IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Location Related Comments | | | | |
| Date: 2014-03-15 | | | | |
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##### Baseline is 11mc D2.1. Changes indicated by a mixture of Word track-changes and instructions. For equation changes, Tex notation is sometimes used. E.g. a\_{xyz}^b denotes axyzb . Yellow highlighting means “look at the highlighted text more closely”.

Changes in R3:

* Implemented issues discussed at Jan F2F
* Conditioned sending AP location also on dot11RMLCIMeasurementActivated
* Maximum Age in LCI request
* Unsolicited neighbor reports / FTM responses if AP position changes
* AP LCI/Civic request in FTM allowed only if schedule FTM parameters element is present also
* FQDN to Public URI
* Relative error to LCI report
* AP/STA usage-rules to LCI report
* AP location expected to change into LCI report

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2404 | 701.00 |  | 8.4.2.21.13 |  |  | Location civic report assumes the STA is configured with its civic location. A valid use case is when the feature is supported but the STA does not know its civic location. Add a sentence which describes how the STA indicates in the Location Civic Report that it does not know its civic location. | add a sentence to this extent: "when the country code in the civic location field (figure 8-194) is set to an invalid value (see ISO3166 for valid country codes), it indicates that the reporting STA does not know its civic location." same change for 8.4.4.13 AP Civic Location ANQP-element subclause. | Revised, see changes in 14/1509r<motionjedRev> that correct the parsing of the Civic field. When the Civic location is unknown, it is indicated by an empty subelement |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2403 | 692.00 |  | 8.4.2.21.10 |  |  | LCI report assumes that when the feature is supported, location is known. A valid scenario is when the STA supports the feature, but does not know its location. | add a sentence saying "The value of FFFF for longitude, latitude and altitude fields is reserved, a STA sets these fields to FFFF when it does not know its location." Same change to 8.4.4.12. | Revised, see changes in 14/1509r<motionjedRev> that correct the parsing of the LCI field. When a field is unknown, it is indicated by an empty subelement |

***Discussion 2404:***

1)

Parsibility of response is fragile – could become difficult to distinguish start of Civic Location type from another optional subelement. Issue also affects Public Identifier URI field in Location Identifier Report.

Proposed fix is to prefix these fields by Element ID and Length octets.

Examples of payloads

|  |
| --- |
| D 0 1 2 3  H 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1  C +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+  P | GEOCONF\_CIVIC | N | what | country |  V +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+  4 | code | civic address elements ...  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+  D 0 1 2 3  H 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1  C +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+  P | OPTION\_GEOCONF\_CIVIC | option-len |  V +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+  6 | what | country code | .  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+ .  . civic address elements .  . ... .  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+  GEOCONF\_CIVIC = 99; OPTION\_GEOCONF\_CIVIC = 36, presumably in network byte order (big endian) so 0x00-34. So if we defined a sub-element with Element ID = 0 or 99, parsing would be very difficult / impossible. Or if IETF prepared a new RFC (e.g. “DHCPv9”) with a new leading octet, parsing would also be much more difficult.  Basically we are creating an unnecessary coupling between layers. |

2)

The RFC is an IETF standard, with network coding (big-endian) ordering, unlike 802.11, so we need to be explicit if this is little-endian or big-endian. Propose little endian as per 8.2.2 (same as LCI)

3)

Then, when the Civic Location is unknown, then set the Length to 0. This aligns with a discussion with an IETF representative (Marc Linsner), who says “In the IETF, lack of data indicates I don't know.”

4)

Location Civic is also useful for FTM procedure. Add optional Civic request/response within FTM request/next FTM frame

5)

Location Civic is also useful within the Neighbor Report. Add optional Civic request/response within Neighbor Report Req/Resp exchange

6)

Fix up URI encoding

|  |
| --- |
| For the URI, consider <http://www.example.com>, [ftp.example.com](ftp://ftp.example.com), gopher:, mailto:, news:, telnet: etc etc. So if we defined a sub-element with Subelement ID = 104, 102, 103, 109, 110, 116, parsing would be very difficult / impossible. Or if a new URI prefix became popular (e.g. “!!!://”) with a new leading octet, parsing would also be much more difficult.  Basically we are creating an unnecessary coupling between layers. |

***Discussion 2403:***

1)

Presentation 14/32 to address CIDs 2402, 2492, 2491 and 2493 adopts the newer “uncertainty” fields over the older “resolution” fields and makes other changes.

Although it is possible to indicate an unknown location by 1) max-ing out the uncertainty and 2) including an invalid lat/long, this is long, clumsy and not really consistent with “In the IETF, lack of data indicates I don't know.” Therefore use the same solution as for Civic – turn this into a subelement, where a zero-length subelement indicates “I don’t know”.

2)

Related, the LCI figure includes an element ID and length but there is no text on how they are set, no element ID is assigned and in fact this figure is for the LCI field that is a suffix to the Measurement Report element where no element ID or length is needed. Clean this up by converting this element ID to a subelement ID (set to zero, so it is first).

3)

LCI lacks AP height above floor and floor number (Civic provides floor string but not floor number). Add suitable optional subelement.

4) The LCI responder may have recently computed and cached the requested location. It is not clear under what circumstances the responder may reuse this cached location, so add a maximum age subelement in the LCI request.

5)

LCI is also useful for FTM procedure. Add optional LCI request/response within FTM request/next FTM frame

6)

LCI is also useful within the Neighbor Report. Add optional LCI request/response within Neighbor Report Req/Resp exchange

7)

AP locations are not fixed in stone. Provide a way to signal for APs expected to change their location to be able to advertise this and also allow unsolicited transmission of AP locations.

8) The Public Location URI messaging works well for HELD location servers but not for SUPL location servers (which is important giving SUPL’s use in the cellular/outdoor location industry, and recognizing that indoor location can be treated as an extension to outdoor location. Therefore extend the Public Location URI to support FQDNs as well as URIs

9)

LCI includes absolute uncertainties, which may be relatively large due to imperfect georeferencing of satellite imagery (e.g. 50ft error). But oftentimes the relative errors are small (e.g. all APs on a floor are carefully placed on the same floorplan, with error of << 3 ft) and this information enables a) much more accurate location for speed/angle estimation, and b) for 100% indoor use cases with an indoor map, the absolute error is not relevant. Add an indication of relative error to the LCI report.

10)

When an intiating STA requests the location of a responding STA from the responding STA, the responding STA may already have calculated its location, and may prefer to reuse that. But that location may be too old for the initiating STA. Therefore add a maximum age in the LCI “Where Are You” request that allows the responding STA to know if its already available location is not too stale.

11)

Distributing location is sensitive (both for individuals and venues). IETF defined usage rules (in geopriv) to held address this concern. Allow IETF geopriv usage-rules parameters to be included in an LCI report

***Change:***

**2. Normative references**

OMA OMA-TS-ULP-V2\_0\_1 UserPlane Location Protocol

IETF RFC 5985 HTTP-Enabled Location Delivery (HELD)

IETF RFC 4119 A Presence-based GEOPRIV Location Object Format

***11mc editor: Replace all instances of “Public Identifier URI” by “Public Identifier URI/FQDN” and all instances of “AP Location Public Identifier URI” by “AP Location Public Identifier URI/FQDN”***

8.4.2.20.10 Location Configuration (#136)Request

Table 8-79—Optional subelement IDs for LCI request (#1294)(#1429)

|  |  |  |
| --- | --- | --- |
| Subelement ID | Name | Extensible |
| 0 | Reserved |  |
| 1 | Azimuth Request | Yes |
| 2 | Originator Requesting STA MAC Address | No |
| 3 | Target MAC Address | No |
| 4 | Maximum Age | Yes |
| 5–220 | Reserved |  |

***11mc editor: insert before vendor specific paragraph:***

The Maximum Age subelement indicates the maximum age of the requested LCI. The format of the Maximum Age subelement is defined in Figure 8-147xx. The absence of a Maximum Age subelement indicates that an LCI determined at or after the LCI request is received is requested.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Subelement ID | Length | Maximum Age |
| Octets | 1 | 1 | 2 |

Figure 8-147xx: Format of Maximum Age subelement

The Subelement ID field is set to the value for Maximum Age in Table 8-79 (Optional subelement

IDs for LCI request).

