IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| TGaq – ANQP Service Discovery Elements | | | | |
| Date: 2014-09-16 | | | | |
| Author(s): | | | | |
| Name | Company | Address | Phone | email |
| Stephen McCann | BlackBerry Ltd | 200 Bath Road, Slough, Berkshire, SL1 3XE, UK | +44 1753 667099 | smccann@blackberry.com |

Abstract

This document proposes to re-use ANQP for the PADP request/response messages.

This uses Draft P802.11REVmc\_D3.0.pdf and Draft P802.11aq\_D0.02 as baselines.

***Can remove Advertisment ID table from D0.02, as PADP re-uses ANQP.***

**8.4.2.122a Pre-association Discovery Capabilities**

The PAD Capabilities element contains information identifying Service Types and Upper Layer Protocols (ULPs) that are supported by a STA. The PAD Capabilities element is transmitted in beacons and probe responses.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Service Type mask | PAD Mode | ULP List count (optional) | ULP ID#1  (optional) | … | ULP ID#n  (optional) |
| Octets | 1 | 1 | 1 | 1 | 1 | 1 |  | 1 |

Figure 8-401aq – PADP Capabilities element format

The Element ID field is set to the value given in Table 8-54*{this table requires a new value added to it}.*

The value of the Length field is 2 plus the number of optional ULP ID elements

The Service Type mask is a 1 octet bit mask, indicating the Service Types which are supported by an AP. The format of the mask is shown in Figure 8-402aq.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Peripheral | WEB Service | Streaming  Multimedia | Interactive  Multimedia | Location Based Services | Reserved |
| Bit : | 0 | 1 | 2 | 3 | 4 | 5-7 |

Figure 8-402aq – Service Type mask format

The PAD Mode field indicates the mode in which PAD is operated by an AP. The PAD Mode is one of the following:

**Table 8-401aq – PAD Mode of operation**

|  |  |
| --- | --- |
| **PAD Mode Description** | **PAD Mode** |
| ANQP Service request/response using a Service Identifier Hash | 0 |
| Encapsulated ULP | 1 |
| Reserved | 2-220 |
| Vendor Specific | 221 |
| Reserved | 222-255 |

The ULP List length field is a 1 octet field indicating the length of the ULP ID sub-elements.

The ULP ID field is a 1 octet field indicating a value of a ULP that is supported by the AP. A suggested mapping of ULP ID is shown in Table 8-402aq:

**Table 8-402aq – Upper Layer Protocol Mappings**

|  |  |  |
| --- | --- | --- |
| **ULP name** | **ULP Abbreviation** | **ULP ID** |
| List of available ULPs | - | 0 |
| DNS Service Discovery, part of Apple’s Bonjour technology | DNS-SD, Bonjour | 1 |
| Service Location Protocol | SLP | 2 |
| Simple Service Discovery Protocol as used in Universal Plug and Play | SSDP, UPnP | 3 |
| Universal Description Discovery and Integration for web services | UDDI | 4 |
| Jini for Java objects. | JINI | 5 |
| Bluetooth Service Discovery Protocol | SDP | 6 |
| Salutation | Salutation | 7 |
| XMPP Service Discovery | XEP-0030 | 8 |
| Web Services Dynamic Discovery | WS-Discovery | 9 |
| multicast DHCP | MDHCP | 10 |
| Internet Storage Name Service | iSNS | 11 |
| Web Proxy Autodiscovery Protocol | WPAD | 12 |
| Dynamic Host Configuration Protocol | DHCP | 13 |
| eXtensible Resource Descriptor Sequence | XRDS | 14 |
| e911 (Emergency Service) | e911 | 15 |
| Next Generation 911 (Emergency Service) | NG911 | 16 |
| Location Service | Location | 17 |
| Reserved | - | 18-220 |
| Vendor Specific | - | 221 |
| Reserved | - | 222-255 |

