IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Proposed Text Changes for Client Management | | | | |
| Date: 2017-06-14 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Eldad Perahia | HPE-Aruba |  |  | eldad.perahia@hpe.com |
| Sachin Ganu | HPE-Aruba |  |  |  |
| Shahnawaz Siraj | HPE-Aruba |  |  |  |
| Chuck Lukaszewski | HPE-Aruba |  |  |  |
| Laurent Cariou | Intel |  |  |  |
| Robert Stacey | Intel |  |  |  |

Abstract

This submission proposes resolutions for the client management (e.g. client association, roaming, spatial reuse) comment related to TGax D1.0 with the following CID: 5163.

R1: changes highlighted in green. Modified Suggested BSS transition to allow for move to other ESS. Changed “managed ESS” to “Planned ESS”. Added roaming thresholds to assist client.

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 TGax Draft. This introduction is not part of the adopted material.

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

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Section** | **Pg / Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 5163 | 10.3.2.4a | P115L46 | Regarding "10.3.2.4a Duration-based RTS/CTS. In dense environments, managing RTS usage by an AP can help the overall interference situation since the AP may have better view of the network situation.", while this a good start in adding control by the AP over non-AP STAs other aspects of client management need to addressed. In an large, dense, managed ESS, the network has much better visibility into the best selection of AP and band that the client should initially associate with and then subsequently select during roaming. The network also needs to be able to control usage of probe request and probe response in an ESS in improve network efficiency. | Add tighter management by the network of client association and roaming | Accepted  Please see document 11-17/YYYYr0 |

**Discussion:**

In order to maximize network efficiency in a dense ESS, the network needs to be able to direct clients to associate/re-associate to the most appropriate AP. One method of doing so is via “**Neighbor report information upon rejection with suggested BSS transition**”, and the clients following the AP’s direction. Furthermore, we need to modify the Neighbor Report element to be HE aware. Clients also need to use the information in the BSS Transition Management request to better inform its decision when roaming in a dense ESS.

TGax Editor: Please modify this section as follows:

**11.3.8 Neighbor report information upon rejection with suggested BSS transition**

***Insert the following at the end of the subclause:***

An HE STA that requested association with an HE AP but received an Authentication or (Re)Association Response frame that has the Reason Code field set to REJECTED\_WITH\_SUGGESTED\_BSS\_TRANSITION and that includes one or more Neighbor Report elements for BSSs that are part of the ESS of the HE AP shall select an AP from the Neighbor Report element on subsequent authentication or (re)association attempts, unless the HE STA selects an alternate ESS.

TGax Editor: Please modify this section as follows:

**9.4.2.37 Neighbor Report element**

…

The BSSID Information field can be used to help determine neighbor service set transition candidates. It is

4 octets in length and contains the subfields as shown in Figure 9-296.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 B1 | B2 | B3 | B4 B9 | B10 | B11 | | B12 | | B13 | | B14 | | B15 B31 | | |
|  | AP  Reachability | Security | Key Scope | Capabilities | Mobility  Domain | High  Throughput | | Very High  Throughput | | FTM | | High Efficiency | | Reserved | |
| Bits: | 2 | 1 | 1 | 6 | 1 |  | 1 | | 1 | | 1 | | 1 | | 17 | | |

**Figure 9-296—BSSID Information field**

…

The FTM field is set to 1 to indicate that the AP represented by this BSSID is an AP that has set the Fine

Timing Measurement Responder field of the Extended Capabilities element to 1. The FTM field is set to 0 to

indicate either that the reporting AP has dot11FineTimingMsmtRespActivated equal to false, or the reported

AP has not set the Fine Timing Measurement Responder field of the Extended Capabilities element to 1 or

that the Fine Timing Measurement Responder field of the reported AP is not available to the reporting AP at

this time.

The High Efficiency bit is set to 1 to indicate that the AP represented by this BSSID is an HE AP and

that the HE Capabilities element, if included as a subelement in the report, is identical in content to the

HE Capabilities element included in the AP’s beacon.

