

IPWorks 3GPP AAA Server-WLAN Access Network Wa Interface

INTERWORK DESCRIPTION

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1 Introduction

This document describes the Wa reference point between IPWorks AAA server and the WLAN Access Network.

Scope

The Wa interface is used by IPWorks AAA server to interact with WLAN Access Network.

This document covers the following topics:

- Interface Overview
- Interface Role
- Services
- Encapsulation and Addressing
- Procedures
- Information Model
- Related Standards

Target Groups

This document is intended for personnel needing to understand the logical entity, including interfaces and protocols, of the IPWorks.

1.1 Prerequisites

N/A

1.2 Related Information

Trademark information, typographic conventions, definition, and explanation of acronyms and terminology can be found in the following documents:

- Trademark Information, Reference [1]
- Glossary of Terms and Acronyms, Reference [2]
- Typographic Conventions, Reference [3]

The standard related to the Wa interface can be found in the section References.



2 Interface Overview

The prime purpose of the protocols crossing the Wa reference point is to transport authentication, authorization, and charging-related information in a secure manner. EAP authentication is transported over the Wa reference point and protocol is Diameter or RADIUS based. Currently, IPWorks AAA server uses RADIUS protocol to convey the EAP-AKA/SIM authentication message.

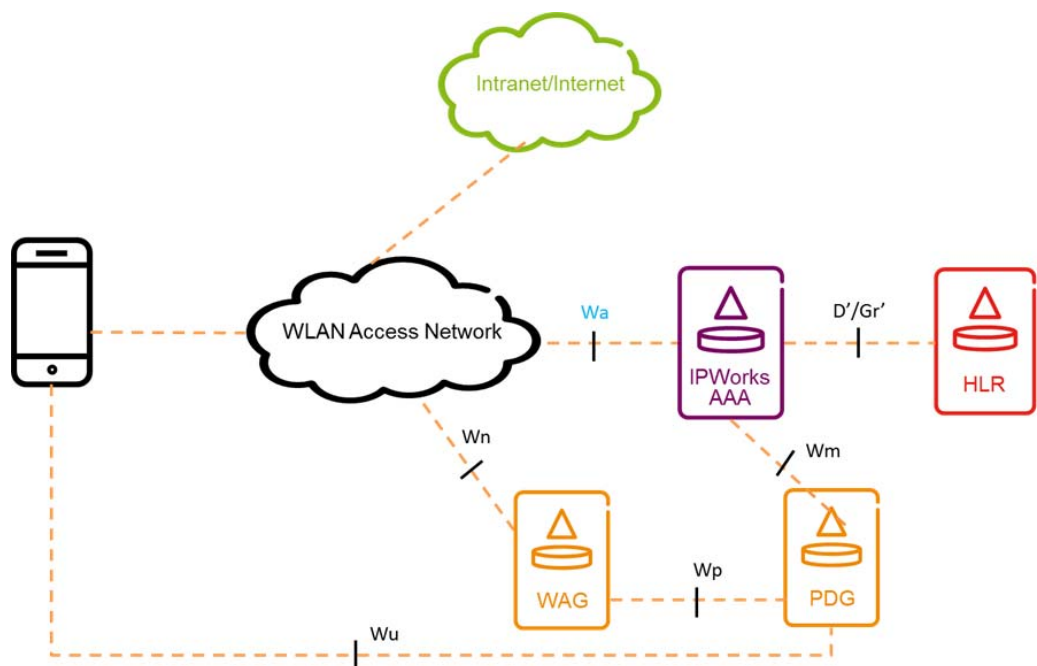


Figure 1 Wa Reference Point in 3GPP WLAN Inter-working Reference Model

2.1 Interface Role

In Wa reference point, IPWorks AAA server takes the role AAA in 3GPP network.

2.2 Services

Table 1 Offered Services

| Offered Service | Description |
|---|--|
| Authentication, Authorization, Accounting | IPWorks AAA server offers the AAA service to WLAN Access Network |



2.3 Encapsulation and Addressing

The following protocol stack is used on this interface for IPWorks AAA Server:

| | |
|---------|---------|
| EAP AKA | EAP SIM |
| RADIUS | |
| UDP | |
| IP | |

Figure 2 Protocol Stack Used in 3GPP Network

The AAA service offered by IPWorks AAA server is addressed by the following RADIUS packets.

2.3.1 WLAN Access Authentication and Authorization

The offered WLAN access authentication and authorization service by IPWorks AAA server is addressed by the following RADIUS packets that are defined in RFC2865, Reference [4] and RFC3579, Reference [5].

- Access-Request
- Access-Challenge
- Access-Accept
- Access-Reject

The Extensible Authentication Protocol mechanism for authentication and session key distribution that uses the GSM Subscriber Identity Module (SIM) is specified in RFC4186, Reference [8], include following packets:

- EAP-Request/SIM/Start
- EAP-Response/SIM/Start
- EAP-Request/SIM/Challenge
- EAP-Response/SIM/Challenge
- EAP-Request/SIM/Re-authentication
- EAP-Response/SIM/Re-authentication
- EAP-Response/SIM/Client-Error
- EAP-Request/SIM/Notification
- EAP-Response/SIM/Notification



The Extensible Authentication Protocol mechanism for authentication and session key distribution that uses the Authentication and Key Agreement (AKA) mechanism is specified in RFC4187, Reference [9], include following packets:

- EAP-Request/AKA-Identity
- EAP-Response/AKA-Identity
- EAP-Request/AKA-Challenge
- EAP-Response/AKA-Challenge
- EAP-Response/AKA-Authentication-Reject
- EAP-Response/AKA-Synchronization-Failure
- EAP-Request/AKA-Reauthentication
- EAP-Response/AKA-Reauthentication
- EAP-Response/AKA-Client-Error
- EAP-Request/AKA-Notification
- EAP-Response/AKA-Notification

2.3.2 Accounting

AAA server uses the following RADIUS for accounting functionality. For more information refer to RFC2866, Reference [7].

