

# IPWorks 3GPP AAA Server-HLR D'/Gr' Interface

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## INTERWORK DESCRIPTION

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# 1 Introduction

This document describes the D'/Gr' interface between the IPWorks AAA server node and the Home Location Register (HLR) node.

## 1.1 Prerequisites

Not Applicable.

## 1.2 Related Information

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

- *Glossary of Terms and Acronyms*
- *Trademark Information*
- *Typographic Conventions*

The standard, related to the HLR D'/Gr' interface, can be found in the section References.





## 2 Interface Overview

This section describes the D'/Gr' interface between the IPWorks AAA server node and HLR node as shown in Figure 1 and Figure 2.

The main purpose of D'/Gr' reference is to communicate between AAA and HLR. Support of the D'/Gr' reference points requires no modifications to the MAP protocol at the HLR.

In IPWorks AAA, the following functionalities can be enabled if they are available in HLR:

- Retrieval of authentication vectors, such as for USIM authentication, from HLR
- Registration of the 3GPP AAA Server of an authorized WLAN user in the HLR
- Indication of change of subscriber profile within HLR (for example, indication for service termination)
- Purge procedure between the 3GPP AAA server and the HLR
- Fault recovery procedure between the HLR and the 3GPP AAA server
- Retrieval of service-related information

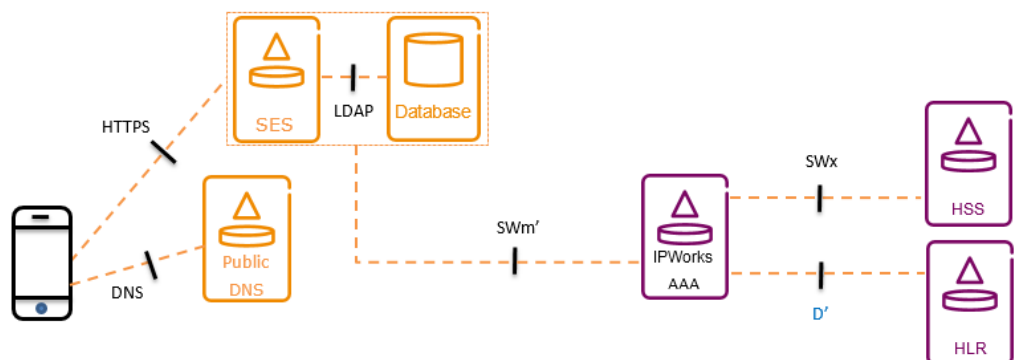


Figure 1 D' Interface in EPC network

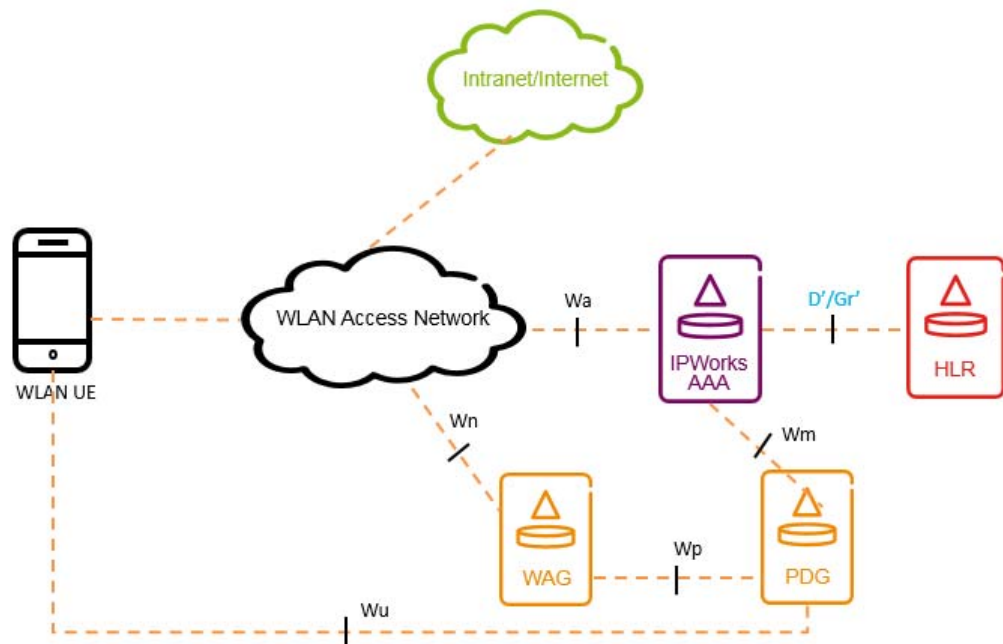


Figure 2 D'/Gr' Interface in 3GPP-WLAN Network

When IPWorks AAA is deployed both in EPC network and 3GPP-WLAN network, it's required to configure D' interface in EPC network and Gr' interface in 3GPP-WLAN network.

The functions provided on the D'/Gr' reference points are a subset of the functions provided on the D'/Gr' reference points described in TS 23.002:

- When IPWorks AAA server supports the D' reference point, it appears to the HLR as a VLR and behaves according to the description of the behavior of a VLR supporting the D' reference point as described in TS 23.002.
- When IPWorks AAA Server supports the Gr' reference point, it appears to the HLR as an SGSN and behaves according to the description of the behavior of an SGSN supporting the Gr' reference point as described in TS 23.002.

## 2.1 Interface Role

D'/Gr' interface uses the Mobile Application Part (MAP) protocol to get the authentication vector and other information from HLR.

MAP is an SS7 protocol, which provides an application layer for various nodes in GSM and UMTS mobile core networks and GPRS core networks. With the application layer, the various nodes can communicate with each other to provide services to the mobile phone users.



For D' interface, IPWorks AAA simulates the part of behaviors of VLR in interaction with HLR.

For Gr' interface, IPWorks AAA simulates the part of behaviors of SGSN interaction with HLR.

## 2.2 Services

This section describes the services used within the D'/Gr' as shown in Table 1.

*Table 1 Offered Services*

Service	Description
MAP_SEND_AUTHENTICATIO N_INFO	This service is used between the IPWorks AAA and the HLR to retrieve authentication information from the HLR in both D' and Gr' interface.
MAP_RESTORE_DATA	IPWorks AAA simulating VLR uses this service to request the HLR to send all data to the VLR that are to be stored in the subscriber's IMSI record in D' interface.
MAP_UPDATE_GPRS_LOCATI ON	IPWorks AAA simulating SGSN uses this service to request the HLR to send all data to the SGSN that are to be stored in the subscriber's IMSI record in Gr' interface.
MAP-INSERT-SUBSCRIBER-D ATA	This service is used by a HLR to update an IPWorks AAA (VLR/SGSN) with certain subscriber data both D' and Gr' interface.
MAP_DELETE_SUBSCRIBER_ DATA	This service is used by an HLR to remove certain subscriber data from IPWorks AAA (SGSN) if the subscription of one or more supplementary services or basic services is withdrawn from Gr' interface.
MAP_CANCEL_LOCATION	This service is used between HLR and IPWorks AAA (SGSN) to delete a subscriber record in the Gr' interface.



Service	Description
MAP_RESET	This service is used by the HLR, after a restart, to indicate to IPWorks AAA(SGSN) that a failure occurred in Gr' interface.
MAP_PURGE_MS	This service is invoked by IPWorks AAA (SGSN) to inform the HLR that IPWorks AAA does not cache the information of one subscriber because the subscriber has been inactive for some time in Gr' interface.

## 2.3 Encapsulation and Addressing

This section describes the lower-level protocols on the D'/Gr'.

IPWorks AAA supports MAP standard protocol for accessing HLR data. Using the MAP protocol for the communication between entities in the PLMN implies the use of Transaction Capabilities (TC) and the Signalling Connection Control Part (SCCP) of SS7.

