

**Oracle® Communications
Subscriber Data Management**

SIP Interface Description

Release 9.3

910-6878-001 Revision B

January 2014

ORACLE®

Oracle® Communications SIP Interface Description, Release 9.3

Copyright© 2010, 2014 Oracle and/or its affiliates. All rights reserved.

This software and related documentation are provided under a license agreement containing restrictions on use and disclosure and are protected by intellectual property laws. Except as expressly permitted in your license agreement or allowed by law, you may not use, copy, reproduce, translate, broadcast, modify, license, transmit, distribute, exhibit, perform, publish, or display any part, in any form, or by any means. Reverse engineering, disassembly, or decompilation of this software, unless required by law for interoperability, is prohibited.

The information contained herein is subject to change without notice and is not warranted to be error-free. If you find any errors, please report them to us in writing.

If this is software or related documentation that is delivered to the U.S. Government or anyone licensing it on behalf of the U.S. Government, the following notice is applicable:

U.S. GOVERNMENT RIGHTS Programs, software, databases, and related documentation and technical data delivered to the U.S. Government customers are "commercial computer software" or "commercial technical data" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, the use, duplication, disclosure, modification, and adaptation shall be subject to restrictions and license terms set forth in applicable Government contract, and, to the extent applicable by the terms of the Government contract, the additional rights set forth in FAR 52.227-19, Commercial Computer Software License (December 2007). Oracle America, Inc., 500 Oracle Parkway, Redwood City, CA 94065.

This software or hardware is developed for general use in a variety of information management applications. It is not developed or intended for use in any inherently dangerous applications, including applications that may create a risk of personal injury. If you use this software or hardware in dangerous applications, then you shall be responsible to take all appropriate fail-safe, backup, redundancy, and other measures to ensure its safe use. Oracle Corporation and its affiliates disclaim any liability for any damages caused by use of this software or hardware in dangerous applications.

Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

Intel and Intel Xeon are trademarks or registered trademarks of Intel Corporation. All SPARC trademarks are used under license and are trademarks or registered trademarks of SPARC International, Inc. AMD, Opteron, the AMD logo, and the AMD Opteron logo are trademarks or registered trademarks of Advanced Micro Devices. UNIX is a registered trademark of The Open Group.

This software or hardware and documentation may provide access to or information on content, products, and services from third parties. Oracle Corporation and its affiliates are not responsible for and expressly disclaim all warranties of any kind with respect to third-party content, products, and services. Oracle Corporation and its affiliates will not be responsible for any loss, costs, or damages incurred due to your access to or use of third-party content, products, or services.

Publication History

Revision	Date	Reason
A	October 2013	Initial Release. Same as 910-6855-001_rev_b.
B	January 2014	Added Oracle front page and copyrights. Updated release date.

Table of Contents

1. INTRODUCTION.....	6
1.1 General	6
1.2 Document Scope	6
1.3 Legend.....	6
1.4 Acronyms	6
2. FUNCTIONAL DESCRIPTION	8
1.6 SDM SIP Architecture Overview.....	8
1.7 SIP Subscriber Profiles	9
1.8 SIP Registrar Responses	9
1.9 SIP Redirection Server Responses	10
1.10 Other response codes	10
1.11 GSM Registration Agent.....	11
3. NGHLR AS SIP REGISTRAR.....	12
3.1 Successful SIP Registration without authentication	12
3.1.1 Message Sequence.....	12
3.1.2 Traces.....	12
3.2 Successful SIP Registration with authentication	13
3.2.1 Message Sequence.....	13
3.2.2 Traces.....	14
3.3 Unsuccessful SIP Registration (user not found).....	15
3.3.1 Message Sequence.....	15
3.3.2 Traces.....	15
4. NGHLR AS SIP REDIRECTION SERVER	16
4.1 SIP INVITE to SIP-registered subscriber, GSM detached	16
4.1.1 Message Sequence.....	16
4.1.2 Traces.....	16
4.2 SIP INVITE to GSM attached subscriber, SIP deregistered.....	18
4.2.1 Message Sequence.....	18
4.2.2 Traces.....	18
4.3 SIP INVITE to subscriber with active CFU	19
4.3.1 Message Sequence.....	19
4.3.2 Traces.....	19
4.4 SIP INVITE to subscriber with active CFNRC	20
4.4.1 Message Sequence.....	20
4.4.2 Traces.....	20
4.5 SIP INVITE to SIP-registered & GSM-attached subscriber.....	21
4.5.1 Message Sequence.....	21
4.5.2 Traces.....	21
4.6 Optional SIP Diversion header	22
4.6.1 Example SIP messages for MSRN	22
4.7 Optional Subscriber Information	23

4.8	Reverse AOR search (using VoipDN)	25
4.8.1	Traces.....	25
5.	NGHLR AS GSM REGISTRATION AGENT.....	26
5.1	SIP Registration on UpdateLocation	26
5.1.1	Message Sequence.....	26
5.1.2	Traces.....	26
5.2	SIP Deregistration on Not Reachable.....	27
5.2.1	Message Sequence.....	27
5.2.2	Traces.....	28
5.3	IMS Headers	28
5.3.1	IMS Header Required.....	28
5.3.2	Path Header Required.....	29
5.3.3	Set username in Contact Header	29
5.3.4	Username is a phone number	29

1. Introduction

1.1 General

This document aims to provide a description of the SDM Session Initiation Protocol (SIP) Interface. The SIP interface is an available option of the Tekelec ngHLR™ application. The full set of functionality described in this document is available in Tekelec Release 5.2 onwards.

1.2 Document Scope

The document details technical compliance of the interface and provides example traces of key messages exchanged between the SDM SIP Application Server and the external SIP peers.

1.3 Legend

Throughout the document are provided traces for various message sequences. Within those traces, color-coding as follows:

Yellow-highlighted text represents values that are configured at system-level in the Tekelec ngHLR

Green-highlighted text represents values that are provisioned in the subscriber profile in the Tekelec ngHLR

Blue-highlighted text represents values that are provided by other network elements during the call flow (e.g. an MSRN).

1.4 Acronyms

Acronym	Description
AAA	RADIUS Authentication, Authorization, and Accounting Server
ACK	Data Acknowledgement
AOR	Address of Record
CAMEL	Customized Applications for Mobile network Enhanced Logic
CFNRC	Call Forwarding Not Reachable
CFU	Call Forwarding Unconditional
EU	European Union
GRA	GSM Registration Agent
GSM	Global System for Mobile Communications
FTN	Forward To Number
HSS	Home Subscriber Server
IMS	IP Multimedia Subsystem
MD5	Message Digest (Version 5)
MSRN	Mobile Station Roaming Number
ngHLR	Tekelec Home Location Number
PDN	Packet Data Network
PGW	PDN Gateway

Acronym	Description
PRND	Preferred Routing Network Domain
RADIUS	Remote Authentication Dial In User Service
RoHS	Restriction of Hazardous Subscriber
SCP	Service Control Point
SDM	Subscriber Data Management
SDS	Session Data Subscriber
SIP	Session Initiation Protocol
SREG	SIP Registrar
SRES	SIP Redirection Server
SRI	Send Routing Info
URI	Uniform Resource Identifier
VLR	Visitor Location Register
VoIP	Voice Over Internet Protocol
WEEE	Waste Electronic and Electrical Equipment

