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## Session Initiation Protocol Service Examples draft-ietf-sipping-service-examples-15

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### Abstract

This document gives examples of Session Initiation Protocol (SIP) services. This covers most features offered in so-called IP Centrex offerings from local exchange carriers and PBX (Private Branch Exchange) features. Most of the services shown in this document are implemented in the SIP User Agents, although some require the assistance of a SIP Proxy. Some require some extensions to SIP including the REFER, SUBSCRIBE, and NOTIFY methods and the Replaces and Join header fields. These features are not intended to be an exhaustive

set, but rather show implementations of common features likely to be implemented on SIP IP telephones in a business environment.

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## 1. Overview

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This document provides example call flows detailing a SIP implementation of the following traditional telephony services:

Call Hold	Music on Hold
Unattended Transfer	Consultation Hold
Unconditional Call Forwarding	Attended Transfer
No Answer Call Forwarding	Busy Call Forwarding
3-way Call	Incoming Call Screening
Find-Me	Call Pickup
Call Park	Outgoing Call Screening
Automatic Redial	Click to Dial

Note that the Single Line Extension call flow has been removed from this document and will be covered in a separate document.

The call flows shown in this document were developed in the design of a SIP IP communications network. They represent an example set of so-called IP Centrex services or PBX services.

It is the hope of the authors that this document will be useful for SIP implementers, designers, and protocol researchers alike and will help further the goal of a standard implementation of [RFC 3261 \(Rosenberg, J., Schulzrinne, H., Camarillo, G., Johnston, A., Peterson, J., Sparks, R., Handley, M., and E. Schooler, "SIP: Session Initiation Protocol," June 2002.\)](#) [RFC3261] and some of its extensions.

These flows represent carefully checked and working group reviewed scenarios of SIP service examples as a companion to the specifications. These call flows are based on the current version 2.0 of SIP in [RFC 3261 \(Rosenberg, J., Schulzrinne, H., Camarillo, G., Johnston, A., Peterson, J., Sparks, R., Handley, M., and E. Schooler, "SIP: Session Initiation Protocol," June 2002.\)](#) [RFC3261] with SDP usage described in [RFC 3264 \(Rosenberg, J. and H. Schulzrinne, "An Offer/Answer Model with Session Description Protocol \(SDP\)," June 2002.\)](#) [RFC3264] Other RFCs also form part of the SIP standard and are used and referenced in these call flows.

The SIP specification and the other referenced documents are definitive as far as protocol issues are concerned. Also, these flows do not represent the only way to implement these services - other approaches such as [3pcc \(Third Party Call Control\) \(Rosenberg, J., Peterson, J., Schulzrinne, H., and G. Camarillo, "Best Current Practices for Third Party Call Control \(3pcc\) in the Session Initiation Protocol \(SIP\)," April 2004.\)](#) [RFC3725] or Back-to-Back User Agents (B2BUA) can be used. This specification does not preclude these or other approaches for implementing such services. The peer-to-peer design and principles of these service examples are described in the [Multiparty Framework document \(Mahy, R., Sparks, R., Rosenberg, J., Petrie, D., and A. Johnston, "A Call Control and Multi-party usage framework for the Session Initiation Protocol \(SIP\)," December 2009.\)](#)

[I-D.ietf-sipping-cc-framework].

These flows assume the functionality described in the [SIP Call Flow Examples document \(Johnston, A., Donovan, S., Sparks, R., Cunningham, C., and K. Summers, "Session Initiation Protocol \(SIP\) Basic Call Flow Examples," December 2003.\)](#) [RFC3665], which explores basic SIP

behavior. Some of the scenarios described herein make use of the SIP method extension [REFER \(Sparks, R., "The Session Initiation Protocol \(SIP\) Refer Method," April 2003.\)](#) [RFC3515] and the SIP header extension [Replaces \(Mahy, R., Biggs, B., and R. Dean, "The Session Initiation Protocol \(SIP\) "Replaces" Header," September 2004.\)](#) [RFC3891], and the SIP header extension [Join \(Mahy, R. and D. Petrie, "The Session Initiation Protocol \(SIP\) "Join" Header," October 2004.\)](#) [RFC3911]. The [SIP Events document \(Roach, A., "Session Initiation Protocol \(SIP\)-Specific Event Notification," June 2002.\)](#) [RFC3265] describes the use of SUBSCRIBE and NOTIFY while the [SIP Dialog Event Package \(Rosenberg, J., Schulzrinne, H., and R. Mahy, "An INVITE-Initiated Dialog Event Package for the Session Initiation Protocol \(SIP\)," November 2005.\)](#) [RFC4235] document describes the dialog event package. Some examples make use of the [GRUU \(Globally Routable User Agent URI\) \(Rosenberg, J., "Obtaining and Using Globally Routable User Agent \(UA\) URIs \(GRUU\) in the Session Initiation Protocol \(SIP\)," October 2007.\)](#) [I-D.ietf-sip-gruu] extension.

These flows were prepared assuming a network of proxies, registrars, and other SIP servers. The use of Secure SIP URIs (sips) is shown throughout this document, implying TLS transport on each hop with assumed certificate validation. However, other security approaches can be used. The use of Digest authentication is shown in some examples. The emphasis in these call flows is the SIP signaling exchange. As a result, only very simple SDP offer/answer exchanges are shown with audio media. These flows apply equally well for other media and multimedia sessions. For more advanced examples of SDP offer/answer exchanges, refer to [\[RFC4317\] \(Johnston, A. and R. Sparks, "Session Description Protocol \(SDP\) Offer/Answer Examples," December 2005.\)](#). Each call flow is presented with a textual description of the scenario, a message flow diagram showing the messages exchanged between separate network elements, and the detailed contents of each message shown in the diagram.

### 1.1 Legend for Message Flows

Dashed lines (---) represent control messages that are mandatory to the call scenario. These control messages can be SIP signaling.

Double dashed lines (===) represent media paths between network elements.

Messages with parenthesis around name represent optional control messages.

Messages are identified in the Figures as F1, F2, etc. This references the message details in the table that follows the Figure.

Lines longer than 72 characters are handled using the <allOneLine> convention defined in Section 2.1 of [RFC 4475 \(Sparks, R., Hawrylyshen, A., Johnston, A., Rosenberg, J., and H. Schulzrinne, "Session Initiation Protocol \(SIP\) Torture Test Messages," May 2006.\)](#) [RFC4475].

Comments in the message details are shown in the following form:

/\* Comments. \*/

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## 2. Service Examples

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## 2.1. Call Hold

Alice	Proxy	Bob
INVITE F1		
----->		
	INVITE F2	
(100 Trying) F3	----->	
<-----		
	180 Ringing F4	
180 Ringing F5	<-----	
<-----		
	200 OK F6	
200 OK F7	<-----	
<-----		
ACK F8		
----->	ACK F9	
	----->	
Both way RTP Established		
<=====>		
	INVITE(hold) F10	
INVITE(hold) F11	<-----	
<-----		
200 OK F12		
----->	200 OK F13	
	----->	
	ACK F14	
ACK F15	<-----	
<-----		
No RTP Sent!		
	INVITE F16	
INVITE F17	<-----	
<-----		
200 OK F18		
----->	200 OK F19	
	----->	
	ACK F20	
ACK F21	<-----	
<-----		
Both way RTP Established		
<=====>		
BYE F22		
----->	BYE F23	
	----->	
	200 OK F24	
200 OK F25	<-----	
<-----		

In this scenario, Alice calls Bob, then Bob places the call on hold. Bob then takes the call off hold, then Alice hangs up the call. Note that hold is unidirectional in nature. However, a UA that places the other party on hold will generally also stop sending media, resulting in no media exchange between the UAs. Older UAs may set the connection address to 0.0.0.0 when initiating hold. However, this behavior has been deprecated in favor of using the a=sendonly SDP attribute. Also note the use of the rendering feature tag defined in RFC 4235 [\[RFC4235\] \(Rosenberg, J., Schulzrinne, H., and R. Mahy, "An INVITE-Initiated Dialog Event Package for the Session Initiation Protocol \(SIP\)," November 2005.\)](#) used in F10 and F11 to indicate in that Bob's UA is no longer rendering media to Bob, i.e. that Bob has placed the call on hold.

Message Details



F1 INVITE Alice -> Proxy 1

```
INVITE sips:bob@biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf9
Max-Forwards: 70
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>
Call-ID: 12345601@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:alice@client.atlanta.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...
```

```
v=0
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com
s=
c=IN IP4 client.atlanta.example.com
t=0 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F2 INVITE Proxy 1 -> Bob

```
INVITE sips:bob@client.biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS ss1.example.com:5061
    ;branch=z9hG4bK83749.1
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf9
    ;received=192.0.2.103
Record-Route: <sips:ss1.example.com;lr>
Max-Forwards: 69
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>
Call-ID: 12345601@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:alice@client.atlanta.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...
```

```
v=0
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com
s=
```

c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F3 (100 Trying) Proxy 1 -> Alice

SIP/2.0 100 Trying  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 INVITE  
Content-Length: 0

F4 180 Ringing Bob -> Proxy 1

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Content Length:0

F5 180 Ringing Proxy 1 -> Alice

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Content Length: 0

F6 200 OK Bob -> Proxy 1

SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844527 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F7 200 OK Proxy 1 -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844527 IN IP4 client.biloxi.example.com

s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F8 ACK Alice -> Proxy 1

ACK sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf92  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

F9 ACK Proxy 1 -> Bob

ACK sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK837492.1  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf92  
;received=192.0.2.103  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

/\* Bob places Alice on hold. Note that the version is  
incremented in the o= field of the SDP \*/

F10 INVITE Bob -> Proxy 1

INVITE sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
Route: <sips:ss1.example.com;lr>

Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>;+sip.rendering="no"  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844528 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000  
a=sendonly

F11 INVITE Proxy 1 -> Alice

INVITE sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
;received=192.0.2.105  
Record-Route: <sips:ss1.example.com;lr>  
Max-Forwards: 69  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>;+sip.rendering="no"  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844528 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000  
a=sendonly

/\* Alice replies to hold \*/

F12 200 OK Alice -> Proxy 1

SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
;received=192.0.2.105  
Record-Route: <sips:ss1.example.com;lr>  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844527 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000  
a=recvonly

F13 200 OK Proxy 1 -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
;received=192.0.2.105  
Record-Route: <sips:ss1.example.com;lr>  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844527 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000  
a=recvonly

F14 ACK Bob -> Proxy 1

ACK sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds72  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

F15 ACK Proxy 1 -> Alice

ACK sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds72  
;received=192.0.2.105  
Max-Forwards: 69  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

/\* Bob takes the call off hold \*/

F16 INVITE Bob -> Proxy 1

INVITE sips:alice@client.atlanta.example.com SIP/2.0

Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds73  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345601@atlanta.example.com  
CSeq: 2 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844529 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F17 INVITE Proxy 1 -> Alice

INVITE sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK837493.1  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds73  
;received=192.0.2.105  
Record-Route: <sips:ss1.example.com;lr>  
Max-Forwards: 69  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345601@atlanta.example.com  
CSeq: 2 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844529 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0



a=rtpmap:0 PCMU/8000

F18 200 OK Alice -> Proxy 1

SIP/2.0 200 OK

Via: SIP/2.0/TLS ss1.example.com:5061

;branch=z9hG4bK837493.1

;received=192.0.2.54

Via: SIP/2.0/TLS client.biloxi.example.com:5061

;branch=z9hG4bKnashds73

;received=192.0.2.105

Record-Route: <sips:ss1.example.com;lr>

From: Bob <sips:bob@biloxi.example.com>;tag=314159

To: Alice <sips:alice@atlanta.example.com>;tag=1234567

Call-ID: 12345601@atlanta.example.com

CSeq: 2 INVITE

Contact: <sips:alice@client.atlanta.example.com>

Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY

Supported: replaces

Content-Type: application/sdp

Content-Length: ...

v=0

o=alice 2890844526 2890844528 IN IP4 client.atlanta.example.com

s=

c=IN IP4 client.atlanta.example.com

t=0 0

m=audio 49170 RTP/AVP 0

a=rtpmap:0 PCMU/8000

F19 200 OK Proxy 1 -> Bob

SIP/2.0 200 OK

Via: SIP/2.0/TLS client.biloxi.example.com:5061

;branch=z9hG4bKnashds73

;received=192.0.2.105

Record-Route: <sips:ss1.example.com;lr>

From: Bob <sips:bob@biloxi.example.com>;tag=314159

To: Alice <sips:alice@atlanta.example.com>;tag=1234567

Call-ID: 12345601@atlanta.example.com

CSeq: 2 INVITE

Contact: <sips:alice@client.atlanta.example.com>

Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY

Supported: replaces

Content-Type: application/sdp

Content-Length: ...

v=0

o=alice 2890844526 2890844528 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F20 ACK Bob -> Proxy 1

ACK sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds74  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345601@atlanta.example.com  
CSeq: 2 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

F21 ACK Proxy 1 -> Alice

ACK sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK837494.1  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds74  
;received=192.0.2.105  
Max-Forwards: 69  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345601@atlanta.example.com  
CSeq: 2 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

/\* RTP Media stream re-established. Alice disconnects. \*/

F22 BYE Alice -> Proxy 1

BYE sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf97  
Route: <sips:ss1.example.com;lr>

Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

F23 BYE Proxy 1 -> Bob

BYE sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK837497.1  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf97  
;received=192.0.2.103  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

F24 200 OK Bob -> Proxy 1

SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK837497.1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf97  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

F25 200 OK Proxy 1 -> Alice

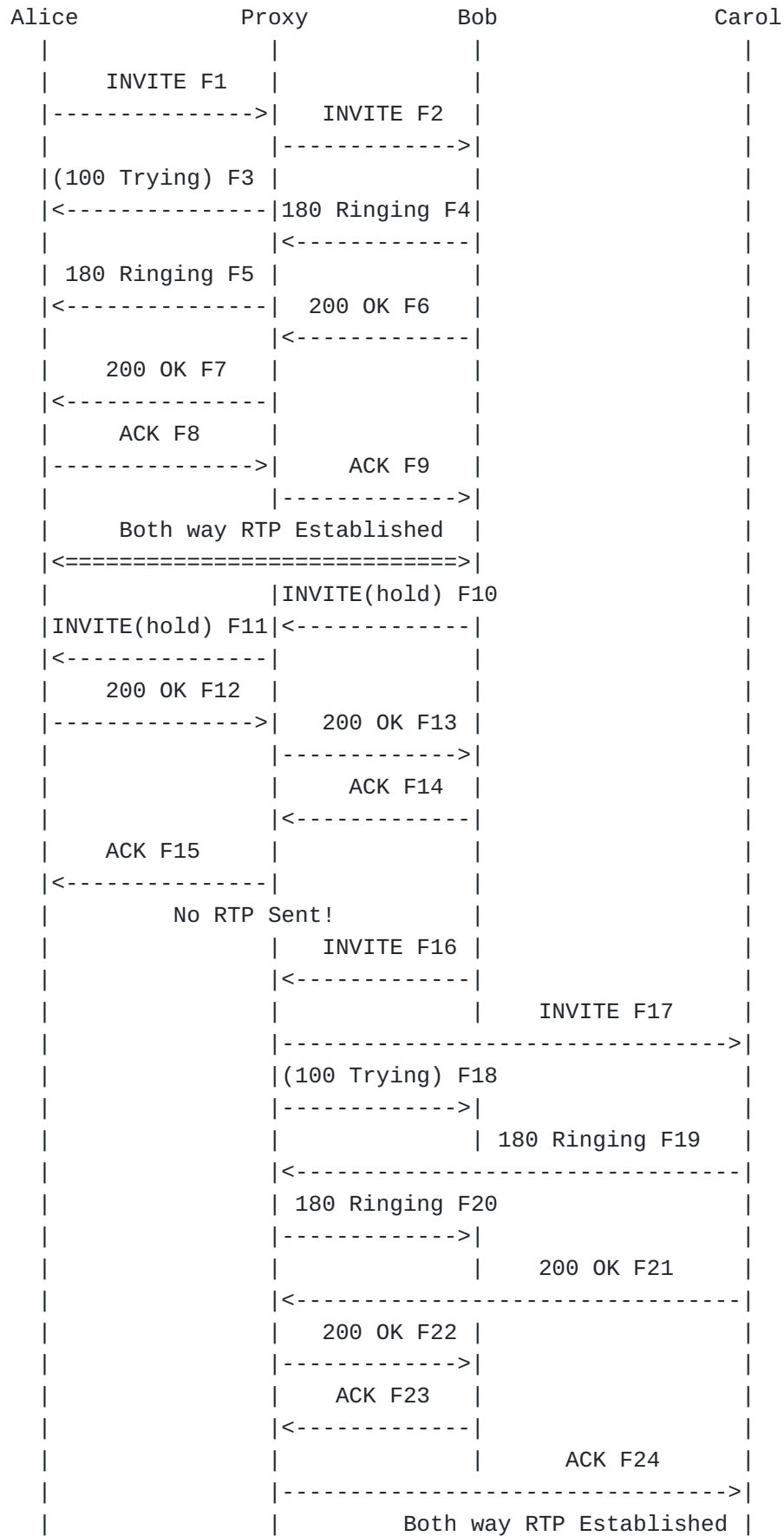
SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf97  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com

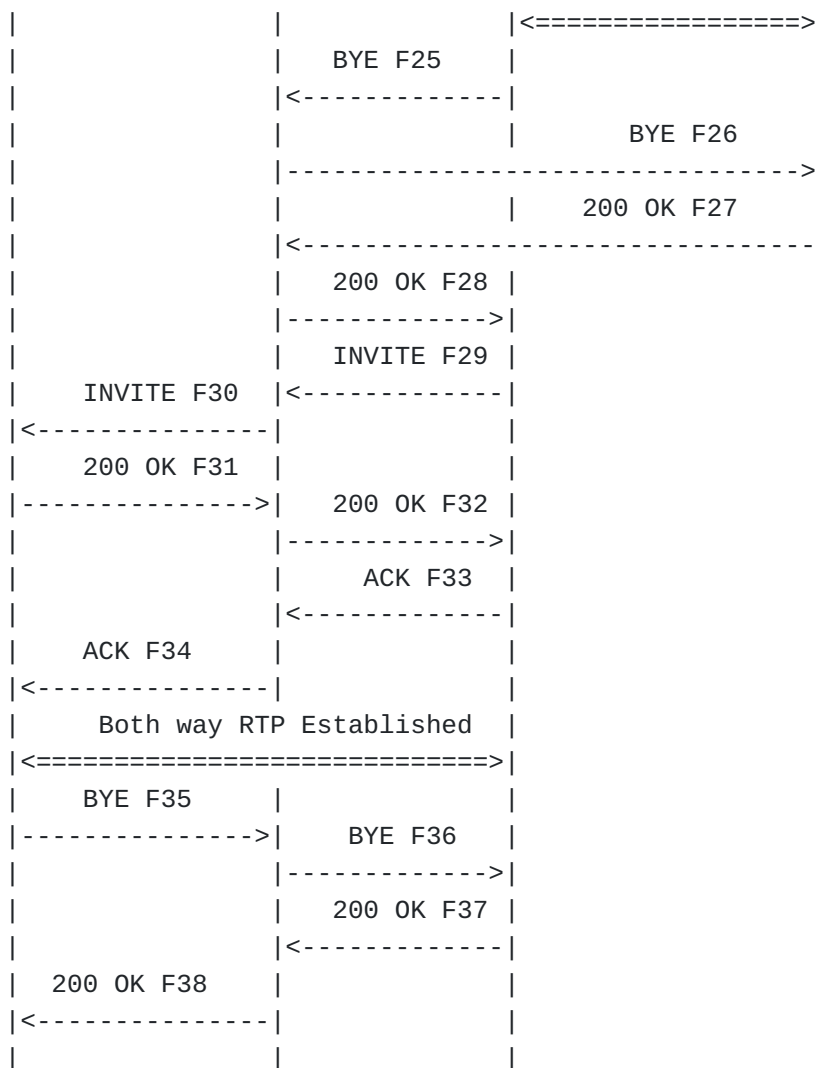
CSeq: 2 BYE  
Content-Length: 0

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[TOC](#)

## 2.2. Consultation Hold





In this scenario, Alice calls Bob. Bob places call on hold. Bob calls Carol. Bob then disconnects with Carol, then takes the call with Alice off hold. The call ends when Alice hangs up.

Also note the use of the rendering feature tag defined in RFC 4235 [\[RFC4235\] \(Rosenberg, J., Schulzrinne, H., and R. Mahy, "An INVITE-Initiated Dialog Event Package for the Session Initiation Protocol \(SIP\)," November 2005.\)](#) used in F10 to indicate in that Bob's UA is no longer rendering media to Bob, i.e. that Bob has placed the call on hold.

Message Details

F1 INVITE Alice -> Proxy 1

INVITE sip:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F2 INVITE Proxy 1 -> Bob

INVITE sip:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=



c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F3(100 Trying) Proxy 1 -> Alice

SIP/2.0 100 Trying  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Content-Length: 0

F4 180 Ringing Bob -> Proxy 1

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Content Length:0

F5 180 Ringing Proxy 1 -> Alice

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Content Length: 0

F6 200 OK Bob -> Proxy 1

SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844527 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F7 200 OK Proxy 1 -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844527 IN IP4 client.biloxi.example.com

s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F8 ACK Alice -> Proxy 1

ACK sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf45  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

F9 ACK Proxy 1 -> Bob

ACK sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK837494.1  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf45  
;received=192.0.2.103  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

/\* Bob places Alice on hold. \*/

F10 INVITE Bob -> Proxy 1

INVITE sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70

From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>;+sip.rendering="no"  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844528 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000  
a=sendonly

F11 INVITE Proxy 1 -> Alice

INVITE sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK837497.1  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
;received=192.0.2.105  
Record-Route: <sips:ss1.example.com;lr>  
Max-Forwards: 69  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>;+sip.rendering="no"  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844528 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000  
a=sendonly

F12 200 OK Alice -> Proxy 1

SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK837497.1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
;received=192.0.2.105  
Record-Route: <sips:ss1.example.com;lr>  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844527 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000  
a=recvonly

F13 200 OK Proxy 1 -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
;received=192.0.2.105  
Record-Route: <sips:ss1.example.com;lr>  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0

o=alice 2890844526 2890844527 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000  
a=recvonly

F14 ACK Bob -> Proxy 1

ACK sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashdsg  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

F15 ACK Proxy 1 -> Alice

ACK sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK8374.1  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashdsg  
;received=192.0.2.105  
Max-Forwards: 69  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

F16 INVITE Bob -> Proxy 1

INVITE sips:carol@chicago.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds22  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>  
Call-ID: 9876543210@biloxi.example.com

CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844834 2890844834 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 50170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F17 INVITE Proxy 1 -> Carol

INVITE sips:carol@client.chicago.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749a.1  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds22  
;received=192.0.2.105  
Record-Route: <sips:ss1.example.com;lr>  
Max-Forwards: 69  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>  
Call-ID: 9876543210@biloxi.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844834 2890844834 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 50170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F18 (100 Trying) Proxy 1 -> Bob

SIP/2.0 100 Trying  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds22

;received=192.0.2.105  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>  
Call-ID: 9876543210@biloxi.example.com  
CSeq: 1 INVITE  
Content-Length: 0

F19 180 Ringing Carol -> Proxy 1

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749a.1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds22  
;received=192.0.2.105  
Record-Route: <sips:ss1.example.com;lr>  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=456654  
Call-ID: 9876543210@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:carol@client.chicago.example.com>  
Content Length:0

F20 180 Ringing Proxy 1 -> Bob

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds22  
;received=client.chicago.example.com  
Record-Route: <sips:ss1.example.com;lr>  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=456654  
Call-ID: 9876543210@biloxi.example.com  
CSeq: 1 INVITE  
Contact: <sips:carol@client.chicago.example.com>  
Content Length: 0

F21 200 OK Carol -> Proxy 1

SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749a.1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds22  
;received=192.0.2.105



Record-Route: <sips:ss1.example.com;lr>  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=456654  
Call-ID: 9876543210@biloxi.example.com  
CSeq: 1 INVITE  
Contact: <sips:carol@client.chicago.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=carol 2890844922 2890844922 IN IP4 client.chicago.example.com  
s=  
c=IN IP4 client.chicago.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F22 200 OK Proxy 1 -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds22  
;received=192.0.2.105  
Record-Route: <sips:ss1.example.com;lr>  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=456654  
Call-ID: 9876543210@biloxi.example.com  
CSeq: 1 INVITE  
Contact: <sips:carol@client.chicago.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=carol 2890844922 2890844922 IN IP4 client.chicago.example.com  
s=  
c=IN IP4 client.chicago.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F23 ACK Bob -> Proxy 1

ACK sips:carol@client.chicago.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061

;branch=z9hG4bKnashds24  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=456654  
Call-ID: 9876543210@biloxi.example.com  
CSeq: 1 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

F24 ACK Proxy 1 -> Carol

ACK sips:carol@client.chicago.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749b.1  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds24  
;received=192.0.2.105  
Max-Forwards: 69  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=456654  
Call-ID: 9876543210@biloxi.example.com  
CSeq: 1 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

F25 BYE Bob -> Proxy 1

BYE sips:carol@client.chicago.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7j  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=456654  
Call-ID: 9876543210@biloxi.example.com  
CSeq: 2 BYE  
Content-Length: 0

F26 BYE Proxy 1 -> Carol

BYE sips:carol@client.chicago.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749k.1  
Via: SIP/2.0/TLS client.biloxi.example.com:5061

;branch=z9hG4bKnashds7j  
;received=192.0.2.105  
Max-Forwards: 69  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=456654  
Call-ID: 9876543210@biloxi.example.com  
CSeq: 2 BYE  
Content-Length: 0

F27 200 OK Carol -> Proxy 1

SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749k.1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7j  
;received=192.0.2.105  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=456654  
Call-ID: 9876543210@biloxi.example.com  
CSeq: 2 BYE  
Content-Length: 0

F28 200 OK Proxy 1 -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7j  
;received=192.0.2.105  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=456654  
Call-ID: 9876543210@biloxi.example.com  
CSeq: 2 BYE  
Content-Length: 0

/\* Bob takes the call off hold \*/

F29 INVITE Bob -> Proxy 1

INVITE sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7b  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567

Call-ID: 12345600@atlanta.example.com  
CSeq: 2 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844529 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F30 INVITE Proxy 1 -> Alice

INVITE sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749q.1  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7b  
;received=192.0.2.105  
Record-Route: <sips:ss1.example.com;lr>  
Max-Forwards: 69  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844529 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F31 200 OK Alice -> Proxy 1

SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749q.1  
;received=192.0.2.54

Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7b  
;received=192.0.2.105  
Record-Route: <sips:ss1.example.com;lr>  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844528 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F32 200 OK Proxy 1 -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7b  
;received=192.0.2.105  
Record-Route: <sips:ss1.example.com;lr>  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844528 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F33 ACK Bob -> Proxy 1

ACK sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7d7  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

F34 ACK Proxy 1 -> Alice

ACK sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK8374.1  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7d7  
;received=192.0.2.105  
Max-Forwards: 69  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

F35 BYE Alice -> Proxy 1

BYE sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf10  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

F36 BYE Proxy 1 -> Bob

BYE sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK8379.1  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf10  
;received=192.0.2.103  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

F37 200 OK Bob -> Proxy 1

SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK8379.1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf10  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

F38 200 OK Proxy 1 -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf10  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

### 2.3. Music On Hold



Alice	Bob	Music Server
INVITE F1		
----->		
180 Ringing F2		
<-----		
200 OK F3		
<-----		
ACK F4		
----->		
RTP		
<=====		
Bob places Alice on hold		
INVITE (hold) F5		
<-----		
200 OK F6		
----->		
ACK F7		
<-----		
no RTP		
Bob initiates music on hold		
	REFER Refer-To: A F8	
	----->	
	202 F9	
	<-----	
	NOTIFY F10	
	<-----	
	200 F11	
	----->	
INVITE F12 Replaces: B		
<-----		
200 OK F13		
----->		
ACK F14		
<-----		
RTP Music		
<=====		
BYE F15		
----->	NOTIFY F17	
200 OK F16	<-----	
<-----	200 OK F18	
	----->	

