

## IEEE P802.15 Wireless Personal Area Networks

Project	IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)	
Title	<b>TG3 LB19 security comment resolution</b>	
Date Submitted	[11 September, 2002]	
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Re:	[802.15.3 D11]	
Abstract	[This document is a record of security comment resolutions for LB19.]	
Purpose	[To provide a record of the security comment resolution for LB19.]	
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Release	The contributor acknowledges and accepts that this contribution becomes the property of IEEE and may be made publicly available by P802.15.	

### 1. Security Comment Resolution, Monterey

#### 1.1 Tuesday, September 10, 2002

404 - ACCEPT IN PRINCIPLE. Add "The DEV shall set the secure frame counter to 0 whenever it receives a new key." to the end of clause 7.2.8.2.

110 - ACCEPT

5 - ACCEPT IN PRINCIPLE. Change "it shall verify that the beacon number is greater than the MACPIB\_CurrentBeaconNumber, that the SECID matches the MACPIB\_PNCSECID stored in the MAC PIB and that the integrity code passes. If all of these checks succeed, the DEV shall set the MACPIB\_CurrentBeaconNumber to the received beacon number value and set the MACPIB\_ValidBeacon to valid. If the beacon number is greater than the MACPIB\_CurrentBeaconNumber, but the SECID does not

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1 match the MACPIB\_PNCSECID, the device may set the MACPIB\_CurrentBeaconNumber to the value in  
 2 the beacon and send a key request command to the PNC to obtain the new key."

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 4 to

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 6 "it shall verify that the beacon number in the beacon is greater than the LastKnownGoodBeaconNumber,  
 7 that the SECID matches the stored broadcast SECID and the integrity code passes. If all of these checks suc-  
 8 ceed, accept the beacon number in the beacon as the LastKnownGoodBeaconNumber. If the beacon number  
 9 in the beacon is greater than the LastKnownGoodBeaconNumber, but the SECID does not match the stored  
 10 broadcast SECID, the device may set the LastKnownGoodBeaconNumber to the value in the beacon and  
 11 send a key request command to the PNC to obtain the new key."

12  
 13 Delete "stored in the MACPIB\_CurrentBeaconNumber in the MAC PIB" from line 16 on page 221.

14  
 15 On page 220, line 41, Change "greater than the CurrentBeaconNumber and less than the CurrentBeacon-  
 16 Number + aMaxBeaconChange." to "greater than the LastKnownGoodBeaconNumber and less than the  
 17 LastKnownGoodBeaconNumber + aMaxBeaconChange."

18  
 19 6 - ACCEPT IN PRINCIPLE. Move the definition of public-key object type from 7.5.2.1 to 7.4.15. Replace  
 20 line 16 on page 128 with lines 1-11 on page 134. Replace lines 1-11 on page 134 with "The public-key  
 21 object type field specifies the type of public key specified in the public-key object {xref 7.4.15}."

22  
 23 403 - REJECT. To maintain proper synchronization of keying material, the SECID is required. It is the only  
 24 way a DEV can determine that it is out of sync.

25  
 26 113 - ACCEPT

27  
 28 99 - ACCEPT IN PRINCIPLE. See resolution of CID 6 which did this.

29  
 30 114 - ACCEPT IN PRINCIPLE. On line 30 change "and security manager" to "and security manager of the  
 31 piconet ". On line 31 change "security manager acts as the central security point for all DEVs to obtain key-  
 32 ing material for the piconet." to "piconet security manager authenticates DEVs for membership in the piconet  
 33 and provides the broadcast payload protection key for the piconet." On line 37, change "all piconet data."  
 34 to "data using the broadcast key."

35  
 36 78 - ACCEPT

37  
 38 82 - REJECT. The PublicKeyObjectLength for ECC and RSA certificates can vary. Table 10 on page 43  
 39 incorrectly states that PublicKeyObjectLength is defined by the security suite. Change "Defined by the secu-  
 40 rity suite, Clause 10." to "May be constant or variable as defined by the security suite, Clause 10."

41  
 42 83 - ACCEPT IN PRINCIPLE. Remove OID and OIDLength from 6.3.7.5 and 6.3.7.6. And update Figure  
 43 146 in 9.8.3 to reflect this change.

