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**Universal Mobile Telecommunications System (UMTS);
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InterWorking Function (IWF)
between MAP based and Diameter based interfaces
(3GPP TS 29.305 version 14.0.0 Release 14)**



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Introduction

The content of this specification is a part of overall solution to meet the requirement of the interworking between EPS and the legacy system, mainly for the interfaces between S4-SGSN/MME and HSS/HLR/EIR.

1 Scope

The present document is to specify the InterWorking Functions (IWF)

- between MAP-based Gr, Gf interfaces and Diameter-based S6a, S6d, S13, S13a interfaces;
- between the S6a interface with SMS subscription data on the MME side and the S6a interface without SMS subscription data plus the MAP-based D interface for SMS subscription on the HSS side;
- between MAP-based C for SMS interface and Diameter-based S6c interface;
- between MAP-based E for SMS interface and Diameter-based SGd interface.

The InterWorking Function between the S6a interface with SMS subscription data and the S6a interface without SMS subscription data plus the MAP-based D interface for SMS subscription (S6a/S6a+D) is described in Annex A.

The InterWorking Function between MAP-based C for SMS interface and Diameter-based S6c interface is described in Annex A.3

The InterWorking Function between MAP-based E for SMS interface and Diameter-based SGd interface is described in Annex A.2

For each IWF scenario, the present document will specify the mapping of related procedures and the corresponding parameter handling.

The present document will also specify the related mechanisms for the IWF, e.g. message routing, user data handling. The other mechanism, such as security, will also be described in this document as a part of the whole solution.

If there is no specific indication, the SGSN in the specification refers to a S4-SGSN which supports S4 interface.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 33.401: "3GPP System Architecture Evolution: Security Architecture".
- [3] 3GPP TS 23.272: "Circuit Switched (CS) fallback in Evolved Packet System (EPS); Stage 2".
- [4] 3GPP TS 23.272: "Circuit Switched (CS) fallback in Evolved Packet System (EPS); Stage 2".
- [5] 3GPP TS 29.272: "Evolved Packet System (EPS); Mobility Management Entity (MME) and Serving GPRS Support Node (SGSN) related interfaces based on Diameter protocol".
- [6] 3GPP TS 23.204: "Support of Short Message Service (SMS) over generic 3GPP Internet Protocol (IP) access; Stage 2".
- [7] 3GPP TS 23.003: "Numbering, addressing and identification".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

example: text used to clarify abstract rules by applying them literally.

3.2 Symbols

For the purposes of the present document, the following symbols apply:

<symbol> <Explanation>

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

EPS	Evolved Packet System
IWF	Interworking Function
TAU	Tracking Area Update

4 Introduction (Informative)

4.1 General Description

The interworking scenarios in this specification are described based on interface mapping.

The stage 2 network deployments for each of the interworking scenarios are also described.

4.2 Scenario One: S6a/S6d - Pre Rel8 Gr interworking scenario with one IWF

4.2.1 General Description

This interworking scenario is for S6a/S6d interface based on Diameter and Pre Rel8 Gr interface based on MAP with one IWF in the path.

This IWF scenario can be an inter PLMN use case.

This IWF scenario can be an intra PLMN use case for operator to do the partly update of their legacy network.

This interworking scenario is described as below:

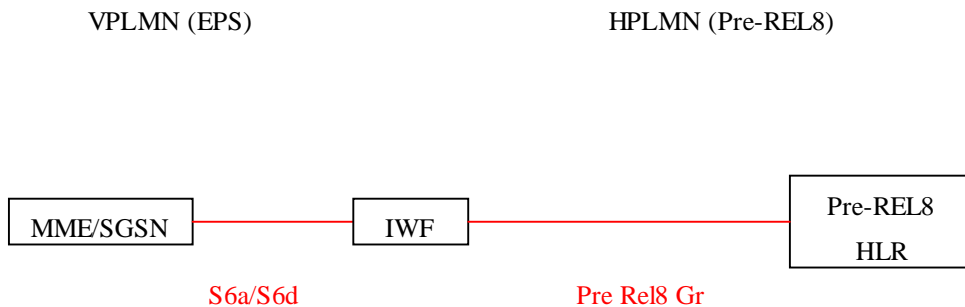


Figure 4.2.1-1 S6a/S6d - Pre Rel8 Gr interworking scenario with one IWF

The Pre Rel8 HLR shall be upgraded to support Rel-8 EPS security and Pre Rel8 Gr shall be upgraded to support transfer of Rel-8 security parameters..

4.2.2 Network Deployments

This IWF scenario will apply the following network deployment situation:

- Users of a Pre Rel8 UMTS/GPRS network access into a visited EPS with only E-UTRAN, which is described as below:

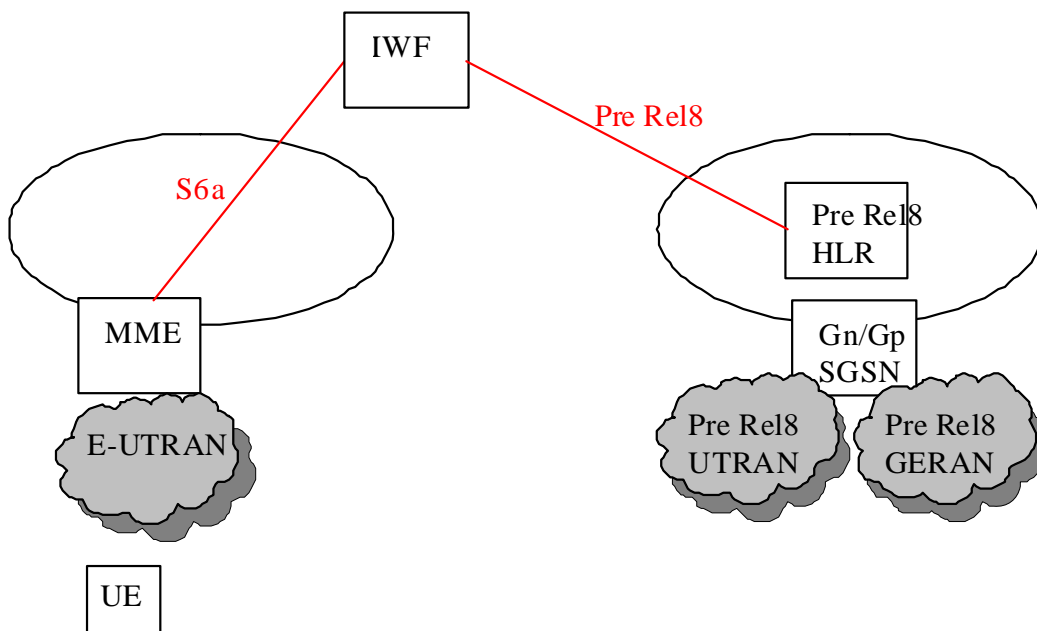


Figure 4.2.2-1 IWF Scenario one network deployment: visited EPS with E-UTRAN only, home Pre Rel8 UMTS/GPRS only

The subscription data for Pre Rel8 Gn/Gp SGSN is downloaded to MME. Mapping of the subscription data is done on MME. Additional security solution is needed in which the Pre Rel8 HLR can not be changed.

- Users of a Pre Rel8 UMTS/GPRS network access into a visited EPS with E-UTRAN and UTRAN/GERAN, which is described as below:

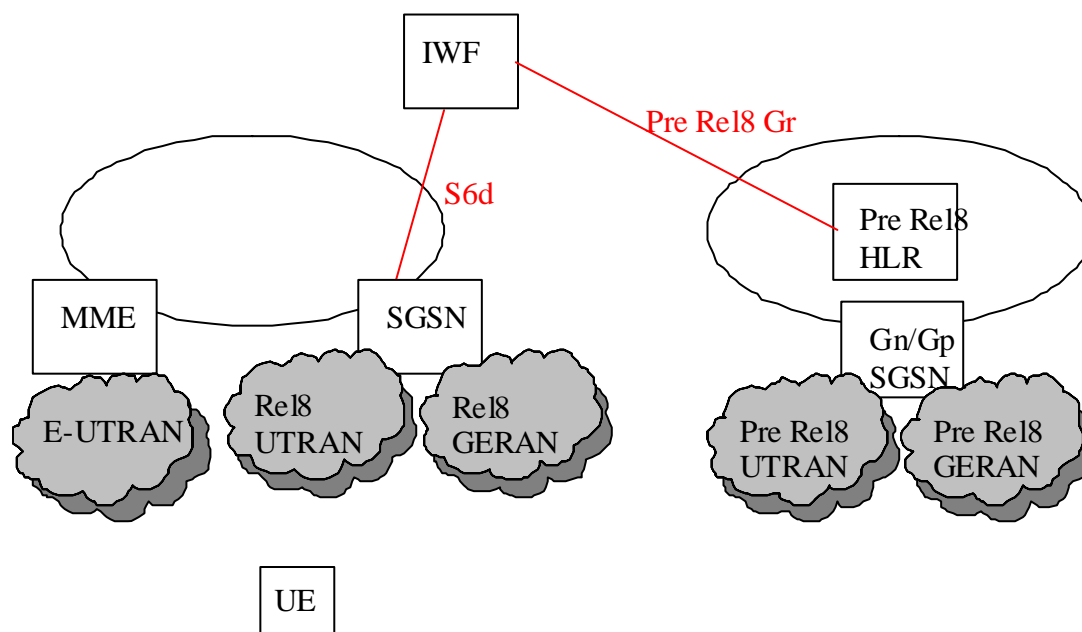


Figure 4.2.2-2 IWF Scenario one network deployment: visited EPS with E-UTRAN and UTRAN/GERAN, home Pre Rel8 UMTS/GPRS only

The subscription data for Pre Rel8 Gn/Gp SGSN is downloaded to SGSN. Mapping of the subscription data is done on SGSN. Security solution is not needed because the security mechanism in visited and home network is the same.

4.3 Scenario Two: S6a/S6d - Rel8 Gr interworking scenario with one IWF

4.3.1 General Description

This interworking scenario is for S6a/S6d interface based on Diameter and Rel8 Gr interface based on MAP with one IWF in the path.

This IWF scenario can be an inter PLMN use case.

This IWF scenario can be an intra PLMN use case for operator to do the partly update of their legacy network.

This interworking scenario is described as below:

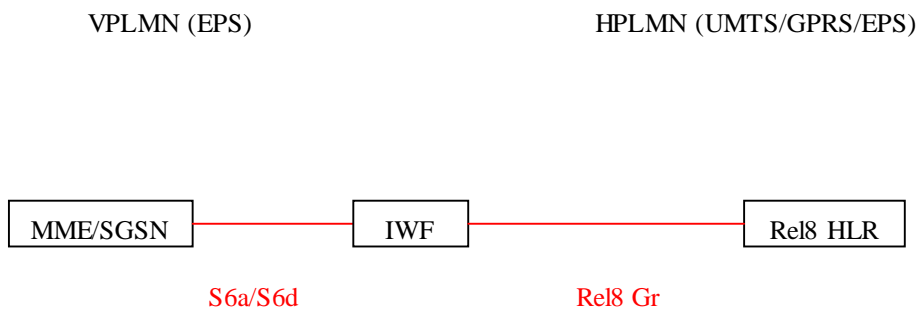


Figure 4.3.1-1 S6a/S6d - Rel8 Gr interworking scenario with one IWF

4.3.2 Network Deployments

This IWF scenario will apply the following network deployment situation:

- Users of a Rel8 UMTS/GPRS network access into a visited EPS with only E-UTRAN, which is described as below:

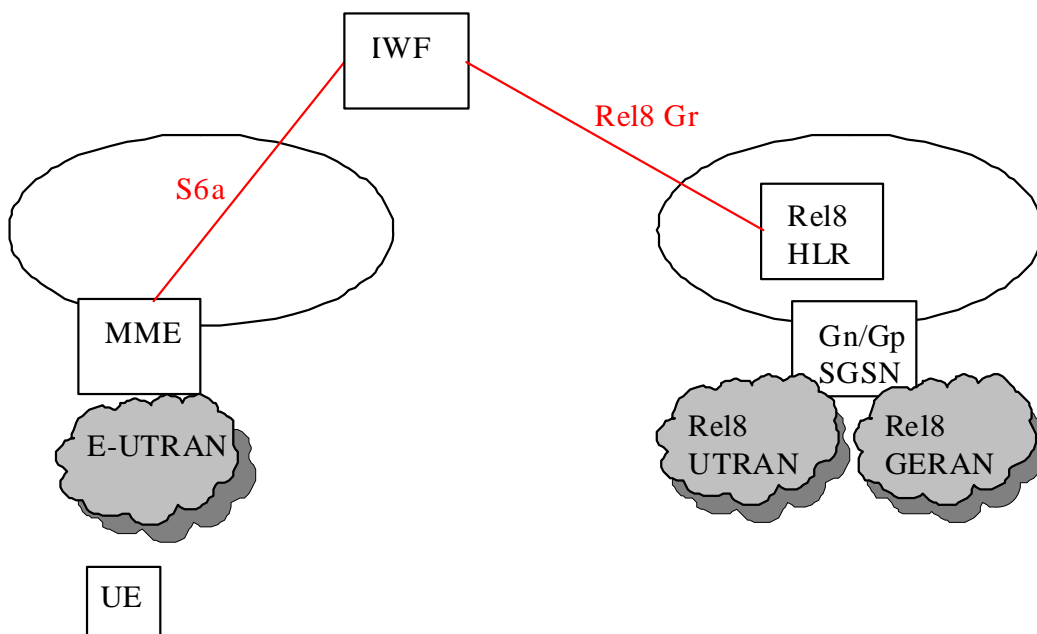


Figure 4.3.2-1 IWF Scenario two network deployment: visited EPS with E-UTRAN only, home Rel8 UMTS/GPRS only

The subscription data for Rel8 Gn/Gp SGSN is downloaded to MME. Mapping of the subscription data is done on MME. Additional security solution is needed in which the Pre Rel8 HLR can be changed.

- Users of a Rel8 UMTS/GPRS network access into a visited EPS with E-UTRAN and UTRAN/GERAN, which is described as below:

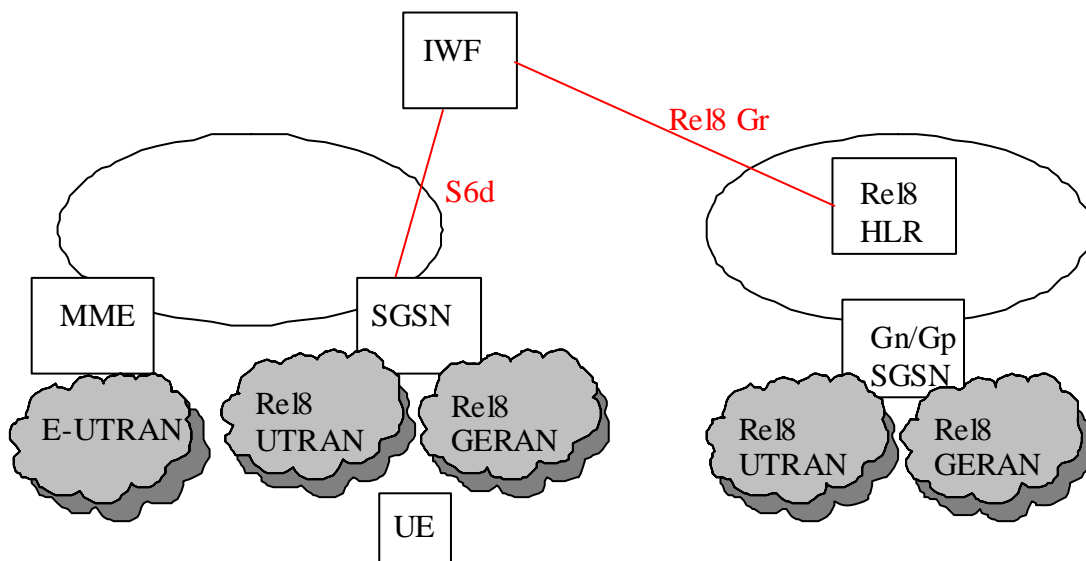


Figure 4.3.2-2 IWF Scenario two network deployment: visited EPS with E-UTRAN and UTRAN/GERAN, home Rel8 UMTS/GPRS only

The subscription data for Rel8 Gn/Gp SGSN is downloaded to SGSN. Mapping of the subscription data is done on SGSN. Security solution is not needed because the security mechanism in visited and home network is the same.

- Users of a Pre Rel8 UMTS/GPRS/E-UTRAN network access into a visited EPS with E-UTRAN and UTRAN/GERAN, which is described as below:

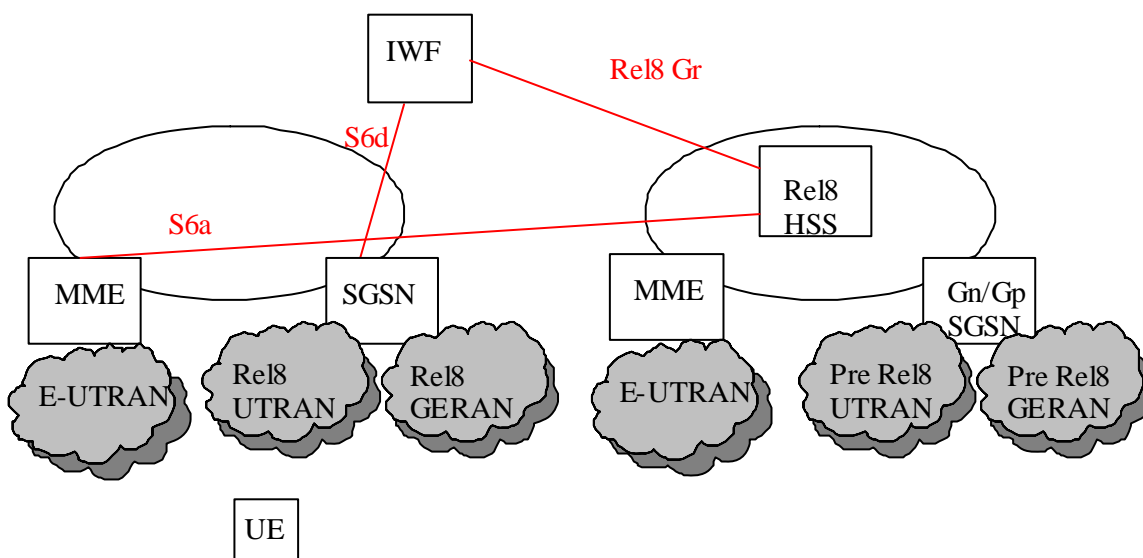


Figure 4.3.2-3 IWF Scenario two network deployment: visited EPS with E-UTRAN and UTRAN/GERAN, home EPS with E-UTRAN only and Pre Rel8 UMTS/GPRS

The subscription data for Pre Rel8 Gn/Gp SGSN and the subscription data for MME is downloaded to SGSN. Mapping of the subscription data is done on SGSN. Security solution is not needed because the security mechanism in visited and home network is the same.

4.4 Scenario Three: S6a/S6d - S6a/S6d interworking scenario with two IWFs

4.4.1 General Description

This interworking scenario is for S6a/S6d interface based on Diameter, S6a/S6d interface based on Diameter and SS7/MAP based roaming agreement with two IWFs in the path.

With this interworking scenario, two EPS operators can reuse the SS7 based roaming agreement.

This IWF scenario can only be an inter PLMN use case in which the two IWFs are in the VPLMN and HPLMN separately.

This interworking scenario is described as below:

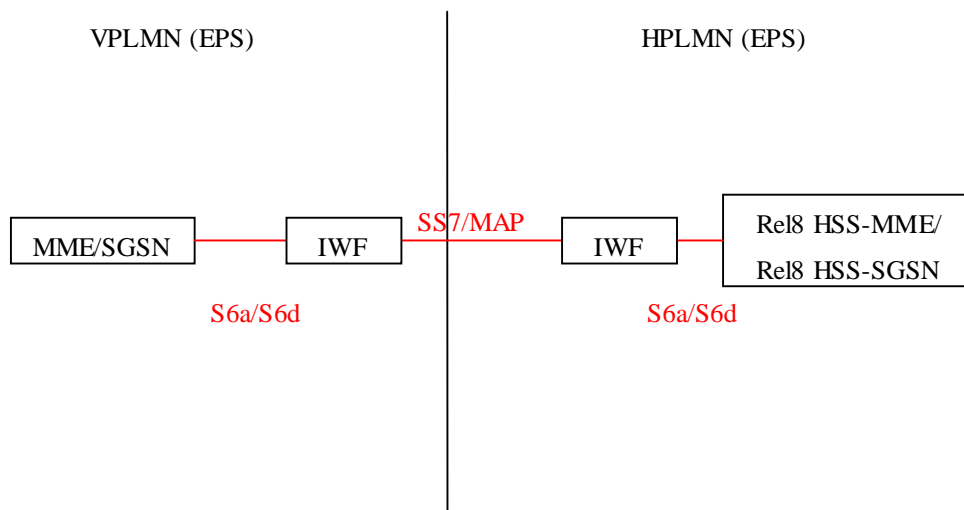


Figure 4.4.1-1 S6a/S6d - S6a/S6d interworking scenario with two IWFs

4.4.2 Network Deployments

This IWF scenario will apply the following network deployment situation:

- Users of a Pre Rel8 UMTS/GPRS/EPS for UTRAN/GERAN and E-UTRAN network access into a visited EPS with only E-UTRAN, which is described as below:

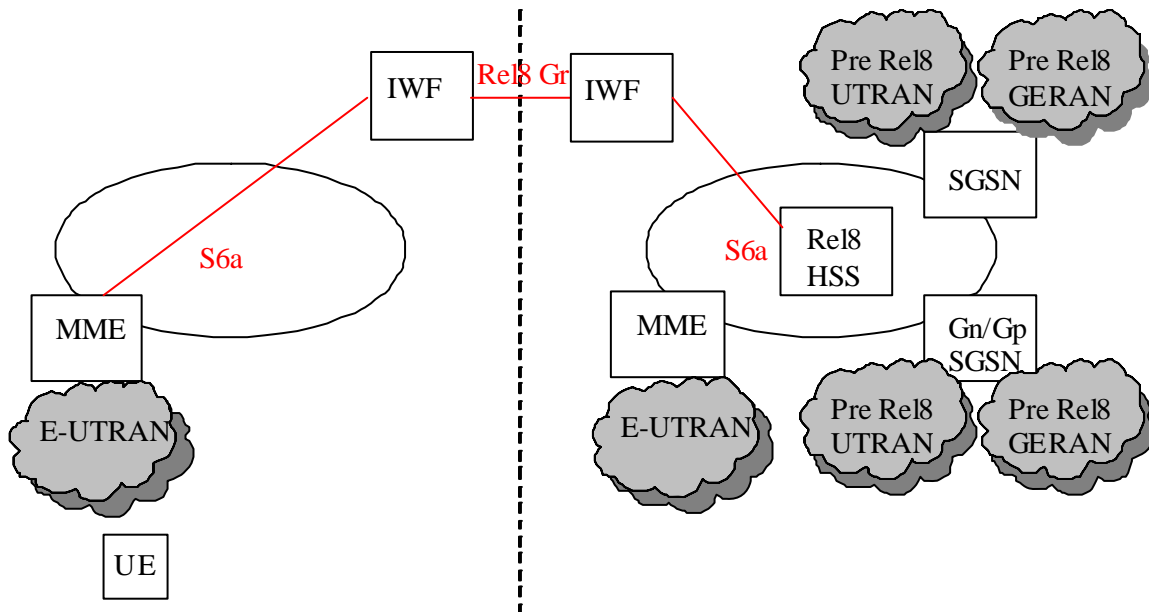


Figure 4.4.2-1 IWF Scenario three network deployment: visited EPS with E-UTRAN only, home EPS with E-UTRAN and UTRAN/GERAN and Pre Rel8 UMTS/GPRS

The subscription data for Pre Rel8 Gn/Gp SGSN, subscription data for SGSN and the subscription data for MME is downloaded to MME. MME picks up the subscription data for MME and discards the subscription data for Pre Rel8 UMTS/GPRS and the subscription data for SGSN.

- Users of a Pre Rel8 UMTS/GPRS/EPS for UTRAN/GERAN and E-UTRAN network access into a visited EPS with E-UTRAN and UTRAN/GERAN, which is described as below:

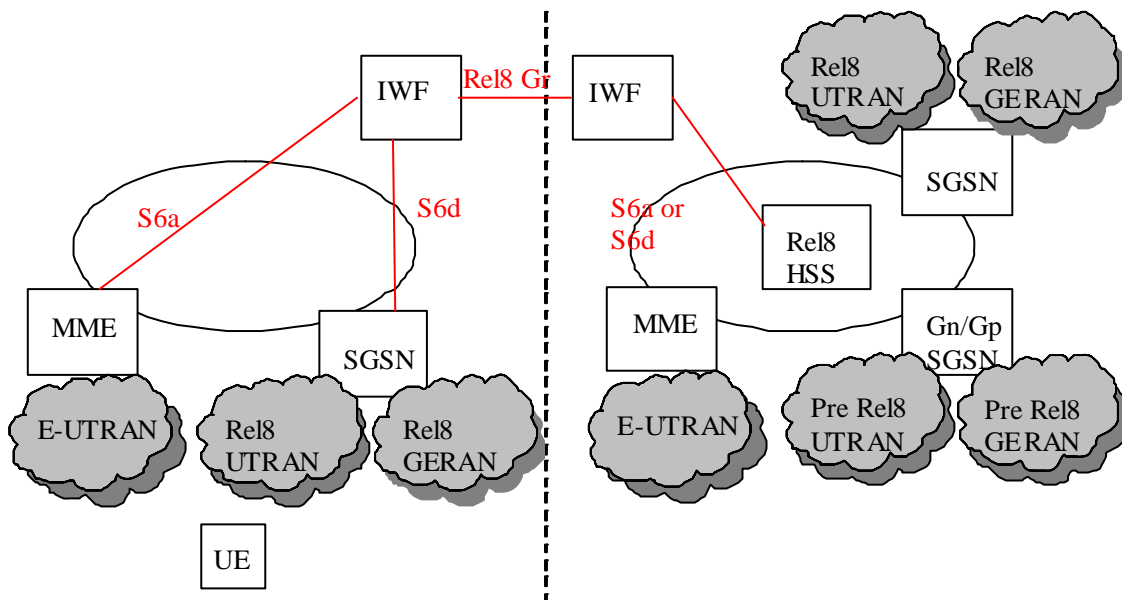


Figure 4.4.2-2 IWF Scenario three network deployment: visited EPS with E-UTRAN only and UTRAN/GERAN, home EPS with E-UTRAN and UTRAN/GERAN and Pre Rel8 UMTS/GPRS

The subscription data for Pre Rel8 Gn/Gp SGSN, subscription data for SGSN and the subscription data for MME is downloaded to SGSN or MME. SGSN or MME picks up the subscription data for SGSN or MME and discards the subscription data for Pre Rel8 UMTS/GPRS and the subscription data for MME or SGSN.

- Users of an EPS for UTRAN/GERAN and E-UTRAN network access into a visited EPS with only E-UTRAN, which is described as below:

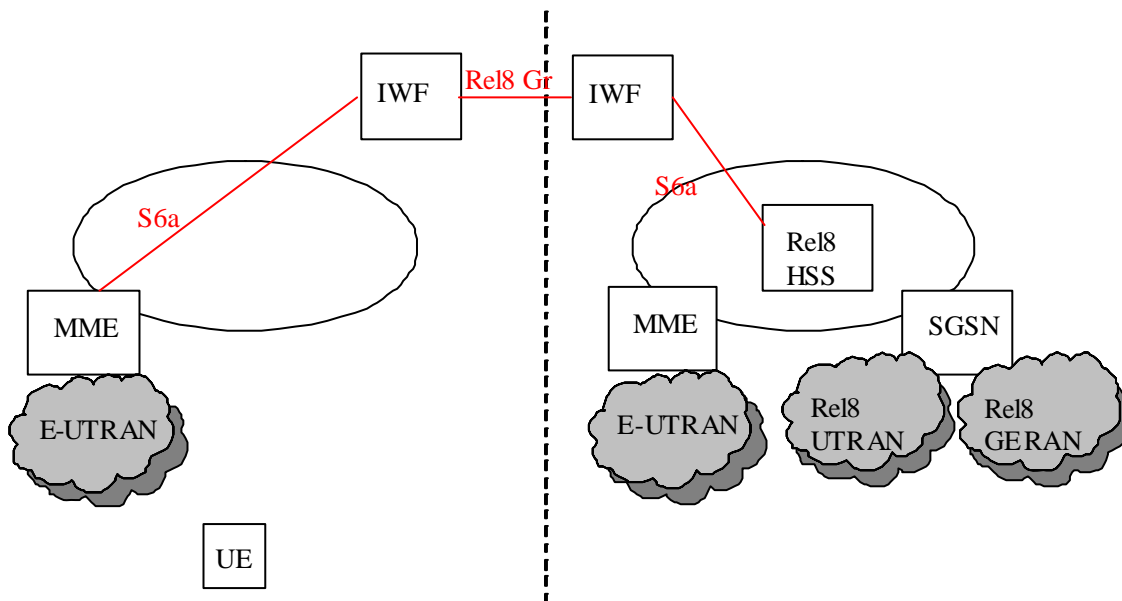


Figure 4.4.2-3 IWF Scenario three network deployment: visited EPS with E-UTRAN only, home EPS with E-UTRAN and UTRAN/GERAN

The subscription data for SGSN and the subscription data for MME is downloaded to MME. MME picks up the subscription data for MME and discards the subscription data for the subscription data for SGSN.

- Users of an EPS for UTRAN/GERAN and E-UTRAN network access into a visited EPS with E-UTRAN and UTRAN/GERAN, which is described as below:

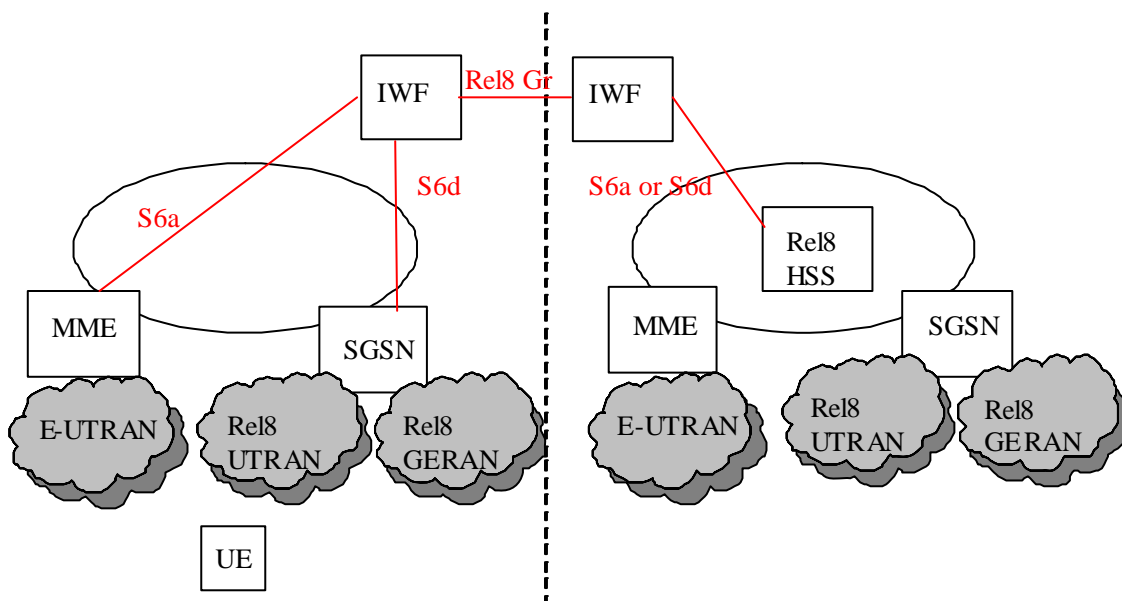


Figure 4.4.2-4 IWF Scenario three network deployment: visited EPS with E-UTRAN and UTRAN/GERAN, home EPS with E-UTRAN and UTRAN/GERAN

The subscription data for SGSN and the subscription data for MME is downloaded to SGSN or MME. SGSN or MME picks up the subscription data for SGSN or MME and discards the subscription data for MME or SGSN.

- Users of a Pre Rel8 UMTS/GPRS/EPS for E-UTRAN only network access into a visited EPS with only E-UTRAN, which is described as below:

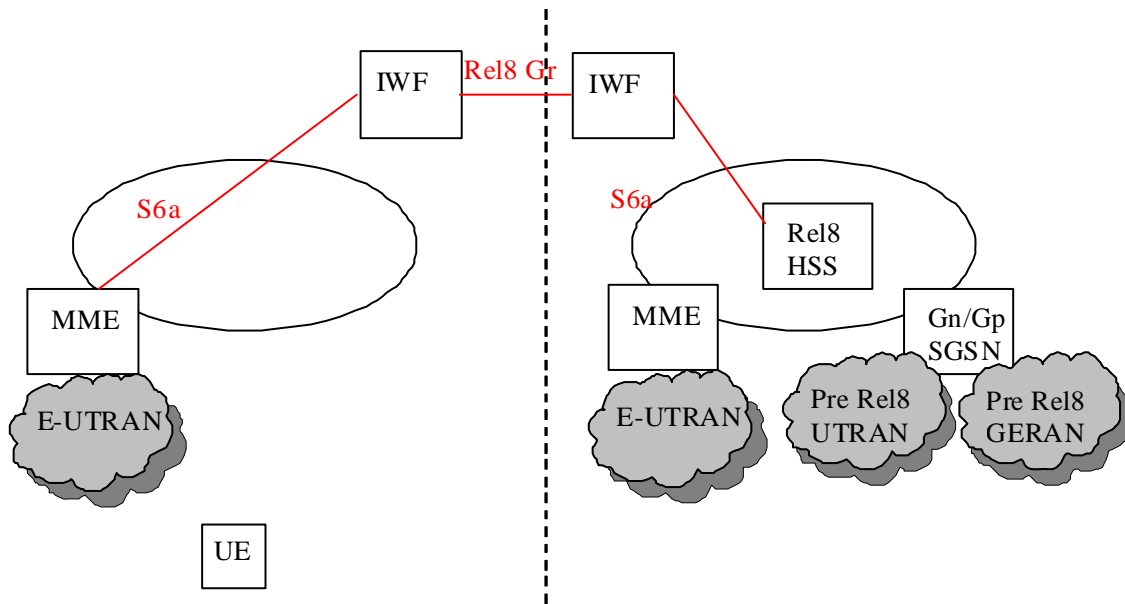


Figure 4.4.2-5 IWF Scenario three network deployment: visited EPS with E-UTRAN only, home ESP with E-UTRAN only and Pre Rel8 UMTS/GPRS

The subscription data for Pre Rel8 Gn/Gp SGSN and the subscription data for MME is downloaded to MME. MME picks up the subscription data for MME and discards the subscription data for Pre Rel8 Gn/Gp SGSN.

NOTE: This IWF scenario can not be used for interworking between two EPS network with only E-UTRAN in which there in no MAP based roaming agreement to be reused.

4.5 Scenario Four: S13/S13' - Gf interworking scenario with one IWF

4.5.1 General Description

This interworking scenario is for S13/S13' interface based on Diameter and Gf interface based on MAP with one IWF in the path.

This IWF scenario can only be an intra PLMN use case for operator to do the partly update of their legacy network.

This interworking scenario is described as below:

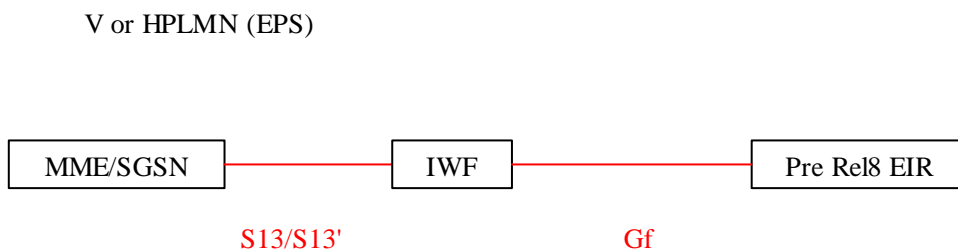


Figure 4.5.1-1 S13/S13' - Gf interworking scenario with one IWF

4.5.2 Network Deployments

This IWF scenario will apply the following network deployment situation:

- ME identity/IMEISV of a user from a Pre Rel8 UMTS/GPRS network can be checked in a visited EPS with E-UTRAN only, which is described as below:

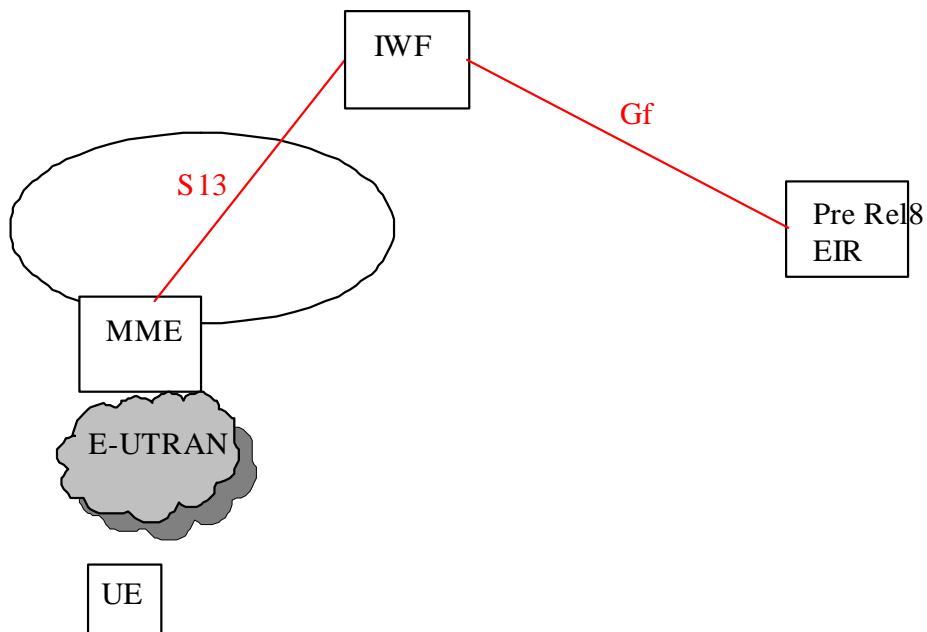


Figure 4.5.2-1 IWF Scenario for network deployment: UE access from EPS with E-UTRAN only

- ME identity/IMEISV of a user from a Pre Rel8 UMTS/GPRS network can be checked in a visited EPS with E-UTRAN and UTRAN/GERAN, which is described as below:

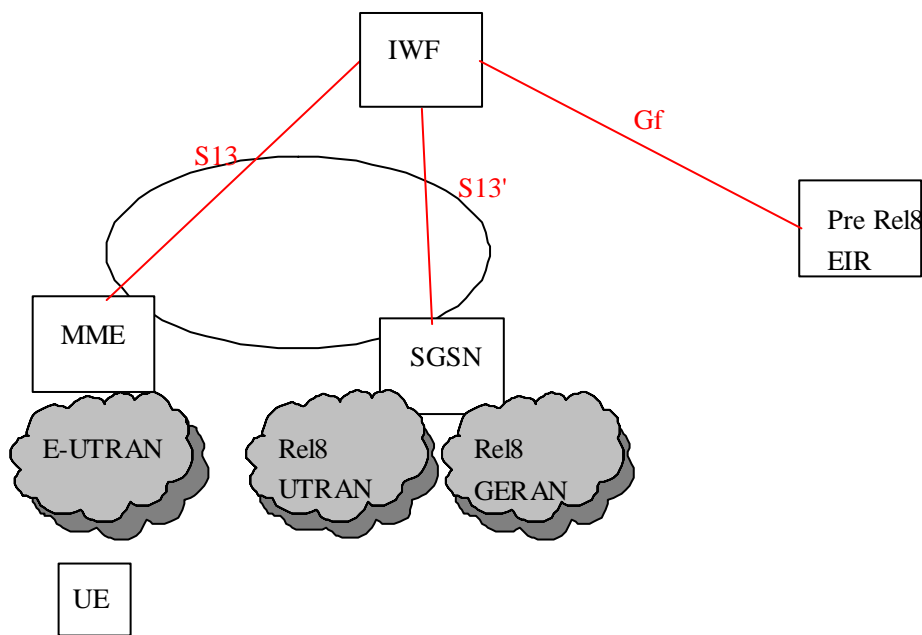


Figure 4.5.2-2 IWF Scenario for network deployment: UE access from EPS with E-UTRAN and UTRAN/GERAN

5 General issues

5.1 Message Routing Mechanism

The principles for IWF message routing are:

- For the same user, the messages shall go to and come back through the same route with the same IWF(s) for the duration of a MAP dialog.
- To ensure the correct message routing for the interworking scenarios, the IWFs in the network shall be able to map the SS7 number and the Diameter identity of the MME/SGSN 1-to-1. This may be achieved by static or dynamic configuration.
- To ensure the parallel multiple request messages can get their correct response messages, the IWFs in the network shall be able to map the MAP Dialogue Id and the Diameter Session Id 1-to-1.

