**IEEE P802.15**

**Wireless Personal Area Networks**

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) |
| Title | **Proposed comment resolution for i-92, i-106 from the sponsor ballot** |
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| Re: | 802.15.10 Consolidated Sponsor Ballor Comments, CID i-92, i-106 |
| Abstract | Provides a proposed resolution to CID i-92, i-106 |
| Purpose | To be used by the technical editor to apply the necessary changes to the draft to resolve CID i-92, i-106 |
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**Comments**

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| **CID** | **Page** | **Clause** | **Line** | **Comment** | **Proposed change** |
| i-92 | 118 | 7.2.1 | 9 | How does the multicast frame sending work. Musticast frames have short addresses as destination addresses, but here it says the address mode depends on the MeshAddressMode. | Specify how multicast frame sending works. |
| i-106 | 121 | 7.2.3 | 48 | How does the multicast frame receiving work. The FnlDestAddr is in short address format, even if the mesh uses long addresses, so the MeshAddressMode cannot be used to know the format of FnlDestAddr format. | Explain how multicast receiving works. |

**Resolution: Revise**

The L2R Routing IE contains a Mesh Address Mode field and a Destination Address Mode field. The latter was added after D05 to allow the use of multicast even in 64-bit address operated mesh.

Make the L2R-DATA.request primitive consistent with the L2R Routing IE.

* ***Create a new subclause level with the current text in 7.2 as follows***

**7.2.1 Unicast and broadcast data services**

* ***Move all sublcauses 7.2.1-7.2.3 up one level, i.e. 7.2.1 🡺 7.2.1.1 ...***
* ***Create a new subclause as follows:***

**7.2.2 Multicast data service**

The following primitives are provided to handle multicast data traffic:

* L2R-MC-DATA.request
* L2R-MC-DATA.confirm
* L2R-MC-DATA.indication
* ***Create a new L2R-MC-DATA.(request, confirm, indication) primitive as follows:***

**7.2.2.1 L2R-MC-DATA.request**

The L2R-MC-DATA.request primitive is used by the next higher layer to initiate the transmission of a data frame intended for a multicast group.

The semantics of this primitive are:

L2R-MC-DATA.request (

 MeshAddressMode,

 MeshRootAddress,

 SrcPanId,

 MulticastAddress,

 L2rPayload,

 L2rMcHandle,

 Ttl)

The parameters of this primitive are defined in Table 1.

Table 1 – L2R -MC-DATA.request parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid range** | **Description** |
| MeshAddressMode | Enumeration  | SHORT, EXTENDED | Indicates the addressing mode used in the L2R mesh.  |
| MeshRootAddress | Address | Short or extended address as specified by MeshAddressMode | Address of the mesh root of the L2R mesh on which the multicast data frame being transmitted. |
| SrcPanId | Integer | 0x0000-0xffff | The PAN identifier of the original source of the data frame being transmitted. Valid only if MPO is FALSE in the MT. |
| MulticastAddress | Short address | 0xff00 – 0xfffd | Address of the multicast group for which the data frame is intended. |
| L2rPayload | Set of octets | – | The set of octets forming the L2R data payload to be transmitted by the L2R sublayer. |
| L2rMcHandle | Integer | 0x00 – 0xff | The handle associated with the L2R data being transmitted by the L2R sublayer used by the next higher layer to track the status of the data frame. |
| Ttl | Integer | 0x00 – 0xff | Value used to set the TTL field in the L2R Routing IE. If set to 0xff, the value of *l2rDefaultTtl* is used. |

**7.2.2.2 L2R-MC-DATA.confirm**

The L2R-MC-DATA.confirm primitive is used by the L2R sublayer in response to an L2R-MC-DATA.request primitive. The primitive returns a Status of either SUCCESS, indicating that the transmission was successful, or the appropriate error code otherwise.

The semantics of this primitive are:

L2R-MC-DATA.confirm (

 L2rMcHandle,

 Status)

The parameters of this primitive are defined in Table 2

Table 2 – L2R-MC-DATA.confirm parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid range** | **Description** |
| L2rMcHandle | Integer | 0x00 – 0xff | The handle associated with the L2R multicast data that was requested to be transmitted by the L2R sublayer with the L2R-MC-DATA.request primitive. |
| Status | ENUMERATION | SUCCESS, INVALID\_PARAMETER, MCPS-DATA.confirm error code | Status of the multicast data transmission identified by L2rMcHandle.  |

If one of the parameters of the L2R-MC-DATA.request primitive are unsupported or out of range, the Status is set to INVALID\_PARAMETER.

If any error occurs during the MAC data transmission, Status is set to the error code of the MCPS-DATA.confirm.