44  
 45 79 - ACCEPT

46  
 47 366 - ACCEPT

48  
 49 402 - ACCEPT

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 51 371 - ACCEPT IN PRINCIPLE. Change Pub\_D to Pub\_key\_D. Change Pr\_D to Pr\_key\_D. Change  
 52 Pub\_SM to Pub\_key\_SM. Change Pr\_SM to Pr\_key\_SM. Change Keys\_D to Sym\_keys\_D. Change  
 53 Keys\_G to Sym\_keys\_G. Change BH to SBH and add SCH for secure command header. Beacon and com-  
 54

mand shouldn't be lumped together. Add CD for command Data to separate it from BD. Use these identifiers as a guideline and update tables, text and figures in clause 9 as required.

432 - ACCEPT

107 - ACCEPT IN PRINCIPLE. Reference changed to clause where correction is to be made. Add BAD-BEACON-NUMBER to Table 14, page 54, line 49 since it is referenced in clause 9.2.8 on page 220, line 33.

382 - ACCEPT

241 - ACCEPT IN PRINCIPLE. Change "failure" on line 45 to "ChallengeResponse generation failure".

239 - ACCEPT IN PRINCIPLE. Change "Failure" to "Challenge verification failure".

86 - ACCEPT IN PRINCIPLE. The EncryptedSeed should be changed to Key and the IntegrityCode should be removed from the MLME-REQUEST-KEY.response. Change "with an encrypted version of therequested seed" to "with the requested key" in line 4.

90 - ACCEPT

20 - ACCEPT IN PRINCIPLE. Change "EncryptionSeed" on line 32 to "Key". Delete "in an encrypted format" from line 26.

89 - ACCEPT

88 - ACCEPT

87 - ACCEPT

## 1.2 Thursday September 12, 2002

102 - ACCEPT IN PRINCIPLE:

*Author's note: Add the following sub-clause to 6.3 after 6.3.13. OIDs are currently sent on a per-device basis because a security manager may support multiple OIDs.*

### 1.2.1 Retrieving ACL information

These primitives are used to request ACL information about other DEVS in the piconet. The parameters used for the MLME-ACL-INFO primitives are defined in Table 1.

#### 1.2.1.1 MLME-ACL-INFO.request

This primitive initiates a request to the DEV for ACL information regarding either a single DEV or all of the DEVS in the piconet. The semantics of the primitive are as follows:

```

MLME-ACL-INFO.request      (
                             TrgtID,
                             QueriedDEVID,
                             ACLInfoTimeout
                             )

```

The primitive parameters are defined in Table 1.

**Table 1—MLME-ACL-INFO primitive parameters**

Name	Type	Valid range	Description
QueriedDEVID	Integer	Any valid DEVID as defined in 7.2.3.	Specifies the DEVID of the DEV for which information is being requested. A value of BestID is defined as a request for information from all associated DEVs.
TrgtID	Integer	Any valid DEVID as defined in 7.2.3.	Specifies the DEVID of the DEV that the ACL information request is intended for.
OrigID	Integer	Any valid DEVID as defined in 7.2.3.	Specifies the DEVID of the DEV that initiated the MLME request.
NumACLInfoSet	Integer	0-65535	Number of entries in the ACLInfoSet
ACLInfoSet	As defined in 1.2.2.2.	As defined in 1.2.2.2.	A set of ACL entry elements for the requested DEVs.
ACLInfoTimeout	Duration	0-65535	The time in milliseconds in which the operation initiated by the MLME request needs to be completed before responding with a ResultCode of TIMEOUT.
ResultCode	Enumeration	SUCCESS, DENIED, TIMEOUT	Indicates the result of the MLME request.

**1.2.1.1.1 When generated**

The originating DME sends this primitive to its MLME when it wants to obtain ACL information about either an individual DEV or all of the DEVs in the piconet.

**1.2.1.1.2 Effect of receipt**

The MLME, upon receiving this primitive, sends the ACL information request command, 1.2.2.1, to the DEV specified by the TrgtID to request security information managed by that DEV.

**1.2.1.2 MLME-ACL-INFO.indication**

This primitive indicates the reception of a request by a DEV for ACL information it manages regarding either a specific DEV or all of the DEVs in the piconet. The semantics of the primitive are as follows:

```
MLME-ACL-INFO.indication      (
                                QueriedDEVID,
                                OrigID
                                )
```

The primitive parameters are defined in Table 1.

**1.2.1.2.1 When generated**

The DEV MLME sends this primitive to its associated DME upon receiving an ACL information request command, 1.2.2.1, from the requesting DEV specified by the OrigID.

