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3rd-Generation Partnership Project (3GPP) SIP URI Inter Operator Traffic Leg parameter

draft-holmberg-dispatch-iotl-05.txt

Abstract

In 3rd-Generation Partnership Project (3GPP) networks, the signalling path between a calling user and a called user can be partioned into segments, referred to as traffic legs. Each traffic leg may span networks belonging to different operators, and will have its own characteristics that can be different from other traffic legs in the same call. A traffic leg might be associated with multiple SIP dialogs, e.g. in case a B2BUA which modifies the SIP dialog identifier is located within the traffic leg.

This document defines a new SIP URI parameter, 'iotl'. The parameter can be used in a SIP URI to indicate that the entity associated with the address, or an entity responsible for the host part of the address, represents the end of a specific traffic leg (or multiple traffic legs).

The SIP URI 'iotl' parameter defined in this document has known uses in 3GPP networks. Usage in other networks is also possible.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on August 16, 2015.

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1. Introduction

In a 3rd-Generation Partnership Project (3GPP) network, an end user device can be attached (e.g. using a radio access network) to its own operator network (home network) [TS.3GPP.24.229], or to another operator's network (visited network) [TS.3GPP.24.229]. In the latter case the user is referred to as a roaming user.

3GPP operator networks are often not connected directly to each other. Instead, there might be intermediate networks, referred to as 3GPP transit networks, between them. Such transit network act on SIP level or on IP level.

In 3GPP networks, the signalling path between a calling user and a called user can be partioned into segments, referred to as traffic legs. Each traffic leg may span networks belonging to different operators, and will have its own characteristics that can be different from other traffic legs in the same call. A traffic leg might be associated with multiple SIP dialogs, e.g. in case a Back-To-Back User Agent (B2BUA) [RFC3261] which modifies the SIP dialog identifier is located within the traffic leg.

The traffic leg information can be used by intermediary entities to make policy decisions, related to e.g. media anchoring, signalling policy, insertion of media functions (e.g. transcoder) and charging.

The figure below shows two users (Alice and Bob) and the different type of networks that the signaling might traverse. The signalling path can be divided into multiple traffic legs, and the type of traffic legs depends on how the signalling is routed.

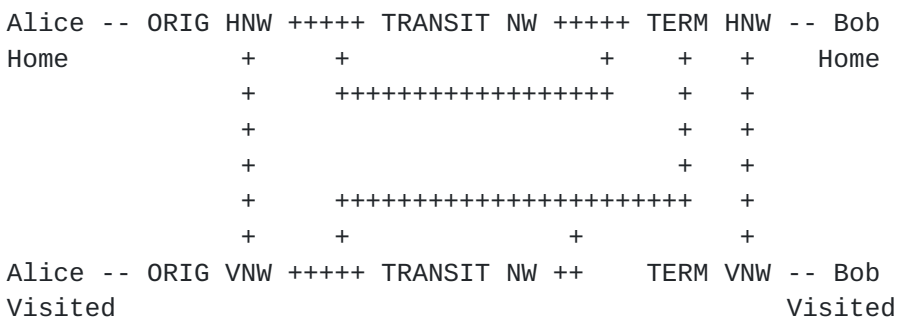


Figure 1: 3GPP operator network roaming roles

ORIG HNW = Originating 3GPP Home Network

TERM HNW = Terminating 3GPP Home Network

ORIG VNW = Originating 3GPP Visited Network

TERM VNW = Terminating 3GPP Visited Network

TRANSIT NW = 3GPP Transit Network

In Figure 1 Alice is a user initiating communication with Bob, and:

Alice is attached to an originating network, which is either the home network of Alice, or a visited network (in case Alice is roaming). In both cases any originating service is provided by the home network of Alice.

Bob is attached to a terminating network, which is either the home network of Bob, or a visited network (in case Bob is roaming). In both cases any terminating service is provided by the home network of Bob.

A transit network, providing transit functions (e.g. translation of free phone numbers), may be included between the originating and terminating networks and between visited and home networks.

This document defines a new SIP URI parameter [RFC3261], 'iotl' (an abbreviation of Inter Operator Traffic Leg). The parameter can be used in a SIP URI to indicate that the entity associated with the address, or an entity responsible for the host part of the address, represents the end of a specific traffic leg (or multiple traffic legs).