The Length field is defined in 8.4.3 (Information Subelements).

The Maximum Age field of a Maximum Age subelement indicates the maximum elapsed time between when an LCI is determined and when an LCI request is received, within which the LCI satisfies the LCI request. The Maximum Age field is encoded as unsigned integer with units of 0.1 seconds. The value of 0 is reserved. The value of 65535 indicates that an acceptable LCI age is 6553.5 seconds or higher.

**8.4.2.21.10 Location Configuration Information Report**

A known LCI (#1294)report includes Latitude, Longitude, Altitude, and optional Z and Azimuth information. An unknown LCI is indicated by a subelement Length of 0 and no following fields. The LCI report field format is shown in Figure 8-186.99 (Measurement Report field format for Location Configuration Information Report(#1692)).

|  |  |  |
| --- | --- | --- |
|  | LCI subelement | Optional Subelements |
| Octets | 2 or 18 | Variable |

Figure 8-186.99: Measurement Report field format for Location Configuration Information Report

***11mc editor: move Table 8-99 to here***

**Table 8-99—Subelement IDs for Location Configuration Information Report**

***11mc editor: Insert new rows and renumber reserved rows***

|  |  |  |
| --- | --- | --- |
| **Subelement ID** | **Name** | **Extensible** |
| 0 | LCI | No |
| 4 | Z | Subelements |
| 5 | Relative Location Error | Yes |
| 6 | Usage-rules | Yes |

The LCI subelement is formatted according to Figure 8-187 (LCI subelement format).

***802.11m editor: Change “Element ID” to “Subelement ID” and mark following fields as optional (as per figure below).***

***802.11m editor: Presentation 14/32 also updates other fields in this figure; so the intent of the change indicated below is to keep all fields after “Length” marked as “0 or 1”.***



Figure 8-187—LCI subelement format

***Note movement of text (not shown via Word track changes)***

The definitions of fields within the LCI report subelement are as specified in Section 2.2 of IETF RFC 6225(#1692) (July 2011) or as defined herein. This structure and information fields are little-endian, per conventions defined in 8.2.2 (Conventions), and are based on the LCI format described in IETF RFC 6225(#1692).

NOTE—An example of fixed/fractional notation, using the longitude of the Sears Tower from

p. 28of IETF RFC6225(#1692) (July 2011):

Longitude 87.63602 °(#1491) West (or –87.63602 °(#1491)),

Using (#273)2s complement, 34 bit fixed point, 25 bit fraction,

Longitude = 0xf50ba5b97,

Longitude = 1101010000101110100101101110010111 (big-endian)

DSE registered location expression for a Longitude resolution of 34-bits:

Bits 56–61 Longitude resolution = (bit 56) 0 1 0 0 0 1 (bit 61)

Bits 62–86 Longitude fraction = (bit 62) 1 1 1 0 1 0 0 1 1 1 0 1 1 0 1 0 0 1 0 1 1 1 0 1 0 (bit 86)

Bits 87–95 Longitude integer = (bit 87) 0 0 0 1 0 1 0 1 1 (bit 95)

The octets in transmission order = E2 E5 96 2E D4.

The RegLoc Agreement field is set to 1 to report that the STA is operating within a national policy area or an

international agreement area near a national border (see 10.12.3 (Registered STA operation)); otherwise, it is

0.(#1692)

The RegLoc DSE field is set to 1 to report that the enabling STA is enabling the operation of STAs with

DSE; otherwise, it is 0.(#1692)

The Dependent STA field is set to 1 to report that the STA is operating with the enablement of the enabling

STA whose LCI is being reported; otherwise, it is 0.(#1692)

The Optional Subelements field comprises zero or more subelements with subelement ID greater than or equal to 1 as listed in Table 8-99 (Subelement IDs for Location Configuration Information Report(#1429)). A Yes in the Extensible column of a subelement listed in Table 8-99 (Subelement IDs for Location Configuration Information Report(#1429)) indicates that the (Ed)subelement might be extended in future revisions or amendments of this standard. When the Extensible column of an element is equal to Subelements, then the subelement might be extended in future revisions or amendments of this standard by defining additional subelements within the subelement. See 9.25.9 (Extensible subelement parsing).

***11mc editor: Insert at end of subclause***

The Z subelement is used to report the floor and location of the STA with respect to the floor level.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Sub-element ID | Length | STA Floor Info | STA Height Above Floor | STA Height Above Floor Uncertainty |
| Octets | 1 | 1 | 2 | 2 | 1 |

Figure 8-188xxx – Z subelement format

The Subelement ID field is equal to the value for Z in Table 8-99.

The Length field is defined in 8.4.3.

The format of the STA Floor Info field is defined in Figure 8-188xxy

|  |  |  |  |
| --- | --- | --- | --- |
|  | Expected to Move | STA Floor Number | Reserved |
| Bits | B0 | B1 B14 | B15 |

Figure 8-188xxy-STA Floor Info field format

An Expected to Move value equal to 1 indicates that the STA is expected to change its location. An Expected to Move value equal to 0 indicates that the STA is not expected to change its location.

NOTE - Examples of STAs that are expected to move include a) battery-powered STAs, b) STAs installed within trains/vehicles, c) STAs installed for temporary events.

The STA Floor Number field indicates the floor number of the STA. A higher value indicates a higher floor, and the integer approximates the floor number labels used at the venue (e.g. in the stairwells and elevators, if present). The field is encoded as a twos complement integer with units of 1/16-th of a floor. The value of 8191 indicates an unknown floor number. The value of 8190 indicates the height of the STA above the floor is 8190/16 floors or more. The value of -8192 indicates the height of the STA above the floor is -8192/16 floors or less.

NOTE: For example, a building with floors labelled as Basement1, Ground, Mezzanine, 1, and 2 can have the floors identified by STA Floor Number values equal -16, 0, 8, 16 and 32 respectively.

The STA Height Above Floor field indicates the height of the STA above the floor. The field is coded as a two complement integer with units of 1/256 meters. The value of -32768 indicates an unknown STA height above floor. The value of -32767 indicates the height of the STA above the floor is -32767/256 meters or less. The value of 32767 indicates the height of the STA above the floor is 32767/256 meters or more.

An STA Height Above Floor Uncertainty value of 0 indicates an unknown STA height above floor uncertainty. Values of 19 or higher are reserved. A value between 1 and 18 inclusive indicates that the actual STA height above floor is bounded according to:

***Note to reader (not for inclusion in the 11mc draft): this somewhat unnatural encoding follows RFC6225’s encoding for latitude uncertainty, which in turn is due to attempting to align with the original RFC3825 “Resolution” encoding.***

STA height above floor in meters - 29 - STA Height Above Floor Uncertainty <= actual STA height above floor <= STA height above floor in meters + 29 - STA Height Above Floor Uncertainty

If the STA Height Above Floor field indicates an unknown STA height above floor, the STA Height Above Floor Uncertainty field is set to 0.

