IEEE P802.11
Wireless LANs

|  |
| --- |
| Proposed Text for Neighboring Network Information Sharing through RLSS  |
| Date: 2012-01-16 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Padam Kafle | Nokia | 6021 Connection Drive, Irving, TX, 75039 | +1-214-673-6232 | Padam.kafle@nokia.com |
| Mika Kasslin | Nokia | Itämerenkatu 11-13, 00180 Helsinki, Finland  | +358-50-4836294 | Mika.kasslin@nokia.com |
| Prabodh Varshney | Nokia | 6021 Connection Drive, Irving, TX, 75039 | +1 469 9512745 | Prabodh.varshney@nokia.com |
| Zhou Lan | NICT | 3-4, Hikarino-oka, Yokosuka, Kanagawa, Japan, 239-0847 |  | lan@nict.go.jp |
| Hiroshi Harada | NICT | 3-4, Hikarino-oka, Yokosuka, Kanagawa, Japan, 239-0847 |  | harada@nict.go.jp |

Abstract

This submission proposes resolutions to some comments on coexistence from the first WG letter ballot on 802.11af D1.0.

This document is based on IEEE 802.11af-D1.05.

Submission addresses the following CIDs: 8, and 500~~, 733, and 811~~.

**Introduction**

## Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGaf Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGaf Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGaf Editor: Editing instructions preceded by “TGaf Editor” are instructions to the TGaf editor to modify existing material in the TGaf draft. As a result of adopting the changes, the TGaf editor will execute the instructions rather than copy them to the TGaf Draft.***

***Submission Note: Notes to the reader of this submission are not part of the motion to adopt. These notes are there to clarify or provide context.***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Clause Number(C)** | **Page(C)** | **Line(C)** | **Comment** | **Proposed Change** |
| 8 | 4.5.5.2 |  |  | Need a mechanism for a portable BSS to detect presence of co-channel fixed devices so that it can move into a different channel. This is because there is a 16dB EIRP difference between the fixed and portable. So fixed APs may never detect a portable devices in the co-channel and thereby cause interference to the portable device BSS. |  Make transmission of unsolicited TPC report element mandatory for fixed TVWS devices. Also see 11/0265r0 for suggested text. |

**Discussion:**

Agree with the problem raised by the commenter in the overlapping BSSS created by a fixed AP and personal/portable AP. Since the Fixed AP may operate with substantially higher power level, the fixed devices can interfere with co-channel BSS of portable devices within a large coverage area. For such scenario, the legacy RTS/CTS protection does not work to avoid interference from a hidden fixed STA. The commenter suggested transmitting unsolicited TPC Report element so that the portable devices will be able to detect the transmissions of fixed devices. However, the interference problem here appears to be more problematic in other side, due to inability of fixed devices to detect network of portable devices. The portable devices can already detect the presence of high-power BSS when the fixed AP periodically transmits its identifying information as required by FCC.

A simple solution is proposed here through the use of RLSS so that the information of the operating channels, transmit power level and other relevant information about other neighboring networks including that from fixed devices will be provided to a master mode device before network setup so that the personal/portable devices will be able to avoid the channels used by fixed devices and operate without interference.

**Propose** Revisedfor CID 8 as per the editorial instructions in this document- 11/1272r5.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 500 | 10.af1 | 50 | 20 | The channel power management currently provides mechanisms for advertising available channels or changes to channel(s) or constrained maximum transmit power level(s). However, the problem of potential interference among multiple overlapping BSSs while operating on the allocated channel and transmit power levels are not taken in to account. | Given the greater coverage range in TVWS band to more likely incur interferences, options for interference management among multiple overlapping networks should be specified in the specification.  |

**Discussion:**

Agree with the commenter on the open problem of OBSS interference due to overlapping of BSS with different bandwidths and transmit power levels due to longer range in TVWS. To avoid the operation having overlapping BSS using dissimilar bandwidths or substantially different transmit power levels casuing interference to each other, a solution is proposed here so that the adjacent networks can avoid such scenarios. The RLSS can provide information about operating parameters of neighboring networks to help avoid interference.