**7.2.2.3 L2R-MC-DATA.indication**

The L2R-MC-DATA.indication primitive is used by the L2R sublayer to indicate the reception of a multicast data frame to the next higher layer.

The semantics of this primitive are:

L2R-MC-DATA.indication (

 MeshAddressMode,

 MeshRootAddress,

 SrcPanId,

 SrcAddress,

 MulticastAddress,

 L2rPayload,

 SecurityLevel,

 KeyIdMode,

 KeySource,

 KeyIndex)

The parameters of this primitive are defined in Table 3.

Table 3 – L2R-MC-DATA.indication parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid range** | **Description** |
| MeshAddressMode | Enumeration  | SHORT, EXTENDED | Indicates the addressing mode used in the L2R mesh.  |
| MeshRootAddress | Address | Short or extended address as specified by MeshAddressMode | Address of the mesh root of the L2R mesh on which the multicast data frame has been received. |
| SrcPanId | Integer | 0x0000-0xffff | The PAN identifier of the original source of the multicast data frame received. Valid only if MPO is FALSE in the MT. |
| SrcAddress | Address | Short or extended address as specified by MeshAddressMode | The address of the original source of the data frame received. |
| MulticastAddress | Short address | 0xff00 – 0xfffd | Address of the multicast group for which the data frame is intended. |
| L2rPayload | Set of octets | – | The set of octets forming the L2R data payload received by the L2R sublayer. |
| SecurityLevel | Integer | 0-7 | As defined in Table 8-77 in IEEE Std 802.15.4. |
| KeyIdMode | Integer | As defined in Table 8-77 in IEEE Std 802.15.4. | As defined in Table 8-77 in IEEE Std 802.15.4. |
| KeySource | Set of octets | As specified by KeyIdMode | As defined in Table 8-77 in IEEE Std 802.15.4. |
| KeyIndex | Integer | As defined in Table 8-77 in IEEE Std 802.15.4. | As defined in Table 8-77 in IEEE Std 802.15.4. |

* ***Modify the L2R-DATA.request primitive as follows (unchanged parameters omitted):***

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid range**  | **Description** |
| MeshAddressMode | Enumeration | SHORT, EXTENDED | Indicates the addressing mode used in the L2R mesh.  |
| MeshRootAddress | Address | Short or extended address as specified by MeshAddressMode | Address of the mesh root of the L2R mesh on which the data frame is being transmitted. |
| ... | ... | ... | ... |
| SrcPanId | Integer | 0x0000-0xffff | The PAN identifier of the original source of the data frame being transmitted. |
| DestPanId | Integer | 0x0000-0xffff | The PAN identifier of the final destination of the data frame being transmitted. Ignored if MeshRootData is TRUE. |
| DestAddr | Address | Short or extended address as specified by MeshAddressMode  | The address of the final destination of the data frame being transmitted. Ignored if MeshRootData is TRUE. |

* ***Modify the L2R-DATA.indication primitive as follows (unchanged parameters omitted):***

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid range**  | **Description** |
| MeshAddressMode | Enumeration | SHORT, EXTENDED | Indicates the addressing mode used in the L2R mesh.  |
| ... | ... | ... | ... |
| SrcPanId | Integer | 0x0000-0xffff | The PAN identifier of the original source of the data frame received. |
| SrcAddr | Address | Short or extended address as specified by MeshAddressMode | The address of the original source of the data frame received. |
| DestPanId | Integer | 0x0000-0xffff | The PAN identifier of the final destination of the data frame received. |
| DestAddr | Address | Short or extended address as specified by MeshAddressMode. | The address of the final destination of the data frame received. |
| ... | ... | ... | ... |

* ***Create a new L2IB attribute as follows***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute** | **Type** | **Range** | **Description** | **Default** |
| *l2rMulticastAddressList* | List of short addresses | 0xff00 – 0xfffd | List of addresses of the multicast groups of which the device is a member | \_\_ |

* ***Modify 5.2.6 as follows:***

An implementation may require the transmission of the same data to a group of devices based on criteria such as geographic location (district, block, floor…), device type (actuators, sensors…), etc. These devices are organized into static and administratively defined multicast groups. The set of short addresses ranging from 0xff00 to 0xfffd is reserved for multicast groups. Multicast groups may be dynamic. The management of the groups is out of the scope of this document. If a higher layer protocol uses extended multicast addresses, they should be mapped to the reserved multicast short addresses. This mapping is out of the scope of the document. Multicast routing is handled by the L2R sublayer if the L2R multicast parameter of the corresponding MT is TRUE. Otherwise, multicast frames are treated as broadcast frames by the L2R sublayer and are filtered by higher layers as further described in 5.4.2.