The Relative Location Error subelement is used to report the location error of STAs with respect to a reference STA (rather than with respect to an absolute geographic location). The format of the Relative Location Error subelement is defined in Figure 8-188xxy.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Sub-element ID | Length | Reference STA | Relative Location Error |
| Octets | 1 | 1 | 6 | 1 |

Figure 8-188xxy – Relative Location Error subelement format

The Subelement ID field is equal to the value for Relative Location Error in Table 8-99.

The Length field is defined in 8.4.3.

The Reference STA field contains the MAC address of the reference STA.

The format of the Relative Location Error field is defined in Figure 8-188xxz.

|  |  |  |
| --- | --- | --- |
|  | Power Of Two Horizontal Error | Power Of Two Vertical Error |
| Bits | 0 3 | 4 7 |

Figure 8-188xxz. Relative Location Error field format

The Power Of Two Horizontal Error field contains an upper bound on the error between the horizontal location of the Reference STA and the Latitude and Longitude fields in the LCI subelement. The Power Of Two Horizontal Error field indicates a relative horizontal error of 1 meter \* (Power Of Two Horizontal Error - 8) for the Power Of Two Horizontal Error field in the range of 0 to 13 inclusive. The value 14 indicates a relative horizontal error of greater than 32 meters. The value 15 indicates an unknown relative horizontal error.

The Power Of Two Vertical Error field contains an upper bound on the error between the vertical location of the Reference STA and the Altitude field in the LCI subelement. The Power Of Two Vertical Error field indicates a relative vertical error of 1 meter \* (Power Of Two Vertical Error - 8) for the Power Of Two Vertical Error field in the range of 0 to 13 inclusive. The value 14 indicates a relative vertical error of greater than 32 meters. The value 15 indicates an unknown relative vertical error.

The Usage-rules subelement is used to report the usage rules of the reporting STA. The format of the Usage-rules subelement is defined in Figure 8-188xyy.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  | Optional |
|  | Sub-element ID | Length | Usage-rules Parameters | Retention-expires-relative |
| Octets | 1 | 1 | 1 | 2 |

Figure 8-188xyy – Usage-rules subelement format

The Subelement ID field is equal to the value for Usage-rules in Table 8-99.

The Length field is defined in 8.4.3.

The Usage-rules Parameters field is defined in Figure 8-188xyz.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Retransmission-allowed | Retention-expires-relative Present | Reserved |
| Bits | 0 | 1 | 2 7 |

Figure 8-188xyz – Usage-rules Parameters field format

The Retransmission-allowed field definition is the same as the definition for the retransmission-allowed element in [RFC 4119], except that the “no” and “yes” text encoding specified in [RFC 4119] is replaced by 0 and 1 respectively.

The Retention-expires-relative Present field equal to 1 indicates that the Retention-expires-relative field is present; otherwise the Retention-expires-relative field is not present. If the Retention-expires-relative field is not present, it indicates that the .retention duration of the LCI report field is unbounded.

The Retention-expires-relative definition is the same as the definition for the retention-expires element in [RFC 4119], except that the absolute time text encoding specified in [RFC 4119] is replaced by a relative binary encoding. The Retention-expires-relative field is encoded as a number of hours in the future relative to the time of transmission of the Usage-rules subelement.

**8.4.2.21.13 Location Civic Report**

The Location Civic Report includes the location information defined in Civic format for the location subject provided in the Location Civic measurement request, as shown in Figure 8-194 (Location Civic Report field format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Civic Location Type | Location Civic subelement | Optional Subelements |  |
| Octets: | 1 | variable | variable |  |

**Figure 8-194—Location Civic Report field format**

The Civic Location Type field contains the format of location information in the Civic Location field, as

indicated in Table 8-84 (Civic Location Type).

**Table 8-84—Civic Location Type**

|  |  |
| --- | --- |
| **Civic Location Type value** | **Description** |
| 0 | IETF RFC4776-2006 starting at the country code field (i.e. excluding the GEOCONF\_CIVIC/ OPTION\_GEOCONF\_CIVIC, N/ option-len and what fields); includes all subsequent RFCs that define additional civic address Types. |

***11mc editor: move Table 8-104 to here***

**Table 8-104—Subelement IDs for Location Civic Report(#1429)**

|  |  |  |
| --- | --- | --- |
| **Subelement ID** | **Name** | **Extensible** |
| 0 | Location Civic | No |
| 1 | Originator Requesting STA MAC Address | No |
| 2 | Target MAC Address | No |
| 3 | Location Reference |  |
| 4 | Location Shape |  |
| 5 | Map Image |  |
| 6–220 | Reserved |  |
| 221 | Vendor Specific |  |
| 222–255 | Reserved |  |

The Location Civic subelement of the Location Civic Report (see Figure 8-194 (Location Civic Report field format)) is formatted according to Figure XXX1.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Subelement ID | Length | Location Civic |
| Octets | 1 | 1 | Variable |

Figure XXX1: Location Civic Report subelement format

The Subelement ID is equal to Location Civic as defined inTable 8-104.

The Location Civic field contains the location information in the format as indicated in the Civic Location Type field. When the Civic Location Type is IETF RFC4776-2006:

* Location Civic field is formatted according to IETF RFC4776-2006 starting at the country code field (i.e. excluding the GEOCONF\_CIVIC/ OPTION\_GEOCONF\_CIVIC, N/ option-len and what fields)
* An unknown Civic Location is indicated by a subelement Length of 0 and a zero-length Location Civic field
* The Civic Location field follows the little-endian octet ordering

When the Civic Location Type is IETF RFC4776-2006, the Optional Subelements field optionally(#1677) includes the Location Reference, Location Shape, Map Image, and Vendor Specific subelements as defined in Table 8-104 (Subelement IDs for Location Civic Report(#1429)).

When the Civic Location Type value is Vendor Specific, a Vendor Specific subelement is included in the Optional Subelements field that identifies the Organization Identifier corresponding to the Civic Location Type.

The Optional Subelements field format contains zero or more subelements with subelement ID greater than or equal to 1, each consisting of a 1-octet Subelement ID field, a 1-octet Length field, and a variable-length Data field, as shown in Figure 8-504 (Subelement format). The optional subelements are ordered by nondecreasing subelement ID.

The Subelement ID field values for the defined subelements are shown in Table 8-104 (Subelement IDs for Location Civic Report(#1429)). A Yes in the Extensible column of a subelement listed in Table 8-104 (Subelement IDs for Location Civic Report(#1429)) indicates that the length of the subelement might be extended in future revisions or amendments of this standard. When the Extensible column of an element is Subelement, then the subelement might be extended in future revisions or amendments of this standard by defining additional subelements within the subelement. See 9.25.9 (Extensible subelement parsing).

**8.4.2.21.14 Location Identifier Report**

The Location Identifier (#1294)report includes an indirect reference to the location information for the

location subject provided in the Location Identifier measurement request, as shown in Figure 8-207

(Location Identifier (#1294)report field format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Zero or more |  |  |
|  | Expiration TSF | Public Identifier URI/FQDN subelement | Optional Subelements |  |
| Octets: | 8 | Variable | variable |  |

**Figure 8-207—Location Identifier (#1294)report field format**

The Expiration TSF field is the value of the TSF when the Public Identifier URI/FQDN subelements(s) that indicate a location object are no longer valid. The Expiration TSF field set to 0 indicates the Public Identifier URI/FQDN subelements(s) that indicate a location object do not expire.

