IEEE P802.15
Wireless Personal Area Networks

Project	IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)	
Title	TG3 Recommended D10 changes in support of ballot comments	
Date Submitted	07 July, 2002	
Source	Jay Bain Time Domain7057 Old Madison Pike Huntsville, AL 35801	Voice: 256 922-9229 Fax: 256 922-0837 E-mail: jay.bain@timedomain.com
Re:	IEEE Draft P802.15.3/D10	
Abstract	This document is a supplement to the authors D10 ballot response and provides recommended changes to D10. Most of the text is related to Child and Neighbor piconets.	
Purpose	Accepted recommendations from this document would be placed in D11 .	
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.	

Revision history for this document

r0 - covers the MLME structure for providing operation parameters for the dependent piconet. It also contains text changes in 8.2.4 and 8.2.5 to address the change in starting the PNC operation for the dependent piconet. Some outline notes for considering responsiveness of PNCs to DEV requirement is provided. A note listing areas that have proposed changes follows the revision history.

List of changes to go from 02/118r1 to r2 (this document) power save text

Take the figure and table numbering for this version with a grain of salt as they are an auto numbering done by Frame. The clause numbering is not Frame formated and is still referenced to the d10 numbering.

The major area addressed with this document is the child and neighbor piconet capability of the draft. Sections of clause 6 and 8 are provided below with changes as recommended in ballot comments by the author. Clause 5 text is not provided here.

This revision does not include the graphics changes yet. The two figures for the setup of child and neighbor piconets require change. A different commenter recommended that true MSCs be used in place of the current style.

Key changes are:

A method to move existing piconet DEVs to child piconets. Suggest that disassociated and then reassociate takes place although this is an ugly thing to do.

The consideration of multiples of any dependent piconet be it child or neighbor. As part of this is the impact of the parent leaving the piconet without handing off to regular member of the parent's piconet. For a single dependent, the text is clear that the dependent is able to become the owner of the channel. Text on multiples assumes that everything is taken down and then rebuilt. This is also ugly!

New text in clause 8 and primitive in clause 6 to correctly initiate the dependent piconet (not including non-15.3 piconets) after the creation of private GTSs. Part of this area provides corrections to current text

Clause 6 changes

6.3.x Dependent PNC initialize

This mechanism completes the process of creating a new dependent piconet. The parameters used for these primitives are defined in Table 6 and Table 7

6.3.x.1 MLME-INIT-DEPENDENT-PNC.request

This primitive requests that the MAC entity of a dependent PNC start operations. The semantics of the primitive are as follows:

```
MLME-INIT-DEPENDENT-PNC.request(
                                MACParameterSet,
                                PiconetMaxTXPower,
                                PiconetDescriptionSet
                                )
```

{Note: Not all of the parameters of the MACParameterSet and PiconetDescriptionSet are used. Should we develop a new structure that picks up only the desired parameters?}

6.3.x.1.1 When generated

This primitive is generated by the DME to convey operating parameters to the PNC of a dependent piconet .

6.3.x.1.2 Effect of receipt

This primitive initiates the piconet initialization procedure defined in {xref}. The MLME subsequently issues an MLME-INIT-DEPENDENT-PNC.confirm that reflects the results of the initialization procedure.

6.3.x.2 MLME-INIT-DEPENDENT-PNC.confirm

This primitive reports the results of a dependent piconet initialization procedure. The semantics of the primitive are as follows:

```
MLME-INIT-DEPENDENT-PNC.confirm(
                                ResultCode
                                )
```

The primitive parameter is defined in Table 6.

6.3.x.2.1 When generated

This primitive is generated by the MLME as a result of an MLME-INIT-DEPENDENT-PNC.request.

6.3.x.2.2 Effect of receipt

The DME is notified of the results of the dependent PNC initialization procedure. A ResultCode of SUCCESS indicates that the DEV has started dependent PNC operations. If this is a duplicate primitive and the dependent PNC is already established, the ResultCode shall be ALREADY_STARTED.

Clause 8 changes

8.2.x Dependent Piconets

This standard provides for three distinct dependent piconet types that are required to operate within a parent piconet. Child, 802.15.3 Neighbor, and non-802.15.3 neighbor are defined in the following sub-clauses.