This document defines the following 'iotl' parameter values:

- homea-homeb
- homeb-visitedb
- visiteda-homea
- homea-visiteda
- visiteda-homeb

SIP entities that do not support the SIP URI 'iotl' parameter will simply ignore it, if received, as defined in [RFC3261].

2. Applicability

The SIP URI 'iotl' parameter defined in this document has known uses in 3GPP networks. Usage in other networks is also possible.

3. Use-cases

3.1. General

This section describes examples of different types of traffic legs in 3GPP networks.

3.2. Originating roaming call

In this case, Alice is located in a visited network. When Alice sends the initial SIP INVITE request for a call, one traffic leg (referred to as the 'visiteda-homea' traffic leg) represents the signalling path between the UA of Alice and the home S-CSCF [3GPP TS 24.229] of Alice.

3.3. Terminating roaming call

In this case, Bob is located in a visited network. When the home S-CSCF of Bob forwards the initial SIP INVITE request for a call towards Bob, one traffic leg (referred to as the 'homeb-visitedb' traffic leg) represents the signalling path between the home S-CSCF of Bob and the UA of Bob.

3.4. Originating home to terminating home call

In this case, the home S-CSCF of Alice forwards the initial SIP INVITE request towards the home S-CSCF of Bob. The signalling path between the S-CSCFs represents one traffic leg (referred to as the 'homea-homeb' traffic leg).

4. Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

5. iotl SIP URI parameter

5.1. Usage

As specified in [RFC3261], when a SIP entity inserts a SIP URI in an initial request for a dialog, or in a stand-alone request, the SIP URI will be used to route the request to another SIP entity, addressed by the SIP URI, or to a SIP entity responsible for the host part of the SIP URI (e.g. a SIP registrar). If such entity represents the end of one or more traffic legs, the SIP entity inserting the SIP URI can add a SIP URI 'iotl' parameter to the SIP URI, to indicate the type(s) of traffic leg. Each parameter value indicates a type of traffic leg.

For routing of a SIP request, a SIP entity can add the 'iotl' parameter to the SIP URI of the Request-URI [RFC3261], or to the SIP URI of a Route header field [RFC3261], of an initial request for a dialog, or of an stand-alone request. SIP entities can add the 'iotl' parameter to the SIP URI of a Path header field [RFC3327] or a Service-Route header field [RFC3608], in order for the parameter to later occur in a Route header field.

When a SIP entity receives an initial request for a dialog, or a stand-alone request, which contains one or more SIP URI 'iotl' parameters, it identifies the type of traffic leg in the following way:

- If the SIP request contains a single Route header field containing a SIP URI with an 'iotl' parameter, that parameter identifies the type of traffic leg;

- If the SIP request contains multiple Route header fields containing a SIP URI with an 'iotl' parameter, the 'iotl' parameter associated with the SIP URI of the topmost Route header field (or, if the SIP URI of the topmost Route header field does not contain an 'iotl' parameter, the SIP URI of the Route header field closest to the topmost) identifies the type of traffic leg; or

- If a SIP request contains an 'iotl' parameter only in the Request-URI SIP URI, the 'iotl' parameter identifies the type of traffic leg.

During SIP registration [RFC3261], entities can add the 'iotl' parameter to the SIP URI of a Path or Service-Route header field, if the entity is aware that SIP URI will be used to indicate the end of a specific traffic leg for initial requests for dialogs, or stand-alone requests, sent on the registration path.

As defined in [RFC3261], a SIP entity must not modify or remove uri parameters from SIP URIs associated with other entities. This also applies to the 'iotl' parameter.

5.2. Parameter Values

5.2.1. General

This section describes the SIP URI 'iotl' parameter values defined in this specification.

5.2.2. homea-homeb

This value indicates that a SIP entity responsible for the host part of the SIP URI associated with the parameter represents the end of a traffic leg between the home network (originating) of the calling user and the home network (terminating) of the called user.

In 3GPP, this traffic leg is between two S-CSCFs.

5.2.3. homeb-visitedb

This value indicates that the SIP entity addressed by the SIP URI associated with the parameter represents the end of a traffic leg between the home network (terminating) of the called user and the visited network (terminating) in which the called user is located.

