**IEEE P802.15**

**Wireless Personal Area Networks**

|  |  |
| --- | --- |
| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) |
| Title | **Text for Discovery and Association for HRP UWB** |
| Date Submitted | 16 May 2023 |
| Source | Kangjin Yoon, Chunyu Hu, Carlos Aldana, Claudio Da Silva (Meta)Lei Huang, Kuan Wu, Bin Qian, David Xun Yang, and Rojan Chitrakar (Huawei) |
| Re: | Contribution to IEEE 802.15.4ab  |
| Abstract | This document provides draft text for device discovery and association protocol for HRP UWB devices |
| Purpose | Support development of technical content for the draft |
| Notice | This document has been prepared to assist the IEEE P802.15. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein. |
| Release | The contributor acknowledges and accepts that this contribution becomes the property of IEEE and may be made publicly available by P802.15. |

***Insert the new text at the end of 6.17 as follows***

**6.18 Device discovery and association for HRP UWB block-based mode**

**6.18.1 Overview**

To discover and make association with controlees, a controller may send the Control Message with the Application Control IE (AC IE) whose Association Availability field is set to 1.

**6.18.2 Device discovery**

A controller indicates its presence to other devices by sending AC IE in Control Message. This allows the other devices to perform device discovery.

A controlee may repeat the scanning process for each mandatory channel and mandatory preamble code combination, unless the channel and preamble code information are provided in advance. How to provide the channel and preamble code information to controlees is out of the scope of this standard.

**6.18.3 Association**

A controller indicates its availability for associations with new controlees by setting the Association Availability field in the AC IE. When the Association Availability field is 1, a controlee may send HRP UWB Association Request command in any unscheduled slot in the round, unless the AC IE has Contention Slots Info field. When the AC IE contains the Contention Slots Info field, the HRP UWB Association Request command, if present, shall be sent in the slots specified by the Contention Slots Info field. When the Association Availability field is 0, a controlee shall not send an HRP UWB Association Request command in the block.

A controlee shall use extended address when the controller is using its extended address for the Control Message. When the controller is using its short address for the Control Message, a controlee shall generate a short address and use the short address for the HRP UWB Association Request command. How to generate the short address is out of scope of this standard. A controlee also conveys its capability information in the HRP UWB Association Request command.

Upon successful receipt of the HRP UWB Association Request command, the controller shall schedule a slot in the next block for the transmission of an HRP UWB Association Response command to the sender of the HRP UWB Association Request command, unless the controller has no available slots in the next block. The HRP UWB Association Response command contains the status of the association. The controller may deny the association request based on capability information and or any other reason. When the controller sends the HRP UWB Association Response command with the Association Status field set to 0x00 or 0x02, the Association Response command from the controller shall contain the Session Configuration field. When the same short address with the short address chosen by the controlee already exists, the controller may send Association Response command with the Association Status field set to 0x02 to update the short address for the controlee. When the Association Status field is set to 0x02, the Association Response command shall contain the Updated Short Address field whose value is unique in the session.



**Figure 7-X – Example of frame exchange for HRP UWB association**

***Update Table 7-53 as follows***

**Table 7-53 – MAC commands**

|  |  |  |  |
| --- | --- | --- | --- |
| Command ID | Command name | RFD | Subclause |
| TX | RX |
| 0x29-0x~~ff~~2f | Reserved |  |  |  |
| 0x30 | HRP UWB Association Request command | X |  | 7.5.31 |
| 0x31 | HRP UWB Association Response command |  | X | 7.5.32 |
| 0x32-0xff | Reserved |  |  |  |

***Insert the new text at the end of 7.5.30 as follows***

**7.5.31 HRP UWB Association Request command**

This command shall only be sent by an unassociated HRP UWB controlee that wishes to associate with a HRP UWB controller.

The Source Addressing Mode field and the Destination Addressing Mode field shall be set to the same mode as indicated in the Control Message to which the HRP UWB Association Request command refers.

The Frame Pending field shall be set to zero and ignored upon reception.

The PAN ID Compression field shall be set to one and ignored upon reception. The Destination PAN ID and Source PAN ID fields shall not be included.

