3GPP TSG SA WG3 Security — S3#37
Sophia Antipolis, France 21 - 25 February 2005

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CHANGE REQUEST

⌘ **33.234** **CR** **055** ⌘ **rev** **-** ⌘ Current version: **6.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Clarification on EAP-AKA(SIM) description in 3GPP IP access authentication and authorization.
Source:	⌘	ZTE Corporation
Work item code:	⌘	WLAN
Date:	⌘	07/02/2005
Category:	⌘	**D**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
Ph2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)
Rel-7 (Release 7)

Reason for change:	⌘	In Figure 7A and 7B (tunnel authentication and authorization), only EAP-AKA is showed in the message flows, but EAP-SIM is neglected, although there are some explainary texts below. Our changes make specification more clear and simple to understand.
Summary of change:	⌘	Modification of figures and coressponding texts on tunnel authentication description.
Consequences if not approved:	⌘	Potential misunderstanding of description of tunnel authentication and authorization flows.

Clauses affected:	⌘	6.1.5.1, 6.1.5.2

	Y	N		
Other specs affected: ⌘		X	Other core specifications	⌘
		X	Test specifications	
		X	O&M Specifications	

Other comments: ⌘

*** BEGIN SET OF CHANGES ***

6.1.5 Mechanisms for the set up of UE-initiated tunnels (WLAN 3GPP IP Access)

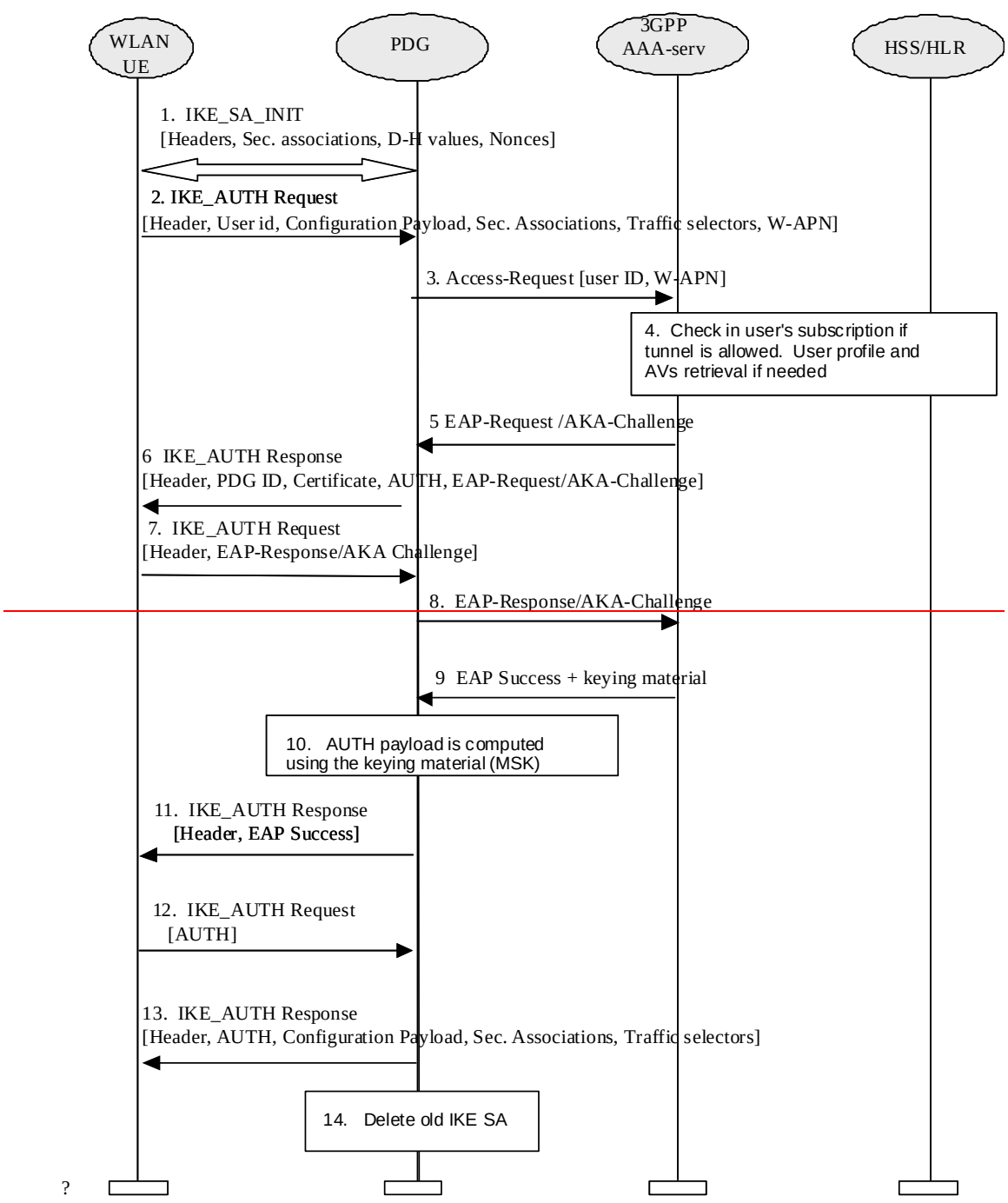
- The WLAN UE and the PDG use IKEv2, as specified in [ikev2], in order to establish IPSec security associations.
- Public key signature based authentication with certificates, as specified in [ikev2], is used to authenticate the PDG. The PDG shall authenticate itself with an identity, for example, "pdg.mncNNN.mccMMM.3gppnetwork.org". This identity shall be contained in the IKEv2 ID_FQDN payload and shall match a dNSName SubjectAltName component in the PDG's certificate. A profile for certificate contents and processing is defined in clause 6.6A.
- EAP-AKA within IKEv2, as specified in [ikev2, section 2.16], is used to authenticate WLAN UEs, which contain a USIM.
- EAP-SIM within IKEv2, as specified in [ikev2, section 2.16], is used to authenticate WLAN UEs, which contain a SIM and no USIM.
- A profile for IKEv2 is defined in section 6.5.