Bits 15–31 are reserved.

**11.24.7.1 BSS transition capability**

***Insert the following at the end of the subclause:***

A non-AP HE STA shall set to 1 the Transition field of the Extended Capabilities elements that it transmits to indicate that it supports BSS transition management.

***Modify the subclause as follows:***

**11.24.7.4 BSS transition management response**

When the non-HE STA’s SME receives an MLME-BTM.indication primitive, it may issue an MLME-BTM.

response primitive. When the HE STA’s SME receives an MLME-BTM.indication primitive, it shall issue an MLME-BTM.response primitive.

The STA’s SME may include the result of its BSS transition decision in the Target BSSID field and BTM

Status Code field in the MLME-BTM.response primitive. A BTM Status Code field set to a value of 0 (i.e.,

Accept) indicates the STA will transition from the current BSS. The STA’s SME receiving an MLME-BTM.indication primitive may issue an MLME-BTM.response primitive with a valid status code not equal to a value of 0 (i.e., Accept) indicating rejection if it is unable to comply with this BSS transition management request.

**Discussion:**

To further assist the roaming capability of clients in a managed ESS, it would be helpful to indicate to the clients that they are infact in a managed ESS and when they reach the physical edge of an ESS. APs that are at the edge of an ESS (e.g. APs near an exit to a stadium of office building) could broadcast such an indication so that clients could prepare for more aggressive roaming or switching to a different system.

TGax Editor: Please modify this section as follows:

**9.4.2.1 General**

***Insert the following new rows into Table 9-77 (Element IDs) (header row shown for convenience):***

|  |  |  |  |
| --- | --- | --- | --- |
| **Element** | **Element ID** | **Element ID Extension** | **Extensible** |
| ESS Report | 255 | <255> | Yes |

TGax Editor: Please add this section as follows:

**9.4.2.37 ESS Report element**

The format of the ESS Report element is shown in Figure 9-XYZ.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  | |  | |  | |  | |  | |
| Element ID | Length | Element ID extension | ESS Information |
| Octets: 1 | 1 | 1 | 2 |  |  |  |  | |  | |  | |  | |  | |

**Figure 9-XYZ—ESS Report element format**

The Element ID, Length and Element ID extension fields are defined in 9.4.2.1.

The ESS Report contains an ESS Information field. The format of the ESS Information field is as defined in Figure 9-XYZ1.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| B0 | B1 | B2 B7 |  | | B8 | B13 | | B14-B15 | | |  | |  | |  | |  | |  | |
| Planned ESS | Edge of ESS | Recommended scanning threshold within the ESS | | Recommended BSS transition threshold within the ESS | | | Reserved | | |
| Bits: 1 | 1 | 6 |  | | 6 |  | |  | 2 | | |  | |  | |  | |  | |  | |

**Figure 9-XYZ1—ESS Information field**

The Planned ESS field indicates whether the BSS is part of an ESS which is planned with several BSSs in overlapping configuration. This value is set to 1 to indicate that the ESS is deployed to ensure a blanket coverage over the Extended Service Area (ESA).

The Edge of ESS field indicates whether the BSS is at the edge of an ESS by setting the value to 1.

The Recommended scanning threshold within the ESS subfield indicates the received signal power of the associated AP below which a STA is recommended to start scanning for neighbor BSS. The Recommended BSS transition threshold within the ESS subfield indicates the received signal power of the associated AP below which a STA is recommended to initiate BSS transition to a neighbor BSS belonging to the ESS.

The resolution for the Recommended scanning threshold within the ESS subfield and the Recommended BSS transition threshold within the ESS subfield is 1 dB. The subfields encoding is defined in Table 9-XYZ1 (Recommended scanning threshold within the ESS subfield and Recommended BSS transition threshold within the ESS subfield encoding) .

|  |  |
| --- | --- |
| Table 9-XYZ1 Recommended scanning threshold within the ESS subfield and Recommended BSS transition threshold within the ESS subfield encoding | |
| Subfield | Description |
| 0-62 | Values 0 to 62 map to 100 dBm to 37 dBm |
| 63 | Indicates no recommendation |

The ESS Report element can be included in Beacon frames, as described in 9.3.3.1; Association Response frames, as described in 9.3.3.6; Ressociation Response frames, as described in 9.3.3.8; Probe Response frames, as described in 9.3.3.10. The use of the ESS Report element is described in 11.24.27.1.