***Modify the table in the following clause:***

* Access Network Query Protocol (ANQP) elements(11u)

|  |  |  |
| --- | --- | --- |
| * ANQP-element definitions (11u) | | |
| ANQP-element name | Info ID | ANQP- (Ed)element (clause) |
| Reserved | 0 – 255 | n/a |
| Query List | 256 | 8.4.4.1 (Query List ANQP-element (11u)) |
| Capability List | 257 | 8.4.4.2 (Capabililty List ANQP-element (11u)) |
| Venue Name | 258 | 8.4.4.3 (Venue Name ANQP-element (11u)) |
| Emergency Call Number | 259 | 8.4.4.4 (Emergency Call Number ANQP-element (11u)) |
| Network Authentication Type | 260 | 8.4.4.5 (Network Authentication Type ANQP-element (11u)) |
| Roaming Consortium | 261 | 8.4.4.6 (Roaming Consortium ANQP-element (11u)) |
| IP Address Type Availability | 262 | 8.4.4.8 (IP Address Type Availability ANQP-element (11u)) |
| NAI Realm | 263 | 8.4.4.9 (NAI Realm ANQP-element(11u)) |
| 3GPP Cellular Network | 264 | 8.4.4.10 (3GPP Cellular Network ANQP-element(11u)) |
| AP Geospatial Location | 265 | 8.4.4.11 (AP Geospatial Location ANQP-element(11u)) |
| AP Civic Location | 266 | 8.4.4.12 (AP Civic Location ANQP-element(11u)) |
| AP Location Public Identifier URI | 267 | 8.4.4.13 (AP Location Public Identifier URI ANQP-element(11u)) |
| Domain Name | 268 | 8.4.4.14 (Domain Name ANQP-element(11u)) |
| Emergency Alert Identifier URI | 269 | 8.4.4.15 (Emergency Alert URI ANQP-element(11u)) |
| TDLS Capability(#13018) | 270 | 8.4.4.17 (TDLS Capability ANQP-element  (#13018)) |
| Emergency NAI | 271 | 8.4.4.16 (Emergency NAI ANQP-element(11u)) |
| Neighbor Report | 272 | 8.4.4.18 (Neighbor Report ANQP-element) |
| Service Request (PAD Request??) | <ANA> | 8.4.4.20 (Service Request ANQP-element) |
| Service Response (PAD Response??) | <ANA+1> | 8.4.4.21 (Service Response ANQP-element) |
| Info ID and Service Request | <ANA+2> | 8.4.4.22  Info ID and Service Request ANQP-element) |
| PAD Encapsultation | <ANA+3> | 8.4.4.23  PAD Encapsulation ANQP-element) |
| Reserved | <ANA+4> – 56796 | n/a |
| Vendor Specific | 56797 | 8.4.4.7 (Vendor Specific ANQP-element (11u)) |
| Reserved | 56798 – 65535 | n/a |

***Insert the following new subclause 8.4.4***



**8.4.4.20 Service Discovery Request**

The Service Request ANQP-element is used to request service information between STAs. The Service Request ANQP-element is included in a GAS Query Request.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Info ID | Length | List of SIHs | Service Type Mask |
| Octets: | 2 | 2 | 6y | 1 |

**Figure 8-404aq – Service Request ANQP-element format**

The Service Identifier HashService Identifier Hash (SIH) field is a 6 octet version of a Unique Service Identifier Hash (USID) for the service which is within the Request or Response ANQP-element. The hash is used both as a identifier within a service query request and also as a response identification of services that are available within the AP. See Annex AQ1.2 for further information.

**8.4.4.21 Service Discovery Response**

The Service Response ANQP-element is used to provide service information between STAs in response to a Service Request ANQP-element. The Response ANQP-element is used in a GAS Query Response.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Info ID | Length | Service Descriptor List Count | SD#1  (optional) | … | SD#n  (optional) |
| Octets: | 2 | 2 | 1 | variable |  | variable |

**Figure 8-405aq – Service Response ANQP-element format**

The Service Descriptor List Count is a 1 octet field indicating the number of Service Descriptor sub-elements in the Response ANQP-element.