**1.2.1.2.2 Effect of receipt**

The DME upon receiving this primitive sends an MLME-ACL-INFO.response to its MLME.

**1.2.1.3 MLME-ACL-INFO.response**

This primitive initiates a DME response to an MLME-ACL-INFO.indication. The semantics of the primitive are as follows:

```
MLME-ACL-INFO.response      (
                               OrigID,
                               NumACLInfoSet,
                               ACLInfoSet
                               )
```

The primitive parameters are defined in Table 1.

**1.2.1.3.1 When generated**

The DME sends this primitive to its MLME as a result of receiving an MLME-ACL-INFO.indication.

**1.2.1.3.2 Effect of receipt**

The MLME upon receiving this primitive sends an ACL information command, 1.2.2.2, to the requesting DEV.

**1.2.1.4 MLME-ACL-INFO.confirm**

This primitive informs the originating DME that its request for ACL information from the specified DEV is complete. The semantics of the primitive are as follows:

```
MLME-ACL-INFO.confirm      (
                               TrgtID,
                               NumACLInfoSet,
                               ACLInfoSet,
                               ResultCode
                               )
```

The primitive parameters are defined in Table 1.

**1.2.1.4.1 When generated**

The MLME sends this primitive to its DME upon receiving either an ACL information command, 1.2.2.2, or a TIMEOUT.

**1.2.1.4.2 Effect of receipt**

The originating DME is informed whether its request for information about either a single DEV or all of the DEVs in the piconet was successful or unsuccessful. If unsuccessful, the DME is able to resend the MLME-ACL-INFO.request. If successful, the DME will have acquired the information it requested.

*Author's note: Add the following sub-clauses to 7.5.*

**1.2.2 ACL information commands**

The ACL information commands allow a DEV to request information about the public key of a specified DEV or DEVs.

**1.2.2.1 ACL information request command**

The ACL information request command shall be formatted as illustrated in Figure 1.

<b>octets: 1</b>	<b>2</b>	<b>2</b>
Queried DEVID	Length (=1)	Command type

**Figure 1—ACL information request command format**

The queried DEVID indicates the DEV whose ACL information is being requested. If the value of this field is the BcstID, then the DEV is requesting all of the ACL information maintained by the target DEV.

**1.2.2.2 ACL information command**

The ACL information command shall be formatted as illustrated in Figure 2.

<b>octets: L<sub>m</sub></b>	---	<b>L<sub>2</sub></b>	<b>L<sub>1</sub></b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>
DEV-m ACL record	...	DEV-2 ACL record	DEV-1 ACL record	Sequ ence num- ber	Total Num ber of Fram e	Length = 1+L <sub>1</sub> +L <sub>2</sub> +...+L <sub>m</sub>	Command type

**Figure 2—ACL information command**

The Total number of frames indicates the number of frames that will be sent to complete this request. The Sequence Number indicates which frame in the sequence is in this command.

The ACL record field shall be formatted as illustrated in Figure 3.

<b>octets: L<sub>2</sub></b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>6</b>	<b>2</b>
Verification info	Verification info length = L <sub>2</sub>	Verification info type	DEVID	DEV address	Length

**Figure 3—Format of an ACL record in an ACL information command**

The DEVID is the ID assigned to the DEV by the PNC. If the DEV is not currently associated in this piconet, the field shall be set to the UnassocID. This field shall not contain the broadcast or multicast IDs.

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The DEV address is the MAC address of the DEV corresponding to the DEVID.

The verification info type indicates the type of verification information that is included in the ACL entry. The valid verification info types are:

- 0 -> NULL
- 1 -> ECMQV Koblitz-283 key
- 2 -> RSA-OAEP raw 1024 key
- 3 -> NTRUEncrypt 251-1 key
- 4 -> ECMQV Koblitz-283 implicit certificate
- 5 -> X.509 certificate
- 6 -> X.509 CA certificate
- 7 -> ECMQV Koblitz-283 CA key
- {Ed note: Make the type entry two four bit fields, one for the security suite type and one for the hash code.}
- 8 -> SHA-1 hash
- 9 -> SHA-256 hash
- 10 -> Certificate chain URL
- 11-255 -> Reserved

These types are defined in 1.2.4.

The verification info length indicates the length of the verification information that is included in the ACL entry. If this length is 0, no verification information field shall be included.