The services offered by the Transaction Capabilities Application Part (TCAP) are used as specified in ITU-T Recommendation (07/96) Q.711 to Q.714.

The services offered by the SCCP are used according to the ITU Recommendation (06/97) Q.771 to Q.775 or ANSI T1.112-20001.

### 2.3.1 Application Context Supported

Table 2 lists the version of the Application Contexts used in IPWorks AAA, with the operations used by them and, where applicable, whether the operation description is the same as for previous versions.

*Table 2 Application Context Supported*

AC Name	AC Version	Operations Used
locationCancellationContext	v3	cancelLocation
infoRetrievalContext	v3	sendAuthenticationInfo
msPurgingContext	v3	purgeMS
resetContext	v2	reset



AC Name	AC Version	Operations Used
networkLocUpContext	v3	restoreData insert SubscriberData
gprsLocationUpdateContext	v3	updateGprsLocation insertSubscriberData
subscriberDataMngtContext	v3	insertSubscriberData deleteSubscriberData

IPWorks AAA does not support AC negotiation for the moment, which means when receiving a TC-U-ABORT indication primitive (the response to the TC-BEGIN message) with the abort-reason set to "AC-not-supported", IPWorks will take the dialog as failed and no further action.

### 2.3.2 Application Context Syntax

```
mobileDomainId OBJECT IDENTIFIER ::= {ccitt (0)
identified-organization (4) etsi (0) mobileDomain (0)}

gsm-NetworkId OBJECT IDENTIFIER ::=
{mobileDomainId gsm-Network (1)}
ac-Id CommonComponentId ::= 0

map-ac OBJECT IDENTIFIER ::= {gsm-NetworkId ac-Id}

locationCancellationContext-v3 OBJECT IDENTIFIER ::=
{map-ac locationCancel(2) version3(3)}

locationInfoRetrievalContext-v3 OBJECT IDENTIFIER ::=
{map-ac locInfoRetrieval(5) version3(3)}

msPurgingContext-v3 OBJECT IDENTIFIER ::=
{map-ac msPurging(27) version3(3)}

resetContext-v2 OBJECT IDENTIFIER ::=
{map-ac reset(10) version2(2)}

networkLocUpContext-v3 OBJECT IDENTIFIER ::=
{map-ac networkLocUp(1) version3(3)}

gprsLocationUpdateContext-v3 OBJECT IDENTIFIER ::=
{map-ac gprsLocationUpdate(32) version3(3)}

subscriberDataMngtContext-v3 OBJECT IDENTIFIER ::=
{map-ac subscriberDataMngt(16) version3(3)}
```

### 2.3.3 SCCP Addressing (ITU-T Standard)

The SCCP addressing consists of the following elements:

- Subsystem Number (SSN)
- Global Title (GT)
- Signalling Point Code (SPC)

#### 2.3.3.1 Calling Party Address

##### 2.3.3.1.1 Without GT

IPWorks AAA uses SPC and SSN in the calling party address. It includes:

- SPC indicator = 1
- SSN indicator = 1 (MAP SSN included)
- SPC(2 octets)
- SSN
- Global title indicator = 0000 (not include Global title)
- Subsystem number (refer to Reference [6])

The following subsystem numbers are used by IPWorks AAA depending on the configuration:

- VLR (7)
- SGSN (149)

##### 2.3.3.1.2 With GT

IPWorks AAA uses GT and SSN in the calling party address. The Global Title follows the structure of a Global Title defined in ITU-T Recommendation Q.713 section B4.6 as Figure 2, include:

- SPC indicator = 0
- SSN indicator = 1 (MAP SSN included)
- SSN
- Global title indicator = 0100 (Global title includes TranslationType=0, NumberingPlan=1(ITU-T E.164), encoding scheme, and nature of address indicator.)
- Subsystem number (refer to Reference [6])



The following subsystem numbers are used by IPWorks AAA depending on the configuration:

- VLR (7)
- SGSN (149)

### 2.3.3.2 Called Party Address

#### 2.3.3.2.1 Numbering Plan is E212

IPWorks AAA uses GT and SSN in the called party address. The Global Title follows the structure of a Global Title defined in ITU-T Recommendation Q.713 section B4.6 as Figure 3, including:

- SPC indicator = 0
- SSN indicator = 1 (MAP SSN included)
- SSN
- Global title indicator = 0100 (Global title includes Translation Type=40, Numberingplan=6(E.212), encoding scheme, and nature of address indicator.)
- Subsystem number (use 6 as the HLR SSN)

8	7	6	5	4	3	2	1	Octets
0	RI = 0	GTI = 4				SSNI = 1	PCI = 0	1
SSN = "0" or internationally standard SSN value, if known								2
Translation type = 40								3
Numbering plan = 6 (ITU-T E.212)				Encoding scheme = 1 or 2				4
0	Nature of address indicator = 4 (International)							5
Second digit of E.212 Number				First digit of E.212 Number				6
Fourth digit of E.212 Number				Third digit of E.212 Number				7
Sixth digit of E.212 Number				Fifth digit of E.212 Number				8
Eighth digit of E.212 Number				Seventh digit of E.212 Number				9
•				•				•
•				•				•
If needed, filler = 0				Last digit of E.212 Number (max. 15 digits)				•

Figure 3 ITU-T SCCP Address Format for TT=40, NP=6, NAI=4

#### 2.3.3.2.2 Numbering plan is E214

IPWorks AAA uses GT and SSN in the called party address. The Global Title follows the structure of a Global Title defined in ITU-T Recommendation Q.713 section B4.6 as Figure 3, include:

- SPC indicator = 0

- SSN indicator = 1 (MAP SSN always included)
- SSN
- Global title indicator = 0100 (Global title includes Translation Type=0, Numberingplan=7(E.214), encoding scheme, and nature of address indicator.)
- Subsystem number (use 6 as the HLR SSN)

As for how to enable E214, refer to the Section *GT Convert* in *Configure Radius AAA*.

## 2.3.4 SCCP Addressing(ANSI Standard)

The SCCP addressing consists of the following elements:

- Subsystem Number (SSN)
- Signalling Point Code (SPC)
- Global Title (GT)

### 2.3.4.1 Calling Party Address

#### 2.3.4.1.1 Without GT

IPWorks AAA uses SPC and SSN in the calling party address. It includes:

- SSN indicator = 1 (MAP SSN always included)
- SPC indicator = 1
- SSN
- SPC (3 octets)
- Global title indicator = 0000 (not include Global title)
- Subsystem number (refer to Reference [6])

The following subsystem numbers are used by IPWorks AAA depending on the configuration:

- VLR (7)
- SGSN (149)



#### 2.3.4.1.2 With GT

IPWorks AAA uses GT and SSN in the calling party address. The Global Title follows the structure of a Global Title defined in ANSI T1.112 as Figure 3, include:

Subsystem number (refer to Reference [6])

- SSN indicator = 1 (MAP SSN always included)
- SPC indicator = 0
- SSN
- Global title indicator = 0001 (Global title includes TranslationType=0, NumberingPlan=1 (ITU-T E.164), encoding scheme.)
- Subsystem number (refer to Reference [6])

The following subsystem numbers are used by IPWorks AAA depending on the configuration:

- VLR (7)
- SGSN (149)

8	7	6	5	4	3	2	1
Res. for Nat. use	Rtg ind	GT Indicator				SPC ind	SSN ind
Subsystem Number					1 octet		
Signaling Point Code					3 octets		
8	7	6	5	4	3	2	1
Translation type							octet 1
Numbering plan				Encoding scheme			octet 2
2nd address signal				1st address signal			octet 3
filler (if necessary)				nth address signal			octet m (m<= 11)

