**IEEE P802.15**

**Wireless Personal Area Networks**

|  |  |
| --- | --- |
| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) |
| Title | **Modified text of subclause 6.6.12.1 to 6.6.12.6** |
| Date Submitted | September, 15, 2010 |
| Source | [][Samsung Electronics][Dong Suwon P.O. Box 105, 416 Maetan-3dong, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742 Korea] | Voice: [ ]Fax: [ ]E-mail: taehan.bae@samsung.com , js1007.son@samsung.com , srajagop@sta.samsung.com  |
| Re: |  |
| Abstract | [Description of document contents.]Response and modification of 6.6.13 comments |
| Purpose | [Description of what the author wants P802.15 to do with the information in the document.] |
| 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. |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Octets: 2** | **1** | **4/10** | **0/5/6/10/14** | **2** | **variable** | **variable** | **0/1** | **variable** | **2** |
| FrameControl | SequenceNumber | Addressingfields | AuxiliarySecurity Header | SuperframeSpecification | GTSfields (Figure 67) | Pendingaddressfields (Figure 68) | cellSearchLength | BeaconPayload | FCS |
| MHR |  | MSDU | MFR |
|  | Update Figure 66 for Beacon frame format |

‘‘””‘””

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Bits: 0–3** | **4-7** | **8-11** | **12** | **13** | **14** | **15** |
| BeaconOrder | SuperframeOrder | FinalCAP Slot | Reserved | WPANCoordinator | AssociationPermit | cellSearchEn |
| Update Figure 69 for Format of the Superframe Specification field |  |

**Add text at the end of subclause 6.2.2.1.2 on page 139**

If the cellSearchEn bit is set, the *cellSearchLength* is transmitted as an additional field in the beacon frame, as shown in Figure 66.

|  |  |  |
| --- | --- | --- |
| **octets: 7** | **1** | **variable** |
| MHR fields | Command Frame Identifier (Table 87) | cellSearchQuality |
| Update Figure 96 for Mobility notification command |

**Add text at the bottom of Figure 96**

The results from the cell search are provided in the mobility notification command as shown in Figure 96. The WQI values (in octets) obtained for the current channel during the cell search procedure defined in 6,6.12.3 shall be included in the command frame. The number of octets sent shall be equal to *cellSearchLength*, as defined in 6.6.12.3.

6.6.12 VLC cell design and mobility support

There may be a need to support link switching due to physical movement or interference. Mobility can be of two types: physical and logical. Physical mobility occurs when the VLC device M1 changes its position due to the movement within the coverage area of infrastructure I1 while logical mobility occurs when the device M1 changes its communication link from a link with infrastructure I2 to one with infrastructure I3 due to interference or deliberate channel switching. This is shown in Figure 134.



Figure 134 = Physical and logical mobility

A co-ordinator DME can separate the optical media into multiple cells for supporting applications such as location based services.

**6.6.12.1 Mobility support using multiple cells**

A single coordinator can support mobility of the device through multiple cells using the PHY switch controlled by the DME as shown in Figure 133. Each optical element in a cell is denoted by *cell\_ID(i,j)* where *j* is the index of the element in the *ith* cell. The size and the position of the cell in the optical media shown in Figure 3 can be variable and can be programmed by the DME. The actual size and position determination for the cell by the coordinator DME is not defined in the standard. If device 1 moves to the next cell, for example, from *cell\_ID(i,j)* to *cell\_ID(i+1,j),* the coordinator can detect the mobility of the device using the uplink signal (i.e. acknowledgment frame).



Figure 133 - **Cell configuration for VLC mobility**

Figure 134 shows the mobility support for a device through multiple cells. When device 1 moves out from *Cell\_ID(i,j)* to *Cell\_ID(i+1,j),* the coordi­nator may not receive the uplink transmission (for example, acknowledgment frame or CVD frame) from *Cell\_ID(i,j).* The coordinator may then search for the device through the adjacent cells such as *Cell\_ID(i+1,j)* and *Cell\_ID(i-1,j)* during the same time slots assigned to device 1 in the superframe*.*  The other devices in *cell\_ID(i,j)* will continue communication in the same cell. The co-ordinator may also expand the cell size in order to provide coverage for mobility of the device. The coordinator can decide on the new cell selection for the device on receiving the uplink transmission from device 1.Thus, if the coordinator can resume communication with the device in *cell\_ID(i+1,j),* the coordinator DME may set the PHY switch to use *cell\_ID(i+1,j)* for device 1 during the time slots allocated for device 1 and then switch back to *cell\_ID(i,j)* to service any existing devices in *cell\_ID(i,j)* in the remaining time slots*.* The searching process can be terminated if the device is not found within the link timeout period, defined in MAC PIB attribute *macLinkTimeOut* in Table 3 and the device can then be considered to be disassociated from the coordinator.



Figure 134— Mobility support for a device through multiple cells

**6.6.12.2 Cell configuration during superframe**

In order to support access for new devices through the entire superframe, the entire optical media shall be configured to a single cell during the beacon and CAP periods. Once devices are discovered and associated, the cell sizes and positions can be determined and the cell structure can be applied to the individual device(s) for communication. This as shown in Figure 135.



Figure 135 Superframe configuration for mobility support

**6.6.12.3 Cell size and location search procedure**

Once a device is associated with a coordinator using the beacon and CAP, the coordinator may establish the size and location of the cell in order to service the new device in the CFP with a smaller cell size. In order to determine the size and location of the cell, the coordinator first sets the *cellSearchEn* bit in the superFrame specification field of the beacon frame as defined in Figure 69. If the *cellSearchEn* bit is set, the *cellSearchLength* is transmitted as an additional field in the beacon frame, as shown in Figure 66. If the *cellSearchEn* bit is set, the coordinator readjusts its superframe GTS allocation to ensure the first *cellSearchLength* slots of the CFP are allocated for cell size and location search.

The first *cellSearchLength* slots are used as visibility slots by the coordinator and the devices. During the first *cellSearchLength* slots, the coordinator sequentially cycles through the *cellSearchLength* cells and transmits CVD frames in all the cells. Figure 136 shows an example of the sequential search for 4 cells. CS1 to CS4 are the 4 cell search slots that are made available for searching via setting the *cellSearchLength* to 4 and setting the *cellSearchEn* bit in the beacon frame.



Figure 136 Cell size and location search procedure

If a device receives a beacon with the *cellSearchEn* bit set to 1, the device shall also continuously transmit CVD frames during the *cellSearchEn* slots while also monitoring the CVD frame reception from the coordinator. The device shall note the WQI during each of the *cellSearchLength* slots and shall report this information back to the coordinator using the mobility notification command frame, as described in 6.3.12.

The coordinator makes the determination of the cell sizes and location based on the information from the mobility notification command and its own reception of the CVD frames from the device during the cell search slots.