- Accounting-Request
- Accounting-Response

2.3.3 Disconnect Subscriber

AAA server can disconnect an online subscriber by using the following DM packets that are defined in RFC5176, Reference [6].

- Disconnect-Request
- Disconnect-ACK
- Disconnect-NAK





3 Procedures

The following procedures describe the general interaction for authentication, authorization, and accounting.

3.1 Authentication/Authorization

IPWorks AAA server supports SIM-based (EAP-AKA/SIM) authentication methods for WLAN access in Wa reference point. The following figures show the basic authentication procedures based on RADIUS protocol.

3.1.1 EAP-AKA Full Authentication

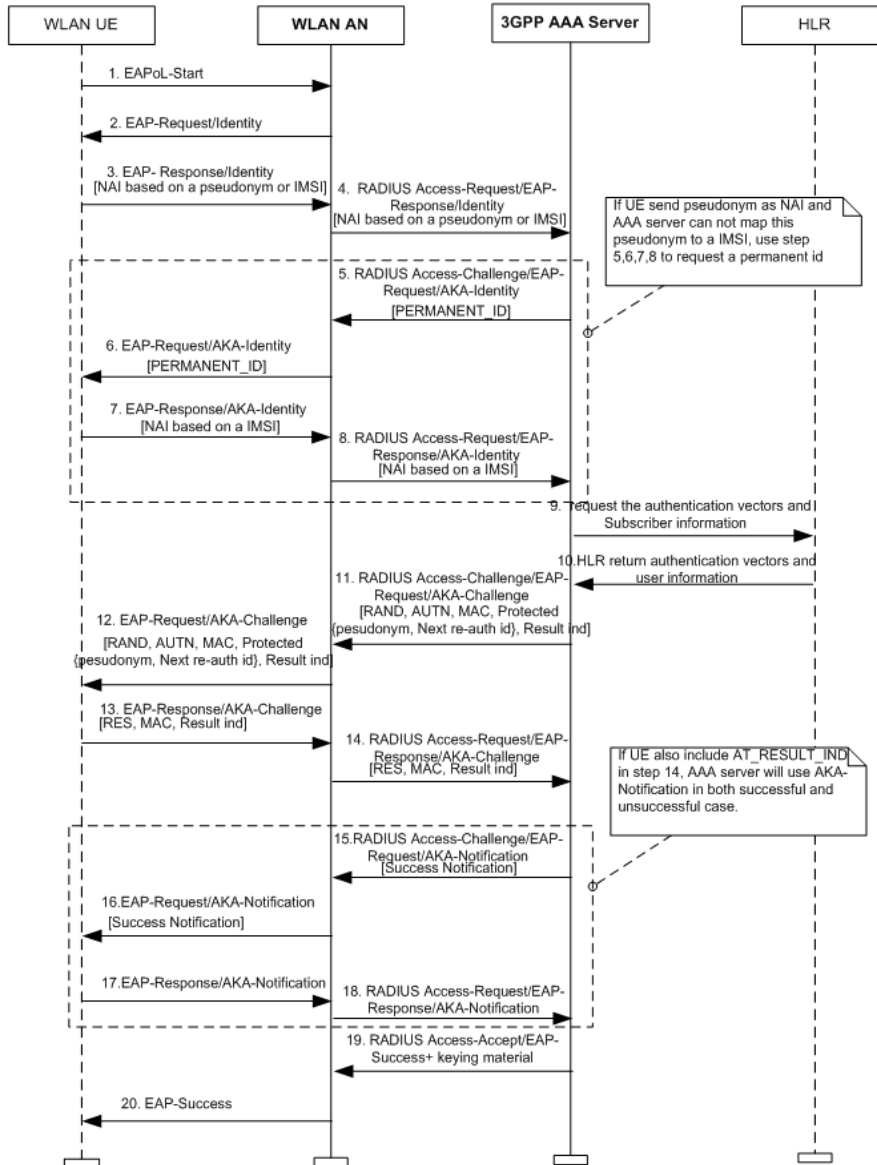


Figure 3 EAP-AKA Full Authentication Flows



3.1.2 EAP-SIM Full Authentication

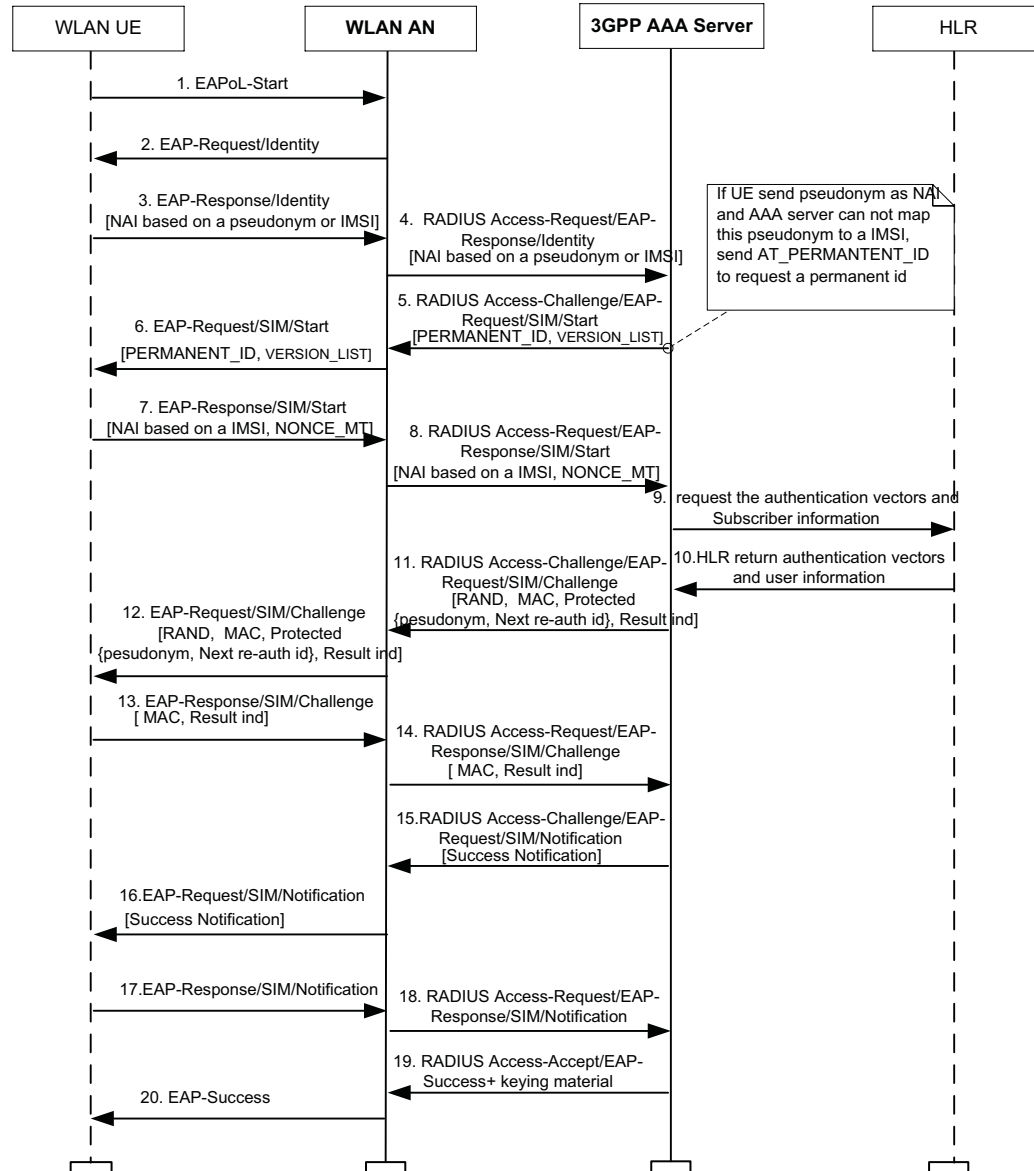


Figure 4 EAP-SIM Full Authentication Flows

3.1.3 EAP-AKA Fast Re-authentication

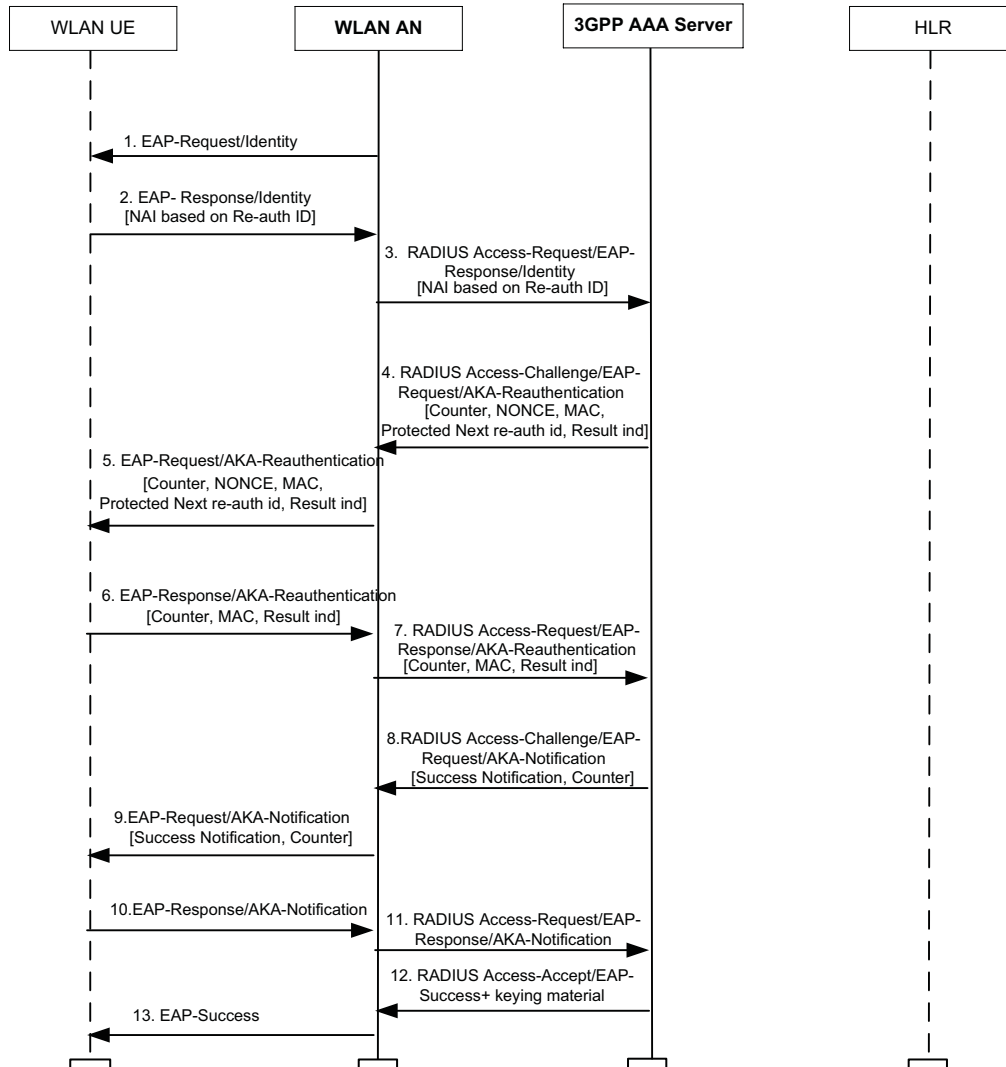


Figure 5 EAP-AKA Fast Re-authentication Flows