Figure 4 ANSI SCCP Address Format for "GT Indicator=0x01"

#### 2.3.4.2 Called Party Address

##### 2.3.4.2.1 Numbering plan is E212

IPWorks AAA uses GT and SSN in the called party address. The Global Title follows the structure of a Global Title defined in ANSI T1.112 as Figure 4, include:

- SSN indicator = 1 (MAP SSN always included)



- SPC indicator = 0
- SSN
- Global title indicator = 0001 (Global title includes TranslationType=40, Numberingplan=6(E.212), encoding scheme.)
- Subsystem number (use 6 as the HLR SSN)

#### 2.3.4.2.2 Numbering plan is E214

IPWorks AAA uses GT and SSN in the called party address. The Global Title follows the structure of a Global Title defined in ANSI T1.112 as Figure 4, include:

- SSN indicator = 1 (MAP SSN always included)
- SPC indicator = 0
- SSN
- Global title indicator = 0001 (Global title includes TranslationType=0, Numberingplan=7(E.214), encoding scheme.)
- Subsystem number (use 6 as the HLR SSN)

As for how to enable E214, refer to the Section *GT Convert* in *Configure Radius AAA*.

## 3 Procedures

This section describes the procedures used in connection with the offered and used interfaces of IPWorks.

### 3.1 MAP\_SEND\_AUTHENTICATION\_INFO

The service is invoked When IPWorks AAA sends a request to HLR to retrieve Authentication Vectors (AV), HLR returns some triplet vectors (RAND, SRES, KC) for a 2G user and some quintuplet vectors (RAND, XRES, CK, IK, AUTN) for 3G users as described in Figure 5 and Figure 6.

See Section 4.1 MAP\_SEND\_AUTHENTICATION\_INFO on page 23 for the service primitives.

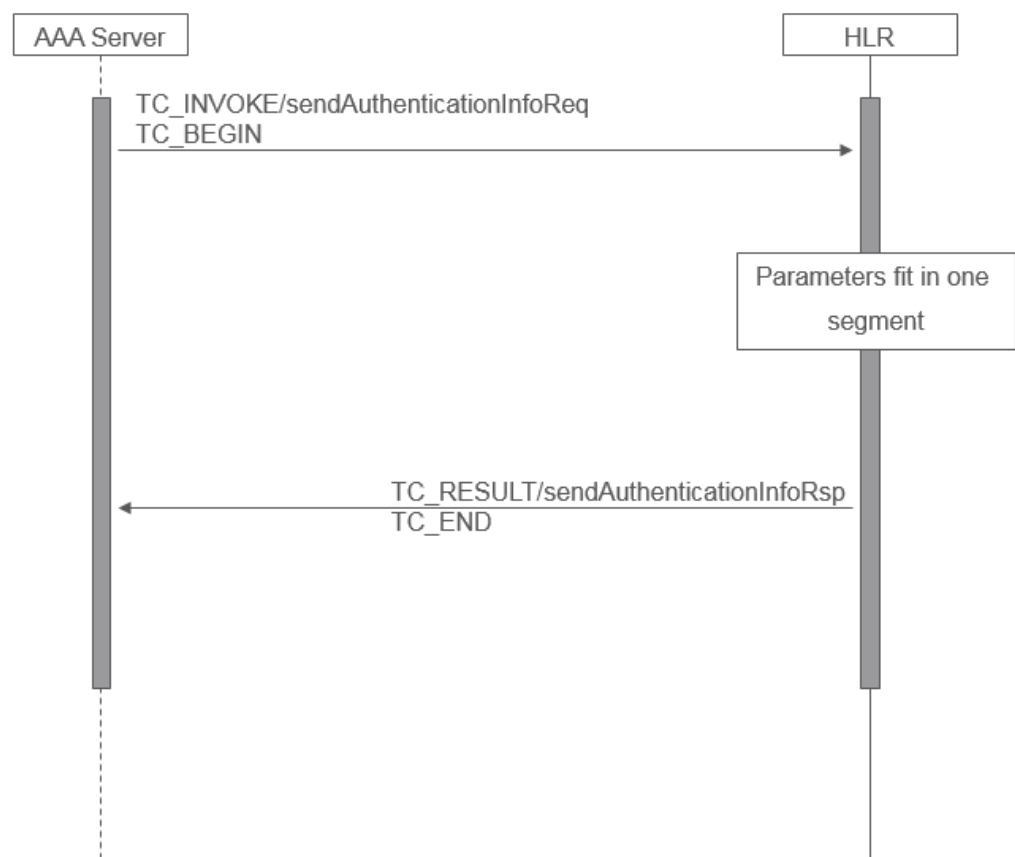


Figure 5 MAP\_SEND\_AUTHENTICATION\_INFO Procedure, No Segmentation

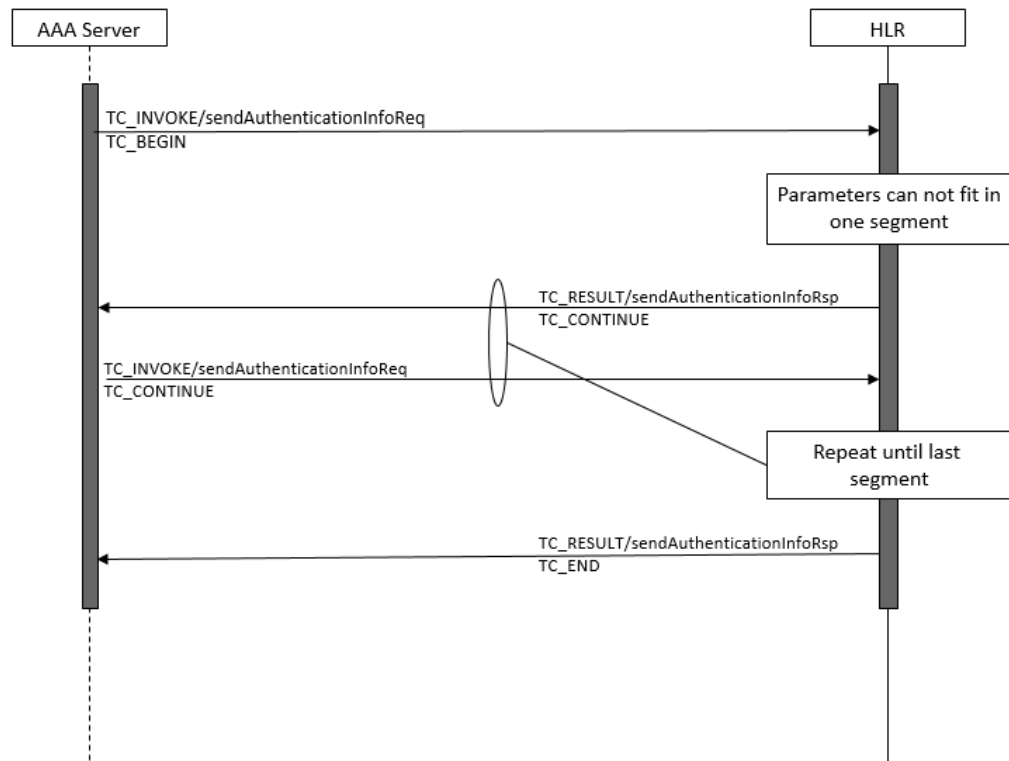


Figure 6 MAP\_SEND\_AUTHENTICATION\_INFO Procedure, Segmentation

## 3.2 MAP\_RESTORE\_DATA

This procedure is triggered by the VLR to request the HLR to send all data to the VLR that are to be stored in the subscriber's IMSI record. IPWorks AAA server sends it when it works as D' interface. In this service IPWorks AAA Server only uses the IMSI parameter.