The verification info specifies the ACL verification info that may be used to verify the validity of the public key associated with that particular DEV.

*Author's note: Replace sub-clause 9.2.4 with the following sub-clause.*

### 1.2.3 PNC handover

When a PNC chooses to handover the PNC role to another DEV in the piconet, the authentication relationships with the old PNC no longer apply to the new PNC. When the old PNC hands over the piconet information using a PNC information command, 7.5.4.2, the list of authenticated DEVs is passed to the new PNC.

PNC handover does not affect the group membership, so it does not require a rekey of the group keys. However, in a piconet with payload protection, the command functions of the PNC that relate to specific DEVs are not implemented until the new PNC has performed the authentication protocol with each DEV in the piconet. When the PNC role has been handed over, the new PNC shall set up time slots for each of the authenticated DEVs to perform the authentication protocol with the new PNC if commands are not allowed in the CAP.

The new PNC or any other DEV may request public-key verification information from the old PNC using an ACL information command, 10.0.2.2.

*Author's note: Add the following sub-clause at the end of 10.2.*

### 1.2.4 Public-key verification information

DEVs may exchange public-key verification information that is intended to be used to verify public keys received in the authentication request command and challenge request command. The types of public-key verification information are specified in 1.2.2.2. The types have the following meanings:

Types 1 through 5 correspond to the actual public key objects themselves. {Ed Note: Revise to match frame format specificaiton.}

Type 6, X.509 CA certificate, corresponds to an X.509 certificate as defined in RFC 3280 that belongs to the CA that signed the corresponding DEV's certificate.

Type 7, ECMQV Koblitz-283 CA key, corresponds to the ECC public key of the CA that signed an implicit certificate for the ecmqv-implicit-1 sub-suite.

Type 8 , SHA-1 hash, is used to transmit the hash of the public-key and ID used in the rsa-oeap-raw-1 and ntruencrypt-raw-1 sub-suites.

Type 9 , SHA-256 hash, is used to transmit the hash of the public-key and ID used in the ecmqv-manual-1 sub-suite.

Type 10, certificate chain url, is used to transmit a uniform resource locator of the certificate chain from which a certificate is built.

319 - ACCEPT IN PRINCIPLE. Delete on page 265, lines 30-31 and Figure 163.

372 - ACCEPT IN PRINCIPLE. Resolve as indicate in CID 374.

373 - Withdrawn

374 - ACCEPT IN PRINCIPLE. Figure 147 is the MSC for Authentication. Page 242, line 4 add "The MSC for authentication is shown in {xref Figure 147}. Page 246, line 2 add "The MSC for authentication is shown in {xref Figure 147}. Delete clause 9.8.3.5 containing Figure 150.

375 - ACCEPT IN PRINCIPLE. Page 256, line 4 add "The MSCs that correspond with this state machine are shown in {xref Figure 147, 153, 154, 156, and 162 Ed to fix}."

376 - ACCEPT IN PRINCIPLE. Page 259, line 17 add "The MSCs that correspond with this state machine are shown in {xref Figure 147, 153, 154, 156, and 162 Ed to fix}."

377 - ACCEPT IN PRINCIPLE. Delete subclause 9.8.7.5 containing Figure 159.

378 - ACCEPT IN PRINCIPLE. Delete subclause 9.8.7.6 containing Figure 160.

379 - ACCEPT IN PRINCIPLE. Delete subclause 9.8.7.7 containing Figure 161.

380 - Withdrawn 12 September, 2002

381 - Withdrawn 12 September, 2002

85 - ACCEPT

81 - ACCEPT

367 - ACCEPT IN PRINCIPLE. Add the following to the sentence that ends with "to join the secure pico-net." New text: "and that the DEV accepts the PNC."

325 - ACCEPT IN PRINCIPLE. Resolve as indicated in CID 81.



326 - ACCEPT IN PRINCIPLE. Add OriginatorDEVAddress parameter to MLME\_Authenticate.indication primitive and Table 10. The description is "The DEV Address of the originator of the authentication process." Add TargetDEVAddress to MLME\_Challenge.request. The description is "The DEV Address of the security manager."

327 - ACCEPT IN PRINCIPLE. Delete the OID and OIDLength parms from the MLME-CHALLENGE.request parm list. Insert the ReasonCode parm just before the SECID parm in the MLME-CHALLENGE.request parm list. Leave TrgtID and OrigID as defined.