The overall message routing mechanism for the scenario is described as below:

1. The MME/SGSN may not be able to identify whether there is an IWF or not on the route to an HSS. The routing of the first message from the MME/SGSN to the IWF/HSS is the same as for a normal Diameter message routing. If the MME/SGSN knows the address/name of the IWF/HSS for a certain user, both the Destination-Realm and Destination-Host AVPs shall be present in the request. Otherwise, only the Destination-Realm AVP shall be present and the command shall be routed to the next Diameter node based on the Diameter routing table in the client.

When the MME/SGSN receives an answer message from the IWF/HSS, it should store the identity of the IWF/HSS for each IMSI for future reference to be able to send messages for the same IMSI.

2. The IWF shall assign an SS7 number for the Diameter node MME/SGSN and shall assign a Diameter identity for the SS7 node HSS. This may be achieved by static configuration or dynamic assignment when the first signalling exchange occurs between the Diameter/SS7 nodes and the IWF. The IWF shall maintain a mapping table (address mapping table) for the assignment relationship.

When a Diameter message reaches the IWF to set up a new Diameter session, the IWF(s) shall allocate a MAP Dialogue Id for the Diameter session. The IWF(s) shall maintain a mapping table (session mapping table) between the MAP Dialogue Id and the Diameter Session Id.

The IWF shall then process messages as described below:

- a. When the IWF receives a Diameter message from a Diameter node, it shall map the Diameter message to a MAP message. It shall obtain a MAP Dialogue Id from the Diameter Session Id in the received message according to the session mapping table. The IWF shall obtain the source/destination SS7 Number from the source/destination Diameter Identity in the received message according to the address mapping table.
 - b. When the IWF receives an SS7 message from an SS7 node, it shall map the MAP message to a Diameter message. It shall obtain the Diameter Session Id from the MAP Dialogue Id in the received message according to the session mapping table. The IWF shall obtain the source/destination Diameter Identity from the source/destination SS7 Number in the received message according to the address mapping table.
3. When the HSS/HLR receives the first message from IWF/SGSN, the HSS/HLR shall record the SS7 number of the source for future message handling.

5.2 Void

5.3 Security Consideration for IWF

To support the full EPS-AKA security level for the related IWF scenarios, the Pre Rel8 HLR shall be upgraded so that E-UTRAN authentication vector requests from nodes serving E-UTRAN can be identified. The detailed mechanism is described in 3GPP TS 33.401 [2].

6 The Interworking Scenarios

6.1 One IWF scenario

In this scenario, one IWF is located between MME or SGSN or combined MME/SGSN and HSS or one IWF is located between MME and EIR, as illustrated in figure 6.1-1:

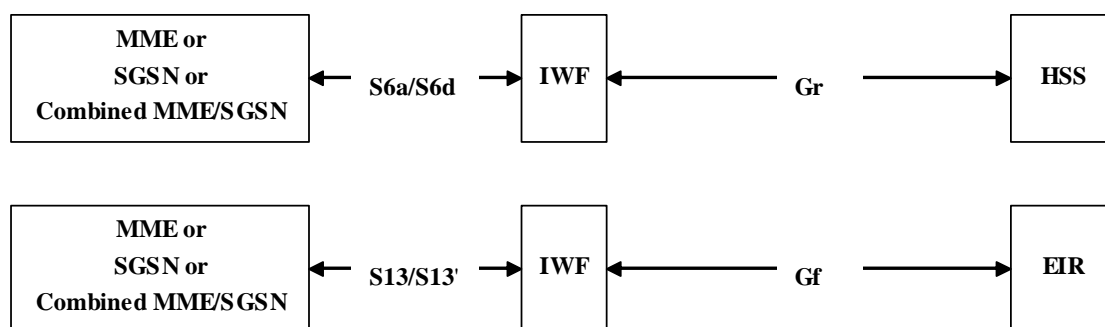


Figure 6.1.-1: One IWF scenarios

The IWF needs not to be aware whether its connection via Gr is to an HSS or to a second IWF (see Two IWF scenario).

6.2 Two IWF scenario

In this scenario, two IWFs are located between MME or SGSN or combined MME/SGSN and HSS, as illustrated in figure 6.2-1:

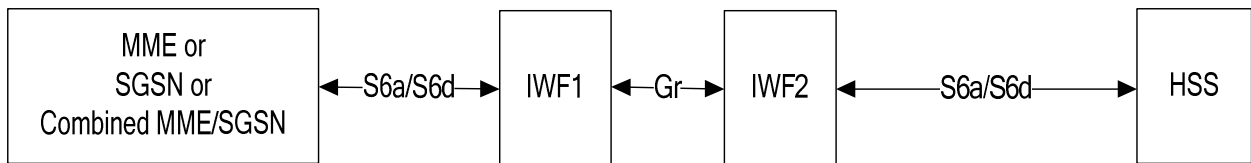


Figure 6.2-1: Two IWFs scenario

The IWF1 is located in the VPLMN. IWF2 is located in the HPLMN. The IWF1 needs not to be aware whether its connection via Gr is to an IWF or to an HSS (see One IWF scenario).

7 The Mapping of the Procedures

7.1 Authentication Information Retrieval

7.1.1 One IWF Scenario

The mapping of procedures for this scenario is shown in figure 7.1.1-1:

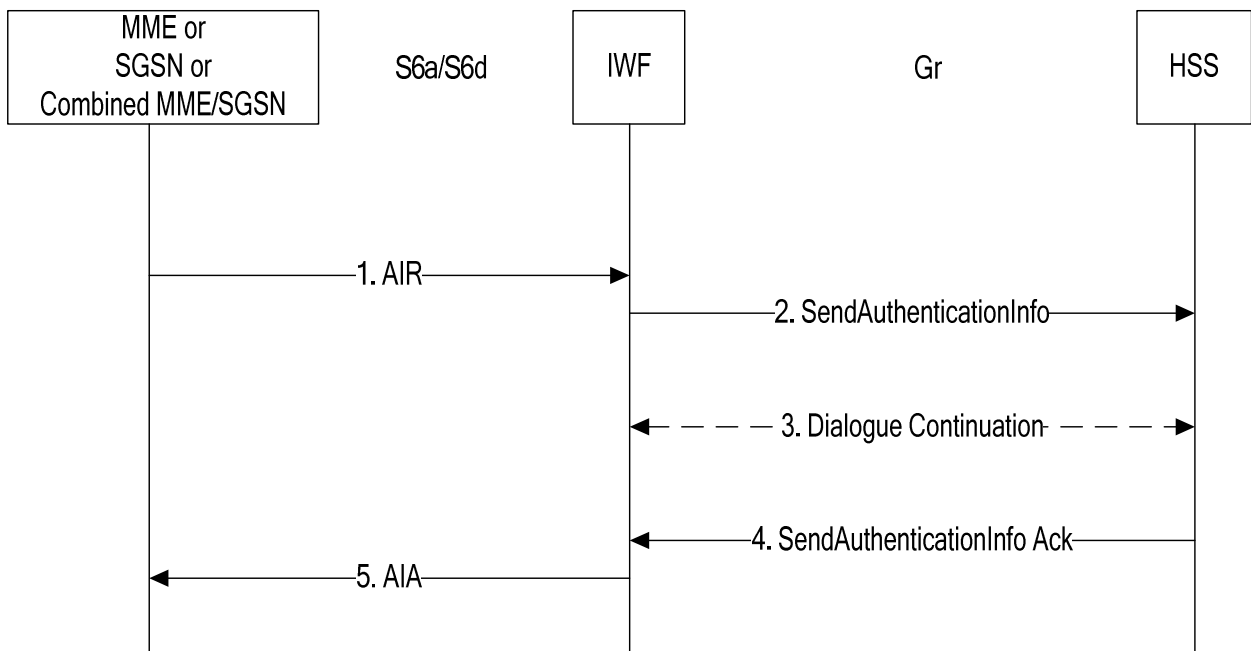


Figure 7.1.1-1: Mapping of Authentication Info Retrieval Procedure for scenario with one IWF

1. The IWF receives an AIR message from the MME, SGSN or combined MME/SGSN.
2. The IWF opens a MAP v3 dialogue towards the HSS by sending SendAuthenticationInfo.
3. The HSS may initiate MAP version fallback and/or send partial results. The IWF performs the version fallback and/or stores the partial results. If EPS-Vectors are requested for immediate use, version fallback is not applicable;
4. The HSS closes the MAP dialogue by sending the (final) SendAuthenticationInfo Ack to the IWF.
5. The IWF uses the information received from the HSS to construct an AIA which is sent to the MME, SGSN, or combined MME/SGSN.

7.1.2 Two IWFs Scenario

The mapping of procedures for this scenario is shown in figure 7.1.2-1:

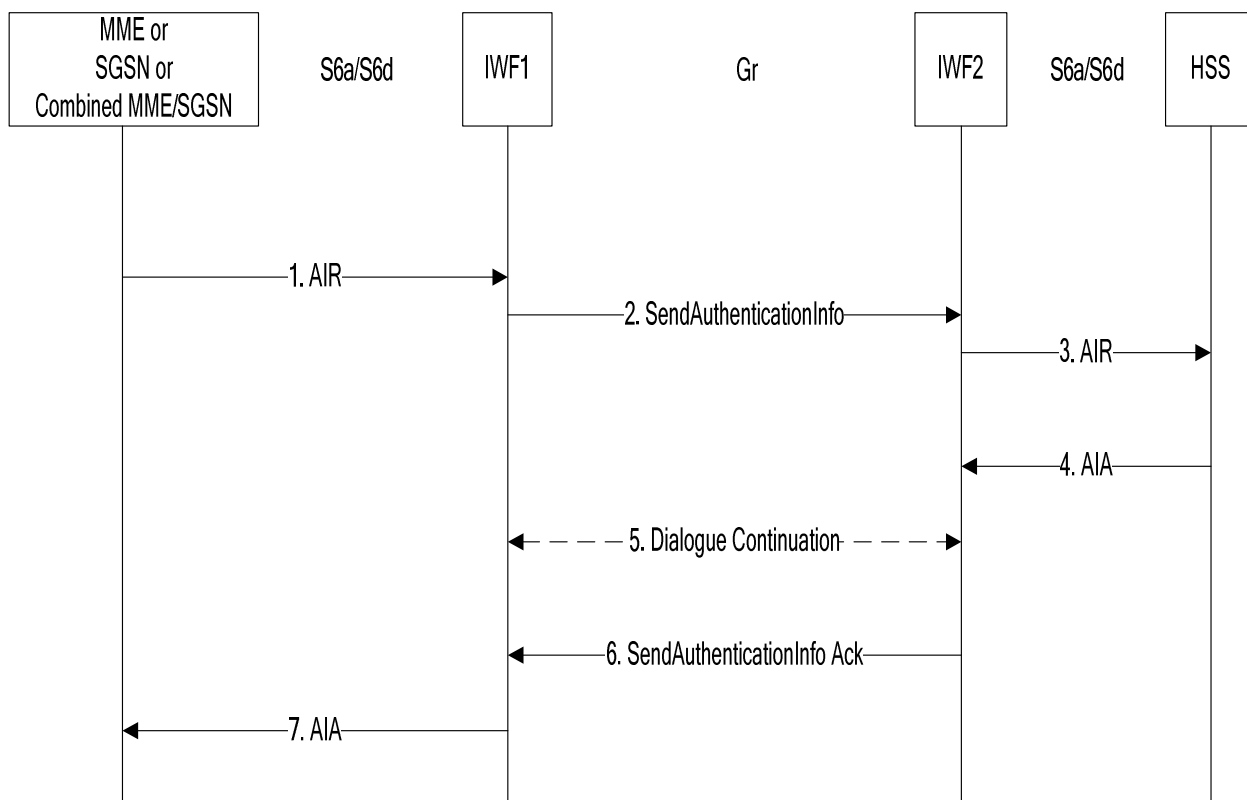


Figure 7.1.2-1: Mapping of Authentication Info Retrieval Procedure for scenario with two IWFs

1. The IWF1 receives an AIR message from the MME, SGSN or combined MME/SGSN.
2. The IWF1 opens a MAP v3 dialogue towards IWF2 by sending SendAuthenticationInfo.
3. The IWF2 constructs an AIR message and sends it to the HSS.
4. The IWF2 receives AIA from the HSS.
5. If segmentation is required, the IWF2 sends partial results to the IWF1 which stores the partial results.
6. The IWF2 closes the MAP dialogue by sending the (final) SendAuthenticationInfo Ack to IWF1.
7. The IWF1 uses the information received from the IWF2 to construct an AIA which is sent to the MME, SGSN, or combined MME/SGSN.

7.2 Update Location

7.2.1 One IWF Scenario

The mapping of procedures for this scenario is shown in figure 7.2.1-1:

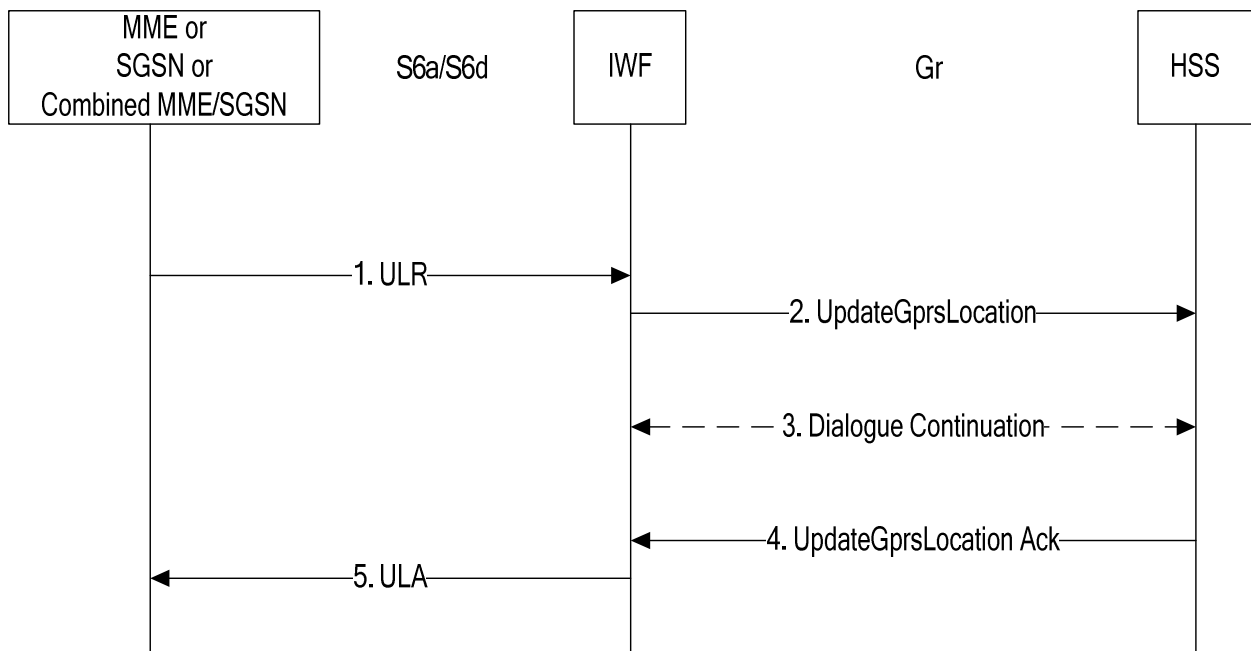


Figure 7.2.1-1: Mapping of Update Location Procedure for scenario with one IWF

1. The IWF receives an ULR message from the MME, SGSN or combined MME/SGSN.
2. The IWF shall open a MAP v3 dialogue towards the HSS by sending UpdateGprsLocation.
3. Depending on "skip subscriber data" indication received in the ULR (bullet 1 above) and hence sent as per bullet 2 in the UpdateGprsLocation, the HSS may continue the MAP dialogue by sending one or several InsertSubscriberData messages (in acknowledgement mode or in burst mode) to the IWF. The IWF then temporarily stores the received data and sends InsertSubscriberData Ack messages to the HSS.

Note that the HSS may send InsertSubscriberData messages although a "skip subscriber data" indication was present. In this case InsertSubscriberData messages received from the HSS shall be acknowledged but need not be stored in the IWF.

When sending InsertSubscriberData Ack messages to the HSS the IWF shall mirror back any services requested by the HSS (within the InsertSubscriberData message) but not supported by the MME or SGSN or combined MME/SGSN (as indicated in 1.ULR). The IWF shall reject a MAP ActivateTraceMode message received from the HSS by returning ActivateTraceMode Error (facilityNotSupported).

If the IWF received a MAP ActivateTraceMode message from the HSS, the IWF needs to store the received trace data. Based upon support of tracing (as indicated the ULR received in bullet 1 above), the MME/SGSN sends an ActivateTraceMode Result (positive Ack) or Error FacilityNotSupported (negative Ack) to the HSS.

4. The HSS shall close the MAP dialogue by sending UpdateGprsLocation Ack to the IWF.
5. The IWF shall use the information received from the HSS to construct an ULA which is sent to the MME, SGSN, or combined MME/SGSN.

7.2.2 Two IWFs Scenario

The mapping of procedures for this scenario is shown in figure 7.2.2-1:

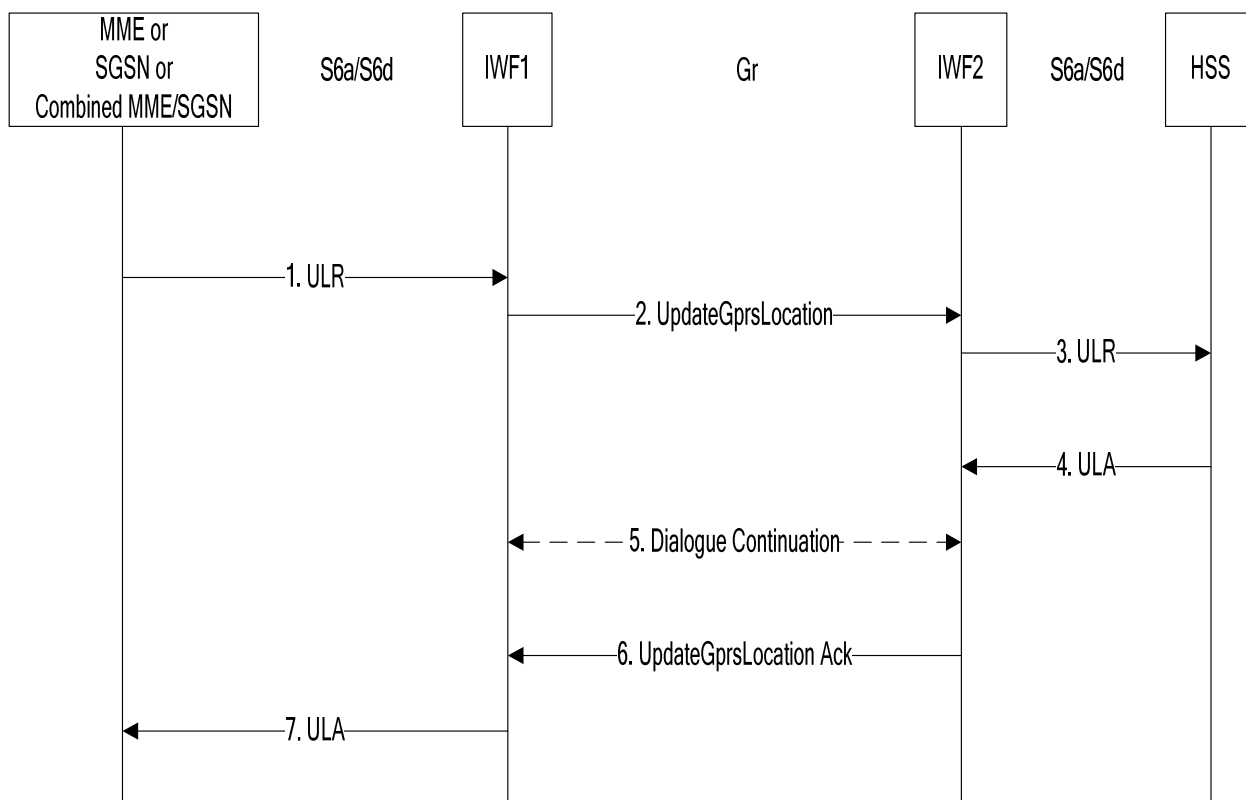


Figure 7.2.2-1: Mapping of Update Location Procedure for scenario with two IWFs

1. The IWF1 receives an ULR message from the MME, SGSN or combined MME/SGSN.
2. The IWF1 shall open a MAP v3 dialogue towards IWF2 by sending UpdateGprsLocation.
3. The IWF2 shall construct a ULR message and shall send it to the HSS.
4. The IWF2 receives ULA from the HSS.
5. If subscriber data is included in the ULA(as per bullet 4), the IWF2 shall send one or several InsertSubscriberData messages (in acknowledgement mode or in burst mode) to the IWF1. IWF1 then temporarily stores the received data and sends InsertSubscriberData Ack messages to the IWF2. If trace data is included in the ULA (bullet 4. above) , the IWF2 sends an ActivateTraceMode message to the IWF1, which sends an ActivateTraceMode Ack message to the IWF2.
6. The IWF2 shall close the MAP dialogue by sending UpdateGprsLocation Ack to IWF1.
7. The IWF1 shall use the information received from the IWF2 to construct an ULA which shall be sent to the MME, SGSN, or combined MME/SGSN.

7.3 Cancel Location

7.3.1 One IWF Scenario

The mapping of procedures for this scenario is shown in figure 7.3.1-1:

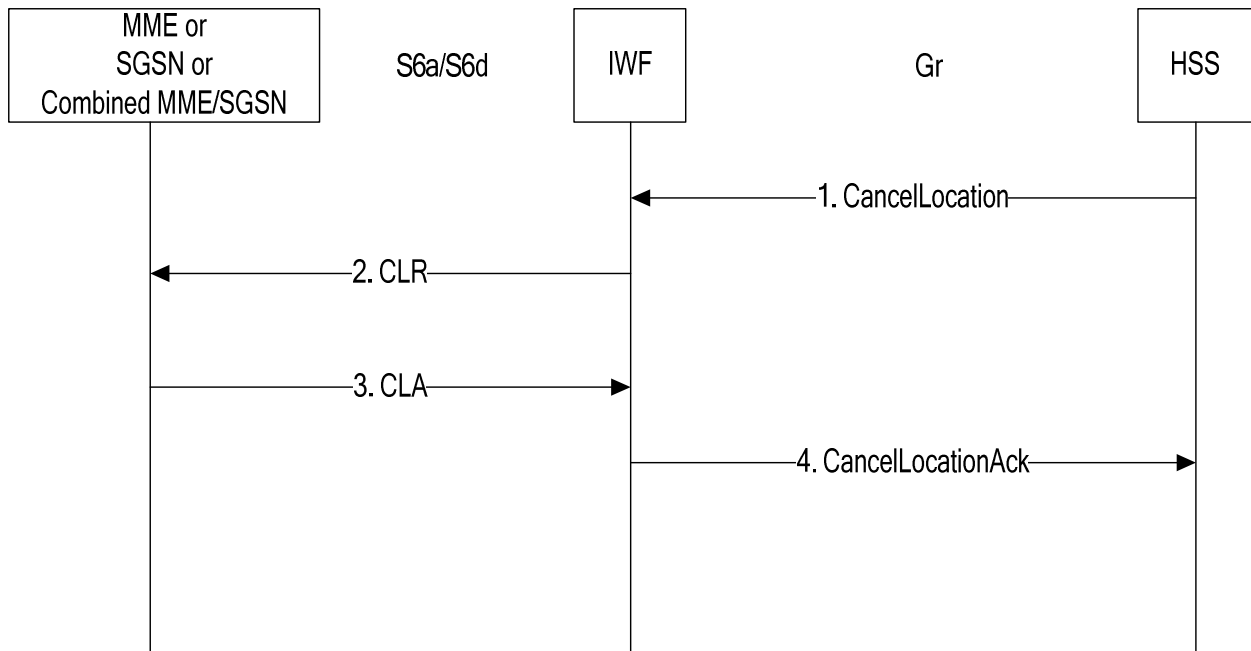


Figure 7.3.1-1: Mapping of Cancel Location Procedure for scenario with one IWF

1. The IWF receives a CancelLocation MAP v3 message from the HSS (the IWF shall reject CancelLocation messages in version <3 and shall initiate version fallback when receiving CancelLocation messages in versions >3; not shown in figure 7.3.1-1).
2. The IWF sends CLR to the MME or SGSN or combined MME/SGSN.
3. The IWF receives CLA.
4. The IWF closes the MAP dialogue with the HSS by sending CancelLocation Ack.

7.3.2 Two IWFs Scenario

The mapping of procedures for this scenario is shown in figure 7.3.2-1:

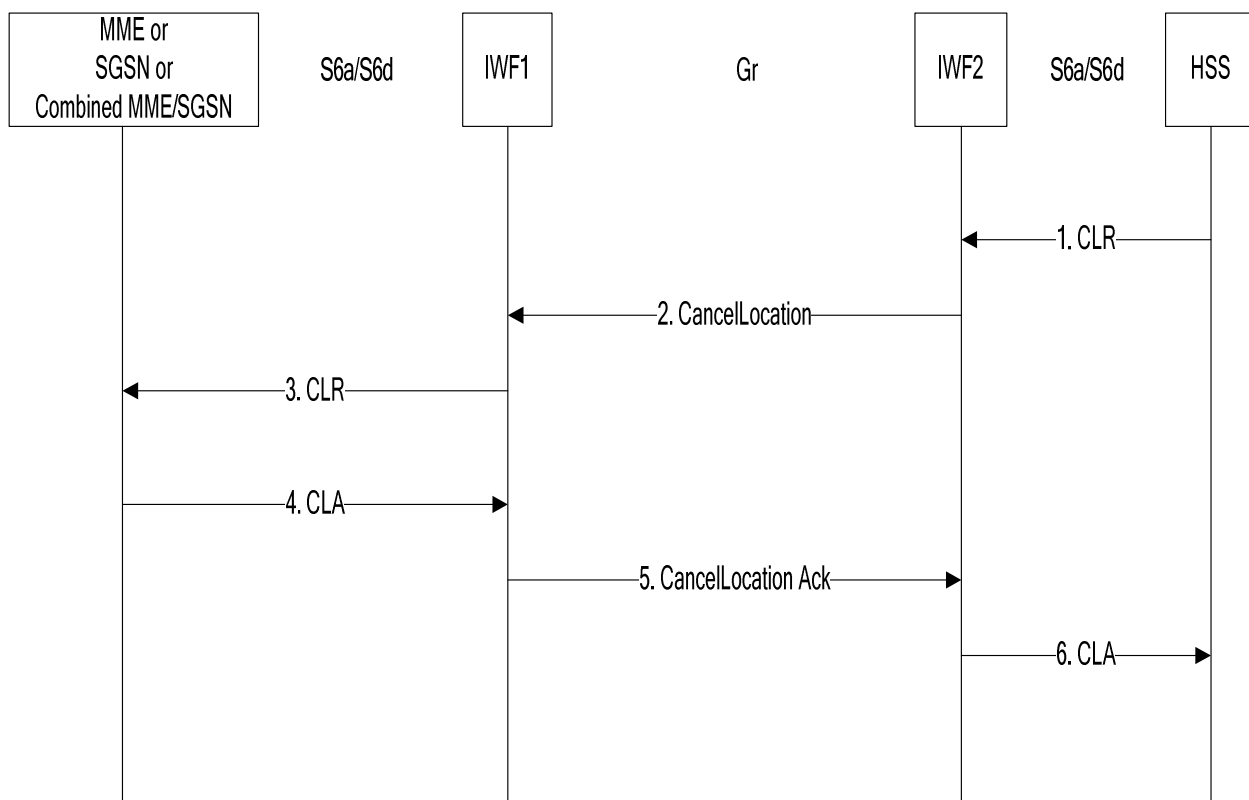


Figure 7.3.2-1: Mapping of Cancel Location Procedure for scenario with two IWFs

1. The IWF2 receives a CLR message from the HSS.
2. The IWF2 opens a MAP v3 dialogue towards IWF1 by sending CancelLocation.
3. The IWF1 constructs a CLR message and sends it to the MME, SGSN, or combined MME/SGSN.
4. The IWF1 receives CLA from the MME, SGSN or combined MME/SGSN.
5. The IWF1 closes the MAP dialogue with the IWF2 by sending CancelLocation Ack.
6. The IWF2 sends CLA to the HSS.

7.4 Purge

7.4.1 One IWF Scenario

The mapping of procedures for this scenario is shown in figure 7.4.1-1:

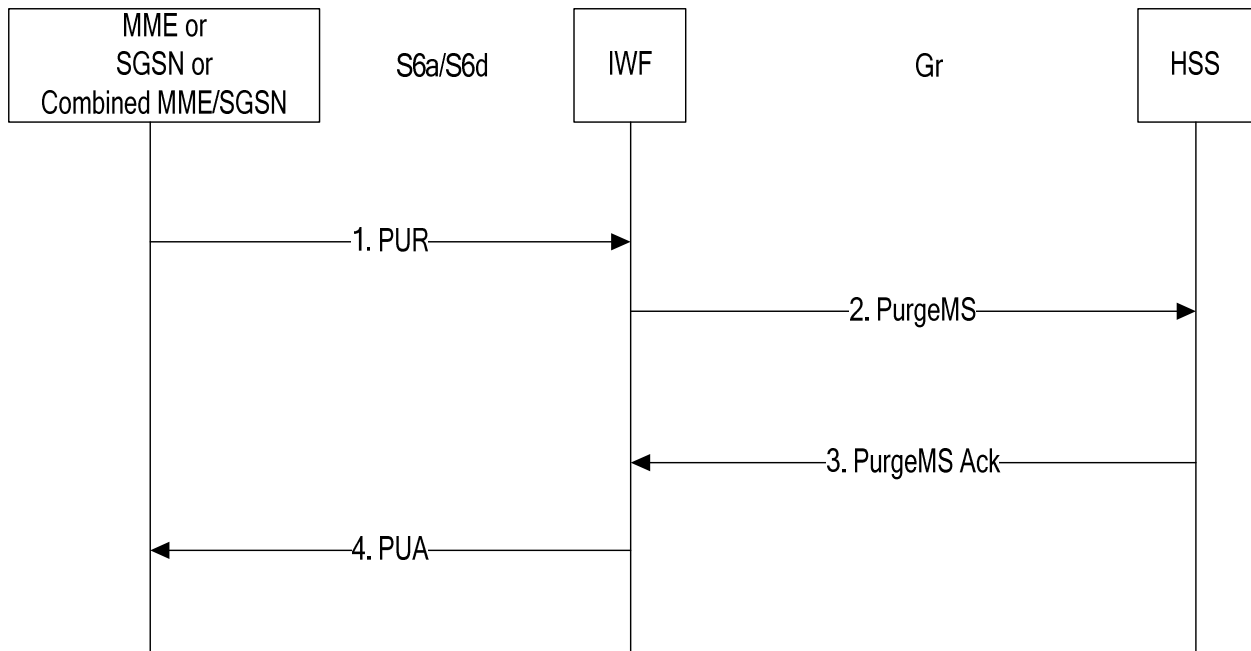


Figure 7.4.1-1: Mapping of Purge Procedure for scenario with one IWF

1. The IWF receives a PUR message from the MME, SGSN, or combined MME/SGSN.
2. The IWF opens a MAP v3 dialogue towards the HSS by sending PurgeMS.
3. The IWF receives PurgeMS Ack from the HSS.
4. The IWF sends PUA to the MME, SGSN, or combined MME/SGSN.

7.4.2 Two IWFs Scenario

The mapping of procedures for this scenario is shown in figure 7.4.2-1:

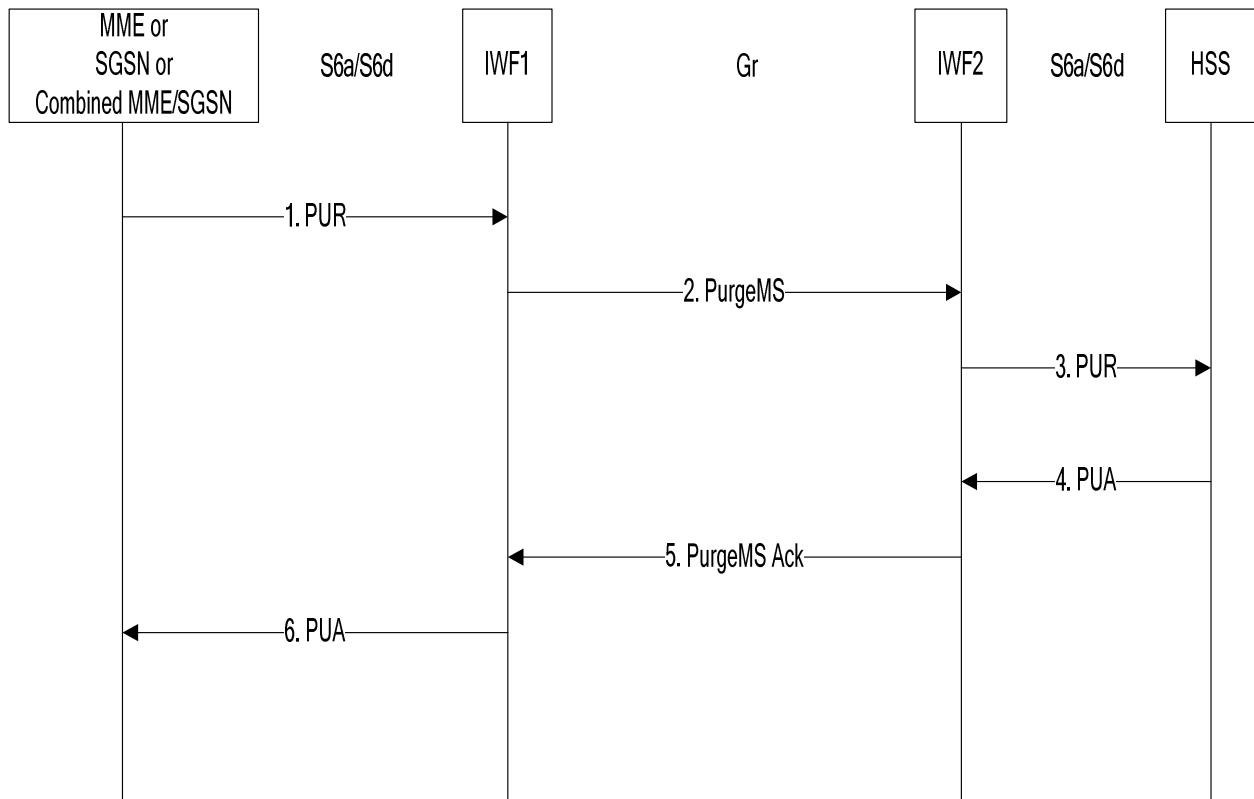


Figure 7.4.2-1: Mapping of Purge Procedure for scenario with two IWFs

1. The IWF1 receives a PUR message from the MME, SGSN, or combined MME/SGSN.
2. The IWF1 opens a MAP v3 dialogue towards IWF2 by sending PurgeMS.
3. The IWF2 constructs a PUR message and sends it to the HSS.
4. The IWF2 receives PUA from the HSS.
5. The IWF2 closes the MAP dialogue with the IWF1 by sending PurgeMS Ack.
6. The IWF1 sends PUA to the MME, SGSN, or combined MME/SGSN.

7.5 Insert Subscriber Data

7.5.1 One IWF Scenario

The mapping of procedures for this scenario is shown in figure 7.5.1-1:

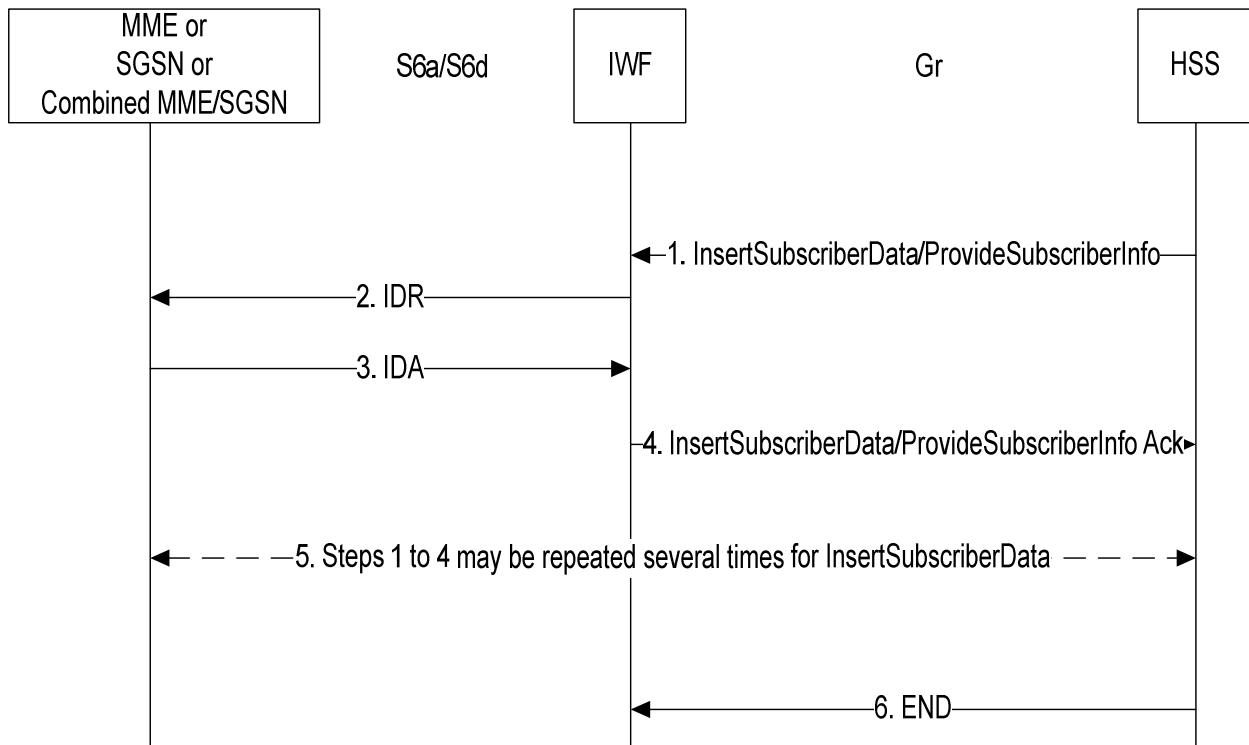


Figure 7.5.1-1: Mapping of Insert Subscriber Data Procedure for scenario with one IWF

1. The IWF receives an (stand alone) InsertSubscriberData or ProvideSubscriberInfo message from the HSS.
2. The IWF constructs an IDR message and sends it to the MME, SGSN, or combined MME/SGSN.
3. The IWF receives IDA from the MME, SGSN, or combined MME/SGSN.
4. The IWF sends InsertSubscriberData or ProvideSubscriberInfo Ack to the HSS.
5. Steps 1 to 4 may be repeated several times for InsertSubscriberData. The repetition may be in burst mode or in acknowledge mode.
6. The HSS closes the MAP dialogue.

NOTE: In a mapping procedure, the IWF correlates the MAP Dialogue ID of the MAP request message and the Diameter Session-ID of the mapped Diameter request message which is to be used in the subsequent mapping from Diameter Answer message to corresponding MAP Ack message.