Multicast route establishment is achieved through the transmission of RA IEs. If a device belongs to a multicast group and if multicast routing is handled by the L2R sublayer, the next higher layer informs the L2R sublayer with an L2R-MULTICAST-SUBSCRIPTION.request primitive. Upon reception of the primitive, the L2R sublayer includes the multicast address(es) in its RA IEs. The L2R sublayer holds the multicast address(es) in *l2rMulticastAddressList*. If the device is the mesh root, the L2R sublayer records the multicast address(es) in *l2rMulticastAddressList* but does not transmit RA IEs.

A device belonging to one or more multicast groups sets the Multicast Subscription Present field to 1 and includes the corresponding multicast address(es) in the Multicast Subscription field in its RA IE during the DS route establishment procedure. The Multicast Subscription field of the RA IE is described in 6.2.1.7.

After the transmission of the RA IE with the multicast subscription information, the L2R sublayer notifies the next higher layer with an L2R-MULTICAST-SUBSCRIPTION.confirm primitive. This procedure is illustrated in Figure 19. The L2R-MULTICAST-SUBSCRIPTION.request and L2R-MULTICAST-SUBSCRIPTION.confirm primitives are described in 7.1.3.1 and 7.1.3.2 respectively. If a device has left a multicast group, the next higher layer informs the L2R sublayer with the L2R-MULTICAST-SUBSCRIPTION.request with the corresponding multicast address omitted. The change is reflected in the next scheduled RA IE and in *l2rMulticastAddressList*.

If a device receives an RA IE with the Multicast Subscription Present field set to 1, the multicast address(es) therein is treated as a unicast address and is recorded in the list of reachable multicast groups of the neighbor from which the RA IE was received.

* ***Modify the 5.4.2 as follows:***

Multicast routing is handled by the L2R sublayer in an L2R mesh if L2R Multicast in the corresponding MT is TRUE.

When multicast routing is handled at the L2R sublayer in a regular mesh (i.e. not in an SSPAN nor a TMCTP), if a frame is to be sent to a multicast group as indicated by a destination address within the range 0xff00 – 0xfffd, the next higher layer requests data routing with the L2R-MC-DATA.request. The Mesh Address Mode field of the L2R Routing IE is set depending on the addressing mode in use in the L2R mesh. The Source Address Present and Destination Address Present fields are set to 1. The Destination Address Mode field is set to 0. The Mesh Root Data, DCat, Source Routing, L2R Retransmission, Delay Critical, Guaranteed Transmission and E2E AR fields are set to 0. The RvS Prohibited field is set to 1. The MAC AR Management field is set to 00. If the original source of the multicast frame is a device other than the mesh root, the frame is first routed to the mesh root through US routing with the multicast address as the DA in the L2R Routing IE. If the original source is the mesh root or when the mesh root receives a multicast frame, it forwards the frame DS with the broadcast address as the NHA. If the mesh root is also a member of the multicast group, its L2R sublayer delivers a copy of the frame to the next higher layer with the L2R-MC-DATA.indication.

From then on, a device receiving the frame forwards it only if it has a DS route to at least one member of the multicast group as indicated by the multicast address found in the list of reachable multicast groups of at least one neighbor, and the NHA is always set to the broadcast address. If a receiving device is a member of the multicast group, the frame is delivered to the next higher layer with the L2R-MC-DATA.indication. If the member of the multicast group also has other members among its descendants, the frame is duplicated and forwarded.

When a device receives a multicast frame for the first time, it records the LSN and the SA. If it receives another frame with the same LSN and SA, the frame should be dropped. This record is deleted after *l2rSnSaRecordTimeout*. Figure 31 illustrates the processing of a multicast data frame by the original source; Figure 32 illustrates the processing of a multicast data frame by an intermediate hop.

In an SSPAN, a TMCTP or if L2R Multicast is FALSE in the MT, multicast frames are treated as broadcast frames and are filtered by the next higher layer. The source device of a multicast frame sets the Destination Address field of the L2R Routing IE to the multicast address and the Destination Address field of the MHR to the broadcast address. The fields of the Descriptor field are set as described above when L2R multicast is used. When a device receives the multicast frame, the L2R sublayer delivers a copy of the received frame to the next higher layer with the L2R-MC-DATA.indication primitive, and the device rebroadcasts the frame at the MAC sublayer.

Additionally, in a TMCTP, each PAN coordinator, with the exception of the SPC, should broadcast a frame on its own channel and on the channel of its parent PAN.

* ***Modify Figure 32 as follows:***