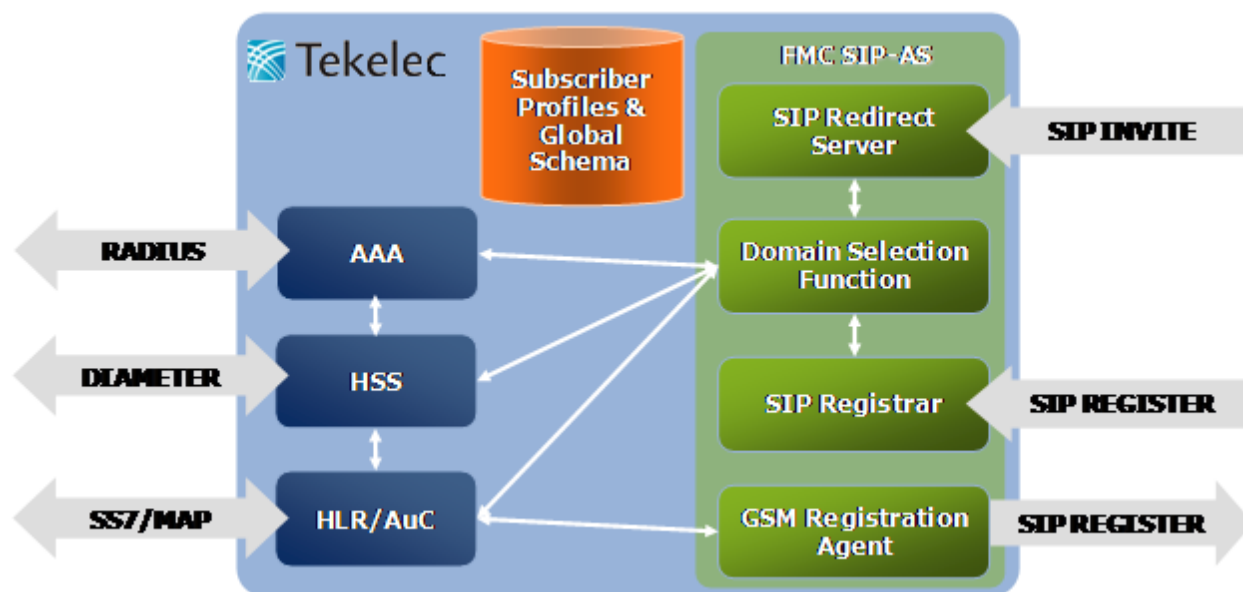
2. Functional Description

1.6 SDM SIP Architecture Overview

The ngHLR3000™ application, running on the SDM platform, can optionally support an RFC3261 compliant SIP Interface. This interface can be used in several different ways depending on the network setup and deployment model. The scenarios for the ngHLR SIP interface can be summarized to the following use cases:

- Enable multi-mode subscribers to SIP register on the ngHLR, alongside the GSM Attach procedure
- Enable external SIP-capable network elements to query the ngHLR using SIP instead of MAP
- Provide Presence and Registration information to external SIP registrars by acting as a SIP User Agent on behalf of the GSM mobile station

In order to enable the above, the ngHLR supports the following SIP functionalities:



- SIP Registrar (SREG)
- SIP Redirection Server (SRES)
- GSM Registration Agent (GRA)

The functional elements described above can be individually enabled or disabled in order to enable either Fixed-Mobile-Convergence deployment model, or to simply support a SIP SendRoutingInfo (SRI) interface. For more details on the ngHLR SIP feature set and capabilities, please refer to document PD-0018.

The ngHLR SIP applications support the following SIP methods: REGISTER, OPTIONS, INVITE, CANCEL, ACK

1.7 SIP Subscriber Profiles

In order to use the ngHLR's SIP functional elements, the CSP 3000 Multi-Profile capabilities need to be leveraged, and each subscriber must be associated at least one SIP profile. SIP profiles may be associated to the Primary IMSI of an HLR subscriber. This is mandatory for the Registrar, Redirection Server and GSM Registration Agent functionalities.

Only the subscribers for which SIP functionality is required need to have a SIP profile.

A SIP profile contains the following elements:

- A SIP subscriber ID. This is a unique logical name for the subscription and it is mapped to the Primary IMSI
- One or several Address Of Record(s), of format *scheme:user@host:port*, as per RFC3986
- A number of optional flags and parameters (please refer to RM-0018 for details)

Below are examples of valid AORs:

sip:joe@operator.com

sip:+15145551111@nghlr.serviceprovider.net:5060

sips:default.user@192.168.190.1

Tel URIs are not supported in the subscriber profile..

1.8 SIP Registrar Responses

The following table provides the possible Registrar responses to a REGISTER message:

Field IsAuthenticationEnabled	Registrar Authentication enabled		Registrar Authentication disabled	
	AOR Authentication enabled	AOR Authentication disabled	AOR Authentication enabled	AOR Authentication disabled
Field IsAORAuthenticationEnabled				
REGISTER to valid AOR without Authentication credentials	401 Unauthorized	200 OK	200 OK	200 OK
REGISTER to valid AOR with correct Authentication credentials	200 OK			
REGISTER to valid AOR with wrong Authentication credentials	401 Unauthorized	200 OK	200 OK	200 OK
REGISTER to AOR not in ngHLR DB	404 Not Found			

Digest MD5 authentication is supported on REGISTER and can be enabled/disabled on system-level and subscriber-level basis (per AOR).

1.9 SIP Redirection Server Responses

The following table provides the possible Redirection responses to an INVITE message:

			CFU active		CFU inactive	
			CFNRC active	CFNRC inactive	CFNRC active	CFNRC inactive
GSM-Attached	SIP-Registered	PRND=GSM	300 (CFU ftn, uri)		300 (MSRN, uri)	
		PRND=SIP	300 (uri, CFU ftn)		300 (uri, MSRN)	
	SIP-Deregistered	PRND=GSM	302 (CFU ftn)		302 (MSRN)	
		PRND=SIP				
GSM-Detached or unreachable	SIP-Registered	PRND=GSM	300 (CFU ftn, uri)		300 (CFNRC ftn, uri)	302 (uri)
		PRND=SIP	300 (uri, CFU ftn)		300 (uri, CFNRC ftn)	302 (uri)
	SIP-Deregistered	PRND=GSM	302 (CFU ftn)		302 (CFNRC ftn)	480 Temporary Unavailable
		PRND=SIP	302 (CFU ftn)		302 (CFNRC ftn)	480 Temporary Unavailable
AOR not in ngHLR DB			404 Not Found			
INVITE request not allowed			403 Forbidden			
SIP Server is overloaded			486 Busy Here			

Definitions:

- PRND = PreferredRoutingNetworkDomain in subs profile
- CFU = Call Forwarding Unconditional
- CFNRC = Call Forwarding Not Reachable
- Ftn = Forward-to-number
- uri = Contact Uniform Resource Identifier(s) registered by the SIP client

Notes:

- MSRN, CFU ftn and CFNRC ftn are provided in the user part of sip:uri format with user=phone
- 300 (a, b) = a has a higher "qValue" than b
- If there are multiple SIP registration bindings, the response will be a 300 (instead of 302)

1.10 Other response codes

The following response codes are common to the Registrar and Redirect server.

503 Service unavailable: This error is returned when the SIP stack is manually disabled by the operator.

500 Server Error: This error is returned when an abnormal error occurred during the processing of the SIP message or related SS7 traffic. For example an invalid/unexpected response is received, unexpected error is received from the SIP stack or a lack of resource to process the message is detected.