```

| The music on hold is complete |
|                               |
|   Bob takes Alice off hold   |
|                               |
|   INVITE Replaces: M F19     |
|<-----|                     |
|   200 OK F20                 |
|----->|                     |
|   ACK F21                   |
|<-----|                     |
|   RTP                        |
|<=====|                     |
|               BYE F22        |
|----->|                     |
|   200 OK F23                 |
|<-----|                     |

```

In this flow, Bob places Alice on hold with music. This is performed by Bob sending a REFER to a Music Server which sends an INVITE with Replaces to Alice. The Music Server then sends RTP music to Alice. Bob picks the call up from hold by sending an INVITE with Replaces to Alice.

Note the use of the rendering feature tag defined in RFC 4235 [\[RFC4235\]](#) (Rosenberg, J., Schulzrinne, H., and R. Mahy, "An INVITE-Initiated Dialog Event Package for the Session Initiation Protocol (SIP)," November 2005.) used in F5 to indicate in that Bob's UA is no longer rendering media to Bob, i.e. that Bob has placed the call on hold. Feature tags are also used in F12 with the automaton (defined in RFC 3840 [\[RFC3840\]](#) (Rosenberg, J., Schulzrinne, H., and P. Kyzivat, "Indicating User Agent Capabilities in the Session Initiation Protocol (SIP)," August 2004.)) and byeless feature tags (defined in RFC 4235 [\[RFC4235\]](#) (Rosenberg, J., Schulzrinne, H., and R. Mahy, "An INVITE-Initiated Dialog Event Package for the Session Initiation Protocol (SIP)," November 2005.)) to describe the capabilities of the Music Server.

Should Alice not wish to receive music on hold, her UA could refuse F12 and she will remain on hold with Bob, but in silence.

Message Details

F1 INVITE Alice -> Bob

INVITE sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:a8342043f@atlanta.example.com;gr>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces, gruu  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F2 180 Ringing Bob -> Alice

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Content-Length: 0

F3 200 OK Bob -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=23431

Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844527 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F4 ACK Alice -> Bob

ACK sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bfd  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

/\* Bob places Alice on hold \*/

F5 INVITE Bob -> Alice

INVITE sips:a8342043f@atlanta.example.com;gr SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bK874bk  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
From: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: 12345600@atlanta.example.com  
CSeq: 712 INVITE  
Contact: <sips:bob@client.biloxi.example.com>;+sip.rendering="no"  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0

o=bob 2890844527 2890844528 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000  
a=sendonly

F6 200 OK Alice -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bK874bk  
;received=192.0.2.105  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
From: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: 12345600@atlanta.example.com  
CSeq: 712 INVITE  
Contact: <sips:a8342043f@atlanta.example.com;gr>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces, gruu  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844527 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000  
a=recvonly

F7 ACK Bob -> Alice

ACK sips:a8342043f@atlanta.example.com;gr SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKq874b  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
From: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: 12345600@atlanta.example.com  
CSeq: 712 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

/\* Bob REFERS Music Server to establish session with Alice

which replaces the established session between  
Alice and Bob. \*/

F8 REFER Bob -> Music Server

```
REFER sips:music@server.example.com SIP/2.0
Via: SIP/2.0/TLS client.biloxi.example.com:5061
    ;branch=z9hG4bKnashds9
Max-Forwards: 70
From: Bob <sips:bob@biloxi.example.com>;tag=02134
To: Music Server <sips:music@server.example.com>
Call-ID: 4802029847@biloxi.example.com
CSeq: 1 REFER
<allOneLine>
  Refer-To: <sips:a8342043f@atlanta.example.com;gr?Replaces=
    12345600%40atlanta.example.com%3Bfrom-tag%3D23431
    %3Bto-tag%3D1234567&Require=replaces>
</allOneLine>
Referred-By: <sips:bob@biloxi.example.com>
Contact: <sips:bob@client.biloxi.example.com>
Content-Length: 0
```

F9 202 Accepted Music Server -> Bob

```
SIP/2.0 202 Accepted
Via: SIP/2.0/TLS client.biloxi.example.com:5061
    ;branch=z9hG4bKnashds9
    ;received=192.0.2.105
From: Bob <sips:bob@biloxi.example.com>;tag=02134
To: Music Server <sips:music@server.example.com>;tag=56323
Call-ID: 4802029847@biloxi.example.com
Contact: <sips:music@server.example.com>
CSeq: 1 REFER
Content-Length: 0
```

F10 NOTIFY Music Server -> Bob