328 - ACCEPT IN PRINCIPLE. Add the ReasonCode parm just before the SECID in the MLME-CHALLENGE.indication parm list. Remove the OIDLength and OID parms from the MLME-CHALLENGE.indication parm list.

329 - Withdrawn 12 September, 2002

84 - Withdrawn 12 September, 2002

330 - Withdrawn 12 September 2002.

397 - REJECT. To avoid potential security problems it is best to not have any exceptions to the defined security policies. In addition, disassociation or deauthentication causes a broadcast key change that will require authentication.

1 - ACCEPT IN PRINCIPLE. Resolve as in CID 5.

118 - REJECT. Agree that the command will contain redundant information, but the BRC does not wish to change the frame format to remove the redundancy.

119 - ACCEPT IN PRINCIPLE. Add to the end of each of the descriptions in Table 89, ", as defined in 10.3.1.3." Proposed diagrams for authentication in the Ntru and RSA suites will be provided by Ari Singer.

120 - ACCEPT IN PRINCIPLE. In table 94 change "Authorization of public key" to Verification of public key".

295 - ACCEPT IN PRINCIPLE. Allow the distribute key request command to be sent with no ack policy. This allows the PNC to open a broadcast slot and send all of the distribute key commands for all DEVs quickly. Add page 136, line 45, "This command may have the ACK policy set to no ack if the source ID is the PNCID." Page 219, line 29 change sentence beginning with "Once all ..." to "Once the distribute key command has been issued for all of the authenticated DEVs that are in ACTIVE mode, the PNC may change the SECID in the beacon."

61 - Withdrawn 12 September 2002.

77 - ACCEPT

121 - ACCEPT

123 - ACCEPT

80 - ACCEPT

98 - ACCEPT IN PRINCIPLE: Change as indicated in 02399r1.

Change figure 10 to the following:

b7-b4	b3	b2	b1	b0
Reserved	SEC use	CAP association	CAP commands	CAP data

**Figure 4—Piconet mode field**

Change the text and Table 40 to the following:

“The SEC use indicates whether secure authentication is required in the piconet. The field is encoded as illustrated in Table 2:”

**Table 2—SEC use field encodings**

Type value b3	SEC use
0	Authentication required
1	Authentication not required

108 - ACCEPT IN PRINCIPLE. Resolve as indicated in CID 5.

2 - ACCEPT IN PRINCIPLE. Resolve as indicated in CID 5.

3 - ACCEPT IN PRINCIPLE. Resolve as indicated in CID 5.

### 1.3 Thursday 19 September, 2002

Attendees: John Barr, Ari Singer, Dan Bailey, Rene Struik, Gregg Rasor, Bill Shvodian

Start - 2PM CDT

Some comments on work done in Monterey were raised by Ari. Comment 306 was changed to 366 since it was recorded incorrectly. The use of LastKnownGoodBeaconNumber in resolution of comment 5 raised the question of where it was defined. From what James said in Monterey, it just needs to be used consistently. Question on comment 120 whether the resolution does enough. Discussion moved to who needs to be able to interpret public key objects. Comment 102, it is up to the security suite to determine how the verification information passed in a DEV ACL record is interpreted. Ari will provide description of the verification information for the Ntru and RSA security suites.

Comment 92 & 98 - Made security a single mode. Rene - We need more than just a single mode. Document 02364r0 is an explanation. Only justification for removing modes is simplification, but no measure of simplification given. Rene, John and Gregg argue for a mode where the entire piconet (even peer to peer) can be guaranteed to run using certificates to prevent any “man in the middle” attacks. Some users (e.g. CableLabs

compliant products) will require use of certificates to identify devices and ensure that the network is not compromised.

End - 3:50 CDT

## 1.4 Proposed Resolutions

104 - AIP Page 226, lines 9-11: Change this paragraph in sub-clause 9.4 to the following (note that this also resolves comment 113):

A security suite defines mechanisms that may be used to perform the authentication process. A security sub-suite, identified by a unique OID, specifies the operations within a security suite for performing authentication. After two DEVs perform the authentication process using any security suite, the two DEVs share keying material for use in the symmetric operations defined in {xref - 10.2.4}. The PNC may perform the authentication process using different security suites with different devices in the same piconet, since the resulting keying material will be of the same form in all cases. The list of accepted security suites and sub-suites are specified in clause {xref - 10}.