In 3GPP, this traffic leg is between the home S-CSCF and the UE of the called user, or between the Service Centralization and Continuity Application Server (SCC AS) in the home network of the called user and Access Transfer Control Function (ATCF) in the visited network of the called user.

5.2.4. visiteda-homea

This value indicates that a SIP entity responsible for the host part of the SIP URI associated with the parameter represents the end of a traffic leg between the visited network (originating) in which the calling user is located and the home network (originating) of the calling user.

In 3GPP, this traffic leg is between the UE and the home S-CSCF of the calling user, or between the P-CSCF in the visited network, serving the calling user, and the home S-CSCF of the calling user.

5.2.5. homea-visiteda

This value indicates that the SIP entity addressed by the SIP URI associated with the parameter represents the end of a traffic leg between the home network (originating) and the visited network (originating) in which the calling user is located.

In 3GPP, this traffic leg is between the home S-CSCF of the calling user and the Transit and Roaming Function (TRF) [3GPP TS 24.229] serving the calling user, and exists in scenarios where the home S-CSCF of the calling user forwards a request back to the visited network where the UE of the calling user is located. An example of this is when the Roaming Architecture for Voice over IMS with Local breakout (RAVEL) [3GPP TS 24.229] feature is enabled.

5.2.6. visiteda-homeb

This value indicates that a SIP entity responsible for the host part of the SIP URI associated with the parameter represents the end of a traffic leg between the visited network (originating) of the calling user and the home network (terminating) of the called user.

In 3GPP, this traffic leg is between the Transit and Roaming Function (TRF) [3GPP TS 24.229] serving the calling user and the home S-CSCF of the called user, and exists in scenarios where a request is forwarded from the visited network where the calling user is located directly to the home S-CSCF of the called user. An example of this is when the Roaming Architecture for Voice over IMS with Local breakout (RAVEL) [3GPP TS 24.229] feature is enabled.

6. Syntax

6.1. General

This section defines the ABNF for the 'iotl' SIP URI parameter. The ABNF defined in this specification is conformant to RFC 5234 [RFC5234].

This specification does not create an IANA registry for 'iotl' parameter values. A registry should be considered if new parameter values are defined in the future.

6.2. ABNF

The ABNF [RFC5234] grammar for the role SIP URI parameter is:

```
uri-parameter =/ iotl-param
iotl-param    = iotl-tag "=" iotl-value ["." iotl-value]
iotl-tag      = "iotl"
iotl-value    = "homea-homeb" / "homeb-visitedb" / "visiteda-homea"
                / "homea-visiteda" / "visiteda-homeb" / other-iotl
other-iotl    = 1*iotl-char
iotl-char     = alphanum / "-"
;; alphanum defined in RFC 3261
```

7. Security Considerations

The information in the 'iotl' parameter is used for making policy decisions. Such policies can be related to charging and triggering of services. In order to prevent abuse, which could cause user billing, or service failure, the parameter SHOULD only be used for making policy decisions based on the role by nodes within the same trust domain [RFC3325], and network boundary entities MUST NOT forward information received from untrusted entities. In addition, there MUST exist an agreement between the operators for usage of the roaming role information.

General security considerations for SIP are defined in [RFC3261]

8. IANA Considerations

[RFC EDITOR NOTE: Please replace RFC-XXXX with the RFC number of this document.] This specification adds one new value to the IANA registration in the "SIP/SIPS URI Parameters" registry as defined in [RFC3969].

Parameter Name	Predefined Values	Reference
iotl	Yes	[This RFC]

9. Acknowledgments

The authors wish to thank everyone in the 3GPP community that gave comments on the initial version of this document, and contributed with comments and suggestion during the work. A special thanks to Paul Kyziwat, Dale Worley and Michael Hammer. Robert Sparks performed the Gen-ARTreview of the draft.

10. Change Log

[RFC EDITOR NOTE: Please remove this section when publishing]

draft-holmberg-dispatch-iotl-04

- Change based on IESG review from Spencer Dawkins:
- - List of defined iotl parameter values listed in the Introduction.
- - ABNF editorial fix.
- Change based on IESG review from Barry Leiba:
- - Only use lowercase when writing the iotl parameter values.
- Change based on IESG review from Alissa Cooper:
- - Sentence about usage in non-3GPP networks removed from the Introduction.
- - Editorial correction in the Security Considerations.
- Change based on IESG review from Benoit Claise:
- - 'iotl' parameter name abbreviation extented in the Introduction.
- Change based on IESG review from Kathleen Moriarty:
- - Reference to RFC 3261 added to the Security Considerations.
- Change based on IESG review from Stephen Farrell:
- - Additional text and explanation added to the Security Considerations.

draft-holmberg-dispatch-iotl-03

- Change based on Gen-ART review from Robert Sparks:
- - Removed text saying that the mechanism is scoped for 3GPP networks only.
- - Clarify that entities that do not support the parameter will ignore it.