1.11 GSM Registration Agent

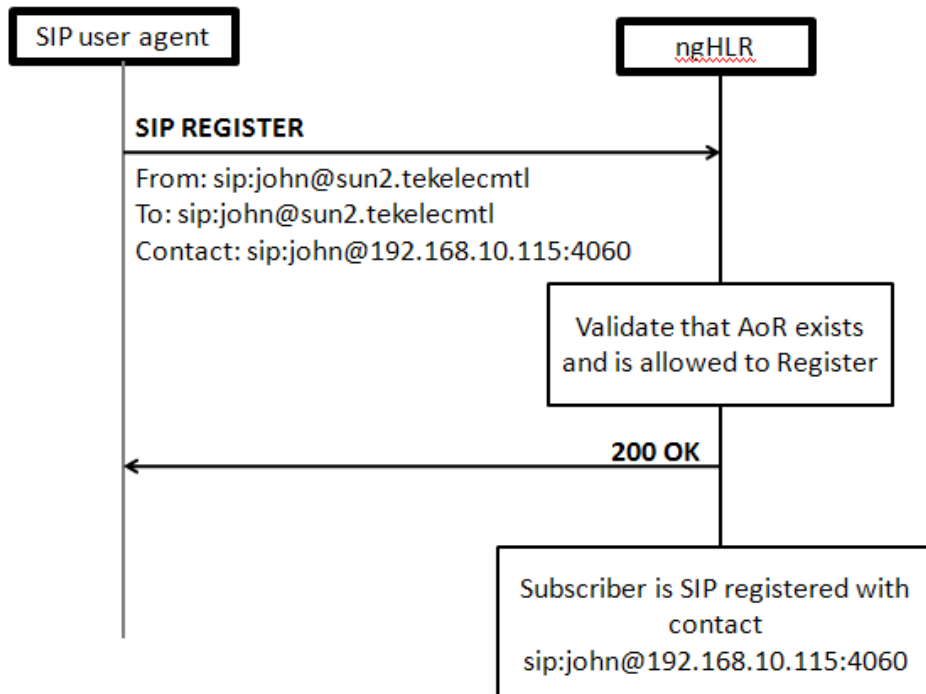
The ngHLR GSM Registration Agent (aka SIP User Agent Gateway) allows the ngHLR to SIP-Register with an external Registrar on behalf of a standard GSM subscriber. The ngHLR will maintain (refresh) the SIP registration using a proprietary algorithm as long as the subscriber is GSM-attached.

3. ngHLR as SIP Registrar

3.1 Successful SIP Registration without authentication

This use case describes a successful SIP Registration of a subscriber for which SIP Digest authentication has been disabled.

3.1.1 Message Sequence



3.1.2 Traces

3.1.2.1 SIP Register

Session Initiation Protocol

Request-Line: **REGISTER sip:sun2.Tekelecmtl SIP/2.0**

Message Header

Via: SIP/2.0/TCP 192.168.10.115:4060;branch=z9hG4bK-21069-1-0

From: "john" <sip:john@sun2.tekelecmtl>;tag=1

To: "john" <sip:john@sun2.tekelecmtl>

Call-ID: 1-21069@192.168.10.115

CSeq: 1 REGISTER

Contact: <sip:john@192.168.10.115:4060>

Content-Length: 0

Expires: 3600

Max-Forwards: 20

3.1.2.2 200 OK

Session Initiation Protocol

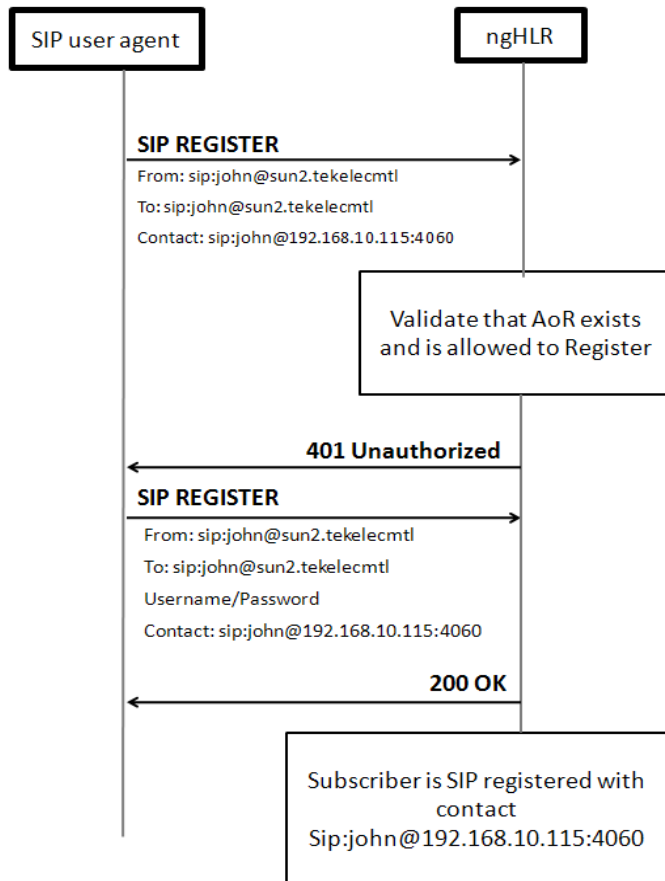
Status-Line: **SIP/2.0 200 OK**

Message Header

```
From: "john" <sip:john@sun2.tekelecmtl>;tag=1
To: "john" <sip:john@sun2.tekelecmtl>;tag=5ad39d08-8246a8c0-13c4
Call-ID: 1-21069@192.168.10.115
CSeq: 1 REGISTER
Via: SIP/2.0/TCP 192.168.10.115:4060;branch=z9hG4bK-21069-1-0
Contact: <sip:john@192.168.10.115:4060>;expires=3600
Content-Length: 0
```

3.2 Successful SIP Registration with authentication

3.2.1 Message Sequence



3.2.2 Traces

3.2.2.1 401 Unauthorized

Session Initiation Protocol

Status-Line: **SIP/2.0 401 Unauthorized**

Message Header

From: "john" <sip:john@sun2.tekelecmt1>;tag=1

To: "john" <sip:john@sun2.tekelecmt1>;tag=5cb53200-8246a8c0-13c4

Call-ID: 1-28689@192.168.10.115

CSeq: 1 REGISTER

WWW-Authenticate: Digest

realm="sun2.tekelecmt1", domain="sun2.tekelecmt1", nonce="49112d8066c5c831bd4a0507e894b37a", opaque="Tekelec", algorithm=MD5, qop="auth"

Via: SIP/2.0/TCP 192.168.10.115:4060;branch=z9hG4bK-28689-1-0

Content-Length: 0

3.2.2.2 SIP Register (2nd)

Session Initiation Protocol

Request-Line: **REGISTER sip:sun2.tekelecmt1 SIP/2.0**

Message Header

Via: SIP/2.0/TCP 192.168.10.115:4060;branch=z9hG4bK-28689-1-2

From: "john" <sip:john@sun2.tekelecmt1>;tag=1

To: "john" <sip:john@sun2.tekelecmt1>

Call-ID: 1-28689@192.168.10.115

CSeq: 1 REGISTER

Authorization: Digest

username="john", realm="sun2.tekelecmt1", cnonce="6b8b4567", nc=00000001, qop=auth, uri="sip:192.168.70.130:5060", nonce="49112d8066c5c831bd4a0507e894b37a", response="1f8fbca01db7dd7b8dc284e5ba41164d", algorithm=MD5, opaque="Tekelec"