7.5.2 Two IWFs Scenario

The mapping of procedures for this scenario is shown in figure 7.5.2-1:

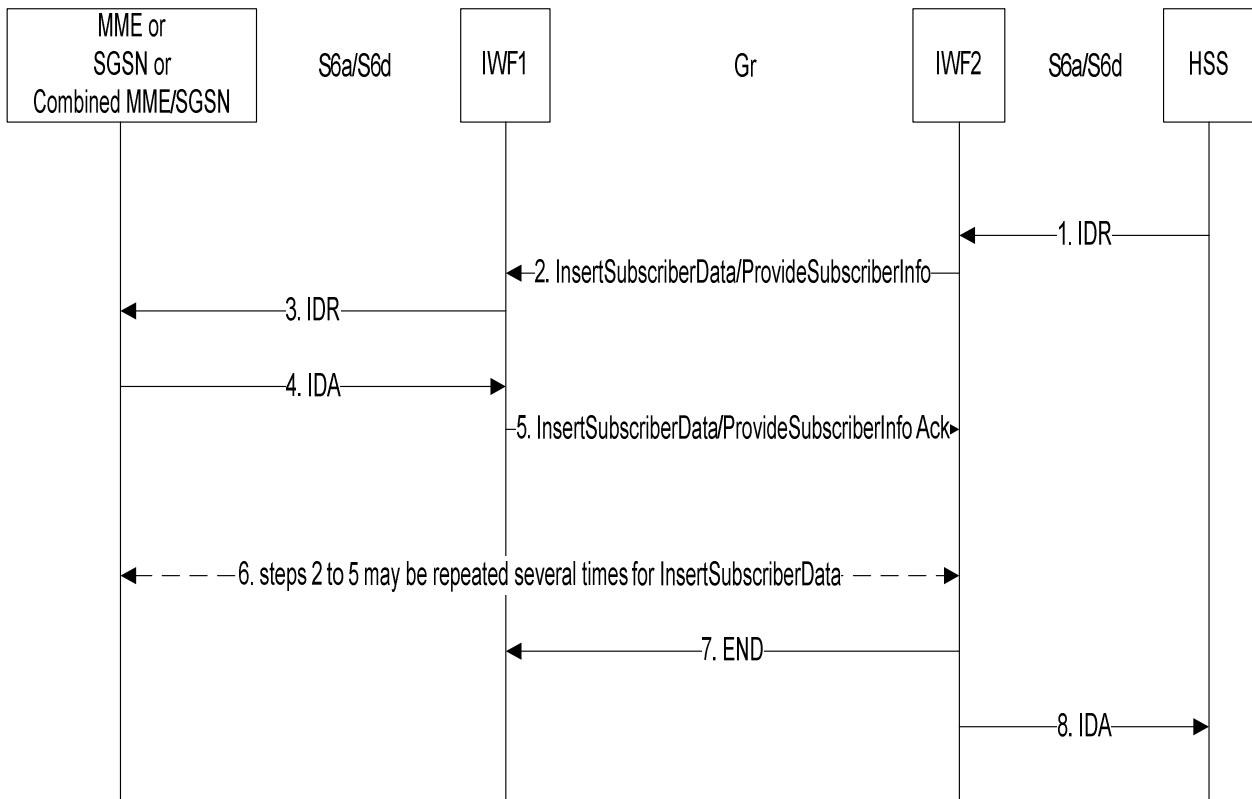


Figure 7.5.2-1: Mapping of Insert Subscriber Data Procedure for scenario with two IWFs

1. The IWF2 receives a IDR message from the HSS.
2. The IWF2 opens a MAP v3 dialogue towards IWF1 by sending InsertSubscriberData (if the IDR-Flags AVP within the IDR is not present or the "UE Reachability Request" flag was set in the IDR-Flags AVP within the IDR) or ProvideSubscriberInfo in other cases. If segmentation of the data (on MAP level) is required the IWF2 temporarily stores the data that could not be sent in this step.
3. The IWF1 constructs a IDR message and sends it to the MME, SGSN, or combined MME/SGSN.
4. The IWF1 receives IDA from the MME, SGSN, or combined MME/SGSN.
5. The IWF1 sends InsertSubscriberData or ProvideSubscriberInfo Ack to IWF2.
6. If segmentation is required for InsertSubscriberData, steps 2 to 5 are be repeated until all data are sent. Repetition may be in burst mode or in acknowledge mode.
7. IWF2 closes the MAP dialogue with IWF1.
8. IWF2 sends IDA to the HSS.

NOTE: In a mapping procedure, the IWFs correlates the MAP Dialogue ID of the MAP request message and the Diameter Session-ID of the mapped Diameter request message which is to be used in the subsequent mapping from Diameter Answer message to corresponding MAP Ack message or vice versa.

7.6 Delete Subscriber Data

7.6.1 One IWF Scenario

The mapping of procedures for this scenario is shown in figure 7.6.1-1:

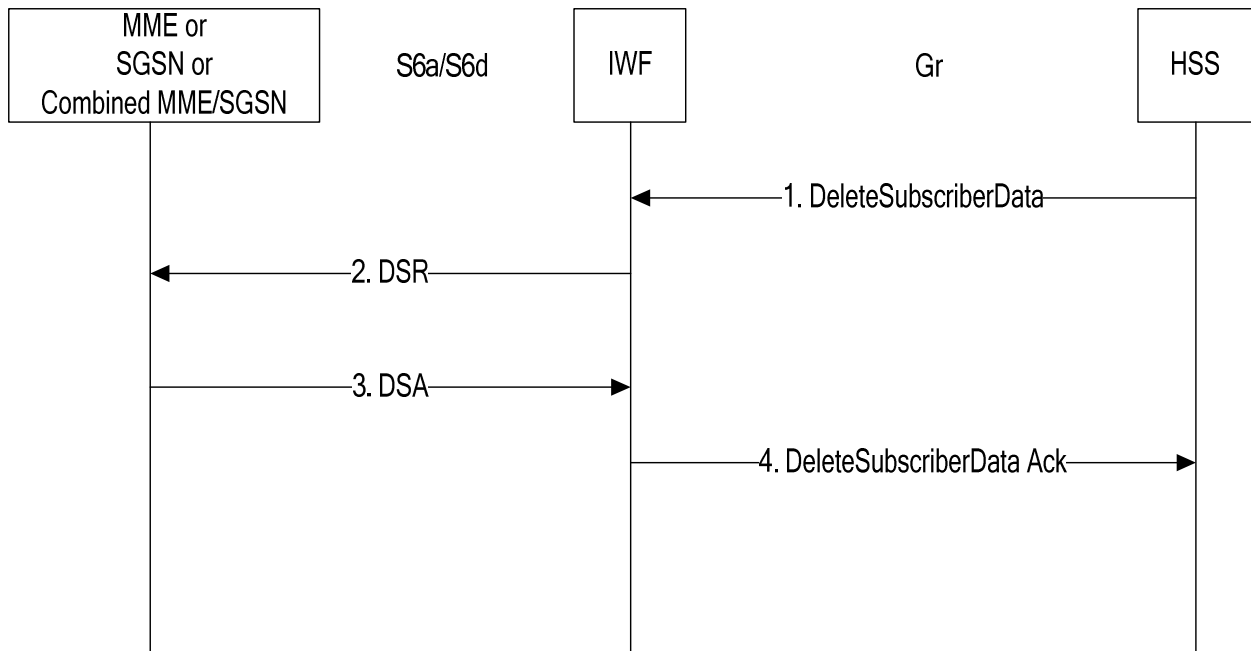


Figure 7.6.1-1: Mapping of Delete Subscriber Data Procedure for scenario with one IWF

1. The IWF receives a DeleteSubscriberData MAP v3 message from the HSS (the IWF shall reject DeleteSubscriberData messages in version <3 and shall initiate version fallback when receiving DeleteSubscriberData messages in versions >3; not shown in figure 7.6.1-1).
2. The IWF sends DSR to the MME or SGSN or combined MME/SGSN.
3. The IWF receives DSA.
4. The IWF closes the MAP dialogue with the HSS by sending DeleteSubscriberData Ack.

7.6.2 Two IWFs Scenario

The mapping of procedures for this scenario is shown in figure 7.6.2-1:

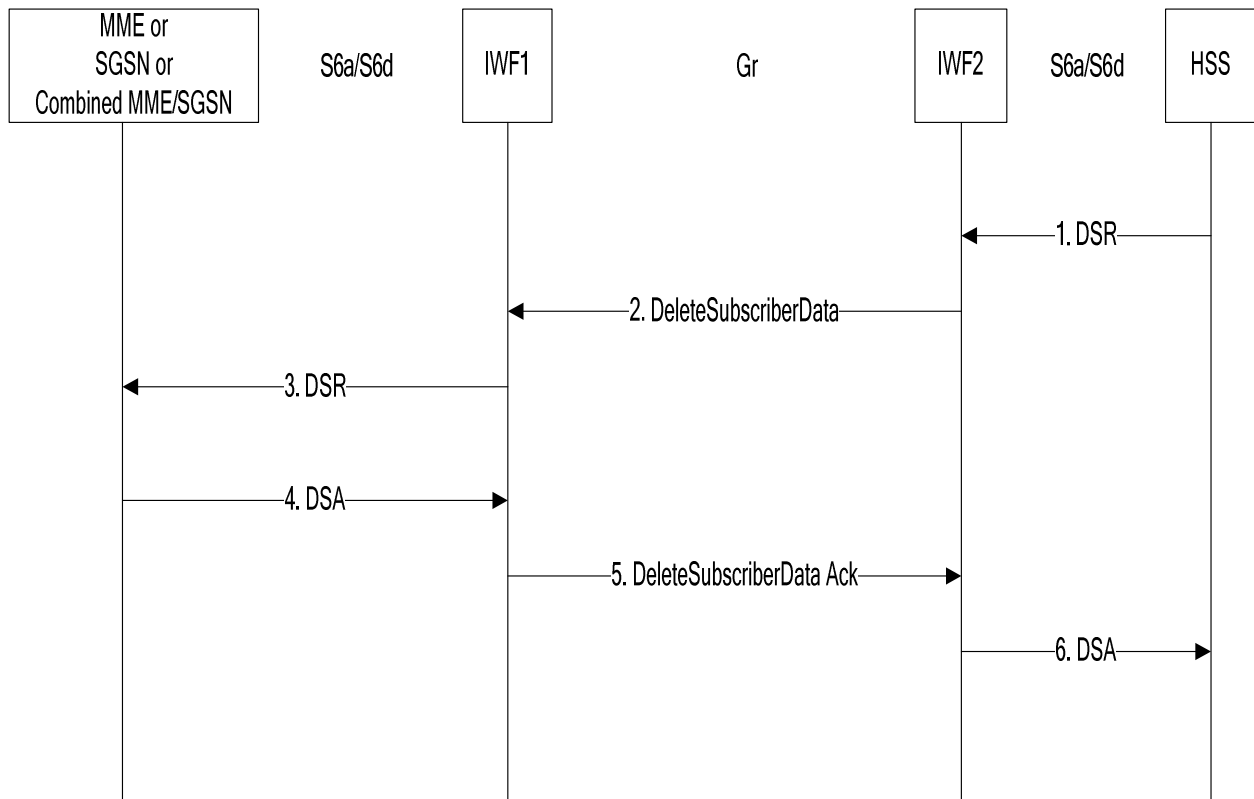


Figure 7.6.2-1: Mapping of Delete Subscriber Data Procedure for scenario with two IWFs

1. The IWF2 receives a DSR message from the HSS.
2. The IWF2 opens a MAP v3 dialogue towards IWF1 by sending DeleteSubscriberData.
3. The IWF1 constructs a DSR message and sends it to the MME, SGSN, or combined MME/SGSN.
4. The IWF1 receives DSA from the MME, SGSN or combined MME/SGSN.
5. The IWF1 closes the MAP dialogue with the IWF2 by sending DeleteSubscriberData Ack.
6. The IWF2 sends DSA to the HSS.

7.7 Reset

7.7.1 One IWF Scenario

The mapping of procedures for this scenario is shown in figure 7.7.1-1:

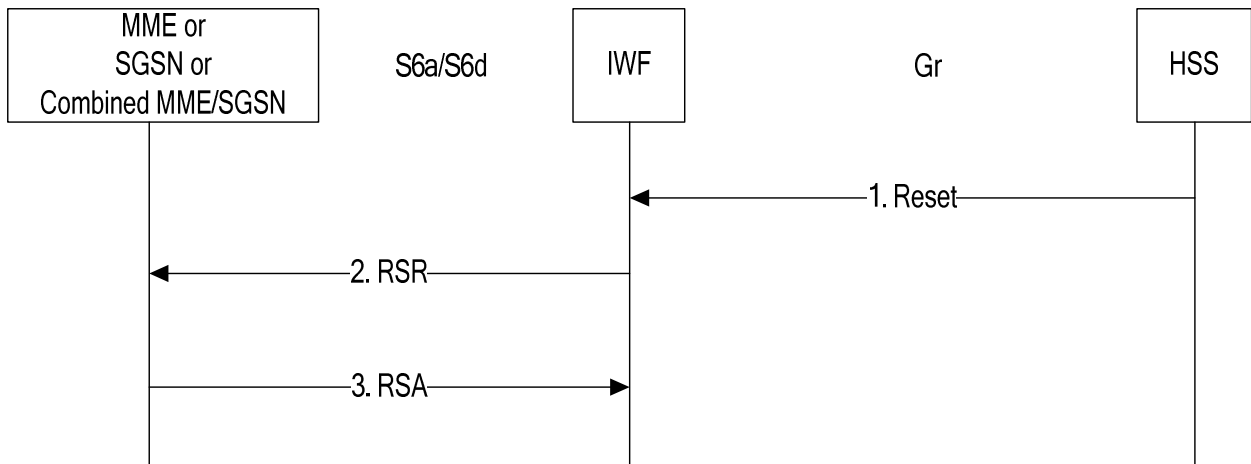


Figure 7.7.1-1: Mapping of Reset Procedure for scenario with one IWF

1. The IWF receives a Reset MAP v1 or v2 message from the HSS.
2. The IWF sends RSR to the MME or SGSN or combined MME/SGSN.
3. The IWF receives RSA.

7.7.2 Two IWFs Scenario

The mapping of procedures for this scenario is shown in figure 7.7.2-1:

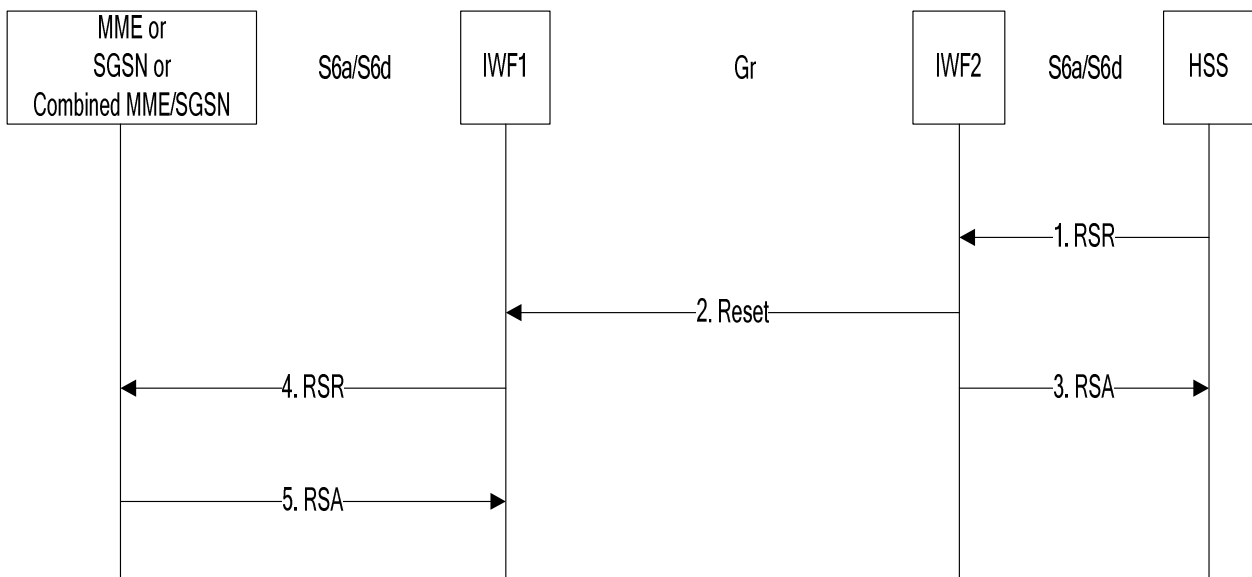


Figure 7.7.2-1: Mapping of Reset Procedure for scenario with two IWFs

1. The IWF2 receives a RSR message from the HSS.
2. The IWF2 opens a MAP v1 or v2 (vendor option) dialogue towards IWF1 by sending Reset.
3. The IWF2 sends RSA to the HSS.
4. The IWF1 constructs a RSR message and sends it to the MME, SGSN, or combined MME/SGSN.
5. The IWF1 receives RSA from the MME, SGSN or combined MME/SGSN.

7.8 Notification

7.8.1 One IWF Scenario

The mapping of procedures for this scenario is shown in figure 7.8.1-1:

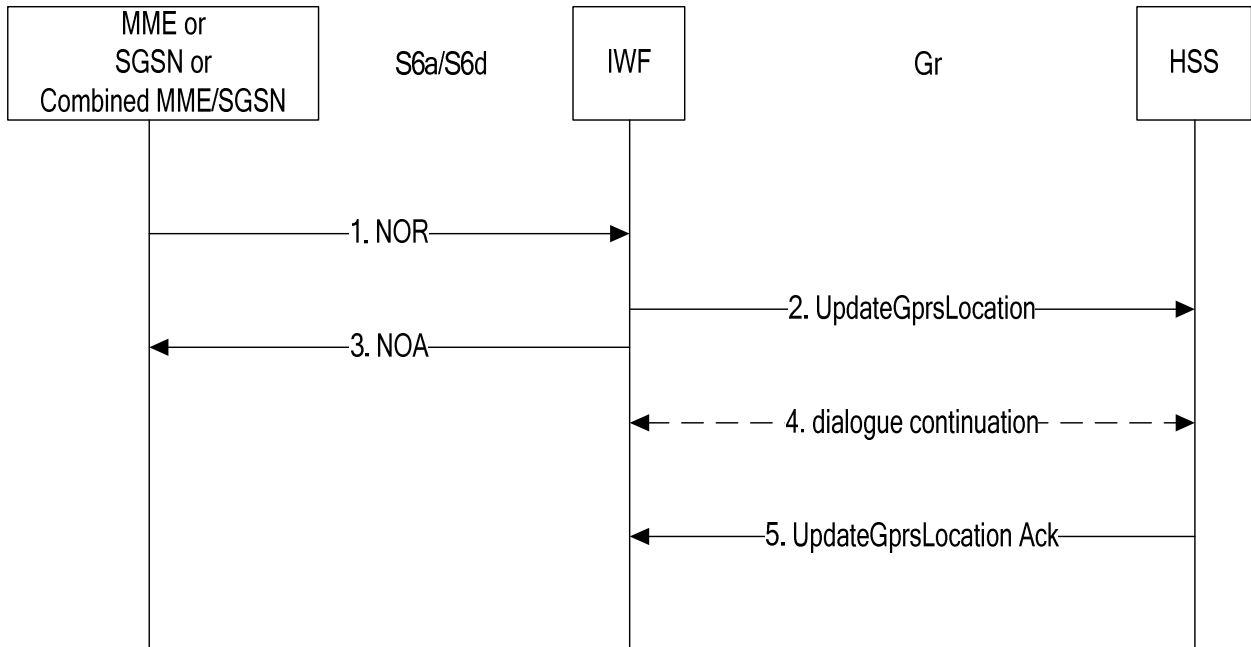


Figure 7.8.1-1: Mapping of Notification Procedure for scenario with one IWF

1. The IWF receives a NOR message from the MME, SGSN, or combined MME/SGSN.
2. The IWF sends UpdateGprsLocation or ReadyForSM to the HSS.
3. The IWF sends NOA to the MME, SGSN, or combined MME/SGSN.
4. The HSS (if it does not support the "skip subscriber data" indication) may continue the MAP dialogue by sending InsertSubscriberData messages which are positively acknowledged and discarded by the IWF.
5. The HSS closes the MAP dialogue by sending UpdateGprsLocation Ack or ReadyForSM Ack.

7.8.2 Two IWFs Scenario

The mapping of procedures for this scenario is shown in figure 7.8.2-1:

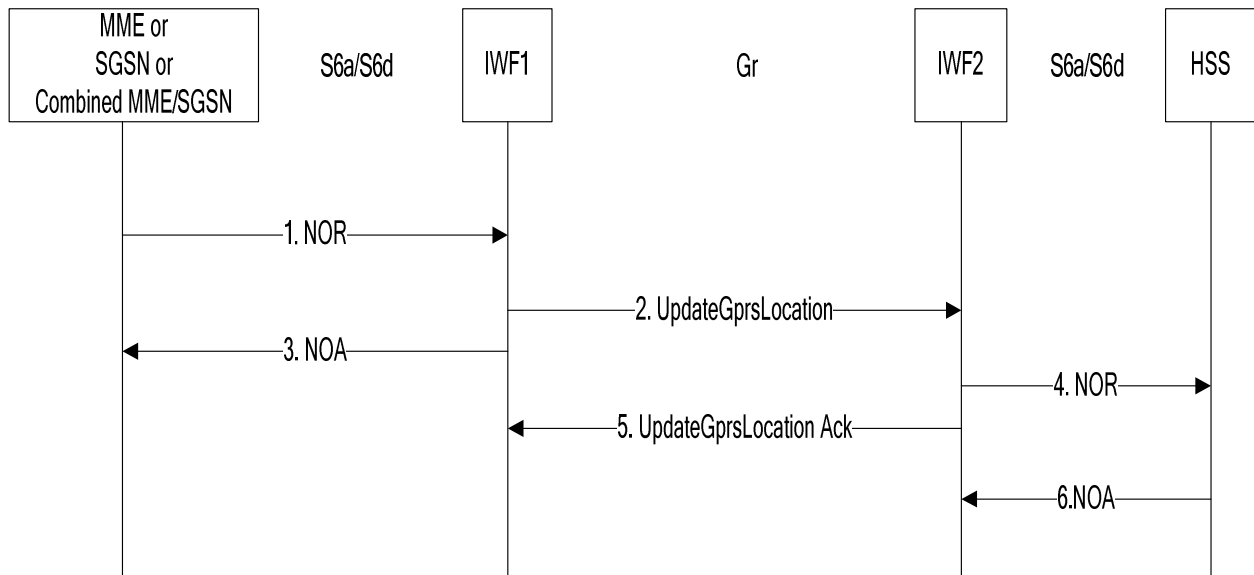


Figure 7.8.2-1: Mapping of Notification Procedure for scenario with two IWFs

1. The IWF1 receives a NOR message from the MME, SGSN, or combined MME/SGSN.
2. The IWF1 sends UpdateGprsLocation or ReadyForSM to the IWF2.
3. The IWF1 sends NOA to the MME, SGSN, or combined MME/SGSN.
4. The IWF2 sends NOR to the HSS.
5. The IWF2 closes the MAP dialogue with IWF1 by sending UpdateGprsLocation Ack or ReadyForSM Ack.
6. The IWF2 receives NOA from the HSS.

7.9 IMEI Check

7.9.1 One IWF Scenario

The mapping of procedures for this scenario is shown in figure 7.9.1-1:

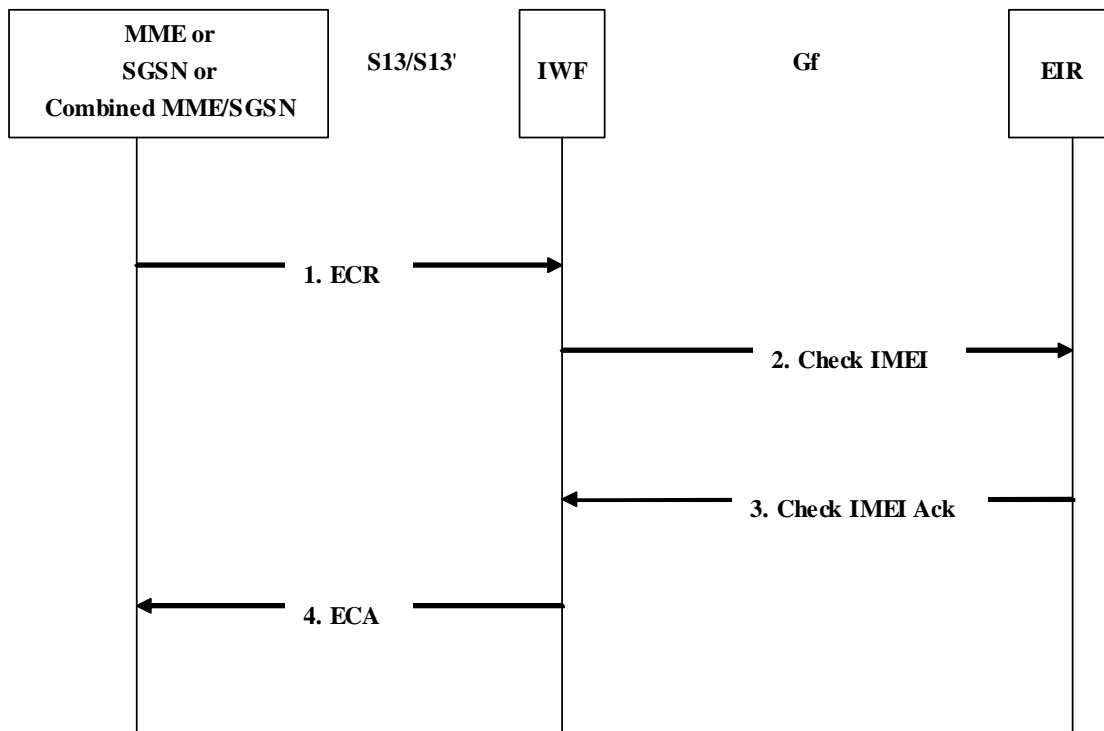


Figure 7.9.1-1: Mapping of IMEI Check Procedure with one IWF

1. The IWF receives an ECR message from the MME/SGSN.
2. The IWF sends Check IMEI to the EIR.
3. The IWF receives Check IMEI Ack from the EIR.
4. The IWF sends ECA to the MME/SGSN.

7.10 Trace Activation

7.10.1 One IWF Scenario

The mapping of procedures for this scenario is shown in figure 7.10.1-1:

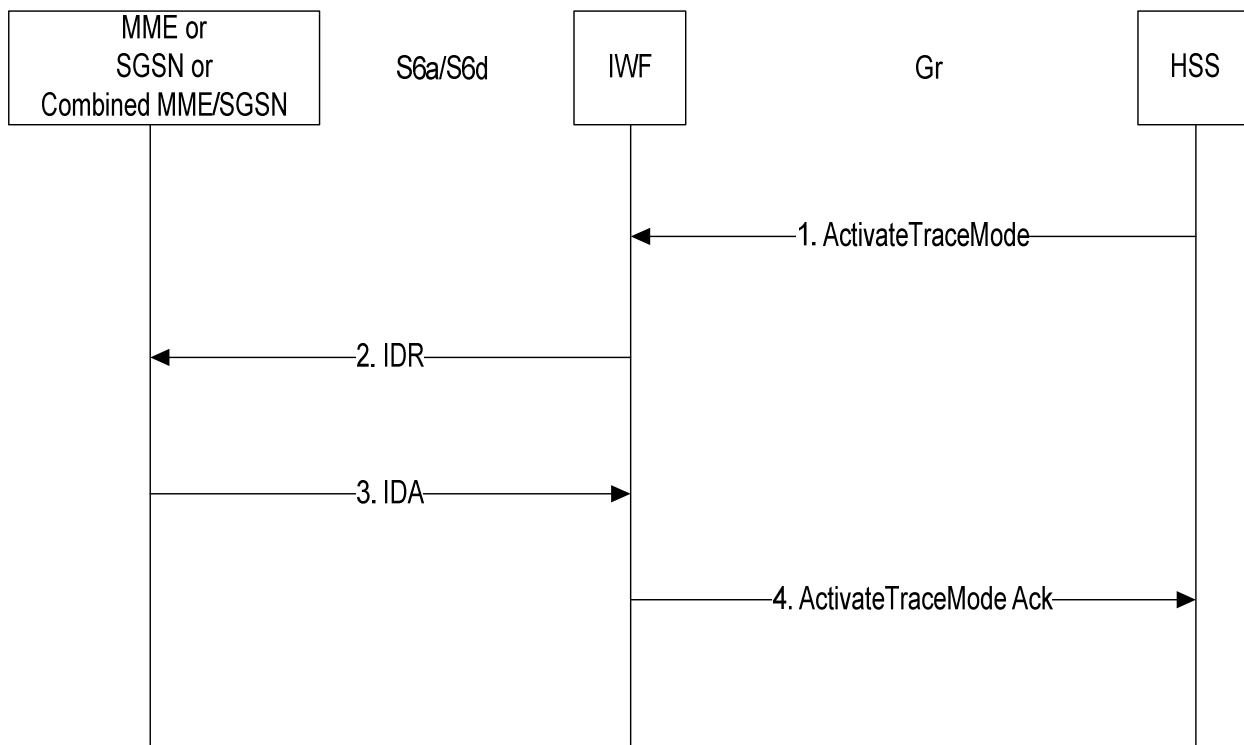


Figure 7.10.1-1: Mapping of Trace Activation Procedure for scenario with one IWF

1. The IWF receives an ActivateTraceMode message from the HSS.
2. The IWF shall construct an IDR message and send it to the MME, SGSN, or combined MME/SGSN.
3. The IWF receives IDA from the MME, SGSN, or combined MME/SGSN.
4. The IWF shall send an ActivateTraceMode Ack to the HSS.

7.10.2 Two IWFs Scenario

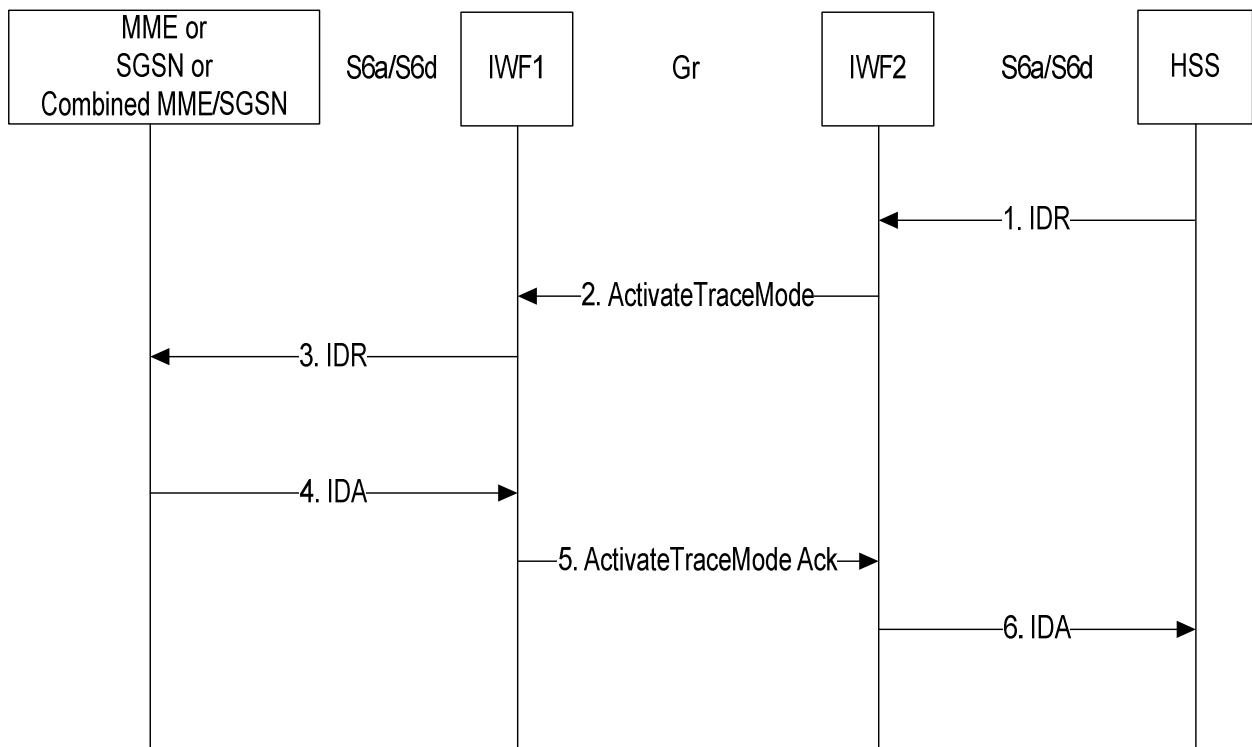


Figure 7.10.2-1: Mapping of Trace Activation Procedure for scenario with two IWFs

1. The IWF2 receives an IDR message from the HSS.
2. If the IWF2 finds that Trace Data is included in the IDR, it shall open a MAP v3 dialogue towards IWF1 by sending ActivateTraceMode.
3. The IWF1 shall construct an IDR message and shall send it to the MME, SGSN, or combined MME/SGSN.
4. The IWF1 receives IDA from the MME, SGSN, or combined MME/SGSN.
5. The IWF1 shall send an ActivateTraceMode Ack to IWF2.
6. IWF2 shall send an IDA to the HSS.

7.11 Trace Deactivation

7.11.1 One IWF Scenario

The mapping of procedures for this scenario is shown in figure 7.11.1-1:

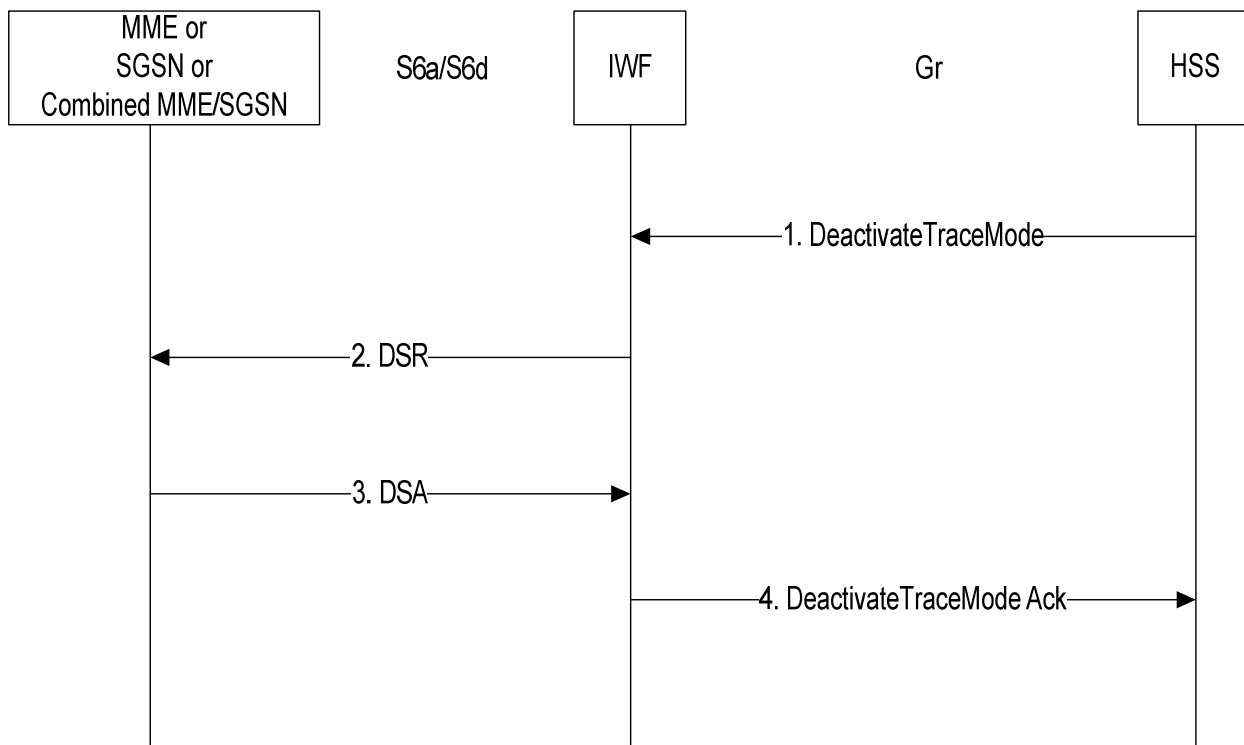


Figure 7.11.1-1: Mapping of Trace Deactivation Procedure for scenario with one IWF

1. The IWF receives a DeactivateTraceMode message from the HSS.
2. The IWF shall construct a DSR message and shall send it to the MME, SGSN, or the combined MME/SGSN.
3. The IWF receives DSA from the MME, SGSN, or combined MME/SGSN.
4. The IWF shall send a DeactivateTraceMode Ack to the HSS.

7.11.2 Two IWFs Scenario

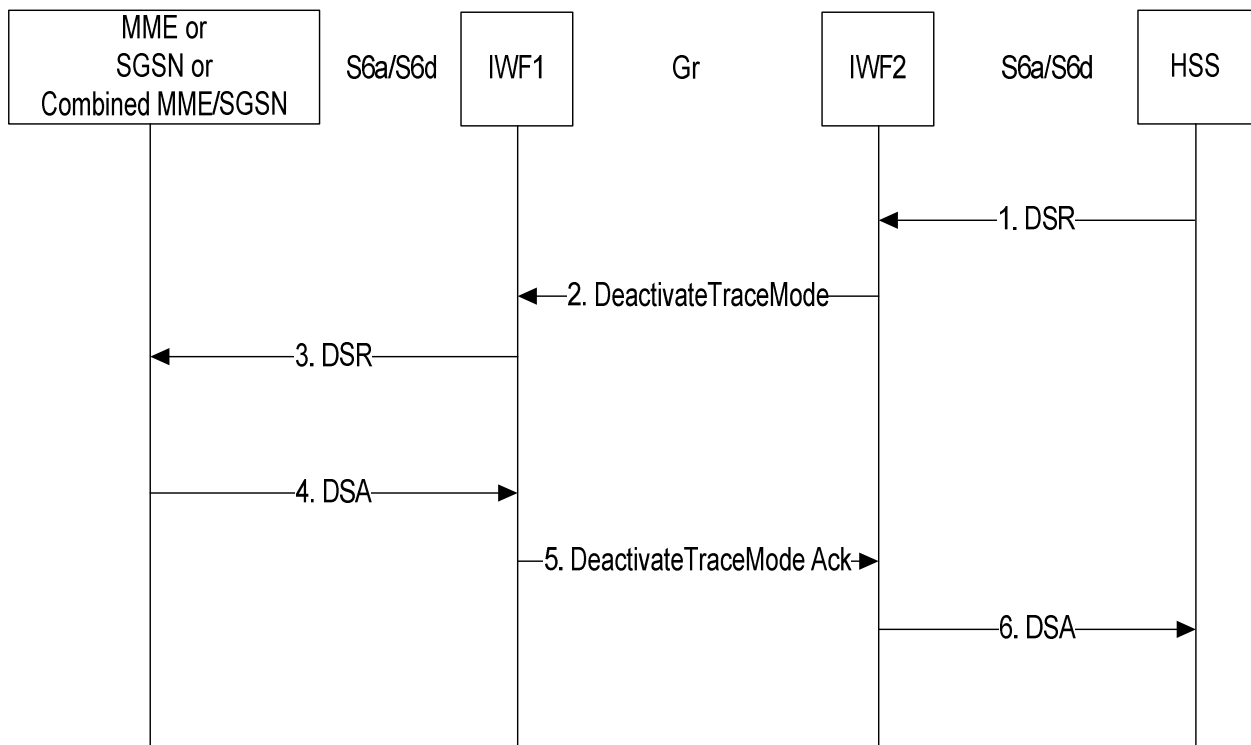


Figure 7.11.2-1: Mapping of Trace Deactivation Procedure for scenario with two IWFs

1. The IWF2 receives a DSR message from the HSS.
2. If the IWF2 finds that a Trace Data Withdrawal indication is included in the DSR, it shall open a MAP v3 dialogue towards IWF1 by sending DeactivateTraceMode.
3. The IWF1 shall construct a DSR message and shall send it to the MME, SGSN, or the combined MME/SGSN.
4. The IWF1 receives DSA from the MME, SGSN, or combined MME/SGSN.
5. The IWF1 shall send a DeactivateTraceMode Ack to the IWF2.
6. The IWF2 shall send a DSA to the HSS.

8 The Mapping of the Parameters

8.1 Mapping of Parameters for the Authentication Info Retrieval Procedure

8.1.1 AIR mapping to SendAuthenticationInfoArg (v3)

When the IWF needs to construct a MAP-SendAuthenticationInfo message as a result of receiving an AIR command (see sections 7.1.1 step 2, and 7.1.2 step 2), the IWF shall open a MAP dialogue in application context version 3 and populate sub-parameters of SendAuthenticationInfoArg as described below:

imsi in SendAuthenticationInfoArg shall be populated with the value of the User-Name AVP received within AIR.

If AIR contains a Requested-EUTRAN-Authentication-Info AVP but does not contain a Requested-UTRAN-GERAN-Authentication-Info AVP:

numberOfRequestedVectors in SendAuthenticationInfoArg shall be populated with the value of the Number-Of-Requested-Vectors AVP received within the Requested-EUTRAN-Authentication-Info AVP received within AIR.

If AIR contains a Requested-UTRAN-GERAN-Authentication-Info AVP but does not contain a Requested-EUTRAN-Authentication-Info AVP:

numberOfRequestedVectors in SendAuthenticationInfoArg shall be populated with the value of the Number-Of-Requested-Vectors AVP received within the Requested-UTRAN-GERAN-Authentication-Info AVP received within AIR.