Child and 802.15.3 Neighbors require initialization by their respective DMEs and have a MLME primitive to provide the final initialization before the DEV can operate as a PNC. Neighbors not conforming to this standard would use procedures not part of this standard.

8.2.4 Child piconet

When an AC-capable DEV that is associated in an existing piconet wants to form a child piconet, the DEV shall use the channel time request command, defined in 7.5.5.1 to request a private GTS. A private GTS is a GTS that has the same source and destination DEVID. The DEV shall set the source and destination addresses in the channel time request command to be the DEVID of the originating DEV, the stream index shall be set to 0 and the CTR type to ACTIVE. The PNC will recognize this as a request for a child piconet. The PNC may allocate a private GTS for the child piconet depending on the availability of network resources, its capabilities and security policy.

If the DEV receives a private GTS, the DEV DME configures the child PNC parameters using the MLME-INIT-DEPENDENT-PNC.request and confirm primitives, {xref 6.3.x}.

The DEV, now the child PNC, shall start sending its beacon in its allocated private GTS. The child PNC shall use a PNID that is distinct from the parent PNID. The child piconet beacon contains the parent PNC DEV address, a shown in Table 38.

Included in the child piconet beacon is a private GTS for the parent piconet, using the PNCID for both the source and destination DEV address. This is provided to reserve the time, not to convey any information to the parent PNC.

Figure 1 illustrates the relationship between the parent piconet superframe and the child piconet superframe. Note that the superframe duration is the same for both the child and the parent piconets.

Figure 1—Parent piconet and child piconet superframe relationship

Note that the slot positions GTS0, GTS1, et al., are not to scale in Figure 1 and so are illustrative only.

The process for creating a child piconet is illustrated in Figure 2.

Figure 2—Process for the creating a child piconet.

The child piconet is an autonomous piconet except that it is dependent on a private GTS from the parent piconet. Association, authentication, security, etc. shall be handled within the child piconet and do not involve the parent PNC.

The child PNC DEV is a member of the parent piconet and thus may exchange data with any DEV in the parent piconet. The child PNC DEV is also a member of the child piconet and thus may exchange data with any DEV in the child piconet.

8.2.5 Neighbor piconet

If after following the scan procedure in 8.2.1, no free channels are available, then a neighbor AC (i.e. an AC from a different system), may attempt to start a neighbor piconet on the same channel as the existing piconet. To start a neighbor piconet, the neighbor AC shall send an association request, defined in 7.5.1.1, to the PNC. The neighbor PNC bit in the capability field shall be set as indicated in 7.4.4 when the association request command is sent.

If the neighbor association request is accepted, then the PNC shall set the DEVID in the command to be one of the unused NbrIDs, 7.2.3. If the request was rejected, 7.5.1.2, depending on the reason code, the neighbor AC may retry the request at a later time. If the reason code in the rejection indicates that neighbor piconets are not supported, then the neighbor AC should not retry the request while that DEV is PNC of the parent piconet.

The neighbor AC then sends a channel time request, 7.5.5.1, to obtain a private GTS for the neighbor piconet. The channel time request shall have both the source and destination addresses set to the NbrID that was assigned to the neighbor AC by the PNC.

If the PNC permits the formation of a neighbor piconet, it shall allocate a private GTS using the NbrID as both the source and destination addresses. After receiving this channel time allocation in the beacon, the DEV DME configures the child PNC parameters using the MLME-INIT-DEPENDENT-PNC.request and confirm primitives, {xref 6.3.x}

The neighbor AC, now the neighbor PNC, shall start sending its beacon in its private GTS. The neighbor PNC shall use a PNID that is distinct from the parent PNID. If the neighbor piconet is 802.15.3 compliant, its beacon shall contain the parent PNC DEV address, a shown in Table 38.

If the neighbor piconet is 802.15.3 compliant, a private GTS for the parent piconet is included in the neighbor beacon, using the PNCID for both the SrcID and DestID. This is provided to reserve the slot, not to convey any information to the parent PNC.

If the piconet is not 802.15.3 compliant, it shall allow communications in its network only during the time allocated by the parent piconet using methods appropriate to its protocol.

