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Re:	IEEE P802.16e/D7	
Abstract	The existing PKMv2 is somewhat unorganized and insecure security framework. This contribution provides a resolution for flow and message confusion between the PKMv1 and the PKMv2.	
Purpose	Adoption of proposed changes into P802.16e/D7	
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Corrections for Flow and Message Confusion between PKMv1 and PKMv2

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Introduction

The existing PKMv2 is somewhat in disorder and provides unorganized and insecure security framework.

This contribution supports the backward compatibility with the PKMv1 and security framework of the PKMv2.

This contribution provides a resolution for those problems in the PKMv2.

0.1 IEEE P802.16e/D7 status

There are many sub-messages in the PKM-REQ/RSP messages. Some of them are for the PKMv1, the other are for the PKMv2.

0.2 Problems

- Messages for the PKMv2 were obviously proposed for assuring more secure message transfer, safe key share, and so on. But, it is difficult to distinguish which messages are for the PKMv1 or PKMv2, e.g. Key-Request message, Key-Reply message, EAP-Transfer message.
- Some messages included in the PKMv1 are needed for full operation of the PKMv2. Those messages need to be changed to satisfy the aim of PKMv2 and backward compatibility with PKMv1

0.3 Solutions

We propose PKM-related flow and messages as follows.

- a) The messages included in the PKMv1 are remained for backward compatibility with the PKMv1. In other words, the name and the attributes of messages are maintained.
 - SA Add, Auth Request, Auth Reply, Auth Reject, Key Request, Key Reply, Key Reject, Auth Invalid, TEK Invalid, and Auth Info messages
- b) The messages included in the PKMv2 are changed under the PKMv2 procedure features. In other words, the names of messages are changed by procedure features. Their attributes are changed in case that some problems in the attribute occur. Moreover, code values for PKMv2 message type are re-numbered.
 - For the RSA-based Authorization procedure: The name of messages for the RSA-based Authorization procedure and a few attributes included in those messages are changed as follows:
 - i. PKMv2 Auth-Request message → PKMv2 RSA-Request message (Name and attributes are changed: code # 13)
 - ii. PKMv2 Auth-Reply message → PKMv2 RSA-Reply message (Name and attributes are changed: code # 14)
 - iii. PKMv2 RSA-Reject message (New message is added: code # 15)
 - iv. PKMv2 RSA-Acknowledgement message (New message is added: code # 16)
 - For the EAP-based Authorization procedure: The name of messages for the EAP-based Authorization procedure and a few attributes included in those messages are changed as follows:
 - i. EAP Transfer message → PKMv2 EAP-Transfer message (Name is changed: code # 17)
 - ii. Protected EAP message → PKMv2 Protected-EAP-Transfer message (Name and attributes are changed: code # 18)
 - iii. PKMv2 EAP-Transfer-Complete message (New message is added: code # 19)
 - For MS's Authorization Key Generation procedure: This procedure generates the AK with seeds (such as Nonce) transferred from MS and BS. New messages for MS's Authorization Key Generation procedure are as follows:
 - i. PKMv2 Authorization-Challenge message (New message is added: code # 20)
 - ii. PKMv2 Authorization-Request message (New message is added: code # 21)
 - iii. PKMv2 Authorization-Reply message (New message is added: code # 22)
 - iv. PKMv2 Authorization-Reject message (New message is added: code # 23)
 - For the TEK exchange procedure: This procedure is for distributing TEK (or GTEK) in protecting replay-attack. The protecting function from replay-attack is added into the messages used for PKMv1 TEK exchange procedure. New messages for TEK exchange procedure are as follows:
 - i. PKMv2 Key-Request message (New message is added: code # 24)
 - ii. PKMv2 Key-Reply message (New message is added: code # 25)
 - iii. PKMv2 Key-Reject message (New message is added: code # 26)
 - For the Dynamic SA addition procedure: This procedure is for adding new dynamic SA in protecting replay-attack. The protecting function from replay-attack is added into the messages used for PKMv1 Dynamic SA addition procedure. New messages for Dynamic SA addition procedure are as follows:
 - i. PKMv2 SA-Addition message (New message is added: code # 27)