3.1.4 EAP-SIM Fast Re-authentication

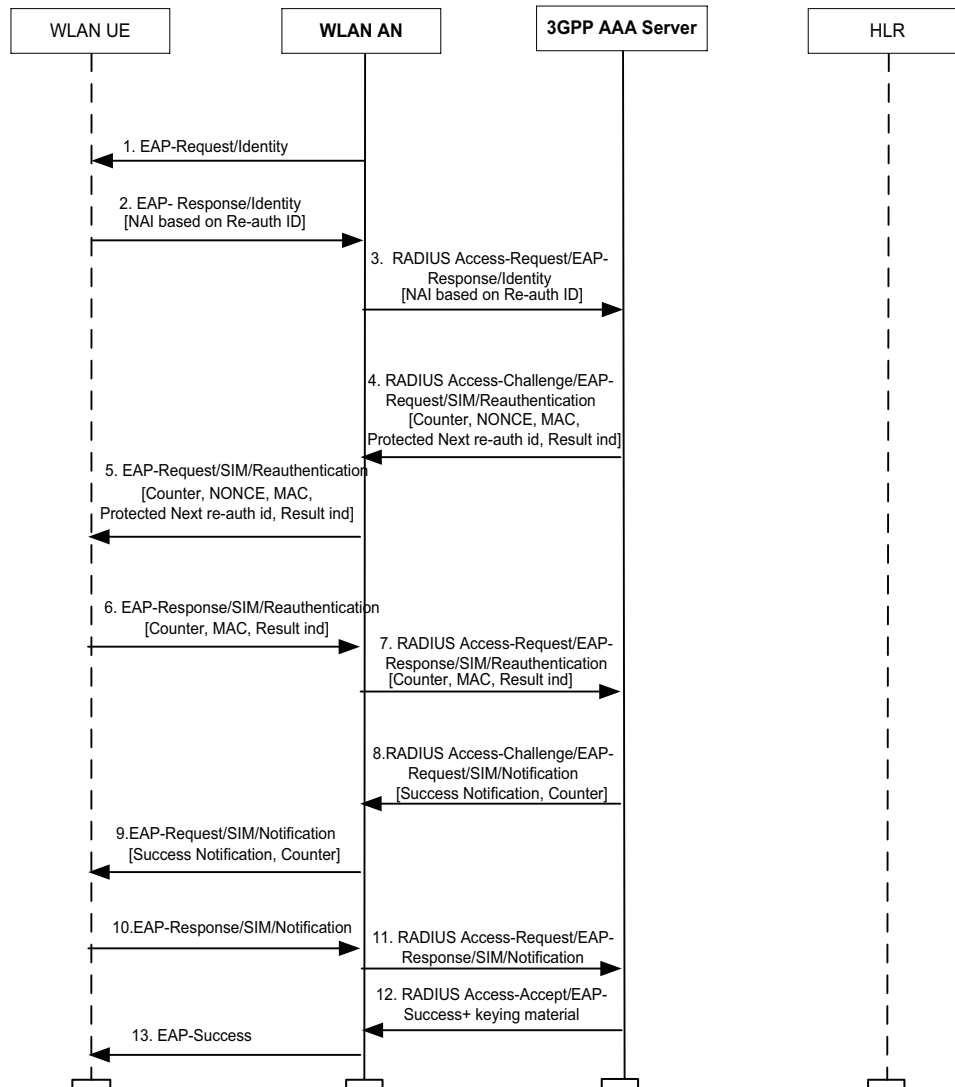


Figure 6 EAP-SIM Fast Re-authentication Flows

3.2 Accounting

Accounting is used to collect the resource usage information for analysis or billing purposes. Accounting-Request START message means that a user session has started; Accounting-Request Interim-Update is used to update the user session information; and Accounting-Request STOP means that the user session is terminated.