***11mc editor: move Table 8-107 to here***

**Table 8-107—Subelement IDs for Location Identifier report(#1294)(#1429)**

|  |  |  |
| --- | --- | --- |
| **Subelement ID** | **Name** | **Extensible** |
| **0** | **Public Identifier URI/FQDN** | **No** |

The Public Identifier URI/FQDN subelement of the Location Identifier Report (see Figure 8-207 (Location Identifier report field format)) is formatted according to Figure XXX2.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Subelement ID | Length | URI/FQDN Descriptor | Public Identifier URI/FQDN |
| Octets | 1 | 1 | 1 | Variable |

Figure XXX2: Public Identifier URI/FQDN subelement format

The Subelement ID is equal to Public Identifier URI/FQDN as defined inTable 8-107.

The URI/FQDN Descriptor field describes the Public Identifier URI/FQDN field. The encoding of the URI/FQDN Descriptor field is defined in Table 8-107a.

Table 8-107a: URI/FQDN Descriptor field encoding

|  |  |
| --- | --- |
| URI/FQDN Descriptor | Usage |
| 0 | Reserved |
| 1 | URI of HELD location object [IETF RFC 5985] |
| 2 | Fully qualified domain name of D-SLP SUPL server (excludes port number) [OMA OMA-TS-ULP-V2\_0\_1] (or higher version) |
| 3-255 | Reserved |

The Public Identifier URI/FQDN field contains a value in URI or FQDN format that points to a location object or location server respectively.

A Public Identifier URI/FQDN field that points to a location object can be used to return the location value for the requesting STA. The format of the location value returned when the URI is dereferenced is dependent on the provider of the URI as indicated by the URI/FQDN Descriptor field. The Public Identifier URI field confirms the validity of the location estimate to an external agent when a STA forwards a location estimate to that agent. The protocol used to query the infrastructure for a location report based on the Public Identifier URI field is beyond the scope of this standard.

A Public Identifier URI/FQDN field that points to a location server can be used to discover the location server and establish communications with it. The protocol used with the location server is indicated by the URI/FQDN Descriptor field.

The Optional Subelements field format contains zero or more subelements with subelement ID greater than or equal to 1, each consisting of a 1-octet

Subelement ID field, a 1-octet Length field and a variable-length Data field, as shown in Figure 8-516

(Subelement format). Any optional subelements are ordered by nondecreasing subelement ID.

The Subelement ID field values for the defined subelements are shown in Table 8-107 (

subelement IDs for Location Identifier report(#1294)(#1429)). A Yes in the Extensible column of a subelement listed in Table 8-107 (subelement IDs for Location Identifier report(#1294)(#1429))

indicates that the (Ed)subelement might be extended in future revisions or amendments of this standard.

When the Extensible column of an element is Subelement, then the subelement might be extended in future

revisions or amendments of this standard by defining additional subelements within the subelement. See

9.25.9 (Extensible subelement parsing).

The Originator Requesting STA MAC Address subelement contains the MAC address of the STA that

requested the Location Information and it is present whenever the location subject definition field in the

corresponding Location Identifier (#1294)request was set to 2. The format of the Originator Requesting

STA MAC Address subelement is shown in Figure 8-146 (Originator Requesting STA MAC Address

subelement format).

The Target MAC Address subelement contains the MAC address of the STA whose Location Information

was requested and it is present whenever the location subject definition field in the corresponding Location

Identifier (#1294)request was set to 2. The format of the Target MAC Address subelement is shown in

Figure 8-147 (Target MAC Address subelement format).

**8.4.2.36 Neighbor Report element**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 B1 | B2 | B3 | B4 B9 | B10 | B11 | B12 | B13 B31 |
|  | AP Reachability | Security | Key Scope | Capabilities | Mobility  Domain | High Throughput | FTM | Reserved |
| Bits | 2 | 1 | 1 | 6 | 1 | 1 | 1 | 19 |

**Figure 8-256—BSSID Information field**

The FTM field equal to 1 indicates that the AP represented by this BSSID is an AP that has set the Fine Timing Measurement field of the Extended Capabilities element to 1. If the FTM field is 0, it indicates either that the reporting AP has dot11FineTimingMsmtActivated equal to false, or the reported AP has not set the Fine Timing Measurement field of the Extended Capabilities element to 1 or that the Fine Timing Measurement field of the reported AP is not available to the reporting AP at this time.

Bits 13–31 are reserved.

**Table 8-131—Optional subelement IDs for neighbor report**

***11mc editor: Insert new row and renumber reserved rows***

|  |  |  |
| --- | --- | --- |
| **Subelement ID** | **Name** | **Extensible** |
| 39 | Measurement Report | Subelements |

***11mc editor: Insert at the end of this subclause***

A Measurement Report subelement with Measurement Type equal to LCI report (see Table 8-90) is optionally present. If present, the subelement has the same format as the Measurement Report element with Measurement Type equal to LCI report.The subelement indicates the LCI of the neighbour STA and further includes the Z subelement, or the subelement indicates an unknown LCI (see 10.24.6.2). The Late, Incapable and Refused bits in the Measurement Report Mode field are set to 0.

A Measurement Report subelement with Measurement Type equal to Location Civic report (see Table 8-90) is optionally present. If present, the subelement has the same format as the Measurement Report element with Measurement Type equal to Location Civic report, and the subelement indicates the Civic address of the transmitting STA or an unknown Civic address (see 10.24.6.2). The Late, Incapable and Refused bits in the Measurement Report Mode field are set to 0.

* AP Location Public Identifier URI/FQDN ANQP-element

The AP Location Public Identifier URI/FQDN ANQP-element provides an indirect reference to the location information for the AP or a location server that has location information for the AP and optionally nearby STAs. This list element may be returned in response to a GAS Query using the procedures in 10.25.3.2 (ANQP procedures). The format of the AP Location Public Identifier URI/FQDN ANQP-element is provided in Figure 8-539 (AP Location Public Identifier URI/FQDN ANQP-element format).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | Zero or more |  |  |
|  | Info ID | Length | Public Identifier URI/FQDN |  |  |
| Octets: | 2 | 2 | Variable |  |  |
| * AP Location Public Identifier URI/FQDN ANQP-element format | | | | | |

The Info ID and Length fields are defined in 8.4.4.1 (General).(#1430)

The Public Identifier URI/FQDN field is a variable-length field containing zero or more Public Identifier URI/FQDN subelements, as defined in 8.4.2.21.14 (Location Identifier report).(#1171)

***11mc editor: Sections 8.6.7.4 (Link Measurement request), 8.6.7.5 (Link Measurement Report), and 8.6.7.6 (Neighbor report request) all describe a frame with trailing optional subelments. But, being contained directly in frames, our convention is that these should be optional elements. Accordingly:***

* ***Replace “subelement” by “element” in text and figures in these sections***
* ***Remove description of optional subelements field, description of format of subelements, and table of subelements, in accordance with usual conventions for how we describe elements in frames***
* ***For tables of subelements that contain other than VS subelements (e.g. DMG Link Margin and DMG Link adaptation Acknowledgement elements in 8.6.7.5 (Link Measurement Report), and SSID subelement in Neighbor report request ), convert the content from subelement content to element content***
* ***Fortunately, the format of the subelement and elements are identical (including subelement/element IDs)***
* ***Note: There is some duplication in the changes identified immediately above and the changes below for 8.6.7.6.***

**8.6.7.6 Neighbor Report Request frame format**

**Table 8-256—Optional element IDs for Neighbor Report Request frame**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | Optional | Optional | Optional |
|  | Category | Radio Measurement Action | Dialog token | SSID | Measurement Request element with Measurement Type equal to LCI request | Measurement Request element with Measurement Type equal to Location Civic request |
| Octets | 1 | 1 | 1 | variable | variable | variable |

Figure 8-564—Neighbor Report Request frame Action field format

***11mc editor: Note deletion of table***

The presence of an optional SSID element in a Neighbor Report Request frame indicates a request for a neighbor list for the specified SSID in the SSID element. The absence of an SSID element indicates a request for a neighbor report for the current ESS.