- o - Clarify that the draft does not create an IANA registry for parameter values.
- o - Remove sentence regarding directionality.
- o - Reference to RFC 3327 added.
- o - Reference to RFC 3608 added.
- o - 'dialogue' -> 'dialog'.
- o Change based on Ops-ART review from Nevil Brownlee:
- o - Reference to RFC 3261 added to 'B2BUA'.
- o - Reference to 3GPP TS 24.229 added for 'S-CSCF'.

draft-holmberg-dispatch-iotl-02

- o Change based on comments from Richard Barnes:
- o - 3GPP scope text modified.
- o - Reference to 3GPP TS 24.229 added.
- o - Reference to RFC 3325 added, and incorporated into the Security Considerations.
- o - 'iotl' selection procedure made into a bullet list.

draft-holmberg-dispatch-iotl-01

- o Scope the SIP URI 'iotl' parameter to 3GPP, based on decision at IETF#90:
- o - Document name changed.
- o - Clarified that usage of the parameter is only defined within 3GPP networks.

draft-holmberg-dispatch-iotl-00

- o Added text on how to identify the traffic leg type when SIP-URIs of multiple Route header fields and/or the Request-URI contain an 'iotl' parameter.
- o Clarify that a traffic leg might span over multiple SIP dialogs.

- Added text saying that entities supporting the 'iotl' parameter must not remove a parameter from a request, if the parameter is associated with a SIP URI belonging to another entity.

- Modified ABNF, in order to allow multiple iotl values for a single URI.

- In IANA section, changed indication that predefined values exist.

- Example call flows added.

11. References

11.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC3261] Rosenberg, J., Schulzrinne, H., Camarillo, G., Johnston, A., Peterson, J., Sparks, R., Handley, M., and E. Schooler, "SIP: Session Initiation Protocol", RFC 3261, June 2002.

[RFC3327] Willis, D. and B. Hoeneisen, "Session Initiation Protocol (SIP) Extension Header Field for Registering Non-Adjacent Contacts", RFC 3327, December 2002.

[RFC3608] Willis, D. and B. Hoeneisen, "Session Initiation Protocol (SIP) Extension Header Field for Service Route Discovery During Registration", RFC 3608, October 2003.

[RFC3969] Camarillo, G., "The Internet Assigned Number Authority (IANA) Uniform Resource Identifier (URI) Parameter Registry for the Session Initiation Protocol (SIP)", BCP 99, RFC 3969, December 2004.

[RFC5234] Crocker, D. and P. Overell, "Augmented BNF for Syntax Specifications: ABNF", STD 68, RFC 5234, January 2008.

[TS.3GPP.24.229] 3GPP, "Vocabulary for 3GPP Specifications", 3GPP TS 24.229 12.6.0, September 2014.

11.2. Informative References

[RFC3325] Jennings, C., Peterson, J., and M. Watson, "Private Extensions to the Session Initiation Protocol (SIP) for Asserted Identity within Trusted Networks", RFC 3325, November 2002.