6.1.5.1 Tunnel full authentication and authorization

The tunnel end point in the network is the PDG. As part of the tunnel establishment attempt the use of a certain W-APN is requested. When a new attempt for tunnel establishment is performed by the WLAN UE, the WLAN UE shall use IKEv2 as specified in ref. [29]. The EAP messages carried over IKEv2 shall be terminated in the AAA server, which communicates with the PDG via Wm interface, implemented with Diameter. Then the PDG shall extract the EAP messages received from the WLAN UE over IKEv2, and send them to the AAA server over Diameter (the opposite for messages sent from the AAA server). The WLAN UE shall use the Configuration Payload of IKEv2 to obtain the Remote IP address.

The sequence diagram is shown in figure 7A. The EAP message parameters and procedures regarding authentication are omitted since they are already described in this technical specification. Only decisions and processes relevant to this EAP-IKEv2 procedure are explained.

As the WLAN UE and PDG generated nonces are used as input to derive the encryption and authentication keys in IKEv2, replay protection is implemented as well. For this reason, there is no need for the AAA server to request the user identity again using the EAP AKA or EAP SIM specific methods (as specified in ref. [4] and ref. [5]), because the AAA server is certain that no intermediate node has modified or changed the user identity.


WLAN UE
PDG
3GPP AAA-serv
HSS/HLR
1. IKE_SA_INIT
[Headers, Sec. associations, D-H values, Nonces]
2. IKE_AUTH Request
[Header, User id, Configuration Payload, Sec. Associations, Traffic selectors, W-APN]
3. Access-Request [user ID, W-APN]
4. Check in user's subscription if tunnel is allowed. User profile and AVs retrieval if needed
5 EAP-Request /AKA-Challenge
6 IKE_AUTH Response
[Header, PDG ID, Certificate, AUTH, EAP-Request/AKA-Challenge]
7. IKE_AUTH Request
[Header, EAP-Response/AKA Challenge]
8. EAP-Response/AKA-Challenge
9 EAP Success + keying material
10. AUTH payload is computed using the keying material (MSK)
11. IKE_AUTH Response
[Header, EAP Success]
12. IKE_AUTH Request
[AUTH]
13. IKE_AUTH Response
[Header, AUTH, Configuration Payload, Sec. Associations, Traffic selectors]
14. Delete old IKE SA
?