Figure 1 illustrates the relationship between the parent piconet superframe and the neighbor piconet superframe. .

Figure 3—Parent piconet and neighbor piconet superframe relationship

The process for the initiation of the neighbor piconet is illustrated in Figure 4.

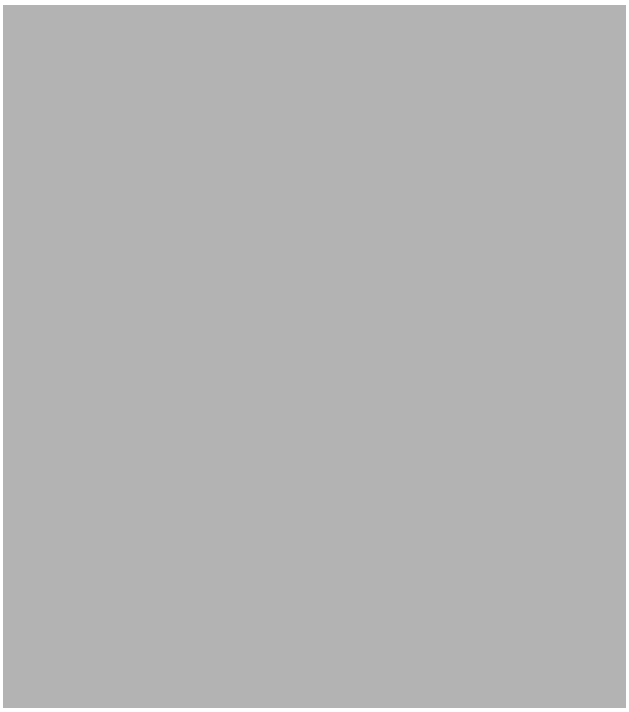

Figure 4—Process for the initiating of a neighbor piconet.

The neighbor piconet is an autonomous piconet except that it is dependent on a private GTS from the parent piconet. Association, authentication, security, etc. shall be handled within the neighbor piconet and do not involve the parent PNC.

The neighbor PNC is not a member of the parent piconet and shall only send the association request command, the dissassociation command, the channel time request command, authentication commands or any required Imm-ACK frames in the parent piconet. The parent PNC is not a member of the neighbor piconet.

8.2.6 Stopping piconet operations.

If the PNC intends to remove itself from the piconet and no other DEVs are capable of taking over as the PNC, the PNC places the PNC shutdown information element, 7.4.13, in the beacon. The PNC shall send at least aMinBeaconInfoRepeat times in the beacon before shutting down the piconet.

If the parent PNC wants to end a child the parent PNC shall use either the stream termination process, 8.5.1.3, to remove the GTS from the beacon. If the parent PNC wants to end a neighbor piconet, it shall use the disassociation process, 8.3.4, to remove the neighbor PNC from the network.

If the parent piconet ends operation, the child or neighbor piconet may continue operation. The child PNC shall remove the parent PNC DEV address element from its beacon frame, signifying that it is a free-standing piconet. If the neighbor piconet is an 802.15.3 piconet, then the neighbor PNC removes the parent PNC DEV address element from its beacon frame, signifying that it is a freestanding piconet.

{Consideration of slotted Aloha as used in Open and Association MTSs

It is not clear that a method is present that allows the DEV DME to be made aware of issues with too many DEVs accessing the Open or Association MTSs. This may only be an issue if the PNC is not reacting to piconet dynamics with the insertion of additional MTSs per superframe. There is a mechanism to request additional MTS capability via the CTR but is it clear that the DME knows enough to make the request. If it makes sense, such an MLME primitive would be an indication without any response associated with it. The MLME primitive would be local between the MAC its DME and be based on the MAC's perception of the Open or Association MTS. For association, there is not much to do since the DEV has no ability to request additional services prior to association. As a result, the recommendation is to shorten the aMTSAssocPeriod from its current 0.6 second to a value that would assure that reasonable connect times for a DEV joining a piconet.

An additional consideration is that the PNC may not be aware of the increasing of the window by the various DEVs trying to talk to it. Is there a way to assure that the PNC sees collisions?}