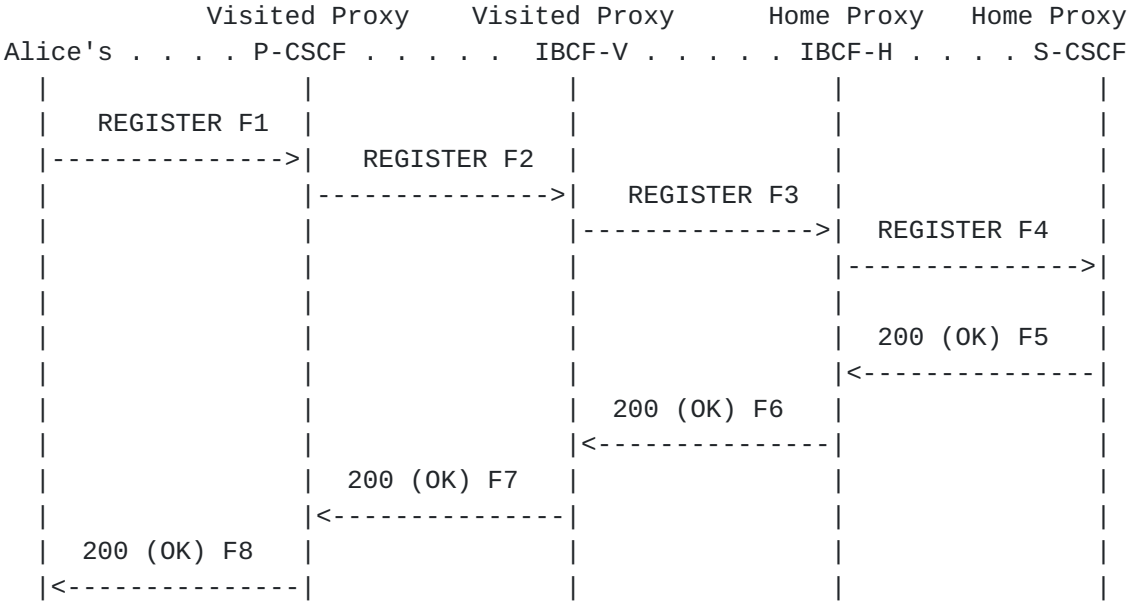
Appendix A. 3GPP Examples

A.1. General

This section contains example call flows based on 3GPP usage of the SIP URI 'iotl' parameter.

A.2. The UE registers via P-CSCF

The Visited Proxy (P-CSCF) adds the iotl value 'homeb-visitedb' to the Path header field of the REGISTER request, to be used for terminating routing towards Alice. The Home Proxy (S-CSCF) adds the iotl value 'visiteda-homea' to the Service-Route header field, to be used for originating initial/stand-alone requests from Alice.



F1 REGISTER Alice -> P-CSCF
REGISTER sip:registrar.home1.net SIP/2.0

F2 REGISTER P-CSCF -> IBCF-V
REGISTER sip:registrar.home1.net SIP/2.0
Path: <p-cscf URI;iotl=homeb-visitedb>

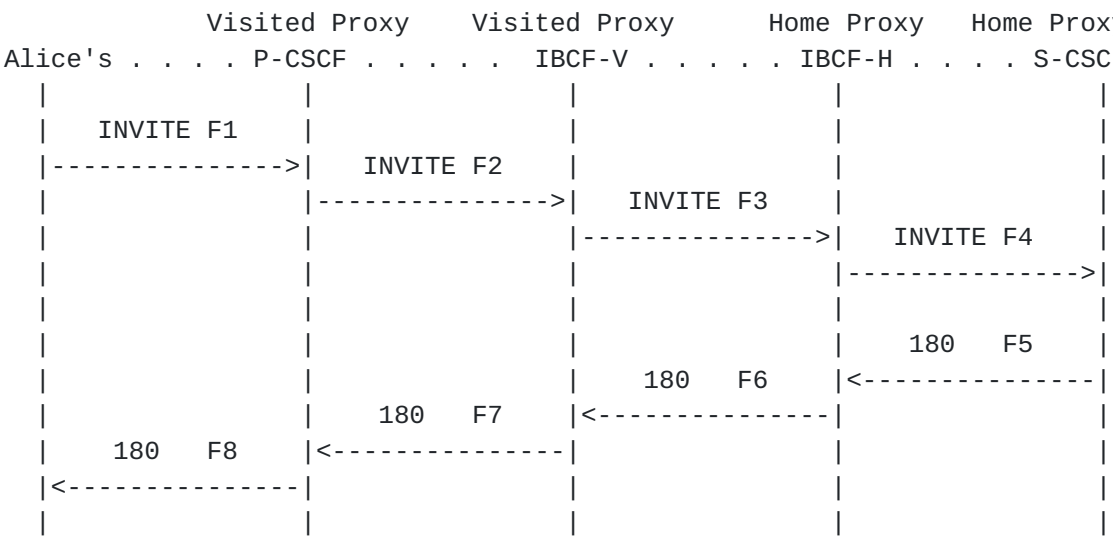
F3 REGISTER IBCF-V -> IBCF-H
REGISTER sip:registrar.home1.net SIP/2.0

```
Path: <p-cscf URI;iotl=homeb-visitedb>

F4 REGISTER IBCF-H -> S-CSCF
REGISTER sip:registrar.home1.net SIP/2.0
Path: <p-cscf URI;iotl=homeb-visitedb>

F5 200 OK S-CSCF -> IBCF-H
200 OK
Path: <p-cscf URI;iotl=homeb-visitedb>
Service-Route: <s-cscf URI;iotl=visiteda-homea>

F6 200 OK IBCF-H -> IBCF-V
200 OK
Path: <p-cscf URI;iotl=homeb-visitedb>
Service-Route: <s-cscf URI;iotl=visiteda-homea>

F7 200 OK IBCF-V -> P-CSCF
200 OK
Path: <p-cscf URI;iotl=homeb-visitedb>
Service-Route: <s-cscf URI;iotl=visiteda-homea>

F8 200 OK P-CSCF -> Alice
200 OK
Path: <p-cscf URI;iotl=homeb-visitedb>
Service-Route: <s-cscf URI;iotl=visiteda-homea>
```