115 - AIP

Page 275, lines 36-37: Replace the text at the beginning of 10.2.4 with the following:

An authenticated DEV operating in a secure piconet or a DEV that is authenticated with a peer DEV shall protect frames using the symmetric cryptography building blocks specified in the following sub-clauses.

Page 276, lines 53-54: Replace the text at the beginning of 10.2.5 with the following:

“An authenticated DEV operating in a secure piconet or a DEV that is authenticated with a peer DEV shall protect frames using the symmetric cryptography operations specified in the following sub-clauses.”

Page 282, lines 40-41: Change the text in 10.3.2.1 to the following:

“All sub-suites of the ECMQV Koblitz-283 security suite shall perform the symmetric operations within the authentication protocol as specified in the following sub-clauses.”

Remove the sentence “The symmetric operations performed in this security suite are those specified in 10.2.5.” from 10.4 on page 289 line 16.

Remove the sentence “The symmetric operations performed in this security suite are those specified in sub-clause 10.2.5.” from 10.5 on page 291 lines 29-30.

384 - AIP Change as indicated in 02399r2.

### 1.4.1 Initializing and Updating SECID Information

This primitive is used to initialize or update the management security information associated with a new SECID as the result of an authorization process. The parameters used for the MLME-SECID-UUPDATE primitive are defined in Table 3.

**Table 3—MLME-SECID-UPDATE primitive parameters**

Name	Type	Valid range	Description
ManagementSECID	Integer	Any valid SECID as defined in {xref}	Specifies the security session ID for the management key.
TrgtID	Integer	Any valid DEVID as defined in 7.2.3.	The DEVID of the target DEV for this relationship.
SecurityManager	Boolean	True/False	This DEV is the security manager for this relationship.
KeyInfoLength	Integer	0-255	Length of ManagementKeyInfo
ManagementKeyInfo	???	???	The key agreed upon during authentication that are used for protecting commands.

**1.4.1.1 SECID-UPDATE.request**

This primitive requests that the SECID and management keying information associated with the DEV be included or updated. The semantics of the primitive are as follows:

```

MLME-SECID-UPDATE.request      (
                                ManagementSECID,
                                TrgtID,
                                SecurityManager,
                                KeyInfoLength
                                ManagementKeyInfo
                                )

```

The primitive parameters are defined in Table 1.

**1.4.1.1.1 When generated**

The DME sends this request to the MLME after completing authentication with the PNC or a peer DEV.

**1.4.1.1.2 Effect of receipt**

The MLME adds this SECID to the list of authenticated SECIDs that can be used to protect command data with the target DEV in this authentication relationship.

**1.5 Comment Information for Unresolved Comments**

104 - After the authentication process has been completed, all security suites behave in an interoperable manner.

Text should be added to clause 9 indicating that a PNC may support multiple security suites in the same piconet.

431 - Text in ln 19:22 and Figure-41 are utterly confusing. Is this trying to tell that Public-key objects larger than 254 octets can be fragmented and can be sent in multiple IEs that have appropriate indices? In any case, state clearly.

Change the text in ln 19:22 and figure 41 to following:

Text:

If the public-key object is larger than 254 octets, it can be fragmented with fragment size of 254 and sent in atmost 4 IEs. The fragmentation is only due to the reason that IEs do not accommodate more than 254 octets.

For this purpose there are four public-key object IE indices defined for this in Table-47. They are

- Public-key object carrying first fragment or the entire public key object if it is less than 255 octets long
- Public-key object-1 carrying second fragment, if present
- Public-key object-2 carrying third fragment, if present
- Public-key object-3 carrying fourth fragment, if present

When fragmentation is performed, the corresponding IEs shall be placed together in the frame carrying them and they shall appear in the order of the fragment they are carrying with fragment-0 appearing first.

Figure:

four different boxes, one for each IE, with their payload joining to form overall Public-key-object

105 - The probe command will not function as specified in this sub-clause, as the recipient device will assume that the public-key information being sent belongs to the old PNC, not the new PNC.

Change this paragraph to reference a new command that may be sent to pass ACL information to other DEVs.

111 - Table 57: It needs to be indicated either here or in clause 7 that the probe command, piconet services command and disassociate command may be sent insecurely before authentication has taken place.

Add text that indicates that the probe command, piconet services command and disassociate command may be sent insecurely before authentication has taken place.