Contact: <sip:john@192.168.10.115:4060>

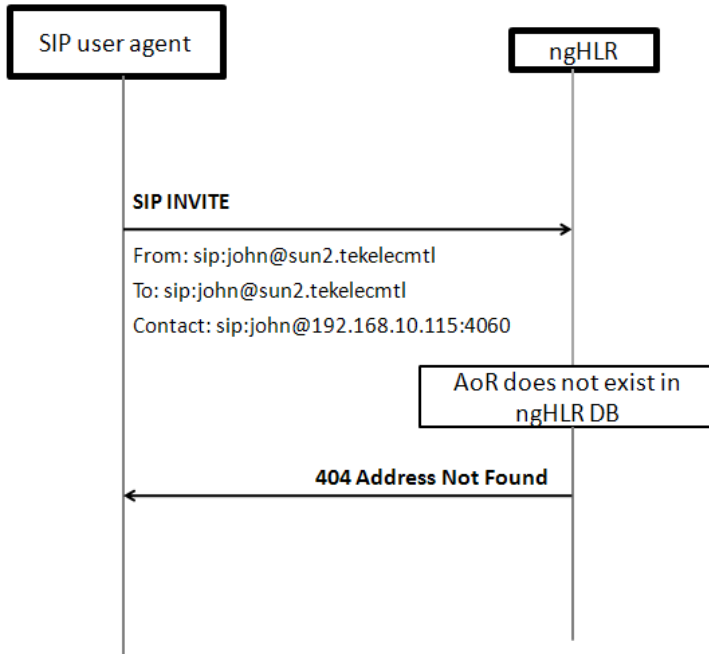
Content-Length: 0

Expires: 3600

Max-Forwards: 20

3.3 Unsuccessful SIP Registration (user not found)

3.3.1 Message Sequence



3.3.2 Traces

3.3.2.1 404 Address Not Found

Session Initiation Protocol

Status-Line: **SIP/2.0 404 Not Found**

Message Header

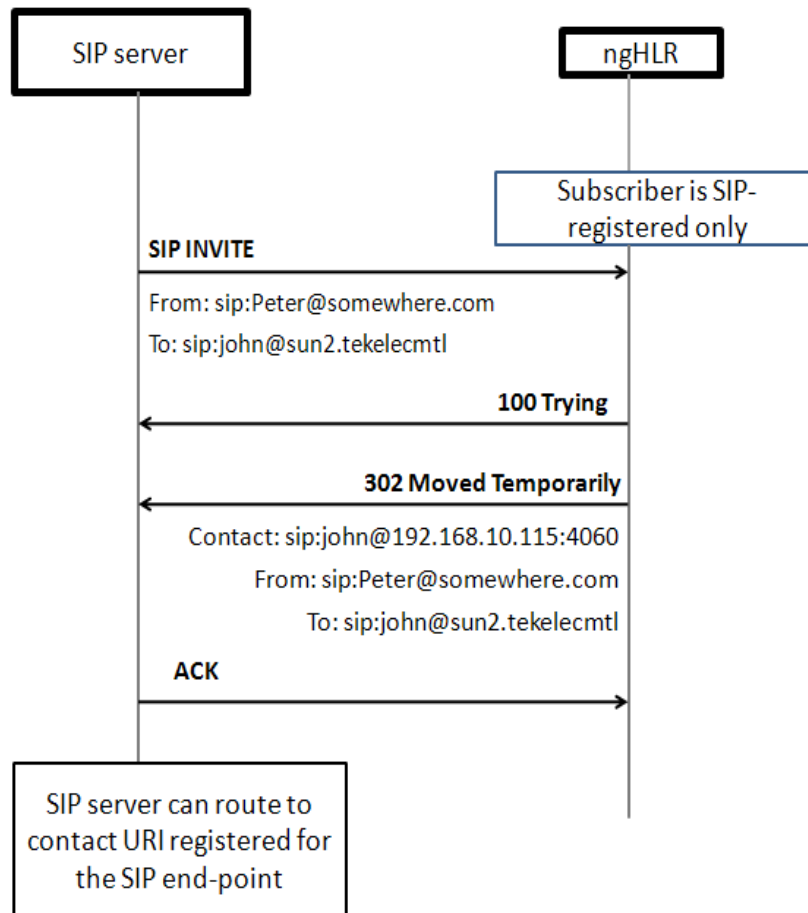
```
From: "john" <sip:john@sun2.tekelecmtl>;tag=1
To: "john" <sip:john@sun2.tekelecmtl>;tag=5a950eb0-8246a8c0-13c4
Call-ID: 1-20679@192.168.10.115
CSeq: 1 REGISTER
Via: SIP/2.0/TCP 192.168.10.115:4060;branch=z9hG4bK-20679-1-0
Content-Length: 0
```

4. ngHLR as SIP Redirection Server

4.1 SIP INVITE to SIP-registered subscriber, GSM detached

Pre-requisites: Subscriber has one Contact URI in its Registration Bindings and has no GSM profile (IMSI), or subscriber has GSM profile but is detached/unreachable without CFU/CFNRC enabled.

4.1.1 Message Sequence



4.1.2 Traces

4.1.2.1 INVITE to ngHLR

Session Initiation Protocol

Request-Line: **INVITE sip:john@sun2.tekelecmtl SIP/2.0**

Message Header

Via: SIP/2.0/TCP 192.168.10.115:4060;branch=z9hG4bK-20732-1-0
To: "john" <sip:john@sun2.tekelecmt1>
From: "Peter" <sip:Peter@somewhere.com>;tag=1
Call-ID: 1-20732@192.168.10.115
CSeq: 1 INVITE
User-Agent: tekelec invite
Max-Forwards: 20
Contact: <sip:Peter@192.168.10.115>
Content-Type: application/sdp
Content-Length: 154
Message body

4.1.2.2 302 Redirection to Contact uri

Session Initiation Protocol

Status-Line: **SIP/2.0 302 Moved Temporarily**

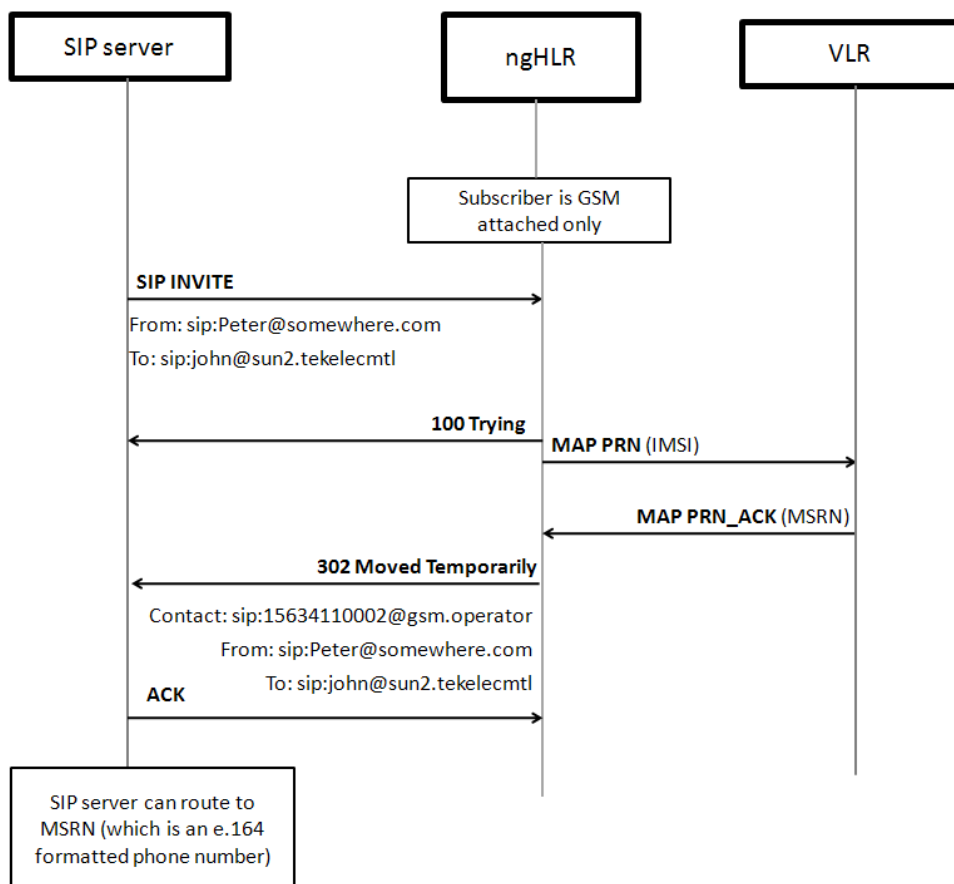
Message Header

From: "Peter" <sip:Peter@somewhere.com>;tag=1
To: "john" <sip:john@sun2.tekelecmt1>;tag=5a951058-8246a8c0-13c4
Call-ID: 1-20732@192.168.10.115
CSeq: 1 INVITE
Contact: <sip:john@192.168.10.115:4060>
Via: SIP/2.0/TCP 192.168.10.115:4060;branch=z9hG4bK-20732-1-0
Content-Length: 0

4.2 SIP INVITE to GSM attached subscriber, SIP deregistered

Pre-requisites: Subscriber is GSM-attached, and its associated AOR has no registration binding. CFU is not enabled.