**Propose:** Accepted forCID 500 as per the editorial instructions in this document- 11/1272r5.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ~~733~~ | ~~General~~ |  |  | ~~there is no specification for how the 5 and 10 MHz mode would coexist in a same TVWS channel, since the preambles cannot interoperate~~ | ~~add detailed coexistence mechanisms~~ |

**~~Discussion:~~**

~~When the preambles cannot interoperate between two networks of dissimilar bandwidth partially overlapping, it is desirable to avoid such scenarios. In order for APs to select operating channels and other parameters to avoid mutual interference, sharing useful information through RLSS is highly valuable. The proposed text here provides a simple means for network coexistence through RLSS.~~

**~~Propose~~** ~~Revised~~~~for~~~~CID 733 as per the editorial instructions in this document- 11/1272r4.~~

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ~~811~~ | ~~General~~ | ~~66~~ | ~~36~~ | ~~802.11af is intended for increased range. However with that comes increased OBSS interference.~~  | ~~Recommend studying interference mitigation schemes between OBSS~~ |

**~~Discussion:~~**

~~It is true that the longer range due to transmissions in low UHF or VHF band used for .11af will have additional challenges to OBSS interference. Two main problems are the possibility of overlapping among networks of substantially different transmit power levels (fixed devices vs personal/portable devices), and dissimilar bandwidths overlapping partially. A simple interference mitigation technique is proposed here by facilitating sharing of relevant information from neighboring networks through RLSS.~~

**~~Propose~~** ~~Revised for~~~~CID 811 as per the editorial instructions in this document- 11/1272r4.~~

## Editing instructions:

**8. Frame formats**

**8.4 Management frame body components**

**8.4.2.29 Extended Capabilities element**

TGaf Editor: Insert the following row in Table 8-103:

Table 8-103--Capabilities field

|  |  |  |
| --- | --- | --- |
| **Bit** | **Information** | **Notes** |
| <ANA> | NNI Query/Response  | The STA sets the NNI Query/Response field to 1 when the MIB attribute dot11NNIActivated is true, and set it to zero otherwise, see 10.af1 (Neighboring Network Information (NNI) Query/Response Procedures) |

**8.4.5 Registered Location Query Protocol elements**

**8.4.5.1 General**

*TGaf Editor: Insert the following RLQP IDs after the RLQP Network Channel Control and change the Reserved as shown.*

Table 8-190c – Registered Location Query Protocol info ID definitions

|  |  |  |
| --- | --- | --- |
| Info Name | RLQP ID | RLQP Element (subclause) |
| Neighboring Network Information Query | 277 | 8.4.5.6 (Neighboring Network Information Query element) |
| Neighboring Network Information Response | 278 | 8.4.5.7 (Neighboring Network Information Response element) |
| Reserved | ~~5~~279 – 56796 | N/A |

***TGaf Editor: Insert the following new subclause after 8.4.5.5, as shown:***

**8.4.5.6 Neighboring Network Information Query element**

The Neighboring Network Information Query element of RLQP is used to send the request for information about current operating parameters of the neighboring networks using the GAS protocol. The Neighboring Network Information Query element is included in a GAS Query Request.

The element is in the format shown in Figure 8-45af1 (Neighboring Network Information Query element format).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
|  | RLQP ID | Length | RequesterSTA Address | Request Type  | Device Identification Information | Estimated Maximum Transmit Power | Device Location Information |
| Octets**:** | 2 | 2 | 6 | 1 | Variable | 1  | Variable (optional) |

**Figure 8-45af1 Neighboring Network Information Query element format**

The RLQP ID field is set to the value for Neighboring Network Information Query defined in Table 8-190c (Regis­tered Location Query Protocol info ID definitions).

The Length field indicates the length of the remaining element fields in octets, and the value is variable. The minimum value of the Length field is 8.

The RequesterSTAAddress field is the MAC address of the requesting STA that initiates the Neighboring Network Information Query. The length of the RequesterSTAAddress field is 6 octets.