***11mc editor: Insert at the end of this subclause***

A Measurement Request element with Measurement Type equal to LCI request (see Table 8-66) is optionally present. If present, the element indicates a request for a Measurement Report subelement with Measurement Type equal to LCI report for each Neighbor Report element (see 10.11.10.2). The Enable bit in the Measurement Request Mode field in the Measurement Request element is set to 0. The Location Subject field in the Measurement Request field of the Measurement Request element is set to Location Subject Remote (see Table 8-78). The Request, Report and Duration Mandatory bits within the Measurement Request Mode field in the Measurement Request element are reserved (see 8.4.2.20.1)

A Measurement Request element with Measurement Type equal to Location Civic request (see Table 8-66) is optionally present. If present, the element indicates a request for a Measurement Report subelement with Measurement Type equal to Location Civic report for each Neighbor Report element (see 10.11.10.2). The Enable bit in the Measurement Request Mode field within the Measurement Request element is set to 0. The Location Subject field in the Measurement Request field of the Measurement Request element is equal to Location Subject Remote (see Table 8-78). The Location Service Interval Units field in the Measurement Request field of the Measurement Request element is set to 0. The Request, Report and Duration Mandatory bits in the Measurement Request Mode field in the Measurement Request element are reserved (see 8.4.2.20.1)

**8.6.8.25 Fine Timing Measurement Request frame format**

***11mc editor: Append the two elements shown to fixed-length fields in the frame. 14/160 is also adding fields at the end of the frame, so when/if that is accepted, the new elements below are added before the new elements in 14/160.***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  | 0 or 1 | 0 or 1 |
|  | Category | Action | Trigger | Measurement Request element with Measurement Type equal to LCI request | Measurement Request element with Measurement Type equal to Location Civic request |
| Octets: | 1 | 1 | 1 | Variable | Variable |

***11mc editor: Insert at the end of this subclause***

A Measurement Request element with Measurement Type equal to LCI request (see Table 8-66) is optionally present. If present, the element indicates a request for a Measurement Report element with Measurement Type equal to LCI (see 10.24.6.2). The Enable bit in the Measurement Request Mode field in the Measurement Request element is equal to 0. The Location Subject field in the Measurement Request field of the Measurement Request element is equal to Location Subject Remote (see Table 8-78). The Request, Report and Duration Mandatory bits in the Measurement Request Mode field in the Measurement Request element are reserved (see 8.4.2.20.1)

A Measurement Request element with Measurement Type equal to Location Civic request (see Table 8-66) is optionally present. If present, the element indicates a request for a Measurement Report element with Measurement Type equal to Location Civic report (see 10.24.6.2). The Enable bit in the Measurement Request Mode field in the Measurement Request element is equal to 0. The Location Subject field in the Measurement Request field of the Measurement Request element is equal to Location Subject Remote (see Table 8-78). The Location Service Interval Units field in the Measurement Request field of the Measurement Request element is equal to 0. The Request, Report and Duration Mandatory bits in the Measurement Request Mode field within the Measurement Request element are reserved (see 8.4.2.20.1)

***14/160 is also adding fields at the end of the frame, so when/if that is accepted, the new elements below are added before the new elements in 14/160.***

**8.6.8.26 Fine Timing Measurement frame format**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  | 0 or 1 | 0 or 1 |
|  | Category | Action | Dialog Token | Follow Up Dialog Token | TOD | TOA | Max TOD Error | Max TOA Error | Measurement Report element with Measurement Type equal to LCI report | Measurement Report element with Measurement Type equal to Location Civic report |
| Octets: | 1 | 1 | 1 | 1 | 6 | 6 | 2 | 2 | Variable | Variable |

Figure 8-589—Fine Timing Measurement frame format

***11mc editor: Insert at the end of this subclause***

A Measurement Report element with Measurement Type equal to LCI report (see Table 8-90) is optionally present. If present, the element either indicates the LCI of the transmitting STA and includes the Z subelement or the element indicates an unknown LCI (see 10.24.6.2). The Late, Incapable and Refused bits in the Measurement Report Mode field are equal to 0.

A Measurement Report element with Measurement Type equal to Location Civic report (see Table 8-90) is optionally present. If present, the element either indicates the Civic address of the transmitting STA or an unknown Civic address (see 10.24.6.2). The Late, Incapable and Refused bits in the Measurement Report Mode field are equal to 0.

10.11.9.6 Location Configuration Information Report

If dot11RMLCIMeasurementActivated is true, a STA shall reject any LCI (#1294)request for location information that is not available and shall respond with a Radio Measurement Report frame including a Radio Measurement Report element with the Refused bit set to 1. If dot11RMLCIMeasurementActivated is true and a STA accepts an LCI (#1294)request that does not include an Azimuth Request, it shall respond with a Radio Measurement Report frame including one LCI subelement (LCI (#1294)report). If both dot11RMLCIMeasurementActivated and dot11RMLCIAzimuthActivated are true, and the STA accepts an LCI request that includes an Azimuth Request, it shall respond with a Radio Measurement Report frame that includes one LCI subelement (LCI (#1294)report) and the requested Azimuth Report, if available. If dot11RMLCIAzimuthActivated is false, a STA shall reject any LCI (#1294)request that includes an Azimuth Request and shall respond with a Radio Measurement Report frame including an Radio Measurement Report element with the Incapable bit set to 1.

If the STA receiving an LCI request has no location information about the requested LCI Subject physical location, the STA shall send a LCI subelement indicating an unknown LCI (see 8.4.2.21.10 (Location Configuration Information Report)). If the STA receiving an LCI request has no location information about the requested Azimuth, the STA shall omit the Azimuth report subelement.

If the STA receiving an LCI request that contains a Maximum Age subelement has determined the requested LCI within the indicated Maximum Age, the STA may respond with its determined LCI; otherwise the STA shall initiate a new LCI determination. The method by which the physical location and azimuth information in the LCI (#1294)report is generated is outside the scope of this standard.

A STA that receives an LCI report that contains a Usage-rules subelement shall process the LCI information in compliance with the retransmission and retention permissions in the Usage-rules subelement.

**10.11.9.10 Location Identifier (#1294)report**

The Location Identifier (#1294)report provides the ability for a STA to receive one or more

* indirect URI references and forward a subset of those references to an external agent for the purposes of that agent gathering the STA’s location value. The protocol used to query for a location report based on the Public Identifier URI/FQDN provided in the Location Identifier (#1294)report is indicated by the URI/FQDN Descriptor field.
* FQDNs, one per location server, that can be used to discover the location server and establish communications with it. The protocol used with the location server is indicated by the URI/FQDN Descriptor field.

If dot11RMIdentifierMeasurementActivated is true and location information is not available, the STA shall reject any Location Identifier (#1294)request and shall respond with a Measurement Report frame including a Measurement Report element with the incapable bit set to 1. If dot11RMIdentifierMeasurementActivated is true and location information is available, the STA shall respond with a Measurement Report frame including one Measurement Report element containing a Location Identifier Report element that carries one or more Public Identifier URI/FQDN subelements.

**10.11.10.2 Requesting a neighbor report**

A STA requesting a neighbor report from an AP shall send a Neighbor Report Request frame to its associated AP.

The requesting STA, to the LCI of neighboring APs of its associated AP that advertises Fine Timing Measurement capability (see 8.4.2.26) within the Neighbor Report procedure, shall include a Measurement Request element with Measurement Type equal to LCI request within the Neighbor Report Request frame.