```
NOTIFY sips:bob@client.biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS server.example.com:5061
    ;branch=z9hG4bK74bT6
To: Bob <sips:bob@biloxi.example.com>;tag=02134
Max-Forwards: 70
From: Music Server <sips:music@server.example.com>;tag=56323
Call-ID: 4802029847@biloxi.example.com
CSeq: 1 NOTIFY
Event: refer
Subscription-State: active;expires=60
Contact: <sips:music@server.example.com>
```

Content-Type: message/sipfrag  
Content-Length: ...

SIP/2.0 100 Trying

F11 200 OK Bob -> Music Server

SIP/2.0 200 OK  
Via: SIP/2.0/TLS server.example.com:5061  
;branch=z9hG4bK74bT6  
;received=192.0.2.103  
To: Bob <sips:bob@biloxi.example.com>;tag=02134  
From: Music Server <sips:music@server.example.com>;tag=56323  
Call-ID: 4802029847@biloxi.example.com  
CSeq: 1 NOTIFY  
Content-Length: 0

/\* Music Server places call to Alice to replace session  
between Alice and Bob. \*/

F12 INVITE Music Server -> Alice

INVITE sips:a8342043f@atlanta.example.com;gr SIP/2.0  
Via: SIP/2.0/TLS server.example.com:5061  
;branch=z9hG4bK74rf  
Max-Forwards: 70  
From: <sips:music@server.example.com>;tag=0111  
To: <sips:a8342043f@atlanta.example.com;gr>  
Call-ID: a5-75-34-12-76@server.example.com  
CSeq: 1 INVITE  
Referred-By: <sips:bob@biloxi.example.com>  
Contact: <sips:music@server.example.com>;automaton  
;+sip.byeless;+sip.rendering="no"  
Require: replaces  
Replaces: 12345600@atlanta.example.com  
;from-tag=23431;to-tag=1234567  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, SUBSCRIBE, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=MusicServer 2890844576 2890844576 IN IP4 server.example.com  
s=  
c=IN IP4 server.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

a=sendonly

F13 200 OK Alice -> Music Server

SIP/2.0 200 OK  
Via: SIP/2.0/TLS server.example.com:5061  
;branch=z9hG4bK74rf  
;received=192.0.2.103  
From: <sips:music@server.example.com>;tag=0111  
To: <sips:a8342043f@atlanta.example.com;gr>;tag=098594  
Call-ID: a5-75-34-12-76@server.example.com  
CSeq: 1 INVITE  
Contact: <sips:a8342043f@atlanta.example.com;gr>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, SUBSCRIBE, NOTIFY  
Supported: replaces, gruu  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000  
a=recvonly

F14 ACK Music Server -> Alice

ACK sips:a8342043f@atlanta.example.com;gr SIP/2.0  
Via: SIP/2.0/TLS server.example.com:5061  
;branch=z9hG4bK7rfF  
Max-Forwards: 70  
From: <sips:music@server.example.com>;tag=0111  
To: <sips:a8342043f@atlanta.example.com;gr>;tag=098594  
Call-ID: a5-75-34-12-76@server.example.com  
CSeq: 1 ACK  
Content-Length: 0

F15 BYE Alice -> Bob

BYE sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bKnashds7  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=23431



Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

F16 200 OK Bob -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bKnashds7  
;received=192.0.2.105  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

/\* Music Server reports success back to Bob by returning  
a 200 OK response. Bob obtains the dialog identifiers  
from the headers included in the response. \*/

F17 NOTIFY Music Server -> Bob

NOTIFY sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS server.example.com:5061  
;branch=z9hG4bK74bf9  
To: Bob <sips:bob@biloxi.example.com>;tag=02134  
Max-Forwards: 70  
From: Music Server <sips:music@server.example.com>;tag=56323  
Call-ID: 4802029847@biloxi.example.com  
CSeq: 2 NOTIFY  
Event: refer  
Subscription-State: terminated;reason=noresource  
Contact: <sips:music@server.example.com>  
Content-Type: message/sipfrag  
Content-Length: ...

SIP/2.0 200 OK  
Via: SIP/2.0/TLS server.example.com:5061  
;branch=z9hG4bK74rf  
;received=192.0.2.103  
From: <sips:music@server.example.com>;tag=0111  
To: <sips:a8342043f@atlanta.example.com;gr>;tag=098594  
Call-ID: a5-75-34-12-76@server.example.com  
CSeq: 1 INVITE  
Contact: <sips:a8342043f@atlanta.example.com;gr>

F18 200 OK Bob -> Music Server

SIP/2.0 200 OK  
Via: SIP/2.0/TLS server.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
To: Bob <sips:bob@biloxi.example.com>;tag=02134  
From: Music Server <sips:music@server.example.com>;tag=56323  
Call-ID: 4802029847@biloxi.example.com  
CSeq: 2 NOTIFY  
Content-Length: 0

/\* Alice is now parked at the Music Server \*/

/\* Bob picks up the call by sending an INVITE to Alice who  
replaces the existing session with the Music Server. \*/

F19 INVITE Bob -> Alice

INVITE sips:a8342043f@atlanta.example.com;gr SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bK74bf9  
From: Bob <sips:bob@biloxi.example.com>;tag=4i323pr  
To: Alice <sips:a8342043f@atlanta.example.com;gr>  
Call-ID: uioewrjk2k2were  
CSeq: 42121 INVITE  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER,  
SUBSCRIBE, NOTIFY  
Replaces: a5-75-34-12-76@server.example.com  
;to-tag=098594;from-tag=0111  
Contact: <sips:bob@client.biloxi.example.com>  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844631 2890844631 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3458 RTP/AVP 0  
a=rtpmap:0 PCMU/8000  
a=sendrecv

F20 200 OK Alice -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061

;branch=z9hG4bK74bf9  
;received=192.0.2.105  
From: Bob <sips:bob@biloxi.example.com>;tag=4i323pr  
To: Alice <sips:a8342043f@atlanta.example.com;gr>;tag=6654323  
Call-ID: uioewrjk2k2were  
CSeq: 42121 INVITE  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER,  
SUBSCRIBE, NOTIFY  
Contact: <sips:alice@client.atlanta.example.com>  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844576 2890844576 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000  
a=sendrecv

F21 200 ACK Bob -> Alice

ACK sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKj974bf9  
From: Bob <sips:bob@biloxi.example.com>;tag=4i323pr  
To: Alice <sips:a8342043f@atlanta.example.com;gr>;tag=6654323  
Call-ID: uioewrjk2k2were  
CSeq: 42121 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER,  
SUBSCRIBE, NOTIFY  
Supported: replaces  
Content-Length: 0

F22 BYE Alice -> Music Server

BYE sips:music@server.example.com SIP/2.0  
Max-Forwards: 70  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74rf  
To: <sips:music@server.example.com>;tag=0111  
From: <sips:a8342043f@atlanta.example.com;gr>;tag=098594  
Call-ID: a5-75-34-12-76@server.example.com  
CSeq: 15 BYE  
Content-Length: 0

F23 200 OK Music Server -> Alice

SIP/2.0 200 OK

Via: SIP/2.0/TLS client.atlanta.example.com:5061

;branch=z9hG4bK74rf

;received=192.0.2.103

To: <sips:music@server.example.com>;tag=0111

From: <sips:a8342043f@atlanta.example.com;gr>;tag=098594

Call-ID: a5-75-34-12-76@server.example.com

CSeq: 15 BYE

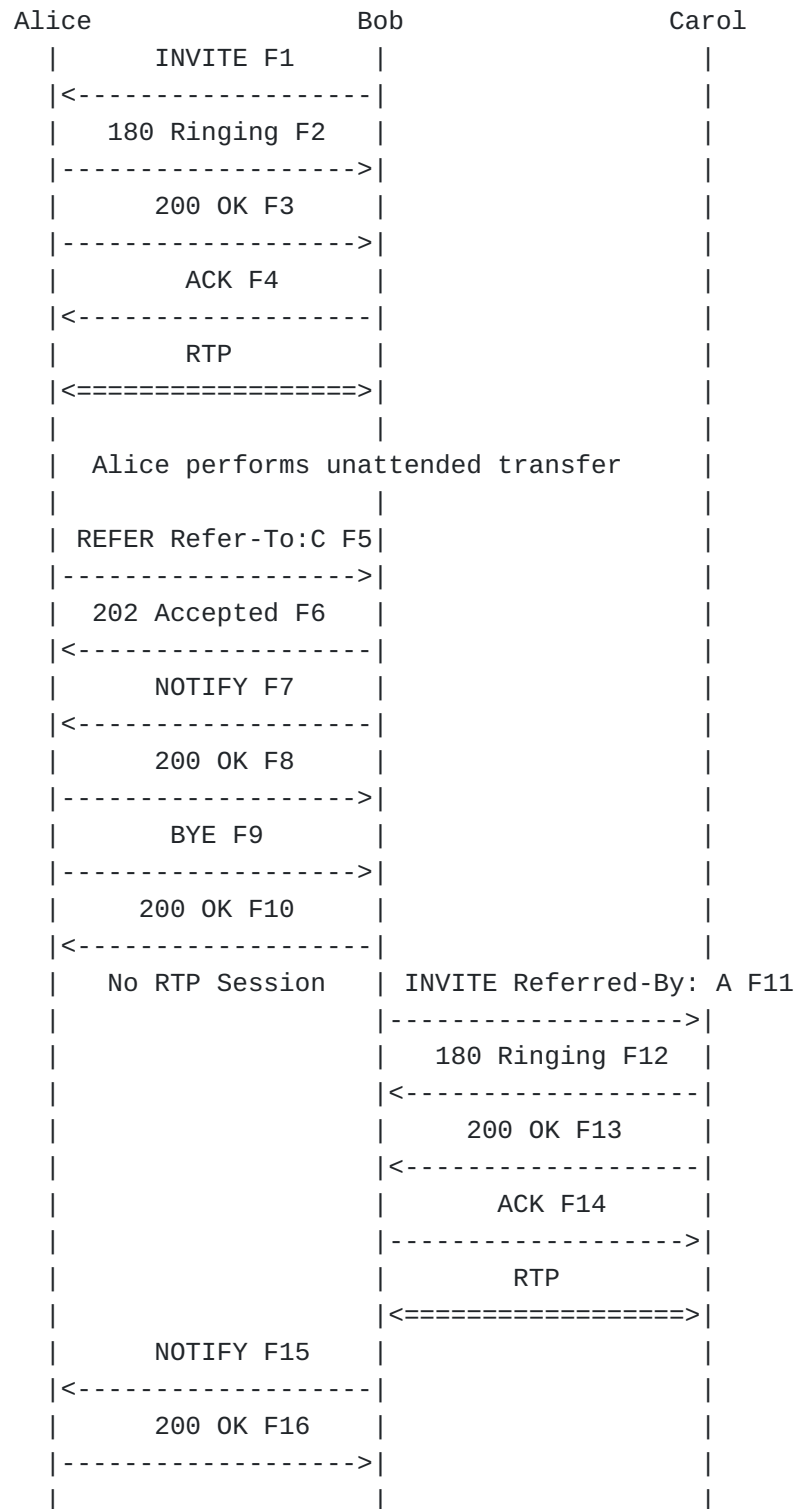
Content-Length: 0

/\* Normal media session between Alice and Bob is resumed \*/

---

[TOC](#)

## 2.4. Transfer - Unattended



In this scenario, Bob calls Alice. Alice then transfers Bob to Carol, then Alice disconnects with Bob. Bob establishes the session to Carol then reports the success back to Alice in the NOTIFY in F15. If the

transfer fails, Bob can send a new INVITE back to Alice to re-establish the session.

Despite the BYE sent by Alice in F9, the dialog between Alice and Bob still exists until the subscription created by the REFER has terminated (either due to a NOTIFY containing a Subscription-State: terminated;reason=noresource header field, as in F15, or a 481 response to a NOTIFY).

For more about call transfer see the [transfer \(Sparks, R. and A. Johnston, "Session Initiation Protocol Call Control - Transfer," March 2009.\)](#) [I-D.ietf-sipping-cc-transfer] document.

Message Details

F1 INVITE Bob -> Alice

INVITE sips:alice@atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844527 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F2 180 Ringing Alice -> Bob

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
;received=192.0.2.113  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Content-Length: 0

F3 200 OK Alice -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
;received=192.0.2.113  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345601@atlanta.example.com

CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F4 ACK Bob -> Alice

ACK sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds2  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

/\* Session is established between Alice and Bob. \*/

/\* Alice performs unattended transfer of Bob to Carol \*/

F5 REFER Alice -> Bob

REFER sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds8  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com  
CSeq: 101 REFER  
Refer-To: <sips:carol@chicago.example.com>  
Referred-By: <alice@atlanta.example.com>  
Contact: <sips:alice@client.atlanta.example.com>  
Content-Length: 0



F6 202 Accepted Bob -> Alice

SIP/2.0 202 Accepted  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds8  
;received=192.0.2.105  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com  
Contact: <sips:bob@client.biloxi.example.com>  
CSeq: 101 REFER  
Content-Length: 0

F7 NOTIFY Bob -> Alice

NOTIFY sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds32  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345601@atlanta.example.com  
CSeq: 2 NOTIFY  
Event: refer  
Subscription-State: active;expires=60  
Contact: <sips:bob@client.biloxi.example.com>  
Content-Type: message/sipfrag  
Content-Length: ...

SIP/2.0 100 Trying

F8 200 OK Alice -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds32  
;received=192.0.2.113  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345601@atlanta.example.com  
CSeq: 2 NOTIFY  
Content-Length: 0

/\* Alice now disconnects with Bob. \*/

F9 BYE Alice -> Bob

BYE sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds43  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com  
CSeq: 102 BYE  
Content-Length: 0

F10 200 OK Bob -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds43  
;received=192.0.2.105  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com  
CSeq: 102 BYE  
Content-Length: 0

/\* Bob attempts the transfer to Carol \*/

F11 INVITE Bob -> Carol

INVITE sips:carol@chicago.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds1  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>  
Call-ID: 7436222@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Referred-By: <alice@atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844539 2890844539 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3458 RTP/AVP 0

a=rtpmap:0 PCMU/8000

F12 180 Ringing Carol -> Bob

SIP/2.0 180 Ringing

Via: SIP/2.0/TLS client.biloxi.example.com:5061

;branch=z9hG4bKnashds1

;received=192.0.2.113

From: Bob <sips:bob@biloxi.example.com>;tag=8675309

To: Carol <sips:carol@chicago.example.com>;tag=928287

Call-ID: 7436222@atlanta.example.com

CSeq: 1 INVITE

Contact: <sips:carol@client.chicago.example.com>

Content-Length: 0

F13 200 OK Carol -> Bob

SIP/2.0 200 OK

Via: SIP/2.0/TLS client.biloxi.example.com:5061

;branch=z9hG4bKnashds1

;received=192.0.2.113

From: Bob <sips:bob@biloxi.example.com>;tag=8675309

To: Carol <sips:carol@chicago.example.com>;tag=928287

Call-ID: 7436222@atlanta.example.com

CSeq: 1 INVITE

Contact: <sips:carol@client.chicago.example.com>

Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY

Supported: replaces

Content-Type: application/sdp

Content-Length: ...

v=0

o=carol 2890944542 2890844542 IN IP4 client.chicago.example.com

s=

c=IN IP4 client.chicago.example.com

t=0 0

m=audio 3456 RTP/AVP 0

a=rtpmap:0 PCMU/8000

F14 ACK Bob -> Carol

ACK sips:carol@client.chicago.example.com SIP/2.0

Via: SIP/2.0/TLS client.biloxi.example.com:5061

;branch=z9hG4bKnashds9

Max-Forwards: 70

From: Bob <sips:bob@biloxi.example.com>;tag=8675309

To: Carol <sips:carol@chicago.example.com>;tag=928287

Call-ID: 7436222@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

/\* Bob and Carol now have established a session. Bob reports  
success to Alice which Alice probably ignores. \*/

F15 NOTIFY Bob -> Alice

NOTIFY sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds67  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345601@atlanta.example.com  
CSeq: 3 NOTIFY  
Event: refer  
Subscription-State: terminated;reason=noresource  
Contact: <sips:bob@client.biloxi.example.com>  
Content-Type: message/sipfrag  
Content-Length: ...

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds1  
;received=192.0.2.113  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=928287  
Call-ID: 7436222@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:carol@client.chicago.example.com>  
Content-Type: application/sdp  
Content-Length: ...

F16 200 OK Alice -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds6  
;received=192.0.2.113  
From: Bob <sips:bob@biloxi.example.com>;tag=314159  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345601@atlanta.example.com  
CSeq: 3 NOTIFY  
Content-Length: 0



## 2.5. Transfer - Attended

Alice	Bob	Carol
INVITE F1		
----->		
180 Ringing F2		
<-----		
200 OK F3		
<-----		
ACK F4		
----->		
RTP		
<=====		
INVITE (hold) F5		
<-----		
200 OK F6		
----->		
ACK F7		
<-----		
No RTP		
	INVITE F8	
	----->	
	180 Ringing F9	
	<-----	
	200 OK F10	
	<-----	
	ACK F11	
	----->	
	RTP	
	<=====	
	INVITE (hold) F12	
	----->	
	200 OK F13	
	<-----	
	ACK F14	
	----->	
	No RTP	
REFER Refer-To: C F15		
<-----		
202 Accepted F16		
----->		
NOTIFY F17		
----->		
200 OK F18		
<-----		
INVITE Replaces: B F19		
----->		
	200 OK F20	