The format of the Service Descriptor (SD) sub-field is shown in Figure 8-406aq

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Length | SIH | Attributes  Count | Attribute#1  (optional) | … | Attribute #n  (optional) | ULP  (optional) |
| Octets: | 2 | 6 | 1 | 4 |  | 4 | 1 |

**Figure 8-406aq – Service Descriptor sub-field format**

The Length field is a 1 octet field indicating the length of the Service Descriptor sub-field.

The SIH sub-field is described in section 8.4.6.2.1.

The Attributes Count is a 1 octet field indicating the number of Attribute sub-fields.

The Attribute sub-field is a 4 octet field each of which contain additional information about the service identified by the SIH, for example, a service name string.

The ULP sub-field is an optional 1 octet field that identifies an ULP associated with the SIH and is defined in section 8.4.2.122a.

***8.4.4.22 Info ID and Service Request***

*The Info ID and Service Request ANQP-element is used to request service information between STAs using the PADP Request/Response protocol. The Request ANQP-element is included in a GAS Query Request.*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Info ID* | *Length* | *List of Info IDs* | *List of SIHs* | *Service Type Mask* |
| *Octets:* | *2* | *2* | *x* | *6y* | *1* |

***Figure 8-404aq – Info ID and Service Request ANQP-element format***

*The Service Identifier Hash (SIH) field is a 6 octet version of a Unique Service Identifier Hash (USID) for the service which is within the Request or Response ANQP-element. See Annex AQ1.2 for further information.*

**8.4.4.23 PAD Encapsulation ANQP-element**

The PAD Encapsulation ANQP-element is used to exchange upper layer protocol (ULP) frames between STAs using the GAS protocol. The PAD Encapsulation ANQP-element is used as a request included in a GAS Query Request or returned as a response in the GAS Query Response.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Info ID | Length | <TBD> |
| Octets: | 2 | 2 | variable |

**Figure 8-409aq – Encapsulation PADP-element format**

The Length and Token fields are defined in 8.4.6.1 (General).

The format of the <TBD> sub-field is <TBD> and relates to the ULPs defined in Table 8-402aq

***Modify the text and table in the following clause:***

* ANQP procedures(11u) (10.25)
* General(Ed)

A STA may use ANQP to retrieve information as defined in Table 8-184 from a peer STA. The ANQP requests use ANQP-elements that include the ANQP-element type of Q in Table 10-10. The ANQP query request uses the Query List ANQP-element comprised of ANQP-elements Info IDs from Table 8-184.

These ANQP requests are transported in the Query Requst field of GAS Request frames as per 10.24.3.1.4. The ANQP responses are transported in the Query Response field of GAS Response frames, as per 10.24.3.1.4.