TGax Editor: Please modify this section as follows:

**9.3.3.1 Beacon frame format**

***Insert the following new rows into Table 9-27 (*Beacon frame body*) (header row shown for convenience):***

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| <next number> | ESS Report | The ESS Report element is optionally present when dot11HEOptionImplemented is true; otherwise it is not present. |

TGax Editor: Please modify this section as follows:

**9.3.3.6 Association Response frame format**

***Insert the following new rows into Table 9-30 (*Association Response frame body*) (header row shown for convenience):***

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| <next number> | ESS Report | The ESS Report element is optionally present when dot11HEOptionImplemented is true; otherwise it is not present. |

TGax Editor: Please modify this section as follows:

**9.3.3.8 Ressociation Response frame format**

***Insert the following new rows into Table 9-32 (*Reassociation Response frame body*) (header row shown for convenience):***

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| <next number> | ESS Report | The ESS Report element is optionally present when dot11HEOptionImplemented is true; otherwise it is not present. |

TGax Editor: Please modify this section as follows:

**9.3.3.10 Probe Response frame format**

***Insert the following new rows into Table 9-34 (*Probe Response frame body*) (header row shown for convenience):***

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| <next number> | ESS Report | The ESS Report element is optionally present when dot11HEOptionImplemented is true; otherwise it is not present. |

TGax Editor: Please modify this section as follows:

**11.24.7.1 BSS transition capability**

The BSS transition capability enables improved throughput, effective data rate and/or QoS for the aggregate of STAs in a network by shifting (via transition) individual STA traffic loads to more appropriate points of association within the ESS. In addition, the BSS transition capability provides accounting session control information to a non-AP STA, which might be used to provide an alert to the non-AP STA’s user that the STA’s session is almost over and the STA will be disassociated from the ESS. The Planned ESS bit in the ESS Information field indicates to the non-AP STA that it is associated with a BSS that is part of an ESS which is planned with several BSSs in overlapping configuration, whereby it may adjust its BSS transition algorithms accordingly. The Edge of the ESS bit in the ESS Information field field indicates to the non-AP STA that it is associated with a BSS at the edge of an ESS (e.g. exit of a building). The Recommended scanning threshold within the ESS subfield and Recommended BSS transition threshold within the ESS subfield indicates to the non-AP STA recommendations on when it should start scanning and when it should initiate a transition with respect to its roaming algorithm. The state of the Edge of ESS bit may be changed by the AP STA if conditions in the ESS change.

**Discussion:**

The AP/network management entity is also going to need information from the STAs engaging in Spatial Reuse. As SR changes the interference environment, the AP/network management entity needs information from the Beacon Report to map the interference environment and make intelligent SR parameter, channel number, and channel bandwidth settings. Without such information, STAs may cause undo interference and reduce network capacity, counter to the goal of Spatial Reuse.

TGax Editor: Please modify this section as follows:

**27.9 Spatial reuse operation**

**27.9.1 General**

The objective of the HE spatial reuse operation is to improve the system level performance, the utilization of medium resources and power saving in dense deployment scenarios by early identification of signals from overlapping basic service sets (OBSSs) and interference management.

When the conditions specified in 27.9 (Spatial reuse operation) are met that allow the transmission of an SR PPDU, an HE STA may transmit an SR PPDU to either an HE STA or a non-HE STA.

An HE STA participating in spatial reuse operation shall accept a Beacon request and respond with a Radio Measurement Report frame containing Beacon reports for all observed BSSs matching the BSSID and SSID in the Beacon Report request, at the level of detail requested in the Reporting Detail.