```

|<-----|
|          ACK F21          |
|----->|
|          RTP              |
|<=====|
|          | BYE F22        |
|          |<-----|
|          | 200 OK F23     |
|          |----->|
| NOTIFY F24 |              |
|----->|
| 200 OK F25 |              |
|<-----|
| BYE F26    |              |
|<-----|
| 200 OK F27 |              |
|----->|

```

In this scenario, Alice calls Bob. Bob puts Alice on hold then calls Carol to announce transfer, then places Carol on hold. Bob transfers Alice to Carol which replaces the session between Bob and Carol. Carol then disconnects session with Bob. Alice reports success of transfer to Bob, who then disconnects with Alice. In this example, the [Replaces header field \(Mahy, R., Biggs, B., and R. Dean, "The Session Initiation Protocol \(SIP\) "Replaces" Header," September 2004.\)](#) [RFC3891] is inserted into the Refer-To URI by Bob. Note that the Refer-To URI is the Contact URI returned by Carol in the 200 OK response F10. This ensures that only the correct instance of Carol is reached. The presence of the gr URI parameter in the Contact URI in message F10 indicates that the Contact URI is a [GRUU \(Rosenberg, J., "Obtaining and Using Globally Routable User Agent \(UA\) URIs \(GRUU\) in the Session Initiation Protocol \(SIP\)," October 2007.\)](#) [I-D.ietf-sip-gruu] and will be globally routable outside of the dialog. Without knowing the Contact URI is a gruu, Bob must be prepared, if the triggered INVITE had failed, to retry the REFER with a Refer-To URI of the URI used to reach Carol but with a Require: replaces header escaped in the Refer-To header field, as discussed in the [transfer \(Sparks, R. and A. Johnston, "Session Initiation Protocol Call Control - Transfer," March 2009.\)](#) [I-D.ietf-sipping-cc-transfer] document.

Message Details



F1 INVITE Alice -> Bob

INVITE sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F2 180 Ringing Bob -> Alice

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Content-Length: 0

F3 200 OK Bob -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: 12345600@atlanta.example.com

CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844527 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F4 ACK Alice -> Bob

ACK sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

/\* Alice and Bob have established a session.  
Bob puts Alice on Hold \*/

F5 INVITE Bob -> Alice

INVITE sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=23431  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1024 INVITE  
Contact: <sips:bob@client.biloxi.example.com>;+sip.rendering="no"  
Content-Type: application/sdp  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: ...

v=0  
o=bob 2890844527 2890844528 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000  
a=sendonly

F6 200 OK Alice -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
;received=192.0.2.113  
From: Bob <sips:bob@biloxi.example.com>;tag=23431  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1024 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844527 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000  
a=recvonly

F7 ACK Bob -> Alice

ACK sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds3  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=23431  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1024 ACK  
Content-Length: 0

/\* Bob calls Carol \*/

F8 INVITE Bob -> Carol

INVITE sips:carol@chicago.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnash  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>  
Call-ID: sdjfdjfskdf@biloxi.example.com  
CSeq: 42 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 28908445834 2890844834 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3458 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F9 180 Ringing Carol -> Bob

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnash  
;received=192.0.2.113  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=5f35a3  
Call-ID: sdjfdjfskdf@biloxi.example.com  
CSeq: 42 INVITE  
Contact: <sips:39itp34klkd@chicago.example.com>  
Content-Length: 0

F10 200 OK Carol -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnash  
;received=192.0.2.113  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=5f35a3  
Call-ID: sdjfdjfskdf@biloxi.example.com  
CSeq: 42 INVITE

Contact: <sips:39itp34klkd@chicago.example.com;gr>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces, gruu  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=carol 2890844922 2890844922 IN IP4 client.chicago.example.com  
s=  
c=IN IP4 client.chicago.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F11 ACK Bob -> Carol

ACK sips:39itp34klkd@chicago.example.com;gr SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashd5  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=5f35a3  
Call-ID: sdjfdjfskdf@biloxi.example.com  
CSeq: 42 ACK  
Content-Length: 0

/\* Bob puts Carol on hold \*/

F12 INVITE Bob -> Carol

INVITE sips:39itp34klkd@chicago.example.com;gr SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds0  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=5f35a3  
Call-ID: sdjfdjfskdf@biloxi.example.com  
CSeq: 43 INVITE  
Contact: <sips:bob@client.biloxi.example.com>;+sip.rendering="no"  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 289084834 2890844835 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com

t=0 0  
m=audio 3458 RTP/AVP 0  
a=rtpmap:0 PCMU/8000  
a=sendonly

F13 200 OK Carol -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds0  
;received=192.0.2.113  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=5f35a3  
Call-ID: sdjfdjfskdf@biloxi.example.com  
CSeq: 43 INVITE  
Contact: <sips:39itp34klkd@chicago.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces, gruu  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=carol 2890844922 2890844923 IN IP4 client.chicago.example.com  
s=  
c=IN IP4 client.chicago.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000  
a=recvonly

F14 ACK Bob -> Carol

ACK sips:39itp34klkd@chicago.example.com;gr SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnash334  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=5f35a3  
Call-ID: sdjfdjfskdf@biloxi.example.com  
CSeq: 43 ACK  
Content-Length: 0

/\* Bob Transfers Alice to Carol. \*/

F15 REFER Bob -> Alice

REFER sips:alice@client.atlanta.example.com SIP/2.0

Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds2g  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=23431  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1025 REFER  
<allOneLine>  
Refer-To: <sips:39itp34klkd@chicago.example.com?Replaces=  
sdjfdjfskdf%40biloxi.example.com%3Bto-tag%3D5f35a3  
%3Bfrom-tag%3D8675309&Require=replaces>  
</allOneLine>  
Referred-By: <sips:bob@biloxi.example.com>  
Contact: <sips:bob@client.biloxi.example.com>  
Content-Length: 0

F16 202 Accepted Alice -> Bob

SIP/2.0 202 Accepted  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds2g  
;received=192.0.2.113  
From: Bob <sips:bob@biloxi.example.com>;tag=23431  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
Contact: <sips:alice@client.atlanta.example.com>  
CSeq: 1025 REFER  
Content-Length: 0

F17 NOTIFY Alice -> Bob

NOTIFY sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bfK  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 NOTIFY  
Contact: <sips:alice@client.atlanta.example.com>  
Event: refer  
Subscription-State: active;expires=60  
Content-Type: message/sipfrag  
Content-Length: ...

SIP/2.0 100 Trying

F18 200 OK Bob -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bfK  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 NOTIFY  
Content-Length: 0

/\* Alice establishes session with Carol which replaces the  
session between Bob and Carol \*/

F19 INVITE Alice -> Carol

INVITE sips:39itp34klkd@chicago.example.com;gr SIP/2.0  
Via: SIP/2.0/TLS chicago.example.com:5061  
;branch=z9hG4bKadfe4ko  
To: Carol <sips:39itp34klkd@chicago.example.com>  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=3461  
Call-ID: 9435674543@atlanta.example.com  
CSeq: 1 INVITE  
Require: replaces  
Referred-By: <sips:bob@biloxi.example.com>  
Replaces: sdjfdjfskdf@biloxi.example.com  
;to-tag=5f35a3;from-tag=8675309  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844989 2890844989 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 3458 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F20 200 OK Carol -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS chicago.example.com:5061  
;branch=z9hG4bKadfe4ko



;received=192.0.2.103  
To: Carol <sips:39itp34klkd@chicago.example.com>;tag=ff3a  
From: Alice <sips:alice@atlanta.example.com>;tag=3461  
Call-ID: 9435674543@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:39itp34klkd@chicago.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces, gruu  
Content-Type: application/sdp  
Content-Length: ...  
  
v=0  
o=carol 2890844221 2890844221 IN IP4 client.chicago.example.com  
s=  
c=IN IP4 client.chicago.example.com  
t=0 0  
m=audio 49172 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F21 ACK Alice -> Carol

ACK sips:39itp34klkd@chicago.example.com;gr SIP/2.0  
Via: SIP/2.0/TLS chicago.example.com:5061  
;branch=z9hG4bKadfe4kU3  
To: Carol <sips:39itp34klkd@chicago.example.com>;tag=ff3a  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=3461  
Call-ID: 9435674543@atlanta.example.com  
CSeq: 1 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

/\* Carol then disconnects from Bob \*/

F22 BYE Carol -> Bob

BYE sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bfE  
To: Bob <sips:bob@biloxi.example.com>;tag=8675309  
Max-Forwards: 70  
From: Carol <sips:carol@chicago.example.com>;tag=5f35a3  
Call-ID: sdjfdjfskdf@biloxi.example.com  
CSeq: 1 BYE  
Content-Length: 0

F23 200 OK Bob -> Carol

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bfE  
;received=192.0.2.123  
To: Bob <sips:bob@biloxi.example.com>;tag=8675309  
From: Carol <sips:carol@chicago.example.com>;tag=5f35a3  
Call-ID: sdjfdjfskdf@biloxi.example.com  
CSeq: 1 BYE  
Content-Length: 0

/\* Alice tells Bob that the call has been  
successfully transferred \*/

F24 NOTIFY Alice -> Bob

NOTIFY sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf2N  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: 12345600@atlanta.example.com  
CSeq: 3 NOTIFY  
Event: refer  
Subscription-State: terminated;reason=noresource  
Contact: <sips:alice@client.atlanta.example.com>  
Content-Type: message/sipfrag  
Content-Length: ...

SIP/2.0 200 OK  
Via: SIP/2.0/TLS chicago.example.com:5061  
;branch=z9hG4bKadfe4ko  
;received=192.0.2.103  
To: Carol <sips:39itp34klkd@chicago.example.com>;tag=ff3a  
From: Alice <sips:alice@atlanta.example.com>;tag=3461  
Call-ID: 9435674543@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:39itp34klkd@chicago.example.com>

F25 200 OK Bob -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567

To: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: 12345600@atlanta.example.com  
CSeq: 3 NOTIFY  
Content-Length: 0

/\* Bob disconnects with Alice \*/

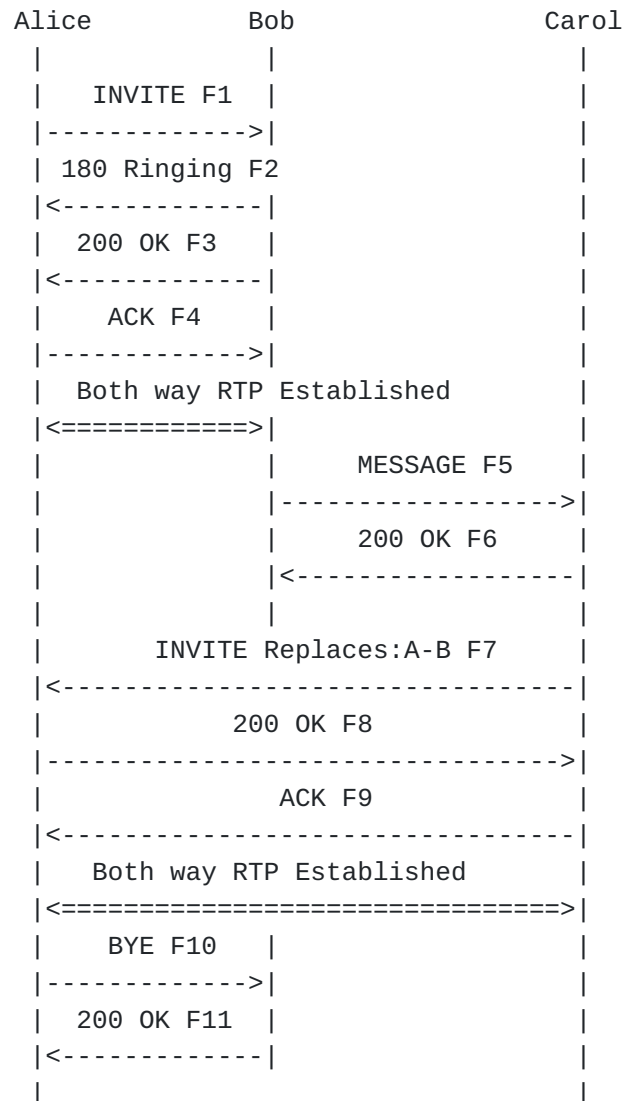
F26 BYE Bob -> Alice

BYE sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7P  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=23431  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1026 BYE  
Content-Length: 0

F27 200 OK Alice -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7P  
;received=192.0.2.113  
From: Bob <sips:bob@biloxi.example.com>;tag=23431  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1026 BYE  
Content-Length: 0

## 2.6. Transfer - Instant Messaging



In this scenario, Alice and Bob establish a session between them. Bob wants Carol to take the call so sends an Instant Message (IM) to Carol containing Alice's URI and an embedded Replaces header field. If Carol clicks on the URI, Carol's SIP UA sends an INVITE to Alice which replaces the session with Bob.

This scenario shows the use of the SIP [MESSAGE \(Campbell, B., Rosenberg, J., Schulzrinne, H., Huitema, C., and D. Gurle, "Session Initiation Protocol \(SIP\) Extension for Instant Messaging," December 2002.\)](#) [RFC3428] method to pass the URI. However, another IM protocol or other method could have been used to pass the URI from Bob to Carol.

Message Details

F1 INVITE Alice -> Bob

INVITE sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:a8342043f@atlanta.example.com;gr>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces, gruu  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F2 180 Ringing Bob -> Alice

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=3145678  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Content-Length: 0

F3 200 OK Bob -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=3145678  
Call-ID: 12345600@atlanta.example.com

Contact: <sips:bob@client.biloxi.example.com>  
CSeq: 1 INVITE  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY, MESSAGE  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844527 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F4 ACK Alice -> Bob

ACK sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74r  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=3145678  
Call-ID: 12345600@atlanta.example.com  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
CSeq: 1 ACK  
Content-Length: 0

/\* Bob IMs Carol \*/

F5 MESSAGE Bob -> Carol

MESSAGE sips:carol@chicago.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnash  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>  
Call-ID: sdjfdjfskdf@biloxi.example.com  
CSeq: 42 MESSAGE  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY, MESSAGE  
Supported: replaces  
Content-Type: text/html  
Content-Length: ...

<HTML>Do you want to take this call from  
<allOneLine>

```
<A HREF="sips:a8342043f@atlanta.example.com;gr?Replaces=
12345600@atlanta.example.com%3Bto-tag%3D3145678
%3Bfrom-tag%3D1234567&Require=replaces">
Alice</A>?
</allOneLine>
</HTML>
```

F6 200 OK Carol -> Bob

```
SIP/2.0 200 OK
Via: SIP/2.0/TLS client.biloxi.example.com:5061
    ;branch=z9hG4bKnash
    ;received=192.0.2.113
From: Bob <sips:bob@biloxi.example.com>;tag=8675309
To: Carol <sips:carol@chicago.example.com>;tag=5f35a3
Call-ID: sdjfdjfskdf@biloxi.example.com
CSeq: 42 MESSAGE
Contact: <sips:carol@client.chicago.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY, MESSAGE
Supported: replaces
Content-Length: 0
```

/\* Carol takes the call from Bob \*/

F7 INVITE Carol -> Alice

```
INVITE sips:a8342043f@atlanta.example.com;gr SIP/2.0
Via: SIP/2.0/TLS pc.biloxi.example.com:5061
    ;branch=z9hG4bK74HH
Max-Forwards: 70
From: Carol <sips:carol@chicago.example.com>;tag=8675310
To: Alice <sips:a8342043f@atlanta.example.com;gr>
Call-ID: 563456212@b2.chicago.example.com
CSeq: 1 INVITE
Require: replaces
Replaces: 12345600@atlanta.example.com
    ;to-tag=3145678;from-tag=1234567
Contact: <sips:carol@client.chicago.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY, MESSAGE
Supported: replaces
Content-Type: application/sdp
Content-Length: ...
```

```
v=0
o=carol 2890843122 2890843122 IN IP4 client.chicago.example.com
s=
c=IN IP4 client.chicago.example.com
t=0 0
```

m=audio 5342 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

/\* Alice matches the dialog information in the  
Replaces header and accepts the INVITE \*/

F8 200 OK Alice -> Carol

SIP/2.0 200 OK  
Via: SIP/2.0/TLS pc.biloxi.example.com:5061  
;branch=z9hG4bK74HH  
;received=192.0.2.114  
From: Carol <sips:carol@chicago.example.com>;tag=8675310  
To: Alice <sips:a8342043f@atlanta.example.com;gr>;tag=131256  
Call-ID: 563456212@b2.chicago.example.com  
CSeq: 1 INVITE  
Contact: <sips:a8342043f@atlanta.example.com;gr>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces, gruu  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 289084543 289084543 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49172 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F9 ACK Carol -> Alice

ACK sips:a8342043f@atlanta.example.com;gr SIP/2.0  
Via: SIP/2.0/TLS b2.biloxi.example.com:5061  
;branch=z9hG4bK7435  
Max-Forwards: 70  
From: Carol <sips:carol@chicago.example.com>;tag=8675310  
To: Alice <sips:a8342043f@atlanta.example.com;gr>;tag=131256  
Call-ID: 563456212@b2.chicago.example.com  
CSeq: 1 ACK  
Content-Length: 0

/\* RTP streams are established between Alice and Carol.  
Alice Hangs Up with Bob due to the Replaces header field. \*/

F10 BYE Alice -> Bob



BYE sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=3145678  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

F11 200 OK Bob -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=3145678  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

## 2.7. Call Forwarding Unconditional

Alice	Proxy	Gateway
INVITE F1		
----->		
(100 Trying) F2		
<-----		
(181 Call Is Being Forwarded) F3		
<-----	INVITE F4	
	----->	
	180 Ringing F5	
180 Ringing F6	<-----	
<-----	200 OK F7	
200 OK F8	<-----	
<-----		
ACK F9		
----->	ACK F10	
	----->	
Both way RTP Established		
<=====		
BYE F11		
----->	BYE F12	
	----->	
	200 OK F13	
200 OK F14	<-----	
<-----		

Bob wants all calls forwarded to the PSTN (which is just another URI to the proxy server). Alice calls Bob. The proxy server rewrites the Request URI, and forwards the INVITE to a Gateway. Details of messaging behind the Gateway are not shown.

Note that the 181 Call Is Being Forwarded response does not have a To tag added as the proxy does not wish to establish an early dialog with Alice. Strictly speaking, the proxy is behaving as a User Agent in this case as a proxy can not generate non-100 provisional responses.

Note also that forwarding could be accomplished using a redirect (302 Moved Temporarily response).

Message Details

F1 INVITE Alice -> Proxy

```
INVITE sips:bob@biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf9
Max-Forwards: 70
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:alice@client.atlanta.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Content-Type: application/sdp
Content-Length: ...

v=0
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com
s=
c=IN IP4 client.atlanta.example.com
t=0 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F2 (100 Trying) Proxy -> Alice

```
SIP/2.0 100 Trying
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf9
    ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Content-Length: 0
```

F3 (181 Call is Being Forwarded) Proxy -> Alice

```
SIP/2.0 181 Call is Being Forwarded
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf9
    ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=9214d
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Content-Length: 0
```

/\* Proxy forwards call by rewriting Request-URI \*/

F4 INVITE Proxy -> Gateway

INVITE sip:+19727293660@gw1.example.com;user=phone SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Content-Type: application/sdp  
Content-Length: ...

v=0

o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F5 180 Ringing Gateway -> Proxy

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:+19727293660@gw1.example.com;user=phone>  
Content Length:0

F6 180 Ringing Proxy -> Alice

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:+19727293660@gw1.example.com;user=phone>  
Content Length: 0

F7 200 OK Gateway -> Proxy

SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:+19727293660@gw1.example.com;user=phone>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=GATEWAY1 2890844527 2890844527 IN IP4 gatewayone.example.com  
s=  
c=IN IP4 gatewayone.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F8 200 OK Proxy -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>

From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:+19727293660@gw1.example.com;user=phone>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Content-Type: application/sdp  
Content-Length: ...  
  
v=0  
o=GATEWAY1 2890844527 2890844527 IN IP4 gatewayone.example.com  
s=  
c=IN IP4 gatewayone.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F9 ACK Alice -> Proxy

ACK sips:+19727293660@gw1.example.com;user=phone SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf31  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

F10 ACK Proxy -> Gateway

ACK sips:+19727293660@gw1.example.com;user=phone SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749ws.1  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf31  
;received=192.0.2.103  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

F11 BYE Alice -> Proxy

BYE sips:+19727293660@gw1.example.com;user=phone SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bfJe  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

F12 BYE Proxy -> Gateway

BYE sips:+19727293660@gw1.example.com;user=phone SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749G1  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bfJe  
;received=192.0.2.103  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

F13 200 OK Gateway -> Proxy

SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749G1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bfJe  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

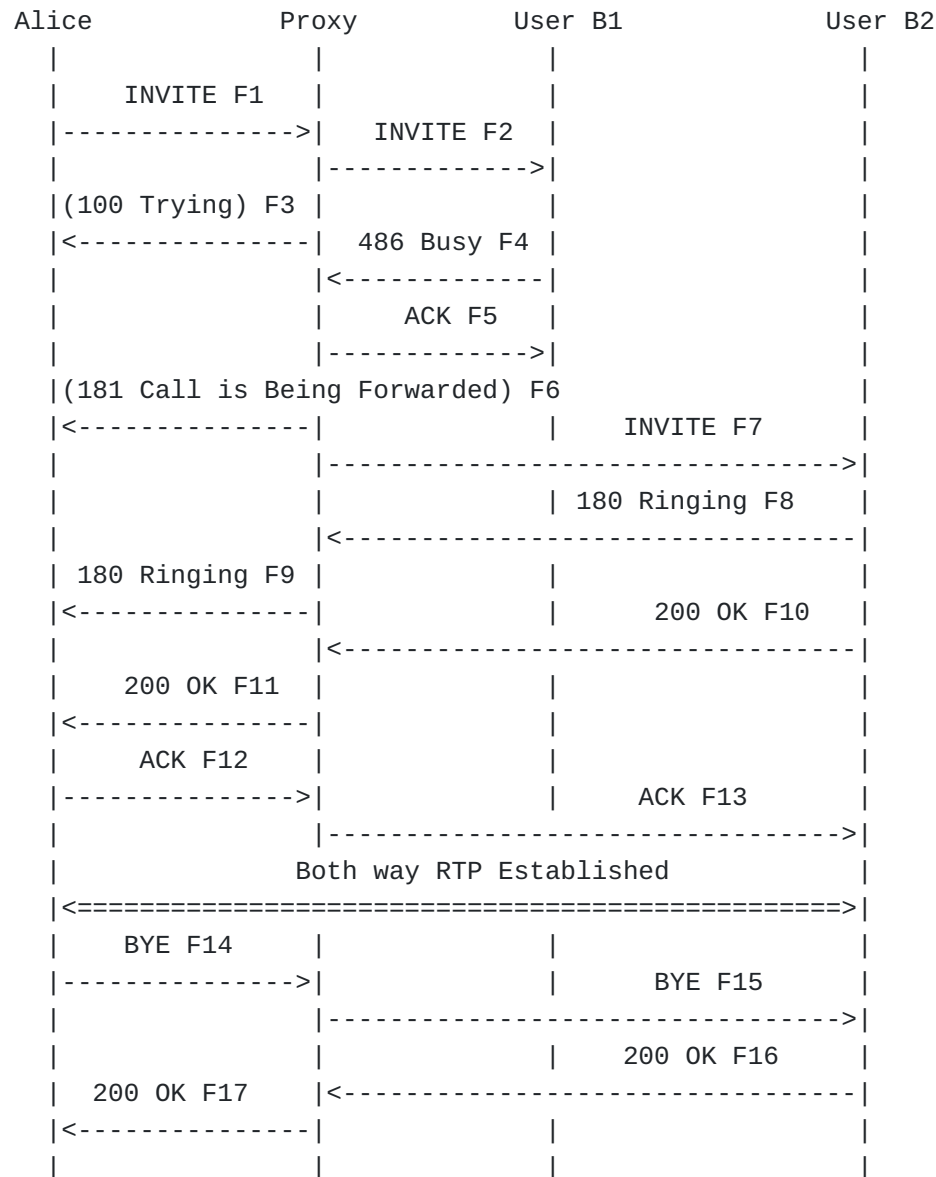
F14 200 OK Proxy -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bfJe  
;received=192.0.2.103

From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

2.8. Call Forwarding - Busy

[TOC](#)



Bob wants calls to B1 forwarded to B2 if B1 is busy (this information is known to the proxy). Alice calls B1, B1 is busy, the proxy server places call to B2.