In D' interface, IPWorks AAA starts a timer periodically to invoke MAP\_RESTORE\_DATA for retrieving subscription.

See Section 4.2 on page 24 for the service primitives.

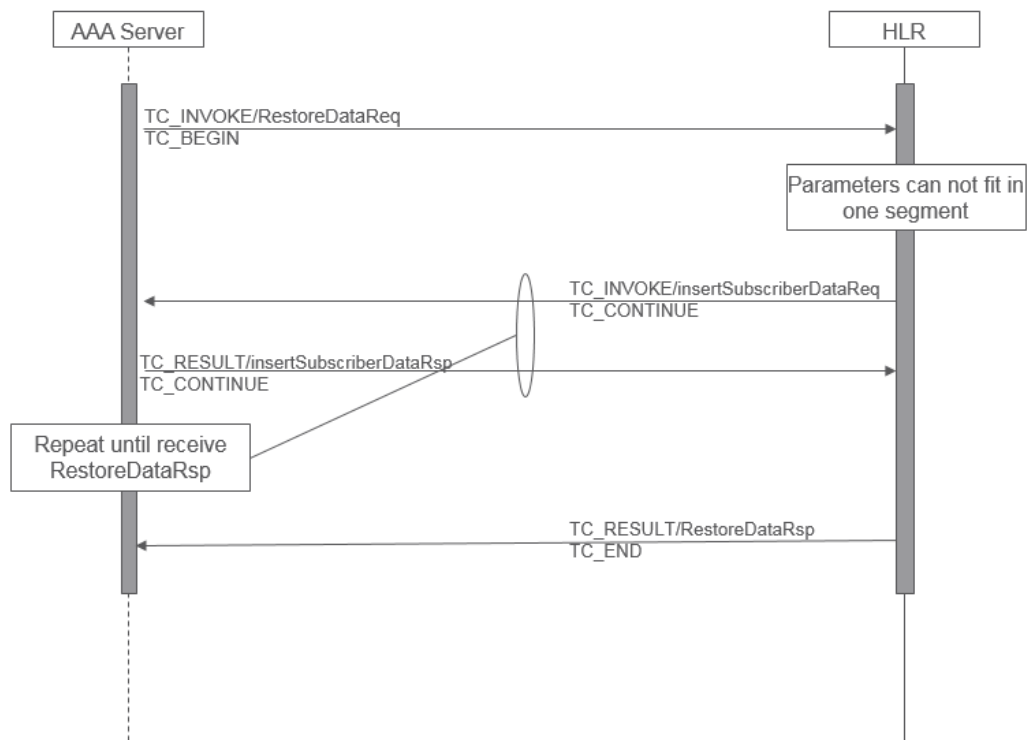


Figure 7 MAP\_RESTORE\_DATA Procedure

### 3.3 MAP\_UPDATE\_GPRS\_LOCATION

This service is invoked by the SGSN to update location and request the HLR to send all data to the SGSN that are to be stored in the subscriber's IMSI record. IPWorks AAA server sends it when it works as Gr' interface. In this service IPWorks AAA Server only uses IMSI, SGSN number, SGSN addresss.

In `MAP_UPDATE_GPRS_LOCATION_rsp` if HLR returns HLR number parameter, IPWorks AAA saves it as the IMSI-related HLR for some sequent service like `MAP_RESET`.

See Section 4.3 on page 25 for the service primitives and used parameters.

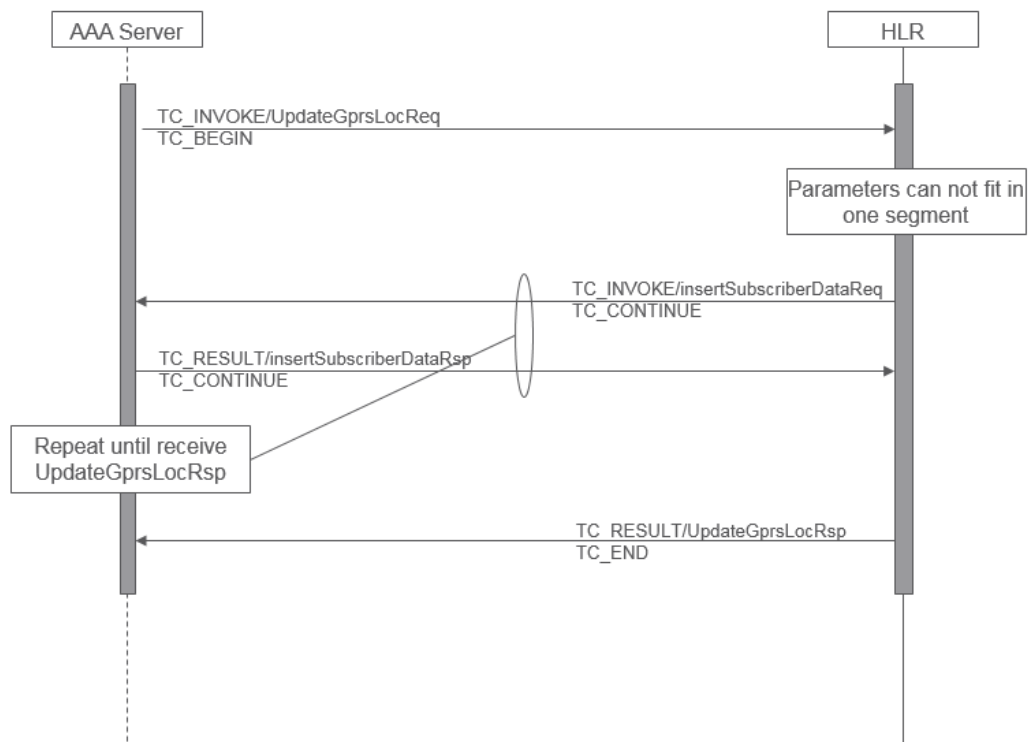


Figure 8 MAP\_UPDATE\_GPRS\_LOCATION Procedure

## 3.4 MAP\_INSERT\_SUBSCRIBER\_DATA

This service is used by an HLR to update a VLR/SGSN with certain subscriber data. There are two occasions when HLR invokes this service in IPWorks.

In the first occasion, the service is triggered by `RestoreData` or `UpdateGprsLocation` in D' or Gr' interface (refer to Section 3.2 on page 14 and Section 3.3 on page 15).

In the other occasion, if the operator has changed the subscription of one or more supplementary services, basic services or data of a subscriber, HLR invokes this service to inform IPWorks AAA server about the modification in Gr' interface. If IPWorks AAA receives this service, IPWorks checks whether the user's WLAN access ability has been changed. If the WLAN access ability has been disabled for a user, IPWorks deletes the cached user data and send the DM message for an online user at the same time.

The following diagram illustrates the working sequence when IPWorks AAA uses either the APN or ODB to check the WiFi subscription.

See Section 4.4 on page 27 for the service primitives.