The requesting STA, to request the Location Civic of neighboring APs of its associated AP that advertises Fine Timing Measurement capability (see 8.4.2.26) within the Fine Timing Measurement procedure, shall include a Measurement Request element with Measurement Type equal to Location Civic request within the Neighbor Report Request frame.

**10.11.10.3 Receiving a neighbor report**

If dot11RMNeighborReportActivated is true, an AP receiving a neighbor report request shall respond with a

Neighbor Report Response frame containing zero or more Neighbor Report elements. If an SSID element is

specified in the corresponding Neighbor Report Request frame, the Neighbor Report element(s) shall

contain information only concerning neighbor APs that are members of the current ESS identified by the

SSID element contained within the neighbor report request. If the SSID element is omitted, the Neighbor

Report element(s) shall contain information concerning neighbor APs that belong to the same ESS as the

requesting STA. If the wildcard SSID element is specified in the corresponding Neighbor Request frame, the

Neighbor Report element(s) shall contain information concerning all neighbor APs. If there are no neighbor

APs available, the AP shall send a Neighbor Report Response frame with no Neighbor Report elements.

If dot11RMNeighborReportActivated is false in an AP receiving a neighbor report request, it shall ignore

the request and return a Neighbor Report frame with the Incapable bit in the Measurement Report Mode

field set to 1.

A STA receiving a neighbor report element with an unknown subelement identifier shall ignore the

unknown subelement and continue to process remaining subelements. A STA receiving a neighbor report

element containing a Vendor Specific subelement with an unknown Organization Identifier should ignore

this vendor-specific subelement and shall continue to process any remaining Vendor Specific subelements.

A serving AP shall include a TSF (#136)subelement in the Neighbor Report element if it is able to guarantee

an accumulated error of 1.5 TU or better on the TSF Offset subfield. Otherwise, the AP shall not include a

TSF (#136)subelement in the Neighbor Report element.

When

* an AP that has both dot11FineTimingMsmtActivated and dot11RMLCIMeasurementActivated equal to true receives a Measurement Request element with Measurement Type equal to LCI request within a Neighbor Report Request frame, or
* an AP that has dot11LciCivicInNeighborReport and dot11RMLCIMeasurementActivated equal to true receives a Neighbor Report Request frame,

then the AP shall include a Measurement Report subelement with Measurement Type equal to LCI report in each Neighbor Report element in the Neighbor Report response frame. If the maximum horizontal or vertical location error of a neighboring AP relative to a reference AP is known to the AP and this relative error is smaller than the absolute error indicated in the LCI subelement, then the AP may include a Relative Location Error subfield in the Measurement Report field. If the Measurement Report subelement is included but the LCI information of the neighbor is unknown, the AP shall indicate an unknown LCI for the neighbor following the format defined in 8.4.2.21.10.

When

* an AP that has at least one of dot11FineTimingMsmtActivated and dot11RMLCIMeasurementActivated equal to false receives a Measurement Request element with Measurement Type equal to LCI request within a Neighbor Report Request frame, and
* an AP that has at least one of dot11LciCivicInNeighborReport and dot11RMLCIMeasurementActivated equal to false receives a Neighbor Report Request frame,

then the AP shall include a Measurement Report subelement with the Incapable field set to 1 in each Neighbor Report element in the Neighbor Report response frame.

When

* an AP that has dot11FineTimingMsmtActivated and dot11RMCivicMeasurementActivated equal to true receives a Measurement Request element with Measurement Type equal to Location Civic request within a Neighbor Report Request frame, or
* an AP that has dot11LciCivicInNeighborReport and dot11RMCivicMeasurementActivated equal to true receives a Neighbor Report Request frame,

then the AP shall include a Measurement Report subelement with Measurement Type equal to Location Civic report in each Neighbor Report element in the Neighbor Report response frame. If the Measurement Report subelement is included but the Location Civic information of the neighbor is unknown, the AP shall indicate an unknown Civic address following the format defined in 8.4.2.21.13.

When

* an AP that has at least one of dot11FineTimingMsmtActivated and dot11RMCivicMeasurementActivated equal to false receives a Measurement Request element with Measurement Type equal to Location Civic request within a Neighbor Report Request frame, and
* an AP that has at leasr one of dot11LciCivicInNeighborReport and dot11RMCivicMeasurementActivated equal to false receives a Neighbor Report Request frame,

then the AP shall include a Measurement Report subelement with the Incapable field equal to 1 in each Neighbor Report element in the Neighbor Report response frame.

Each Measurement Report subelement returned shall have the same Measurement Token as in the corresponding Measurement Request element, or, if there is no corresponding Measurement Request then the Measurement Token shall be set to 0.

If an AP determines that the LCI and/or Civic location of a neighboring AP changes, the AP may send an unsolicited Neighbor Report Response frame containing complete neighbor information including the updated neighboring AP location information. The Dialog Token field is set to 0 as defined in 8.6.7.7 (Neighbor Report Response frame format).

A STA that receives an LCI report that contains a Usage-rules subelement shall process the LCI information in compliance with the retransmission and retention permissions in the Usage-rules subelement.

***11mc editor: Insert new section after 10.24.6.X. If 14/160, which demotes and modifies contents of 10.24.6 into 10.24.6.1-4 with new section titles, is adopted, then the new text below is a new section 10.24.6.5. In the unlikely event that 14/160 is not adopted, demote the existing 10.24.6 into 10.24.6.1 with heading “Fine Timing Measurement” in which case the new text below is a new section 10.24.6.2***

**10.24.6.Xa LCI and Location Civic retrieval using Fine timing measurement procedure**

Within the Fine Timing Measurement procedure, a STA, to request the LCI of an AP that advertises Fine Timing Measurement capability (see 8.4.2.26), shall include a Measurement Request element with Measurement Type equal to LCI request within the Fine Timing Measurement Request frame.

Within the Fine Timing Measurement procedure, a STA, to request the Location Civic of an AP that advertises Fine Timing Measurement capability (see 8.4.2.26), shall include a Measurement Request element with Measurement Type equal to Location Civic request within the Fine Timing Measurement Request frame.

***11mc editor: insert the following paragraph if and only if 14/160 is also adopted***

A Measurement Request element with Measurement Type equal to LCI request shall not be included in a Fine Timing Measurement Request frame unless the Fine Timing Measurement Request frame also includes a Fine Timing Measurement Parameter element. A Measurement Request element with Measurement Type equal to Location Civic request shall not be included in a Fine Timing Measurement Request frame unless the Fine Timing Measurement Request frame also includes a Fine Timing Measurement Parameter element.

When an AP that has both dot11FineTimingMsmtActivated and dot11RMLCIMeasurementActivated equal to true receives a Measurement Request element with Measurement Type equal to LCI request within a Fine Timing Measurement Request frame, the AP shall include a Measurement Report element with Measurement Type equal to LCI report in the following Fine Timing Measurement frame. The AP shall not include a Measurement Report element with Measurement Type equal to LCI report in the following Fine Timing Measurement frame. If the maximum horizontal or vertical location error of the AP relative to a reference AP is known and this relative error is smaller than the absolute error indicated in the LCI subelement, then the AP may include a Relative Location Error subfield in the Measurement Report field. If the Measurement Report element is included but the LCI information is unknown, the AP shall indicate an unknown LCI following the format defined in 8.4.2.21.10. If the AP’s LCI changes after the AP transmitted a Measurement Report element with Measurement Type equal to LCI report to a STA, then the AP may include an updated Measurement Report element with Measurement Type equal to LCI report in a subsequent Fine Timing Measurement frame sent to the STA.

When an AP that has at least one of dot11FineTimingMsmtActivated and dot11RMLCIMeasurementActivated equal to false receives a Measurement Request element with Measurement Type equal to LCI request within a Fine Timing Measurement Request frame, the AP shall include a Measurement Report element with the Incapable field set to 1 in the following Fine Timing Measurement frame.