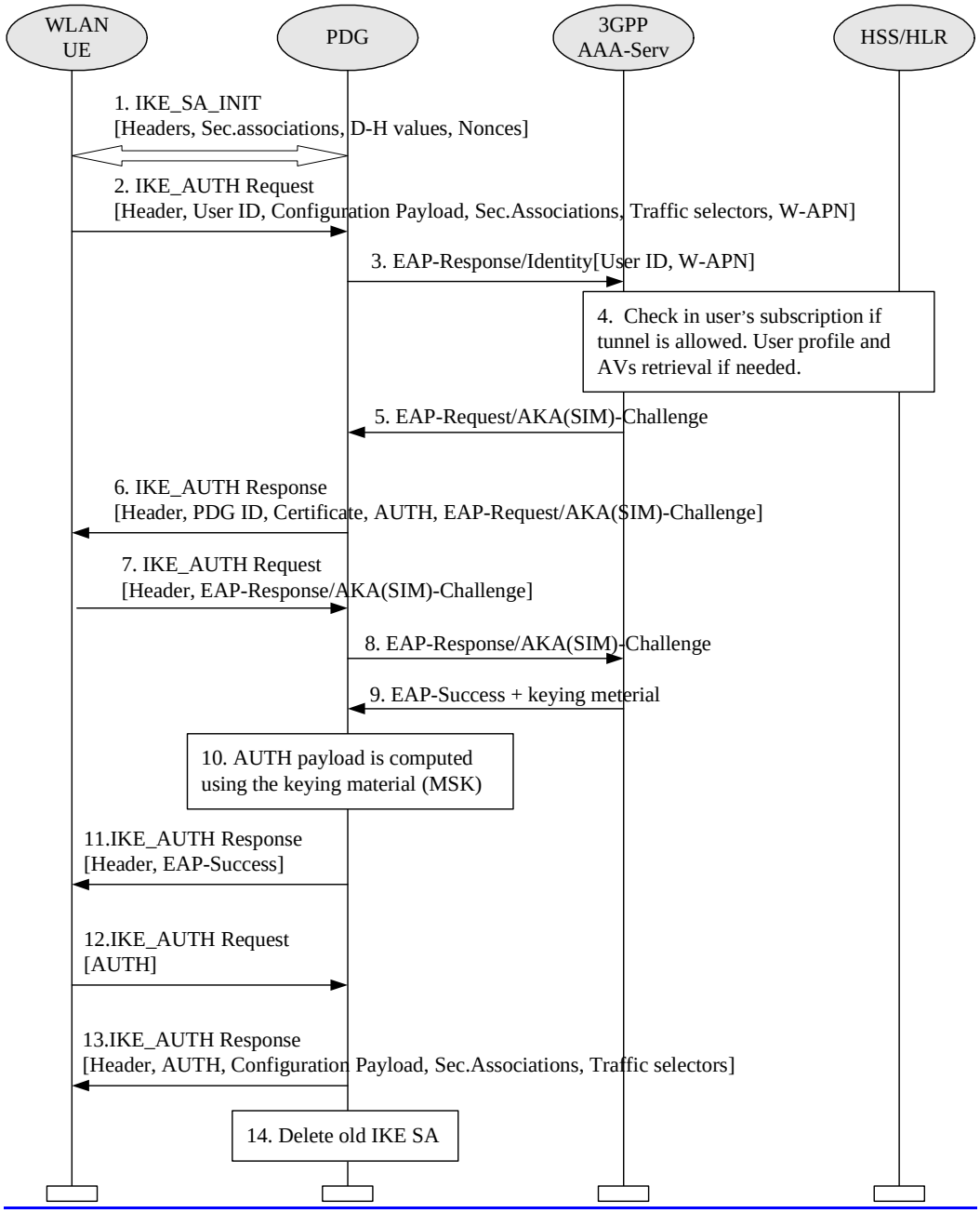


Figure 7A: Tunnel full authentication and authorization

1. The WLAN UE and the PDG exchange the first pair of messages, known as IKE_SA_INIT, in which the PDG and WLAN UE negotiation cryptographic algorithms, exchange nonces and perform a Diffie_Hellman exchange.

2. The WLAN UE sends the user identity (in the Idi payload) and th'e W-APN information (in the Idr payload) in this first message of the IKE_AUTH phase, and begins negotiation of child security associations. The WLAN UE omits the AUTH parameter in order to indicate to the PDG that it wants to use EAP over IKEv2. The user identity shall be compliant with Network Access Identifier (NAI) format specified in RFC 2486 [14], containing the IMSI or the pseudonym. The identity in NAI format generated from the IMSI is described in ref. [4] and ref. [5], depending on the type of EAP method to be used (EAP SIM or EAP AKA). The WLAN UE shall send the configuration payload (CFG_REQUEST) within the IKE_AUTH request message to obtain a Remote IP Address.