4.2.1 Message Sequence



4.2.2 Traces

4.2.2.1 302 Redirection to MSRN

Session Initiation Protocol

Status-Line: **SIP/2.0 302 Moved Temporarily**

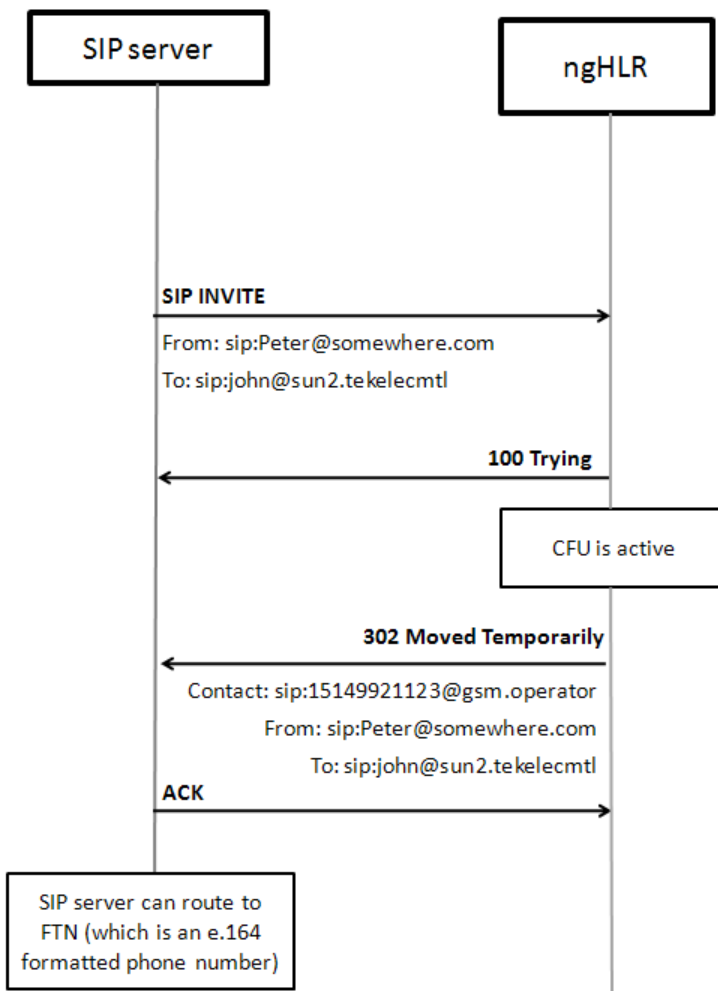
Message Header

```
From: "Peter" <sip:Peter@somewhere.com>;tag=1
To: "john" <sip:john@sun2.tekelecmtl>;tag=5a951058-8246a8c0
Call-ID: 1-20732@192.168.10.115
CSeq: 1 INVITE
Contact: <sip:15634110002@gsm.operator>;expires=1;user=phone
Via: SIP/2.0/TCP 192.168.10.115:4060;branch=z9hG4bK-20732-1-0
Content-Length: 0
```

4.3 SIP INVITE to subscriber with active CFU

Pre-requisites: Subscriber's CFU is enabled. AOR has no registration binding (the GSM contact would otherwise be included in a "300 Multiple Choices" response).

4.3.1 Message Sequence



4.3.2 Traces

4.3.2.1 302 Redirection to CFU Forward-To-Number

Session Initiation Protocol

Status-Line: **SIP/2.0 302 Moved Temporarily**

Message Header

From: "Peter" <sip:Peter@somewhere.com>;tag=1

To: "john" <sip:john@sun2.tekelecomtl>;tag=5a951058-8246a8c0-13c4

Call-ID: 1-20732@192.168.10.115

CSeq: 1 INVITE

Contact: <sip:15149921123@gsm.operator;cause=302;>;expires=1;user=phone

Via: SIP/2.0/TCP 192.168.10.115:4060;branch=z9hG4bK-20732-1-0

Content-Length: 0

4.4 SIP INVITE to subscriber with active CFNRC

Pre-requisites: Subscriber's CFNRC is enabled (and CFU is not). AOR has no registration binding (the GSM contact would otherwise be included in a "300 Multiple Choices" response)

4.4.1 Message Sequence

Similar to section 4.3.1 above. The difference being that a MAP PRN is sent to the VLR (like in section 4.2.1) but no MSRN is returned because the mobile is not reachable.

4.4.2 Traces

4.4.2.1 302 Redirection to CFNRC

Same as section 4.3.2.1 above (only the **cause** (in bold below) in the Contact URI parameter is different)

Session Initiation Protocol

Status-Line: **SIP/2.0 302 Moved Temporarily**

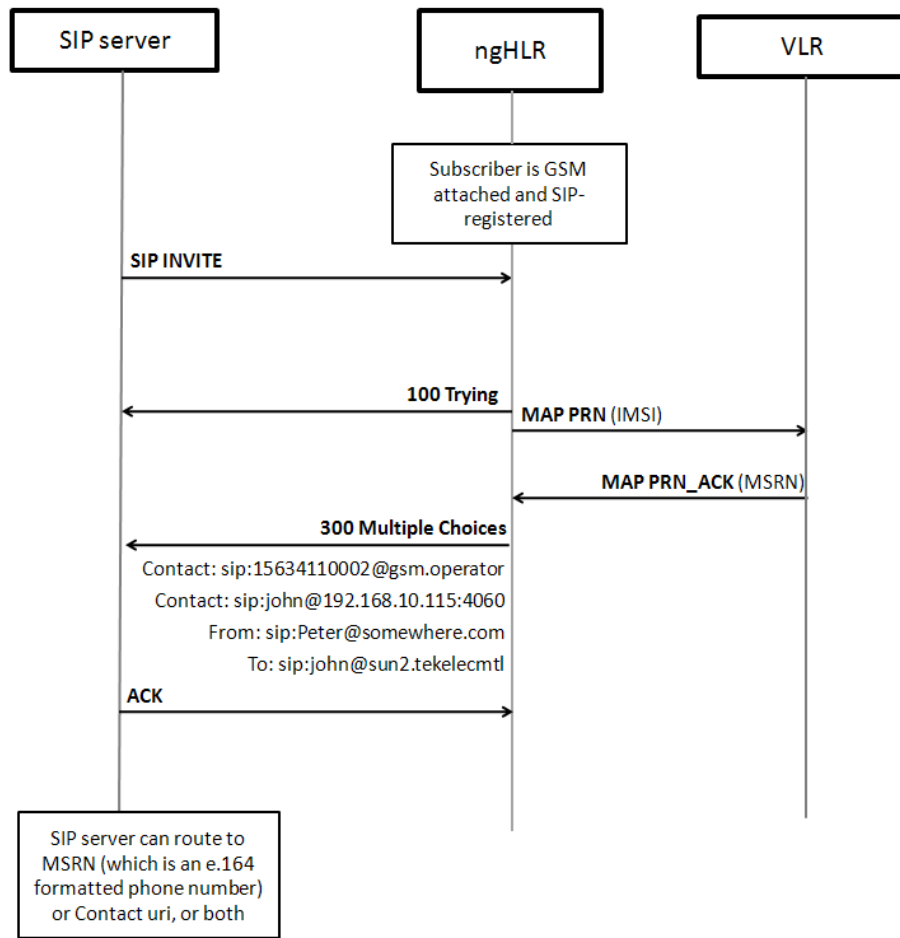
Message Header

```
From: "Peter" <sip:Peter@somewhere.com>;tag=1
To: "john" <sip:john@sun2.tekelecmtl>;tag=5a951058-8246a8c0-13c4
Call-ID: 1-20732@192.168.10.115
CSeq: 1 INVITE
Contact: <sip:15149921123@gsm.operator;cause=503;>;expires=1;user=phone
Via: SIP/2.0/TCP 192.168.10.115:4060;branch=z9hG4bK-20732-1-0
Content-Length: 0
```

4.5 SIP INVITE to SIP-registered & GSM-attached subscriber

Pre-requisites: Subscriber is GSM-attached and has one Registration binding for its associated AOR. CFU is not enabled. Preferred Routing Network Domain is set to "GSM".