If AIR contains a Requested-EUTRAN-Authentication-Info AVP and a Requested-UTRAN-GERAN-Authentication-Info AVP, and the Immediate-Response-Preferred AVP is present within the Requested-EUTRAN-Authentication-Info AVP:

numberOfRequestedVectors in SendAuthenticationInfoArg shall be populated with the value of the Number-Of-Requested-Vectors AVP received within the Requested-EUTRAN-Authentication-Info AVP received within AIR.

If AIR contains a Requested-EUTRAN-Authentication-Info AVP and a Requested-UTRAN-GERAN-Authentication-Info AVP, and the Immediate-Response-Preferred AVP is not present within the Requested-EUTRAN-Authentication-Info AVP:

numberOfRequestedVectors in SendAuthenticationInfoArg shall be populated with the value of the Number-Of-Requested-Vectors AVP received within the Requested-UTRAN-GERAN-Authentication-Info AVP received within AIR.

segmentationProhibited shall be absent in SentAuthenticationInfoArg.

If AIR contains a Requested-EUTRAN-Authentication-Info AVP but does not contain a Requested-UTRAN-GERAN-Authentication-Info AVP:

immediateResponsePreferred in SendAuthenticationInfoArg shall be present if and only if the Immediate-Response-Preferred AVP is present within the Requested-EUTRAN-Authentication-Info AVP within AIR.

If AIR contains a Requested-UTRAN-GERAN-Authentication-Info AVP but does not contain a Requested-EUTRAN-Authentication-Info AVP:

immediateResponsePreferred in SendAuthenticationInfoArg shall be present if and only if the Immediate-Response-Preferred AVP is present within the Requested-UTRAN-GERAN-Authentication-Info AVP within AIR.

If AIR contains a Requested-EUTRAN-Authentication-Info AVP and a Requested-UTRAN-GERAN-Authentication-Info AVP:

immediateResponsePreferred in SendAuthenticationInfoArg shall be present if and only if the Immediate-Response-Preferred AVP is present within the Requested-UTRAN-GERAN-Authentication-Info AVP or within the Requested-EUTRAN-Authentication-Info AVP within AIR.

re-synchronisationInfo in SendAuthenticationInfoArg shall be present if and only if a Re-synchronization-Info AVP is present within the Requested-EUTRAN-Authentication-Info AVP or within the Requested-UTRAN-GERAN-Authentication-Info AVP within AIR.

extensionContainer in SendAuthenticationInfoArg shall be absent.

requestingNodeType in SendAuthenticationInfoArg shall be present and shall be populated with the value "mme" if a Requested-EUTRAN-Authentication-Info AVP and no Requested-UTRAN-GERAN-Authentication-Info AVP was present within AIR;

"sgsn" if a Requested-UTRAN-GERAN-Authentication-Info AVP and no Requested EUTRAN-Authentication-Info AVP was present within AIR;

"mme-sgsn" if both a Requested-EUTRAN-Authentication-Info AVP and a Requested-UTRAN-GERAN-Authentication-Info AVP were present within AIR .

requestingPLMN-Id in SendAuthenticationInfoArg shall be present and shall be populated with the value received within the Visited-PLMN-ID AVP within AIR.

numberOfRequestedAdditional-Vectors in SendAuthenticationInfoArg shall be present if and only if both a Requested-EUTRAN-Authentication-Info AVP and a Requested-UTRAN-GERAN-Authentication-Info AVP are present within AIR. If present, the parameter shall be populated with the value received in the Number-Of-Requested-

Vectors AVP within the Requested-EUTRAN-Authentication-Info (if the Immediate-Response-Preferred AVP is absent within Requested-EUTRAN-Authentication-Info AVP within AIR) or with the value received in the Number-Of-Requested-Vectors AVP within the Requested-UTRAN-GERAN-Authentication-Info AVP (otherwise).

additionalVectorsAreForEPS shall be present in SendAuthenticationInfoArg if and only if a Requested-EUTRAN-Authentication-Info AVP and a Requested-UTRAN-GERAN-Authentication-Info AVP are present within AIR and the Immediate-Response-Preferred AVP is absent in the Requested-EUTRAN-Authentication-Info AVP.

8.1.2 AIR mapping to SendAuthenticationInfoArg (v2)

When the IWF needs to construct a MAP-SendAuthenticationInfo message in MAP AC version 2 as a result of MAP version negotiation (see sections 7.1.1 step 3), the IWF shall open a MAP dialogue in application context version 2 and populate sub-parameters of SendAuthenticationInfoArg as described below:

imsi in SendAuthenticationInfoArg shall be populated with the value of the User-Name AVP received within AIR.

8.1.3 AIR mapping to SendParametersArg (v1)

When the IWF needs to construct a MAP-SendParameters message in MAP AC version 1 as a result of MAP version negotiation (see section 7.1.1 step 3), the IWF shall open a MAP dialogue in application context version 1 and populate sub-parameters of SendParametersArg as described below:

subscriberId in SendParametersArg shall take the imsi alternative; imsi shall be populated with the value of the User-Name AVP received within AIR.

requestedParameterList in SendParametersArg shall contain one RequestParameter which contains the value of "requestAuthenticationSet".

8.1.4 SendAuthenticationInfoRes / Error (v3) mapping to AIA

When the IWF needs to construct an AIA command as a result of receiving a SendAuthenticationInfo Ack/Error message in MAP version 3 (see sections 7.1.1 step 5, and 7.1.2 step 7), the IWF shall populate AVPs of AIA as described below:

Result-Code / Experimental-Result AVP shall be set to:

- DIAMETER_SUCCESS if a SendAuthenticationInfoRes parameter was received in a TCAP ResultLast component;
- DIAMETER_ERROR_USER_UNKNOWN if an error of unknownSubscriber without a diagnostic parameter or with a diagnostic parameter of imsiUnknown was received;
- DIAMETER_ERROR_UNKNOWN_SUBSCRIPTION if an error unknownSubscriber with a diagnostic parameter of gprs-eps-SubscriptionUnknown was received;
- an appropriate DIAMETER base protocol result code otherwise.

Auth-Session-State AVP shall be set to the value NO_STATE_MAINTAINED (1).

Supported-Features AVP shall be absent.

Authentication-Info AVP shall be present if authenticationSetList or eps-AuthenticationSetList is present in the received SendAuthenticationInfoRes. If present, the AVP shall contain EPS-Vector AVPs and/or either UTRAN-Vector AVPs or GERAN-Vector AVPs as mapped from received EPC-AVs and/or either AuthenticationQuintuplets or AuthenticationTriplets respectively.

8.1.5 SendAuthenticationInfoRes / Error (v2) mapping to AIA

When the IWF needs to construct an AIA command as a result of receiving a SendAuthenticationInfo Ack/Error message in MAP version 2 (see sections 7.1.1 step 5), the IWF shall populate AVPs of AIA as described below:

Result-Code / Experimental-Result AVP shall be set to:

- DIAMETER_SUCCESS if aSendAuthenticationInfoRes parameter was received in a TCAP ResultLast component;
- DIAMETER_ERROR_USER_UNKNOWN if an error of unknownSubscriber without a diagnostic parameter or with a diagnostic parameter of imsiUnknown was received;
- DIAMETER_ERROR_UNKNOWN_SUBSCRIPTION if an error unknownSubscriber with a diagnostic parameter of gprsSubscriptionUnknown was received;
- an appropriate DIAMETER base protocol result code otherwise.

Auth-Session-State AVP shall be set to the value NO_STATE_MAINTAINED (1).

Supported-Features AVP shall be absent.

Authentication-Info AVP shall be present if authenticationSetList is present in the received SendAuthenticationInfoRes. If present, the AVP shall contain GERAN-Vector AVPs as mapped from received AuthenticationTriplets.

8.1.6 SendParameterList / Error (v1) mapping to AIA

When the IWF needs to construct an AIA command as a result of receiving a SendParameters Ack/Error message in MAP version 1 (see sections 7.1.1 step 5), the IWF shall populate AVPs of AIA as described below:

Result-Code / Experimental-Result AVP shall be set to:

- DIAMETER_SUCCESS if a SentParameterList parameter was received in a TCAP ResultLast component;
- DIAMETER_ERROR_USER_UNKNOWN if an error of unknownSubscriber was received;
- an appropriate DIAMETER base protocol result code otherwise.

Auth-Session-State AVP shall be set to the value NO_STATE_MAINTAINED (1).

Supported-Features AVP shall be absent.

Authentication-Info AVP shall be present if sentParameterList is present in the received TCAP ResultLast component. If present, the AVP shall contain GERAN-Vector AVPs as mapped from received AuthenticationTriplets.

8.1.7 SendAuthenticationInfoArg (v3) mapping to AIR

When the IWF needs to construct an AIR command as a result of receiving a SendAuthenticationInfo message in MAP version 3 (see sections 7.1.2 step 3), the IWF shall populate AVPs of AIR as described below:

Auth-Session-State AVP shall be set to the value NO_STATE_MAINTAINED (1).

User-Name AVP shall be populated with the value received within the imsi parameter of SendAuthenticationInfoArg.

Supported-Features AVP shall be absent.

Requested-EUTRAN-Authentication-Info AVP shall be present if requestingNodeType parameter within SendAuthenticationInfoArg takes the value of "mme" or "mme-sgsn".

Number-Of-Requested-Vectors AVP within Requested-EUTRAN-Authentication-Info AVP (if present) shall be populated with

- a) the value received within the numberOfRequestedVectors parameter of SendAuthenticationInfoArg if requestingNodeType parameter within SendAuthenticationInfoArg takes the value of "mme";
- b) the value received within the numberOfRequestedVectors parameter of SendAuthenticationInfoArg if requestingNodeType parameter within SendAuthenticationInfoArg takes the value of "mme-sgsn" and the additionalVectorsAreForEPS parameter is absent from SendAuthenticationInfoArg;

- c) the value received within the numberOfRequestedAdditional-Vectors parameter of SendAuthenticationInfoArg if requestingNodeType parameter within SendAuthenticationInfoArg takes the value of "mme-sgsn" and the additionalVectorsAreForEPS parameter is present within SendAuthenticationInfoArg.

Immediate-Response-Preferred AVP within Requested-EUTRAN-Authentication-Info AVP (if present) shall be present if:

- a) requestingNodeType parameter within SendAuthenticationInfoArg takes the value of "mme" and immediateResponsePreferred parameter is present in SendAuthenticationInfoArg, or
- b) requestingNodeType parameter within SendAuthenticationInfoArg takes the value of "mme-sgsn" and additionalVectorsAreForEPS parameter is absent from SendAuthenticationInfoArg and immediateResponsePreferred is present within SendAuthenticationInfoArg.

Re-synchronization-Info AVP within Requested-EUTRAN-Authentication-Info AVP (if present) shall be populated with the value received in the re-synchronizationInfo parameter within SendAuthenticationInfoArg.

Requested-UTRAN-GERAN-Authentication-Info AVP shall be present if requestingNodeType parameter within SendAuthenticationInfoArg takes the value of "sgsn" or "mme-sgsn".

Number-Of-Requested-Vectors AVP within Requested-UTRAN-GERAN-Authentication-Info AVP (if present) shall be populated with:

- a) the value received within the numberOfRequestedVectors parameter of SendAuthenticationInfoArg if requestingNodeType parameter within SendAuthenticationInfoArg takes the value of "sgsn";
- b) the value received within the numberOfRequestedVectors parameter of SendAuthenticationInfoArg if requestingNodeType parameter within SendAuthenticationInfoArg takes the value of "mme-sgsn" and the additionalVectorsAreForEPS parameter is present within SendAuthenticationInfoArg;
- c) the value received within the numberOfRequestedAdditional-Vectors parameter of SendAuthenticationInfoArg if requestingNodeType parameter within SendAuthenticationInfoArg takes the value of "mme-sgsn" and the additionalVectorsAreForEPS parameter is absent from SendAuthenticationInfoArg.

Immediate-Response-Preferred AVP within Requested-UTRAN-GERAN-Authentication-Info AVP (if present) shall be present if

- a) requestingNodeType parameter within SendAuthenticationInfoArg takes the value of "sgsn" and immediateResponsePreferred parameter is present in SendAuthenticationInfoArg, or
- b) requestingNodeType parameter within SendAuthenticationInfoArg takes the value of "mme-sgsn" and additionalVectorsAreForEPS parameter is present from SendAuthenticationInfoArg and immediateResponsePreferred is present within SendAuthenticationInfoArg.

Re-synchronization-Info AVP within Requested-EUTRAN-Authentication-Info AVP (if present) shall be populated with the value received in the re-synchronizationInfo parameter within SendAuthenticationInfoArg.

Visited-PLMN-Id AVP shall be populated with the value of the requestingPLMN-Id parameter received within SendAuthenticationInfoArg.

RequestingNodeType AVP shall be populated with the value of the requestingNodeType parameter received within SendAuthenticationInfoArg.

8.1.8 AIA mapping to SendAuthenticationInfoRes/Error (v3)

When the IWF needs to construct a MAP SendAuthenticationInfo Ack message (v3) as a result of receiving an AIA command (see sections 7.1.2 steps 5 and 6), the IWF shall construct partial result messages (if segmentation is required) and a final result message or an error message (if the Result-Code AVP within AIA takes a value different from "success"). Sub-parameters of SendAuthenticationInfoRes shall be populated as described below:

authenticationSetList within SendAuthenticationInfoRes shall be present if UTRAN-Vector AVP or GERAN-Vector AVP is present in Authentication-Info AVP within AIA. If so the parameter shall be populated with the value received within the UTRAN-Vector AVP or GERAN-Vector AVP (whichever is present).

eps-AuthenticationSetList within SendAuthenticationInfoRes shall be present if EPS-Vector AVP is present in Authentication-Info AVP within AIA. If so the parameter shall be populated with the values received within the EPS-Vector AVP.

An error of **unknownSubscriber** with unknownSubscriberParam containing a unknownSubscriberDiagnostic of "imsiUnknown" shall be sent if the received AIA command contains an Experimental-Result AVP with a value of "User Unknown".

An error of **unknownSubscriber** with unknownSubscriberParam containing a unknownSubscriberDiagnostic of "gprs-epsSubscriptionUnknown" shall be sent if the received AIA command contains an Experimental-Result AVP with a value of "Unknown EPS Subscription".

Other values within the Result-Code / Experimental-Result AVP shall be mapped onto an appropriate MAP error.

8.2 Mapping of Parameters for the Update Location Procedure

8.2.1 ULR mapping to UpdateGprsLocationArg

When the IWF needs to construct a MAP-UpdateGprsLocation message as a result of receiving an ULR command (see sections 7.2.1 step 2, and 7.2.2 step 2), the IWF shall open a MAP dialogue in application context version 3 and populate sub-parameters of UpdateGprsLocationArg as described below:

imsi in UpdateGprsLocationArg shall be populated with the value of the User-Name AVP received within ULR.

sgsn-Number in UpdateGprsLocationArg shall be populated with the value of the SGSN.Number AVP if present within ULR, otherwise it shall be populated with a value locally assigned to the IWF and consistent with SS7 routing principles.

sgsn-Address in UpdateGprsLocationArg shall be populated with the IP-address of the source node sending the ULR command.

extensionContainer in UpdateGprsLocationArg shall be absent.

sgsn-Capability in UpdateGprsLocationArg shall be populated as follows:

- solsaSupportIndicator shall be absent;
- extensionContainer shall be absent;
- superChargerSupportedInServingNetworkEntity shall be absent;
- gprsEnhancementSupportIndicator shall be present;
- supportedCamelPhases shall be absent or shall indicate no support of any CAMEL phase;
- supportedLCS-CapabilitySet shall be absent or shall indicate no support of any LCS capability set;
- offeredCamel4CSIs shall be absent;
- smsCallBarringSupportIndicator shall be absent;
- supportedRAT-TypesIndicator shall be present and populated with the value received within the RAT-Type AVP in the received ULR;
- supportedFeatures shall be present if a SupportedFeature AVP was present in the received ULR which indicated support of odbs and regsubs.

informPreviousNetworkEntity in UpdateGprsLocationArg shall be absent;

ps-LCS-NotSupportedByUE in UpdateGprsLocationArg shall be absent

v-gmlc-Address in UpdateGprsLocationArg shall be absent.

add-info in UpdateGprsLocationArg shall be present if a Terminal-Information AVP was present in the received ULR. If present the parameter shall be populated with the received IMEI and software version; skipSubscriberDataUpdate in add-info shall be absent.

eps-info in UpdateGprsLocationArg shall be present.

- if the S6a/S6d indicator within the ULR-Flags AVP was set, the parameter shall contain isr-Information with updateLocation indication, and if a Single-Registration-Indication was present in the received ULR-Flags AVP then the isr-Information shall also contain a cancelSGSN indication, and if an InitialAttachIndicator was present in the received ULR-Flags AVP then the isr-Information shall also contain initialAttachIndicator;
- if the S6a/S6d indicator within the ULR-Flags was not set, the parameter shall contain isr-Information with updateLocation indication, and if an InitialAttachIndicator was present within the ULR-Flags AVP, the parameter shall contain isr-Information with initialAttachIndicator.

servicingNodeTypeInfo in UpdateGprsLocationArg shall be present if the S6a/S6d-Indicator was present in the ULR-Flags AVP within the received ULR.

skipSubscriberData Update in UpdateGprsLocationArg shall be present if a skip subscriber data indication was received within the ULR-Flags within ULR.

usedRAT-Type in UpdateGprsLocationArg shall be populated with the value received within the RAT-Type AVP within ULR.

gprsSubscriptionDataNotNeeded in UpdateGprsLocationArg shall be present if bit 3 (GPRS-Subscription-Data-Indicator) was not set in the ULR-Flags AVP received within ULR.

nodeTypeInfo in UpdateGprsLocationArg shall be present if bit 4 (Node-Type-Indicator) was set in the ULR-Flags AVP received within ULR.

areaRestricted in UpdateGprsLocationArg shall be absent.

ue-reachableIndicator in UpdateGprsLocationArg shall be absent.

ue-srvcc-Capability in UpdateGprsLocationArg shall be present if a UE-SRVCC-Capability AVP was present in the received ULR. If present the parameter shall be populated with the received ue-srvcc-Capability.

mmeNumberforMTSMS in UpdateGprsLocationArg shall be populated with the value of the MME-Number-for-MT-SMS AVP if present within ULR.

sms-Only in UpdateGprsLocationArg shall be populated with the value of the SMS-Only AVP if present within ULR.

smsRegisterRequest in UpdateGprsLocationArg shall be populated with the value of the SMS-Register-Request AVP if present within ULR.

adjacentPLMN-List in UpdateGprsLocationArg shall be constructed with the values of the Adjacent-PLMNs grouped AVP, if present within ULR.

8.2.2

UpdateGprsLocationRes/Error/InsertSubscriberDataArg/ActivateTraceModeArg mapping to ULA

When the IWF needs to construct an ULA command as a result of receiving an UpdateGprsLocation Ack/Error message (see sections 7.2.1 step 5, and 7.2.2 step 7), the IWF shall populate AVPs of ULA as described below:

Result-Code / Experimental-Result AVP shall be set to:

- DIAMETER_SUCCESS if an UpdateGprsLocationRes parameter was received in a TCAP ResultLast component;
- DIAMETER_ERROR_USER_UNKNOWN if an error of unknownSubscriber without a diagnostic parameter or with a diagnostic parameter of imsiUnknown was received;

- **DIAMETER_ERROR_UNKNOWN_SUBSCRIPTION** if an error of unknownSubscriber with a diagnostic parameter of gprs-eps-SubscriptionUnknown was received;
- **DIAMETER_ERROR_RAT_NOT_ALLOWED** if an error of roamingNotAllowed with a roamingNotAllowedParam containing an additionalRoamingNotAllowedCause of "supportedRAT-TypesNotAllowed" was received;
- **DIAMETER_ERROR_ROAMING_NOT_ALLOWED** if an error of roamingNotAllowed without "supportedRAT-TypesNotAllowed" was received;
- an appropriate DIAMETER base protocol result code otherwise.

Auth-Session-State AVP shall be set to the value NO_STATE_MAINTAINED (1).

Supported-Features AVP shall be absent.

ULA-Flags AVP: Flags shall be set as follows:

- **SeparationIndication** shall be set to 1 if the sgsn-mmeSeparationSupported parameter was present within UpdateGprsLocationRes; otherwise shall be set to 0.
- **MME Registered for SMS** shall be set to 1 if the mmeRegisteredforSMS parameter was present within UpdateGprsLocationRes; otherwise shall be set to 0.

Subscription-Data AVP shall be present if MAP InsertSubscriberData messages have been received from the HSS and a "skip-subscriber-Data" indication was not present in the received ULR command or a MAP ActivateTraceMode message has been received from the HSS. If present the AVP shall be populated as follows:

Subscriber status AVP shall be present if a subscriberStatus parameter was present in a received SubscriberData parameter within InsertSubscriberDataArg. If so, values shall be mapped appropriately.

MSISDN AVP shall be present if an msisdn parameter was present in a received SubscriberData parameter within InsertSubscriberDataArg.

STN-SR AVP shall be present if an stn-sr parameter was present in a received EPS-SubscriptionData parameter within InsertSubscriberDataArg.

Network-Access-Mode AVP shall be present if a networkAccessMode parameter was present within InsertSubscriberDataArg.

Operator-Determined-Barring AVP shall be present if an odb-GeneralData parameter was present within an odb-Data parameter within a SubscriberData parameter within InsertSubscriberDataArg.

HPLMN-ODB AVP shall be present if an odb-HPLMN-Data parameter was present within an odb-Data parameter within a SubscriberData parameter within InsertSubscriberDataArg.

Regional-Subscription-Zone-Code AVPs shall be present if ZoneCodes were present within an regionalSubscriptionData parameter within a SubscriberData parameter within InsertSubscriberDataArg.

Access-Restriction-Data AVP shall be present if an accessRestrictionData parameter was present within InsertSubscriberDataArg and/or a ho-to-non-3GPP-Access-Not-Allowed parameter was present in an eps-SubscriptionData parameter within InsertSubscriberDataArg.

APN-OI-Replacement AVP shall be present if an apn-oi-Replacement parameter was present within an eps-SubscriptionData parameter within InsertSubscriberDataArg.

3GPP-Charging-Characteristics AVP shall be present if a chargingCharacteristics parameter was present within InsertSubscriberDataArg.

AMBR AVP shall be present if an ambr parameter was present within an eps-SubscriptionData parameter within InsertSubscriberDataArg.

APN-Configuration-Profile AVP shall be present if an apn-ConfigurationProfile parameter was present within an eps-SubscriptionData parameter within InsertSubscriberDataArg.

RAT-Frequency-Selection-Priority-ID AVP shall be present if a rfsp-id parameter was present within an eps-SubscriptionData parameter within InsertSubscriberDataArg.

Adjacent-Access-Restriction-Data AVP shall be present if adjacentAccessRestrictionDataList was present within InsertSubscriberDataArg.

- **IMSI-Group-Id** AVP shall be present if imsi-Group-Id-List was present within InsertSubscriberDataArg.
- **Trace-Data AVP** shall be present if a MAP ActivateTraceMode message has been received from the HSS. Sub-AVPs in Trace-Data AVP shall be populated as follows:
 - **Trace-Reference** AVP shall be present and populated with the values received within the traceReference and traceReference2 parameters within ActivateTraceModeArg.
 - **Trace-Depth-List** AVP shall be present if a Trace-DepthList parameter was present within ActivateTraceModeArg.
 - **Trace-NE-Type-List** AVP shall be present if a TraceNE-TypeList parameter was present within ActivateTraceModeArg.
 - **Trace-Depth-List** AVP shall be present if a Trace-DepthList parameter was present within ActivateTraceModeArg.
 - **Trace-Interface-List** AVP shall be present if a TraceInterfaceList parameter was present within ActivateTraceModeArg.
 - **Trace-Event-List** AVP shall be present if a TraceEventList parameter was present within ActivateTraceModeArg.
 - **OMC-Id** AVP shall be present if a OMC-Id parameter was present within ActivateTraceModeArg.
 - **Trace-Collection-Entity** AVP shall be present if a TraceCollectionEntity parameter was present within ActivateTraceModeArg.
 - **MDT-Configuration** AVP shall be present if a MDT-Configuration parameter was present within ActivateTraceModeArg.

GPRS-Subscription-Data AVP shall be present if a gprsSubscriptionData parameter was present within InsertSubscriberDataArg.

LCS-Info AVP shall be present if a LCS Information parameter was present within InsertSubscriberDataArg.

CSG-Subscription-Data AVPs shall be populated with information received within the csg-SubscriptionDataList parameter within InsertSubscriberDataArg.

Roaming-Restricted-Due-To-Unsupported-Feature AVP shall be present and set to "Roaming-Restricted-Due-To-Unsupported-Feature (0)" if the parameter roamingRestrictedInSgsnDueToUnsupportedFeature was present within InsertSubscriberDataArg. Otherwise shall be absent.

Teleservice-List AVP shall be present if a Teleservice List parameter was present within InsertSubscriberDataArg.

Call-Barring-Info AVPs shall be present if call barring SS-code and SS-status parameters were present within InsertSubscriberDataArg and the SS-Code AVP and SS-Status AVP within the Call-Barring-Info AVPs shall be populated with the values of the received call barring SS-code and SS-status parameters within InsertSubscriberDataArg.

MDT-User-Consent AVP shall be present if a MDT User Consent parameter was present within InsertSubscriberDataArg.

Subscribed-VSRVCC AVP shall be present if a Subscribed vSRVCC parameter was present in a received EPS-SubscriptionData parameter within InsertSubscriberDataArg.

PS-and-SMS-Only-Service-Provision AVP shall be present if a psAndSMS-OnlyServiceProvision parameter was present within InsertSubscriberDataArg.

SMS-In-SGSN-Allowed AVP shall be present if an smsInSGSNAllowed parameter was present within InsertSubscriberDataArg.

8.2.3 UpdateGprsLocationArg mapping to ULR

When the IWF needs to construct an ULR command as a result of receiving an UpdateGprsLocation message without a pdn-gw-update parameter within eps-info and without an isr-Information parameter within eps-info not indicating updateLocation or without a skipSubscriberDataUpdate parameter within add-info (see section 7.2.2 step 3), the IWF shall populate AVPs of ULR as described below:

Auth-Session-State AVP shall be set to the value NO_STATE_MAINTAINED (1).

User-Name AVP shall be populated with the value received within the imsi parameter of UpdateGprsLocationArg.

Supported-Features AVP shall be populated with a value mapped from received parameter supportedFeatures within sgsn-Capability.

Terminal-Information AVP shall be present if an add-info parameter was received within UpdateGprsLocationArg. If present the received value of the imeisv parameter shall be mapped onto IMEI and (if present) Software Version.

RAT-Type AVP shall be populated with the value received within the usedRAT-Type parameter of UpdateGprsLocationArg

ULR-Flags AVP: Flags shall be set as follows:

Single-Registration-Indication shall be set to 1 if the ISR-Information parameter within the EPS-Info parameter within UpdateGprsLocationArg is present and indicates "cancelSGSN"; otherwise shall be set to 0.

- **S6a/S6d-Indicator** shall be set to 1 if the servingNodeTypeIndicator parameter was present in UpdateGprsLocationArg; otherwise shall be set to 0.
- **Skip Subscriber Data** shall be set to 1 if a skipSubscriberData parameter was present in UpdateGprsLocationArg; otherwise shall be set to 0.
- **GPRS-Subscription-Data-Indicator** shall be set to 1 if the "GPRS Subscription Data not needed Indicator" was absent from UpdateGprsLocationArg; otherwise shall be set to 0.
- **Node-Type-Indicator** shall be set to 1 if the "Node-Type Indicator" was present in UpdateGprsLocationArg; otherwise shall be set to 0.
- **Initial-Attach-Indicator** shall be set to 1 if the initialAttachIndicator parameter within the ISR-Information parameter within the EPS-Info parameter within UpdateGprsLocationArg is present; otherwise shall be set to 0.

Visited-PLMN-Id AVP shall be populated with a value derived from the sgsn-Number parameter received within UpdateGprsLocationArg.

SGSN-Number AVP shall be populated with the value received within the SGSN Number parameter of UpdateGprsLocationArg.

UE-SRVCC-Capability AVP shall be present if a ue-srvcc-Capability parameter was present in UpdateGprsLocationArg. If present the AVP shall be populated with the received ue-srvcc-Capability parameter.

MME-Number-for-MT-SMS AVP shall be populated with the value received within the mmeNumberforMTSMS parameter of UpdateGprsLocationArg.

SMS-Register-Request AVP shall be populated with the value received within the smsRegisterRequest parameter of UpdateGprsLocationArg.

SMS-Only AVP shall be populated with the value received within the sms-Only parameter of UpdateGprsLocationArg.

Adjacent-PLMNs AVP shall be constructed with the values received within the adjacentPLMN-List parameter of UpdateGprsLocationArg.

8.2.4 ULA mapping to InsertSubscriberDataArg/ ActivateTraceModeArg/UpdateGprsLocationRes/Error

When the IWF needs to construct a MAP InsertSubscriberData messages and/or a MAP- ActivateTraceMode message and/or a MAP-UpdateGprsLocation Ack message, as a result of receiving an ULA command (see sections 7.2.2 steps 5 and 6), the IWF shall populate sub-parameters of InsertSubscriberDataArg, ActivateTraceModeArg and UpdateGprsLocationRes/Error as described below:

InsertSubscriberDataArg:

imsi in InsertSubscriberDataArg shall be absent.

msisdn in InsertSubscriberDataArg shall be populated with the value received within the MSISDN AVP within the Subscription-Data AVP within ULA.

category in InsertSubscriberDataArg shall be absent.

subscriberStatus in InsertSubscriberDataArg shall be populated with the value received within the Subscriber-Status AVP within the Subscription-Data AVP within ULA.

bearerServiceList in InsertSubscriberDataArg shall be absent.

teleserviceList in InsertSubscriberDataArg shall be absent

provisionedSS in InsertSubscriberDataArg shall be absent.

odb-Data in InsertSubscriberDataArg shall be populated with the value received within the Operator-Determined-Barring AVP and HPLMN-ODB AVP within the Subscription-Data AVP within ULA.

roamingRestrictedDueToUnsupportedFeature in InsertSubscriberDataArg shall be absent.

regionalSubscriptionData in InsertSubscriberDataArg shall be populated with the value received within the Regional-Subscription-Zone-Code AVPs within the Subscription-Data AVP within ULA.

vbsSubscriptionData in InsertSubscriberDataArg shall be absent.

vgcsSubscriptionData in InsertSubscriberDataArg shall be absent

vlrCamelsubscriptionInfo in InsertSubscriberDataArg shall be absent.

naea-PreferredCI in InsertSubscriberDataArg shall be absent.

gprsSubscriptionData in InsertSubscriberDataArg shall be populated with GPRS-Subscription Data received within the Subscription-Data AVP within ULA.

roamingRestrictedInSgsnDueToUnsupportedFeature in InsertSubscriberDataArg shall be present if a Roaming-Restricted-Due-To-Unsupported-Feature AVP Subscription-Data AVP within ULA.

networkAccessMode in InsertSubscriberDataArg shall be populated with the value received within the Network-Access-Mode AVP within the Subscription-Data AVP within ULA.

lsaInformation in InsertSubscriberDataArg shall be absent.

lmu-Indicator in InsertSubscriberDataArg shall be absent

lcsInformation in InsertSubscriberDataArg shall be absent.

istAlertTimer in InsertSubscriberDataArg shall be absent.

superChargerSupportedInHLR in InsertSubscriberDataArg shall be absent.

mc-SS-Info in InsertSubscriberDataArg shall be absent.

cs-AllocationRetentionPriority in InsertSubscriberDataArg shall be absent.

sgsn-CAMEL-SubscriptionInfo in InsertSubscriberDataArg shall be absent.

chargingCharacteristics in InsertSubscriberDataArg shall be populated with the value received within the 3GPP-Charging-Characteristics AVP within the Subscription-Data AVP within ULA.

accessRestrictionData in InsertSubscriberDataArg shall be populated with the value received within the Access-Restriction-Data AVP within the Subscription-Data AVP within ULA.

ics-Indicator in InsertSubscriberDataArg shall be absent.

LCS Information in InsertSubscriberDataArg shall be populated with the value received within the LCS-Info AVP within the Subscription-Data AVP within ULA.

Teleservice List in InsertSubscriberDataArg shall be populated with the value received within the Teleservice-List AVP within the Subscription-Data AVP within ULA.

SS-code and SS-status parameters of **Call Barring Information List** in InsertSubscriberDataArg shall be populated with the values of SS-Code AVP and SS-Status AVP received within the Call-Barring-Info AVPs within the Subscription-Data AVP within ULA.

psAndSMS-OnlyServiceProvision in InsertSubscriberDataArg shall be populated with the value received within the Subscription-Data AVP within ULA.

smsInSGSNAllowed in InsertSubscriberDataArg shall be populated with the value received within the Subscription-Data AVP within ULA.

adjacentAccessRestrictionDataList in InsertSubscriberDataArg shall be constructed with the values received within the Adjacent-Access-Restriction-Data AVP within the Subscription-Data AVP within ULA.

imsi-Group-Id-List in InsertSubscriberDataArg shall be constructed with the values received within the IMSI-Group-Id AVP within the Subscription-Data AVP within ULA.

Sub-parameters of **eps-SubscriptionData** in InsertSubscriberDataArg shall be populated as follows:

apn-oi-Replacement shall be populated with the value received in the APN-OI-Replacement AVP within the Subscription-Data AVP within ULA.

rfsp-id shall be populated with the value received within the RAT-Frequency-Selection-Priority-ID AVP within the Subscription-Data AVP within ULA.

ambr shall be populated with the value received within the AMBR AVP within the Subscription-Data AVP within ULA.

apn-ConfigurationProfile shall be populated with the value received within the APN-Configuration-Profile AVP within the Subscription-Data AVP within ULA.

stn-sr shall be populated with the value received within the STN-SR AVP within the Subscription-Data AVP within ULA.

csg-SubscriptionDataList shall be populated with values received within CSG-Subscription-Data AVPs within the Subscription-Data AVP within ULA.

ue-ReachabilityRequestIndicator shall be absent.

mdtUserConsent shall be populated with the value received within MDT-User-Consent AVP within the Subscription-Data AVP within ULA.

subscribed-vsrvcc shall be present if the Subscribed-VSRVCC AVP is present within the Subscription-Data AVP within ULA.

pcscf-Restoration-Request shall be absent.

ActivateTraceModeArg:

imsi in ActivateTraceModeArg shall be absent.

TraceReference shall be populated with the value of Trace-ID part of the Trace-Reference AVP received within the Trace-Data AVP within the Subscription-Data AVP within ULA.

TraceType shall be present with any value.

TraceReference2 shall be populated with the value of MCC+MNC part of the Trace-Reference AVP received within the Trace-Data AVP within the Subscription-Data AVP within ULA.

TraceDepthList shall be populated with the value received in the Trace-Depth-List AVP within the Trace-Data AVP within the Subscription-Data AVP within ULA.

TraceNE-TypeList shall be populated with the value received in the Trace-NE-Type-List AVP within the Trace-Data AVP within the Subscription-Data AVP within ULA.

TraceInterfaceList shall be populated with the value received in the Trace-Interface-List AVP within the Trace-Data AVP within the Subscription-Data AVP within ULA.

TraceEventList shall be populated with the value received in the Trace-Event-List AVP within the Trace-Data AVP within the Subscription-Data AVP within ULA.

Omc-Id shall be populated with the value received in the OMC-Id AVP within the Trace-Data AVP within the Subscription-Data AVP within ULA.

TraceCollectionEntity shall be populated with the address received within the Trace-Collection-Entity AVP within the Subscription-Data AVP within ULA.

UpdateGprsLocationRes:

hlr-Number in UpdateGprsLocationRes shall be populated with a value locally assigned to the IWF and consistent with SS7 routing principles.

extensionContainer in UpdateGprsLocationRes shall be absent.

add-Capability in UpdateGprsLocationRes shall be present.

sgsn-mmeSeparationSupported in UpdateGprsLocationRes shall be present if the Separation Indication within the ULA-Flags AVP was set to 1 within ULA.

MDT-Configuration shall be populated with the value received within the MDT-Configuration AVP within the Subscription-Data AVP within ULA.

mmeRegisteredforSMS in UpdateGprsLocationRes shall be present if the "MME registered for SMS" flag within the ULA-Flags AVP was set to 1 within ULA.

UpdateGprsLocation Error:

An error of **unknownSubscriber** with unknownSubscriberParam containing a unknownSubscriberDiagnostic of "imsiUnknown" shall be sent if the received ULA command contains an Experimental-Result AVP with a value of "User Unknown".

An error of **unknownSubscriber** with unknownSubscriberParam containing a unknownSubscriberDiagnostic of "gprs-epsSubscriptionUnknown" shall be sent if the received ULA command contains an Experimental-Result AVP with a value of "Unknown EPS Subscription".

Other values within the Result-Code / Experimental-Result AVP shall be mapped onto an appropriate MAP error.

8.3 Mapping of Parameters for the Cancel Location Procedure

8.3.1 CancelLocationArg mapping to CLR

When the IWF needs to construct a CLR command as a result of receiving a MAP-CancelLocation message (see sections 7.3.1 step 2, and 7.3.2 step 3), the the IWF shall populate AVPs of CLR as described below:

Auth-Session-State AVP shall be set to the value NO_STATE_MAINTAINED (1).

User-Name AVP shall be populated with the imsi value received within the identity parameter of CancelLocationArg.

Supported-Features AVP shall be absent.

CancellationType AVP shall contain the value MME_UPDATE_PROCEDURE if the parameter CancellationType within CancelLocationArg was set to updateProcedure and typeOfUpdate within CancelLocationArg was set to mme-change; the AVP shall contain the value SGSN_UPDATE_PROCEDURE if the parameter CancellationType within CancelLocationArg was set to updateProcedure and typeOfUpdate within CancelLocationArg was set to sgsn-change; the AVP shall contain the value SUBSCRIPTION_WITHDRAWAL if the parameter CancellationType within CancelLocationArg was set to subscriptionWithdraw; the AVP shall contain the value UPDATE_PROCEDURE_IWF if the parameter CancellationType within CancelLocationArg was set to updateProcedure and typeOfUpdate within CancelLocationArg was absent; the AVP shall contain the value INITIAL_ATTACH_PROCEDURE if the parameter CancellationType within CancelLocationArg was set to InitialAttachProcedure.

CLR-Flags AVP: Flags shall be set as follows:

- **S6a/S6d-Indicator** shall be set to 1 if the TypeOfUpdate parameter was present in CancelLocationArg and indicates "mme-change"; it shall be set to 0 if the TypeOfUpdate parameter was present in CancelLocationArg and indicates "sgsn-change".
- **Reattach-Required** shall be set to 1 if the reattach-Required parameter was present in CancelLocationArg.

8.3.2 CLA mapping to CancelLocationRes/Error

When the IWF needs to construct MAP-CancelLocation Ack message as a result of receiving an CLA command (see sections 7.3.1 step 4 and 7.3.2.step 5), the IWF shall populate sub-parameters of CancelLocationRes/Error as described below:

CancelLocationRes:

extensionContainer in CancelLocationRes shall be absent.

CancelLocation Error:

Values other than SUCCESS within the Result-Code / Experimental-Result AVP shall be mapped onto an appropriate MAP error.

8.3.3 CLR mapping to CancelLocationArg

When the IWF needs to construct a MAP-CancelLocation message as a result of receiving a CLR command (see sections 7.3.2 step 2), the IWF shall open a MAP dialogue in application context version 3 and populate sub-parameters of CancelLocationArg as described below:

identity in CancelLocationArg shall be populated with the imsi value of the User-Name AVP received within CLR.

cancellationType in CancelLocationArg shall contain a value of updateProcedure if the Cancellation-Type AVP received in CLR contains the value MME_UPDATE_PROCEDURE or SGSN_UPDATE_PROCEDURE. The parameter shall contain a value of subscriptionWithdraw if the Cancellation-Type AVP received in CLR contains the value SUBSCRIPTION_WITHDRAWAL. The parameter shall contain a value of InitialAttachProcedure if the Cancellation-Type AVP received in CLR contains the value INITIAL_ATTACH_PROCEDURE.

extensionContainer in CancelLocationArg shall be absent.

typeOfUpdate in CancelLocationArg shall be set to sgsn-change if SGSN_UPDATE_PROCEDURE was received in the Cancellation-Type AVP within CLR, or INITIAL_ATTACH_PROCEDURE was received in the Cancellation-Type AVP within CLR and the S6a/S6d-Indicator flag was cleared in the CLR-Flags AVP within the received CLR. It shall be set to mme-change if MME_UPDATE_PROCEDURE was received in Cancellation-Type AVP within CLR, or if INITIAL_ATTACH_PROCEDURE was received in the Cancellation-Type AVP within CLR and the S6a/S6d-Indicator flag was set in the CLR-Flags AVP within the received CLR. Otherwise it shall be absent.

reattach-Required in CancelLocationArg shall be present if the Reattach-Required flag was set in the CLR-Flags AVP received within CLR.