Figure 2: The UE registers via P-CSCF

A.3. Originating IMS call

In the originating INVITE request from Alice, the iotl value 'visiteda-homea', received in the Service-Route header field during registration, is added to the Route header field representing the Home Proxy S-CSCF, to indicate the traffic leg type between the Visited Proxy P-CSCF and the Home Proxy S-CSCF.



F1 INVITE Alice -> P-CSCF
INVITE sip:Bob@homeb.net SIP/2.0
Route: <p-cscf URI>,<s-cscf URI;iotl=visiteda-homea>

F2 INVITE P-CSCF -> IBCF-V
INVITE sip:Bob@homeb.net SIP/2.0
Route: <ibcf-v URI>,<s-cscf URI;iotl=visiteda-homea>

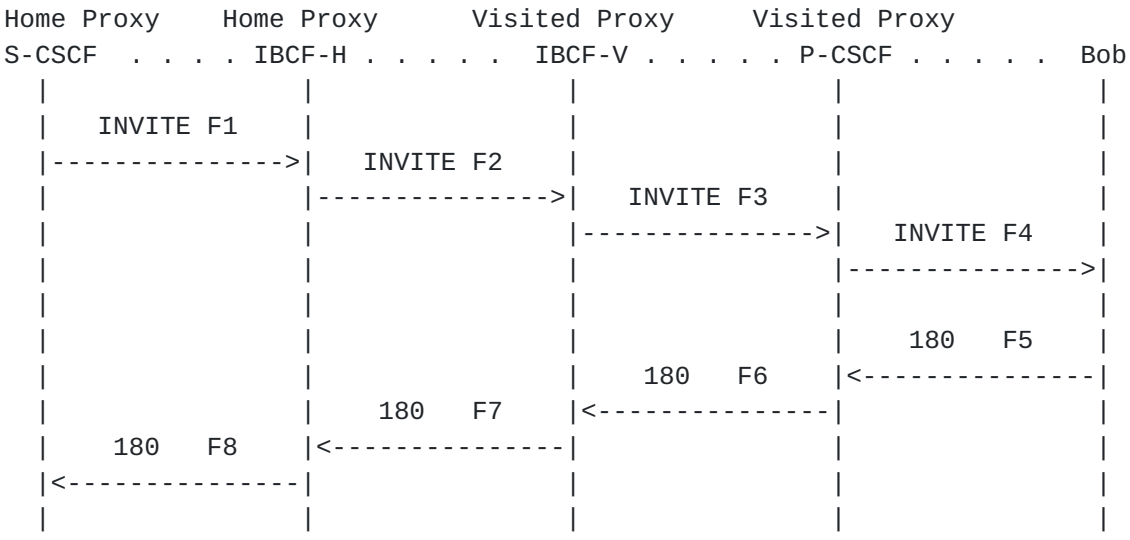
F3 INVITE IBCF-V -> IBCF-H
INVITE sip:Bob@homeb.net SIP/2.0
Route: <ibcf-h URI>,<s-cscf URI;iotl=visiteda-homea>

F4 INVITE IBCF-H -> S-CSCF
INVITE sip:Bob@homeb.net SIP/2.0
Route: <s-cscf URI;iotl=visiteda-homea>

Figure 3: Originating IMS call

A.4. Terminating IMS call

In the terminating INVITE request towards Alice, the iotl value 'homeb-visitedb', provided to the Home Proxy S-CSCF during registration, is added to the Route header field representing the Visited Proxy P-CSCF, to indicate the traffic leg type between the Home Proxy S-CSCF and the Visited Proxy P-CSCF.