The Request Type field is used to indicate the reason that a Neighboring Network Information Query was generated. The length of the Request Type field is 1 octet. The Request Type field values are allocated as shown in Table 8-45af2 (Request Type field values).

Table 8-45af2—Request Type field values

|  |  |
| --- | --- |
| Request Type field value | Description |
| 0 | Query is for the neighboring network information request |
| 1-255 | Reserved |

The Device Identification Information field is used to indicate the identification of the STA sending the Neighboring Network Information Query. The format of the Device Identification Information field is specified in Table 8.2.6.1.2 (Device Identification Information).

The Estimated Maximum Transmit Power field indicates the power, in dBm, of the expected maximum power level the device will be using for its operation, as allowed for its device class. The Estimated Maximum Transmit Power field is a signed integer and is 1 octet in length.

The Device Location Information field is used to provide the location of the STA sending the Neighboring Network Information Query, which is provided in the format specified in 8.2.6.1.4 (Device Location Information).

**8.4.5.7 Neighboring Network Information Response element**

The Neighboring Network Information Response element of RLQP is used in the response for information about current operating parameters of the neighboring networks using the GAS protocol. The Neighboring Network Information Response element is included in a response to a GAS Query Request.

The element is in the format shown in Figure 8-45af2 (Neighboring Network Information Response element format).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | These fields are repeated as determined by the length field |
|  | RLQP ID | Length | RequesterSTA Address | Status Code  | BSSID | Device Class | Operating Class | Channel Number  | Operating Transmit Power | Relative Path Loss |
| Octets**:** | 2 | 2 | 6 | 1 | 6 | Variable | 1 | 1 | 1 | 1 |

**Figure 8-45af2 Neighboring Network Information Response element format**

The RLQP ID field is set to the value for Neighboring Network Information Response defined in Table 8-190c (Regis­tered Location Query Protocol info ID definitions).

The Length field indicates the length of the remaining element fields in octets, and the value is variable. The minimum value of the Length field is 7.

The RequesterSTAAddress field is the MAC address of the requesting STA that has sent the Neighboring Network Information Query. The length of the RequesterSTAAddress field is 6 octets.

The Status Code contains the status code in response to a Neighboring Network Information Query as defined in Table 8.4.1.9 (Status Code field).

The BSSID field indicates the BSSID of the BSS for which the network information is provided by the subsequent fields (Device Class, Operating Class, Channel Number, Operating Transmit Power and Relative Distance).

The Device Class field is the Device Class of the STA operating the network with the preceding BSSID field value contained in the Neighboring Network Information Response element. The format of the Device Class field is specified in Table 8.2.6.1.1 (Device Class).

The Operating Class field is set to the operating class value, as defined in Annex E.1 (Country information and operating classes), for the channel in which the BSS with the preceding BSSID value is operating on.

The Channel Number field is set to the channel number value, as defined in Annex E.1 (Country information and operating classes), in which the BSS with the preceding BSSID value is operating on.

The Operating Transmit Power field indicates the power, in dBm, set as the maximum power allowed for transmissions within the BSS with the preceding BSSID value, for the specified channel in which the BSS is operating on.

The Relative Path Loss field specifies the estimated path loss, in units of 0.5 dB, for the transmissions from the neighboring network, specified by the preceding BSSID field in the Neighboring Network Information Response element, relative to the requesting STA’s position. The value is specified by an unsigned integer and is 1 octet in length. If the Relative Path Loss field value is unknown, the field is set to 0.

**10 MLME**

***TGaf Editor: Insert the following subclause at the end of clause 10:***

**10.af1 Neighboring Network Information (NNI) Query/Response Procedures**

**10.af1.1 General**

The Neighboring Network Information Query/Response procedure is used by a STA to retrieve information from an RLSS about other networks operating in its neighbourhood. The NNI Query element of RLQP is transmitted in a GAS query frame to a GDC AP that has advertised support for RLQP advertisement protocol in its beacon or probe response frame. The NNI response element is received in GAS Initial Response frame or one or more GAS Comeback Response frames. STAs shall use the NNI Query/Response procedures specified in this clause when dot11NNIActivated is true.