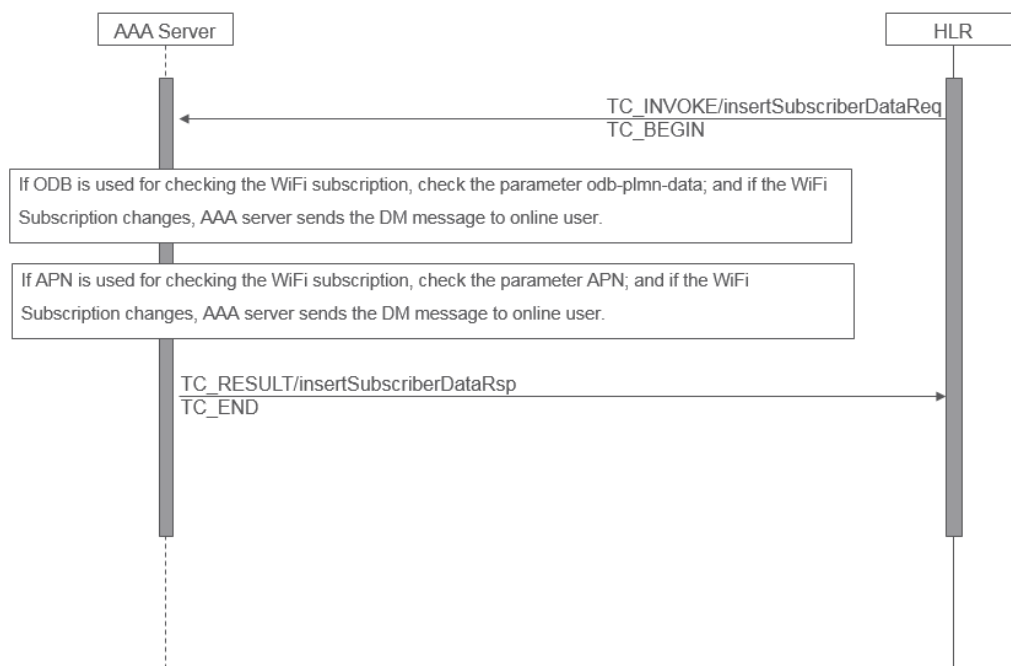


Figure 9 MAP\_INSERT\_SUBSCRIBER\_DATA Procedure

## 3.5

### MAP\_DELETE\_SUBSCRIBER\_DATA

This service is used by an HLR to remove certain subscriber data from a VLR or SGSN if the subscription of one or more supplementary services or basic services is withdrawn.

After receiving this operation, IPWorks AAA server changes the status of the related cached user data to *invalid*, which means if this user logs in again, IPWorks AAA server asks the related information from HLR again.

See Section 4.5 on page 30 for the service primitives.

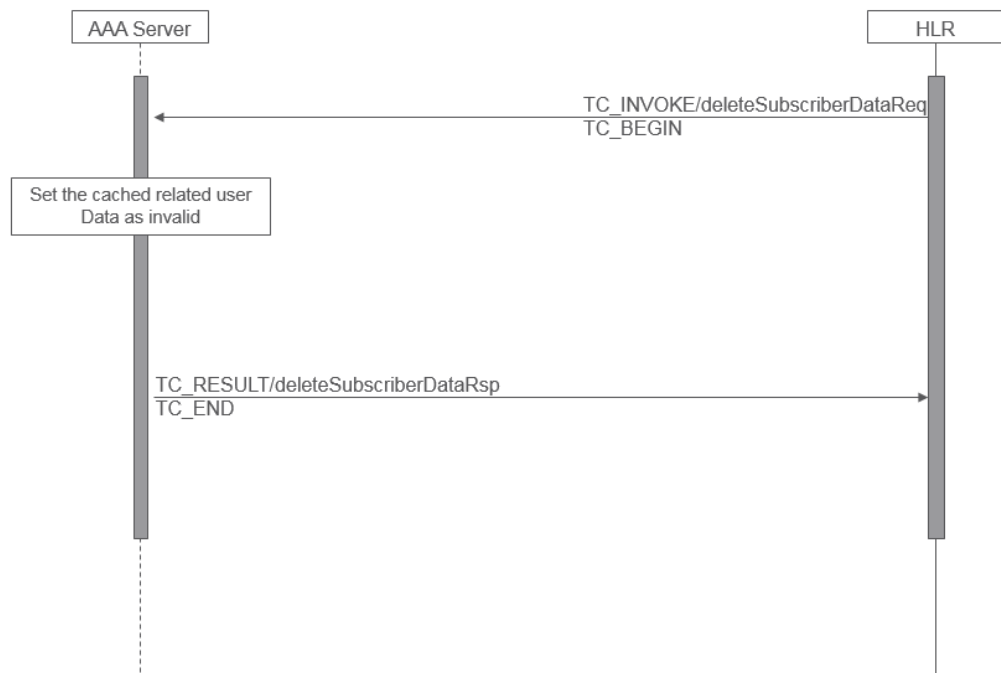


Figure 10 MAP\_DELETE\_SUBSCRIBER\_DATA Procedure

### 3.5.1 Service Primitives

## 3.6 MAP\_CANCEL\_LOCATION

This service is used between HLR and IPWorks AAA server to delete subscriber record from the IPWorks AAA server. After receiving this operation, IPWorks AAA server will disconnect the subscriber by sending DM messages for an online user and delete related cached data. This operation works in Gr' interface.

See Section 4.6 on page 31 for the service primitives.

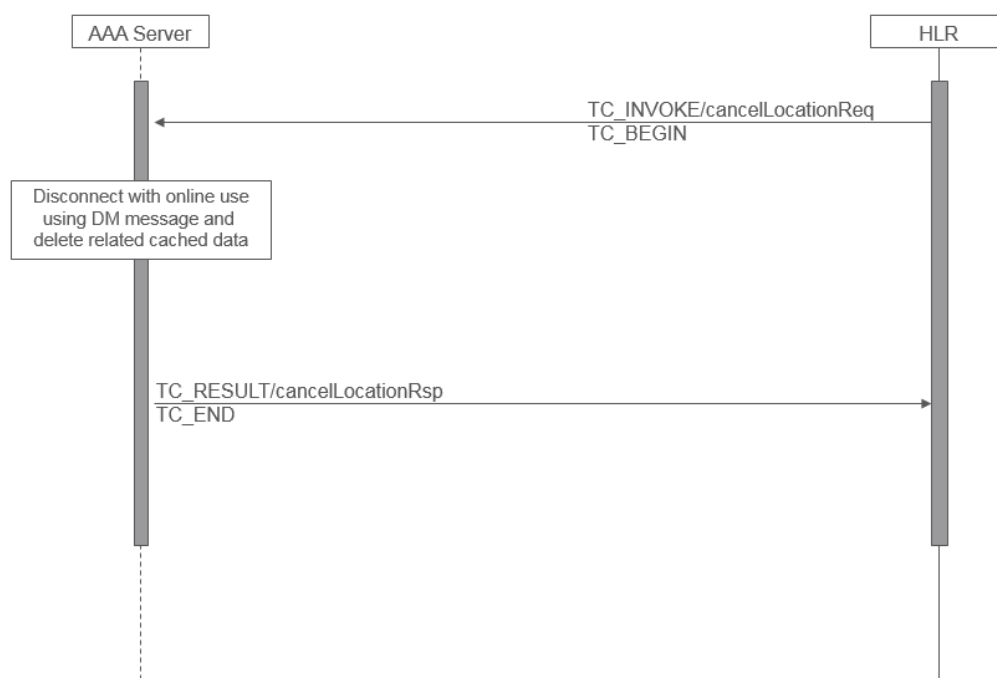


Figure 11 MAP\_CANCEL\_LOCATION Procedure

### 3.7

## MAP\_RESET

This service is used by HLR, after a restart, to indicate to a list of SGSNs that a failure occurred. If IPWorks AAA server receives this operation, IPWorks AAA server sets all the cached user data which is related to the HLR as invalid. If some authentication process is invoked for those data again, AAA server asks the subscriber information from HLR again.

The MAP\_RESET service is a non-confirmed service.

See Section 4.7 on page 32 for the service primitives.