## Message Details

F1 INVITE Alice -> Proxy

```
INVITE sips:bob@biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf9
Max-Forwards: 70
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:alice@client.atlanta.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Content-Type: application/sdp
Content-Length: ...
```

```
v=0
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com
s=
c=IN IP4 client.atlanta.example.com
t=0 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F2 INVITE Proxy -> B1

```
INVITE sips:bob@client.biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS ss1.example.com:5061
    ;branch=z9hG4bK83749.1
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf9
    ;received=192.0.2.103
Record-Route: <sips:ss1.example.com;lr>
Max-Forwards: 69
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:alice@client.atlanta.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Content-Type: application/sdp
Content-Length: ...
```

```
v=0
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com
s=
c=IN IP4 client.atlanta.example.com
t=0 0
```

m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F3 (100 Trying) Proxy -> Alice

SIP/2.0 100 Trying  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Content-Length: 0

F4 486 Busy Here B1 -> Proxy

SIP/2.0 486 Busy Here  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=765432  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Content-Length: 0

F5 ACK Proxy -> B1

ACK sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=765432  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

F6 (181 Call is Being Forwarded) Proxy -> Alice

SIP/2.0 181 Call is Being Forwarded  
Via: SIP/2.0/TLS client.atlanta.example.com:5061

;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=9214d  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Content-Length: 0

/\* The proxy now forwards the call to B2 \*/

F7 INVITE Proxy -> B2

INVITE sips:bob@client2.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.2  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F8 180 Ringing B2 -> Proxy

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.2  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567

To: Bob <sips:bob@biloxi.example.com>;tag=7654321  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client2.biloxi.example.com>  
Content-Length: 0

F9 180 Ringing Proxy -> Alice

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=7654321  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client2.biloxi.example.com>  
Content-Length: 0

F10 200 OK B2 -> Proxy

SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.2  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=7654321  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client2.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844527 IN IP4 client2.biloxi.example.com  
s=  
c=IN IP4 client2.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F11 200 OK Proxy -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=7654321  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client2.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844527 IN IP4 client2.biloxi.example.com  
s=  
c=IN IP4 client2.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F12 ACK Alice -> Proxy

ACK sips:bob@client2.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bfX  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=7654321  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

F13 ACK Proxy -> B2

ACK sips:bob@client2.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83731  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bfX  
;received=192.0.2.103  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=7654321

Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

/\* RTP streams are established between A and B2 \*/

/\* Alice eventually hangs up with User B2. \*/

F14 BYE Alice -> Proxy

BYE sips:bob@client2.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bW4  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=7654321  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

F15 BYE Proxy -> B2

BYE sips:bob@client2.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK837493  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bW4  
;received=192.0.2.103  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=7654321  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

F16 200 OK B2 -> Proxy

SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK837493  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bW4  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567

To: Bob <sips:bob@biloxi.example.com>;tag=7654321  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

F17 200 OK Proxy -> Alice

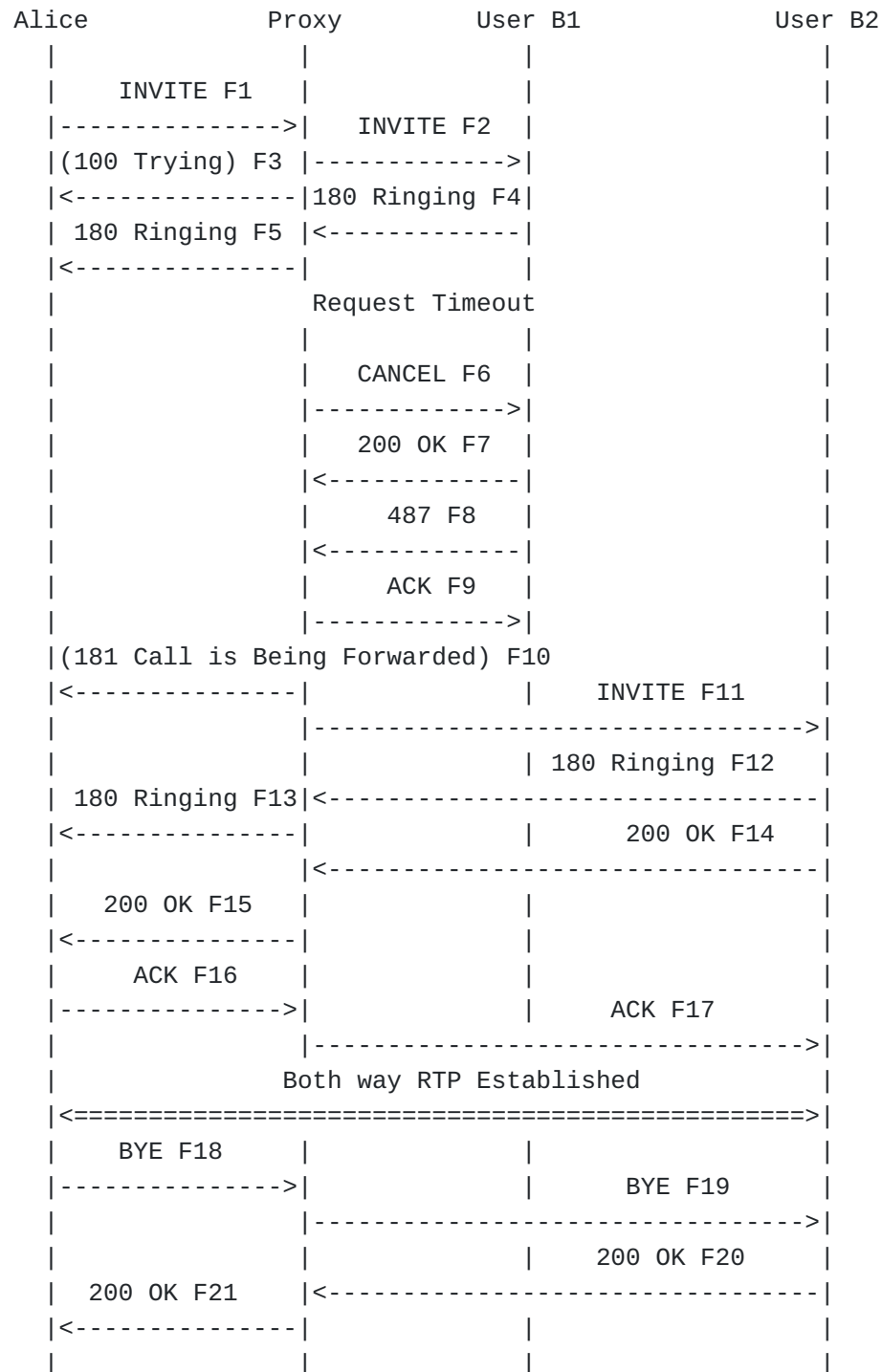
SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bw4  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=7654321  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

---

[TOC](#)



## 2.9. Call Forwarding - No Answer



Bob wants calls to B1 forwarded to B2 if B1 is not answered (information is known to the proxy server). Alice calls B1 and no one answers. The proxy server then places the call to B2.

Message Details

F1 INVITE Alice -> Proxy

```
INVITE sips:bob@biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf9
Max-Forwards: 70
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:alice@client.atlanta.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Content-Type: application/sdp
Content-Length: ...
```

```
v=0
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com
s=
c=IN IP4 client.atlanta.example.com
t=0 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F2 INVITE Proxy -> B1

```
INVITE sips:bob@client.biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS ss1.example.com:5061
    ;branch=z9hG4bK83749.1
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf9
    ;received=192.0.2.103
Record-Route: <sips:ss1.example.com;lr>
Max-Forwards: 69
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:alice@client.atlanta.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Content-Type: application/sdp
Content-Length: ...
```

```
v=0
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com
s=
c=IN IP4 client.atlanta.example.com
t=0 0
```

m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F3 (100 Trying) Proxy -> Alice

SIP/2.0 100 Trying  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Content-Length: 0

F4 180 Ringing B1 -> Proxy

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=3145678  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Content-Length: 0

F5 180 Ringing Proxy -> Alice

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=3145678  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Content-Length: 0

/\* B1 rings until a configurable timer expires in the Proxy. The  
Proxy sends Cancel and proceeds down the list of routes. \*/

F6 CANCEL Proxy -> B1

CANCEL sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 CANCEL  
Content-Length: 0

F7 200 OK B1 -> Proxy

SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
;received=192.0.2.54  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=329d823  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 CANCEL  
Content-Length: 0

F8 487 Request Terminated B1 -> Proxy

SIP/2.0 487 Request Terminated  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=3145678  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Content-Length: 0

F9 ACK Proxy -> B1

ACK sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1

Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=3145678  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

F10 (181 Call is Being Forwarded) Proxy -> Alice

SIP/2.0 181 Call is Being Forwarded  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=9214d  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Content-Length: 0

F11 INVITE Proxy -> B2

INVITE sips:bob@client2.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.2  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F12 180 Ringing B2 -> Proxy

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.2  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=765432  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client2.biloxi.example.com>  
Content-Length: 0

F13 180 Proxy -> Alice

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=765432  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client2.biloxi.example.com>  
Content-Length: 0

F14 200 OK B2 -> Proxy

SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.2  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=765432  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client2.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Content-Type: application/sdp

Content-Length: ...

v=0  
o=bob 2890844527 2890844527 IN IP4 client2.biloxi.example.com  
s=  
c=IN IP4 client2.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F15 200 OK Proxy -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=765432  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client2.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844527 IN IP4 client2.biloxi.example.com  
s=  
c=IN IP4 client2.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F16 ACK Alice -> Proxy

ACK sips:bob@client2.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf3  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=765432  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

F17 ACK Proxy -> B2

ACK sips:bob@client2.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK8374.1  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf3  
;received=192.0.2.103  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=765432  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

/\* RTP streams are established between A and B2.  
Alice Hangs Up with User B2. \*/

F18 BYE Alice -> Proxy

BYE sips:bob@client2.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74b3f  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=765432  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

F19 BYE Proxy -> B2

BYE sips:bob@client2.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK837.1  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74b3f  
;received=192.0.2.103  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=765432  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

F20 200 OK B2 -> Proxy



SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK837.1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74b3f  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=765432  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

F21 200 OK Proxy -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74b3f  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=765432  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

## 2.10. 3-way Conference - Third Party is Added

Alice	Bob	Carol
INVITE F1		
----->		
180 Ringing F2		
<-----		
200 OK F3		
<-----		
ACK F4		
----->		
RTP		
<=====		
INVITE F5		
<-----		
200 OK F6		
----->		
ACK F7		
<-----	INVITE F8	
	----->	
	180 F9	
	<-----	
	200 OK F10	
	<-----	
	ACK F11	
	----->	
	RTP	
	<=====	

In this scenario, Alice and Bob are in a 2-party call (session) when Bob wishes to add Carol into the conversation. Bob is capable of media mixing in a 3-party call. Bob first sends a re-INVITE to Alice changing Contact URIs to one that indicates Bob's mixer and acts like a focus. As a result, Bob includes the ["isfocus" feature tag \(Rosenberg, J., Schulzrinne, H., and P. Kyzivat, "Indicating User Agent Capabilities in the Session Initiation Protocol \(SIP\)," August 2004.\)](#) [RFC3840] as described in [\[RFC4579\] \(Johnston, A. and O. Levin, "Session Initiation Protocol \(SIP\) Call Control - Conferencing for User Agents," August 2006.\)](#). Bob then INVITEs Carol using the same Contact URI. Note that Bob could wait to re-INVITE Alice until after Carol has answered. Bob could also put Alice on hold before calling Carol

Message Details

F1 INVITE Alice -> Bob

INVITE sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F2 180 Ringing Bob -> Alice

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:b54gh42f5@biloxi.example.com>  
Content-Length: 0

F3 200 OK Bob -> Alice

SIP/2.0 200 OK

Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=23431

Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:b54gh42f5@biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces, gruu  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844527 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F4 ACK Alice -> Bob

ACK sips:b54gh42f5@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bFL  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

/\* Alice and Bob have established a session.  
Bob re-INVITES changing Contact URIs \*/

F5 INVITE Bob -> Alice

INVITE sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=23431  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1024 INVITE  
Contact: <sips:bob-Mixer@client.biloxi.example.com>;isfocus  
Content-Type: application/sdp  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces, gruu  
Content-Length: ...

v=0

o=bob 2890844527 2890844528 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 49172 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F6 200 OK Alice -> Bob

SIP/2.0 200 OK

Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
;received=192.0.2.113  
From: Bob <sips:bob@biloxi.example.com>;tag=23431  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1024 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F7 ACK Bob -> Alice

ACK sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnash3G  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=23431  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1024 ACK  
Content-Length: 0

/\* Bob calls Carol \*/

F8 INVITE Bob -> Carol

INVITE sips:carol@chicago.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashJfd  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>  
Call-ID: sdjfdjfskdf@biloxi.example.com  
CSeq: 42 INVITE  
Contact: <sips:bob-Mixer@client.biloxi.example.com>;isfocus  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces, gruu  
Content-Type: application/sdp  
Content-Length: ...  
  
v=0  
o=bob 28908445834 2890844834 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 48174 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F9 180 Ringing Carol -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashJfd  
;received=192.0.2.113  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=341313  
Call-ID: sdjfdjfskdf@biloxi.example.com  
CSeq: 42 INVITE  
Contact: <sips:carol@client.chicago.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

F10 200 OK Carol -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashJfd  
;received=192.0.2.113  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=341313  
Call-ID: sdjfdjfskdf@biloxi.example.com  
CSeq: 42 INVITE

Contact: <sips:carol@client.chicago.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=carol 2890844922 2890844922 IN IP4 client.chicago.example.com  
s=  
c=IN IP4 client.chicago.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F11 ACK Bob -> Carol

ACK sips:carol@client.chicago.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnash431  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=341313  
Call-ID: sdjfdjfskdf@biloxi.example.com  
CSeq: 42 ACK  
Content-Length: 0

/\* User B's mixer know mixes media from both A and C  
to create the 3-way conference. \*/

## 2.11. 3-way Conference - Third Party Joins

Alice	Bob	Carol
INVITE F1		
----->		
180 Ringing F2		
<-----		
200 OK F3		
<-----		
ACK F4		
----->		
RTP		
<=====	INVITE Join:A-B F5	
	<-----	
	180 F6	
	----->	
INVITE F7		
<-----		
200 OK F8		
----->		
ACK F9		
<-----		
	200 OK F10	
	----->	
	ACK F11	
	<-----	
	RTP	
	<=====	

In this scenario, Alice and Bob are in a 2 party call and Carol wishes to join resulting in a three party call. Carol could have learned Bob's dialog identifier using some non-SIP means, or possibly from a NOTIFY with the dialog package sent by Bob. Carol sends an INVITE to Bob containing a Join header identifying the dialog between Alice and Bob. Bob re-INVITES Alice to switch to focus mode and includes the ["isfocus" feature tag \(Rosenberg, J., Schulzrinne, H., and P. Kyzivat, "Indicating User Agent Capabilities in the Session Initiation Protocol \(SIP\)," August 2004.\) \[RFC3840\]](#) as described in [\[RFC4579\] \(Johnston, A. and O. Levin, "Session Initiation Protocol \(SIP\) Call Control - Conferencing for User Agents," August 2006.\)](#). Bob then accepts the INVITE from Carol, resulting in the 3-way call.

Message Details



F1 INVITE Alice -> Bob

INVITE sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F2 180 Ringing Bob -> Alice

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:b54gh42f5@biloxi.example.com>  
Content-Length: 0

F3 200 OK Bob -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: 12345600@atlanta.example.com

CSeq: 1 INVITE  
Contact: <sips:b54gh42f5@biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces, join, gruu  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844527 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F4 ACK Alice -> Bob

ACK sips:b54gh42f5@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf6  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

/\* Alice and Bob have established a session.  
Carol requests to join the session \*/

F5 INVITE Carol -> Bob

INVITE sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS chicago.example.com:5061  
;branch=z9hG4bKnashds7  
Max-Forwards: 70  
From: Carol <sips:carol@chicago.example.com>;tag=8675309  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 452k499sk@chicago.example.com  
CSeq: 99 INVITE  
Contact: <sips:carol@client.chicago.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces, join  
Join: 12345600@atlanta.example.com;from-tag=1234567;to-tag=23431  
Content-Type: application/sdp  
Content-Length: ...

v=0

o=carol 2890844922 2890844922 IN IP4 client.chicago.example.com  
s=  
c=IN IP4 client.chicago.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F6 180 Ringing Bob -> Carol

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS chicago.example.com:5061  
;branch=z9hG4bKnashds7  
;received=120.  
From: Carol <sips:carol@chicago.example.com>;tag=8675309  
To: Bob <sips:bob@biloxi.example.com>;tag=0982  
Call-ID: 452k499sk@chicago.example.com  
CSeq: 99 INVITE  
Contact: <sips:bob-Mixer@client.biloxi.example.com>;isfocus  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Length: 0

F7 INVITE Bob -> Alice

INVITE sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashdyKL  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=23431  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1024 INVITE  
Contact: <sips:bob-Mixer@client.biloxi.example.com>;isfocus  
Content-Type: application/sdp  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces, join, gruu  
Content-Length: ...

v=0  
o=bob 2890844527 2890844528 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 49172 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F8 200 OK Alice -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashdyKL  
;received=192.0.2.113  
From: Bob <sips:bob@biloxi.example.com>;tag=23431  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1024 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F9 ACK Bob -> Alice

ACK sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnash3g  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=23431  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1024 ACK  
Content-Length: 0

F10 200 OK Bob -> Carol

SIP/2.0 200 OK  
Via: SIP/2.0/TLS chicago.example.com:5061  
;branch=z9hG4bKnashds7  
;received=120.  
From: Carol <sips:carol@chicago.example.com>;tag=8675309  
To: Bob <sips:bob@biloxi.example.com>;tag=0982  
Call-ID: 452k499sk@chicago.example.com  
CSeq: 99 INVITE  
Contact: <sips:bob-Mixer@client.biloxi.example.com>;isfocus  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces, join, gruu

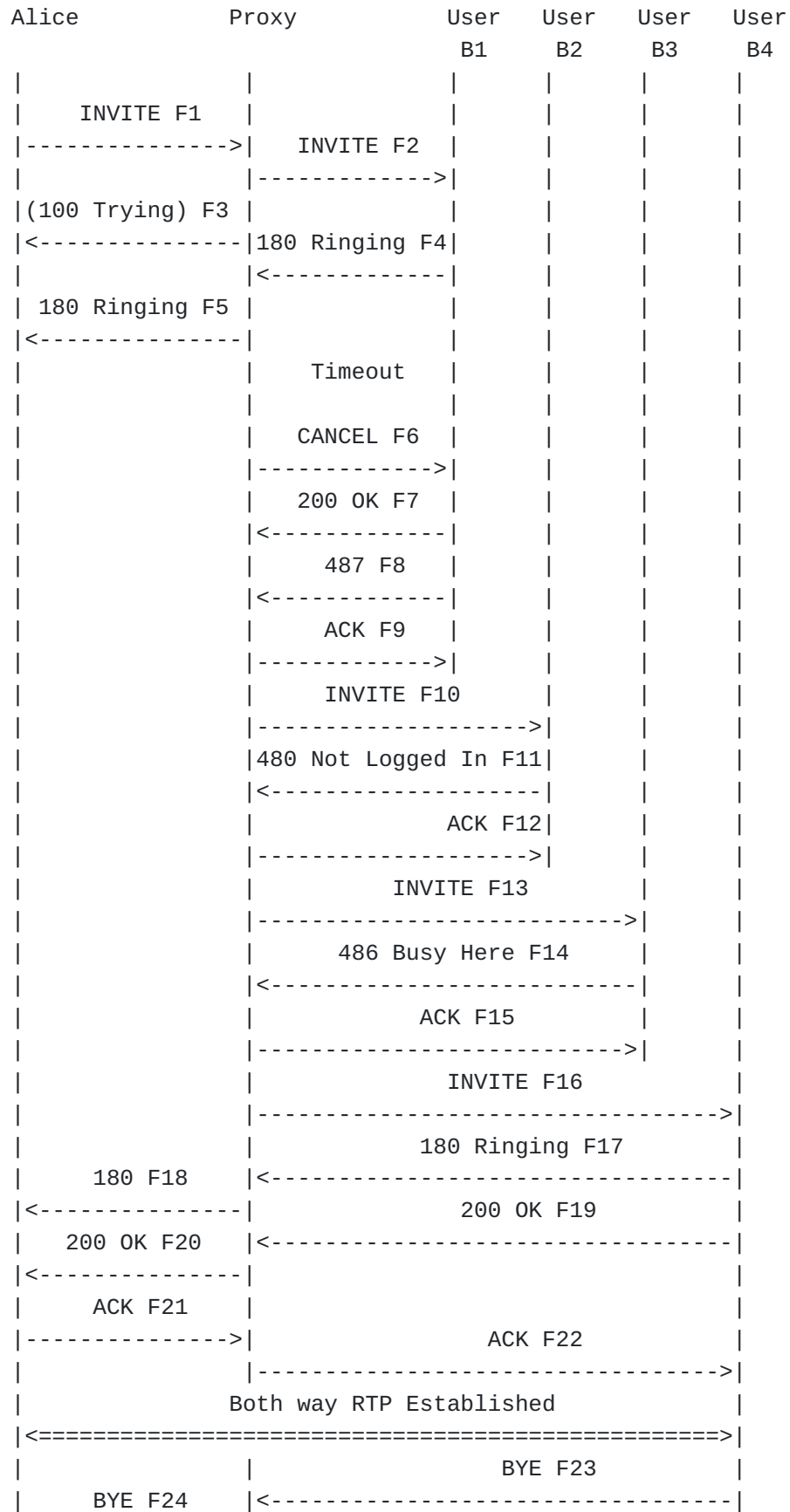
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 28908445834 2890844834 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 48174 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F11 ACK OK Carol -> Bob

ACK sips:bob-Mixer@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS chicago.example.com:5061  
;branch=z9hG4bKnash4Gf  
Max-Forwards: 70  
From: Carol <sips:carol@chicago.example.com>;tag=8675309  
To: Bob <sips:bob@biloxi.example.com>;tag=0982  
Call-ID: 452k499sk@chicago.example.com  
CSeq: 99 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces, join  
Content-Length:0

## 2.12. Find-Me





Alice's call to Bob will result in an attempt to locate that user by calling locations from a list of contacts. The location to answer the call becomes the active set, no other sets may join the call. While this flow shows a sequential search, the search could be accomplished using parallel forking, as in the previous example.