When an AP that has both dot11FineTimingMsmtActivated and dot11RMCivicMeasurementActivated equal to true receives a Measurement Request element with Measurement Type equal to Location Civic request within a Fine Timing Measurement Request frame, the AP shall include a Measurement Report element with Measurement Type equal to Location Civic report in the following Fine Timing Measurement frame. If the Location Civic information is unknown, the AP shall indicate an unknown Civic address following the format defined in 8.4.2.21.13. If the AP’s Civic location changes after the AP transmitted a Measurement Report element with Measurement Type equal to Location Civic report to a STA, then the AP may include an updated Measurement Report element with Measurement Type equal to Location Civic report in a subsequent Fine Timing Measurement frame sent to the STA.

When an AP that has at least one of dot11FineTimingMsmtActivated and dot11RMCivicMeasurementActivated equal to false receives a Measurement Request element with Measurement Type equal to Location Civic request within a Fine Timing Measurement Request frame, the AP shall include a Measurement Report element with the Incapable field set to 1 in the following Fine Timing Measurement frame.

***Note to the modern reader, not for inclusion in the draft. This “without undue delay” language is merely following the precedent in 10.11.6 (Requesting and reporting of measurements)***

Each Measurement Report element returned shall have the same Measurement Token as in the corresponding Measurement Request element. The Fine Timing Measurement frame containing the Measurement Report element(s) should be returned without undue delay to the STA.

A STA that receives an LCI report that contains a Usage-rules subelement shall process the LCI information in compliance with the retransmission and retention permissions in the Usage-rules subelement.

**10.25.3.2.8 AP Location Public identifier URI/FQDN procedures**

A STA when dot11InterworkingServiceActivated is true may retrieve an AP’(#1485)s Location Public identifier URI or a location server’s FQDN using ANQP procedures in 10.25.3.2 (ANQP procedures). A STA in the associated state should retrieve Location Public identifier URI/FQDN information from the AP using the procedures in 10.11.9.10 (Location Identifier (#1294)report).

Due to security concerns, there are some URI schemes that should be cautiously processed when received by a STA. For example, URIs using the scheme names "data:" and "http:" may direct applications (e.g.,(#1559) a browser) on the STA to internet pages that contain active scripts. Therefore, URIs received via this ANQP procedure should not be processed in a general manner, as these scripts may be inadvertently activated.

Instead of listing all the types of URIs that might be misused or potentially have harmful affects, Section 3.3 IANA registers acceptable URI schemes.

***The following is largely new content in r1***

***Insert new row and renumber***

**Table 8-66—Measurement Type definitions for measurement requests**

|  |  |  |
| --- | --- | --- |
| Name | Measurement Type | Measurement Use |
| Fine Timing Measurement range request | <ANA> | Radio Measurement, Spectrum Management,  and WNM |
| Reserved | <ANA+1>-254 | N/A |

8.4.2.20.18a Fine Timing Measurement range request

The Measurement Request field corresponding to a Fine Timing Measurement range request is shown in Figure 8-163a.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Randomization Interval | Minimum AP Count | Neighbor Report subelements | Optional subelements |
| Octets: | 2 | 1 | Variable | Variable |

Figure 8-163a: Measurement Request field for a Fine Timing Measurement range request

Randomization Interval specifies the upper bound of the random delay to be used prior to making the

measurement, expressed in units of TUs. See 10.11.3 (Measurement start time).

Minimum AP Count is the minimum number of Fine Timing Measurement ranges between the requested STA and the APs listed in the Neighbor Report subelements field that are requested. The value of 0 is reserved.

The Neighbor Report subelements field is a concatenation of at least Minimum AP Count Neighbor Report subelements. Each Neighbor Report subelement has the same format as the Neighbor Report element. See 8.4.2.36. The Neighbor Report subelements field specifies a superset of nearby APs with which the requested STA is requested to perform the Fine Timing Measurement procedure (see 10.11.9.10a Fine Timing Measurement range report).

The Optional Subelements field format contains zero or more subelements, each consisting of a 1-octet

Subelement ID field, a 1-octet Length field, and a variable-length Data field, as shown in Figure 8-516

(Subelement format). Any optional subelements are ordered by nondecreasing Subelement ID.

Table 8-90—Measurement Type definitions for measurement reports

|  |  |  |
| --- | --- | --- |
| Name | Measurement Type | Measurement Use |
| Fine Timing Measurement range report | <ANA> | Radio Measurement, Spectrum Management,  and WNM |
| Reserved | <ANA+1>-255 | N/A |

8.4.2.21.17a Fine Timing Measurement range report

The format of the Measurement Report field corresponding to a Fine Timing Measurement range report is shown in Figure 8-173a.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | M x 16 |  | N x 11 |  |
|  | Range Entry Count | Range Entry | Error Entry Count | Error Entry | Optional subelements |
| Octets: | 1 |  |  |  | Variable |

Figure 8-173a – Measurement Report field format for a Fine Timing Measurement range report

The Range Entry Count field indicates the number of Range Entry fields (i.e. M in Figure 8-173a).

The Range Entry field indicates parameters relating to a range measurement with a single AP, and is formatted according to Figure 8-173b.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Measurement Start Time | BSSID | Range | Max Range Error | Reserved |
| Octets: | 4 | 6 | 3 | 2 | 1 |

Figure 8-173b: Range Entry field format

The Measurement Start Time is the lower 4 octets of the TSF (synchronized with the associated AP) at the time (+-32us) at which the first Fine Timing Measurement frame was transmitted where the timestamps of both the frame and response frame were successfully measured.

The BSSID field contains the BSSID of the AP whose range is being reported.

The Range field indicates the estimated range between the requested STA and the AP using the Fine Timing Measurement procedure, in units of 1/256 meters. A value of 224-1 indicates a range of (224-1)/256 meters or higher. See 10.11.9.10a (Fine Timing Measurement range report).

The Max Range Error field contains an upper bound for the error in the value specified in the Range field, in units of 1/256 meters. A value of zero indicates an unknown error. A value of 216-1 indicates a maximum range error of (216-1)/256 meters or higher. For instance, a value of 512 in the Max Range Error field indicates that the value in the Range field has a maximum error of ± 2 m.

The Error Entry Count field indicates the number of Error Entry fields (i.e. N in Figure 8-173a).

The Error Entry field indicates parameters relating to a failed range measurement with a single AP, and is formatted according to Figure 8-173c.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Measurement Start Time | BSSID | Error Code |
| Octets: | 4 | 6 | 1 |

Figure 8-173c: Error Entry field format

The Measurement Start Time is the lower 4 octets of the TSF (synchronized with the associated AP) at the time (+-32us) at which the Fine Toming Measurement failure was first detected.

The BSSID field contains the BSSID of the AP whose range was attempted to be measured

The Error Code field is defined in Table 8-173d.

Table 8-173d

|  |  |
| --- | --- |
| Error Code | Meaning |
| 0-2 | Reserved |
| 3 | AP reported “Request incapable” |
| 4 | AP reported “Request failed. Do not send new request for a specified period” |
| 5-7 | Reserved |
| 8 | Unable to successfully transmit to AP |
| 9-255 | Reserved |

The Optional Subelements field format contains zero or more subelements, each consisting of a 1-octet

Subelement ID field, a 1-octet Length field, and a variable-length Data field, as shown in Figure 8-516

(Subelement format). Any optional subelements are ordered by nondecreasing Subelement ID.