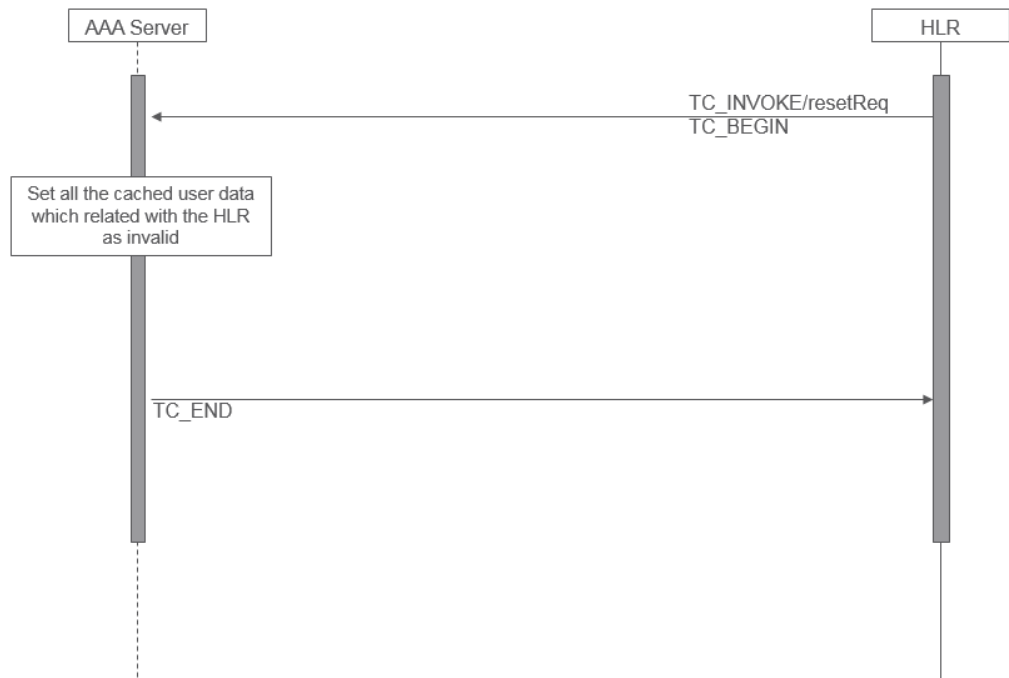


Figure 12 MAP\_RESET Procedure

## 3.8 MAP\_PURGE\_MS

This service is used between the IPWorks AAA Server and the HLR. It is invoked when the subscriber record is to be deleted in the IPWorks AAA Server, for example, under the condition that the MS has been inactive for a long time. The expiry time is configurable and the default value is 24 hours.

See Section 4.8 on page 33 for the service primitives.

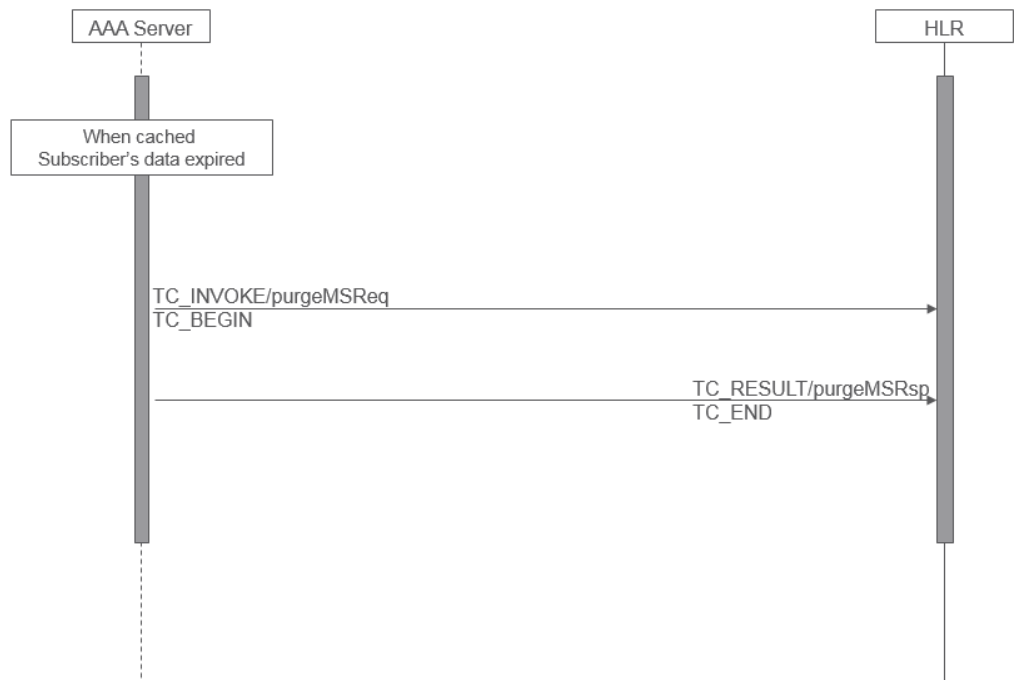


Figure 13 MAP\_PURGE\_MS Procedure





## 4 Information Model

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

The following conventions are used for categorizing parameters, refer to Reference [7].

*Table 3 Conventions for Categorizing Parameters*

M	The inclusion of the parameter is mandatory. The M category can be used for any primitive type and specifies the corresponding parameters that must be presented in the indicated primitive type.
O	The inclusion of the parameter is a service-provider option. The O category can be used in indication and confirm type primitives and is used for parameters that is optionally included by the service-provider.
U	The inclusion of the parameter is a service-user option. The U category can be used in request and response type primitives. The inclusion of the corresponding parameter is the choice of the service-user.
C	<p>The inclusion of the parameter is conditional. The C category can be used for the following purposes:</p> <ul style="list-style-type: none"> <li>To indicate that if the parameter is received from another entity, it must be included for the service being considered.</li> <li>To indicate that the service user must decide whether to include the parameter, based on the context on which the service is used.</li> <li>To indicate that one of a number of mutually exclusive parameters must be included (for example, parameters indicating a positive result versus parameters indicating a negative result).</li> <li>To indicate that a service user optional parameter (marked with "U") or a conditional parameter (marked with "C") presented by the service user in a request or response type primitive is to be presented to the service user in the corresponding indication or confirm type primitive.</li> </ul>
(=)	When the parameter is appended to one of the above, this symbol means that the parameter gets the same value as the parameter shown at the left.
Blank	The parameter is not presented.

### 4.1 MAP\_SEND\_AUTHENTICATION\_INFO

#### 4.1.1 Service Primitives

The service primitives are shown in Table 4.

*Table 4 MAP\_SEND\_AUTHENTICATION\_INFO*

Parameter Name	Request	Indication	Response	Confirm
Invoke ID	M	M(=)	M(=)	M(=)
IMSI	C	C(=)		



Parameter Name	Request	Indication	Response	Confirm
Number of requested vectors	C	C(=)		
Requesting node type	C	C(=)		
Re-synchronization Info	C	C(=)		
Segmentation prohibited indicator	C	C(=)		
Immediate response preferred indicator	U	C(=)		
Requesting PLMN ID	C	C(=)		
AuthenticationSet List			C	C(=)
User error			C	C(=)
Provider error				O

### 4.1.2 Parameter Use

The parameters used by IPWorks AAA are listed as follows:

**Invoke ID:** This parameter identifies corresponding service primitives. The parameter is supplied by the MAP service-user and must be unique over each service-user/service-provider interface.

**IMSI:** This parameter is the International Mobile Subscriber Identity defined in [3GPP Numbering, addressing and identification, TS 23.003 V9.4.0](#), refer to Reference [6].

**Number of requested vectors:** A number that indicates how many authentication vectors the VLR or the SGSN will receive. The HLR shall not return more vectors than the number indicated by this parameter. IPWorks AAA server always requires one authentication vectors.

**Requesting node type:** The type of the requesting node. This parameter shall be presented in the first (or only) request of the dialogue. If multiple service requests are presented in a dialogue then this parameter shall not be presented in any service request other than the first one. In IPWorks AAA server we use 0 as VLR node type and 1 as SGSN node type.