Message Details



F1 INVITE Alice -> Proxy

INVITE sip:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t= 0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F2 INVITE Proxy -> B1

INVITE sip:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t= 0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F3 (100 Trying) Proxy -> Alice

```
SIP/2.0 100 Trying
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf9
    ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Content-Length: 0
```

F4 180 Ringing B1 -> Proxy

```
SIP/2.0 180 Ringing
Via: SIP/2.0/TLS ss1.example.com:5061
    ;branch=z9hG4bK83749.1
    ;received=192.0.2.54
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf9
    ;received=192.0.2.103
Record-Route: <sips:ss1.example.com;lr>
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=765432
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:bob@client.biloxi.example.com>
Content-Length: 0
```

F5 180 Ringing Proxy -> Alice

```
SIP/2.0 180 Ringing
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf9
    ;received=192.0.2.103
Record-Route: <sips:ss1.example.com;lr>
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=765432
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:bob@client.biloxi.example.com>
Content-Length: 0
```

/\* B1 rings until a configurable timer in the Proxy  
expires. The Proxy then sends Cancel and proceeds down

the list of routes. \*/

F6 CANCEL Proxy -> B1

CANCEL sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 CANCEL  
Content-Length: 0

F7 200 OK B1 -> Proxy

SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
;received=192.0.2.54  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=765432  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 CANCEL  
Content-Length: 0

F8 487 Request Terminated B1 -> Proxy

SIP/2.0 487 Request Terminated  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=765432  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Content-Length: 0

F9 ACK Proxy -> B1

ACK sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.1  
Max-Forwards: 70

From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=765432  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

F10 INVITE Proxy -> B2

INVITE sips:bob@client2.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.2  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F11 480 Not Logged In B2 -> Proxy

SIP/2.0 480 Not Logged In  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.2  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314756  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Content-Length: 0

F12 ACK Proxy -> B2

ACK sips:bob@client2.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.2  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314756  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

F13 INVITE Proxy -> B3

INVITE sips:bob@client3.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.3  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F14 486 Busy Here B3 -> Proxy

SIP/2.0 486 Busy Here  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.3  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567

To: Bob <sips:bob@biloxi.example.com>;tag=7654321  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Content-Length: 0

F15 ACK Proxy -> B3

ACK sips:bob@client3.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.3  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=7654321  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

F16 INVITE Proxy -> B4

INVITE sips:bob@client4.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.4  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F17 180 Ringing B4 -> Proxy

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS ss1.example.com:5061

;branch=z9hG4bK83749.4  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=7137136  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client4.biloxi.example.com>  
Content-Length: 0

F18 180 Ringing Proxy -> Alice

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=7137136  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client4.biloxi.example.com>  
Content-Length: 0

F19 200 OK B4 -> Proxy

SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83749.4  
;received=192.0.2.54  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=7137136  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client4.biloxi.example.com>  
Content-Type: application/sdp  
Content-Length: ...

v=0

o=bob 2890844527 2890844527 IN IP4 client4.biloxi.example.com

s=  
c=IN IP4 client4.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F20 200 OK Proxy -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
Record-Route: <sips:ss1.example.com;lr>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=7137136  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client4.biloxi.example.com>  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844527 IN IP4 client4.biloxi.example.com  
s=  
c=IN IP4 client4.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F21 ACK Alice -> Proxy

ACK sips:bob@client4.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=7137136  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

F22 ACK Proxy -> B4

ACK sips:bob@client4.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK8374



Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf  
;received=192.0.2.103  
Max-Forwards: 69  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=7137136  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

/\* RTP streams are established between A and B4\*/

/\* User B4 Hangs Up with User A. \*/

F23 BYE B4 -> Proxy

BYE sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client4.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
Route: <sips:ss1.example.com;lr>  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=7137136  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 BYE  
Content-Length: 0

F24 BYE Proxy -> Alice

BYE sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83754  
Via: SIP/2.0/TLS client4.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
;received=192.0.2.105  
Max-Forwards: 69  
From: Bob <sips:bob@biloxi.example.com>;tag=7137136  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 BYE  
Content-Length: 0

F25 200 OK Alice -> Proxy

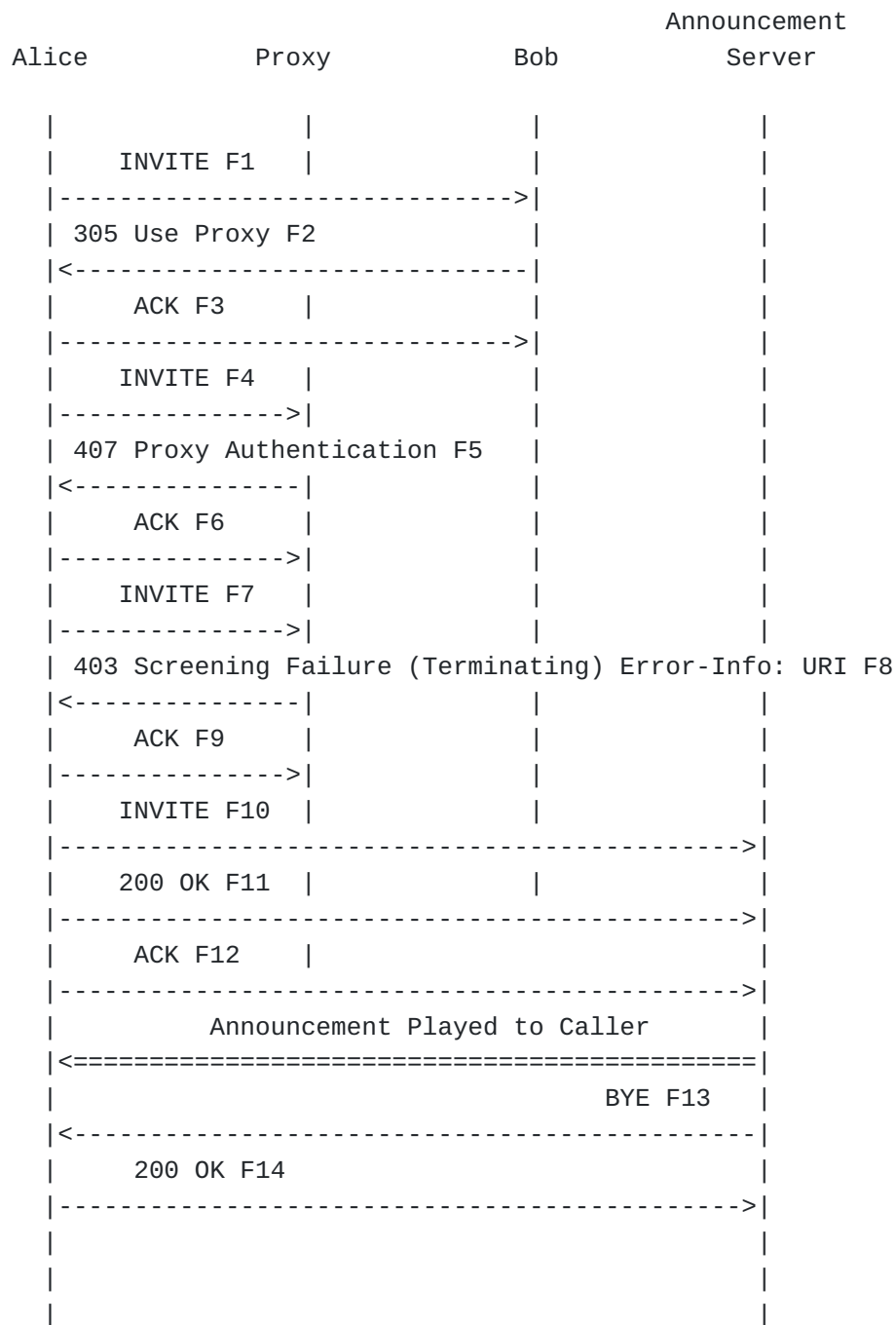
SIP/2.0 200 OK  
Via: SIP/2.0/TLS ss1.example.com:5061  
;branch=z9hG4bK83754

;received=192.0.2.54  
Via: SIP/2.0/TLS client4.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
;received=192.0.2.105  
From: Bob <sips:bob@biloxi.example.com>;tag=7137136  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 BYE  
Content-Length: 0

F26 200 OK Proxy -> B4

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client4.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
;received=192.0.2.105  
From: Bob <sips:bob@biloxi.example.com>;tag=7137136  
To: Alice <sips:alice@atlanta.example.com>;tag=1234567  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 BYE  
Content-Length: 0

### 2.13. Call Management (Incoming Call Screening)



Bob has an incoming call screening list, Alice is included on the list of addresses Bob will not accept calls from. Alice attempts to call Bob. Messages F1, F2, and F3 are included to show that Bob does not accept INVITEs that have not been screened by the proxy. Note that call screening can not be done using the From header - instead some form of authentication credentials must be used. The screening proxy inserts an announcement URI in an Error-Info header field which Alice accesses by sending an INVITE to listen to the

Announcement. The Announcement Server uses the automaton and rendering feature tags in F12 and F13 to indicate that it is a media server only capability of playing announcements.

Message Details

F1 INVITE Alice -> Bob

```
INVITE sip:bob@biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf9
Max-Forwards: 70
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:alice@client.atlanta.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Content-Type: application/sdp
Content-Length: ...

v=0
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com
s=
c=IN IP4 client.atlanta.example.com
t=0 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

```
/* Bob only accepts INVITEs that have been screened
   by the proxy */
```

F2 305 Use Proxy Bob -> Alice

```
SIP/2.0 305 Use Proxy
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf9
    ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=342123
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:ss1.example.com>
Content-Length: 0
```

F3 ACK Alice -> Bob

```
ACK sip:bob@biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf9
Max-Forwards: 70
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
```

To: Bob <sips:bob@biloxi.example.com>;tag=342123  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

/\* A retries the call through the proxy \*/

F4 INVITE Alice -> Proxy 1

INVITE sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf0  
Max-Forwards: 70  
Route: <sips:ss1.example.com>  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

/\* Proxy 1 challenges Alice for authentication \*/

F5 407 Proxy Authentication Required Proxy 1 -> Alice

SIP/2.0 407 Proxy Authentication Required  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf0  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=7886765  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 INVITE  
Proxy-Authenticate: Digest realm="example.com",  
nonce="ea9c8e88df84f1cec4341ae6cbe5a359",  
qop="auth", nc=00000001, cnonce="0a4f113b",  
opaque="", stale=FALSE, qop="auth", algorithm=MD5  
Content-Length: 0

F6 ACK Alice -> Proxy 1

```
ACK sips:bob@biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf0
Max-Forwards: 70
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=7886765
Call-ID: 12345600@atlanta.example.com
CSeq: 2 ACK
Content-Length: 0
```

/\* Alice responds by sending an INVITE with authentication  
credentials in it. \*/

F7 INVITE Alice -> Proxy 1

```
INVITE sips:bob@biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf2
Max-Forwards: 70
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>
Call-ID: 12345600@atlanta.example.com
CSeq: 3 INVITE
Contact: <sips:alice@client.atlanta.example.com>
Proxy-Authorization: Digest username="alice",
    realm="example.com", qop="auth",
    nc=00000001, cnonce="4gr84543ft2",
    nonce="ae9137be1c87d175c2dd63302a0d6e0a",
    opaque="", uri="sips:bob@biloxi.example.com",
    response="bbaec39f943bdc3620d90afc548a45c"
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Content-Type: application/sdp
Content-Length: ...

v=0
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com
s=
c=IN IP4 client.atlanta.example.com
t=0 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F8 403 Screening Failure (Terminating) Proxy 1 -> Alice

SIP/2.0 403 Screening Failure (Terminating)  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf2  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=ffe254  
Call-ID: 12345600@atlanta.example.com  
CSeq: 3 INVITE  
Error-Info: <sips:screen-fail-term-ann@ms.biloxi.example.com>  
Content-Length: 0

F9 ACK Alice -> Proxy 1

ACK sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf2  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=ffe254  
Call-ID: 12345600@atlanta.example.com  
Proxy-Authorization: Digest username="alice",  
realm="example.com", nonce="ae9137be1c87d175c2dd63302a0d6e0a",  
opaque="", uri="sips:bob@biloxi.example.com",  
response="bbaec39f943bdcb3620d90afc548a45c"  
CSeq: 3 ACK  
Content-Length: 0

/\* To hear the recording, Alice connects to the Error-Info URI \*/

F10 INVITE Alice -> Proxy 1

INVITE sips:screen-fail-term-ann@ms.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bfj  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 4 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com



t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F11 200 OK Announcement Server -> Proxy 1

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bfj  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=234934  
Call-ID: 12345600@atlanta.example.com  
CSeq: 4 INVITE  
Contact: <sips:ms.biloxi.example.com>  
;automaton;+sip.rendering="no"  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=annc 2890844543 2890844543 IN IP4 announce.biloxi.example.com  
s=  
c=IN IP4 announce.biloxi.example.com  
t=0 0  
m=audio 49174 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F12 ACK Alice -> Announcement Server

ACK sips:ms.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74b32  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=234934  
Call-ID: 12345600@atlanta.example.com  
CSeq: 4 ACK  
Content-Length: 0

/\* Announcement Server plays announcement then disconnects \*/

F13 BYE Announcement Server -> Alice

BYE sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS announcement.example.com:5061  
;branch=z9hG4bK74bKS

```

Max-Forwards: 70
From: Bob <sips:bob@biloxi.example.com>;tag=234934
To: Alice <sips:alice@atlanta.example.com>;tag=1234567
Call-ID: 12345600@atlanta.example.com
CSeq: 2334 BYE
Content-Length: 0

```

F14 200 OK Alice -> Announcement Server

```

SIP/2.0 200 OK
Via: SIP/2.0/TLS announcement.example.com:5061
    ;branch=z9hG4bK74bKS
    ;received=192.0.2.103
From: Bob <sips:bob@biloxi.example.com>;tag=234934
To: Alice <sips:alice@atlanta.example.com>;tag=1234567
Call-ID: 12345600@atlanta.example.com
CSeq: 2334 BYE
Content-Length: 0

```

---

## 2.14. Call Management (Outgoing Call Screening)

[TOC](#)

Alice	Proxy	Bob
INVITE F1		
----->		
407 Proxy Authentication F2		
<-----		
ACK F3		
----->		
INVITE F4		
----->		
403 Screening Failure (Originating) F5		
<-----		
ACK F6		
----->		

Alice has an outgoing call screening list, Bob is included on the list of addresses Alice will not be able to place a call to. Alice attempts to call Bob.

Alice could establish a session to listen to the announcement in the Error-Info header field.