370 - Table 57: It needs to be indicated either here or in clause 7 that the probe command, piconet services command and disassociate command may be sent insecurely before authentication has taken place.

Change to "A device operating in mode 0 shall not perform any security related

operations on MAC frames."

101 - The disassociation request command may be sent before the device is authenticated. In addition, the table does not specify when the commands shall be sent with security turned on.

The X should be removed from the "authenticated (if required)" column for the disassociation request command and a column should be added indicating which frames shall be sent with security when authenticated. Recommend allowing the probe command and piconet services command and all of the association, authentication and challenge commands not to require security and all the rest of the commands to require security when authenticated. Alternately, this information could be added to clause 9 if that is a more appropriate location.

112 - There needs to be a clear delineation between the aspects of the certificate usage that are within scope and those that are out of scope. If we are specifying the exact format of the entity certificate, it seems that the format of the CA key and the other information should be specified as well.

It should be made clear what checks, if any, are performed by the MLME and what checks should be pushed up to the higher layer.

100 - The public-key object types listed in 7.5.2.1 are not necessarily sufficient for information to verify a public-key object that is received.

A new information element called ACL entry value should be added. The ACL entry value should have a type, length, DEV address and verification value. This verification value may be a SHA-1 hash, a SHA-256 hash, an X.509 CA certificate, an implicit certificate CA certificate or some other as yet undefined field. This should be flexible since in future iterations, the verification information may change form.

54 - We should specify that commands that fail IC check should be ignored. Sometimes they aren't (e.g. beacons).

Add text as indicated.

124 - It seems that the types of security support that are listed here are limited only to the methods that are explicitly defined in the standard. There may be additional methods that should be allowed and there should be a means for vendors to indicate that there are vendor specific methods implemented. For instance, certificates that are not in the format specified here, such as X.509 certificates used in browsers, may be useful to use to provide evidence of the validity of a public key while in mode 1 or mode 2.

Change the ECC and RSA X.509 certificates to be simply an X.509 certificate.

The certificate indicates the method used for authentication.

64 - IN B.3 it references a to-be-published reference, which is a big no-no and quite silly.  
Delete the references to RFC 3280 and RFC 3278

362 - The way that states are numbered and and state transitions can lead to confusion and difficulty understanding the transitions.

Label states 1.0, 2.0, 3.0, ... N.0 and label state transitions as n.m to indicate a transition from state n.0 to state m.0. This impacts a lot of diagrams and text, but it would be a major improvement. Use "x" as the "any" state indicator.

116 - Figure 168: This figure does not reflect the current version of secure beacons.

This figure should be updated to match the secure beacon frame format specified in 7.3.1.2. Better still, replace this with a cross reference to the correct figure.

115 - Since the symmetric cryptography building blocks are shared by each security suite, there is no reason to reference them in the security suites themselves.

Make sub-clause 10.2.4 a stand alone section that does not relate to the security suites. Each security suite should deal only with the authentication operations and the reference to 10.2.4 from the security suites should be removed.

63 - We still don't have a good description of what to do with commands sent or received with security on. Also need to generalize for the case of peer-to-peer security.

Add description including peer-to-peer security.

93 - The security suite and public-key verification information have been removed from the MAC PIB. This implies that there is no accessible information that the MLME can use to perform verification on the public key. In particular, the CA certificate or hash of the public key are not available. In clause 10, each security sub-suite specifies that the ACL indicates which public-keys shall be accepted and which shall be rejected.

Add public-key verification information back into the ACL and specify in each security suite how that ACL information is to be used. If there are operations to be performed by the DME to verify the public key, those should be mentioned in the security suites as well. This applies to 6.5.6 as well.

384 - MAC PIB ACL group defined as an array whose contents are defined in Table 33. All of the entries are dynamic, but no clear mechanism to update these entries has been included in the draft. There are no limits on the minimum and maximum number of entries allowed in the ACL. The only use for this array in the MAC is for generation of the CCM nonce and obtaining the keys associated with a particular SECID for encoding or decoding payloads.

Either remove the MAC PIB ACL or add appropriate method for updating the information in the array. If the ACL is kept, add limit for the minimum number of ACLs that must be supported for a DEV, SM, and PNC. Provide a mechanism for updating and accessing the

contents of an ACL entry. Suggest defining MLME commands for doing this using an index to the array. Add MAC PIB entries to indicate last index used in the array. Finally, clarify relationship between DEVHost and MAC regarding use and management of information in the ACL.

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