Editors note: The control of simultaneous sessions in the EAP authentication has to be possible as in WLAN access authentication. Nevertheless, it is needed to study in detail how the parameters to perform this control have to be transferred in EAP/IKEv2. For example, the VPLMN id could be included in the NAI (see TS 23.234 [13], section 5.3.4)

3. The PDG sends the Access Request message with an empty EAP AVP to the AAA server, containing the user identity and W-APN. The PDG shall include a parameter indicating that the authentication is being performed for tunnel establishment, as indicated in reference [37]. This will help the AAA server to distinguish between authentications for WLAN access and authentications for tunnel setup.

4. The AAA server shall fetch the user profile and authentication vectors from HSS/HLR (if these parameters are not available in the AAA server) and determines the EAP method (SIM or AKA) to be used, according to the user subscription and/or the indication received from the WLAN UE. The AAA server checks in user's subscription if he/she is authorized to establish the tunnel.

~~In this sequence diagram, it is assumed that the user has a USIM and EAP-AKA will be used. For EAP-SIM there is no difference from the IKEv2-EAP relationship point of view, but only for the EAP-SIM mechanism itself, which is explained in this technical specification~~

5. The AAA server initiates the authentication challenge. The user identity is not requested again, as in a normal authentication process, because there is the certainty that the user identity received in the EAP Identity Response message has not been modified or replaced by any intermediate node. The reason is that the user identity was received via an IKEv2 secure channel which can only be decrypted and authenticated by the end points (the PDG and the WLAN UE).

6. The PDG responds with its identity, a certificate, and sends the AUTH parameter to protect the previous message it sent to the WLAN UE (in the IKE_SA_INIT exchange). It completes the negotiation of the child security associations as well. The EAP message received from the AAA server (EAP-Request/AKA(SIM)-Challenge is included in order to start the EAP procedure over IKEv2.

7. The WLAN UE checks the authentication parameters and responds to the authentication challenge. The only payload (apart from the header) in the IKEv2 message is the EAP message.

8. The PDG forwards the EAP-Response/AKA(SIM)-Challenge message to the AAA server.

9. When all checks are successful, the AAA server sends an EAP success and the key material to the PDG. This key material shall consist of the MSK generated during the authentication process. When the Wm interface (PDG-AAA server) is implemented using Diameter, the MSK shall be encapsulated in the EAP-Master-Session-Key parameter, as defined in ref. [23].

   If the W-APN is not active, the AAA server will mark it as "active".

   If the AAA server detects that the W-APN is active in other PDG, it will send an indication to that PDG requesting to delete the IKE SA of the W-APN.

Editor's note: Registration procedure, including transport of parameters needed to perform simultaneous access control, should be performed in order to update registration status in HSS and fetch the necessary data to the AAA server, but this still needs to be studied in detail.

10. The MSK shall be used by the PDG to generate the AUTH parameters in order to authenticate the IKE_SA_INIT phase messages, as specified in ref. [29]. These two first messages had not been authenticated before as there were no key material available yet. According to ref. [29], the shared secret generated in an EAP exchange (the MSK), when used over IKEv2, shall be used to generated the AUTH parameters.

11. The EAP Success message is forwarded to the WLAN UE over IKEv2.

12. The WLAN UE shall take its own copy of the MSK as input to generate the AUTH parameter to authenticate the first IKE_SA_INIT message. The AUTH parameter is sent to the PDG.