10.11.9.10a Fine Timing Measurement range report

The Fine Timing Measurement range report provides a means for a requesting STA to request a responding STA that advertises Fine Timing Measurement equal to true in the Extended Capabilities element to measure and report the ranges between the responding STA and other nearby APs where the ranges are determined using the Fine Timing Measurement procedure (see 10.24.6 (Fine timing measurement procedure)).

If a responding STA that that advertises Fine Timing Measurement equal to true in the Extended Capabilities element accepts a Fine Timing Measurement range request, the responding STA shall wait a random delay up to Randomization Interval in the Measurement Request element (see 10.11.3 (Measurement start time)) then initiate the Fine Timing Measurement procedure with at least Minimum AP Count APs listed in the Neighbor Report subelements field in the Measurement Request field. The responding STA should initiate the Fine Timing Measurement procedure with listed APs until either the responding STA has successfully measured the range between the responding STA and at least Minimum AP Count APs or has attempted the Fine Timing Measurement procedure with all listed APs. The responding STA shall also record error entries for each failed Fine Timing Measurement procedure with an AP.

For procedures related to listed APs that operate on non-operating channels, see 10.11.2 (Measurement on operating and nonoperating channels).

The responding STA shall transform the measurements obtained from each Fine Timing Measurement procedure with an AP into a range and a maximum error between itself and the AP, while accounting for any clock offsets between the responding STA and the AP.

At the completion of all the Fine timing measurement procedures and transformations, the responding STA shall send the all computed range information between itself and other APs, and all error entries, to the requesting STA using a Measurement Report element with Measurement Type equal to Fine Timing Measurement range in a Measurement Report frame.

A requesting STA may request a single set of range measurements by setting the Number of Repetitions field to 0 in the Measurement Request frame, or request a regular sequence of range measurements by

* setting the Number of Repetitions field greater than 0 in the Measurement Request frame, and
* including a Measurement Request element with Measurement Type equal to Fine Timing Measurement range request and a Measurement Request element with Measurement Type equal to Measurement pause request (see 10.11.9.7 (Measurement pause)).

B.4.19 WNM extensions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item | Protocol capability | References | Status | Support |
| WNM23 (#46)  WNM23.1  WNM23.2  WNM23.3  WNM23.4  WNM23.5  WNM23.6 | Fine Timing Measurement  Fine Timing Measurement Request  (including LCI and/or Location Civic request)  Fine Timing Measurement (including LCI and/or Location Civic report)  Request neighbor LCI and/or Civic locations within Neighbor Report Request  Report neighbor LCI and/or Civic locations within Neighbor Report Reponse  Initiator of Measurement request/report with type equal to Fine Timing Measurement range request/report  Responder of Measurement request/report with type equal to Fine Timing Measurement range request/report | 10.24.6 (Fine  timing  measurement  procedure(#46  ))  8.6.8.25 (Fine  Timing  Measurement  Request frame  format(#46))  8.6.8.26 (Fine  Timing  Measurement  frame  format(#46))  10.11.10.2 (Requesting a neighbor report)  10.11.10.2 (Requesting a neighbor report)  10.24.6.2 (LCI and Location Civic retrieval using Fine timing measurement procedure)  10.24.6.2 (LCI and Location Civic retrieval using Fine timing measurement procedure) | CF19:O  WNM23:M  WNM23:M  (CF2 OR CF21) AND WNM23:M  CF1 AND WNM23:M  WNM23:M  (CF2 OR CF21) AND WNM23:M | Yes □ No □ N/A □  Yes □ No □ N/A □  Yes □ No □ N/A □  Yes □ No □ N/A □  Yes □ No □ N/A □  Yes □ No □ N/A □  Yes □ No □ N/A □ |

**C.3 MIB Detail**

***11mc editor: Insert new MIB variable at the end of this sequence***

dot11WirelessMgmtOptionsEntry ::=

dot11WirelessMgmtOptionsEntry ::=

SEQUENCE {

dot11(#1676)LocationActivated TruthValue,

dot11(#1676)FMSImplemented TruthValue,

dot11(#1676)FMSActivated TruthValue,

dot11(#1676)EventsActivated TruthValue,

dot11(#1676)DiagnosticsActivated TruthValue,

dot11(#1676)MultiBSSIDImplemented TruthValue,

dot11(#1676)MultiBSSIDActivated TruthValue,

dot11(#1676)TFSImplemented TruthValue,

dot11(#1676)TFSActivated TruthValue,

dot11(#1676)WNMSleepModeImplemented TruthValue,

dot11(#1676)WNMSleepModeActivated TruthValue,

dot11(#1676)TIMBroadcastImplemented TruthValue,

dot11(#1676)TIMBroadcastActivated TruthValue,

dot11(#1676)ProxyARPImplemented TruthValue,

dot11(#1676)ProxyARPActivated TruthValue,

dot11(#1676)BSSTransitionImplemented TruthValue,

dot11(#1676)BSSTransitionActivated TruthValue,

dot11(#1676)QoSTrafficCapabilityImplemented TruthValue,

dot11(#1676)QoSTrafficCapabilityActivated TruthValue,

dot11(#1676)ACStationCountImplemented TruthValue,

dot11(#1676)ACStationCountActivated TruthValue,

dot11(#1676)CoLocIntfReportingImplemented TruthValue,

dot11(#1676)CoLocIntfReportingActivated TruthValue,

dot11(#1676)MotionDetectionImplemented TruthValue,

dot11(#1676)MotionDetectionActivated TruthValue,

dot11(#1676)TODImplemented TruthValue,

dot11(#1676)TODActivated TruthValue,

dot11(#1676)TimingMsmtImplemented TruthValue,

dot11(#1676)TimingMsmtActivated TruthValue,

dot11(#1676)ChannelUsageImplemented TruthValue,

dot11(#1676)ChannelUsageActivated TruthValue,

dot11(#1676)TriggerSTAStatisticsActivated TruthValue,

dot11(#1676)SSIDListImplemented TruthValue,

dot11(#1676)SSIDListActivated TruthValue,

dot11(#1676)MulticastDiagnosticsActivated TruthValue,

dot11(#1676)LocationTrackingImplemented TruthValue,

dot11(#1676)LocationTrackingActivated TruthValue,

dot11(#1676)DMSImplemented TruthValue,

dot11(#1676)DMSActivated TruthValue,

dot11(#1676)UAPSDCoexistenceImplemented TruthValue,

dot11(#1676)UAPSDCoexistenceActivated TruthValue,

dot11(#1676)WNMNotificationImplemented TruthValue,

dot11(#1676)WNMNotificationActivated TruthValue,

dot11(#1676)UTCTSFOffsetImplemented TruthValue,

dot11(#1676)UTCTSFOffsetActivated TruthValue,

dot11(#1676)FineTimingMsmtImplemented TruthValue,(#46)

dot11(#1676)FineTimingMsmtActivated TruthValue(#46)

dot11 dot11LciCivicInNeighborReport TruthValue

}

dot11LciCivicInNeighborReport OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a control variable.

It is written by an external management entity or the SME.

Changes take effect as soon as practical in the implementation.

This attribute, when true, indicates that the station includes LCI and Civic location subelements in the Neighbor Report without regard to dot11FineTimingMsmtActivated."

DEFVAL { false}

::= { dot11WirelessMgmtOptionsEntry YY }

dot11WNMLocationIdentifierRprtPublicIdUri OBJECT-TYPE

SYNTAX OCTET STRING

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This is a status variable.

It is written by the SME when a management report is completed.

This attribute contains concatenated Public Identifier URI/FQDN subelements, one per Public Identifier URI or FQDN. The format for a Public Identifier URI/FQDN subelement is further detailed in 8.4.2.21.14 (Location Identifier Report)."

::= { dot11WNMLocationIdentifierReportEntry 5}