**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 Service related comments** |
| Date Submitted | 12 November 2015 |
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| Re: | 802.15.10 Consolidated Comment Entry Form, service related comments |
| Abstract | Provides a proposed resolution to service related comments |
| Purpose | To be used by the technical editor to apply the necessary changes to the draft to resolve service related comments |
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| **Commenter** | **Page** | **Clause** | **Line** | **Comment** | **Proposed change** |
| Verotiana Rabarijaona | 71 | 7.1.1.1 | 33 | There is no indication of the desired L2R mesh anymore  | Replace "find a PAN containing a desired L2R mesh" w/ "discover the existing L2R meshes" |
| Noriyuki Sato | 87 | 7.2.1.1 | 41 | This primitive should have 'Mesh root address' to indicate which tree should be used for forwarding. | Add 'Mesh root address' as one of parameters of this primitive. |
| Tero Kivinen | 87 | 7.2.1.1 | 27 | How does the L2R layer know which L2R mesh to use to send data out. Same node might be part of multiple L2R meshes, and they might offer same services, so service ID cannot be used to separate the mesh. Do we need MeshRootAddress or something like that.  | Actually it seems it would be easier to add “MeshId” which would be local identifier for the mesh. I.e it is allocated by the MAC when it adds meshes to the MT table, and it makes sure each MeshRootAddress gets separate MeshId. Then most of those calls that needs to identify which mesh is to be used the MeshId could be used instead of MeshRootAddressMode, and MeshRootAddress combination. |
| Tero Kivinen | 87 | 7.2.1.1 | 30 | I think we need AddressMode field in this primitive too, or otherwise we need to somehow identify the mesh we are talking to. Perhaps we need the AddressMode even if we identify the mesh, as it would make it easier to know whether the FnlDestAddr is short or extended address. | If we add MeshRootAddressMode, and MeshRootAddress, then MeshRootAddressMode will also indicate the address mode of the FnlDestAddr. |

**Resolution: Revise**

If multiple meshes provide the same service, a device joins one of them. A device may also switch to another mesh providing the same service with a better PQM. The selection of the mesh may be made by the L2R sublayer or by the next higher layer. The proposed resolutions in this document are the result of the discussion on the issue raised in document #749 on the service ID as found in document #926 with modifications.

* ***Insert the following row in Table 42 to define a new attribute.***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute** | **Type** | **Range** | **Description** | **Default** |
| *l2rMeshSelection* | Boolean | TRUE, FALSE | If TRUE, the L2R sublayer manages the mesh selection/switch.If FALSE, the next higher layer manages the mesh selection/switch.  | TRUE |

* ***Modify the first paragraph in section 5.1.2.2 as follows***

A device may join an L2R mesh if it is already associated with the appropriate PAN. A device may join several L2R meshes.

**5.1.2.2.1 Mesh selection by the L2R sublayer**

If *l2rMeshSelection* is TRUE, the mesh selection is handled by the L2R sublayer. When a device wishes to join a mesh, the next higher layer invokes the L2RLME-JOIN-MESH.request primitive to request the L2R sublayer to join a mesh with the ServiceID and the MeshRootAddress indicated in the primitive. Upon reception of this primitive, the L2R sublayer initiates an enhanced active scan to discover the existing meshes. During the enhanced active scan, the joining device broadcasts an EBR with a TC IE without content, i.e. all the fields after the Type field in the TC IE are omitted. The TC IE is defined in 6.2.2. When an FFD able to act as a coordinator receives the TC IE, it replies with an EB containing a TC IE. When the device receives a TC IE, it creates a NT entry for the neighbor transmitting the TC IE. If the device receives multiple TC IEs from different meshes, the device creates as many NTs as meshes. At the end of the scan, the L2R sublayer selects the mesh with the appropriate service providing the best PQM. If multiple meshes with different PQMs are available, the algorithm to select the L2R mesh is out of the scope of this document. The device initializes the MT and computes its own depth and PQM as described in 5.2.1. The device is allowed to join an L2R mesh if its depth does not exceed the value in the L2R Max Depth field of the TC IE. The device then transmits its own TC IE. The L2R sublayer sends an L2RLME-JOIN-MESH.confirm primitive with a SUCCESS Status to the next higher layer. This procedure is illustrated in Figure 8. The NTs corresponding to the L2R meshes that were not selected are deleted.

If no mesh satisfies the requirements, the L2R sublayer may reattempt to trigger an enhanced active scan to find the desired L2R mesh up to *l2rMaxScanRetry* times. If ~~l2rMeshSelection is TRUE and~~ the MeshRootAddress indicated in the L2RLME-JOIN-MESH.request primitive is 0xffff or 0xffffffffffffffff, the L2R sublayer decides whether or not to disconnect from the current mesh and join a new L2R mesh if it receives a TC IE from another L2R mesh with the same service provided and a better PQM. ~~manages the mesh switching even after the device join the mesh successfully.~~ In this case, ~~when the L2R sublayer finds a better mesh that have the same service,~~ ~~it~~ the device leaves the current mesh and ~~then~~ ~~re~~joins to the ~~found better~~ L2R mesh. The L2RLME-JOIN-MESH.request and L2RLME-JOIN-MESH.confirm primitives are described in 7.1.1.8 and 7.1.1.9 respectively.