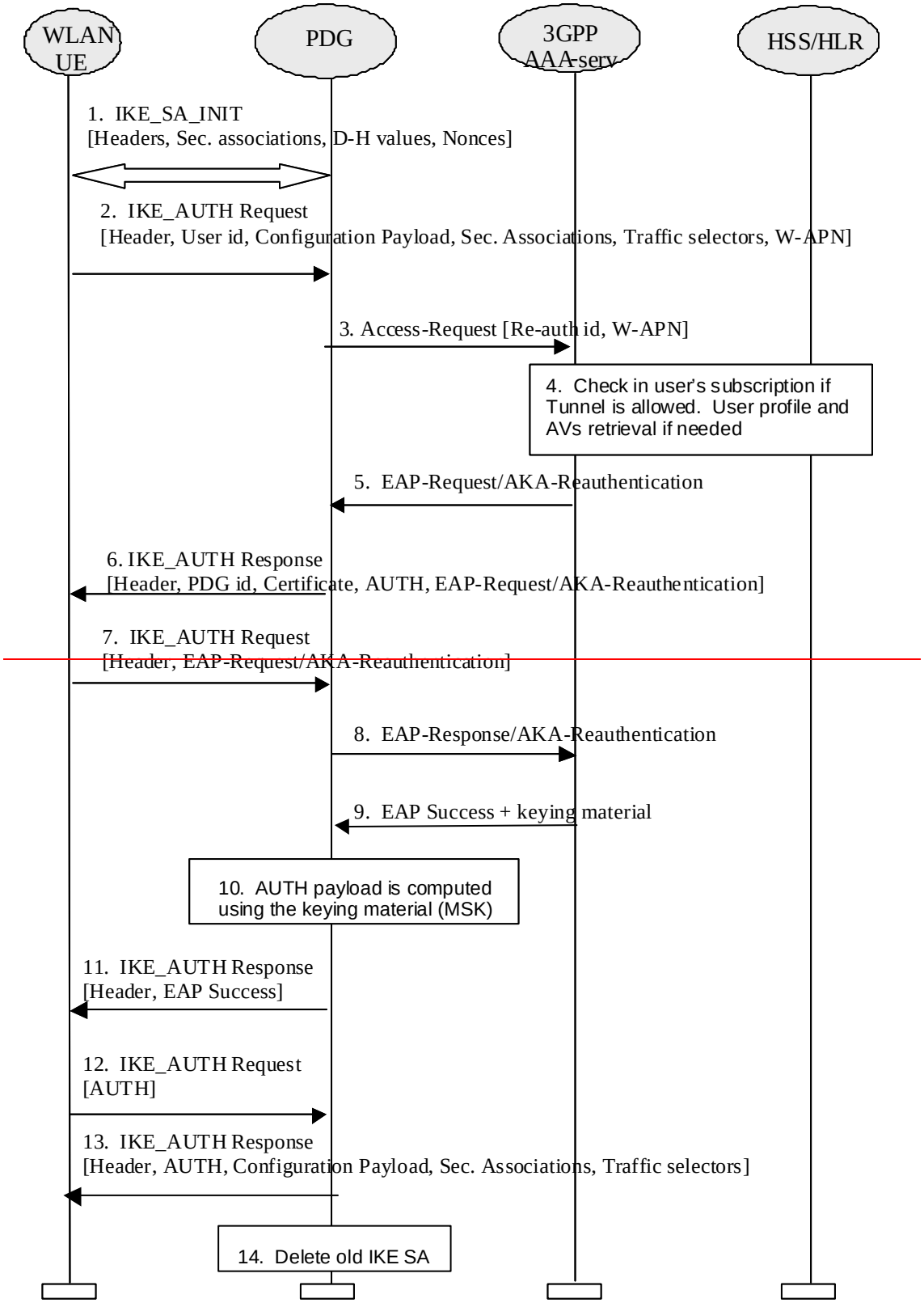
13. The PDG checks the correctness of the AUTH received from the WLAN UE and calculates the AUTH parameter which authenticates the second IKE_SA_INIT message. The PDG shall send the assigned Remote IP address in the configuration payload (CFG_REPLY), if the WLAN UE requested for a Remote IP address through the CFG_REQUEST. Then the AUTH parameter is sent to the WLAN UE together with the configuration payload, security associations and the rest of the IKEv2 parameters and the IKEv2 negotiation terminates.

14. If the PDG detects that and old IKE SA for that W-APN already exists, it will delete the IKE SA and send the WLAN UE an INFORMATIONAL exchange with a Delete payload, as specified in reference [29], in order to delete the old IKE SA in WLAN UE.

6.1.5.2 Tunnel fast re-authentication and authorization

This process is very similar to the tunnel full authentication and authorization. The only difference is that EAP fast re-authentication is used in this case.

The sequence diagram is shown in figure 7B. The EAP message parameters and procedures regarding fast re-authentication are omitted since they are already described in this technical specification. Only decisions and processes relevant to this EAP-IKEv2 procedure are explained.