4.5.1 Message Sequence



4.5.2 Traces

4.5.2.1 300 Redirection to MSRN & Contact URI

Session Initiation Protocol

Status-Line: **SIP/2.0 300 Multiple Choices**

Message Header

```
From: "Peter" <sip:Peter@somewhere.com>;tag=1
To: "john" <sip:john@sun2.tekelecmt1>;tag=5ad39eb0-8246a8c0-13c4
Call-ID: 1-21078@192.168.10.115
CSeq: 1 INVITE
Contact: <sip:15634110002@gsm.operator>;expires=1;user=phone;q=1
Contact: <sip:john@192.168.10.115:4060>;expires=3583;q=0.5
Via: SIP/2.0/TCP 192.168.10.115:4060;branch=z9hG4bK-21078-1-0
Content-Length: 0
```

4.6 Optional SIP Diversion header

SIP "Diversion" header will be added to 300 and 302 responses returned by the ngHLR when the redirection server configuration flag "**RedirectConfig::IsDiversionHeaderIncluded**" is enabled (set to 1).

The Cisco PGW, for example, uses this header to set the B party correctly in the IN query. The 300 and 302 responses are recognized for call routing and can also be used to trigger IN queries to an SCP. Without this header and associated information, the Cisco PGW will create an IN query with the original A party and the MSRN (or call forwarding number) as the B party. This means the SCP does not have the original called party for service execution.

The Diversion header is documented in <http://tools.ietf.org/html/draft-levy-sip-diversion-10> (valid until Jan 2010).

The following sections contain example SIP messages that include a Diversion header. Note that enabling this feature will modify the example messages included in the previous sections by adding an additional Diversion header to 30X responses. Note also that there is a correlation between the cause parameter included in the Contact header and the reason parameter included in this optional Diversion header. For this reason, the Contact header is included in the examples below.

4.6.1 Example SIP messages for MSRN

4.6.1.1 Invite sent to ngHLR

```
Session Initiation Protocol
Status-Line: INVITE sipjohn@sun2.tekelecmtl;user=phone SIP/2.0
Message Header
From: "652013522" <sip:652013522@10.166.211.31;user=phone>;tag=182397
To: "John" <sip:john@sun2.tekelecmtl>
(...)
```

4.6.1.2 302 Redirection to MSRN

```
Session Initiation Protocol
Status-Line: SIP/2.0 302 Moved Temporarily
Message Header
From: "652013522" <sip:652013522@10.166.211.31;user=phone>;tag=182397
To: "John" <sip:john@sun2.tekelecmtl>;tag=1
Contact: <sip:15634110002@gsm.operator>;expires=1;user=phone
Diversion: <sip:john@sun2.tekelecmtl>;reason=follow-
me;screen=yes;counter=1
(...)
```

4.6.1.3 Example SIP messages for CFU

Same as section 4.6.1.2 except for the following headers:

```
Contact: <sip:15149921123@gsm.operator>;cause=302;>;expires=1;user=phone
Diversion:
<sip:john@sun2.tekelecmtl>;reason=unconditional;screen=yes;counter=1
```

4.6.1.4 Example SIP messages for CFNRc

Same as section 4.6.1.2 except for the following headers:

Contact: <sip:15149921123@gsm.operator;cause=302;>;expires=1;user=phone
Diversion: <sip:john@sun2.tekelecmt1>;reason=user-busy;screen=yes;counter=1

4.7 Optional Subscriber Information

The SIP Redirection Server can be configured to include additional subscriber information in SIP responses to a SIP Invite message. This additional information is included in the body of the 300 and 302 responses described in previous sections. The format of this information and associated configuration is described in the following sections.

4.7.1.1 Additional Information

If the redirection server configuration flag “**RedirectConfig::IsAdditionalInfoEnabled**” is enabled (set to 1), a body is included in the SIP 30X responses (302 or 300). It includes a Timestamp and the Active IMSI of the subscriber. Below is an example of the message body.

```
<?xml version="1.0" encoding="UTF-8"?>
<AdditionalInfo>
  <Timestamp>2009-02-27 14:58:40</Timestamp>
  <SubscriberInfo>
    <ActiveImsi>310910421000100</ActiveImsi>
  </SubscriberInfo>
</AdditionalInfo>
```

4.7.1.2 GSM Location Information

If the redirection server configuration flag “**RedirectConfig::IsGsmLocationInfoIncluded**” is enabled (set to 1), more information on the subscriber’s GSM/GPRS location is added to the body of SIP responses. In such case, the body will also contain the VLR number and SGSN number in e.164 format.

Note that the configuration `RedirectConfig::IsAdditionalInfoEnabled` (defined in previous section): **MUST** also be enabled for this GSM information to be included. Below is an example of the message body with location information.

```
<?xml version="1.0" encoding="UTF-8"?>
<AdditionalInfo>
  <Timestamp>2009-02-27 15:05:37</Timestamp>
  <SubscriberInfo>
    <ActiveImsi>310910421000100</ActiveImsi>
    <VlrNumber>1234567890</VlrNumber>
    <SgsnNumber>9876543210</SgsnNumber>
  </SubscriberInfo>
</AdditionalInfo>
```

4.7.1.3 CAMEL Information

If the redirection server configuration flag “**RedirectConfig::IsCamelInfoIncluded**” is enabled (set to 1), Camel information (T-CSI information) can be added to the body of SIP responses.

Upon receiving a SIP INVITE for a subscriber with both SIP and GSM profile, the ngHLR will return a SIP INVITE response that includes the subscriber’s CAMEL data when the following conditions are met:

- The subscriber has CAMEL Data provisioned.
- The subscriber has T-CSI CAMEL services provisioned and active.
- The subscriber has T-CSI Terminating Attempt Authorized provisioned.

If these conditions are met, CAMEL information is returned in the body of the following SIP

INVITE responses:

480 (in the case where the subscriber has no MSRN nor CFN)

30X (in the case where the subscriber has MSRN and a CFN) (where 30X == 302 if only one contact is found and 300 if more than one contact is found).

Note that the configuration RedirectConfig::IsAdditionalInfoEnabled (defined in section 4.7.1.1) MUST also be enabled for this CAMEL information to be included. Below is an example of the message body with location information.

```
<?xml version='1.0' encoding='UTF-8'?>
<AdditionalInfo>
  <TCSIProvisioned>
    <camelCapabilityHandling>3</camelCapabilityHandling>
    <TBcsmCamelTDPData>
      <tBcsmTriggerDetectionPoint>12</tBcsmTriggerDetectionPoint>
      <serviceKey>23333333</serviceKey>
      <gsmSCF-Address>15634115555</gsmSCFAddress>
      <defaultCallHandling>0</defaultCallHandling>
    </TBcsmCamelTDPData>
  </TCSIProvisioned>
</AdditionalInfo>
```


4.8 Reverse AOR search (using VoipDN)

A proprietary mechanism was implemented to allow gateways to retrieve the AOR mapped to a given VoipDn using a SIP INVITE message.