**Re-synchronisation Info:** This parameter will be used in resynchronization case. If multiple service requests are presented in a dialogue, then this parameter shall not be presented in any service request other than the first one.

**AuthenticationSetList:** This parameter is a set of one to five authentication vectors that are transferred from the HLR to the VLR as well as from the HLR to the SGSN.



## 4.2 MAP\_RESTORE\_DATA

### 4.2.1 Service Primitives

The service primitives are shown in Table 5.

Table 5 MAP\_RESTORE\_DATA

Parameter Name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
LMSI	U	C(=)		
Supported CAMEL phases	C	C(=)		
SoLSA Support Indicator	C	C(=)		
IST Support Indicator	C	C(=)		
Super-Charger Supported in Serving Network Entity	C	C(=)		
Long FTN Supported	C	C(=)		
Supported LCS Capability Sets	C	C(=)		
Offered CAMEL 4 CSIs	C	C(=)		
V-GMLC Address	C	C(=)		
HLR number			C	C(=)
MS Not Reachable Flag			C	C(=)
User error			C	C(=)
Provider error				O

### 4.2.2 Parameter Use

The parameters used by IPWorks AAA are listed as follows:

**Invoke ID:** This parameter identifies corresponding service primitives. The parameter is supplied by the MAP service-user and must be unique over each service-user/service-provider interface.

**IMSI:** This parameter is the International Mobile Subscriber Identity defined in [3GPP Numbering, addressing and identification, TS 23.003 V9.4.0](#), refer to Reference [6].



## 4.3 MAP\_UPDATE\_GPRS\_LOCATION

### 4.3.1 Service Primitives

The service primitives are shown in Table 6.

Table 6 MAP\_UPDATE\_GPRS\_LOCATION

Parameter Name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
SGSN number	M	M(=)		
SGSN address	M	M(=)		
Supported CAMEL Phases	C	C(=)		
SoLSA Support Indicator	C	C(=)		
Super-Charger Supported in Serving Network Entity	C	C(=)		
GPRS enhancements support indicator	C	C(=)		
Supported LCS Capability Sets	C	C(=)		
Offered CAMEL 4 CSIs	C	C(=)		
Inform Previous Network Entity	C	C(=)		
PS LCS Not Supported by UE	C	C(=)		
V-GMLC Address	U	C(=)		
Call barring support indicator	C	C(=)		
HLR number			C	C(=)
User error			C	C(=)
Provider error				O

### 4.3.2 Used Parameters

The parameters used by IPWorks AAA are listed as follows:

**Invoke ID:** This parameter identifies corresponding service primitives. The parameter is supplied by the MAP service-user and must be unique over each service-user/service-provider interface.



**IMSI:** This parameter is the International Mobile Subscriber Identity defined in [3GPP Numbering, addressing and identification, TS 23.003 V9.4.0](#), refer to Reference [6].

**SGSN number:** This parameter refers to the ISDN number of a SGSN.

**SGSN address:** This parameter refers to the IP-address of a SGSN. This parameter is defined in [3GPP Numbering, addressing and identification, TS 23.003 V9.4.0](#), refer to Reference [6].

**HLR number:** This parameter refers to the ISDN number of an HLR.

## 4.4 MAP\_INSERT\_SUBSCRIBER\_DATA

### 4.4.1 Service Primitives

The service primitives are shown in Table 7.

Table 7 MAP\_INSERT\_SUBSCRIBER\_DATA

Parameter Name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	C(=)		
MSISDN	M	C(=)		
Category	M	C(=)		
Subscriber Status	M	C(=)		
Bearer service List	M	C(=)	C	C(=)
Teleservice List	M	C(=)	C	C(=)
Forwarding information List	M	C(=)		
Call barring information List	M	C(=)		
CUG information List	M	C(=)		
SS-Data List	M	C(=)		
eMLPP Subscription Data	M	C(=)		
MC-Subscription Data	M	C(=)		
Operator Determined Barring General data	M	C(=)	C	C(=)
Operator Determined Barring HPLMN data	M	C(=)		
Roaming Restriction Due To Unsupported Feature	M	C(=)		
VLR CAMEL Subscription Info	M	C(=)		



Parameter Name	Request	Indication	Response	Confirm
Voice Broadcast Data	M	C(=)		
Voice Group Call Data	M	C(=)		
Network access mode	M	C(=)		
GPRS Subscription Data	M	C(=)		
Roaming Restricted In SGSN Due To Unsupported Feature	M	C(=)		
North American Equal Access preferred Carrier Id List	U	C(=)		
SGSN CAMEL Subscription Info	C	C(=)		
LSA Information	C	C(=)		
IST Alert Timer	C	C(=)		
SS-Code List	C	C(=)	C	C(=)
LMU Identifier	C	C(=)		
LCS Information	C	C(=)		
CS Allocation/Retention priority	C	C(=)		
Super-Charger Supported In HLR	C	C(=)		
Charging Characteristics	C	C(=)		
Regional Subscription Response			C	C(=)
Supported CAMEL Phases			C	C(=)
Offered CAMEL 4 CSIs			C	C(=)
User error			U	C(=)
Provider error				O

#### 4.4.2

#### Used Parameters

IPWorks AAA uses the following parameters and does not handle other parameters. IPWorks AAA decodes the unused parameters and discards them.

- **Invoke ID:** The parameter identifies the corresponding service primitives. The parameter is supplied by the MAP service-user and must be unique over each service-user/service-provider interface.
- **IMSI:** The parameter IMSI is short for International Mobile Subscriber Identity, which is defined in [3GPP Numbering, addressing and identification, TS 23.003 V9.4.0](#). For details, refer to Reference [6].



- **MSISDN:** The parameter MSISDN is short for Mobile Station International ISDN number. When CUI switch is enabled in AAA configuration, MSISDN will be included in CUI AVP and returned by AAA in Access-Accept.
- **Operator Determined Barring (ODB) HPLMN data:** The parameter is used when IPWorks AAA uses ODB to check the WiFi subscription.

This parameter is of BIT STRING type, and each bit value represents one ODB category. The ODB categories are applied only to a subscriber registered in the HPLMN. IPWorks AAA server allows the HLR to use the ODB HPLMN data parameter to specify the ability of WiFi access. The default ODB category is plmn-SpecificBarringType2.

```
odb-HPLMN-Data          BIT STRING {
    plmn-SpecificBarringType1  (0 ),
    plmn-SpecificBarringType2  (1 ),
    plmn-SpecificBarringType3  (2 ),
    plmn-SpecificBarringType4  (3 )} ( SIZE( 4 .. 32 ) )
OPTIONAL,
```

If a subscriber has WiFi subscription, HLR configures the parameter plmn-SpecificBarringType2 as 1; otherwise set it as 0.

- **GPRS Subscription Data:** The parameter GPRSSubscriptionData is used when IPWorks AAA uses APN to check WiFi subscription.

Both APN and PDP-ChargingCharacteristics are included in the parameter GPRSSubscriptionData.

— APN

IPWorks authorizes the WiFi access based on APN. Additionally, when the Trusted WiFi Support feature is enabled, AAA servers use the APN to judge whether the WiFi service scenario is s2a or NSWO.