F1 INVITE S-CSCF -> IBCF-H
INVITE sip:Bob@visitedb.net SIP/2.0
Route: <ibcf-h URI>,<p-cscf-v URI;iotl=homeb-visitedb

F2 INVITE IBCF-H -> IBCF-V
INVITE sip:Bob@visitedb.net SIP/2.0
Route: <ibcf-v URI>,<p-cscf-v URI;iotl=homeb-visitedb

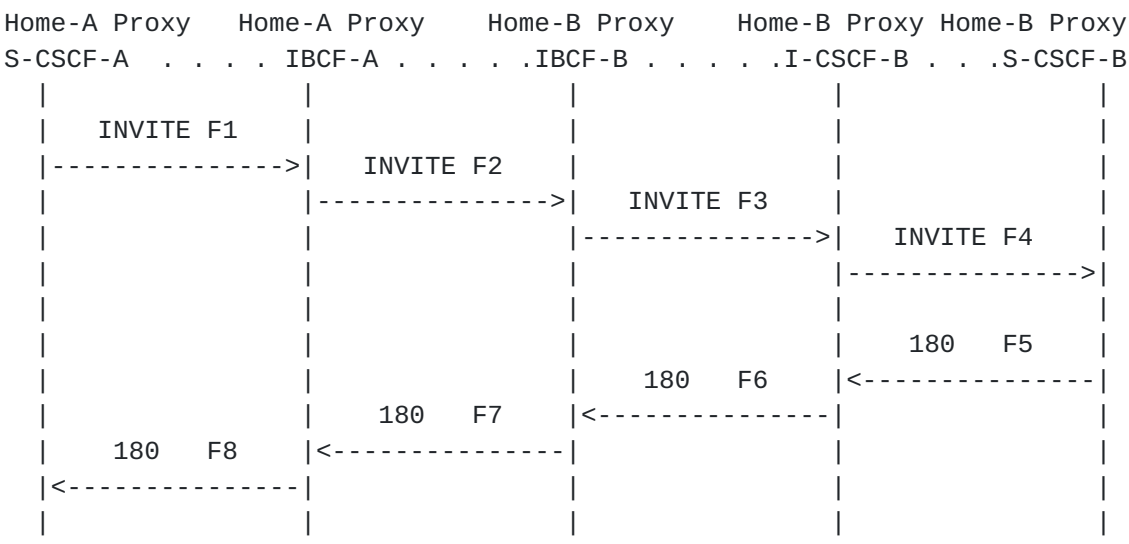
F3 INVITE IBCF-V -> P-CSCF
INVITE sip:Bob@visitedb.net SIP/2.0
Route: <p-cscf-v URI;iotl=homeb-visitedb

F4 INVITE P-CSCF -> Bob
INVITE sip:Bob@visitedb.net SIP/2.0

Figure 4: Terminating IMS call

A.5. Call between originating home and terminating home network

The S-CSCF of the originating home network adds the iotl value 'homea-homeb' in the Request-URI of the INVITE, sent towards the S-CSCF of the terminating network, to indicate the traffic leg type between the S-CSCFs.



F1 INVITE S-CSCF-A -> IBCF-A
INVITE sip:Bob@visitedb.net;iotl=homea-homeb SIP/2.0

F2 INVITE IBCF-a -> IBCF-B
INVITE sip:Bob@visitedb.net;iotl=homea-homeb SIP/2.0

F3 INVITE IBCF-B -> I-CSCF-B
INVITE sip:Bob@visitedb.net;iotl=homea-homeb SIP/2.0

F4 INVITE I-CSCF-B -> S-CSCF-B
INVITE sip:Bob@visitedb.net;iotl=homea-homeb SIP/2.0

Figure 5: Call between originating home and terminating home network

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