The details of the proce­dures for sending a NNI Query and receiving a NNI Response are specified in subclauses 10.af1.2 (Sending a NNI Query) and 10.af1.3 (Receiving a NNI Response).

NOTE- the Neighboring Network Information Query/Response procedure enables a STA to exploit the available information in an RLSS about other networks operating in its neighbourhood. The STA can utilize such information to select operating parameters prior to its network setup (i.e. initializing its BSS), or during its operation.

10.af1.2 Sending a NNI Query

When dot11NNIActivated is true, a STA can use GAS protocol to send a NNI Query to an RLSS. Upon receipt of the MLME-GAS.request primitive with AdvertisementProtocolID set to RLQP and Query param­eters set to NNI Query element, the requesting STA performs the procedures described in 10.24.3.1.2 (STA procedures to transmit a GAS Query) to transmit a GAS Initial Request frame that contains RLQP element with RLQP ID for NNI Query in the Query Request field.

The specific information items in the Query Request field of the GAS Initial Request frame are generated based on the requirements of a station, as described in 8.4.5.6 (Neighboring Network Information Query element).

A STA requests the available NNI information in the RLSS by setting the Request Type subfield in the NNI Query element to 0.

A STA includes the Device Location Information in the NNI Query element when it has not perfomed any prior CAQ or NNI Query procedure with the NNI Responding STA, or when it determines that its current location has changed from its prior reported location; otherwise Device Location Information is not present.

A STA includes the Estimated Maximum Transmit Power information in the NNI Query element based on its device class for the operation in the TVWS band.

NOTE - When the MIB attribute dot11RLSSActivated is set to true, the STA has access to the RLSS and the NNI information retrieval does not require sending a GAS Query request to another STA. In this case, the STA can internally generate and transmit the Query Request to the RLSS that contains the message information contained in the NNI Query RLQP element.

**10.af1.3 Receiving a NNI Response**

When a GDC AP with dot11RLSSActivated set to true receives a GAS query frame containing RLQP element for NNI Query, it generates the NNI Response using the procedure in this subclause.

Upon receipt of the MLME-GAS.response primitive with ResponseInfo parameter set to NNI Response element, the responding STA transmits a RLQP element with RLQP ID for NNI Response in the Query Response field in a GAS Initial Response frame or one or more GAS Comeback Response frames using the procedures described in 10.24.3.1.3 (STA procedures to post a GAS Query to an Advertisement Server) and 10.24.3.1.4 (STA procedures for transmitting the GAS Query Response).

The specific information items in the Query Response field of the GAS Initial Response frame or GAS Comeback Response frame are generated using the fields as described in 8.4.5.7 (Neighboring Network Information Response element).

The responding STA sets the Status Code field in the NNI Query element to the following values, based on the result obtained from RLSS for the Query Response;

1. 0 ("Successful") to indicate the successful response with the the associated NNI Response information in the subsequent fields.
2. 1 ("Unspecified failure") or 38 ("The request has not been successful as one or more parameters have invalid values") to indicate that no information was available, as indicated by the respective reasons.

**Annex C**

**(normative)**

**ASN.1 encoding of the MAC and PHY MIB**

**C.3 MIB Detail**

***TGaf Editor: Insert the following entries at the end of dot11StationConfigEntry sequence List:***

dot11NNIActivated TruthValue,

***TGaf Editor: Insert the following elements after*** dot11GDCEnablementValidityTimer  ***in Annex C as shown:***

dot11GDCActivated OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a control variable.

It is written by the SME when the device is initialized for operation in a band that requires Geolocation Database Control.

This attribute, when true, indicates that the STA’s capability to support the neighboring network information query and response procedure is activated. The capability is disabled otherwise.”

DEFVAL { FALSE }

::= { dot11StationConfigEntry <ANA> }