— PDP-ChargingCharacteristics

The PDP-ChargingCharacteristics contains the information that is used by WiFi-GW to constitute the GTP-Tunnel-Data.

```
GPRSSubscriptionData ::= SEQUENCE (
    completeDataListIncluded    NULL                OPTIONAL,
    gprsDataList                (1)  GPRSDataList
)
```

```
GPRSDataList ::= SEQUENCE SIZE (1..maxNumOfPDP-Contexts)
    OF PDP-Context
```

```
PDP-Context ::= SEQUENCE (
    pdp-ContextId              ContextId,
    pdp-Type                   (16) PDP-Type,
```



```

pdp-Address          (17) PDP-Address          OPTIONAL,
QoS-Subscribed       (18) Qos-Subscribed,
vplmnAddressAllowed  (19) NULL                  OPTIONAL,
apn                 (20) APN,
ext-QoS-Subscribed   (0) Ext-QoS-Subscribed  OPTIONAL,
PDP-ChargingCharacteristics
                                (1) ChargingCharacteristics
OPTIONAL,
ext2-QoS-Subscribed  (2) Ext2-QoS-Subscribed  OPTIONAL,
ext3-QoS-Subscribed  (3) Ext3-QoS-Subscribed  OPTIONAL
}

```

- **Charging Characteristics:** The subscriber charging characteristics information can be extended to the network element, such as NetOP Policy Manager, in order to differentiate the post-paid and pre-paid subscribers.

```

insertSubscriberData  OPERATION ::= {                                --Timer m
ARGUMENT              SEQUENCE {
    imsi                [0] IMSI                                     OPTIONAL,
    COMPONENTS OF       SubscriberData,
    naea-PreferredCI    [15] NAEA-PreferredCI                       OPTIONAL,
    gprsSubscriptionData [16] GPRSSubscriptionData                 OPTIONAL,
    networkAccessMode   [24] NetworkAccessMode                    OPTIONAL,
    lmu-Indicator        [21] NULL                                   OPTIONAL,
    lcsInformation       [22] LCSInformation                        OPTIONAL,
    istAlertTimer        [26] IST-AlertTimerValue                  OPTIONAL,
    sgsn-CAMEL-SubscriptionInfo [17] SGSN-CAMEL-SubscriptionInfo
                                                                OPTIONAL,
    chargingCharacteristics    [18] ChargingCharacteristics
                                                                OPTIONAL,
    accessRestrictionData [19] AccessRestrictionData              OPTIONAL,
    ics-Indicator         [20] BOOLEAN                             OPTIONAL
}

```

## 4.5 MAP\_DELETE\_SUBSCRIBER\_DATA

### 4.5.1 Service Primitives

The service primitives are shown in Table 8.

Table 8 MAP\_DELETE\_SUBSCRIBER\_DATA

Parameter Name	Request	Indication	Response	Confirm
Invoke ID	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
Basic service List	C	C(=)		



Parameter Name	Request	Indication	Response	Confirm
SS-Code List	C	C(=)		
Roaming Restriction Due To	C	C(=)		
Unsupported Feature	C	C(=)		
Camel Subscription Info Withdraw	C	C(=)		
Specific CSI Withdraw	C	C(=)		
Regional Subscription Data	C	C(=)		
VBS Group Indication	C	C(=)		
VGCS Group Indication	C	C(=)		
GPRS Subscription Data Withdraw	C	C(=)		
Roaming Restricted In SGSN Due To Unsupported Feature	C	C(=)		
LSA Information Withdraw	C	C(=)		
IST Information Withdraw	C	C(=)		
Regional Subscription Response	C	C(=)	C	C(=)
GMLC List Withdraw	C	C(=)		
Subscribed Charging Characteristics Withdraw	C	C(=)		
User error			C	C(=)
Provider error				O

## 4.5.2 Used Parameters

The parameters used by IPWorks AAA are listed as follows:

**Invoke ID:** This parameter identifies corresponding service primitives. The parameter is supplied by the MAP service-user and must be unique over each service-user/service-provider interface.

**IMSI:** This parameter is the International Mobile Subscriber Identity defined in [3GPP Numbering, addressing and identification, TS 23.003 V9.4.0](#), refer to Reference [6].

## 4.6 MAP\_CANCEL\_LOCATION

### 4.6.1 Service Primitives

The service primitives are shown in Table 9.

*Table 9 MAP\_CANCEL\_LOCATION*

Parameter Name	Request	Indication	Response	Confirm
Invoke ID	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
LMSI	C	C(=)		
Cancellation Type	C	C(=)		
User error			C	C(=)
Provider error				O

## 4.6.2 Used Parameters

The parameters used by IPWorks AAA are listed as follows:

**Invoke ID:** This parameter identifies corresponding service primitives. The parameter is supplied by the MAP service-user and must be unique over each service-user/service-provider interface.

**IMSI:** This parameter is the International Mobile Subscriber Identity defined in [3GPP Numbering, addressing and identification, TS 23.003 V9.4.0](#), refer to Reference [6].

**Cancellation Type:** This parameter indicates the reason of location cancellation. It is defined in 3GPP TS 23.060. The presence of this parameter is mandatory when the Cancellation Location is sent to the SGSN.

## 4.7 MAP\_RESET

### 4.7.1 Service Primitives

The service primitives are shown in Table 10.

*Table 10 MAP\_RESET*

Parameter Name	Request	Indication	Parameter Use
Invoke ID	M	M(=)	This parameter identifies corresponding service primitives. The parameter is supplied by the MAP service-user and must be unique over each service-user/service-provider interface.
HLR number	M	M(=)	This parameter refers to the ISDN number of an HLR.
HLR Id LIST	U	C(=)	



## 4.7.2 Used Parameters

The parameters used by IPWorks AAA are listed as follows:

**Invoke ID:** This parameter identifies corresponding service primitives. The parameter is supplied by the MAP service-user and must be unique over each service-user/service-provider interface.

**HLR Number:** This parameter refers to the ISDN number of an HLR.

## 4.8 MAP\_PURGE\_MS

### 4.8.1 Service Primitives

The service primitives are shown in Table 11.

Table 11 MAP\_PURGE\_MS

Parameter Name	Request	Indication	Response	Confirm
Invoke ID	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
VLR number	C	C(=)		
Freeze TMSI			C	C(=)
Freeze P-TMSI			C	C(=)
SGSN number	C	C(=)		
User error			C	C(=)
Provider error				O

### 4.8.2 Used Parameters

The parameters used by IPWorks AAA are listed as follows:

**Invoke ID:** This parameter identifies corresponding service primitives. The parameter is supplied by the MAP service-user and must be unique over each service-user/service-provider interface.

**IMSI:** This parameter is the International Mobile Subscriber Identity defined in [3GPP Numbering, addressing and identification, TS 23.003 V9.4.0](#), refer to Reference [6].

**SGSN number:** This parameter shall be presented if the sender is SGSN. This parameter refers to the ISDN number of an SGSN.

**Freeze P-TMSI:** This parameter is sent to the SGSN to indicate that the P-TMSI has to be frozen. It shall be presented if the received SGSN number matches the stored SGSN number.





## 5 Formal Syntax or Schema

IPWorks AAA supports the constants and data types for above operations as specified in [Mobile Application Part \(MAP\) specification 3GPP TS 29.002 version 8.13.0](#), Section 17 Abstract syntax of the MAP protocol, refer to Reference [7].





## 6 Related Standards

- 3GPP Numbering, addressing and identification, TS 23.003 V9.4.0
- Mobile Application Part (MAP) specification 3GPP TS 29.002 version 8.13.0
- 3GPP system to Wireless Local Area Network (WLAN) Interworking, TS 23.234 V9.0.0





## Reference List

### Ericsson Documents

- [1] *Glossary of Terms and Acronyms*
- [2] *Trademark Information*
- [3] *Typographic Conventions*
- [4] *IPWorks Configuration Management*
- [5] *Configure Radius AAA*

### Standards

- [6] [3GPP Numbering, addressing and identification, TS 23.003 V9.4.0](#)
- [7] [Mobile Application Part \(MAP\) specification 3GPP TS 29.002 version 8.13.0](#)
- [8] [3GPP system to Wireless Local Area Network \(WLAN\) interworking, TS 23.234 V9.0.0](#)