**5.1.2.2.2 Mesh selection by the next higher layer**

If *l2rMeshSelection* is FALSE, when a device wishes to join a mesh, the next higher layer invokes the L2RLME-MESH-DISCOVERY.request primitive to request the L2R sublayer to ~~scan~~ discover the L2R meshes around the joining device. Upon reception of this primitive, the ~~L2R sublayer~~ the joining device initiates an enhanced active scan ~~to discover the existing meshes~~. ~~During the enhanced active scan,~~ and ~~the joining device~~ broadcasts an EBR with a TC IE without content. When an L2R router receives the TC IE, it replies with an EB containing a TC IE. When the device receives a TC IE, it creates a NT entry for the neighbor transmitting the TC IE. If the device receives multiple TC IEs from different meshes, the device creates as many NTs as meshes. ~~After ScanDuration,~~ At the end of the scan, the L2R sublayer ~~informs~~ reports the scan result to the next higher layer ~~by issuing~~ with the L2RLME-JOIN-MESH.confirm primitive. The next higher layer selects the L2R mesh to join and informs ~~it to~~ the L2R sublayer by issuing the L2RLME-MESH-SELECT.request primitive. The device initializes the MT and computes its own depth and PQM as described in 5.2.1. ~~Then the L2R sublayer look for the neighbor with the best PQM in the mesh designated by MeshRootAddress parameter and prepares the MT. The Depth parameter is set to the value in the neighbor incremented by one.~~ Other entries of the MT are set according to the information retrieved from the NT of the selected L2R mesh. ~~entry of the neighbor~~. The device then transmits its own TC IE. The L2R sublayer sends an L2RLME-MESH-SELECT.confirm primitive with a SUCCESS Status to the next higher layer. This procedure is illustrated in Figure xxx.

~~After the device joins to the mesh successfully,~~ Whenever the device receives a TC IE ~~belonged to~~ from an L2R mesh other than the current mesh with a better PQM ~~is received~~, the L2R sublayer informs ~~the received TC IE information to~~ the next higher layer ~~by~~ with the L2RLME-NOTIFY.indication primitive where the Notification is set to BETTER\_MESH\_DETECT. ~~If~~ The next higher layer ~~finds the better mesh, it~~ decides whether or not to request the L2R to disconnect from the current L2R mesh and join to the new L2R mesh.

~~The L2RLME-JOIN-MESH.request, L2RLME-JOIN-MESH.confirm primitives,~~ The L2RLME-MESH-DESCOVERY.request, L2RLME-MESH-DISCOVERY.confirm, L2RLME-MESH-SELECT.request and L2RLME-MESH-SELECT.confirm are described in 7.1.1.8, 7.1.1.9, 7.1.1.x and 7.1.1.x respectively.

* ***Replace the text after Table 3 on page 24 as follows:***

When a device *I* receives a TC IE from a neighbor *J* ~~N~~, *I* sets the PQM of *J* in the NT as the sum of the LQM between *I* and *J* and the PQM retrieved from *J*’s TC IE. ~~with a depth D~~:

After the discovery procedure described in 5.1.2.1 and before transmitting its first TC IE, the device *I* browses its NT and finds the neighbor with the best PQM and sets its own PQM to the value found. Assuming the depth of that neighbor is *D*, *I* sets its own depth to *D+1*.

* ~~if its NT is still empty, N is recorded in the NT along with the information retrieved from the TC IE. The current device sets its own depth to D + 1 and the neighbor becomes a parent.~~
* ~~if its NT is not empty, N is recorded into the NT if it is not present yet. N’s depth D in the NT is updated if needed. If the PQM provided by N is better than that of its current parent(s), the current device has found a better parent. It updates its depth to D + 1 and broadcasts a TC IE to inform its neighbors of its new depth.~~

If the best PQM value in the NT is provided by several neighbors, the depth of the receiving device is set to one depth higher than the neighbor with the lowest depth.

Figure 14 shows an example of the mesh construction based on the TC IE propagation where R is the mesh root. The numbers on each line represent the value of the link quality metric (LQM) between the neighbors sharing the link. The LQM may be the incoming link metric or the mutual link metric depending on the presence or absence of NLM IEs. The numbers at the edge of each link represent the PQM of the neighbor which a link is shared with. The numbers below the letter in each node represent the depth of the node.

* ***Insert the following text after the 4th paragraph of clause 5.3.1:***

If a device receives a TC IE from a neighbor with a depth *D’* providing a PQM better than that of its current parent(s), the current device concludes that it has found a better parent. It updates its depth to *D’+1* and informs its neighbors of its new depth in the next scheduled TC IE.