8.3.4 CancelLocationRes / Error mapping to CLA

When the IWF needs to construct an CLA command as a result of receiving a CancelLocation Ack/Error message (see sections 7.3.2 step 6), the IWF shall populate AVPs of CLA as described below:

Result-Code / Experimental-Result AVP shall be set to:

- DIAMETER_SUCCESS if a CancelLocationRes parameter was received in a TCAP ResultLast component;
- an appropriate DIAMETER base protocol result code otherwise.

Supported-Features AVP shall be absent.

Auth-Session-State AVP shall be set to the value NO_STATE_MAINTAINED (1).

8.4 Mapping of Parameters for the Purge Procedure

8.4.1 PUR mapping to PurgeMS-Arg

When the IWF needs to construct a MAP-PurgeMS message as a result of receiving an PUR command (see sections 7.4.1 step 2 and 7.4.2. step 2), the IWF shall open a MAP dialogue in application context version 3 and populate sub-parameters of PurgeMS-Arg as described below:

imsi in PurgeMS-Arg shall be populated with the imsi value of the User-Name AVP received within PUR.

vlr-Number in PurgeMS-Arg shall be absent.

sgsn-Number in PurgeMS-Arg shall be populated with a value locally assigned to the IWF and consistent with SS7 routing principles.

extensionContainer in PurgeMS-Arg shall be absent.

8.4.2 PurgeMS-Res / Error mapping to PUA

When the IWF needs to construct an PUA command as a result of receiving a PurgeMS Ack/Error message (see sections 7.4.1 step 4 and 7.4.2. step 6), the IWF shall populate AVPs of PUA as described below:

Result-Code / Experimental-Result AVP shall be set to:

- DIAMETER_SUCCESS if a PurgeMS-Res parameter was received in a TCAP ResultLast component;
- DIAMETER_ERROR_USER_UNKNOWN if an error of unknownSubscriber without a diagnostic parameter or with a diagnostic parameter of imsiUnknown or gprs-eps-SubscriptionUnknown was received;
- an appropriate DIAMETER base protocol result code otherwise.

Auth-Session-State AVP shall be set to the value NO_STATE_MAINTAINED (1).

PUA-Flags AVP: Flags shall be set as follows:

- **Freeze M-TMSI** shall be set to 1 if the freezeM-TMSI parameter was present within PurgeMS-Res; otherwise shall be set to 0.
- **Freeze P-TMSI** shall be set to 1 if the freezeP-TMSI parameter was present within PurgeMS-Res; otherwise shall be set to 0.

8.4.3 PurgeMS-Arg mapping to PUR

When the IWF needs to construct a PUR command as a result of receiving a MAP-PurgeMS message (see section 7.4.2 step 3), the the IWF shall populate AVPs of PUR as described below:

Auth-Session-State AVP shall be set to the value NO_STATE_MAINTAINED (1).

User-Name AVP shall be populated with the value received within the imsi parameter of PurgeMS-Arg.

Supported-Features AVP shall be absent.

8.4.4 PUA mapping to PurgeMS-Res/Error

When the IWF needs to construct MAP-PurgeMS Ack message as a result of receiving a PUA command (see section 7.4.2.step 5), the IWF shall populate sub-parameters of PurgeMS-Res/Error as described below:

PurgeMS-Res:

freezeTMSI in PurgeMS-Res shall be absent.

freezeP-TMSI in PurgeMS-Res shall be present if a Freeze-P-TMSI indication was received within the PUA-Flags AVP within PUA.

extensionContainer in PurgeMS-Res shall be absent.

freezeM-TMSI in PurgeMS-Res shall be present if a Freeze-M-TMSI indication was received within the PUA-Flags AVP within PUA.

PurgeMS Error:

An error of **unknownSubscriber** with unknownSubscriberParam containing a unknownSubscriberDiagnostic of "imsiUnknown" shall be sent if the received AIA command contains an Experimental-Result AVP with a value of "User Unknown".

Values other than SUCCESS within the Result-Code / Experimental-Result AVP shall be mapped onto an appropriate MAP error.

8.5 Mapping of Parameters for the Insert Subscriber Data Procedure

8.5.1 InsertSubscriberDataArg mapping to IDR

When the IWF needs to construct an IDR command as a result of receiving a MAP-InsertSubscriberData message (see sections 7.5.1 step 2, and 7.5.2 step 3), the IWF shall populate AVPs of IDR as described below:

Auth-Session-State AVP shall be set to the value NO_STATE_MAINTAINED (1).

User-Name AVP shall be populated with the value received within the imsi parameter of InsertSubscriberDataArg.

Supported-Features AVP shall be absent.

Subscription-Data AVP: See chapter 8.2.2.

IDR-Flags AVP: Flags shall be set as follows:

UE Reachability Request shall be set to 1 if the ue-reachabilityRequestIndicator was present within InsertSubscriberDataArg; otherwise shall be set to 0 or the AVP shall be absent.

P-CSCF Restoration Request flag shall be set to 1 if the pcsf-Restoration-Request parameter was present within InsertSubscriberDataArg; otherwise shall be set to 0 or the AVP shall be absent.

8.5.2 IDA mapping to InsertSubscriberDataRes/Error

When the IWF needs to construct a MAP-InsertSubscriberData Ack message as a result of receiving an IDA command (see sections 7.5.1 step 4 and 7.5.2.step 5), the IWF shall populate sub-parameters of InsertSubscriberDataRes/Error as described below:

InsertSubscriberDataRes:

teleserviceList in InsertSubscriberDataRes shall include all teleserviceCodes that have been received within InsertSubscriberDataArg.

bearerServiceList in InsertSubscriberDataRes shall include all bearerServiceCodes that have been received within InsertSubscriberDataArg.

ss-List in InsertSubscriberDataRes shall include all ssCodes that have been received within InsertSubscriberDataArg.

odb-GeneralData in InsertSubscriberDataRes shall include all odb categories that have been requested within the received InsertSubscriberDataArg but are not supported by the serving node as indicated within the Supported-Feature AVP within IDA.

regionalSubscriptionResponse in InsertSubscriberDataRes

-shall be set to regionalSubscNotSupported if regional subscription was requested within the received InsertSubscriberDataArg but is not supported by the serving node as indicated within the Supported-Feature AVP within IDA.

-shall be set to networkNode-AreaRestricted if regional subscription was requested within the received InsertSubscriberDataArg but a Network-Node-Area-Restricted indication has been received within the IDA-Flags AVP within IDA.

- otherwise shall be absent.

supportedCamelPhases in InsertSubscriberDataRes shall be absent or shall indicate that no CAMEL phase is supported.

extensionContainer in CancelLocationRes shall be absent.

offeredCamel4CSIs in InsertSubscriberDataRes shall be absent.

supportedFeatures in InsertSubscriberDataRes shall be populated with the information received within the Supported-Features AVP within IDA.

InsertSubscriberData Error:

Values other than SUCCESS within the Result-Code / Experimental-Result AVP shall be mapped onto an appropriate MAP error.

8.5.3 IDR mapping to InsertSubscriberDataArg/ ActivateTraceModeArg

When the IWF needs to construct a MAP-InsertSubscriberData message or a MAP-ActivateTraceMode message as a result of receiving an IDR command (see sections 7.5.2 step 2, and 7.10.2 step 2), the IWF shall open a MAP dialogue in application context version 3 and populate sub-parameters of InsertSubscriberDataArg/ActivateTraceModeArg as described below:

InsertSubscriberDataArg:

imsi in InsertSubscriberDataArg shall be populated with the value received within the User-Name AVP within IDR.

msisdn in InsertSubscriberDataArg shall be populated with the value received within the MSISDN AVP within the Subscription-Data AVP within IDR.

category in InsertSubscriberDataArg shall be absent.

subscriberStatus in InsertSubscriberDataArg shall be populated with the value received within the Subscriber-Status AVP within the Subscription-Data AVP within IDR.

bearerServiceList in InsertSubscriberDataArg shall be absent.

teleserviceList in InsertSubscriberDataArg shall be absent

provisionedSS in InsertSubscriberDataArg shall be absent.

odb-Data in InsertSubscriberDataArg shall be populated with the value received within the Operator-Determined-Barring AVP and HPLMN-ODB AVP within the Subscription-Data AVP within IDR.

roamingRestrictedDueToUnsupportedFeature in InsertSubscriberDataArg shall be absent.

regionalSubscriptionData in InsertSubscriberDataArg shall be populated with the value received within the Regional-Subscription-Zone-Code AVPs within the Subscription-Data AVP within IDR.

vbsSubscriptionData in InsertSubscriberDataArg shall be absent.

vgcsSubscriptionData in InsertSubscriberDataArg shall be absent

vlrCamelsubscriptionInfo in InsertSubscriberDataArg shall be absent.

naea-PreferredCI in InsertSubscriberDataArg shall be absent.

gprsSubscriptionData in InsertSubscriberDataArg shall be populated with GPRS-Subscription Data received within the Subscription-Data AVP within IDR.

roamingRestrictedInSgsnDueToUnsupportedFeature in InsertSubscriberDataArg shall be present if a Roaming-Restricted-due-To-Unsupported-Feature AVP was received within the Subscription-Data AVP within IDR.

networkAccessMode in InsertSubscriberDataArg shall be populated with the value received within the Network-Access-Mode AVP within the Subscription-Data AVP within IDR.

lsaInformation in InsertSubscriberDataArg shall be absent.

lmu-Indicator in InsertSubscriberDataArg shall be absent

lcsInformation in InsertSubscriberDataArg shall be absent.

istAlertTimer in InsertSubscriberDataArg shall be absent.

superChargerSupportedInHLR in InsertSubscriberDataArg shall be absent.

mc-SS-Info in InsertSubscriberDataArg shall be absent.

cs-AllocationRetentionPriority in InsertSubscriberDataArg shall be absent.

sgsn-CAMEL-SubscriptionInfo in InsertSubscriberDataArg shall be absent.

chargingCharacteristics in InsertSubscriberDataArg shall be populated with the value received within the 3GPP-Charging-Characteristics AVP within the Subscription-Data AVP within IDR.

accessRestrictionData in InsertSubscriberDataArg shall be populated with the value received within the Access-Restriction-Data AVP within the Subscription-Data AVP within IDR.

ics-Indicator in InsertSubscriberDataArg shall be absent.

LCS Information in InsertSubscriberDataArg shall be populated with the value received within the LCS-Info AVP within the Subscription-Data AVP within ULA.

Teleservice List in InsertSubscriberDataArg shall be populated with the value received within the Teleservice-List AVP within the Subscription-Data AVP within ULA.

Call Barring Information List in InsertSubscriberDataArg shall be populated with the value received within the Call- Barring-Info-List AVP within the Subscription-Data AVP within ULA.

adjacentAccessRestrictionDataList in InsertSubscriberDataArg shall be constructed with the value received within the Adjacent-Access-Restriction-Data AVP within the Subscription-Data AVP within IDR.

imsi-Group-Id-List in InsertSubscriberDataArg shall be constructed with the values received within the IMSI-Group-Id AVP within the Subscription-Data AVP within IDR.

- Sub-parameters of **eps-SubscriptionData** in InsertSubscriberDataArg shall be populated as follows:

apn-oi-Replacement shall be populated with the value received in the APN-OI-Replacement AVP within the Subscription-Data AVP within IDR.

rfsp-id shall be populated with the value received within the RAT-Frequency-Selection-Priority-ID AVP within the Subscription-Data AVP within IDR.

ambr shall be populated with the value received within the AMBR AVP within the Subscription-Data AVP within IDR.

apn-ConfigurationProfile shall be populated with the value received within the APN-Configuration-Profile AVP within the Subscription-Data AVP within IDR.

stn-sr shall be populated with the value received within the STN-SR AVP within the Subscription-Data AVP within IDR.

subscribed-vsrvcc shall be present if the Subscribed-VSRVCC AVP is present within the Subscription-Data AVP within IDR.

csg-SubscriptionDataList in InsertSubscriberDataArg shall be populated with information received within the CSG-Subscription-Data AVPs within the Subscription-Data AVP within IDR.

ue-ReachabilityRequestIndicator in the InsertSubscriberDataArg shall be present if the corresponding information was present within the IDR-Flags AVP within an IDR; otherwise it shall be absent.

psAndSMS-OnlyServiceProvision in InsertSubscriberDataArg shall be populated with the information received within the PS-and-SMS-Only-Service-Provision AVP within the Subscription-Data AVP within IDR.

smsInSGSNAllowed in InsertSubscriberDataArg shall be populated with the information received within the SMS-In-SGSN-Allowed AVP within the Subscription-Data AVP within IDR.

pcscf-Restoration-Request in the InsertSubscriberDataArg shall be present if the corresponding information was present within the IDR-Flags AVP within an IDR; otherwise it shall be absent.

ActivateTraceModeArg:

imsi shall be populated with the value received within the User-Name AVP within IDR.

TraceReference shall be populated with the value of Trace-ID part of the Trace-Reference AVP received within the Trace-Data AVP within the Subscription-Data AVP within IDR.

TraceType shall be present with any value.

TraceReference2 shall be populated with the value of MCC+MNC part of the Trace-Reference AVP received within the Trace-Data AVP within the Subscription-Data AVP within IDR.

TraceDepthList shall be populated with the value received in the Trace-Depth-List AVP within the Trace-Data AVP within the Subscription-Data AVP within IDR.

TraceNE-TypeList shall be populated with the value received in the Trace-NE-Type-List AVP within the Trace-Data AVP within the Subscription-Data AVP within IDR.

TraceInterfaceList shall be populated with the value received in the Trace-Interface-List AVP within the Trace-Data AVP within the Subscription-Data AVP within IDR.

TraceEventList shall be populated with the value received in the Trace-Event-List AVP within the Trace-Data AVP within the Subscription-Data AVP within IDR.

Omc-Id shall be populated with the value received in the OMC-Id AVP within the Trace-Data AVP within the Subscription-Data AVP within IDR.

TraceCollectionEntity shall be populated with the address received within the Trace-Collection-Entity AVP within the Subscription-Data AVP within IDR.

8.5.4 InsertSubscriberDataRes / Error mapping to IDA

When the IWF needs to construct an IDA command as a result of receiving an InsertSubscriberData Ack/Error message (see sections 7.5.2 step 8), the IWF shall populate AVPs of IDA as described below:

Result-Code / Experimental-Result AVP shall be set to:

- DIAMETER_SUCCESS if no InsertSubscriberData error component was received;
- an appropriate DIAMETER base protocol result code otherwise.

Auth-Session-State AVP shall be set to the value NO_STATE_MAINTAINED (1).

IDA-Flags AVP: Flags shall be set as follows:

- **Network-Node-Area-Restricted** shall be set to 1 if the regionalSubscriptionResponse parameter within InsertSubscriberDataRes indicated regionalSubscNotSupported; otherwise shall be set to 0.

Supported-Features AVP: Support of features shall be indicated according to information received within the supportedFeatures parameter within InsertSubscriberDataRes.

8.5.5 ProvideSubscriberInfoArg mapping to IDR

When the IWF needs to construct an IDR command as a result of receiving a MAP-ProvideSubscriberInfo message (see sections 7.5.1 step 2, and 7.5.2 step 3), the IWF shall populate AVPs of IDR as described below:

Auth-Session-State AVP shall be set to the value NO_STATE_MAINTAINED (1).

User-Name AVP shall be populated with the value received within the imsi parameter of ProvideSubscriberInfoArg.

Supported-Features AVP shall be absent.

Subscription-Data AVP shall be empty.

IDR-Flags AVP: Flags shall be set as follows:

UE Reachability Request shall be set to 0.

T-ADS Data Request shall be set to 1 if the t-adsData within the RequestedInfo parameter within ProvideSubscriberInfoArg was present; otherwise it shall be set to 0 or the AVP shall be absent.

EPS User State Request shall be set to 1 if the subscriberState within the RequestedInfo parameter was present within ProvideSubscriberInfoArg; otherwise it shall be set to 0 or the AVP shall be absent.

EPS Location Information Request shall be set to 1 if the locationInformation within the RequestedInfo parameter was present within ProvideSubscriberInfoArg; otherwise it shall be set to 0 or the AVP shall be absent.

Current Location Request shall be set to 1 if the currentLocation within the RequestedInfo parameter was present within ProvideSubscriberInfoArg; otherwise it shall be set to 0.

Local Time Zone Request shall be set to 1 if the localTimeZoneRequest within the RequestedInfo parameter was present within ProvideSubscriberInfoArg; otherwise it shall be set to 0.

P-CSCF Restoration Request shall be set to 0.

8.5.6 IDA mapping to ProvideSubscriberInfoRes/Error

When the IWF needs to construct a MAP-ProvideSubscriberInfo Ack message as a result of receiving an IDA command (see sections 7.5.1 step 4 and 7.5.2.step 5), the IWF shall populate sub-parameters of ProvideSubscriberInfoRes/Error as described below:

ProvideSubscriberInfoRes:

Sub-parameters of **SubscriberInfo** in ProvideSubscriberInfoRes shall be populated as follows:

imsVoiceOverPS-SessionsIndication shall be populated with the value received in the IMS-Voice-Over-PS-Sessions-Supported AVP within IDA.

lastUE-ActivityTime shall be populated with the value received in the Last-UE-Activity-Time AVP within IDA.

lastRAT-Type shall be populated with the value received in the RAT-Type AVP within IDA.

eps-SubscriberState shall be populated with the value received in the EPS-User-State AVP within IDA.

Sub-parameters of **locationInformationEPS** shall be populated with the values of the corresponding AVPs received in the EPS-Location-Information AVP within IDA.

timeZone shall be populated with the value received in the Time-Zone AVP within IDA.

daylightSavingTime shall be populated with the value received in the Daylight-Saving-Time AVP within IDA.

extensionContainer in ProvideSubscriberInfoRes shall be absent.

ProvideSubscriberInfo Error:

Values other than SUCCESS within the Result-Code / Experimental-Result AVP shall be mapped onto an appropriate MAP error.

8.5.7 IDR mapping to ProvideSubscriberInfoArg

When the IWF needs to construct a MAP-ProvideSubscriberInfo message as a result of receiving an IDR command (see sections 7.5.2 step 2), the IWF shall open a MAP dialogue in application context version 3 and populate sub-parameters of ProvideSubscriberInfoArg as described below:

ProvideSubscriberInfoArg:

imsi in ProvideSubscriberInfoArg shall be populated with the value received within the User-Name AVP within IDR.

imsi in ProvideSubscriberInfoArg shall be absent.

Sub-parameters of **requestedInfo** in ProvideSubscriberInfoArg shall be populated as follows:

t-adsData in requestedInfo shall be present if the "T-ADS Data Request" flag was set in the IDR-Flags AVP within IDR.

subscriberState in requestedInfo shall be present if the "EPS User State Request" flag was set in the IDR-Flags AVP within IDR.

locationInformation in requestedInfo shall be present if the "EPS Location Information Request" flag was set in the IDR-Flags AVP within IDR.

currentLocation in requestedInfo shall be present if the "Current Location Request" flag was set in the IDR-Flags AVP within IDR.

localTimeZoneRequest in requestedInfo shall be present if the "Local Time Zone Request" flag was set in the IDR-Flags AVP within IDR.

extensionContainer in ProvideSubscriberInfoArg shall be absent.

callPriority in ProvideSubscriberInfoArg shall be absent.

8.5.8 ProvideSubscriberInfoRes/Error mapping to IDA

When the IWF needs to construct an IDA command as a result of receiving an ProvideSubscriberInfo Ack/Error message (see sections 7.5.2 step 8), the IWF shall populate AVPs of IDA as described below:

Auth-Session-State AVP shall be set to the value NO_STATE_MAINTAINED (1).

Supported-Features AVP shall be absent.

Result-Code / Experimental-Result AVP shall be set to:

- DIAMETER_SUCCESS if no ProvideSubscriberInfo error component was received;
- an appropriate DIAMETER base protocol result code otherwise.

IMS-Voice-Over-PS-Sessions-Supported AVP shall be populated with the value received within the imsvoiceOverPS-SessionsIndication parameter within the SubscriberInfo parameter of ProvideSubscriberInfoRes.

Last-UE-Activity-Time AVP shall be populated with the value received within the lastUE-ActivityTime parameter within the SubscriberInfo parameter of ProvideSubscriberInfoRes.

RAT-Type AVP shall be populated with the value received within the lastRAT-Type parameter within the SubscriberInfo parameter of ProvideSubscriberInfoRes.

EPS-User-State AVP shall be populated with the value received within the eps-SubscriberState parameter within the SubscriberInfo parameter of ProvideSubscriberInfoRes.

AVPs within **EPS-Location-Information** AVP shall be populated with the values of the corresponding sub-parameters received within the locationInformationEPS parameter within the SubscriberInfo parameter of ProvideSubscriberInfoRes.

IDA-Flags AVP shall be absent.

AVPs within **Local-Time-Zone** AVP shall be populated as follows:

- **Time-Zone** AVP shall be populated with the value received within the timeZone parameter within the SubscriberInfo parameter of ProvideSubscriberInfoRes.
- **Daylight-Saving-Time** AVP shall be populated with the value received within the daylightSavingTime parameter within the SubscriberInfo parameter of ProvideSubscriberInfoRes.

8.6 Mapping of Parameters for the Delete Subscriber Data Procedure

8.6.1 DeleteSubscriberDataArg mapping to DSR

When the IWF needs to construct a DSR command as a result of receiving a MAP-DeleteSubscriberData message (see sections 7.6.1 step 2, and 7.6.2 step 3), the the IWF shall populate AVPs of DSR as described below:

Auth-Session-State AVP shall be set to the value NO_STATE_MAINTAINED (1).

User-Name AVP shall be populated with the value received within the imsi parameter of DeleteSubscriberDataArg.

Supported-Features AVP shall be absent.

DSR-Flags AVP: Flags shall be set as follows:

- **RegionalSubscriptionWithdrawal** shall be set to 1 if a regionalSubscriptionIdentifier parameter was present in DeleteSubscriberDataArg; otherwise shall be set to 0.
- **Complete APN Configuration Profile Withdrawal** shall be set to 1 if the allePS-Data parameter was present within the EPS-SubscriptionDataWithdraw parameter within DeleteSubscriberDataArg; otherwise shall be set to 0.
- **Subscribed Charging Characteristics Withdrawal** shall be set to 1 if the chargingCharacteristicsWithdraw parameter was present within DeleteSubscriberDataArg; otherwise shall be set to 0.
- **PDN Subscription Context Withdrawal** shall be set to 1 if the contextIdList parameter was present within the EPS-SubscriptionDataWithdraw parameter within DeleteSubscriberDataArg; otherwise shall be set to 0.
- **STN-SR** shall be set to 1 if the stn-srWithdraw parameter was present within DeleteSubscriberDataArg; otherwise shall be set to 0.
- **GMLC List Withdrawal** shall be set to 1 if the GMLC List Withdraw parameter was present within DeleteSubscriberDataArg; otherwise shall be set to 0.
- **LCS Withdrawal** shall be set to 1 if the SS code list parameter was present within DeleteSubscriberDataArg; otherwise shall be set to 0.
- **Complete PDP context list Withdrawal** shall be set to 1 if the allGPRS-Data parameter was present within the GPRS-SubscriptionDataWithdraw parameter within DeleteSubscriberDataArg; otherwise shall be set to 0.

- **PDP context Withdrawal** shall be set to 1 if the contextIdList parameter was present within the GPRS-SubscriptionDataWithdraw parameter within DeleteSubscriberDataArg; otherwise shall be set to 0.
- **Roaming Restricted in due to unsupported feature** shall be set to 1 if the roamingRestrictedInSgsnDueToUnsupportedFeature parameter was present within DeleteSubscriberDataArg; otherwise shall be set to 0.
- **Trace Data Withdrawal** shall be set to 0.
- **CSG Deleted** shall be set to 1 if the csg-SubscriptionDeleted parameter was present within DeleteSubscriberDataArg; otherwise shall be set to 0.
- **APN-OI-Replacement** shall be set to 1 if the apn-oi-replacementWithdraw parameter was present within DeleteSubscriberDataArg; otherwise shall be set to 0.
- **SMS Withdrawal** shall be set to 1 if the SS-Code list parameter was present within DeleteSubscriberDataArg and the service codes are related to short message services; otherwise shall be set to 0.
- **Subscribed VSRVCC Withdrawal** shall be set to 1 if the subscribed-vsrvcWithdraw parameter was present within DeleteSubscriberDataArg; otherwise shall be set to 0.

Context-Identifier AVPs shall be populated with values received within the contextIdList parameter within EPS-SubscriptionDataWithdraw or GPRS-SubscriptionDataWithdraw within DeleteSubscriberDataArg;

8.6.2 DSA mapping to DeleteSubscriberDataRes/Error

When the IWF needs to construct a MAP-DeleteSubscriberData Ack message as a result of receiving a DSA command (see sections 7.6.1 step 4 and 7.6.2.step 5), the IWF shall populate sub-parameters of DeleteSubscriberDataRes/Error as described below:

DeleteSubscriberDataRes:

regionalSubscriptionResponse in DeleteSubscriberDataRes shall be set to:

- regionalSubscNotSupported if a corresponding information was received within the Supported-Feature AVP within DSA .
- networkNode-AreaRestricted if a Network-Node-Area-Restricted indication was received within the DSA-Flags AVP within DSA.

extensionContainer in DeleteSubscriberDataRes shall be absent.

DeleteSubscriberData Error:

Values other than SUCCESS within the Result-Code / Experimental-Result AVP shall be mapped onto an appropriate MAP error.

8.6.3 DSR mapping to DeleteSubscriberDataArg/DeactivateTraceModeArg

When the IWF needs to construct a MAP-DeleteSubscriberData message or a MAP-DeactivateTraceMode message as a result of receiving a DSR command (see sections 7.6.2 step 2, 7.11.2 step 2), the IWF shall open a MAP dialogue in application context version 3 and populate sub-parameters of DeleteSubscriberDataArg/DeactivateTraceModeArg as described below:

DeleteSubscriberDataArg:

imsi in DeleteSubscriberDataArg shall be populated with the value of the User-Name AVP received within DSR.

basicServiceList in DeleteSubscriberDataArg shall be absent.

ss-List in DeleteSubscriberDataArg shall be absent.

roamingRestrictionDueToUnsupportedFeature in DeleteSubscriberDataArg shall be absent.

regionalSubscriptionIdentifier in DeleteSubscriberDataArg shall be present if a Regional-Subscription-Withdrawal indication has been received within the DSR-Flags AVP within DSR. If present, the value of the ZoneCode is arbitrary.

vbsGroupIndication in DeleteSubscriberDataArg shall be absent.

vgcsGroupIndication in DeleteSubscriberDataArg shall be absent.

camelSubscriptionInfoWithdraw in DeleteSubscriberDataArg shall be absent.

extensionContainer in DeleteSubscriberDataArg shall be absent.

gprsSubscriptionDataWithdraw in DeleteSubscriberDataArg shall be present if corresponding information was received within the DSR-Flags AVP and GPRS-Context-Identifier AVPs within DSR.

roamingRestrictedInSgsnDueToUnsupportedFeature in DeleteSubscriberDataArg shall be present if a corresponding indication has been received within the DSR-Flags AVP within DSR.

lsaInformationWithdraw in DeleteSubscriberDataArg shall be absent.

gmnlc-ListWithdraw in DeleteSubscriberDataArg shall be absent.

istInformationWithdraw in DeleteSubscriberDataArg shall be absent.

specificCSI-Withdraw in DeleteSubscriberDataArg shall be absent.

chargingCharacteristicsWithdraw in DeleteSubscriberDataArg shall be present if a Subscribed-Charging-Characteristics-Withdrawal indication was received within the DSR-Flags AVP within DSR.

stn-srWithdraw in DeleteSubscriberDataArg shall be present if a STN-SR indication was received within the DSR-Flags AVP within DSR.

epsSubscriptionDataWithdraw in DeleteSubscriberDataArg shall be present if a Complete-APN-Configuration-Profil-Withdrawal indication or a PDN-Subscription-Context-Withdrawal indication was received within the DSR-Flags AVP. The sub-parameter allEPS-Data shall be present if a Complete-APN-Configuration-Profil-Withdrawal indication was received in the DSR-Flags AVP within DSR. The sub-parameter contextIdList shall be present if a PDN-Subscription-Context-Withdrawal indication was received within the DSR-Flags AVP within DSR; if so, the contextIdList shall be populated with values received within the Context-Identifier AVPs within DSR.

GMLC List Withdraw in DeleteSubscriberDataArg shall be present if a GMLC List Withdrawal indication was received within the DSR-Flags AVP.

SS-Code List in DeleteSubscriberDataArg shall be present if corresponding information was received within the DSR-Flags AVP and SS-Code AVPs within DSR.

apn-oi-replacementWithdraw in DeleteSubscriberDataArg shall be present if a APN-OI-Replacement indication was received within the DSR-Flags AVP within DSR.

csg-SubscriptionDeleted in DeleteSubscriberDataArg shall be present if a CSG Deleted indication was received within the DSR-Flags AVP within DSR.

SS-Code List in DeleteSubscriberDataArg shall be present if SMS Withdrawal bit was set within the DSR-Flags AVP and SS-Code AVPs was within DSR.

subscribed-vsrvccWithdraw in DeleteSubscriberDataArg shall be present if a Subscribed VSRVCC Withdrawal indication was received within the DSR-Flags AVP within DSR.

DeactivateTraceModeArg:

imsi in DeactivateTraceModeArg shall be populated with the value received within the User-Name AVP within DSR.

TraceReference in DeactivateTraceModeArg shall be populated with the value of Trace-ID part of the Trace-Reference AVP received within DSR.

TraceReference2 in DeactivateTraceModeArg shall be populated with the value of MCC+MNC part of the Trace-Reference AVP received within DSR.

8.6.4 DeleteSubscriberDataRes / Error mapping to DSA

When the IWF needs to construct a DSA command as a result of receiving a DeleteSubscriberData Ack/Error message (see sections 7.6.2 step 6), the IWF shall populate AVPs of DSA as described below:

Result-Code / Experimental-Result AVP shall be set to:

- **DIAMETER_SUCCESS** if a DeleteSubscriberDataRes parameter was received in a TCAP ResultLast component;
- an appropriate **DIAMETER** base protocol result code otherwise.

Auth-Session-State AVP shall be set to the value **NO_STATE_MAINTAINED** (1).

Supported-Features AVP shall be present and shall indicate support of Regional Subscription if a Regional-Subscription-Withdrawal indication was present within the DSR-Flags AVP within DSR and no regionalSubscNotSupported indication was received in regionalSubscriptionResponse in DeleteSubscriberDataRes.

DSA-Flags AVP: Flags shall be set as follows:

- **Network-Node-Area-Restricted** shall be set to 1 if a networkNode-AreaRestricted indication was received within the regionalSubscriptionResponse parameter within DeleteSubscriberDataRes; otherwise shall be set to 0.

8.7 Mapping of Parameters for the Reset Procedure

8.7.1 Reset (v1 or v2) mapping to RSR

When the IWF needs to construct a RSR command as a result of receiving a MAP-Reset message with AC version 1 or version 2 (see sections 7.7.1 step 2, and 7.7.2 step 4), the the IWF shall populate AVPs of RSR as described below:

Auth-Session-State AVP shall be set to the value **NO_STATE_MAINTAINED** (1).

User-Id AVPs shall be populated with the values received within the HLR-Id parameters within hlr-list within ResetArg.

Supported-Features AVP shall be absent.

8.7.2 RSR mapping to ResetArg (v1 or v2)

When the IWF needs to construct MAP-Reset message as a result of receiving a RSR command (see section 7.7.2 step 2), the IWF shall open a MAP dialogue in version 1 or version 2 according to an implementation option; note that the IWF shall be prepared to fall back to v1 when v2 is chosen. Sub-parameters of ResetArg shall be populated as described below:

networkResource in ResetArg (only v1) shall be set to hlr.

hlr-Number in ResetArg shall be populated with a value locally assigned to the IWF and consistent with SS7 routing principles.

hlr-List in ResetArg shall be populated with values received within User-Id AVPs within RSR.

8.8 Mapping of Parameters for the Notification Procedure

8.8.1 NOR mapping to UpdateGprsLocation-Arg

When the IWF needs to construct a MAP-UpdateGprsLocation message as a result of receiving an NOR command (see sections 7.8.1 step 2 and 7.8.2. step 2), the IWF shall open a MAP dialogue in application context version 3 and populate sub-parameters of UpdateGprsLocation-Arg as described below:

imsi in UpdateGprsLocationArg shall be populated with the value of the User-Name AVP received within NOR.

sgsn-Number in UpdateGprsLocationArg shall be populated with a value locally assigned to the IWF and consistent with SS7 routing principles.

sgsn-Address in UpdateGprsLocationArg shall be populated with the IP-address of the source node sending the NOR command.

extensionContainer in UpdateGprsLocationArg shall be absent.

sgsn-Capability in UpdateGprsLocationArg shall be absent.

informPreviousNetworkEntity in UpdateGprsLocationArg shall be absent;

ps-LCS-NotSupportedByUE in UpdateGprsLocationArg shall be absent

v-gmlc-Address in UpdateGprsLocationArg shall be absent.

add-info in UpdateGprsLocationArg shall be present if a Terminal-Information AVP was present in the received NOR. If present the parameter shall be populated with the received IMEI and software version, and with a skipSubscriberDataUpdate indication.

eps-info in UpdateGprsLocationArg shall be present and contain a pdn-gw-update parameter if the received NOR contained a MIP6-Agent-Info AVP. It shall be present and contain a isr-Information parameter if the received NOR contained a Single-Registration-Indication indication within the NOR-Flags AVP.

servngNodeTypeIndicator in UpdateGprsLocationArg shall be present only if the S6a/S6d-Indicator flag within the NOR-Flags AVP received within the NOR is set to 1; otherwise, it shall be absent.

skipSubscriberData Update in UpdateGprsLocationArg shall be present.

usedRAT-Type in UpdateGprsLocationArg shall be absent.

gprsSubscriptionDataNotNeeded in UpdateGprsLocationArg shall be absent.

nodeTypeIndicator in UpdateGprsLocationArg shall be absent.

areaRestricted in UpdateGprsLocationArg shall be present if the corresponding information was received within the NOR-Flags AVP within a NOR; otherwise it shall be absent.

ue-reachableIndicator in UpdateGprsLocationArg shall be present if the corresponding information was received within the NOR-Flags AVP within a NOR; otherwise it shall be absent.

ue-srvcc-Capability in UpdateGprsLocationArg shall be present if a UE-SRVCC-Capability AVP was present in the received NOR. If present the parameter shall be populated with the received ue-srvcc-Capability.

homogeneousSupportOfIMSVoiceOverPSSessions in UpdateGprsLocationArg shall be present if the corresponding information was received within the NOR; otherwise it shall be absent.

updateofHomogeneousSupportOfIMSVoiceOverPSSessions in UpdateGprsLocationArg shall be present if the corresponding information was received within the NOR-Flags AVP within a NOR; otherwise it shall be absent.

removalofMMERegistrationforSMS in UpdateGprsLocationArg shall be present if the corresponding information was received within the NOR-Flags AVP within a NOR; otherwise it shall be absent.

8.8.2 UpdateGprsLocation-Arg mapping to NOR

When the IWF needs to construct a NOR command as a result of receiving a MAP-UpdateGprsLocation message with a pdn-gw-update parameter within eps-info or with an isr-Information parameter within eps-info not indicating updateLocation or with a skipSubscriberDataUpdate parameter within add-info or with ue-srvcc-Capability parameter but without usedRAT-Type parameter (see section 7.8.2 step 4), the the IWF shall populate AVPs of NOR as described below:

Auth-Session-State AVP shall be set to the value NO_STATE_MAINTAINED (1).

User-Name AVP shall be populated with the value received within the imsi parameter of UpdateGprsLocation-Arg.

Supported-Features AVP shall be absent.

Terminal-Information AVP shall be present if an add-info parameter was present in UpdateGprsLocationArg..

MIP6-Agent-Info AVP shall be present if pdn-gw-Identity was received within pdn-gw-update parameter within eps-info within UpdateGprsLocationArg.

Service-Selection AVP shall be present if apn was received within pdn-gw-update parameter within eps-info within UpdateGprsLocationArg.

NOR-Flags AVP: Flags shall be set as follows:

- Single-Registration-Indication shall be set to 1 if a cancelSGSN indication was received within the ISR-Information within the eps-info within the UpdateGprsLocationArg; otherwise it shall be set to 0.
- SGSN area restricted shall be set to 1 if an sgsnAreaRestricted indication was received within the UpdateGprsLocationArg; otherwise it shall be set to 0.
- Ready for SM shall be set to 0.
- UE Reachable shall be set to 1 if a ue-reachableIndicator was received within the UpdateGprsLocationArg; otherwise it shall be set to 0.
- S6a/S6d-Indicator shall be set to 1 if a servingNodeTypeIndicator was received within the UpdateGprsLocationArg; otherwise it shall be set to 0.
- Homogeneous Support of IMS Voice Over PS Sessions shall be set to 1 if an updateofHomogeneousSupportOfIMSVoiceOverPSSessions was received within the UpdateGprsLocationArg; otherwise it shall be set to 0.
- Removal of MME Registration for SMS shall be set to 1 if a removalofMMERegistrationforSMS was received within the UpdateGprsLocationArg; otherwise it shall be set to 0.

Context-Identifier AVP shall be present if contextId was received within pdn-gw-update parameter within eps-info within UpdateGprsLocationArg.

UE-SRVCC-Capability AVP shall be present if a ue-srvcc-Capability parameter was present in UpdateGprsLocationArg. If present the AVP shall be populated with the received ue-srvcc-Capability parameter.

Homogeneous-Support-of-IMS-Voice-Over-PS-Sessions AVP shall be present if updateofHomogeneousSupportOfIMSVoiceOverPSSessions was present in UpdateGprsLocationArg; otherwise it shall be absent.

8.8.3 NOR mapping to ReadyForSM-Arg

When the IWF needs to construct a MAP-ReadyForSM message as a result of receiving an NOR command (see sections 7.8.1 step 2 and 7.8.2. step 2), the IWF shall open a MAP dialogue in application context version 3 and populate sub-parameters of ReadyForSMArg as described below:

imsi in ReadyForSMArg shall be populated with the value of the User-Name AVP received within NOR.

alertReason in ReadyForSMArg shall be populated with the value of the Alert-Reason AVP received within NOR.

alertReasonIndicator in ReadyForSMArg shall be present if the "Ready for SM from SGSN" flag within the NOR-Flags AVP received within NOR is set; otherwise it shall be absent.

additionalAlertReasonIndicator in ReadyForSMArg shall be absent.

extensionContainer in ReadyForSMArg shall be absent.

maximumUeAvailabilityTime shall be present and populated with the value of the Max-UE-Availaibility-Time AVP, when received within NOR.

8.8.4 ReadyForSM-Arg mapping to NOR

When the IWF needs to construct a NOR command as a result of receiving a MAP-ReadyForSM message (see section 7.8.2 step 4), the the IWF shall populate AVPs of NOR as described below:

User-Name AVP shall be populated with the value received within the imsi parameter of ReadyForSMArg.

Supported-Features AVP shall be absent.

Terminal-Information AVP shall be absent.

MIP6-Agent-Info AVP shall be absent.

Context-Identifier AVP shall be absent.

Service-Selection AVP shall be absent.

Alert-Reason AVP shall be present and populated with the value received within the alertReason parameter of ReadyForSMArg.

NOR-Flags AVP: Flags shall be set as follows:

- Single-Registration-Indication shall be set to 0.
- SGSN area restricted shall be set to 0.
- Ready for SM from SGSN shall be set to 1 if alertReasonIndicator is received within ReadyForSMArg; otherwise it shall be set to 0.
- Ready for SM from MME shall be set to 1 if alertReasonIndicator is not received within ReadyForSMArg; otherwise it shall be set to 0.
- UE Reachable shall be set to 0.
- Homogeneous Support of IMS Voice Over PS Sessions shall be set to 0.
- Removal of MME Registration for SMS shall be set to 0.

Maximum-UE-Availability-Time AVP shall be present and populated with the value of the maximumUeAvailabilityTime parameter, when received in the ReadyForSMArg.

8.9 Mapping of Parameters for the IMEI Check Procedure

8.9.1 ECR mapping to CheckIMEI-Arg

When the IWF needs to construct a MAP-CheckIMEI message as a result of receiving an ECR command (see section 7.9.1 step 2), the IWF shall open a MAP dialogue in application context version 3 and populate sub-parameters of CheckIMEI-Arg as described below:

imei in CheckIMEI-Arg shall be populated with the imei (and software version) as received within the Terminal-Information AVP within ECR.

requestedEquipmentInfo in CheckIMEI-Arg shall indicate equipmentStatus.

extensionContainer in CheckIMEI-Arg shall be absent.

