Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Enhancement of 802.16e to Support Secure EAP PKM messages**
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Re:	This is a response to a Call for Comments IEEE 802.16e-03/58 on IEEE 802.16e-03/07r5
Abstract	This document contains suggestions to provide protection to EAP PKM messages
Purpose	The document is submitted for review by 802.16e Working Group members.
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Enhancement of 802.16e to Support of Secure EAP PKM messages

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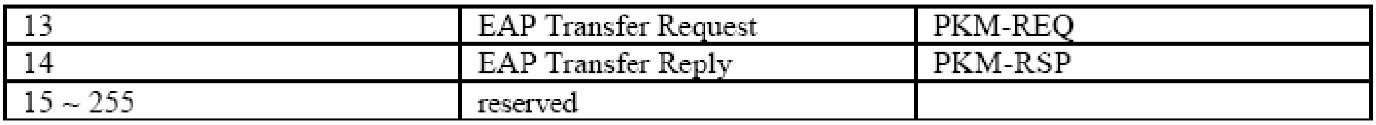
1 Scope of this document

This document outlines how to provide the protection to the Extensible Authentication PKM messages

2 Background

Due to the working group's agreement on the EAP-based Authentication support (See Figure 1), the protection toward to EAP PKM messages is required. As C802.16-71/r3 [1] and RFC2284bis [2] Internet Draft described, EAP has been known for security vulnerability, such as lack of user identity protection and Man in the Middle Attack. Those problems are more often caused by use of legacy authentication method, however those are very often preferred means for user authentication to the operators due to the availability of its legacy user credentials and authentication algorithm deployments. Enabling encryption toward to Primary Management Connection PKM EAP messages for user authentication will fix the above problems (See Figure 2)
In this contribution we propose to add PKM message code 15, 16,17, and 18 for Secure EAP messages (See Figure 3) in addition to PKM EAP message codes previously decided 13 and 14 for User Authentication



13	EAP Transfer Request	PKM-REQ
14	EAP Transfer Reply	PKM-RSP
15 ~ 255	reserved	

Figure-1 Approved new PKM message types

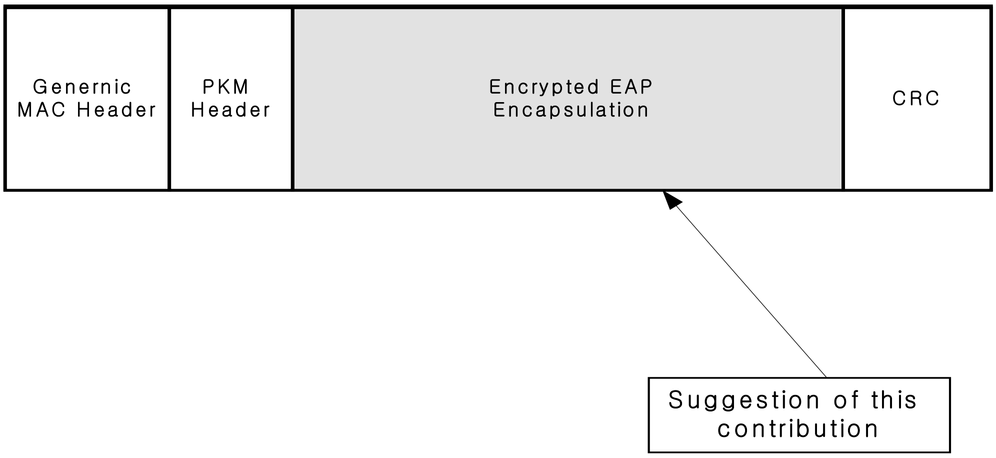


Figure-2 Proposed EAP PKM message encryption

15	Secure EAP Transfer Request	PKM-REQ
16	Secure EAP Transfer Reply	PKM-RSP
17	Secure EAP Transfer Success	PKM-REQ
18	Secure EAP Transfer Failure	PKM-REQ
16~255	Reserved	

Figure-3 Proposed EAP PKM message codes

3. Description of Protected EAP PKM messages

Figure-4 shows Control Plane of PKM message layer providing EAP Message Encryption, HMAC Generation, and Data Encryption