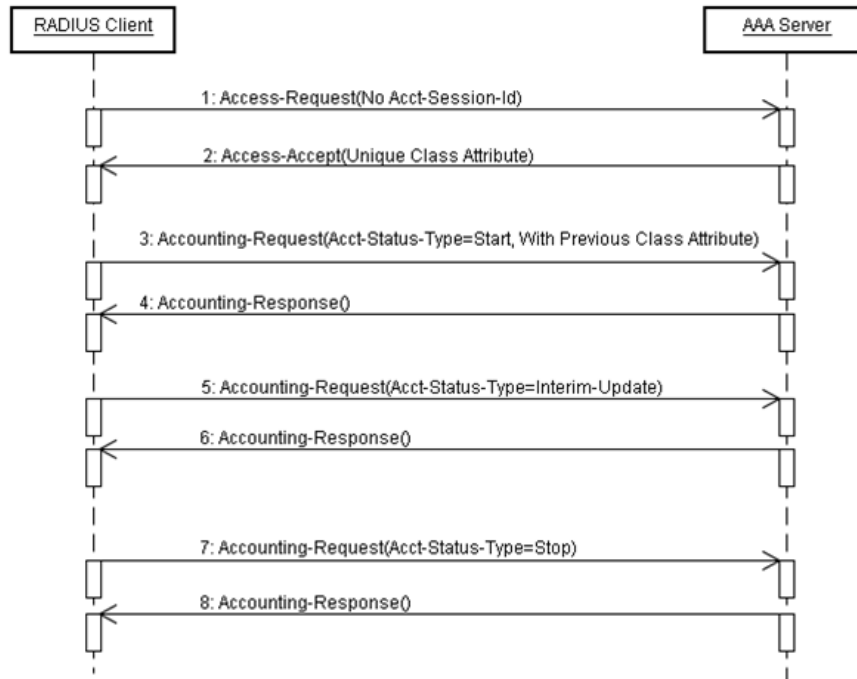


Figure 7 Accounting

3.3 Disconnect Message

The AAA server could receive the status change of related subscribers from HLR and decide whether need to terminate the active session. If the user's WLAN accessible flag has changed or the user logged on from the other server, AAA server may issue the Disconnect-Request messages to notify an NAS about the termination of the accounting sessions.

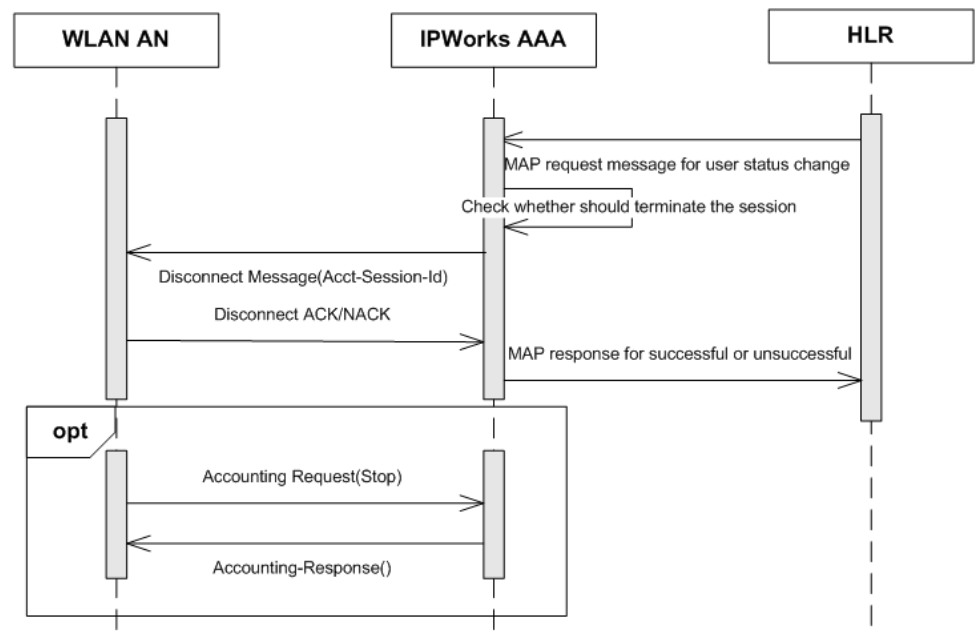


Figure 8 Terminate Session





4 Information Model

This section describes the information model including mandatory and optional parameters of each service operation.

4.1 General

The following convention is used to indicate how the attribute is present in a message:

Table 2 Convention

| Attribute | Description |
|-----------|---|
| 0 | This attribute MUST NOT be present in message. |
| 0+ | Zero or more instances of this attribute MAY be present in message. |
| 0-1 | Zero or one instance of this attribute MAY be present in message. |
| 1 | Exactly one instance of this attribute MUST be present in message. |
| 0* | The attribute is not included in the message in cases specified in the related RFC, but MAY be included in the future versions of the protocol. |

The format <Attr#>/<Vendor-ID>-<Sub-attr#> is used for the vendor-specific subattributes. For example, 26/311-28 is the code of Microsoft vendor-specific RADIUS attribute MS-Primary-DNS-Server.

4.2 RADIUS Message in Wa Interface

The messages supported by the Wa interface comply with the RADIUS data format that is defined in RFC 2865, Reference [4], RFC5176, Reference [6], and RFC 2866, Reference [7]. They can be divided into the following groups:

- Authentication/Authorization: Access-Request, Access-Accept, Access-Reject, Access-Challenge
- DM: Disconnect-Request, Disconnect-ACK/NAK
- Accounting: Accounting-Request, Accounting-Response

The following sections list the attributes which be used in the messages of Wa interface. If the messages also include other attributes according to related protocols, AAA server bypasses them.