8.9.2 CheckIMEI-Res / Error mapping to ECA

When the IWF needs to construct an ECA command as a result of receiving a CheckIMEI Ack/Error message (see section 7.9.1 step 4), the IWF shall populate AVPs of ECA as described below:

Result-Code / Experimental-Result AVP shall be set to:

- DIAMETER_SUCCESS if a CheckIMEI-Res parameter was received in a TCAP ResultLast component;
- DIAMETER_ERROR_UNKNOWN_EQUIPMENT if an error of unknownEquipment was received;
- an appropriate DIAMETER base protocol result code otherwise.

Auth-Session-State AVP shall be set to the value NO_STATE_MAINTAINED (1).

Equipment-Status AVP shall be populated with a value as received within the equipmentStatus parameter within CheckIMEI-Res.

8.10 Mapping of Parameters for the Trace Activate Procedure

8.10.1 ActivateTraceMode-Arg mapping to IDR

When the IWF needs to construct an IDR command as a result of receiving a MAP-ActivateTraceMode message (see sections 7.10.1 step 2), the IWF shall populate AVPs of the IDR as described below:

User-Name AVP shall be populated with the value received within the imsi parameter of ActivateTraceModeArg.

Supported-Features AVP shall be absent.

Subscription-Data AVP shall be present and populated as follows:

Trace-Data AVP shall be present and populated as in chapter 8.2.2.

All other sub-AVPs shall be absent.

8.10.2 IDA mapping to ActivateTraceMode-Res / Error

When the IWF needs to construct a MAP-ActivateTraceMode Ack message as a result of receiving an IDA command (see sections 7.10.1 step 4), the IWF shall populate sub-parameters of ActivateTraceMode Res/Error as described below:

ActivateTraceModeRes:

traceSupportIndicator shall be present if an indication of support of this feature was received within the Supported-Feature AVP within IDA; Otherwise, it shall be absent.

extensionContainer shall be absent.

ActivateTraceMode Error:

Values other than SUCCESS within the Result-Code / Experimental-Result AVP shall be mapped onto an appropriate MAP error.

8.11 Mapping of Parameters for the Trace Deactivate Procedure

8.11.1 DeactivateTraceMode-Arg mapping to DSR

When the IWF needs to construct an DSR command as a result of receiving a MAP-DeactivateTraceMode message (see sections 7.11.1 step 2), the IWF shall populate AVPs of DSR as described below:

User-Name AVP shall be populated with the value received within the imsi parameter of DeactivateTraceModeArg.

Trace-Reference AVP shall be populated with the values received within the traceReference and traceReference2 parameters of DeactivateTraceModeArg.

Supported-Features AVP shall be absent.

DSR-Flags AVP: Trace Data Withdrawal shall be set to 1. All other Flags shall be set as 0.

Context-Identifier AVPs shall be absent.

8.11.2 DSA mapping to DeactivateTraceMode-Res / Error

When the IWF needs to construct a MAP-DeactivateTraceMode Ack message as a result of receiving an DSA command (see sections 7.11.1 step 4), the IWF shall populate sub-parameters of DeactivateTraceMode Res/Error as described below:

DeactivateTraceModeRes:

extensionContainer shall be absent.

DeactivateTraceMode Error:

Values other than SUCCESS within the Result-Code / Experimental-Result AVP shall be mapped onto an appropriate MAP error.

Annex A: IWFs for the support of SMS capable MMEs or SGSNs

A.1 General

This Annex describes the various cases of IWFs used for SMS related interfaces.

A.2 IWF related to the SGd/Gdd interfaces between MME/SGSN and central SMS functions

A.2.1 Introduction

The clause A.2 with its subclauses describes the IWFs used between an MME/SGSN, supporting the SGd/Gdd interface and Central SMS functions (SMS-GMSC, SMS-IWMSC, SMS Router) supporting a MAP E interface.

3GPP TS 23.204 [6] has specified the support of SMS for IMS UE to IMS UE without MSISDN which impacts the IWF description for the IP-SM-GW with SMS Central functions over SGd/Gdd.

A.2.2 General considerations

Void

A.2.3 Interworking scenarios

A.2.3.1 One IWF scenario

This interworking scenario, illustrated in figure A.2.3.1-1, is between a MME/SGSN supporting SGd/Gdd interface based on Diameter and central SMS functions (SMS-GMSC, SMS-IWMSC, SMS Router) supporting a MAP based E interface for SMS with one IWF in the path.

This interworking scenario also applies between an IP/SM/GW supporting SGd/Gdd interface based on Diameter and central SMS functions (SMS-GMSC, SMS-IWMSC) supporting a MAP based E interface for SMS with one IWF in the path, in particular for SMS for IMS UE to IMS UE without MSISDN (see 3GPP TS 23.204 [6]).

This IWF scenario can be an inter PLMN use case where the MME/SGSN and the IWF are in the Visited PLMN.

This IWF scenario can be an intra PLMN use case where the central SMS functions are supporting MAP based interfaces.

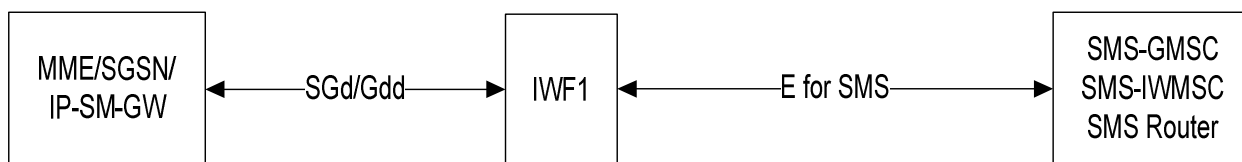


Figure A.2.3.1-1 SGd - E for SMS interworking scenario with one IWF

For MO Forward short messages requests, the IWF shall use the SC address (E.164 number) received over SGd/Gdd for routing over MAP.

For MT Forward short messages, the IWF shall rely on the E.164 number of the MME/SGSN used to route the MAP message towards the IWF to locally determine the Diameter address of the MME/SGSN.

For ALR, the IWF shall use the SC address (E.164 number) received over SGd/Gdd for routing over MAP.

A.2.3.2 Two IWF scenario

This interworking scenario, illustrated in figure A.2.3.2-1 is between a MME/SGSN supporting a SGd/Gdd interface based on Diameter and central SMS functions (SMS-GMSC, SMS-IWMSC, SMS Router) supporting a SGd/Gdd interface based on Diameter with two IWF in the path, a MAP based E interface for SMS being used between the IWFs.

This interworking scenario, also applies between an IP-SM-GW supporting a SGd/Gdd interface based on Diameter and central SMS functions (SMS-GMSC) supporting a SGd/Gdd interface based on Diameter with two IWF in the path, a MAP based E interface for SMS being used between the IWFs, in particular for SMS for IMS UE to IMS UE without MSISDN (see 3GPP TS 23.204 [6]).

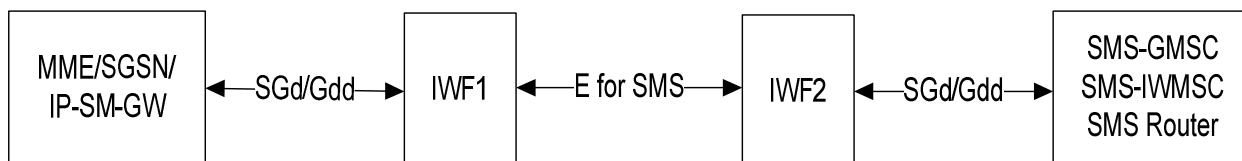


Figure A.2.3.2-1: Two IWFs scenario

The IWF1 is located in the PLMN of the MME/SGSN or in the PLMN of the IP-SM-GW. IWF2 is located in the PLMN of the SMS-GMSC or the SMS-IWMSC or the SMS Router. The SMS Router may be in a PLMN different from the PLMN of the SMS-GMSC.

The IWF1 needs not to be aware whether its connection via E for SMS interface is to an IWF or to central SMS functions (see One IWF scenario).

For routing of MO and MT forward short messages and ALR, the IWF1 shall behave as the IWF of the one IWF scenario.

For MO Forward short messages requests, the IWF2 shall rely on the E.164 number of the SMS-SC used to route the MAP message towards the IWF2 to locally determine the Diameter address of the SMS-IWMSC.

For MT Forward short messages requests, the IWF2 shall use the E.164 number of the MME/SGSN/IP-SM-GW received over SGd/Gdd to route the MAP message towards the IWF1.

For ALR, the IWF2 shall route the message using the SMS-GMSC Diameter Address received in the Alert Service Centre message.

A.2.4 The mapping of procedures

A.2.4.1 MO Forward Short Message

A.2.4.1.1 One IWF Scenario

The mapping of the MO Forward Short Message procedure for this scenario is shown in figure A.2.4.1.1-1:

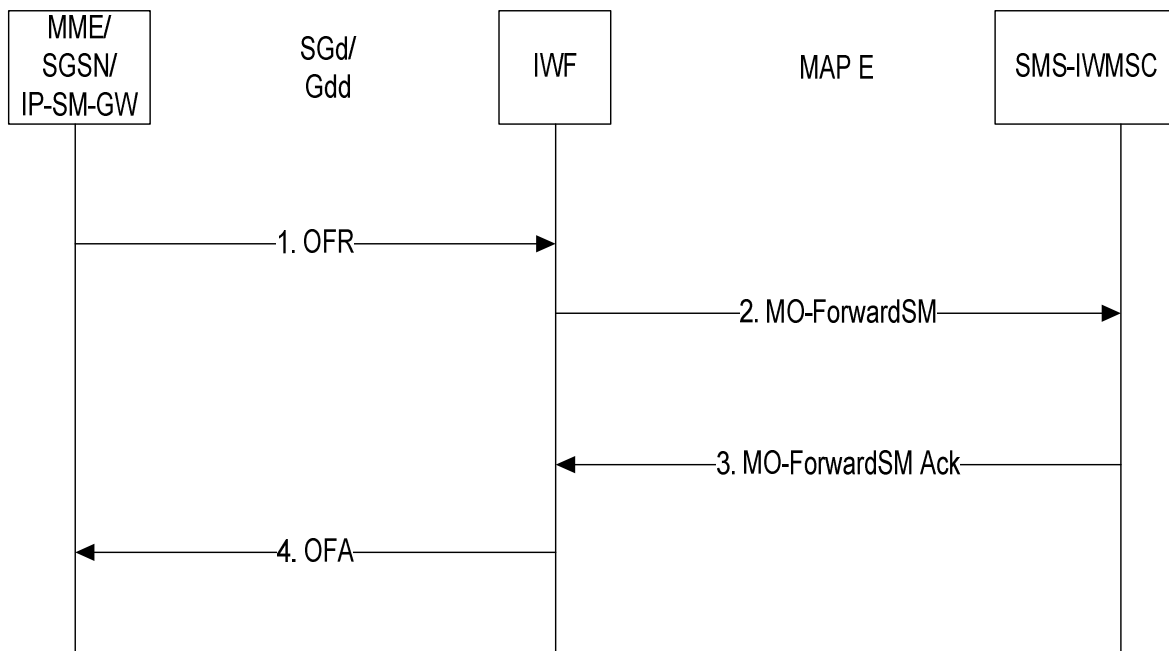


Figure A.2.4.1.1-1: Mapping of MO Forward Short Message procedure with one IWF

1. The IWF receives a OFR message from the MME/SGSN/IP-SM-GW.
2. The IWF opens a MAP v3 dialogue towards the SMS-IWMSC by sending MO-ForwardSM.
3. The IWF receives MO-ForwardSM Ack from the SMS-IWMSC.
4. The IWF sends OFA to the MME/SGSN/IP-SM-GW.

A.2.4.1.2 Two IWFs Scenario

The mapping of the MO Forward Short Message procedure for this scenario is shown in figure A.2.4.1.2-1:

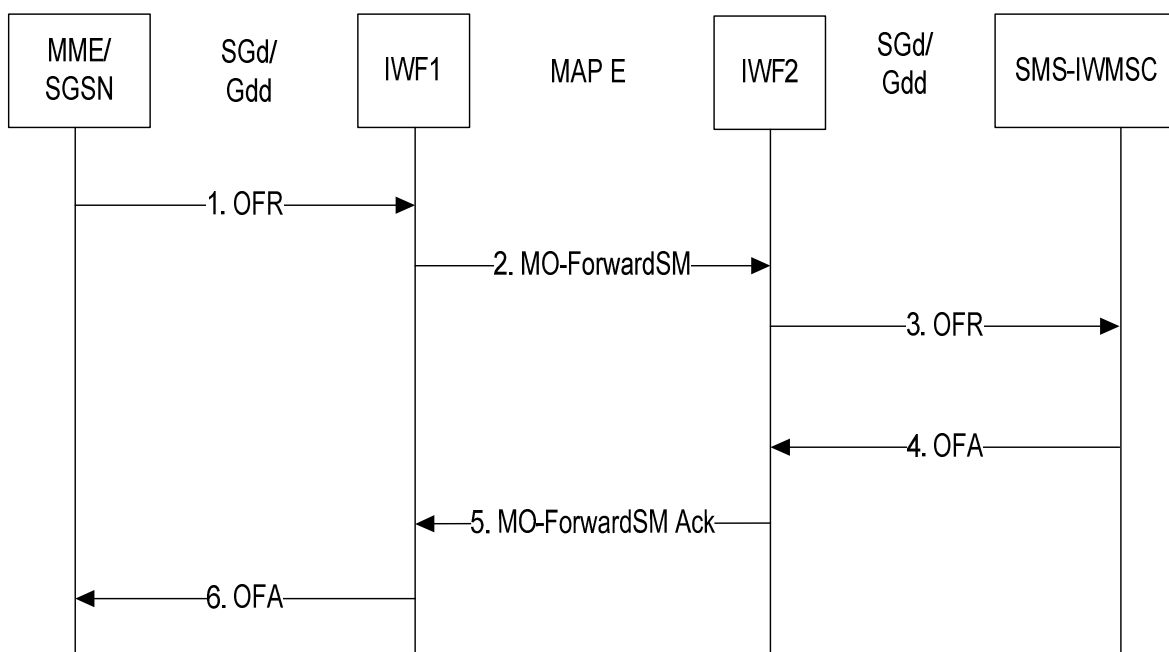


Figure A.2.4.1.2-1: Mapping of MO Forward Short Message procedure with two IWFs

1. The IWF1 receives an OFR message from the MME/SGSN.

2. The IWF1 opens a MAP v3 dialogue towards IWF2 by sending MO-ForwardSM.
3. The IWF2 constructs the OFR message and sends it to the SMS-IWMSC.
4. The IWF2 receives the OFA message from the SMS-IWMSC.
5. The IWF2 closes the MAP dialogue with the IWF2 by sending MO-ForwardSM Ack.
6. The IWF1 sends the OFA message to the MME/SGSN.

A.2.4.2 MT Forward Short Message

A.2.4.2.1 One IWF Scenario

The mapping of the MT Forward Short Message procedure for this scenario is shown in figure A.2.4.2.1-1:

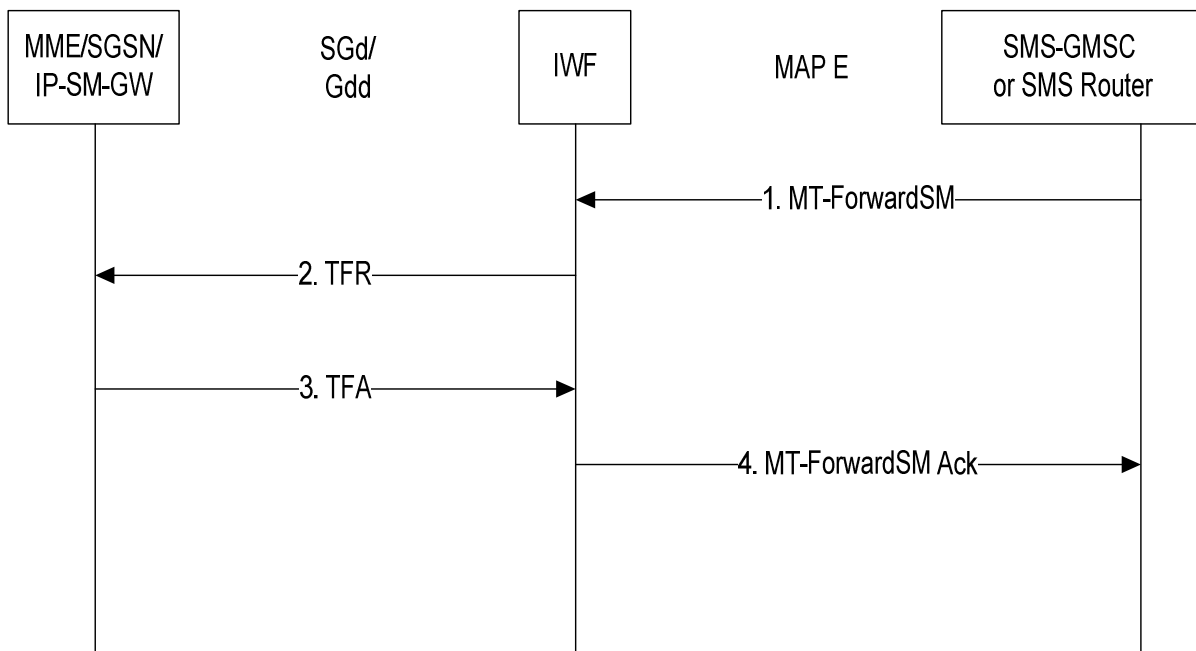


Figure A.2.4.2.1-1: Mapping of MT Forward Short Message procedure with one IWF

1. The IWF receives a [MT-ForwardSM](#) MAP v3 message from the SMS-GMSC or from the SMS Router.
2. The IWF sends TFR to the MME/SGSN/IP-SM-GW.
3. The IWF receives TFA.
4. The IWF closes the MAP dialogue with the SMS-GMSC or the SMS Router by sending [MT-ForwardSM](#) Ack.

A.2.4.2.2 Two IWFs Scenario

The mapping of the MT Forward Short Message procedure for this scenario is shown in figure A.2.4.2.2-1:

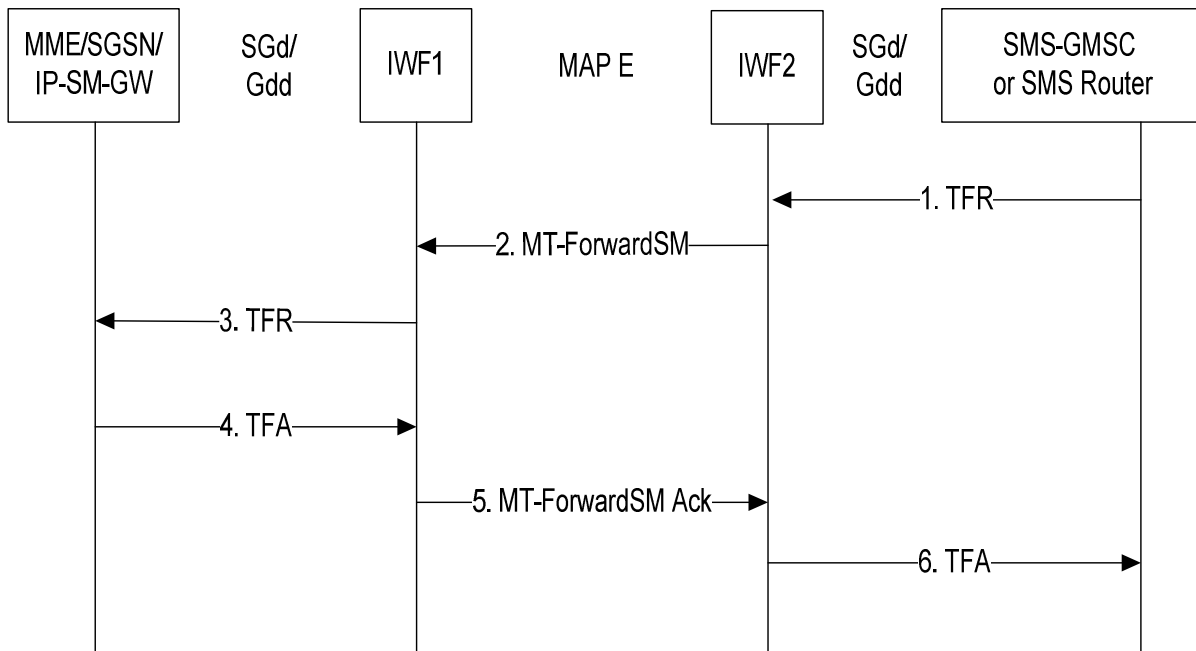


Figure A.2.4.2.2-1: Mapping of MT Forward Short Message procedure with two IWFs

1. The IWF2 receives a TFR message from the SMS-GMSC or the SMS Router.
2. The IWF2 opens a MAP v3 dialogue towards IWF1 by sending MT-ForwardSM.
3. The IWF1 constructs the TFR message and sends it to the MME/SGSN/IP-SM/GW.
4. The IWF1 receives the TFA message from the MME/SGSN/IP-SM/GW.
5. The IWF1 closes the MAP dialogue with the IWF1 by sending MT-ForwardSM Ack.
6. The IWF2 sends an OFA message to the SMS-GMSC or the SMS Router.

A.2.4.3 Alert Service Centre

A.2.4.3.1 One IWF Scenario

The mapping of the Alert Service Center procedure for this scenario is shown in figure A.2.4.3.1-1:

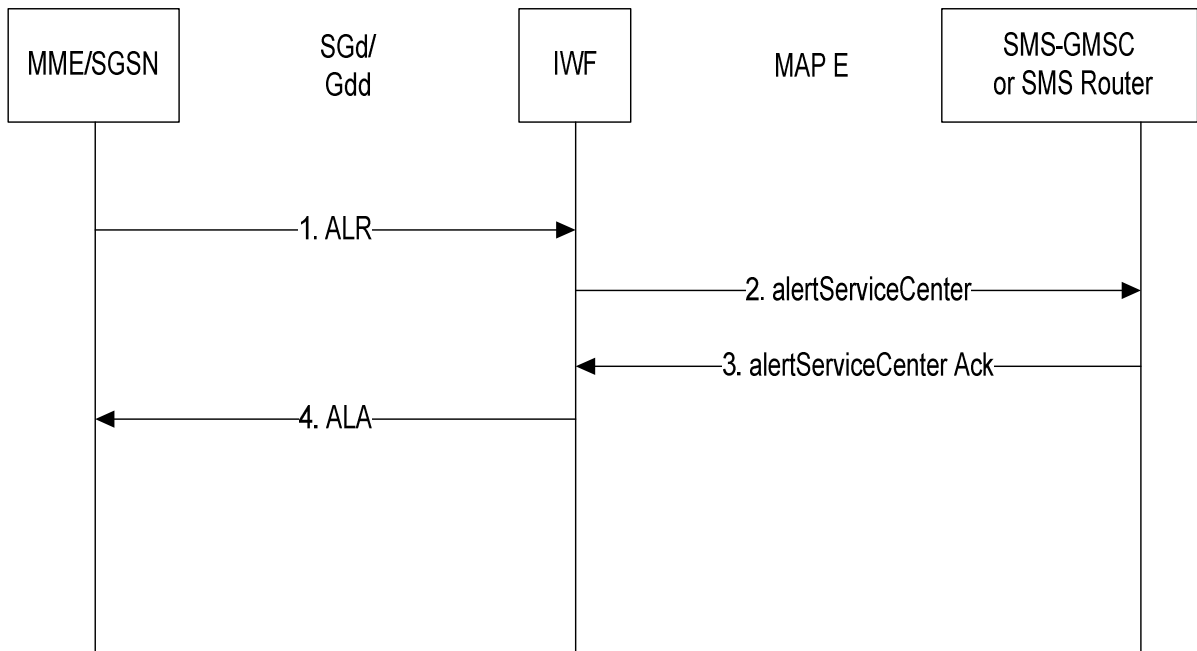


Figure A.2.4.3.1-1: Mapping of Alert Service Centre procedure with one IWF

1. The IWF receives an ALR message from the MME or SGSN.
2. The IWF opens a MAP v3 dialogue towards the SMS-GMSC or SMS Router by sending an alertServiceCentre.
3. The IWF receives an alertServiceCentre Ack from the SMS-GMSC or SMS Router.
4. The IWF sends an ALA message to the MME or SGSN.

A.2.4.3.2 Two IWFs Scenario

The mapping of the Alert Service Center procedure for this scenario is shown in figure A.2.4.x.2-1:

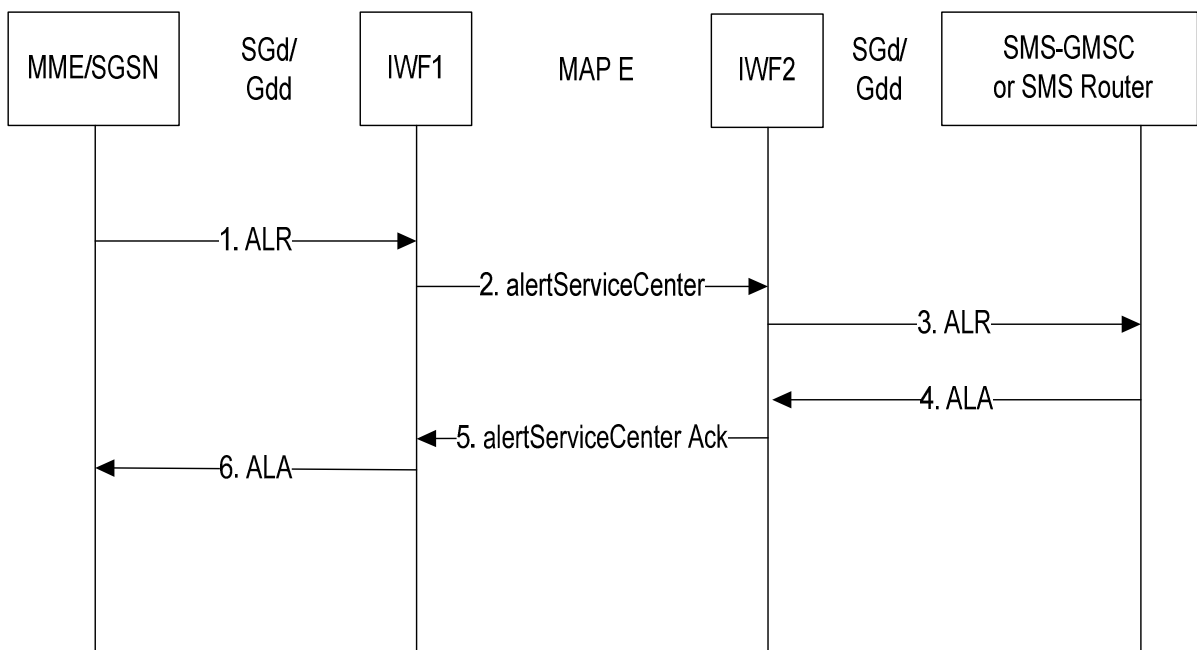


Figure A.2.4.3.2-1: Mapping of Alert Service Centre procedure with two IWFs

1. The IWF1 receives an ALR message from the MME or SGSN.

2. The IWF1 opens a MAP v3 dialogue towards the IWF2 by sending an alertServiceCentre.
3. The IWF2 sends an ALR message to the SMS-GMSC or SMS Router.
4. The IWF2 receives an ALA from the SMS-GMSC or SMS Router.
5. The IWF2 sends an alertServiceCenter Ack to the IWF1.
6. The IWF1 sends an ALA message to the MME or SGSN.

A.2.5 The mapping of parameters

A.2.5.1 Mapping of Parameters for the MO Forward Short Message procedure

A.2.5.1.1 OFR mapping to MO-ForwardSM-Arg

When the IWF needs to construct a MAP MO-ForwardSM message as a result of receiving an OFR command (see subclause A.2.4.1.1 step 2), the IWF shall open a MAP dialogue in application context version 3 and populate sub-parameters of MO-ForwardSM-Arg as described below:

sm-RP-DA in MO-ForwardSM-Arg shall be present and populated with the value received within the SC-Address AVP within OFR.

sm-RP-OA in MO-ForwardSM-Arg shall be present and populated with the value received within the MSISDN AVP within the User-Identifier AVP within OFR.

sm-RP-UI in MO-ForwardSM-Arg shall be present and populated with the value received within the SM-RP-UI AVP within OFR

extensionContainer in MO-ForwardSM-Arg shall be present .

imsi in MO-ForwardSM-Arg shall be present and populated with the value received within the User-Name AVP in the User-Identifier AVP within OFR. .

correlationID in MO-ForwardSM-Arg shall be present if SMSMI-Correlation-ID AVP in OFR is present and be populated as follows:

hlr-id parameter shall be populated with the value received within HSS-ID AVP within SMSMI-Correlation-ID AVP within OFR.

sip-uri-A parameter shall be populated with the value received within Originating-SIP-URI AVP within SMSMI-Correlation-ID AVP within OFR.

sip-uri-B parameter shall be populated with the value received within Destination-SIP-URI AVP within SMSMI-Correlation-ID AVP within OFR.

sm-DeliveryOutcome in MO-ForwardSM-Arg shall be present if SMSMI-Correlation-ID AVP in OFR is present and be populated with the value received in SM-Delivery-Cause within IP-SM-GW-SM-Delivery-Outcome within SM-Delivery-Outcome within OFR.

A.2.5.1.2 MO-ForwardSM-Res / Error mapping to OFA

When the IWF needs to construct an OFA command as a result of receiving a MAP MO-ForwardSM Ack/Error message (see subclause A.2.4.1.1 step 4), the IWF shall populate AVPs of OFA as described below:

Result-Code / Experimental-Result AVP shall be set to:

- DIAMETER_SUCCESS if a MO-ForwardSM-Res parameter was received in the TCAP ResultLast component;
- DIAMETER_ERROR_FACILITY_NOT_SUPPORTED if an error of facilityNotSupported was received;
- DIAMETER_ERROR_SYSTEM_FAILURE if an error of systemFailure was received;
- DIAMETER_SM_DELIVERY_FAILURE if an error of sm-DeliveryFailure was received;

- an appropriate DIAMETER base protocol result code otherwise.

SM-Delivery-Failure-Cause AVP: shall be populated as follows:

SM-Enumerated-Delivery-Failure-Cause AVP shall be present and populated with the value received within the SM-EnumeratedDeliveryFailureCause parameter, when present, within the sm-DeliveryFailureCause of the MO-ForwardSM message.

SM-Diagnostic-Info AVP shall be populated with the value received within the diagnosticInfo parameter, when present, within the sm-DeliveryFailureCause within the MO-ForwardSM message.

SM-RP-UI AVP shall be populated with the value received within the sm-RP-UI parameter, when present, of the MT-ForwardSM-Res message.

A.2.5.1.3 MO-ForwardSM-Arg mapping to OFR

When the IWF needs to construct a OFR command as a result of receiving a MAP MO-ForwardSM message (see subclause A.2.4.1.2 step 3), the IWF shall populate AVPs of OFR as described below:

User-Name AVP shall be present and populated with the value received within the sm-RP-DA parameter of MO-ForwardSM-Arg and translated into an UTF8String format.

User Identifier AVP shall be present and shall be populated as follows:

User-Name AVP shall be present and populated with the value received within the imsi parameter of MO-ForwardSM-Arg and translated into an UTF8String format.

MSISDN AVP shall be populated with the value received within the sm-RP-OA parameter of MO-ForwardSM-Arg

SM-RP-UI AVP shall be populated with the value received within the sm-RP-UI parameter of MO-ForwardSM-Arg

Supported-Features AVP shall be absent.

A.2.5.1.4 OFA mapping to MO-ForwardSM-Res/Error

When the IWF needs to construct MAP MO-ForwardSM Ack message as a result of receiving a OFA command (see subclause A.2.4.1.2 step 5), the IWF shall populate sub-parameters of MO-ForwardSM-Res/Error as described below:

mo-ForwardSM-Res:

sm-RP-UI in MO-ForwardSM-Res shall be populated with the value received within the SM-RP-UI AVP when present.

extensionContainer in MO-ForwardSM-Res shall be absent.

mo-ForwardSM Error:

Values other than SUCCESS within the Result-Code / Experimental-Result AVP shall be mapped onto the following MAP errors:

- An error of **systemFailure** if a DIAMETER_ERROR_SYSTEM_FAILURE result was received;
- An error of **unexpectedDataValue** if a DIAMETER_INVALID_AVP_VALUE result was received;
- An error of **facilityNotSupported** if a DIAMETER_ERROR_FACILITY_NOT_SUPPORTED result was received;
- An error of **sm-DeliveryFailure** if a DIAMETER_ERROR_SM_DELIVERY_FAILURE.
- **sm-DeliveryFailureCause** when a DIAMETER_ERROR_SM_DELIVERY_FAILURE result was received, shall be populated as follows:
 - **SM-EnumeratedDeliveryFailureCause** shall be populated with the value received within the SM-Enumerated-Delivery-Failure-Cause AVP within the SM-DeliveryFailureCause AVP within OFA;

- **diagnosticInfo** parameter shall be populated with the value received within the SM-Diagnostic-Info AVP, when present, within the SM-DeliveryFailureCause AVP within OFA.

A.2.5.2 Mapping of Parameters for the MT Forward Short Message Procedure

A.2.5.2.1 MT-ForwardSM-Arg mapping to TFR

When the IWF needs to construct a TFR command as a result of receiving a MAP MT-ForwardSM message (see subclause A.2.4.2.1 step 2), the IWF shall populate AVPs of TFR as described below:

User-Name AVP shall be populated with the value received within the sm-RP-DA parameter of MT-ForwardSM-Arg.

SC-Address AVP shall be populated with the value received within the sm-RP-OA parameter of MT-ForwardSM-Arg

SM-RP-UI AVP shall be populated with the value received within the sm-RP-UI parameter of MT-ForwardSM-Arg

SMSMI-Correlation-ID AVP shall be present if correlationID in MT-ForwardSM-Arg is present and be populated as follows:

Originating-SIP-URI AVP shall be populated with the value received within the sip-uri-A parameter within correlationID of MT-ForwardSM-Arg.

Destination-SIP-URI AVP shall be populated with the value received within the sip-uri-B parameter within correlationID of MT-ForwardSM-Arg.

TFR-Flags AVP: Flags shall be set as follows:

More-Messages-To-Send shall be set to 1 if the moreMessagesToSend parameter was present within MT-ForwardSM-Arg; otherwise shall be set to 0 or the AVP shall be absent.

Supported-Features AVP shall be absent.

SM-Delivery-Timer AVP shall be present and populated with the value of the smDeliveryTime, when present within the MT-ForwardSM-Arg.

SM-Delivery-Start-Time AVP shall be present and populated with the value of the smDeliveryStartTime, when present within the MT-ForwardSM-Arg.

Maximum-Retransmission-Time AVP shall be present and populated with the value of the maximumRetransmissionTime parameter, when present within the MT-ForwardSM-Arg.

SMS-GMSC Address AVP shall be present and populated with the value of the smsGmscAddress parameter, when present within the MT-ForwardSM-Arg.

A.2.5.2.2 TFA mapping to MT-ForwardSM-Res/Error

When the IWF needs to construct MAP MT-ForwardSM Ack message as a result of receiving a TFA command (see subclause A.2.4.2.1 step 4), the IWF shall populate sub-parameters of MT-ForwardSM-Res/Error as described below:

mt-ForwardSM-Res:

sm-RP-UI in MO-ForwardSM-Res shall be populated with the value received within the SM-RP-UI AVP when present.

extensionContainer in MT-ForwardSM-Res shall be absent.

mt-ForwardSM Error:

Values other than SUCCESS within the Result-Code / Experimental-Result AVP shall be mapped onto the following MAP errors:

- An error of **systemFailure** error if a DIAMETER_ERROR_SYSTEM_FAILURE result was received;
- An error of **dataMissing** if a DIAMETER_MISSING_AVP result was received;

- An error of **unexpectedDataValue** if a DIAMETER_INVALID_AVP_VALUE result was received;
- An error of **facilityNotSupported** if a DIAMETER_ERROR_FACILITY_NOT_SUPPORTED result was received;
- An error of **unidentifiedSubscriber** if a DIAMETER_ERROR_USER_UNKNOWN result was received;
- An error of **illegalSubscriber** if a DIAMETER_ERROR_ILLEGAL_USER result was received;
- An error of **illegalEquipment** if a DIAMETER_ERROR_ILLEGAL_EQUIPMENT result was received;
- An error of **subscriberBusyForMT-SMS** if a DIAMETER_ERROR_USER_BUSY_FOR_MT_SMS result was received;
- An error of **sm-DeliveryFailure** if a DIAMETER_ERROR_SM_DELIVERY_FAILURE result was received;
- An error of **absentSubscriberSM** if a DIAMETER_ERROR_ABSENT_USER result was received.
- **sm-DeliveryFailureCause**, when a DIAMETER_ERROR_SM_DELIVERY_FAILURE result was received, shall be populated as follows:
 - **SM-EnumeratedDeliveryFailureCause** shall be populated with the value received within the SM-Enumerated-Delivery-Failure-Cause AVP within the SM-DeliveryFailureCause AVP within TFA;
 - **diagnosticInfo** shall be populated with the value received within the SM-Diagnostic-Info AVP, when present, within the SM-DeliveryFailureCause AVP within TFA.
- **absentSubscriberDiagnosticSM**, when a DIAMETER_ERROR_ABSENT_USER result was received, shall be populated with the value received within the Absent-Subscriber-Diagnostic-SM AVP, when present, within TFA.
- **requestedRetransmissionTime** shall be present and populated with the value received in the Requested-Retransmission-Time AVP, when present, within TFA.

A.2.5.2.3 TFR mapping to MT-ForwardSM-Arg

When the IWF needs to construct a MAP MT-ForwardSM message as a result of receiving a TFR command (see subclause A.2.4.2.2 step 2), the IWF shall open a MAP dialogue in application context version 3 and populate sub-parameters of MT-ForwardSM-Arg as described below:

sm-RP-DA in MT-ForwardSM-Arg shall be present and populated with the value received within the User-Name AVP within TFR.

sm-RP-OA in MT-ForwardSM-Arg shall be present and populated with the value received within the SC-Address AVP within TFR.

correlationID in MT-ForwardSM-Arg shall be present if SMSMI-Correlation-ID AVP in TFR is present and be populated as follows:

sip-uri-A parameter shall be populated with the value received within Originating-SIP-URI AVP within SMSMI-Correlation-ID AVP within TFR.

sip-uri-B parameter shall be populated with the value received within Destination-SIP-URI AVP within SMSMI-Correlation-ID AVP within TFR.

sm-RP-UI in MT-ForwardSM-Arg shall be present and populated with value received within the SM-RP-UI AVP within TFR

moreMessagesToSend shall be present if the More-Messages-To-Send flag is set to 1 within the TFR-Flags AVP within MT-ForwardSM-Arg.

smDeliveryTime in MT-ForwardSM-Arg shall be present and populated with the value within the SM-Delivery-Timer AVP when received within TFR.

smDeliveryStartTime in MT-ForwardSM-Arg shall be present and populated with the value within the SM-Delivery-Start-Time AVP when received within TFR.

maximumRetransmissionTime in MT-ForwardSM-Arg shall be present and populated with the value of the Maximum-Retransmission-Time AVP when received within TFR.

smsGmscAddress shall be present and populated with the value within the SMS-GMSC Address AVP, when received within TFR.

NOTE: The value of the MME-Number-For-MT-SMS AVP or of the SGSN-Number AVP is not conveyed in the MAP MT-ForwardSM message but is used by IWF2 for routing the MAP MT-ForwardSM message towards IWF1.

A.2.5.2.4 MT-ForwardSM-Res / Error mapping to TFA

When the IWF needs to construct a TFA command as a result of receiving a MAP MT-ForwardSM Ack/Error message (see subclause A.2.4.2.2 step 6), the IWF shall populate AVPs of TFA as described below:

Result-Code / Experimental-Result AVP shall be set to:

- DIAMETER_SUCCESS if a MT-ForwardSM-Res parameter was received in the TCAP ResultLast component;
- DIAMETER_ERROR_USER_UNKNOWN if an error of unidentifiedSubscriber was received;
- DIAMETER_ERROR_ABSENT_USER if an error of absentSubscriberSM was received;
- DIAMETER_ERROR_USER_BUSY_FOR_MT_SMS if an error of subscriberBusyForMT-SMS was received;
- DIAMETER_ERROR_ILLEGAL_USER if an error of illegalSubscriber was received;
- DIAMETER_ERROR_ILLEGAL_EQUIPMENT if an error of illegalEquipment was received
- DIAMETER_ERROR_SYSTEM_FAILURE if an error of systemFailure was received
- DIAMETER_SM_DELIVERY_FAILURE if an error of sm-DeliveryFailure was received;
- an appropriate DIAMETER base protocol result code otherwise.