The Destination Address field shall contain the value of *macShortAddress* or *macExtendedAddress*, when the Destination Addressing Mode field is 0b10 or 0b11, respectively.

The Source Address field shall contain the value of *macShortAddress* or *macExtendedAddress*, when the Source Addressing Mode field is 0b10 or 0b11, respectively.

The HRP UWB Association Request command Content field shall be formatted as illustrated in Figure 7-X.

|  |  |
| --- | --- |
| Octets: 4 | 2 |
| Session ID | UWB HRP Capability Information |

**Figure 7-X – HRP UWB Association Request command Content field format**

The Session ID field contains a 4-octet session identifier that is unique to a session per controller.

The UWB HRP Capability Information field shall be formatted as illustrated in Figure 7-XX.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Bits: 0 | 1 | 2–3 | TBD | TBD | TBD | … | 15 |
| LDPC | High Throughput | Supported AIFS | TBD | TBD | TBD | … | TBD |

**Figure 7-XX – HRP UWB Association Request command Content field format**

The LDPC field shall be set to one if the controlee is capable of LDPC. Otherwise, it shall be set to zero.

The High Throughput field shall be set to one if the controlee is capable of 124.8 Mbps data rate. Otherwise, it shall be set to zero.

The Supported AIFS field specifies the AIFS time supported by the controlee. The Supported AIFS field shall have one of the values specified in Table 7-X.

**Table 7-X – Values of the Supported AIFS field**

|  |  |
| --- | --- |
| Supported AIFS field value | Supported AIFS |
| 0 | 64 us |
| 1 | 64, 32 us |
| 2 | 64, 32, 16 us |
| 3 | Reserved |

**7.5.32 HRP UWB Association Response command**

This command shall only be sent by the HRP UWB controller to an unassociated HRP UWB controlee that is currently trying to associate.

The Source Addressing Mode field and the Destination Addressing Mode field shall be set to the same mode as indicated in the HRP UWB Association Request command to which the HRP UWB Association Response command refers.

The Frame Pending field shall be set to zero and ignored upon reception.

The PAN ID Compression field shall be set to one and ignored upon reception. The Destination PAN ID and Source PAN ID fields shall not be included.

The Destination Address field shall contain the value of *macShortAddress* or *macExtendedAddress*, when the Destination Addressing Mode field is 0b10 or 0b11, respectively.

The Source Address field shall contain the value of *macShortAddress* or *macExtendedAddress*, when the Source Addressing Mode field is 0b10 or 0b11, respectively.

The HRP UWB Association Response command Content field shall be formatted as illustrated in Figure 7-XXX.

|  |  |  |
| --- | --- | --- |
| Octets: 1 | 0/1 | 0/2 |
| Association Status | Session Configuration | Updated Short Address |

**Figure 7-XXX – HRP UWB Association Response command Content field format**

Valid values of the Association Status field are defined in Table 7-XX.

**Table 7-XX – Valid values of the Association Status field**

|  |  |
| --- | --- |
| Association Status | Description |
| 0x00 | Association successful. |
| 0x01 | Session at capacity. |
| 0x02 | Association successful with updated short address |
| 0x03 | Association denied by other reason. |
| 0x04-0xff | Reserved. |

The Association Response command shall convey the Session Configuration field if the Association Status field is set to 0x00 or 0x02. The Session Configuration field shall be formatted as illustrated in Figure 7-XXX.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Bits: 0–1 | 1 | 2 | … | 7 |
| AIFS | TBD | TBD | … | TBD |

**Figure 7-XXX – Session Configuration field format**

The AIFS field specifies the AIFS time which will be used in the session. The AIFS field shall have one of the values specified in Table 7-XXXX.

**Table 7-XXXX – Values of the AIFS field**

|  |  |
| --- | --- |
| AIFS field value | AIFS time |
| 0 | 64 us |
| 1 | 32 us |
| 2 | 16 us |
| 3 | Reserved |

The controlee shall update its *macHrpUwbAifsPeriod* to the value specified in the AIFS field of HRP UWB Association Response command.

The Association Response command shall convey the Updated Short Address field if the Association Status field is set to 0x02.