4.2.1 Authentication/Authorization Message Attributes

The following table contains the authentication or authorization message attributes:

Table 3 Attributes Supported by Authentication/Authorization Message for Wa Interface

| Attr # | Attribute Name | Access-Request | Access-Accept | Access-Reject | Access-Challenge | Description |
|---------------------|-------------------------------|----------------|---------------|---------------|------------------|--|
| 1 | User-Name ⁽¹⁾ | 1 | 1 | 1 | 1 | Section 5.1, RFC 2865 |
| 4 | NAS-IP-Address | 1 | 0 | 0 | 0 | Section 5.4, RFC 2865 |
| 31 | Calling-Station-ID | 1 | 0 | 0 | 0 | Section 5.31, RFC 2865 |
| 30 | Called-Station-ID | 1 | 0 | 0 | 0 | Section 5.30, RFC 2865 |
| 32 | NAS-Identifier | 1 | 0 | 0 | 0 | Section 5.32, RFC 2865 |
| 87 | NAS-Port-Id | 1 | 0 | 0 | 0 | Section 5.32, RFC 2865 |
| 24 | State | 0-1 | 0-1 | 0 | 1 | Section 5.7, RFC 2865 Section 2.1.1, RFC 5080 |
| 27 | Session-Timeout | 0 | 1 | 0-1 | 0 | Section 5.27, RFC 2865 Section 3.17, RFC 3580 |
| 29 | Termination-Action | 0 | 1 | 0-1 | 0 | Section 5.29, RFC 2865 Section 3.17, RFC 3580 |
| 79 | EAP-Message | 1+ | 1+ | 1+ | 1+ | Section 3.1, RFC 3579 |
| 80 | Message-Authenticator | 1 | 1 | 1 | 1 | Section 3.2, RFC 3579 |
| 89 | Chargeable-User-Identity | 0-1 | 1 | 0 | 0 | Section 2.2, RFC 4372 |
| 85 | Acct_Interim_Interval | 0 | 1 | 0 | 0 | Section 5.16, RFC 2869 |
| 26-31 1-17 | MS-MPPE-Recv-Key | 0 | 1 | 0 | 0 | Section 2.4.3, RFC 2548 |
| 26-31 1-16 | MS-MPPE-Send-Key | 0 | 1 | 0 | 0 | Section 2.4.2, RFC 2548 |
| 25 | class | 0 | 0+ | 0 | 0 | Section 5.25, RFC 2865 |
| 26-1 0415 -13 | 3GPP-Charging-Characteristics | 0 | 0-1 | 0 | 0 | 3GPP TS 29.061 v9.0.0, Section 16.4.7.2 |

(1) When the Trusted WiFi Support feature is enabled, the value of User - Name is only set as IMSI; otherwise set as NAI.



4.2.2 DM Message Attributes

Table 4 Attributes Supported by DM Message for Wa Interface

| Attr # | Attribute Name | Disconnect-Request | Disconnect-ACK | Disconnect-NAK | Description |
|--------|-----------------------|--------------------|----------------|----------------|------------------------|
| 1 | User-Name(1) | 1 | 0 | 0 | Section 5.1, RFC 2865 |
| 4 | NAS-IP-Address | 1 | 0 | 0 | Section 5.4, RFC 2865 |
| 32 | NAS-Identifier | 1 | 0 | 0 | Section 5.32, RFC 2865 |
| 44 | Acct-Session-Id | 1 | 0 | 0 | Section 5.5, RFC 2866 |
| 80 | Message-Authenticator | 1 | 1 | 1 | Section 3.2, RFC 3579 |

Note: The value of User-Name attribute will be the NAI in the Access-Accept which be sent in the last successful authentication.

4.2.3 Accounting Message Attributes

Table 5 Accounting Message Attributes

| Attr # | Attribute Name | Accounting-Request START | Accounting-Request STOP | Accounting-Request Interim-Update | Description |
|--------|--------------------------|--------------------------|-------------------------|-----------------------------------|------------------------|
| 1 | User-Name | 1 | 1 | 1 | Section 5.1, RFC 2865 |
| 4 | NAS-IP-Address | 1 | 1 | 1 | Section 5.4, RFC 2865 |
| 31 | Calling-Station-ID | 1 | 1 | 1 | Section 5.31, RFC 2865 |
| 30 | Called-Station-ID | 0-1 | 0-1 | 0-1 | Section 5.30, RFC 2865 |
| 32 | NAS-Identifier | 1 | 1 | 1 | Section 5.32, RFC 2865 |
| 87 | NAS-Port-Id | 1 | 1 | 1 | Section 5.17, RFC 2869 |
| 40 | Acct-Status-Type | 1 | 1 | 1 | Section 5.1, RFC 2866 |
| 42 | Acct-Input-Octets | 0 | 1 | 1 | Section 5.3, RFC 2866 |
| 43 | Acct-Output-Octets | 0 | 1 | 1 | Section 5.4, RFC 2866 |
| 44 | Acct-Session-Id | 1 | 1 | 1 | Section 5.5, RFC 2866 |
| 89 | Chargeable-User-Identity | 0-1 | 0-1 | 0-1 | Section 2.2, RFC 4372 |
| 46 | Acct-Session-Time | 0 | 1 | 1 | Section 5.7, RFC 2866 |
| 47 | Acct-Input-Packets | 0 | 1 | 1 | Section 5.8, RFC 2866 |



Table 5 Accounting Message Attributes

| Attr # | Attribute Name | Accounting-Request START | Accounting-Request STOP | Accounting-Request Interim-Update | Description |
|--------|-----------------------|--------------------------|-------------------------|-----------------------------------|------------------------|
| 48 | Acct-Output-Packets | 0 | 1 | 1 | Section 5.9, RFC 2866 |
| 52 | Acct-Input-Gigawords | 0 | 1 | 1 | Section 5.1, RFC 2869 |
| 53 | Acct-Output-Gigawords | 0 | 1 | 1 | Section 5.2, RFC 2869 |
| 27 | Session-TimeOut | 1 | 0 | 0 | Section 5.27, RFC 2865 |
| 25 | class | 0+ | 0+ | 0+ | Section 5.25, RFC 2865 |
| 49 | Acct-Terminate-Cause | 0 | 1 | 0 | Section 5.10, RFC 2866 |

4.3 EAP Message in Wa Interface

In Wa interface, the following EAP packets will be used for authentication:

- Request(1)
- Response(2)
- Success(3)
- Failure(4)

The following EAP types will be used in EAP Request/Response exchanges for the Wa interface.