SM-Delivery-Failure-Cause AVP, when an error of sm-DeliveryFailure was received, shall be populated as follows:

- **SM-Enumerated-Delivery-Failure-Cause** AVP shall be present and populated with the value received within the SM-EnumeratedDeliveryFailureCause parameter of the MT-ForwardSM Error message.
- **SM-Diagnostic-Info** AVP shall be populated with the value received within the diagnosticInfo parameter, when present, within the sm-DeliveryFailureCause within the MT-ForwardSM Error message.

Absent-Subscriber-Diagnostic-SM AVP, when an error of absentSubscriberSM was received, shall be populated with the value received within the absentSubscriberDiagnosticSM parameter of the MT-ForwardSM Error message.

SM-RP-UI AVP shall be populated with the value received within the sm-RP-UI parameter, when present, of the MT-ForwardSM-Res message.

Requested-Retransmission-Time AVP shall be present and populated with the value received within the requestedRetransmissionTime parameter, when present within the MT-ForwardSM Error message.

A.2.5.3 Mapping of Parameters for the Alert Service Centre Procedure

A.2.5.x.1 ALR mapping to alertServiceCentre-Arg

When the IWF needs to construct a MAP alertServiceCentre message as a result of receiving an ALR command, the IWF shall open a MAP dialogue in application context version 3 and populate sub-parameters of alertServiceCentre-Arg as described below:

- **msisdn** shall be populated with the dummy MSISDN value (see clause 3 of 3GPP TS 23.003 [7])

NOTE: No MSISDN AVP is present in this scenario within the User-Identifier AVP in the ALR message.

- **imsi** shall be populated with the value received within User-Name AVP within the User-Identifier AVP within ALR.
- **serviceCentreAddress** shall be present and populated with the value received within the SC-Address AVP within ALR.
- **newSgsnNumber** shall be present and populated with the value received within the SGSN-Number AVP of the Serving-Node AVP within ALR.
- **newMmeNumber** shall be present and populated with the value received within the MME-Number-for-MT-SMS AVP of the Serving-Node AVP within ALR.
- **newSgsnDiameterAddress** shall be present and populated with the value received within the SGSN-Name and SGSN-Realm AVPs of the Serving-Node AVP, when present in ALR.
- **newMmeDiameterAddress** shall be present and populated with the value received within the MME-Name and MME-Realm AVPs of the Serving-Node AVP, when present in ALR.
- **smsGmscAlertEvent** shall be present and populated with the value received within the SMS-GMSC-Alert-Event AVP within ALR.
- **smsGmscDiameterAddress** shall be present and populated with the value received in the Destination-Host and Destination-Realm in ALR.

A.2.5.3.2 alertServiceCentre-Res / Error mapping to ALA

When the IWF needs to construct an ALA command as a result of receiving a MAP alertServiceCentre Ack/Error message, the IWF shall populate AVPs of ALA as described below:

Result-Code / Experimental-Result AVP shall be set to:

- DIAMETER_SUCCESS if no error was received in the TCAP ResultLast component;
- a DIAMETER base protocol result code according to the following table:

Table A.2.5.3.2-1 Mapping from MAP error codes to Diameter error codes

MAP error code	Diameter Result code / Experimental Result
systemFailure	DIAMETER_UNABLE_TO_COMPLY
dataMissing	DIAMETER_MISSING_AVP
unexpectedDataValue	DIAMETER_INVALID_AVP_VALUE

Supported Features AVP shall be absent.

A.2.5.3.3 alertServiceCentre-Arg mapping to ALR

When the IWF needs to construct an ALR command as a result of receiving a MAP alertServiceCentre message, the IWF shall populate the ALR as described below:

- **User-Name AVP within User-Identifier AVP** shall be present and populated with the value received within the imsi parameter of the alertServiceCenter-Arg.
- **SC-Address AVP** shall be present and populated with the value received within the serviceCentreAddress parameter of the alertServiceCenter-Arg.
- **SGSN-Number AVP of the Serving-Node AVP** shall be present and populated with the value received within the newSgsnNumber of the alertServiceCenter-Arg.

- **MME-Number-for-MT-SMS AVP** shall be present and populated with the value received within the newMmeNumber of the alertServiceCenter-Arg.
- **SGSN-Name** and **SGSN-Realm AVPs of the Serving-Node AVP** shall be present and populated with the value received within newSgsnDiameterAddress, when present in the alertServiceCenter-Arg.
- **MME-Name** and **MME-Realm AVPs** shall be present and populated with the value received within newMmeDiameterAddress, when present in the alertServiceCenter-Arg.
- **SMS-GMSC-Alert-Event AVP** shall be present and populated with the value received within the smsGmscAlertEvent of the alertServiceCenter-Arg.
- **Destination-Host** and **Destination-Realm AVPs** shall be present and populated with the value received in the smsGmscDiameterAddress in the alertServiceCenter-Arg.

A.2.5.3.4 ALA mapping to alertServiceCentre-Res

When the IWF needs to construct a MAP alertServiceCentre Ack/Error message as a result of receiving an ALA command, the IWF shall populate the MAP alertServiceCenter Ack/Error as described below:

MAP error code shall be set as follows:

Table A.2.5.3.4-1 Mapping from Diameter error codes to MAP error codes

Diameter Result code / Experimental Result	MAP error code
DIAMETER_UNABLE_TO_COMPLY	systemFailure
DIAMETER_MISSING_AVP	dataMissing
DIAMETER_INVALID_AVP_VALUE	unexpectedDataValue

A.3. IWF related to the S6c interface between HSS and central SMS functions

A.3.1 Introduction

3GPP TS 23.272 [3] has specified the "SMS in MME" architecture option, where an IWF between the HSS supporting the S6c interface and the central SMS functions (SMS-GMSC, SMS-IWMSC, SMS Router) supporting the MAP C interface for SMS is defined. This S6c IWF is described in the following subclauses.

3GPP TS 23.204 [6] has specified the support of SMS for IMS UE to IMS UE without MSISDN which impacts the IWF description over S6c.

A.3.2 Interworking scenarios

A.3.2.1 IWF scenario

This interworking scenario is illustrated in the two following figures:

- in figure A.3.2.1-1, an IWF is between a HSS supporting the S6c interface based on Diameter and central SMS functions (SMS-GMSC, SMS-IWMSC) supporting a MAP based C interface for SMS. There is no SMS Router.
- in figure A.3.2.1-2, there is a SMS router used for MT SMS with which the IWF will interact, taking into account that Diameter requests from the IWF, according to operator configuration, are sent to the SMS Router either directly or via the HSS.

This IWF scenario can be an inter PLMN use case where the HSS, the SMS Router, the IP-SM-GW and the IWF are in the Home PLMN.

In the Home PLMN, when the HSS supports S6c, the SMS Router shall also support S6c, i.e. there is no IWF between HSS and SMS Router.

This IWF scenario can be an intra PLMN use case.

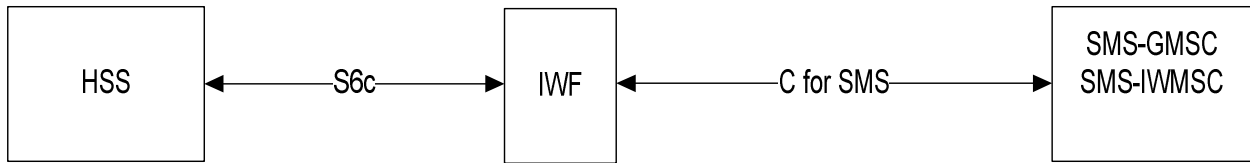


Figure A.3.2.1-1 S6c - C for SMS interworking scenario with an IWF

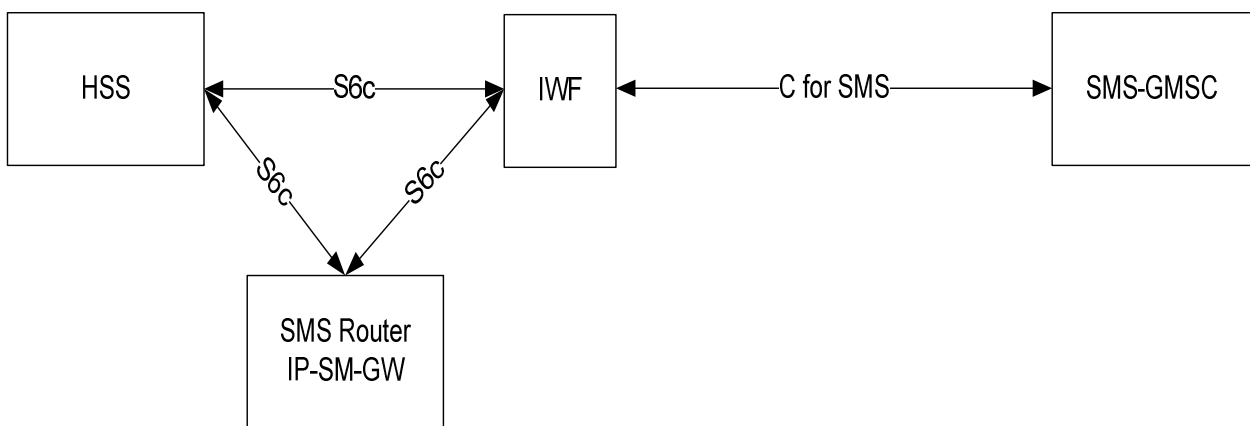


Figure A.3.2.1-2 S6c - C for SMS interworking scenario with SMS Router and an IWF

A.3.3 General considerations

A.3.3.1 Routing considerations

MAP requests issued by the SMS-GMSC are routed to the IWF on the basis of the SSN and of the MSISDN, then the corresponding Diameter requests are routed on the basis of the Diameter application identifier and of the MSISDN or of the IMSI. If a SMS router is deployed, the HSS will forward the Send Routing Info for SM commands to the SMS router.

In a retry context of SMS for IMS UE to IMS UE without MSISDN (see 3GPP TS 23.204 [6]), the MAP requests issued by the SMS-GMSC or the SMS-SC are routed to the IWF on the basis of the SSN and of the HSS ID, then the corresponding Diameter requests are routed on the basis of the Diameter application identifier and of the HSS ID. In this case, the HSS does not forward the Send Routing Info for SM commands to the IP-SM-GW.

Diameter requests (i.e when an Alert procedure) issued by the HSS are routed to the IWF on the basis of the application identifier and of the SC-Address AVP containing the SMS-SC number. Then the corresponding MAP request is routed to the SMS-IWMSC on the basis of the SSN and of the SMS-SC number.

A.3.4 The mapping of procedures

A.3.4.1 Send Routing Info for SM

The mapping of the Send Routing Info for SM procedure is shown in figure A.3.4.1-1:

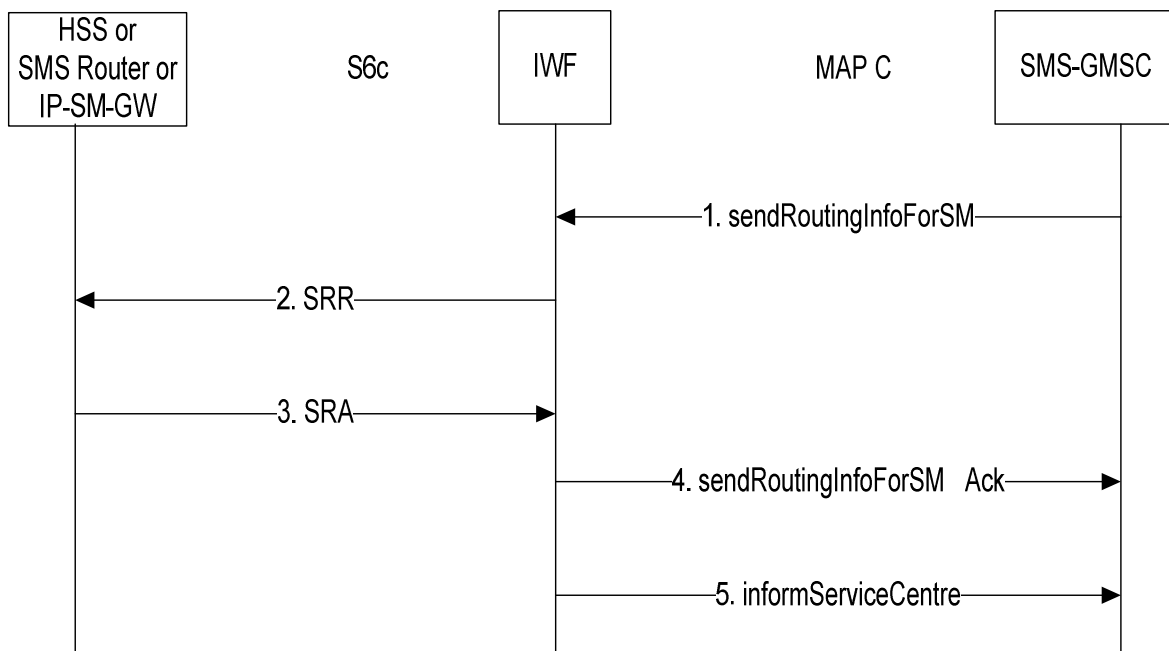


Figure A.3.4.1-1: Mapping of Send Routing Info for SM procedure

1. The IWF receives a sendRoutingInfoForSM MAP V3 message from the SMS-GMSC.
2. The IWF sends SRR to the HSS or SMS Router or IP-SM-GW.
3. The IWF receives SRA from the HSS or SMS Router or IP-SM-GW.
4. The IWF sends a sendRoutingInfoForSM Ack message to the SMS-GMSC.
5. The IWF sends an informServiceCentre message to the SMS-GMSC if the SRA contains information elements requiring to be delivered with an informServiceCentre message and closes the MAP dialog

A.3.4.2 Alert Service Centre

The mapping of the Alert Service Centre procedure is shown in figure A.3.4.2-1:

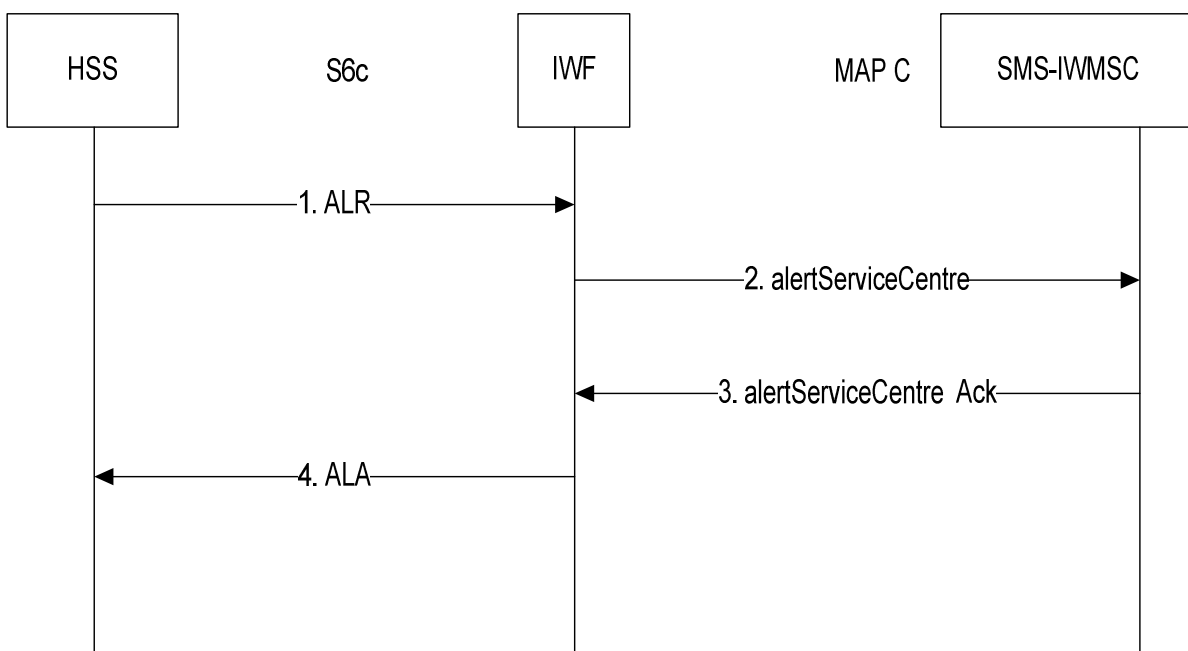


Figure A.3.4.2-1: Mapping of Alert Service Centre procedure

1. The IWF receives a ALR message from the HSS.
2. The IWF opens a MAP v3 dialogue towards the SMS-IW MSC by sending alertServiceCentre.
3. The IWF receives alertServiceCentre Ack from the SMS-IW MSC.
4. The IWF sends ALA to the MME, SGSN.

A.3.4.3 Report SM Delivery Status

The mapping of the Report SM Delivery Status procedure is shown in figure A.3.4.3-1:

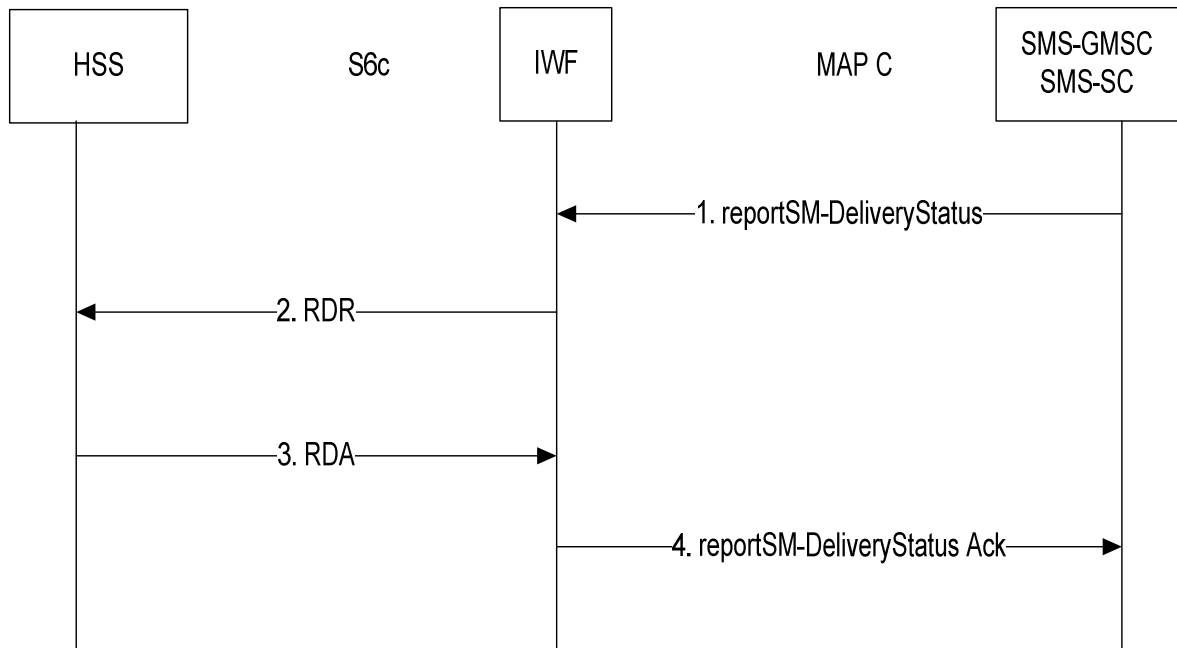


Figure A.3.4.3-1: Mapping of Report SM Delivery Status procedure

1. The IWF receives a reportSM-DeliveryStatus MAP V3 message from the SMS-GMSC or the SMS-SC.
2. The IWF sends RDR to the HSS.
3. The IWF receives SRA from the HSS.
4. The IWF closes the MAP dialogue with the SMS-GMSC by sending a reportSM-DeliveryStatus Ack to the SMS-GMSC or the SMS-SC.

A.3.5 The mapping of parameters

A.3.5.1 Mapping of Parameters for the Send Routing Info for SM Procedure

A.3.5.1.1 RoutingInfoForSM-Arg mapping to SRR

When the IWF needs to construct a SRR command as a result of receiving a MAP sendRoutingInfoForSM message (see subclause A.3.4.1.1 step 2), the IWF shall populate AVPs of SRR as described below:

- **MSISDN AVP** shall be populated with the value received within the msisdn parameter of RoutingInfoForSM-Arg when available.
- **User-Name AVP** shall be populated with the value received within the imsi parameter of RoutingInfoForSM-Arg when available.

- **SMSMI-Correlation-ID** AVP shall be present if correlationID in RoutingInfoForSM-Arg is present and be populated as follows:
 - **Destination-SIP-URI** AVP shall be populated with the value received within the sip-uri-B parameter of RoutingInfoForSM-Arg.
- **SM-RP-PRI** AVP shall be present and populated with the value received within the sm-RP-PRI parameter of RoutingInfoForSM-Arg.
- **SC-Address** AVP shall be present and populated with the value received within the serviceCentreAddress parameter of RoutingInfoForSM-Arg
- **SM-RP-MTI** AVP shall be populated with the value received within the sm-RP-MTI parameter, when present, of RoutingInfoForSM-Arg
- **SM-RP-SMEA** AVP shall be populated with the value received within the sm-RP-SMEA parameter, when present, of RoutingInfoForSM-Arg
- **SRR-Flags** AVP: Flags shall be set as follows:
 - **GPRS-Indicator** shall be set to 1 if the gprsSupportIndicator parameter was present within RoutingInfoForSM-Arg; otherwise shall be set to 0 or the AVP shall be absent.
- **SM-Delivery-Not-Intended** AVP shall be populated with the value received within the sm-deliveryNotIntended parameter, when present, of RoutingInfoForSM-Arg
- **Supported-Features** AVP shall be absent.

A.3.5.1.2 SRA mapping to RoutingInfoForSM-Res/Error

When the IWF needs to construct a MAP sendRoutingInfoForSM Ack message as a result of receiving a SRA command (see subclause A.3.4.1.1 step 5), the IWF shall populate sub-parameters of RoutingInfoForSM-Res/Error as described below:

RoutingInfoForSM-Res:

- **imsi** shall be populated with the value received within the User-Name AVP, when present, within SRA.
- Sub-parameters of **locationInfoWithLMSI** shall be populated as follows:
 - **networkNode-Number** shall be populated with the value received within either the MME-Number-for-MT-SMS AVP or the MSC-Number AVP or the SGSN-Number AVP or the IP-SM-GW-Number AVP, within the Serving-Node when present, within the SRA.
 - Sub-parameters **diameter-Name** and **diameter-Realm** of **networkNodeDiameterAddress** shall be populated with the values received within the MME-Name & MME-Realm AVPs or within the IP-SM-GW-Name & IP-SM-GW-Realm AVPs within the Serving-Node AVP when present, within the SRA.
 - **imsi** shall be populated with the value received within the LMSI AVP when present, within the SRA.
 - **gprsNodeIndicator** shall be set if the received Serving Node AVP contains a SGSN AVP.
 - **additional-Number** shall be populated with the value received within either the MME-Number-for-MT-SMS User-Name AVP or the MSC-Number AVP or the SGSN-Number SGSN AVP, within the Additional-Serving-Node when present, within the SRA.
 - Sub-parameters **diameter-Name** and **diameter-Realm** of **additionalNetworkNodeDiameterAddress** shall be populated with the values received within the MME-Name and MME-Realm AVPs within the Additional-Serving-Node AVP when present, within the SRA.
- **sm-RP-UI** in MO-ForwardSM-Res shall be populated with the value received within the SM-RP-UI AVP when present.
- **extensionContainer** in MT-ForwardSM-Res shall be absent.

Error:

Values other than SUCCESS within the Result-Code / Experimental-Result AVP shall be mapped according to the following table:

Table A.3.5.1.2-1 Mapping from Diameter error codes to MAP error codes

Diameter Result code / Experimental Result	MAP error code
DIAMETER_UNABLE_TO_COMPLY	systemFailure
DIAMETER_MISSING_AVP	dataMissing
DIAMETER_INVALID_AVP_VALUE	unexpectedDataValue
DIAMETER_ERROR_FACILITY_NOT_SUPPORTED	facilityNotSupported
DIAMETER_ERROR_USER_UNKNOWN	unknownSubscriber
DIAMETER_ERROR_SERVICE_NOT_SUBSCRIBED	teleserviceNotProvisioned
DIAMETER_ERROR_SERVICE_BARRED	callBarred
DIAMETER_ERROR_ABSENT_USER	absentSubscriberSM

When the Diameter Result code is DIAMETER_ERROR_ABSENT_USER, one or two absent user diagnostics (MME-Absent-User-Diagnostic-SM or MSC-Absent-User-Diagnostic-SM or SGSN-Absent-User-Diagnostic-SM AVPs) may be received. The following additional mapping shall apply:

- When only one absent user diagnostic AVP is received, it is mapped to the absentSubscriberDiagnosticSM parameter.
- When two absent user diagnostics AVPs are received, the SGSN-Absent-User-Diagnostic-SM AVP is mapped to the additionalAbsentSubscriberDiagnosticSM parameter, the other AVP is mapped to the absentSubscriberDiagnosticSM parameter.

A.3.5.1.3 SRA mapping to informServiceCentreArg

When the IWF needs to construct a MAP informServiceCentre message as a result of receiving a SRA command (see subclause A.3.4.1.1 step 4), the IWF shall populate sub-parameters of InformServiceCentreArg as described below:

- **storedMSISDN** shall be populated with the value received within the MSISDN AVP within the User Identifier AVP, when present, within SRA.
- **mw-Status** shall be populated with the value received within the MWD-Status AVP, when present, within SRA.
- **absentSubscriberDiagnosticSM** shall be populated with the value received within
 - either the MME-Absent-User-Diagnostic-SM AVP or the MSC-Absent-User-Diagnostic-SM AVP or the SGSN-Absent-User-Diagnostic-SM AVP, when only one of them is present, within the SRA.
 - either MME-Absent-User-Diagnostic-SM AVP or the MSC-Absent-User-Diagnostic-SM AVP, if one of them is present and if SGSN-Absent-User-Diagnostic-SM AVP is also present.
- **additionalAbsentSubscriberDiagnosticSM** shall be populated with the value received within the SGSN-Absent-User-Diagnostic-SM AVP, if it is present and if either the MME-Absent-User-Diagnostic-SM AVP or the MSC-Absent-User-Diagnostic-SM AVP is present, within the SRA.

A.3.5.2 Mapping of Parameters for the Alert Service Centre Procedure

A.3.5.2.1 ALR mapping to alertServiceCentre-Arg

When the IWF needs to construct a MAP alertServiceCentre message as a result of receiving an ALR command (see subclause A.3.4.2 step 2), the IWF shall open a MAP dialogue in application context version 3 and populate sub-parameters of alertServiceCentre-Arg as described below:

- **msisdn** shall be populated with the value received within MSISDN AVP, when present, within the User-Identifier AVP within ALR.
- **imsi** shall be populated with the value received within User-Name AVP, when present, within the User-Identifier AVP within ALR.

- **serviceCentreAddress** shall be present and populated with the value received within the SC-Address AVP within ALR.
- **correlationId** shall be present if SMSMI-Correlation-ID AVP within ALR is present and be populated as follows:
 - sip-uri-B parameter** shall be populated with the value received within Destination-SIP-URI AVP within SMSMI-Correlation-ID AVP within ALR

A.3.5.2.2 alertServiceCentre-Res / Error mapping to ALA

When the IWF needs to construct an ALA command as a result of receiving a MAP alertServiceCentre Ack/Error message (see subclause A.3.4.2 step 4), the IWF shall populate AVPs of ASA as described below:

Result-Code / Experimental-Result AVP shall be set to:

- DIAMETER_SUCCESS if a MO-ForwardSM-Res parameter was received in the TCAP ResultLast component;
- a DIAMETER base protocol result code according to the following table:

Table A.3.5.2.2-1 Mapping from MAP error codes to Diameter error codes

MAP error code	Diameter Result code / Experimental Result
systemFailure	DIAMETER_UNABLE_TO_COMPLY
dataMissing	DIAMETER_MISSING_AVP
unexpectedDataValue	DIAMETER_INVALID_AVP_VALUE

Supported Features AVP shall be absent.

A.3.5.3 Mapping of Parameters for the Report SM Delivery Status Procedure

A.3.5.3.1 ReportSM-DeliveryStatusArg mapping to RDR

When the IWF needs to construct a SRR command as a result of receiving a MAP reportSM-DeliveryStatus message (see subclause A.3.4.3 step 2), the IWF shall populate AVPs of SRR as described below:

- **User-Identifier** AVP shall be present and populated as follows:
 - **MSISDN AVP** shall be populated with the value received, after format translation, within the msisdn parameter of ReportSM-DeliveryStatusArg.
- **SMSMI-Correlation-ID** AVP shall be present if correlationID in ReportSM-DeliveryStatusArg is present and be populated as follows:
 - **Destination-SIP-URI** AVP shall be populated with the value received within the sip-uri-B parameter of ReportSM-DeliveryStatusArg.
- **SC-Address** AVP shall be present and populated with the value received within the serviceCentreAddress parameter of RoutingInfoForSM-Arg
- **SM-Delivery-Outcome** AVP shall be present and populated as follows:

SGSN-SM-Delivery-Outcome AVP shall be populated

- with the value received in sm-DeliveryOutcome parameter within ReportSM-DeliveryStatusArg if deliveryOutcomeIndicator flag is present;
- with the value received in additionalSM-DeliveryOutcome, when present, within ReportSM-DeliveryStatusArg;

otherwise SGSN-SM-Delivery-Outcome AVP shall be absent.

MSC-SM-Delivery-Outcome AVP shall be populated

- with the value received in sm-DeliveryOutcome parameter within ReportSM-DeliveryStatusArg if deliveryOutcomeIndicator flag is absent;

otherwise MSC-SM-Delivery-Outcome AVP shall be absent.

MME-SM-Delivery-Outcome AVP shall be absent.

NOTE: the MAP-REPORT-SM-DELIVERY-STATUS request does not differentiate the delivery to a MSC from a delivery to a MME.

IP-SM-GW-Delivery-Outcome AVP shall be populated

- with the value received in sm-DeliveryOutcome parameter within ReportSM-DeliveryStatusArg if ip-sm-gw-Indicator flag is present;
- with the value received in ip-sm-gw-sm-deliveryOutcome, when present, within ReportSM-DeliveryStatusArg;

otherwise IP-SM-GW- Delivery-Outcome AVP shall be absent.

NOTE: The IP-SM-GW- Delivery-Outcome AVP presence can only occur when SMS-GMSC supports T4 triggering.

Supported-Features AVP shall be absent.

A.3.5.3.2 RDA mapping to ReportSM-DeliveryStatusRes/Error

When the IWF needs to construct a MAP reportSM-DeliveryStatus Ack message as a result of receiving a RDA command (see subclause A.3.4. step 4), the IWF shall populate sub-parameters of reportSM-DeliveryStatusRes/Error as described below:

reportSM-DeliveryStatusRes:

- **storedMSISDN** shall be populated with the value, after format translation, received within the User-Name AVP, when present, within SRA.
- **extensionContainer** shall be absent.

Error:

Values other than SUCCESS within the Result-Code / Experimental-Result AVP shall be mapped according to the following table:

Table A.3.5.3.2-1 Mapping from Diameter error codes to MAP error codes

Diameter Result code / Experimental Result	MAP error code
DIAMETER_UNABLE_TO_COMPLY	systemFailure
DIAMETER_MISSING_AVP	dataMissing
DIAMETER_INVALID_AVP_VALUE	unexpectedDataValue
DIAMETER_ERROR_USER_UNKNOWN	unknownSubscriber
DIAMETER_ERROR_MWD_LIST_FULL	messageWaitingListFull

A.4 IWF related to the S6a/S6a+D interface between MME and HSS

A.4.1 Introduction

3GPP TS 23.272 [2] has specified the "SMS in MME" architecture option, where an IWF, named S6a/S6a+D IWF, between the S6a interface with SMS subscription data on the MME side and the S6a interface without SMS subscription data plus the MAP-based D interface for SMS subscription on the MME side is defined. This S6a/S6a+D IWF is described in the following subclauses.

A.4.2 Interworking scenario

This interworking scenario is illustrated in the figure A.4.2.1-1 where an IWF is placed between a MME supporting a Diameter based S6a interface with the SMS in MME feature and a HSS supporting a S6a interface without the SMS feature and a MAP D interface where the IWF emulates a VLR limited to the support of SMS teleservice.

This IWF scenario, according to 3GPP TS 23.272 [4], may be used for roaming cases between the HSS in the home PLMN and the MME in the visited network.

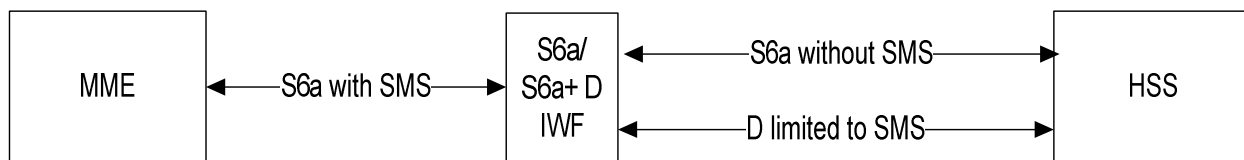


Figure A.4.2-1 S6a/S6a+D for SMS interworking scenario with one IWF

The S6a interface without SMS between the IWF and the HSS may be replaced by a MAP Gr interface without SMS between a S6a/Gr + D IWF and the HSS as illustrated in the figure A.4.2-2. The mapping of procedures described in clause A.4.4 and the mapping of parameters described in clause A.4.5 shall apply by replacing the commands transferred between the IWF and the HSS over S6a by the corresponding ones over the Gr interface in compliance with the clauses 6, 7, 8.

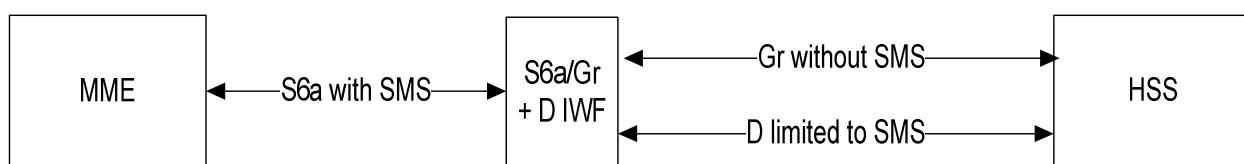


Figure A.4.2-2 S6a/Gr+D for SMS interworking scenario with one IWF

The IWF shall be configured as a MSC-VLR in the HSS over the D interface. Only the SMS teleservice will be available on the D interface.

A.4.3 General considerations

A.4.3.1 Procedures covered

The MAP procedures on the D interface to be supported by the IWF are:

- the procedures involved in the support of SMS teleservice:

- MAP-UPDATE-LOCATION
- MAP-CANCEL-LOCATION
- MAP-INSERT-SUBSCRIBER-DATA
- MAP-DELETE-SUBSCRIBER-DATA
- MAP-READY-FOR-SM
- the procedures not linked to the SMS teleservice as such:
 - MAP-PURGE
 - MAP-RESET

Other MAP procedures of the D interface between a VLR and the HSS shall not be supported by the IWF.

NOTE 1: Some MAP general procedures that are not linked to the SMS service does not need to be handled over the MAP D interface, as they will be normally handled with equivalent procedures by the HSS over the S6 interface, e.g. for MAP-PROVIDE-SUBSCRIBER-INFO, MAP-ACTIVATE/DEACTIVATE-TRACE-MODE or MAP-RESTORE-DATA.

NOTE 2: It is considered that proper configuration of HSS will avoid the HSS to attempt to use procedures not supported by the IWF.

The following S6a procedures defined in 3GPP TS 29.272 [5] shall be supported by the IWF.

- Update Location
- Cancel Location
- Purge UE
- Insert Subscriber Data
- Delete Subscriber Data
- Authentication Information Retrieval
- Reset
- Notification

The Authentication Information Retrieval procedure can be simply relayed by the IWF as having no interaction with a MAP procedure on the D interface.

A.4.4 The mapping of procedures

A.4.4.1 Common aspects

In the S6a, ULR and NOR commands requests received from MME with the SMS in MME feature bit set , the IWF may remove it in the corresponding command transferred to the HSS.

In the S6a ULA, NOA commands that the IWF transfers to the MME, the IWF shall set the SMS in MME feature bit if it was set in the associated ULR or NOR request.

In the S6a commands IDR, DSR that the IWF transfers to the MME, the IWF shall set the SMS in MME feature bit if it was set in the previous ULR received from the MME.

In the S6a, IDA, DSA answers received from MME with the SMS in MME feature bit set, the IWF may remove it in the corresponding command transferred to the HSS.

The IWF shall support MAP version V3 and should support fallback to version V1 or V2.

A.4.4.2 Update Location

The mapping of the Update Location procedure is shown in figure A.4.4.2-1:

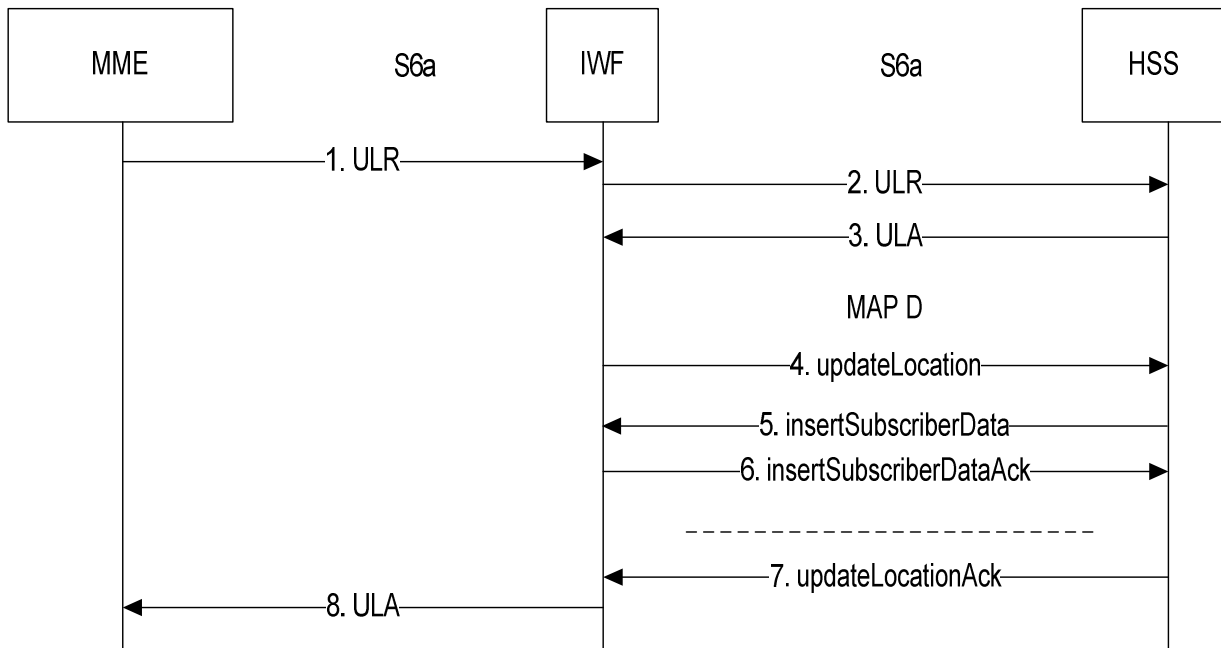


Figure A.4.4.2-1: Mapping of the Update Location procedure

1. The IWF receives a ULR from the MME with the SMS in MME feature bit set and a request to be registered for MT-SMS.
2. The IWF stores the SMS related information (SMS Register Request, SMS only indication, MME number for MT-SMS), sends the ULR to the HSS where the IWF may clear the SMS in MME feature bit and remove the information related to SMS.
3. The HSS answers with a ULA.
4. If the ULA is successful and has the SMS in MME feature bit cleared and the received Network Access Mode (NAM) is PS + CS, the IWF sends a MAP updateLocation to the HSS with the MME Number for MT SMS. Otherwise the IWF skips to the step 8.
5. The HSS sends a MAP insertSubscriberData with the CS subscription data of the user.
6. If the IWF receives the SMS teleservice in insertSubscriberData and
 - if the SMS Register Request is "SMS in MME required",
 - or if the SMS Register Request is "No preference" and a "SMS only indication" was received in step 2,
 - or if the SMS Register Request is "No preference" and no "SMS only indication" was received in step 2 and no other CS teleservices than the SMS teleservice have been received,
 then the IWF sends an insertSubscriberDataAck in which the IWF returns the received CS teleservices other than the SMS teleservice, if any;
 - otherwise the IWF sends an insertSubscriberDataAck in which the IWF returns the received CS teleservices including the SMS teleservice.
- If the IWF has not received the SMS teleservice in insertSubscriberData, the IWF sends an insertSubscriberDataAck where the IWF returns the received CS teleservices
7. The HSS sends a MAP updateLocationAck.

