes matching with the received Probe Request containing the Service Hash element sent by the non-AP STA.

The non-AP STA may associate to the AP based on the received Service Advertisement Information element or may use PADP Service Information Request to request more detailed information as defined in Table 8-175 (Advertisement protocol ID definitions) prior to association. The receiving AP shall respond to the PADP Service Information Request with PADP Service Information Response.

A STA that encounters an unknown or reserved PADP Info ID value in a GAS frame (see 8-210) received without error shall ignore that PADP Info ID and shall parse any remaining PADP Info IDs.

A STA that encounters an unknown vendor-specific PADP-element field or subfield in a GAS frame (see 8-210) 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.