- EAP-AKA(23)
- EAP-SIM(18)

4.4 EAP-AKA Message in Wa Interface

The following table provides a guide to which attributes may be found in which kinds of messages, and in what quantity. Messages are denoted with numbers in parentheses as follows:

- EAP-Request/AKA-Identity(1)
- EAP-Response/AKA-Identity(2)
- EAP-Request/AKA-Challenge(3)
- EAP-Response/AKA-Challenge(4)
- EAP-Request/AKA-Notification(5)



- EAP-Response/AKA-Notification(6)
- EAP-Response/AKA-Client-Error(7)
- EAP-Request/AKA-Reauthentication(8)
- EAP-Response/AKA-Reauthentication(9)
- EAP-Response/AKA-Authentication-Reject(10)
- EAP-Response/AKA-Synchronization-Failure(11)

The column denoted with “E” indicates whether the attribute is a nested attribute that MUST be included within AT_ENCR_DATA.

Table 6 EAP-AKA Message in Wa Interface

| Attribute Name | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | E | Description |
|---------------------|-----|-----|-----|---|---|---|---|---|---|----|----|-----|-------------------------|
| AT_PERMANENT_ID_REQ | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No | Section 10.2, RFC 4187 |
| AT_ANY_ID_REQ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No | Section 10.3, RFC 4187 |
| AT_FULLAUTH_ID_REQ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No | Section 10.4, RFC 4187 |
| AT_IDENTITY | 0 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No | Section 10.5, RFC 4187 |
| AT_RANDOM | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No | Section 10.6, RFC 4187 |
| AT_AUTHN | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No | Section 10.7, RFC 4187 |
| AT_RESET | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No | Section 10.8, RFC 4187 |
| AT_AUTHS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | No | Section 10.9, RFC 4187 |
| AT_NEXT_PSEUDONYM | 0 | 0 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Yes | Section 10.10, RFC 4187 |



Table 6 EAP-AKA Message in Wa Interface

| Attribute Name | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | E | Description |
|--------------------------------------|---|---|-----|-----|-----|-----|---|-----|-----|----|----|-----|--------------------------|
| AT_N EXT_ REAU TH_ID | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0-1 | 0 | 0 | 0 | Yes | Section 10.1.1, RFC 4187 |
| AT_IV | 0 | 0 | 0-1 | 0* | 0-1 | 0-1 | 0 | 1 | 1 | 0 | 0 | No | Section 10.1.2, RFC 4187 |
| AT_E NCR_ DATA | 0 | 0 | 0-1 | 0* | 0-1 | 0-1 | 0 | 1 | 1 | 0 | 0 | No | Section 10.1.2, RFC 4187 |
| AT_P ADDI NG | 0 | 0 | 0-1 | 0* | 0-1 | 0-1 | 0 | 0-1 | 0-1 | 0 | 0 | Yes | Section 10.1.2, RFC 4187 |
| AT_C HECK CODE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No | Section 10.1.3, RFC 4187 |
| AT_R ESUL T_IND | 0 | 0 | 0-1 | 0-1 | 0 | 0 | 0 | 0-1 | 0-1 | 0 | 0 | No | Section 10.1.4, RFC 4187 |
| AT_M AC | 0 | 0 | 1 | 1 | 0-1 | 0-1 | 0 | 1 | 1 | 0 | 0 | No | Section 10.1.5, RFC 4187 |
| AT_C OUNT ER | 0 | 0 | 0 | 0 | 0-1 | 0-1 | 0 | 1 | 1 | 0 | 0 | Yes | Section 10.1.6, RFC 4187 |
| AT_C OUNT ER_T OO_S MALL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0-1 | 0 | 0 | Yes | Section 10.1.7, RFC 4187 |
| AT_N ONCE _S | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | Yes | Section 10.1.8, RFC 4187 |
| AT_N OTIF ICATI ON | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | No | Section 10.1.9, RFC 4187 |
| AT_CL IENT_ ERRO R_CO DE | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | No | Section 10.2.0, RFC 4187 |



4.5 EAP-SIM Message in Wa Interface

The following table provides a guide to which attributes may be found in which kinds of messages, and in what quantity. Messages are denoted with numbers in parentheses as follows:

- EAP-Request/SIM/Start(1)
- EAP-Response/SIM/Start(2)
- EAP-Request/SIM/Challenge(3)
- EAP-Response/SIM/Challenge(4)
- EAP-Request/SIM/Notification(5)
- EAP-Response/SIM/Notification(6)
- EAP-Response/SIM/Client-Error(7)
- EAP-Request/SIM/Re-authentication(8)
- EAP-Response/SIM/Re-authentication(9)

The column denoted with “Encr” indicates whether the attribute is a nested attribute that **MUST** be included within AT_ENCR_DATA, and the column denoted with “Skip” indicates whether the attribute is a skippable attribute.