Upon reception of an INVITE, the redirect server first tries to find the AOR in the Database (AOR from the To header as explained in the previous sections). IF the AOR is NOT Found, the Redirect server then performs a search in the VoipDn allocated (using only the user part of the AOR SIP URI). If a matching VoipDn is found in the provisioned AOR table, a 302 message is returned and the corresponding AOR is included in a Contact header.

4.8.1 Traces

In the example traces below, the AOR "sip:john@sun2.tekelecmt1" is provisioned with a VoipDn of **5149982722**.

4.8.1.1 INVITE to ngHLR (VoipDn in AOR URI user part)

```
Session Initiation Protocol
Request-Line: INVITE sip:5149982722@sun2.tekelecmt1 SIP/2.0
Message Header
Via: SIP/2.0/TCP 192.168.10.115:4060;branch=z9hG4bK-20732-1-0
To: <sip:5149982722@sun2.tekelecmt1>
From: "Peter" <sip:Peter@somewhere.com>;tag=1
Call-ID: 1-20732@192.168.10.115
CSeq: 1 INVITE
User-Agent: tekelec invite
Contact: <sip:Peter@192.168.10.115>
Max-Forwards: 20
Content-Length: 0
```

*Note that the To header (with VoIP DN) can also contain a TEL URI, like for ex: <tel:5149982722>

4.8.1.2 302 Redirection (with provisioned AOR returned in Contact header)

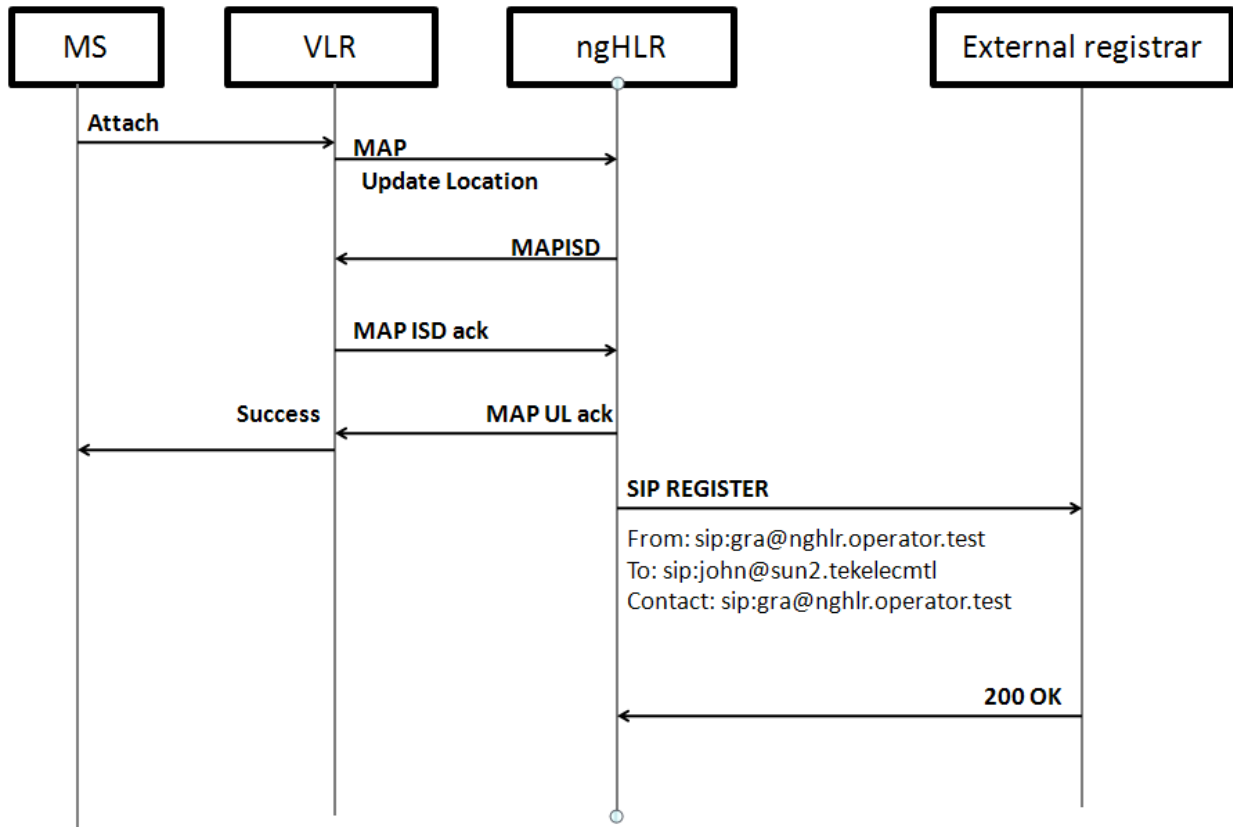
```
Session Initiation Protocol
Status-Line: SIP/2.0 302 Moved Temporarily
Message Header
From: "Peter" <sip:Peter@somewhere.com>;tag=1
To: <sip:5149982722@sun2.tekelecmt1>;tag=5a951058-8246a8c0-13c4
Call-ID: 1-20732@192.168.10.115
CSeq: 1 INVITE
Contact: <sip:john@sun2.tekelecmt1>
Via: SIP/2.0/TCP 192.168.10.115:4060;branch=z9hG4bK-20732-1-0
Content-Length: 0
```

5. ngHLR as GSM Registration Agent

5.1 SIP Registration on UpdateLocation

This use case describes the ngHLR GRA acting as a SIP User Agent on behalf of a GSM device, and SIP-registering the device upon reception of the MAP Update Location message.

5.1.1 Message Sequence



5.1.2 Traces

5.1.2.1 SIP Register from the ngHLR

Session Initiation Protocol

Request-Line: REGISTER sip:external.registrar.operator SIP/2.0

Message Header

From: <sip:gra@nghlr.operator.test>;tag=4d04b1c0-8246a8c0-13c6

To: <sip:john@sun2.tekelecmtl>

Call-ID: a7002d0-8246a8c0-13c6-45026-427e0-74ae52f4-427e0

CSeq: 1 REGISTER

Via: SIP/2.0/TCP 192.168.70.130:5062;branch=z9hG4bK-427e0-103bc39d

User-Agent: Tekelec GSM Registration Agent

Max-Forwards: 70

Contact: <sip:gra@nghlr.operator.test>

Expires: 3600

Content-Length: 0

NOTES:

- 1- 'From' header can be configured to be the same as the 'To' header
- 2- IMS headers can be included (refer to section 5.3, IMS Headers for details).