* ***Move l2rMaxScanRetry from Table 42 to Table 41***
* ***Modify the Table of L2RLM-NOTIFY.indication parameters as follows.***

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid Range** | **Description** |
| Notification | Enumeration | ROOT\_CONFLICT, BETTER\_MESH\_DETECT | Notifies the next higher layer of an event at the L2R sublayer  |

If an L2R router within an SL2R receives an L2R-D IE where the mesh root address does not match the mesh root address recorded in its MT, the Notification is set to ROOT\_CONFLICT.

If an L2R node receives a TC IE ~~belonged to~~ from an L2R mesh other than the current mesh with a better PQM, the Notification is set to BETTER\_MESH\_DETECT.

* ***Insert a parameter of ServiceID in L2RLME-JOIN-MESH.request primitive.***
* ***Modify the Table 24 as follows.***

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid Range** | **Description** |
| ServiceID | Integer | 0x00 – 0xff | Identifies the service the device wishes to use. ~~whose L2R mesh the device is going to join to.~~ |
| MeshRootAddress | Address | Short address or EUI-64 | Indicates the address of the mesh root whose L2R mesh the device should join. If is set to 0xffff or 0xffffffffffffffff, the node may join any L2R mesh ~~that have the~~ providing the service indicated by ServiceID. |

* ***Add new primitive definitions as follows***

**7.1.1.x L2RLME-MESH-DISCOVERY.request**

L2RLME-MESH-DISCOVERY.request (

 ScanDuration,

SecurityLevel,

KeyIdMode,

KeySource,

KeyIndex,

)

The parameters of the primitive are defined in Table xx.

Table xx-L2RLME-MESH-DISCOVERY.request parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid Range** | **Description** |
| ScanDuration | Integer | As defined in Table 82 in IEEE P802.15.4-D00 | As defined in Table 82 in IEEE P802.15.4-D00. |
| SecurityLevel | Integer | As defined in Table 127 in IEEE P802.15.4-D00 | As defined in Table 127 in IEEE P802.15.4-D00. |
| KeyIdMode | Integer | As defined in Table 127 in IEEE P802.15.4-D00 | As defined in Table 127 in IEEE P802.15.4-D00. |
| KeySource | Set of 0, 4 or 8 octets | As defined in Table 127 in IEEE P802.15.4-D00 | As defined in Table 127 in IEEE P802.15.4-D00. |
| KeyIndex | Integer | As defined in Table 127 in IEEE P802.15.4-D00 | As defined in Table 127 in IEEE P802.15.4-D00. |

**7.1.1.x L2RLME-MESH-DISCOVERY.confirm**

L2RLME-MESH-DISCOVERY.confirm (

 Status

)

The parameters of the primitive are defined in Table xx.

Table xx-L2RLME-MESH-DISCOVERY.confirm parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid Range** | **Description** |
| Status | ENUMERATION | SUCCESS, IN-VALID\_PARAMETER, NO\_ MESH, MLME-SCAN.confirm ~~MAC transmission~~ error codes | The result of invoking an L2RLME-MESH-ISCOVERY.request primitive. |

If any parameter in the request primitive is not supported or is out of range, the L2RLME-MESH-DISCOVERY.confirm primitive is returned with a Status INVALID\_PARAMETER.

If no TC IE is received during the scan, the Status is set to NO\_MESH.

If an error occurs at the MAC sublayer, the Status is set to the MLME-SCAN.confirm error code.

**7.1.1.x L2RLME-MESH-SELECT.request**

L2RLME-MESH-SELECT.request (

 MeshRootAddress

)

The parameters of the primitive are defined in Table xx.

Table xx-L2RLME-MESH-SELECT.request parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid Range** | **Description** |
| MeshRootAddress | Address | Short address or EUI-64 | Indicates the address of the mesh root whose L2R mesh the device should join. |

**7.1.1.x L2RLME-MESH-SELECT.confirm**

L2RLME-MESH-SELECT.confirm (

 Status

)

The parameters of the primitive are defined in Table xx.

Table xx-L2RLME-MESH-SELECT.confirm parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Valid Range** | **Description** |
| Status | ENUMERATION | SUCCESS, IN-VALID\_PARAME-TER, MLME-BEACON.confirm ~~MAC transmission~~ error codes | The result of invoking an L2RLME-MESH-SELECT.request primitive. |

If any parameter in the request primitive is not supported or is out of range, the L2RLME-MESH-DISCOVERY.confirm primitive is returned with a Status INVALID\_PARAMETER.

If an error occurs at the MAC sublayer, the Status is set to the MLME-SCAN.confirm error code.

* ***In p.71, l. 33, replace "find a PAN containing a desired L2R mesh" w/ "discover the existing L2R meshes."***
* ***CID 1489, 1490:***
* Insert a MeshAddressMode in the L2RLME.DATA.request
* Insert a MeshRootAddress in the L2RLME.DATA.request
* ***CID 1491: Add the following parameter to the L2R-DATA.request primitive:***

|  |  |  |  |
| --- | --- | --- | --- |
| MeshAddressMode | Enumeration | SHORT, EXTENDED | Indicates the addressing mode of FnlDestAddr and the MeshRootAddress |

* ***On p.15, l.32, “A device may join several L2R meshes.” with:***

A device may join several L2R meshes if it needs to access different services provided on different L2R meshes.