Table 7 EAP-SIM Message in Wa Interface

| Attribute Name | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Encr | Skip | Description |
|---------------------|-----|-----|-----|---|---|---|---|---|---|------|------|-------------------------|
| AT_VERSION_LIST | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No | No | Section 10.2, RFC 4186 |
| AT_SELECTED_VERSION | 0 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No | No | Section 10.3, RFC 4186 |
| AT_NONCE_MT | 0 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No | No | Section 10.4, RFC 4186 |
| AT_PERMANENT_ID_REQ | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No | No | Section 10.5, RFC 4186 |
| AT_ANY_ID_REQ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No | No | Section 10.6, RFC 4186 |
| AT_FULLAUTH_ID_REQ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No | No | Section 10.7, RFC 4186 |
| AT_IDENTITY | 0 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No | No | Section 10.8, RFC 4186 |
| AT_RAND | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | No | No | Section 10.9, RFC 4186 |
| AT_NEXT_PSEUDONYM | 0 | 0 | 0-1 | 0 | 0 | 0 | 0 | 0 | 0 | Yes | Yes | Section 10.10, RFC 4186 |



Table 7 EAP-SIM Message in Wa Interface

| Attribute Name | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Encr | Skip | Description |
|----------------------|---|---|-----|-----|-----|-----|---|-----|-----|------|------|-------------------------|
| AT_NEXT_REAUTH_ID | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0-1 | 0 | Yes | Yes | Section 10.11, RFC 4186 |
| AT_IV | 0 | 0 | 0-1 | 0* | 0-1 | 0-1 | 0 | 1 | 1 | No | Yes | Section 10.12, RFC 4186 |
| AT_ENCR_DATA | 0 | 0 | 0-1 | 0* | 0-1 | 0-1 | 0 | 1 | 1 | No | Yes | Section 10.12, RFC 4186 |
| AT_PADDING | 0 | 0 | 0-1 | 0* | 0-1 | 0-1 | 0 | 0-1 | 0-1 | Yes | No | Section 10.12, RFC 4186 |
| AT_RESULT_IND | 0 | 0 | 1 | 0-1 | 0 | 0 | 0 | 0-1 | 0-1 | No | Yes | Section 10.13, RFC 4186 |
| AT_MAC | 0 | 0 | 1 | 1 | 0-1 | 0-1 | 0 | 1 | 1 | No | No | Section 10.14, RFC 4186 |
| AT_COUNTER | 0 | 0 | 0 | 0 | 0-1 | 0-1 | 0 | 1 | 1 | Yes | No | Section 10.15, RFC 4186 |
| AT_COUNTER_TOO_SMALL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0-1 | Yes | No | Section 10.16, RFC 4186 |
| AT_NONCE_S | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Yes | No | Section 10.17, RFC 4186 |
| AT_NOTIFICATION | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | No | No | Section 10.18, RFC 4186 |
| AT_CLIENT_ERROR_CODE | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | No | No | Section 10.19, RFC 4186 |



5 Formal Syntax

N/A





6 Related Standards

The following protocols and standards specified the behavior of Wa interface.

Table 8 Related Standards

| Reference Interface | Standard Version |
|--|--|
| The basic function of Wa interface | 3GPP system to WLAN interworking, TS 23.234 V9.0.0 |
| The RADIUS packets exchange process | RFC2865 |
| The RADIUS attributes used in authentication | RFC3579,RFC2869,RFC5080 |
| The RADIUS disconnect message usage | RFC5176 |
| The Accounting message usage | RFC2866 |
| The EAP message usage | RFC3579 |
| The EAP-AKA authentication message exchange | RFC4187 |
| The EAP-SIM authentication message exchange | RFC4186 |
| Extensible Authentication Protocol Tunneled Transport Layer Security Authenticated Protocol Version 0 (EAP-TTLSv0) | RFC5281 |





Reference List

IPWorks Library Documents

- [1] Trademark Information
- [2] Glossary of Terms and Acronyms
- [3] Typographic Conventions

Standards

- [4] [Remote Authentication Dial In User Service \(RADIUS\)](#)
- [5] [Remote Authentication Dial In User Service \(RADIUS\) Support For Extensible Authentication Protocol \(EAP\)](#)
- [6] [Dynamic Authorization Extensions to Remote Authentication Dial In User Service \(RADIUS\)](#)
- [7] [RADIUS Accounting](#)
- [8] [Extensible Authentication Protocol Method for Global System for Mobile Communications\(GSM\) Subscriber Identity Modules \(EAP-SIM\)](#)
- [9] [Extensible Authentication Protocol Method for 3rd Generation Authentication and Key Agreement \(EAP-AKA\)](#)
- [10] [Extensible Authentication Protocol \(EAP\)](#)
- [11] [RADIUS Extensions](#)
- [12] [Common RADIUS Implementation Issues and Suggested Fixes](#)
- [13] [IEEE 802.1X RADIUS Usage Guidelines](#)
- [14] [Chargeable User Identity](#)
- [15] [3GPP system to Wireless Local Area Network \(WLAN\) interworking, TS 23.234 V9.0.0](#)
- [16] [3GPP Interworking between the Public Land Mobile Network \(PLMN\) supporting packet based services and Packet Data Networks \(PDN\), TS 29.061 V9.0.0](#)
- [17] [3GPP Evolved Packet System \(EPS\); Evolved General Packet Radio Service \(GPRS\) Tunnelling Protocol for Control plane \(GTPv2-C\) Stage 3, TS 29.274 v11.3.0](#)
- [18] [3GPP Numbering, addressing and identification, TS 23.003 v10.0.0](#)