- For the TEK Invalid procedure: This procedure is for informing MS of using the invalid TEK in protecting replay-attack. The protecting function from replay-attack is added into the messages used for PKMv1 TEK Invalid procedure. New messages for TEK Invalid procedure are as follows:
 - i. PKMv2 TEK-Invalid message (New message is added: code # 28)
- For Group Key Update procedure: This procedure is for pushing Group keying material to MSs. The name of messages for Group Key Update procedure are changed as follows:
 - i. Group Key Update Command message → PKMv2 Group-Key-Update-Command message (Name and attributes are changed: code # 29)
- For Pre-Authentication procedure: This procedure is for pre authentication for MS trying to HO. The name and the attributes of messages for Group Key Update procedure are changed as follows:
 - i. Pre-Auth-Request message → PKMv2 Pre-Authentication-Request message (Name and attributes are changed: code # 30)
 - ii. Pre-Auth-Reply message → PKMv2 Pre-Authentication-Reply message (Name and attributes are changed: code #31)
 - iii. Pre-Auth-Reject message → PKMv2 Pre-Authentication-Reject message (Name and attributes are changed: code #32)

Code	PKM message type	MAC Management message name
13	EAP Transfer	PKM-REQ/PKM-RSP
14	Pre-Auth-Request	PKM-REQ
15	Pre-Auth-Reply	PKM-RSP
16	Pre-Auth-Reject	PKM-RSP
17	PKMv2-Auth-Request	PKM-REQ
18	PKMv2-Auth-Reply	PKM-RSP
19	Key Update Command	PKM-RSP
20	Protected EAP	PKM-REQ/PKM-RSP
21	SA-TEK-Challenge	PKM-RSP
22	SA-TEK-Request	PKM-REQ
23	SA-TEK-Response	PKM-RSP
24-255	reserved	
13	PKMv2 RSA-Request	PKM-REQ
14	PKMv2 RSA-Reply	PKM-RSP
15	PKMv2 RSA-Reject	PKM-RSP
16	PKMv2 RSA-Acknowledgement	PKM-REQ
17	PKMv2 EAP-Transfer	PKM-REQ/PKM-RSP
18	PKMv2 Protected EAP-Transfer	PKM-REQ/PKM-RSP
19	PKMv2 EAP-Transfer-Complete	PKM-REQ
20	PKMv2 Authorization-Challenge	PKM-RSP
21	PKMv2 Authorization-Request	PKM-REQ
22	PKMv2 Authorization-Reply	PKM-RSP
23	PKMv2 Authorization-Reject	PKM-RSP
24	PKMv2 Key-Request	PKM-REQ
25	PKMv2 Key-Reply	PKM-RSP
26	PKMv2 Key-Reject	PKM-RSP
27	PKMv2 SA-Addition	PKM-RSP
28	PKMv2 TEK-Invalid	PKM-RSP
29	PKMv2 Group-Key-Update-Command	PKM-RSP
30	PKMv2 Pre-Authentication-Request	PKM-REQ
31	PKMv2 Pre-Authentication-Reply	PKM-RSP
32	PKMv2 Pre-Authentication-Reject	PKM-RSP
33-255	reserved	

Proposed Changes into IEEE P802.16e/D7

[Change the Table 26 in sub-clause 6.3.2.3.9:]

6.3.2.3.9 Privacy key management (PKM) message (PKM-REQ/PKM-RSP)

Code	PKM message type	MAC Management message name
13	EAP Transfer	PKM-REQ/PKM-RSP
14	Pre-Auth Request	PKM-REQ
15	Pre-Auth Reply	PKM-RSP
16	Pre-Auth Reject	PKM-RSP
17	PKMv2 Auth Request	PKM-REQ
18	PKMv2 Auth Reply	PKM-RSP
19	Key Update Command	PKM-RSP
20	Protected EAP	PKM-REQ/PKM-RSP
21	SA-TEK Challenge	PKM-RSP
22	SA-TEK Request	PKM-REQ
23	SA-TEK Response	PKM-RSP
24-255	reserved	
13	PKMv2 RSA-Request	PKM-REQ
14	PKMv2 RSA-Reply	PKM-RSP
15	PKMv2 RSA-Reject	PKM-RSP
16	PKMv2 RSA-Acknowledgement	PKM-REQ
17	PKMv2 EAP-Transfer	PKM-REQ/PKM-RSP
18	PKMv2 Protected EAP-Transfer	PKM-REQ/PKM-RSP
19	PKMv2 EAP-Transfer-Complete	PKM-REQ
20	PKMv2 Authorization-Challenge	PKM-RSP
21	PKMv2 Authorization-Request	PKM-REQ
22	PKMv2 Authorization-Reply	PKM-RSP
23	PKMv2 Authorization-Reject	PKM-RSP
24	PKMv2 Key-Request	PKM-REQ
25	PKMv2 Key-Reply	PKM-RSP
26	PKMv2 Key-Reject	PKM-RSP
27	PKMv2 SA-Addition	PKM-RSP
28	PKMv2 TEK-Invalid	PKM-RSP
29	PKMv2 Group-Key-Update-Command	PKM-RSP
30-255	reserved	