WLAN UE
PDG
3GPP AAA-serv
HSS/HLR
1. IKE_SA_INIT
[Headers, Sec. associations, D-H values, Nonces]
2. IKE_AUTH Request
[Header, User id, Configuration Payload, Sec. Associations, Traffic selectors, W-APN]
3. Access-Request [Re-auth id, W-APN]
4. Check in user's subscription if Tunnel is allowed. User profile and AVs retrieval if needed
5. EAP-Request/AKA-Reauthentication
6. IKE_AUTH Response
[Header, PDG id, Certificate, AUTH, EAP-Request/AKA-Reauthentication]
7. IKE_AUTH Request
[Header, EAP-Request/AKA-Reauthentication]
8. EAP-Response/AKA-Reauthentication
9. EAP Success + keying material
10. AUTH payload is computed using the keying material (MSK)
11. IKE_AUTH Response
[Header, EAP Success]
12. IKE_AUTH Request
[AUTH]
13. IKE_AUTH Response
[Header, AUTH, Configuration Payload, Sec. Associations, Traffic selectors]
14. Delete old IKE SA

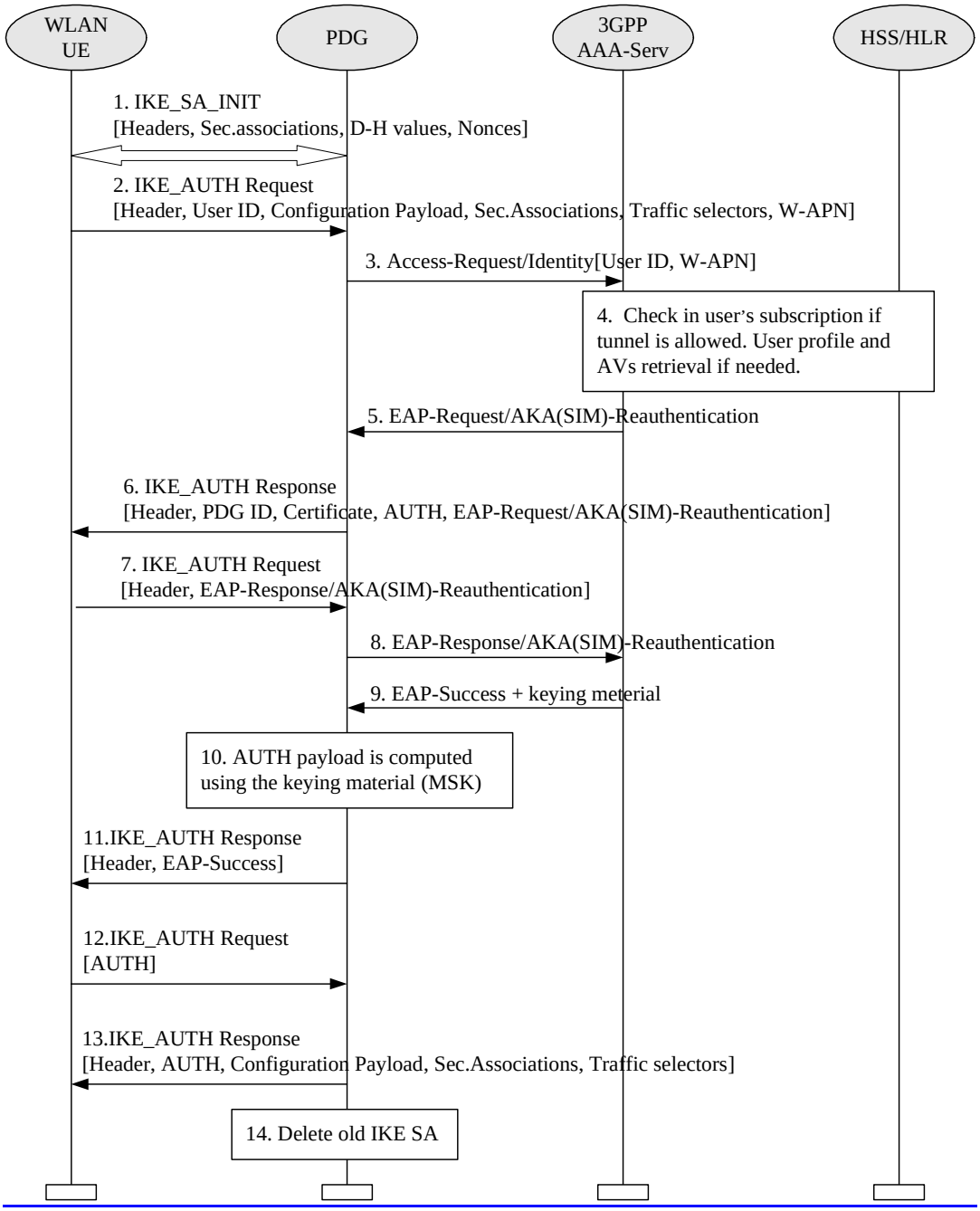


Figure 7B: Tunnel fast re-authentication and authorization

1. The WLAN UE and the PDG exchange the first pair of messages, known as IKE_SA_INIT, in which the PDG and WLAN UE negotiation cryptographic algorithms, exchange nonces and perform a Diffie_Hellman exchange.

2. The WLAN UE sends the re-authentication identity (in the Idi payload) and the W-APN information (in the Idr payload) in this first message of the IKE_AUTH phase, and begins negotiation of child security associations. The WLAN UE omits the AUTH parameter in order to indicate to the PDG that it wants to use EAP over IKEv2. The re-authentication identity used by the WLAN UE shall be the one received in the previous authentication process. The WLAN UE shall send the configuration payload (CFG_REQUEST) within the IKE_AUTH request message to obtain a Remote IP Address.

3. The PDG sends the Access Request message with an empty EAP AVP to the AAA server, containing the re-authentication identity and W-APN. The PDG shall include a parameter indicating that the authentication is being performed for tunnel establishment, as indicated in ref. [37]. This will help the AAA server to distinguish between authentications for WLAN access and authentications for tunnel setup.

4. The AAA server shall fetch the user profile and authentication vectors from HSS/HLR (if these parameters are not available in the AAA server) and determines the EAP method (SIM or AKA) to be used, according to the user subscription. The AAA server checks in user's subscription if he/she is authorized to establish the tunnel.