## Message Details

F1 INVITE Alice -> Proxy 1

```
INVITE sips:bob@biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf9
Max-Forwards: 70
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:alice@client.atlanta.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Content-Type: application/sdp
Content-Length: ...

v=0
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com
s=
c=IN IP4 client.atlanta.example.com
t=0 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

/\* Proxy 1 challenges Alice for authentication \*/

F2 407 Proxy Authentication Required Proxy 1 -> Alice

```
SIP/2.0 407 Proxy Authentication Required
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf9
    ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=90210
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Proxy-Authenticate: Digest realm="example.com",
    nonce="ea9c8e88df84f1cec4341ae6cbe5a359",
    qop=auth, nc=00000001, cnonce="0a4f113b",
    opaque="", stale=FALSE, algorithm=MD5
Content-Length: 0
```

F3 ACK Alice -> Proxy 1

```
ACK sips:bob@biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74bf9
```

Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=90210  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

/\* Alice responds by sending an INVITE with authentication  
credentials in it. \*/

F4 INVITE Alice -> Proxy 1

INVITE sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74b4  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Proxy-Authorization: Digest username="alice", realm="example.com",  
nonce="cb360afc54bbaec39f943bd820d9a45c", opaque="",  
uri="sips:bob@biloxi.example.com",  
response="b9d2e5bcdec9f69ab2a9b44f270285a6"  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F5 403 Screening Failure (Originating) Proxy 1 -> Alice

SIP/2.0 403 Screening Failure (Originating)  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74b4  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=18017  
Call-ID: 12345600@atlanta.example.com  
CSeq: 2 INVITE  
Error-Info: <sips:screen-fail-orig-ann@announcement.example.com>

Content-Length: 0

F6 ACK Alice -> Proxy 1

ACK sips:bob@biloxi.example.com SIP/2.0

Via: SIP/2.0/TLS client.atlanta.example.com:5061

;branch=z9hG4bK74b4

Max-Forwards: 70

From: Alice <sips:alice@atlanta.example.com>;tag=1234567

To: Bob <sips:bob@biloxi.example.com>;tag=18017

Call-ID: 12345600@atlanta.example.com

CSeq: 2 ACK

Proxy-Authorization: Digest username="alice", realm="example.com",  
nonce="cb360afc54bbaec39f943bd820d9a45c", opaque="",  
uri="sips:bob@biloxi.example.com",  
response="b9d2e5bcdec9f69ab2a9b44f270285a6"

Content-Length: 0

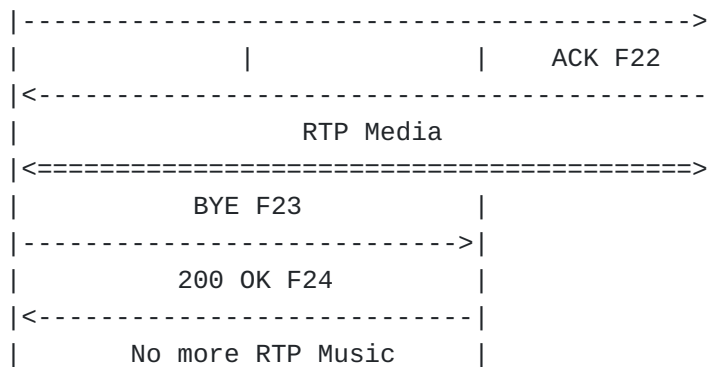
---

[TOC](#)

## 2.15. Call Park

Alice	Bob	Park Server	Carol
INVITE F1			
----->			
180 Ringing F2			
<-----			
200 OK F3			
<-----			
ACK F4			
----->			
RTP Media			
<=====			
Bob Parks Call			
	REFER Refer-To: A F5		
	----->		
	202 F6		
	<-----		
	NOTIFY F7		
	<-----		
	200 F8		
	----->		
INVITE F9 Replaces: B			
<-----			
200 OK F10			
----->			
ACK F11			
<-----			
RTP Music			
<=====			
BYE F12			
----->	NOTIFY F14		
200 OK F13	<-----		
<-----	200 OK F15		
	----->		
	Carol picks up the call		
		SUBSCRIBE F16	
		<-----	
		200 OK F17	
		----->	
		NOTIFY F18	
		----->	
		200 OK F19	
		<-----	
INVITE Replaces: Park Server F20			
<-----			
		200 F21	





In this example, Alice calls Bob. Bob then parks the call at the Park Server by sending a REFER to the Park Server. The server sends an INVITE to Alice which replaces the session between Alice and Bob. The Park Server utilizes the automaton, rendering, and byeless feature tags in F9 to indicate its capabilities to Alice. The call is accepted by Alice and causes Alice to send a BYE to Bob. Bob receives notification of the successful park, and also receives the dialog identifiers in the application/sip body of the NOTIFY response.

Carol wishes to retrieve the call, so she sends an INVITE containing the dialog identifiers to Alice which replaces the session with the Park Server. Alice accepts the call and sends a BYE to the Park Server. Carol obtains the dialog identifiers from a NOTIFY from the Park Server.

Note that this call flow is a special case of call transfer.

Note also that this flow could also be used for Music on Hold.

Message Details.

F1 INVITE Alice -> Bob

INVITE sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.alice.example.com:5061  
;branch=z9hG4bKnashds7  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:a8342043f@atlanta.example.com;gr>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, SUBSCRIBE, NOTIFY  
Supported: replaces, gruu  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F2 180 Ringing Bob -> Alice

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bKnashds7  
;received=192.0.2.105  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Content-Length: 0

F3 200 OK Bob -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bKnashds7  
;received=192.0.2.105  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com

CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, SUBSCRIBE, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844527 2890844527 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F4 ACK Alice -> Bob

ACK sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bKnashds7  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com  
CSeq: 1 ACK  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, SUBSCRIBE, NOTIFY  
Supported: replaces  
Content-Length: 0

/\* Bob REFERS Park Server to establish session with A  
which replaces the established session between A and B.  
Note that there is no session established between B  
and the Park Server. \*/

F5 REFER Bob -> Park Server

REFER sips:park@server.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds9  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=02134  
To: Park Server <sips:park@server.example.com>  
Call-ID: 4802029847@biloxi.example.com  
CSeq: 1 REFER  
<allOneLine>  
Refer-To: <sips:a8342043f@atlanta.example.com;gr?Replaces=  
12345601%40atlanta.example.com%3Bfrom-tag%3D314159  
%3Bto-tag%3D1234567&Require=replaces>

</allOneLine>

Referred-By: <sips:bob@biloxi.example.com>  
Contact: <sips:bob@client.biloxi.example.com>  
Content-Length: 0

F6 202 Accepted Park Server -> Bob

SIP/2.0 202 Accepted  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds9  
;received=192.0.2.105  
From: Bob <sips:bob@biloxi.example.com>;tag=02134  
To: Park Server <sips:park@server.example.com>;tag=56323  
Call-ID: 4802029847@biloxi.example.com  
Contact: <sips:park@server.example.com>  
CSeq: 1 REFER  
Content-Length: 0

F7 NOTIFY Park Server -> Bob

NOTIFY sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS server.example.com:5061  
;branch=z9hG4bK74bT6  
To: Bob <sips:bob@biloxi.example.com>;tag=02134  
Max-Forwards: 70  
From: Park Server <sips:park@server.example.com>;tag=56323  
Call-ID: 4802029847@biloxi.example.com  
CSeq: 1 NOTIFY  
Event: refer  
Contact: <sips:park@server.example.com>  
Subscription-State: active;expires=60  
Content-Type: message/sipfrag  
Content-Length: ...

SIP/2.0 100 Trying

F8 200 OK Bob -> Park Server

SIP/2.0 200 OK  
Via: SIP/2.0/TLS server.example.com:5061  
;branch=z9hG4bK74bT6  
;received=192.0.2.103  
To: Bob <sips:bob@biloxi.example.com>;tag=02134  
From: Park Server <sips:park@server.example.com>;tag=56323  
Call-ID: 4802029847@biloxi.example.com  
CSeq: 1 NOTIFY  
Content-Length: 0

/\* Park Server places call to Alice to replace session  
between Alice and Bob. \*/

F9 INVITE Park Server -> Alice

INVITE sips:a8342043f@atlanta.example.com;gr SIP/2.0  
Via: SIP/2.0/TLS server.example.com:5061  
;branch=z9hG4bK74rf  
Max-Forwards: 70  
From: <sips:park@server.example.com>;tag=0111  
To: <sips:a8342043f@atlanta.example.com;gr>  
Call-ID: a5-75-34-12-76@server.example.com  
CSeq: 1 INVITE  
Referred-By: <sips:bob@biloxi.example.com>  
Contact: <sips:park@server.example.com>;automaton  
;+sip.byeless;+sip.rendering="no"  
Require: replaces  
Replaces: 12345601@atlanta.example.com  
;from-tag=314159;to-tag=1234567  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, SUBSCRIBE, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=ParkServer 2890844576 2890844576 IN IP4 Park.server.example.com  
s=  
c=IN IP4 server.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F10 200 OK Alice -> Park Server

SIP/2.0 200 OK  
Via: SIP/2.0/TLS server.example.com:5061  
;branch=z9hG4bK74rf  
;received=192.0.2.103  
From: <sips:park@server.example.com>;tag=0111  
To: <sips:a8342043f@atlanta.example.com;gr>;tag=098594  
Call-ID: a5-75-34-12-76@server.example.com  
CSeq: 1 INVITE  
Contact: <sips:a8342043f@atlanta.example.com;gr>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, SUBSCRIBE, NOTIFY  
Supported: replaces, gruu  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000  
a=recvonly

F11 ACK Park Server -> Alice

ACK sips:a8342043f@atlanta.example.com;gr SIP/2.0  
Via: SIP/2.0/TLS server.example.com:5061  
;branch=z9hG4bK7rfF  
Max-Forwards: 70  
From: <sips:park@server.example.com>;tag=0111  
To: <sips:a8342043f@atlanta.example.com;gr>;tag=098594  
Call-ID: a5-75-34-12-76@server.example.com  
CSeq: 1 ACK  
Content-Length: 0

F12 BYE Alice -> Bob

BYE sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bKnashds7  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

F13 200 OK Bob -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bKnashds7  
;received=192.0.2.105  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 12345601@atlanta.example.com  
CSeq: 2 BYE  
Content-Length: 0

```
/* Park Server reports success back to Bob by returning
   a 200 OK response. Bob obtains the dialog identifiers
   from the headers included in the response. */
```

F14 NOTIFY Park Server -> Bob

```
NOTIFY sips:bob@client.biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS server.example.com:5061
    ;branch=z9hG4bK74bf9
To: Bob <sips:bob@biloxi.example.com>;tag=02134
Max-Forwards: 70
From: Park Server <sips:park@server.example.com>;tag=56323
Call-ID: 4802029847@biloxi.example.com
CSeq: 2 NOTIFY
Event: refer
Subscription-State: terminated;reason=noresource
Contact: <sips:park@server.example.com>;automaton
    ;sip.byeless;sip.rendering="no"
Content-Type: message/sipfrag
Content-Length: ...
```

```
SIP/2.0 200 OK
Via: SIP/2.0/TLS server.example.com:5061
    ;branch=z9hG4bK74rf
    ;received=192.0.2.103
From: <sips:park@server.example.com>;tag=0111
To: <sips:a8342043f@atlanta.example.com;gr>;tag=098594
Call-ID: a5-75-34-12-76@server.example.com
CSeq: 1 INVITE
Contact: <sips:a8342043f@atlanta.example.com;gr>
```

F15 200 OK Bob -> Park Server

```
SIP/2.0 200 OK
Via: SIP/2.0/TLS server.example.com:5061
    ;branch=z9hG4bK74bf9
    ;received=192.0.2.103
To: Bob <sips:bob@biloxi.example.com>;tag=02134
From: Park Server <sips:park@server.example.com>;tag=56323
Call-ID: 4802029847@biloxi.example.com
CSeq: 2 NOTIFY
Content-Length: 0
```

```
/* Alice is now parked at the Park Server */
```

```
/* Carol picks up the call by sending an INVITE to A which
   replaces the existing session with the Park/Park Server.
   Carol needs to know the dialog information to construct
```

the Replaces header. \*/

F16 SUBSCRIBE Carol -> Park Server

SUBSCRIBE sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.chicago.example.com:5061  
;branch=z9hG4bK74b232  
Max-Forwards: 70  
From: Carol <sips:carol@chicago.example.com>;tag=158x93461  
To: <sips:park@server.example.com>  
Call-ID: 2d6485356dfaj34dsf  
CSeq: 1 SUBSCRIBE  
Contact: <sips:carol@client.chicago.example.com>  
Event: dialog  
Expires: 0  
Accept: application/dialog-info+xml  
Content-Length: 0

F17 200 OK Park Server -> Carol

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.chicago.example.com:5061  
;branch=z9hG4bK74b232  
;received=192.0.2.105  
From: Carol <sips:carol@chicago.example.com>;tag=158x93461  
To: <sips:park@server.example.com>;tag=3213j  
Call-ID: 2d6485356dfaj34dsf  
CSeq: 1 SUBSCRIBE  
Contact: <sips:park@server.example.com>;automaton  
;+sip.byeless;+sip.rendering="no"  
Content-Length: 0

F18 NOTIFY Park Server -> Carol

NOTIFY sips:carol@client.example.com SIP/2.0  
Via: SIP/2.0/TLS server.example.com:5061  
;branch=z9hG4bK74b8skd  
Max-Forwards: 70  
To: Carol <sips:carol@chicago.example.com>;tag=158x93461  
From: <sips:park@server.example.com>;tag=3213j  
Call-ID: 2d6485356dfaj34dsf  
CSeq: 1 NOTIFY  
Contact: <sips:park@server.example.com>;automaton  
;+sip.byeless;+sip.rendering="no"  
Event: dialog  
Subscription-State: terminated;reason=timeout



Content-Type: application/dialog-info+xml  
Content-Length: ...

```
<?xml version="1.0"?>
<dialog-info xmlns="urn:ietf:params:xml:ns:dialog-info"
  version="0" state="full" entity="sips:park@server.example.com">
  <dialog id="439920143524" call-id="a5-75-34-12-76@server.example.com"
    local-tag="0111" remote-tag="098594"
                                direction="initiator">
    <duration>1</duration>
    <local>
      <target>sips:park@server.example.com</target>
    </local>
    <remote>
      <target>sips:a8342043f@atlanta.example.com;gr</target>
    </remote>
    <state>confirmed</state>
  </dialog>
</dialog-info>
```

F19 200 OK Carol -> Park Server

SIP/2.0 200 OK  
Via: SIP/2.0/TLS server.example.com:5061  
;branch=z9hG4bK74b8skd  
;received=192.0.2.103  
To: Carol <sips:carol@chicago.example.com>;tag=158x93461  
From: <sips:park@server.example.com>;tag=3213j  
Call-ID: 2d6485356dfaj34dsf  
CSeq: 1 NOTIFY  
Contact: <sips:carol@client.chicago.example.com>  
Content-Length: 0

F20 INVITE Carol -> Alice

INVITE sips:alice@atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.chicago.example.com:5061  
;branch=z9hG4bK74bQ2  
Max-Forwards: 70  
From: Carol <sips:carol@chicago.example.com>;tag=5893461  
To: Alice <sips:alice@atlanta.example.com>  
Call-ID: 6485356@chicago.example.com  
CSeq: 1 INVITE  
Contact: <sips:carol@client.chicago.example.com>  
Require: replaces  
Replaces: a5-75-34-12-76@server.example.com  
;to-tag=098594;from-tag=0111

Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER,  
SUBSCRIBE, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=carol 2890844922 2890844922 IN IP4 client.chicago.example.com  
s=  
c=IN IP4 client.chicago.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F21 200 OK Alice -> Carol

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.chicago.example.com:5061  
;branch=z9hG4bK74bQ2  
;received=192.0.2.105  
From: Carol <sips:carol@chicago.example.com>;tag=5893461  
To: Alice <sips:alice@atlanta.example.com>;tag=222  
Call-ID: 6485356@chicago.example.com  
CSeq: 1 INVITE  
Contact: <sips:a8342043f@atlanta.example.com;gr>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, SUBSCRIBE, NOTIFY  
Supported: replaces, gruu  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844527 2890844527 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F22 ACK Carol -> Alice

ACK sips:a8342043f@atlanta.example.com;gr SIP/2.0  
Via: SIP/2.0/TLS client.chicago.example.com:5061  
;branch=z9hG4bK74bJ0  
Max-Forwards: 70  
From: Carol <sips:carol@chicago.example.com>;tag=5893461  
To: Alice <sips:alice@atlanta.example.com>;tag=222  
Call-ID: 6485356@chicago.example.com  
CSeq: 1 ACK

Content-Length: 0

```
/* A replaces the session to the Park Server with the new
   session with C and generates a BYE to disconnect the
   Park Server. */
```

F23 BYE Alice -> Park Server

```
BYE sips:park@server.example.com SIP/2.0
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74b4N
Max-Forwards: 70
From: Alice <sips:alice@atlanta.example.com>;tag=098594
To: <sips:park@server.example.com>;tag=0111
Call-ID: a5-75-34-12-76@server.example.com
CSeq: 1 BYE
Content-Length: 0
```

F24 200 OK Park Server -> Alice

```
SIP/2.0 200 OK
Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74b4N
    ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=098594
To: <sips:park@server.example.com>;tag=0111
Call-ID: a5-75-34-12-76@server.example.com
CSeq: 1 BYE
Content-Length: 0
```

## 2.16. Call Pickup

Alice	Bob	Bill
INVITE F1		
----->		
180 Ringing F2		
<-----		
	SUBSCRIBE F3	
	<-----	
	200 OK F4	
	----->	
	NOTIFY F5	
	----->	
	200 OK F6	
	<-----	
INVITE Replaces:Bob F7		
<-----		
	200 OK F8	
----->		
CANCEL F9		
----->		
200 OK F10		
<-----		
487 F11		
<-----		
ACK F12		
----->		
	ACK F13	
<-----		
Two way RTP Established		
<=====		
	BYE F14	
----->		
	200 OK F15	
<-----		

Bob and Bill are part of a work group at example.com that can pick up each other's calls. Alice calls Bob who does not answer. Bill wishes to pick up the call and sends a SUBSCRIBE to Bob to retrieve the dialog information. Bill then generates an INVITE with a Replaces to Alice. Alice answers the INVITE and sends a CANCEL to stop Bob's phone ringing. Note that the relative order of the 487/ACK sequence (F11/F12) and the 200 OK to the CANCEL (F10) is not deterministic.

This call flow shows the use of the "early-only" parameter [\[RFC3891\]](#) (Mahy, R., Biggs, B., and R. Dean, "The Session Initiation Protocol (SIP) "Replaces" Header," September 2004.) in the Replaces header field of F7. This parameter prevents Alice from accepting the INVITE if Bob has already accepted the INVITE. If Bill had wished to "take" the call from Bob regardless of whether he had answered, the parameter would not have been present in F7.

Also note that the subscription between Bob and Carol could have been established prior to Alice's call.

Message Details

F1 INVITE Alice -> Bob

INVITE sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:a8342043f@atlanta.example.com;gr>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces, gruu  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F2 180 Ringing Bob -> Alice

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=3145678  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Content-Length: 0

/\* Bill decides to pick up the call. \*/

F3 SUBSCRIBE Bill -> Bob

SUBSCRIBE sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS pc.biloxi.example.com:5061  
;branch=z9hG4bK74bf  
Max-Forwards: 70  
From: Bill <sips:bill@biloxi.example.com>;tag=8675309

To: Bob <sips:bob@biloxi.example.com>  
Call-ID: rt4353gs2egg@pc.biloxi.example.com  
CSeq: 1 SUBSCRIBE  
Contact: <sips:bill@pc.biloxi.example.com>  
Event: dialog  
Expires: 0  
Accept: application/dialog-info+xml  
Content-Length: 0

F4 200 OK Bob -> Bill

SIP/2.0 200 OK  
Via: SIP/2.0/TLS pc.biloxi.example.com:5061  
;branch=z9hG4bK74bf  
;received=192.0.2.114  
Max-Forwards: 70  
From: Bill <sips:bill@biloxi.example.com>;tag=8675309  
To: Bob <sips:bob@biloxi.example.com>;tag=31451098  
Call-ID: rt4353gs2egg@pc.biloxi.example.com  
CSeq: 1 SUBSCRIBE  
Content-Length: 0

F5 NOTIFY Bob -> Bill

NOTIFY sips:bill@pc.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bK74br  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=31451098  
To: Bill <sips:bill@biloxi.example.com>;tag=8675309  
Call-ID: rt4353gs2egg@pc.biloxi.example.com  
CSeq: 1 NOTIFY  
Contact: <sips:bob@client.biloxi.example.com>  
Event: dialog  
Subscription-State: terminated;reason=timeout  
Content-Type: application/dialog-info+xml  
Content-Length: ...