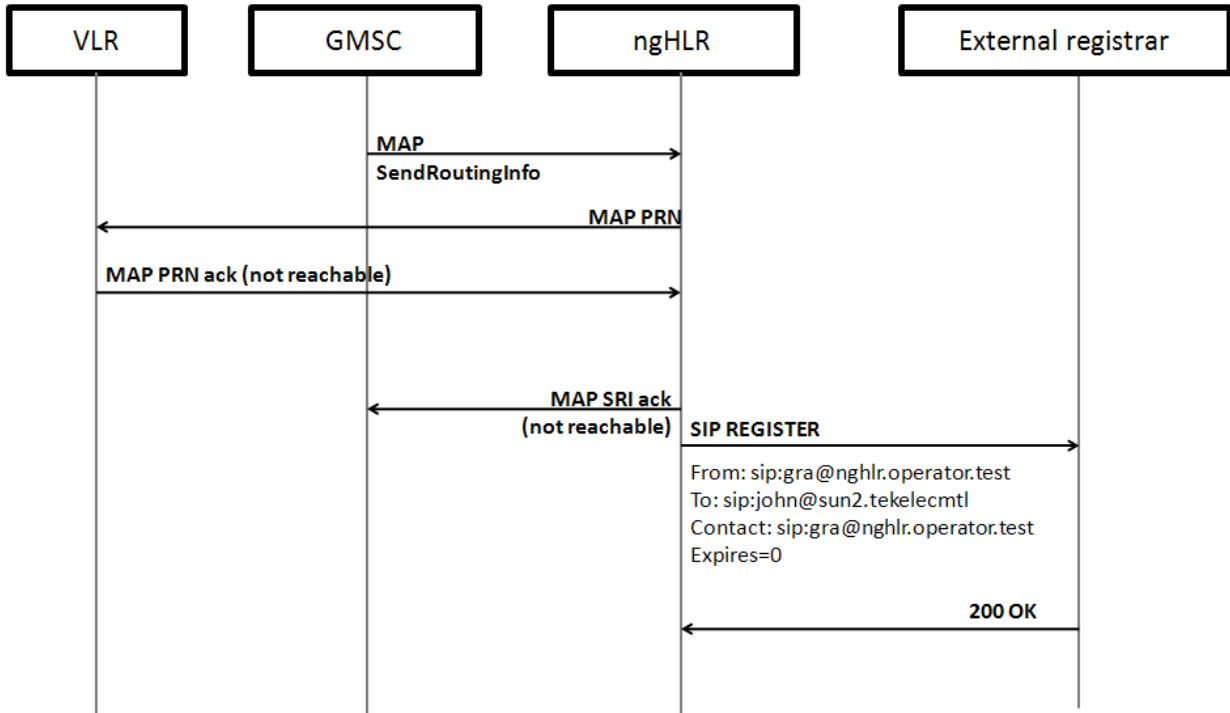
5.1.2.2 200 OK

```
Session Initiation Protocol
  Status-Line: SIP/2.0 200 OK
  Message Header
    Via: SIP/2.0/TCP 192.168.70.130:5062;branch=z9hG4bK-427e0-103bc39d-
6ec8f7db;received=192.168.10.115
    From: <sip:gra@nghlr.operator.test>;tag=4d04b1c0-8246a8c0-13c6
    To: <sip:john@sun2.tekelecmtl>;tag=21596SIPpTag2001
    Call-ID: a7002d0-8246a8c0-13c6-45026-427e0-74ae52f4-427e0
    CSeq: 1 REGISTER
    Contact: <sip:gra@nghlr.operator.test>;expires=3666
    Content-Length: 0
```

5.2 SIP Deregistration on Not Reachable

This use case describes the ngHLR GRA sending a REGISTER with expires=0 to de-register the GSM device when it reaches a "not reachable status" event.

5.2.1 Message Sequence



5.2.2 Traces

5.2.2.1 SIP Deregistration from the ngHLR

Session Initiation Protocol

```
Request-Line: REGISTER sip:external.registrar.operator SIP/2.0
Message Header
  From: <sip:gra@nghlr.operator.test>;tag=4d04b1c0-8246a8c0-13c6
  To: <sip:john@sun2.tekelecmt1>
  Call-ID: a7002d0-8246a8c0-13c6-45026-427e0-74ae52f4-427e0
  CSeq: 1 REGISTER
  Via: SIP/2.0/TCP 192.168.70.130:5062;branch=z9hG4bK-427e0-103bc39d
  User-Agent: Tekelec GSM Registration Agent
  Max-Forwards: 70
  Contact: <sip:gra@nghlr.operator.test>
  Expires: 0
  Content-Length: 0
```

NOTES:

- 1- 'From' header can be configured to be the same as the 'To' header
- 2- IMS headers can be included (refer to section 5.3, IMS Headers for details).

5.3 IMS Headers

By default, the ngHLR GRA is configured in pre-IMS mode. It is possible to configure the system in order to add or modify some SIP headers included in the REGISTER messages sent by the ngHLR GRA. The following sections details these configuration options and their effect on generated messages. By default, all configuration listed in this section is turned off. The headers are added to the message described in sections 7.1 and 7.2.

Note that these configuration flags are system wide, in other words, modification to this configuration will affect all REGISTER messages sent by the ngHLR GRA.

5.3.1 IMS Header Required

If the configuration flag "**SipUaConfiguration::IsImHeaderRequired**" is enabled (set to 1), a P-Access-Network-Info and an Authorization header will be added to the REGISTER message.

The **dsl-location** parameter sent in the P-Access-Network-Info header will contain the domain name; followed by the ngHLR GRA IP address used for sending SIP messages.

The **username** parameter sent in the initial Authorization header is automatically derived from the primary IMSI according to 3GPPTS 23.003 §13.3 (device id). Examples of such headers are provided below.

```
P-Access-Network-Info: ADSL;dsl-
location="sun2.tekelecmt1;192.168.10.27"
Authorization: Digest
username="310910421000100@ims.mnc091.mcc310.3gppnetwork.org",
realm="sun2.tekelecmt1",nonce="",uri="sip:sun2.tekelecmt1",response=""
```

5.3.2 Path Header Required

If the configuration flag “**SipUaConfiguration::IsPathHeaderRequired**” is enabled (set to 1), a Path header will be included in the REGISTER message sent by the ngHLR GRA. The value defined in the table named “**SipUaRegisterConfiguration::PathHeaderValue**” will be used to fill this header.

For example, if “sip:bgc@192.168.10.121;lr” is set as the Path header value, the following header will be added to the SIP REGISTER message:

```
Path: <sip:bgc@192.168.10.121;lr>
```

5.3.3 Set username in Contact Header

If the configuration flag “**SipUaConfiguration::IsUsernameSetInContactHeader**” is enabled (set to 1), the AOR username will be inserted in the Contact header. This will replace the system wide configured contact username (same for all AORs) that is specified by default in the Contact header.

This configuration option can be used to make the contact header point directly to a media gateway (i.e. not to the ngHLR Redirection server). Example is provided below.

Session Initiation Protocol

```
Request-Line: REGISTER sip:external.registrar.operator SIP/2.0
Message Header
From: <sip:gra@nghlr.operator.test>;tag=4d04b1c0-8246a8c0-13c6
To: <sip: +33689365315@sun2.tekelecmtl>
Call-ID: a7002d0-8246a8c0-13c6-45026-427e0-74ae52f4-427e0
CSeq: 1 REGISTER
Via: SIP/2.0/TCP 192.168.70.130:5062;branch=z9hG4bK-427e0-103bc39d
User-Agent: Tekelec GSM Registration Agent
Max-Forwards: 70
Contact: <sip:+33689365315@mediagateway.operator.test>
Expires: 3600
Content-Length: 0
```

5.3.4 Username is a phone number

If the configuration flag “**SipUaConfiguration::IsUsernamePhoneNumber**” is enabled (set to 1), the parameter **user=phone** will be added in the To header. It will also be added in the Contact header if the AOR username is set in the contact header, as defined in section 7.3.3.

Session Initiation Protocol

```
Request-Line: REGISTER sip:external.registrar.operator SIP/2.0
Message Header
From: <sip:gra@nghlr.operator.test>;tag=4d04b1c0-8246a8c0-13c6
To: <sip: +33689365315@sun2.tekelecmtl;user=phone>
Call-ID: a7002d0-8246a8c0-13c6-45026-427e0-74ae52f4-427e0
CSeq: 1 REGISTER
Via: SIP/2.0/TCP 192.168.70.130:5062;branch=z9hG4bK-427e0-103bc39d
User-Agent: Tekelec GSM Registration Agent
Max-Forwards: 70
Contact: <sip:+33689365315@mediagateway.operator.test;user=phone>
Expires: 3600
Content-Length: 0
```

Subscriber Data Management

SIP Interface Description

910-6878-001

Revision B