(see REVmc 3.3)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| * ANQP usage (11u) | | | | | |
|  | |  | BSS | | IBSS |
| ANQP-element Name | ANQP-element (subclause)(Ed) | ANQP-element Type | AP | Non-AP STA | STA |
| Query List | 8.4.4.1 (Query List ANQP-element (11u)) | Q | T, R | T, R | T, R |
| Capabililty List | 8.4.4.2 (Capabililty List ANQP-element(11u)) | S | T, R | T, R | T, R |
| Venue Name | 8.4.4.3 (Venue Name ANQP-element (11u)) | S | T | R | — |
| Emergency Call Number | 8.4.4.4 (Emergency Call Number ANQP-element (11u)) | S | T | R | — |
| Network Authentication Type | 8.4.4.5 (Network Authentication Type ANQP-element(11u)) | S | T | R | — |
| Roaming Consortium | 8.4.4.6 (Roaming Consortium ANQP- element(11u)) | S | T | R | — |
| Vendor Specific | 8.4.4.7 (Vendor Specific ANQP-element(11u)) | Q, S | T, R | T, R | T, R |
| IP Address Type Availability | 8.4.4.8 (IP Address Type Availability ANQP-element (11u)) | S | T, R | T, R | T, R |
| NAI Realm | 8.4.4.9 (NAI Realm ANQP-element(11u)) | S | T | R | T, R |
| 3GPP Cellular Network | 8.4.4.10 (3GPP Cellular Network ANQP-element(11u)) | S | T | R | — |
| AP Geospatial Location | 8.4.4.11 (AP Geospatial Location ANQP-element(11u)) | S | T | R | T, R |
| AP Civic Location | 8.4.4.12 (AP Civic Location ANQP-element(11u)) | S | T | R | T, R |
| (#13006)AP Location Public Identifier URI | 8.4.4.13 (AP Location Public Identifier URI ANQP-element(11u)) | S | T | R | T, R |
| Domain Name | 8.4.4.14 (Domain Name ANQP-element(11u)) | S | T | R | — |
| Emergency Alert Identifier URI | 8.4.4.15 (Emergency Alert URI ANQP-element(11u)) | S | T | R | T, R |
| TDLS Capability (#13018) | 8.4.4.17 (TDLS Capability ANQP-element(#13018)) | Q, S | T,R | T,R | T, R |
| Emergency NAI | 8.4.4.16 (Emergency NAI ANQP-element(11u)) | S | T | R | — |
| Neighbor Report | 8.4.4.18 (Neighbor Report ANQP-element) | S | T | R | - |
| Service Discovery Request | 8.4.4.20 (Service Request ANQP-element) | Q | T, R | T,R | T, R |
| Service Discovery Response | 8.4.4.21 (Service Response ANQP-element) | S | T, R | T, R | T, R |
| *Info ID and Service Request* | *8.4.4.22 (Info ID and Service Reuqest ANQP-element)* | *Q* | *T* | *T* |  |
| PAD Encapsulation | 8.4.4.23 (PAD Encapsulation ANQP-element | Q, S | T,R | T,R | T, R |
| **Symbols**  Q element is an ANQP query  S element is an ANQP response  T ANQP-element may be transmitted by MAC entity  R ANQP-element may be received by MAC entity  — ANQP-element is neither transmitted nor received by MAC entity | | | | | |

**10.24.3.2.xx Service Discovery Request procedure**

The Service Request ANQP-element is used by a requesting STA to perform an ANQP request using the

procedures defined in 10.24.3.2.1.

The Service Request ANQP-element is used to discover available services within the BSS. A Service Identifier Hash (SIH) may be placed within the request. The SIH is used within the BSS to assist with discovering services, as described in Annex AQ.

The Service Discovery Request ANQP-element is re-directed to the proxy as described in Annex AQ, as this query is directed to the Service Information Server, as opposed to an ANQP Advertisement Server.

If no SIH value is present, the BSS will return all known services within the response.

**10.24.3.2.xx Service Response procedure**

The Service Response ANQP-element is returned in response to a Service Request ANQP-element. It contains a list of SIHs and attributes resulting from the service discovery as described in Annex AQ

**10.24.3.2.xx Info ID and Service Request procedure**

The Info ID and Service Request ANQP-element is used by a requesting STA to perform an ANQP request using the

procedures defined in 10.24.3.2.1.

It combines the features of the Query List ANQP-element and the Service Request ANQP-element.

Responses to the requests, are returned in individual ANQP-elements associated with each Info ID or as a Service Request. Therefore multiple ANQP-elements can be returned to the requesting STA for each individual Info ID and Service Request ANQP-element.

**10.24.3.2.xx PAD Encapsulation procedure**

The PAD Encapsultation ANQP-element is used by STAs to allow the transmission of upper layer protocol frames . PAD Encapsulation provides a means to exchange service discovery information between STAs. The elements support multiple service discovery protocols.