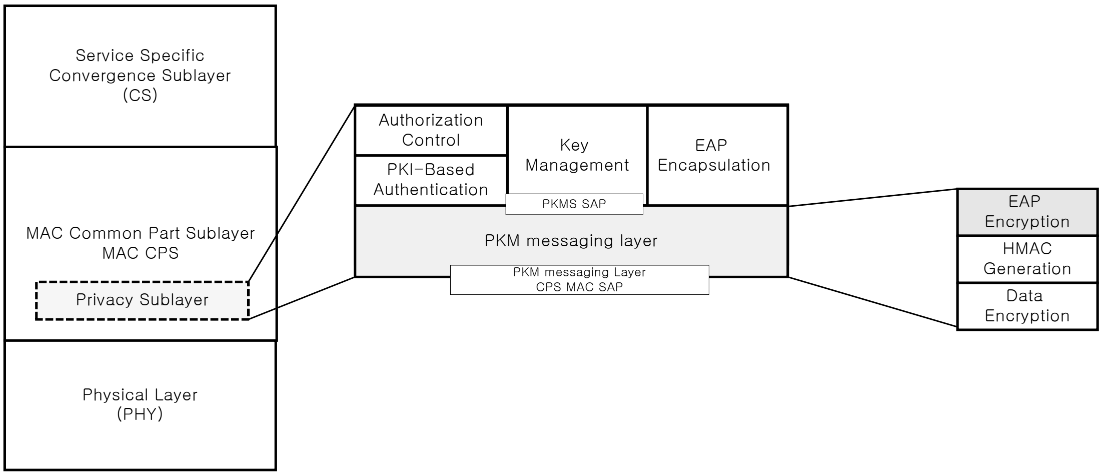


Figure 4 Control Plane

3.1 SEK (Secure EAP Key) based Secure EAP messages

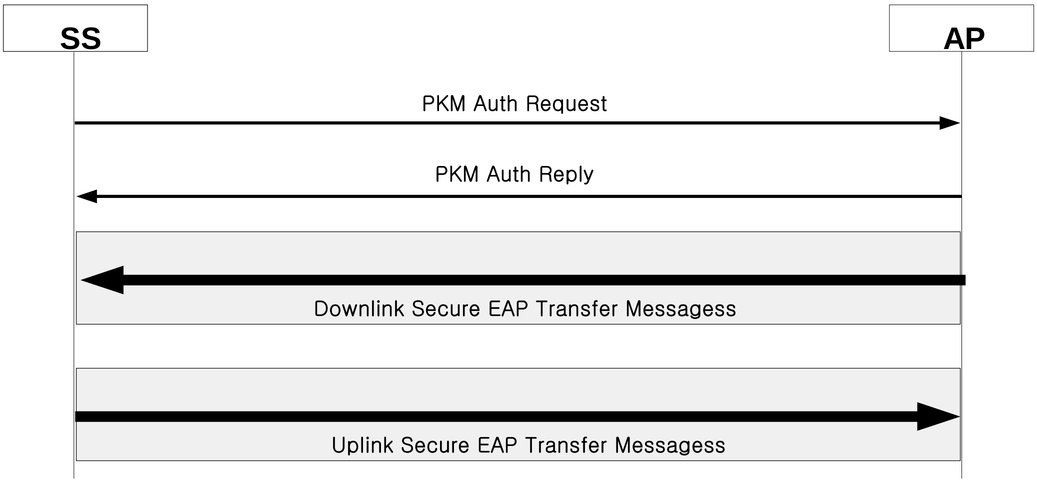
PKM EAP transfer messages can be secured by SEK derived from AK. In this way Primary Management Connection is not mapped to SA, however Message encryption will be performed to PKM EAP transfer message based on SEK derived from AK. (Note that Secure EAP support will be negotiated during SBC Capability negotiation in addition to exiting Authorization Policy)

The SEK shall be derived as follows:

- SEK_D (128bits) = Truncate (SHA (S_PAD_D | AK), 128)
- SEK_U (128bits) = Truncate (SHA (S_PAD_U | AK), 128)

S_PAD_D = 0x3B repeated 64 times
S_PAD_U = 0x5D repeated 64 times

PKM EAP Transfer message shall be encrypted by AES ECB mode.
Encryption: C = Es1[P]
Decryption: P = Ds1[C]
S1= the 128bits SEK_D/SEK_U
E[ ] = 128-bits AES ECB mode encryption
D[ ] = 128-bits AES ECB mode decryption


SS
AP
PKM Auth Request
PKM Auth Reply
Downlink Secure EAP Transfer Messagess
Uplink Secure EAP Transfer Messagess

Proposed Text Change

TBA

Reference

- IEEE C802.16-71/r4, Enhancement of 802.16e to Support EAP-based Authentication/Key Distribution Rev.4 Streetwaves Networking
- RFC 2284bis IETF Internet Draft