~~In this sequence diagram, it is assumed that the user has a USIM and EAP-AKA will be used. For EAP-SIM there is no difference from the IKEv2-EAP relationship point of view, but only for the EAP-SIM mechanism itself, which is explained in this technical specification.~~

5. The AAA server initiates the fast re-authentication challenge.

6. The PDG responds with its identity, a certificate, and sends the AUTH parameter to protect the previous message it sent to the WLAN UE (in the IKE_SA_INIT exchange). It completes the negotiation of the child security associations as well. The EAP message received from the AAA server (EAP-Request/AKA(SIM)-Reauthentication is included in order to start the EAP procedure over IKEv2.

7. The WLAN UE checks the authentication parameters and responds to the fast re-authentication challenge. The only payload (apart from the header) in the IKEv2 message is the EAP message.

8. The PDG forwards the EAP-Response/AKA(SIM)-Reauthentication message to the AAA server.

9. When all checks are successful, the AAA server sends an EAP success and the key material to the PDG. This key material shall consist of the MSK generated during the fast re-authentication process. When the Wm interface (PDG-AAA server) is implemented using Diameter, the MSK shall be encapsulated in the EAP-Master-Session-Key parameter, as defined in ref. [23].

   If the W-APN is not active, the AAA server will mark it as "active".

   If the AAA server detects that the W-APN is active in other PDG, it will send an indication to that PDG requesting to delete the IKE SA of the W-APN.

10. The MSK shall be used by the PDG to generate the AUTH parameters in order to authenticate the IKE_SA_INIT phase messages, as specified in ref. [29]. These two first messages had not been authenticated before as there were no key material available yet. According to ref. [29], the shared secret generated in an EAP exchange (the MSK), when used over IKEv2, shall be used to generated the AUTH parameters.

11. The EAP Success message is forwarded to the WLAN UE over IKEv2.

12. The WLAN UE shall take its own copy of the MSK as input to generate the AUTH parameter to authenticate the first IKE_SA_INIT message. The AUTH parameter is sent to the PDG.

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14. If the PDG detects that and old IKE SA for that W-APN already exists, it will delete the IKE SA and send to the WLAN UE an INFORMATIONAL exchange with a Delete payload, as specified in reference [29], in order to delete the old IKE SA in WLAN UE.

*** END SET OF CHANGES ***