8. If the ULA received in step 3 is successful and the received Network Access Mode (NAM) is PS, the IWF sends the received ULA with the SMS in MME feature bit set and the indication that MME is not registered for SMS.

NOTE: The use of SMS in MME is not possible in this IWF case when the user has no CS subscription for the SMS teleservice.

If the IWF receives the SMS teleservice in insertSubscriberData and

if the SMS Register Request is "SMS in MME required",

or if the SMS Register Request is "No preference" and a "SMS only indication" was received in step 2,

or if the SMS Register Request is "No preference" and no "SMS only indication" was received in step 2 and no other CS teleservices than the SMS teleservice have been received in step 5,

then the IWF sends the ULA received in step 3 in which the IWF sets the SMS in MME feature bit and indicates that the MME is registered for SMS and includes the SMS subscription data;

otherwise the IWF sends the ULA received in step 3 in which the IWF sets the SMS in MME feature bit and indicates that the MME is not registered for SMS and does not include any SMS subscription data.

NOTE: the MSC registration is not cancelled because it has been indicated that SMS teleservice is not supported. Further it is assumed that the MME will perform an SGs association which will initiate a Location Update via a VLR

If the IWF has not received the SMS teleservice in insertSubscriberData, the IWF sends the ULA received in step 3 in which the IWF indicates that the MME is not registered for SMS.

If the ULA received in step 4 is unsuccessful, the IWF sends the ULA received in step 3 unchanged.

If in step 7, the IWF receives an updateLocation answer with a MAP error, the IWF sends the ULA received in step 3 unchanged with the indication that MME is not registered for SMS.

A.4.4.3 Cancel Location

A.4.4.3.1 Cancel Location over S6a

The mapping of the Cancel Location over S6a procedure is shown in figure A.4.4.3.1-1:

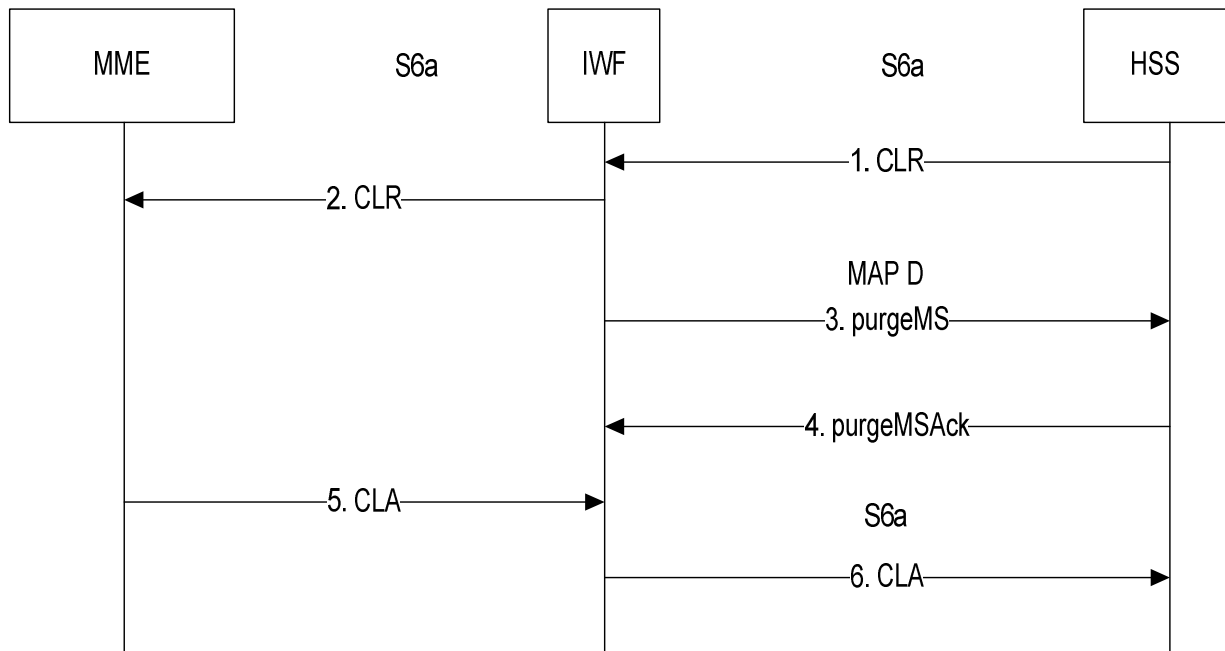


Figure A.4.4.3.1-1: Mapping of the Cancel Location over S6a procedure

1. The IWF receives a CLR from the HSS.
2. The IWF send the CLR unchanged to the MME.
3. The IWF, if it has been registered by the HSS over the MAP D interface shall send a MAP purgeMS message to the HSS.
4. the IWF receives a purgeMSAck from the HSS.
5. the IWF receives a CLA from the MME.
6. the IWF sends the CLA unchanged to the MME.

The steps 3/4 and the step 5 may occur in parallel.

A.4.4.3.2 Cancel Location over MAP D

The mapping of the Cancel Location over MAP D procedure is shown in figure A.4.4.3.2-1:

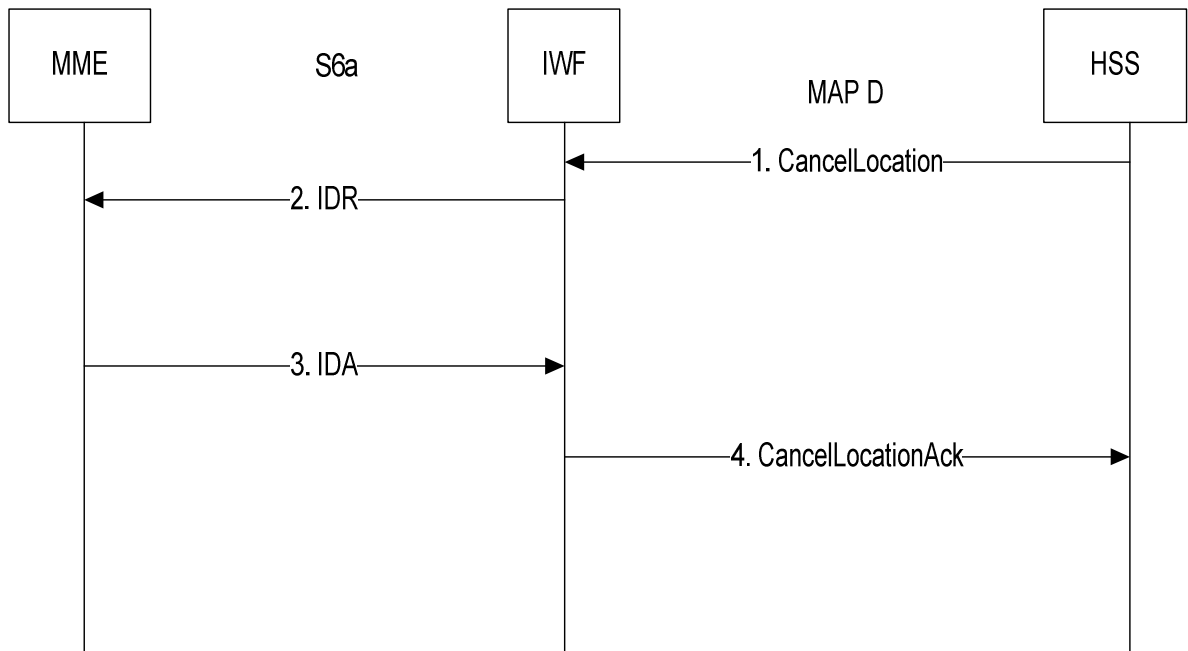


Figure A.4.4.3.2-1: Mapping of the Cancel Location over MAP D procedure

1. The IWF receives a CancelLocation from the HSS
2. If the MME is registered for SMS, the IWF sends an IDR to the MME with the indication to remove the MME registration for SMS; otherwise the IWF skips to the step 4.
3. The IWF receives an IDA.
4. The IWF sends a CancelLocation Ack to the HSS.

A.4.4.4 Purge

The mapping of the Purge procedure is shown in figure A.4.4.4-1:

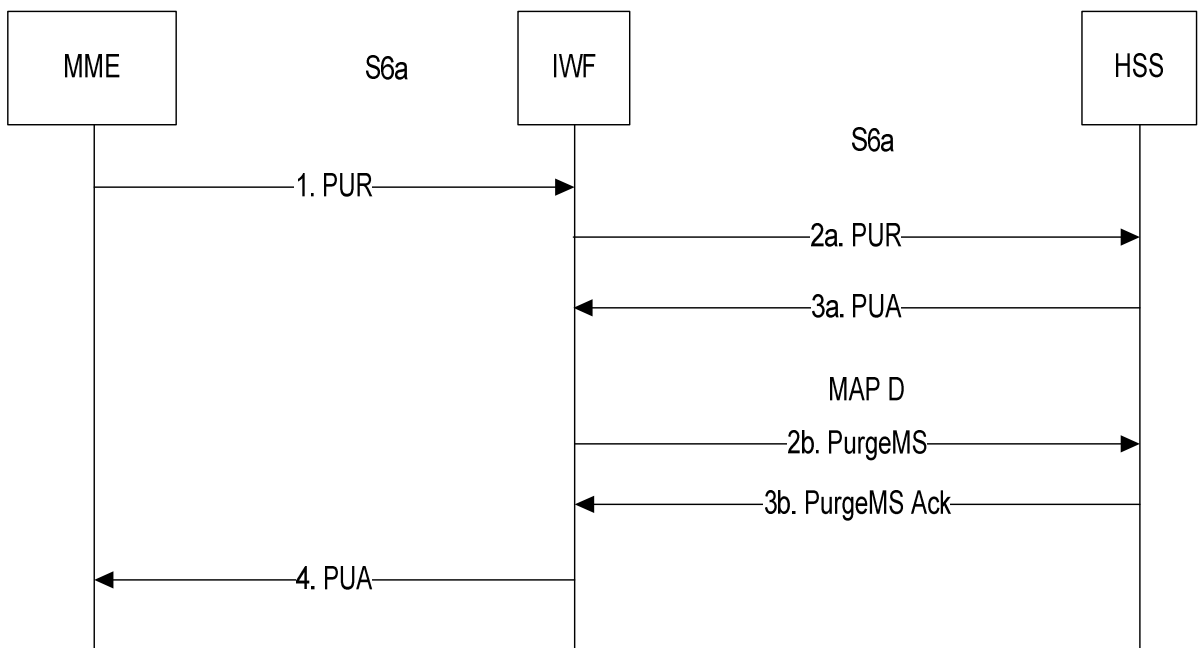


Figure A.4.4.4-1: Mapping of the Purge procedure

1. The IWF receives a PUR message from the MME.

- 2a. The IWF sends the PUR message unchanged to the HSS.
- 3a. The IWF receives PUA from the HSS.
- 2b. The IWF, if it has been registered by the HSS over the MAP D interface, sends a MAP purgeMS message to the HSS.
- 3b. The IWF receives a MAP purgeMSAck message from the HSS.
4. The IWF sends PUA to the MME.

The steps 2a/3a and 2b/3b may occur in parallel.

A.4.4.5 Insert Subscriber Data

A.4.4.5.1 Insert Subscriber Data over S6a

If the IWF receives an IDR from the HSS, the IWF sends the IDR unchanged to the MME apart the possible setting of the SMS in MME feature bit as described in subclause A.4.4.1.

A.4.4.5.2 Insert Subscriber Data over MAP D

The mapping of the Insert Subscriber Data over MAP D procedure is shown in figure A.4.4.5.2-1:

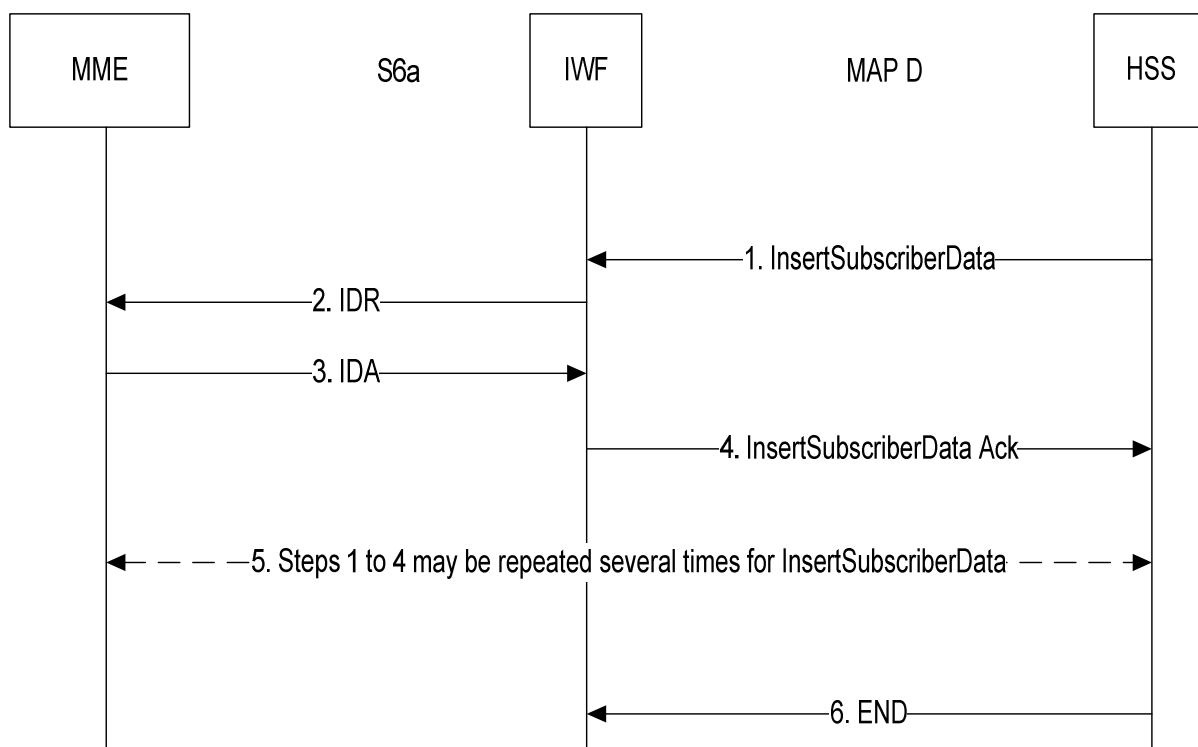


Figure A.4.4.5.2-1: Mapping of the Insert Subscriber Data over MAP D procedure

1. The IWF receives a (stand alone) MAP InsertSubscriberData message from the HSS.
 2. If the MAP InsertSubscriberData does not contain any data related to SMS, the IWF ignores the received data and skips to the step 4
- If the MAP InsertSubscriberData contains data related to SMS, the IWF maps them into an IDR towards the MME and ignores the other received data data.
3. The IWF receives IDA from the MME.
 4. The IWF sends InsertSubscriberData Ack to the HSS.

5. Steps 1 to 4 may be repeated several times for InsertSubscriberData. The repetition may be in burst mode or in acknowledge mode.
6. The HSS closes the MAP dialogue.

A.4.4.6 Delete Subscriber Data

A.4.4.6.1 Delete Subscriber Data over S6a

If the IWF receives a DSR from the HSS, the IWF sends the DSR unchanged to the MME apart the possible setting of the SMS in MME feature bit as described in subclause A.4.4.1

A.4.4.6.2 Delete Subscriber Data over MAP D

The mapping of the Delete Subscriber Data over MAP D procedure is shown in figure A.4.4.6.2-1:

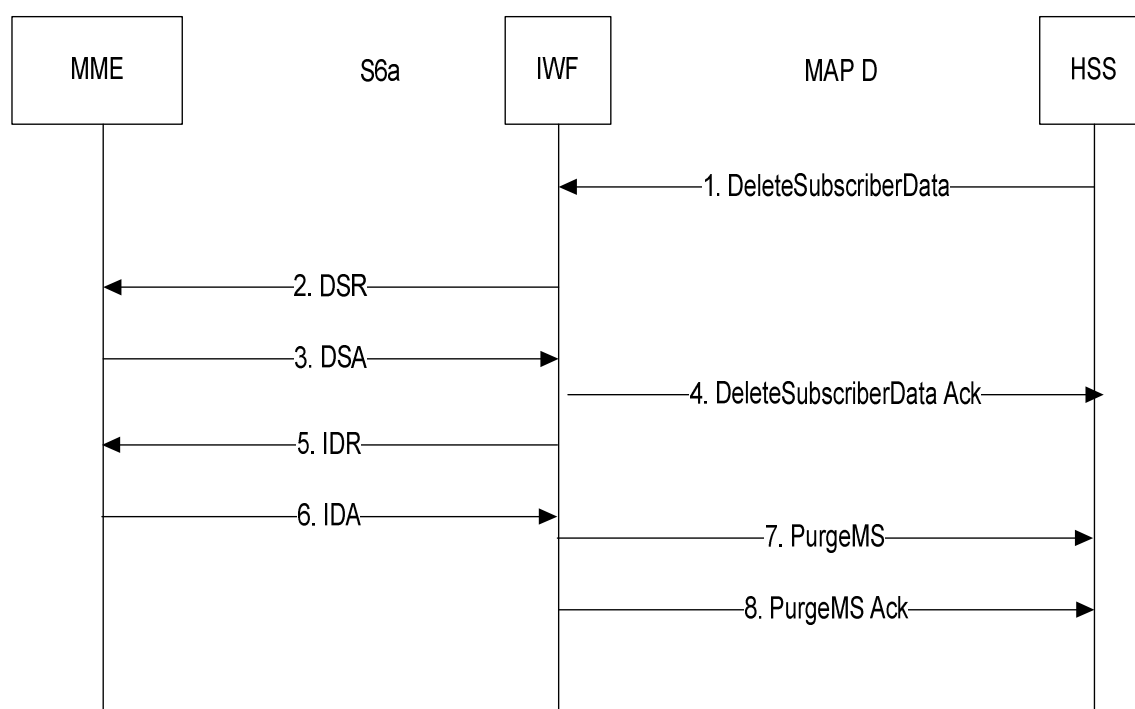


Figure A.4.4.6.2-1: Mapping of the Delete Subscriber Data over MAP D procedure

1. The IWF receives a MAP DeleteSubscriberData message from the HSS.
2. If the MAP DeleteSubscriberData does not contain any data related to SMS, the IWF ignores the received data data. The IWF skips to step 4. If the MAP DeleteSubscriberData contains data related to SMS, the IWF maps them into a DSR towards the MME and ignores the other received data data.
3. The IWF receives DSA from the MME.
4. The IWF sends DeleteSubscriberData Ack to the HSS.
5. If the SMS subscription is withdrawn, the IWF sends an IDR to the MME with the indication to remove the MME registration for SMS. Otherwise the procedure is terminated.
6. The IWF receives an IDA from the MME.
7. The IWF sends a PurgeMS to the HSS.
8. The IWF receives a Purge MS Ack from the HSS.

A.4.4.7 Reset

The mapping of the Reset procedure is shown in figure A.4.4.7-1:

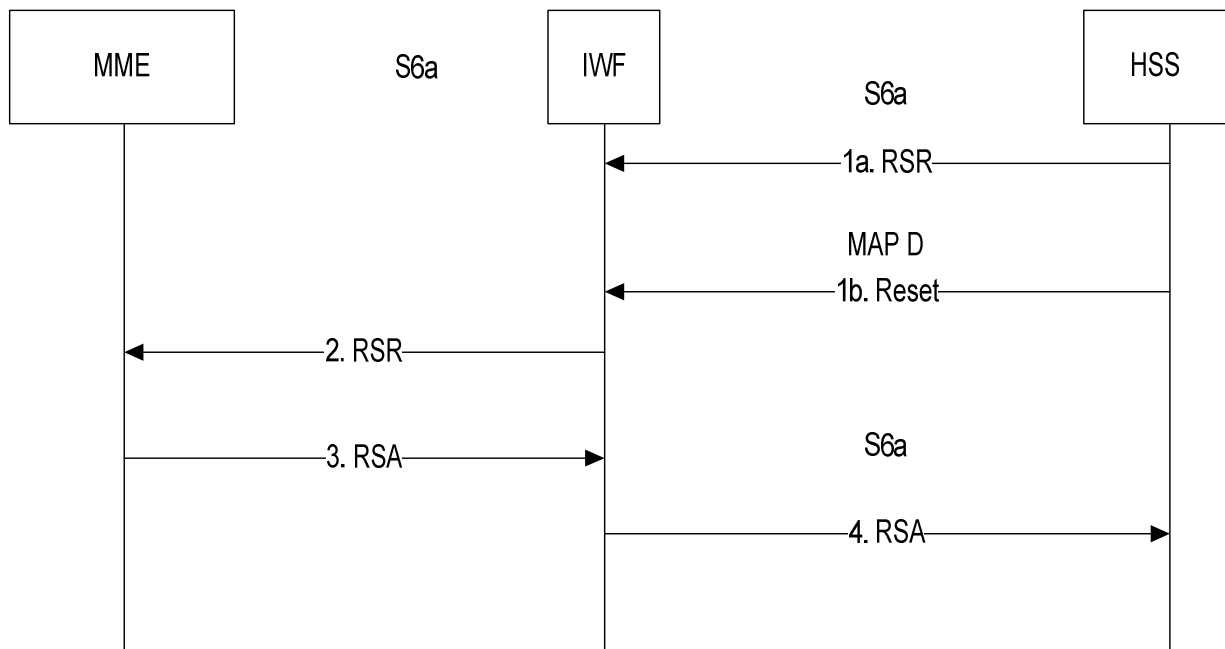


Figure A.4.4.7-1: Mapping of the Reset over S6a procedure

When there is a reset from HSS, the reset shall normally occur on both the S6a interface and the MAP D interface. The procedure handling may also apply when only a RSR is received on the S6a interface and no Reset message over the MAPD interface.

NOTE: It is out of the scope to address the handling of a Reset message received over the MAP D interface without receiving a RSR over the S6a interface.

- 1a. The IWF receives a RSR from the HSS, the IWF stores this information
- 1.b The IWF should receive a MAP Reset from the HSS.
2. The IWF sends a RSR unchanged to the MME.
3. The IWF receives a RSA from the MME.
4. The IWF sends the RSA unchanged to the HSS.

A.4.4.8 Notification

The mapping of the Notification procedure is shown in figure A.4.4.8-1:

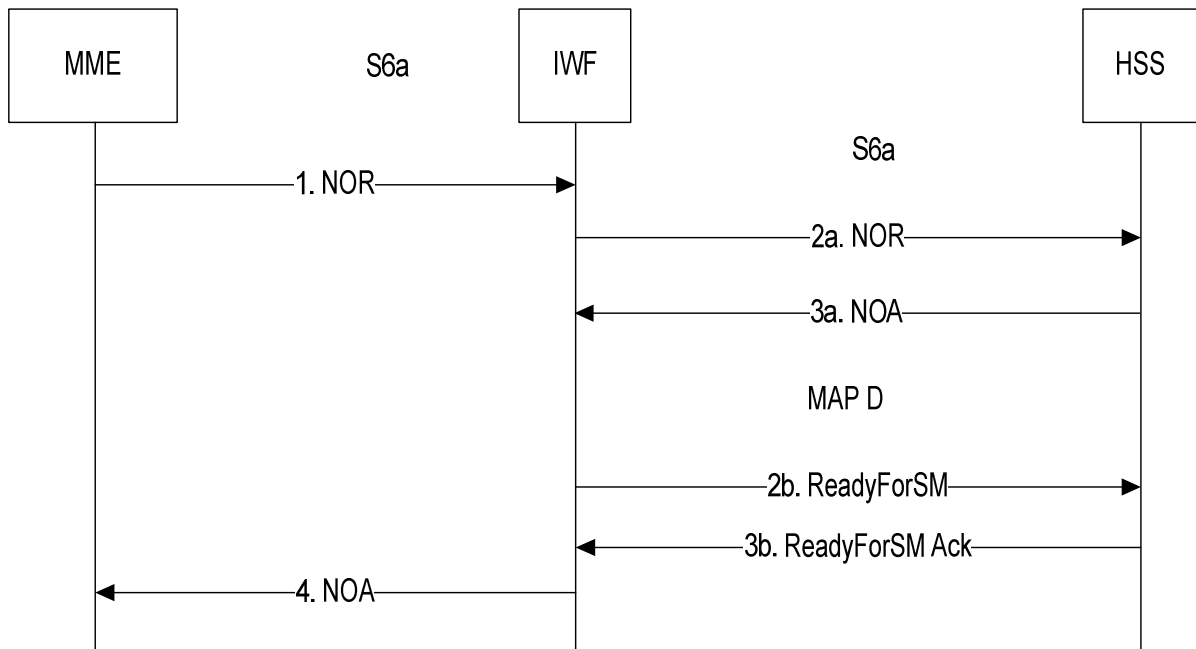


Figure A.4.4.8-1: Mapping of the Notification Procedure

1. The IWF receives a NOR message from the MME.
- 2a. If the NOR message contains notifications other than the Ready for SM from MME notification, the IWF sends a NOR message with the Ready for SM flag cleared, the Alert Reason information element removed and unchanged for the other notifications to the HSS.
- 3a. The IWF receives a NOA if a NOR was sent in step 2a.
- 2b. If the Ready for SM from MME flag is set in the NOR received in step 1, the IWF sends a MAP ReadyForSM message to the HSS.
- 3b. The IWF receives a MAP ReadyForSM Ack message, if a MAP ReadyForSM message was sent in step 2b.
4. If the NOR and/or the MAP ReadyForSM Ack messages received from the HSS are successful, the IWF sends a successful NOA to the MME.

The steps 2a/3a and 2b/3b may occur in parallel.

If one of the NOA or ReadyForSM answer from the HSS is successful and the other unsuccessful, the NOA sent to MME should be with an unsuccessful result mapped from the received error.

A.4.5 The mapping of parameters

A.4.5.1 Unchanged AVPs

Many commands between the MME and the IWF are not specific to SMS and are transferred over the S6a interface between the IWF and the HSS. Unless otherwise stated in the following A.4.5 subclauses, the AVPs received by the IWF in a Diameter command are transferred unchanged in the Diameter command sent by the IWF.

A.4.5.2 Mapping of Parameters for the Update Location procedure

A.4.5.2.1 ULR mapping to ULR

When the IWF receives a ULR from the MME with the SMS in MME feature bit set, the IWF generates a ULR towards the HSS where:

- the feature bit "SMS in MME" shall not be set;

- the MME-Number-for-MT-SMS AVP, the SMS-Only AVP and the SMS-Register-Request AVP shall be removed.

A.4.5.2.1 ULR mapping to UpdateLocationArg

When the IWF needs to construct a MAP-UpdateLocation message as a result of receiving an ULR command (see sections A.Z.4.2 step 4), the IWF shall open a MAP dialogue in application context version 3 and populate sub-parameters of UpdateLocationArg as described below:

- **imsi** in UpdateLocationArg shall be populated with the value of the User-Name AVP received within ULR.
- **mnc-Number** in UpdateLocationArg shall be populated with the value of the MME-Number-for-MT-SMS AVP within ULR,
- **vlr-Number** in UpdateLocationArg shall be populated with a value locally assigned to the IWF and consistent with SS7 routing principles.
- **mme-DiameterAddress** in UpdateLocationArg shall be present and be populated as follows
 - **diameter-Name** shall be populated with the value received in the Origin-Host AVP within ULR;
 - **diameter-Realm** shall be populated with the value received within the Origin-Realm AVP within ULR.

Other parameters defined for UpdateLocationArg shall be absent.

A.4.5.2.2 InsertSubscriberDataArg mapping to ULA

When the IWF needs to construct an ULA command as a result of receiving a successful ULA and a successful UpdateLocation Ack, the IWF shall behave as described in subclause A.Z.4.2 step 8 and in particular:

- **Teleservice-List** AVP shall only contain the TS-Code AVPs related to the short message teleservice with the values received in the corresponding Ext-TeleserviceCode parameters in the InsertSubscriberDataArg.
- **Call-Barring-Info** AVPs shall be present if call barring SS-code and SS-status parameters were present within the Call Barring Information List parameter within the InsertSubscriberDataArg and the SS-Code AVP and SS-Status AVP within the Call-Barring-Info AVPs shall be populated with the values of the received call barring SS-code and SS-status parameters within the Call Barring Information List parameter within the InsertSubscriberDataArg.
- **Operator-Determined-Barring** AVP shall be present if an odb-GeneralData parameter within SubscriberData parameter within InsertSubscriberDataArg was present with values related to call barring which shall be mapped to the corresponding flags within Operator-Determined-Barring AVP.

NOTE: ODB values in the ULA received from HSS are transferred unchanged in the ULA sent to the MME.

A.4.5.2.2 Mapping to InsertSubscriberDataRes

When the IWF needs to construct a MAP-InsertSubscriberData Ack message as a result of receiving an InsertSubscriberDataArg message (see subclause A.Z.4.2, step 6), the IWF shall populate sub-parameter of InsertSubscriberDataRes as follows:

- **ss-List** in InsertSubscriberDataRes shall include the ssCodes that have been received within InsertSubscriberDataArg and for which the corresponding flag of the Feature-List AVP is not set in the IDA.
- **teleserviceList** in InsertSubscriberDataRes shall include all teleserviceCodes that have been received within InsertSubscriberDataArg except those related to the short message teleservice.
- **bearerServiceList** in InsertSubscriberDataRes shall include all bearerServiceCodes that have been received within InsertSubscriberDataArg.
- **odb-GeneralData** in InsertSubscriberDataRes shall include all odb categories that have been received within InsertSubscriberDataArg and that are not supported by the MME as indicated within the Supported-Feature AVP within ULR.

Other sub parameters in InsertSubscriberDataRes shall be absent.

- For **InsertSubscriberData Error**: Values other than SUCCESS within the Result-Code / Experimental-Result AVP shall be mapped onto an appropriate MAP error.

A.4.5.3 Mapping of Parameters for the Cancel Location procedure

A.4.5.3.1 CLR mapping to PurgeMSArg mapping to

When the IWF needs to construct a MAP-PurgeMS message as a result of receiving CLR command (see subclause A.4.4.3.1 step 3), the IWF shall open a MAP dialogue in application context version 3 and populate sub-parameters of PurgeMS-Arg as described below:

- **imsi** in PurgeMS-Arg shall be populated with the imsi value of the User-Name AVP received within CLR.
- **vlr-Number** in PurgeMS-Arg shall be populated with the value given in the previous Update Location procedure.
- **sgsn-Number** and **extensionContainer** in PurgeMS-Arg shall be absent.

A.4.5.3.2 CancelLocationArg mapping to IDR

When the IWF needs to construct an IDR as a result of receiving a CancelLocation message (see subclause A.4.4.3.2 step 2), the IWF shall populate AVPs of DSR as described below:

IDR-Flags AVP:

- **Remove SMS Registration** flag shall be set to 1.
- Other flags shall be set to 0.

Subscription-Data AVP shall be included empty.

A.4.5.3.3 IDA mapping to CancelLocationRes/Error

When the IWF needs to construct a MAP-CancelLocation Ack message as a result of receiving an IDA command (see subclause A.4.4.3.2 step 4), the IWF shall populate sub-parameters of CancelLocationRes/Error as described below:

CancelLocationRes:

- **extensionContainer** in CancelLocationRes shall be absent.

CancelLocation Error:

- Values other than SUCCESS within the Result-Code / Experimental-Result AVP shall be mapped onto an appropriate MAP error.

A.4.5.4 Mapping of Parameters for the Purge Procedure

A.4.5.4.1 PUR mapping to PurgeMS-Arg

When the IWF needs to construct a MAP-PurgeMS message as a result of receiving a PUR command (see subclause A.4.4.4 step 2b), the IWF shall open a MAP dialogue in application context version 3 and populate sub-parameters of PurgeMS-Arg as described below:

- **imsi** in PurgeMS-Arg shall be populated with the imsi value of the User-Name AVP received within PUR.
- **vlr-Number** in PurgeMS-Arg shall be populated with the value given in the previous Update Location procedure.
- **sgsn-Number** and **extensionContainer** in PurgeMS-Arg shall be absent.

A.4.5.4.2 PurgeMS-Res / Error mapping to PUA

The Result-Code / Experimental-Result AVP and the other AVPs of the PUA sent by the IWF to the MME, shall be the same as those received in the PUA from the HSS and are not dependent of the PurgeMS Ack message received over MAP D.

A.4.5.5 Mapping of Parameters for the Insert Subscriber Data Procedure

A.4.5.5.1 InsertSubscriberDataArg mapping to IDR

When the IWF needs to construct an IDR as a result of receiving a InsertSubscriberData message, the IWF shall behave as described in subclause A.Z.4.2 step 8. In particular:

- **Teleservice-List** AVP, shall be present if short message related Ext-TeleserviceCode parameters were received and shall contain the TS-Code AVPs related to the short message teleservice with the values received in the corresponding Ext-TeleserviceCode parameters.
- **Call-Barring-Info** AVPs shall be present if call barring SS-code and SS-status parameters were present within the Call Barring Information List parameter within the InsertSubscriberDataArg and the SS-Code AVP and SS-Status AVP within the Call-Barring-Info AVPs shall be populated with the values of the received call barring SS-code and SS-status parameters within the Call Barring Information List parameter within the InsertSubscriberDataArg.

A.4.5.5.2 IDA mapping to InsertSubscriberDataRes/Error

When the IWF needs to construct a MAP-InsertSubscriberData Ack message as a result of receiving an IDA command (see subclause A.Z.4.5.2, step 4), the IWF shall populate sub-parameter of InsertSubscriberDataRes as follows:

ss-List in InsertSubscriberDataRes shall include the ssCodes that have been received within InsertSubscriberDataArg and for which the corresponding flag of the Feature-List AVP is not set in the IDA.

Other sub parameters in InsertSubscriberDataRes shall be absent.

For **InsertSubscriberData Error**: Values other than SUCCESS within the Result-Code / Experimental-Result AVP shall be mapped onto an appropriate MAP error.

A.4.5.6 Mapping of Parameters for the Delete Subscriber Data Procedure

A.4.5.6.1 DeleteSubscriberDataArg mapping to DSR

When the IWF needs to construct a DSR command as a result of receiving a MAP-DeleteSubscriberData message (see subclause A.4.4.6.2 step 2), the the IWF shall populate AVPs of DSR as described below:

- **User-Name** AVP shall be populated with the value received within the imsi parameter of DeleteSubscriberDataArg.
- **Supported-Features** AVP shall be absent.
- **DSR-Flags** AVP: Flags shall be set as follows:
 - **SMS Withdrawal** shall be set to 1 if the SS-Code list parameter was present within DeleteSubscriberDataArg and the service codes are related to short message services; otherwise shall be set to 0.
 - other flags shall be set to 0.

A.4.5.6.2 DSA mapping to DeleteSubscriberDataRes/Error

When the IWF needs to construct a MAP-DeleteSubscriberData Ack message as a result of receiving a DSA command (see subclause A.4.4.6.2 step 4), the IWF shall populate sub-parameters of DeleteSubscriberDataRes/Error as described below:

DeleteSubscriberDataRes:

- No sub-parameter shall be present in DeleteSubscriberDataRes.

DeleteSubscriberData Error:

Values other than SUCCESS within the Result-Code / Experimental-Result AVP shall be mapped onto an appropriate MAP error.

A.4.5.7 Mapping of Parameters for the Reset Procedure

A.4.5.7.1 Reset mapping to RSR

When the IWF needs to construct a RSR command as a result of receiving a RSR and a MAP Reset message (see subclause A.4.4.7 step 2), the IWF shall send the RSR received from HSS unchanged and ignore the sub-parameters of the MAP Reset message.

A.4.5.8 Mapping of Parameters for the Notification Procedure

A.4.5.8.1 NOR mapping to ReadyForSMArg

When the IWF needs to construct a MAP-ReadyForSM message as a result of receiving a NOR command (see subclause A.Z.4.8 step 2b), the IWF shall open a MAP dialogue in application context version 3 and populate sub-parameters of ReadyForSMArg as described below:

- **imsi** in ReadyForSMArg shall be populated with the value of the User-Name AVP received within NOR.
- **alertReason** in ReadyForSMArg shall be populated with the value of the Alert-Reason AVP received within NOR.
- **alertReasonIndicator** in ReadyForSMArg shall be absent.
- **additionalAlertReasonIndicator** in ReadyForSMArg shall be absent.
- **extensionContainer** in ReadyForSMArg shall be absent.
- **maximumUeAvailabilityTime** in ReadyForSMArg shall be present and populated with the value received within the Maximum-UE-Availability-Time AVP, when present, within NOR .

Annex B (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2008-12	CT#42	CP-080711			Version 1.0.0 approved in CT#42	1.0.0	8.0.0
2009-03	CT#43	CP-090056	0001		Supported RAT Type	8.0.0	8.1.0
		CP-090056	0002		Trace		
		CP-090056	0004		Context Identifier for Update or Removal of PDN GW		
		CP-090044	0005	2	Ready For SM		
		CP-090044	0006		Handling LCS Subscription Data		
		CP-090056	0007	1	Requesting-Node-Type mapping		
		CP-090056	0008		Parameter mapping correction		
		CP-090044	0010	2	Handling SMS Subscription Data		
2009-06	CT#44	CP-090308	0011		Parameter Mapping	8.1.0	8.2.0
		CP-090380	0013	3	User Data Download		
2009-09	CT#45	CP-090545	0014		Notification of SMS over IP Non-Delivery for E-UTRAN and UE Reachability	8.2.0	8.3.0
		CP-090545	0015		Removal of User Data Handling Principles		
		CP-090545	0016	2	Cancel Location for Initial Attach		
2009-12	-	-	-	-	Update to Rel-9 version (MCC)	8.3.0	9.0.0
2011-03	CT#51	CP-110082	0018	1	UE SRVCC Capability Support for IWF	9.0.0	10.0.0
2011-06	CT#52	CP-110380	0020	1	Parameter Mapping for MDT	10.0.0	10.1.0
2011-09	CT#53	CP-110584	0021	2	Add vSRVCC updates to the IWF function	10.1.0	11.0.0
2012-03	CT#55	CP-120024	0026	1	Mapping of Parameters for Insert Subscriber Data	11.0.0	11.1.0
		CP-120025	0022	1	Mapping of Parameters for Cancel Location		
2012-06	CT#56	CP-120240	0023	3	Mapping of CSG ID and Local Time for NPLI	11.1.0	11.2.0
2012-09	CT#57	CP-120473	0029	4	SMS in MME/SGSN	11.2.0	11.3.0
		CP-120473	0032	1	SMS in MME IWF General		
		CP-120480	0034	1	Local Time Zone		
2012-12	CT#58	CP-120714	0038	4	Clarification on EPS Info	11.3.0	11.4.0
		CP-120732	0033	5	SMS in MME S6c IWF		
		CP-120732	0035	3	SMS in MME IWF error cases for SGd		
		CP-120732	0036	5	SMS in MME S6a/S6a+D IWF		
		CP-120732	0037	-	SMS in MME SGd IWF		
2013-06	CT#60	CP-130278	0045	1	Parameter Mapping of SS Status for Call Barring	11.4.0	11.5.0
2013-09	CT#61	CP-130450	0048	-	MME Diameter address mapping	11.5.0	11.6.0
2013-09	CT#61	CP-130463	0046	2	CancelLocation requesting reattach	11.6.0	12.0.0
		CP-130456	0047	1	IWF description for Gdd support		
2013-12	CT#62	CP-130614	0050	4	Parameter Mapping for S6aS6d-Indicator in NOR	12.0.0	12.1.0
		CP-130617	0055	-	Parameter Mapping for MME Initiated Removal of MME Registration for SMS		
		CP-130623	0051	1	S6c support for HSS and SMS Router		
		CP-130623	0056	1	Figures about IWF description for Gdd support		
		CP-130800	0052	2	IWFs with SMS for IMS UE without MSISDN		
		CP-130643	0053	1	Forwarding of Diameter based SRI for SMS		
2014-09	CT#65	CP-140506	0058	1	P-CSCF Restoration Indication	12.1.0	12.2.0
2015-06	CT#68	CP-150263	0060	1	Access Restriction Data per PLMN	12.2.0	13.0.0
2015-12	CT#70	CP-150784	0061	1	Introducing IMSI-Group ID List	13.0.0	13.1.0
2016-03	CT#71	CP-160030	0062	-	Alert procedure from MME/SGSN to SMS-GMSC for MT SMS to UE using eDRX	13.1.0	13.2.0
2017-03	CT#75	-	-	-	Update to Rel-14 version (MCC)	13.2.0	14.0.0

History

Document history		
V14.0.0	April 2017	Publication