```
<?xml version="1.0"?>
<dialog-info xmlns="urn:ietf:params:xml:ns:dialog-info"
  version="0" state="full" entity="sips:bob@biloxi.example.com">
  <dialog id="94992014524" call-id="12345600@atlanta.example.com"
    local-tag="3145678" remote-tag="1234567"
                                direction="recipient">
    <duration>1</duration>
    <local>
      <identity display="Bob">sips:bob@biloxi.example.com</identity>
```

```
        <target>sips:bob@client.biloxi.example.com</target>
    </local>
    <remote>
        <identity display="Alice">sips:alice@atlanta.example.com
                                                    </identity>
        <target>sips:a8342043@atlanta.example.com;gr</target>
    </remote>
    <state>early</state>
</dialog>
</dialog-info>
```

F6 200 OK Bill -> Bob

```
SIP/2.0 200 OK
Via: SIP/2.0/TLS client.biloxi.example.com:5061
    ;branch=z9hG4bK74br
    ;received=192.0.2.105
From: Bob <sips:bob@biloxi.example.com>;tag=31451098
To: Bill <sips:bill@biloxi.example.com>;tag=8675309
Call-ID: rt4353gs2egg@pc.biloxi.example.com
CSeq: 1 NOTIFY
Contact: <sips:bill@pc.biloxi.example.com>
Content-Length: 0
```

F7 INVITE Bill -> Alice

```
INVITE sips:a8342043f@atlanta.example.com;gr SIP/2.0
Via: SIP/2.0/TLS pc.biloxi.example.com:5061
    ;branch=z9hG4bK74HH
Max-Forwards: 70
From: Bill <sips:bill@biloxi.example.com>;tag=8675310
To: Alice <sips:alice@atlanta.example.com>
Call-ID: 563456212@b2.biloxi.example.com
CSeq: 1 INVITE
Require: replaces
Replaces: 12345600@atlanta.example.com
    ;from-tag=314578;to-tag=1234567;early-only
Contact: <sips:bill@pc.biloxi.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...
```

```
v=0
o=bill 2890843122 2890843122 IN IP4 pc.biloxi.example.com
s=
c=IN IP4 pc.biloxi.example.com
```



t=0 0  
m=audio 5342 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

/\* Alice matches the dialog information in the Replaces header  
and accepts the INVITE. \*/

F8 200 OK Alice -> Bill

SIP/2.0 200 OK  
Via: SIP/2.0/TLS pc.biloxi.example.com:5061  
;branch=z9hG4bK74HH  
;received=192.0.2.114  
From: Bill <sips:bill@biloxi.example.com>;tag=8675310  
To: Alice <sips:alice@atlanta.example.com>;tag=131256  
Call-ID: 563456212@b2.biloxi.example.com  
CSeq: 1 INVITE  
Contact: <sips:a8342043f@atlanta.example.com;gr>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces, gruu  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 289084543 289084543 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49172 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

/\* Alice stops Bob's phone from ringing by sending a CANCEL \*/

F9 CANCEL Alice -> Bob

CANCEL sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 CANCEL  
Content-Length: 0

F10 200 OK Bob -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=3145678  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 CANCEL  
Content-Length: 0

F11 487 Request Terminated Bob -> Alice

SIP/2.0 487 Request Terminated  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=3145678  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Content-Length: 0

F12 ACK Alice -> Bob

ACK sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK83749.1  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=3145678  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK  
Content-Length: 0

F13 ACK Bill -> Alice

ACK sips:a8342043f@atlanta.example.com;gr SIP/2.0  
Via: SIP/2.0/TLS pc.biloxi.example.com:5061  
;branch=z9hG4bK7435  
Max-Forwards: 70  
From: Bill <sips:bill@biloxi.example.com>;tag=8675310  
To: Alice <sips:alice@atlanta.example.com>;tag=131256  
Call-ID: 563456212@b2.biloxi.example.com  
CSeq: 1 ACK  
Content-Length: 0

/\* RTP streams are established between Alice and Bill.  
Later, Alice Hangs Up with Bob. \*/

F14 BYE Alice -> Bill

BYE sips:bill@pc.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf2  
Max-Forwards: 70  
To: Bill <sips:bill@biloxi.example.com>;tag=8675310  
From: Alice <sips:alice@atlanta.example.com>;tag=131256  
Call-ID: 563456212@b2.biloxi.example.com  
CSeq: 1 BYE  
Content-Length: 0

F15 200 OK Bill -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf2  
;received=192.0.2.105  
To: Bill <sips:bill@biloxi.example.com>;tag=8675310  
From: Alice <sips:alice@atlanta.example.com>;tag=131256  
Call-ID: 563456212@b2.biloxi.example.com  
CSeq: 1 BYE  
Content-Length: 0

## 2.17. Automatic Redial

Alice	Bob
INVITE F1	
----->	
486 Busy Here F2	
<-----	Bob is busy
ACK F3	
----->	
SUBSCRIBE F4	
----->	
200 OK F5	
<-----	
NOTIFY F6	
<-----	
200 OK F7	
----->	
NOTIFY F8	Bob is now available
<-----	
200 OK F9	
----->	
INVITE F10	
----->	Session setup successfully
180 Ringing F11	
<-----	
200 OK F12	
<-----	
ACK F13	
----->	
Media Session	
<=====	
NOTIFY F14	
<-----	
200 OK F15	
----->	
SUBSCRIBE F16	Alice terminates subscription
----->	
200 OK F17	
<-----	
NOTIFY F18	
<-----	
200 OK F19	
----->	

Bob is initially busy when Alice calls. Alice subscribes to Bob's call state using a SUBSCRIBE F4. Bob sends a NOTIFY F8 when Bob is available. Alice is alerted, then Alice sends an INVITE to Bob to establish the session. The subscription is terminated using SUBSCRIBE F16.

Message Details

F1 INVITE Alice -> Bob

INVITE sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, SUBSCRIBE, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844526 2890844526 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F2 486 Busy Here

SIP/2.0 486 Busy Here  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=982039i4  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 INVITE  
Content-Length: 0

F3 ACK Alice -> Bob

ACK sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bf9  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=982039i4  
Call-ID: 12345600@atlanta.example.com  
CSeq: 1 ACK

Content-Length: 0

F4 SUBSCRIBE Alice -> Bob

SUBSCRIBE sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74b8G  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=837348234  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 4524526232@atlanta.example.com  
CSeq: 1 SUBSCRIBE  
Contact: sips:alice@client.atlanta.example.com  
Event: dialog  
Accept: application/dialog-info+xml  
Content-Length: 0

F5 200 OK Bob -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74b8G  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=837348234  
To: Bob <sips:bob@biloxi.example.com>;tag=341123  
Call-ID: 4524526232@atlanta.example.com  
Expires: 60  
CSeq: 1 SUBSCRIBE  
Contact: sips:bob@client.biloxi.example.com  
Content-Length: 0

F6 NOTIFY Bob -> Alice

NOTIFY sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bK74bn2  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=341123  
To: Alice <sips:alice@atlanta.example.com>;tag=837348234  
Call-ID: 4524526232@atlanta.example.com  
CSeq: 1 NOTIFY  
Contact: <sips:bob@client.biloxi.example.com>  
Event: dialog  
Subscription-State: active;expires=59  
Content-Type: application/dialog-info+xml  
Content-Length: ...



```
<?xml version="1.0"?>
<dialog-info xmlns="urn:ietf:params:xml:ns:dialog-info"
  version="0" state="full" entity="sips:bob@biloxi.example.com">
  <dialog id="562623442g3">
    <duration>1</duration>
    <state>confirmed</state>
  </dialog>
</dialog-info>
```

F7 200 OK Alice -> Bob

```
SIP/2.0 200 OK
Via: SIP/2.0/TLS client.biloxi.example.com:5061
  ;branch=z9hG4bK74bn2
  ;received=192.0.2.105
From: Bob <sips:bob@biloxi.example.com>;tag=341123
To: Alice <sips:alice@atlanta.example.com>;tag=837348234
Call-ID: 4524526232@atlanta.example.com
CSeq: 1 NOTIFY
Content-Length: 0
```

/\* Bob is now available. \*/

F8 NOTIFY Bob -> Alice

```
NOTIFY sips:alice@atlanta.example.com SIP/2.0
Via: SIP/2.0/TLS client.biloxi.example.com:5061
  ;branch=z9hG4bK74bVi
Max-Forwards: 70
From: Bob <sips:bob@biloxi.example.com>;tag=341123
To: Alice <sips:alice@atlanta.example.com>;tag=837348234
Call-ID: 4524526232@atlanta.example.com
CSeq: 2 NOTIFY
Event: dialog
Subscription-State: active;expires=27
Contact: <sips:bob@client.biloxi.example.com>
Content-Type: application/dialog-info+xml
Content-Length: ...
```

```
<?xml version="1.0"?>
<dialog-info xmlns="urn:ietf:params:xml:ns:dialog-info"
  version="0" state="full" entity="sips:bob@biloxi.example.com">
  <dialog id="562623442g3">
    <state>terminated</state>
  </dialog>
</dialog-info>
```

F9 200 OK Alice -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bK74bVi  
;received=192.0.2.105  
From: Bob <sips:bob@biloxi.example.com>;tag=341123  
To: Alice <sips:alice@atlanta.example.com>;tag=837348234  
Call-ID: 4524526232@atlanta.example.com  
CSeq: 2 NOTIFY  
Content-Length: 0

F10 INVITE Alice -> Bob

INVITE sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bfq  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=f23fkg14k  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: aoij4i9okittr@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:alice@client.atlanta.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, SUBSCRIBE, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=alice 2890844826 2890844826 IN IP4 client.atlanta.example.com  
s=  
c=IN IP4 client.atlanta.example.com  
t=0 0  
m=audio 49170 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F11 180 Ringing Bob -> Alice

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK74bfq  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=f23fkg14k  
To: Bob <sips:bob@biloxi.example.com>;tag=23431  
Call-ID: aoij4i9okittr@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Content-Length: 0

F12 200 OK Bob -> Alice

SIP/2.0 200 OK

Via: SIP/2.0/TLS client.atlanta.example.com:5061

;branch=z9hG4bK74bfq

;received=192.0.2.103

From: Alice <sips:alice@atlanta.example.com>;tag=f23fkg14k

To: Bob <sips:bob@biloxi.example.com>;tag=23431

Call-ID: aoij4i9okittr@atlanta.example.com

CSeq: 1 INVITE

Contact: <sips:bob@client.biloxi.example.com>

Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, SUBSCRIBE, NOTIFY

Supported: replaces

Content-Type: application/sdp

Content-Length: ...

v=0

o=bob 2890854527 2890854527 IN IP4 client.biloxi.example.com

s=

c=IN IP4 client.biloxi.example.com

t=0 0

m=audio 3456 RTP/AVP 0

a=rtpmap:0 PCMU/8000

F13 ACK Alice -> Bob

ACK sips:bob@client.biloxi.example.com SIP/2.0

Via: SIP/2.0/TLS client.atlanta.example.com:5061

;branch=z9hG4bK74bLBJ

Max-Forwards: 70

From: Alice <sips:alice@atlanta.example.com>;tag=f23fkg14k

To: Bob <sips:bob@biloxi.example.com>;tag=23431

Call-ID: aoij4i9okittr@atlanta.example.com

CSeq: 1 ACK

Content-Length: 0

F14 NOTIFY Bob -> Alice

NOTIFY sips:alice@client.atlanta.example.com SIP/2.0

Via: SIP/2.0/TLS client.biloxi.example.com:5061

;branch=z9hG4bK4bnd2

Max-Forwards: 70

From: Bob <sips:bob@biloxi.example.com>;tag=341123

To: Alice <sips:alice@atlanta.example.com>;tag=837348234

Call-ID: 4524526232@atlanta.example.com

CSeq: 3 NOTIFY

Contact: <sips:bob@client.biloxi.example.com>  
Event: dialog  
Subscription-State: active;expires=15  
Content-Type: application/dialog-info+xml  
Content-Length: ...

```
<?xml version="1.0"?>
<dialog-info xmlns="urn:ietf:params:xml:ns:dialog-info"
  version="0" state="full" entity="sips:bob@biloxi.example.com">
  <dialog id="62d2623442g3">
    <duration>1</duration>
    <state>confirmed</state>
  </dialog>
</dialog-info>
```

F15 200 OK Alice -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bK4bnd2  
;received=192.0.2.105  
From: Bob <sips:bob@biloxi.example.com>;tag=341123  
To: Alice <sips:alice@atlanta.example.com>;tag=837348234  
Call-ID: 4524526232@atlanta.example.com  
CSeq: 3 NOTIFY  
Content-Length: 0

/\* Alice terminates the subscription \*/

F16 SUBSCRIBE Alice -> Bob

SUBSCRIBE sips:bob@client.biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK474b8  
Max-Forwards: 70  
From: Alice <sips:alice@atlanta.example.com>;tag=837348234  
To: Alice <sips:alice@atlanta.example.com>;tag=837348234  
Call-ID: 4524526232@atlanta.example.com  
CSeq: 2 SUBSCRIBE  
Contact: sips:alice@client.atlanta.example.com  
Event: dialog  
Expires: 0  
Accept: application/dialog-info+xml  
Content-Length: 0

F17 200 OK Bob -> Alice

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.atlanta.example.com:5061  
;branch=z9hG4bK474b8  
;received=192.0.2.103  
From: Alice <sips:alice@atlanta.example.com>;tag=837348234  
To: Bob <sips:bob@biloxi.example.com>;tag=341123  
Call-ID: 4524526232@atlanta.example.com  
Expires: 0  
CSeq: 2 SUBSCRIBE  
Contact: sips:bob@client.biloxi.example.com  
Content-Length: 0

F18 NOTIFY Bob -> Alice

NOTIFY sips:alice@client.atlanta.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKb5n2j  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=341123  
To: Alice <sips:alice@atlanta.example.com>;tag=837348234  
Call-ID: 4524526232@atlanta.example.com  
CSeq: 4 NOTIFY  
Contact: <sips:bob@client.biloxi.example.com>  
Event: dialog  
Subscription-State: terminated;reason=noresource  
Content-Type: application/dialog-info+xml  
Content-Length: ...

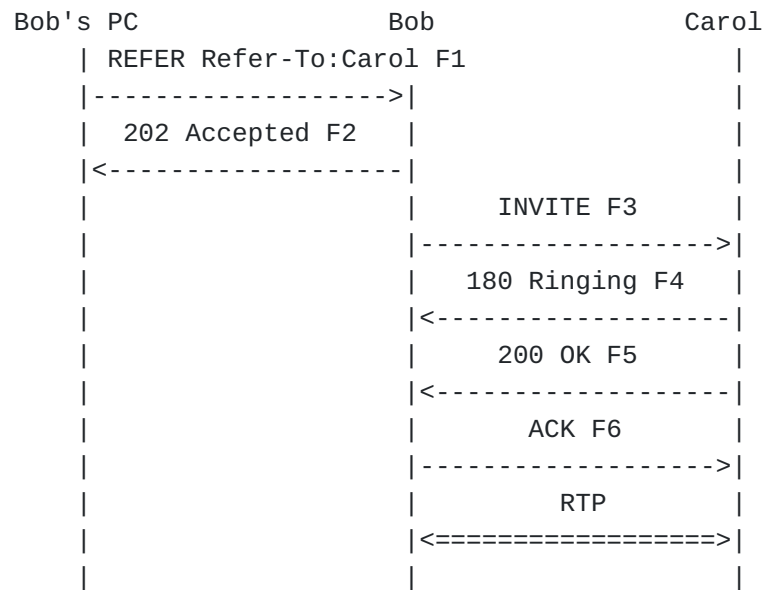
```
<?xml version="1.0"?>
<dialog-info xmlns="urn:ietf:params:xml:ns:dialog-info"
  version="0" state="full" entity="sips:bob@biloxi.example.com">
  <dialog id="62d2623442g3">
    <duration>3</duration>
    <state>confirmed</state>
  </dialog>
</dialog-info>
```

F19 200 OK Alice -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKb5n2j  
;received=192.0.2.105  
From: Bob <sips:bob@biloxi.example.com>;tag=341123  
To: Alice <sips:alice@atlanta.example.com>;tag=837348234  
Call-ID: 4524526232@atlanta.example.com  
CSeq: 4 NOTIFY

2.18. Click to Dial

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In this example, while browsing the web on his PC, Bob clicks on Carol's SIP URI intending to establish a session with Carol. Bob's web browser passes the SIP URI to the SIP client on Bob's PC. The PC client is configured with the URI of Bob's SIP phone. A REFER is sent to the SIP phone which results in the establishment of the session between Bob and Carol.

Note that Bob's PC requests that no REFER dialog be established by the use of the Refer-Sub: false header field [\[RFC4488\] \(Levin, O., "Suppression of Session Initiation Protocol \(SIP\) REFER Method Implicit Subscription," May 2006.\)](#).

This flow is preferable to the 3pcc flow because the end-to-end SIP signaling is not interrupted by the 3pcc controller, and because Bob's experience of the call will not be marred by the lack of ringback tone or possible clipping. Suitable authorization of the REFER and explicit authorization of the triggered INVITE by Bob is necessary.

Message Details

/\* Bob's PC SIP Client sends a REFER to Bob's SIP phone \*/

F1 REFER PC -> Bob

REFER sips:bob@biloxi.example.com SIP/2.0  
Via: SIP/2.0/TLS pc.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
Max-Forwards: 70  
From: <sips:pc.biloxi.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>  
Call-ID: 1234560183434  
CSeq: 1 REFER  
Refer-To: <sips:carol@chicago.example.com>  
Refer-Sub: false  
Contact: <sips:pc.biloxi.example.com>  
Content-Length: 0

F2 202 Accepted Bob -> PC

SIP/2.0 202 Accepted  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashds7  
;received=192.0.2.103  
From: <sips:pc.biloxi.example.com>;tag=1234567  
To: Bob <sips:bob@biloxi.example.com>;tag=314159  
Call-ID: 1234560183434  
Contact: <sips:bob@client.biloxi.example.com>  
CSeq: 1 REFER  
Refer-Sub: false  
Content-Length: 0

F3 INVITE Bob -> Carol

INVITE sips:carol@chicago.example.com SIP/2.0  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashdK9  
Max-Forwards: 70  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>  
Call-ID: 7436222@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:bob@client.biloxi.example.com>  
Referred-By: <sips:pc.biloxi.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=bob 2890844539 2890844539 IN IP4 client.biloxi.example.com  
s=  
c=IN IP4 client.biloxi.example.com  
t=0 0  
m=audio 3458 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F4 180 Ringing Carol -> Bob

SIP/2.0 180 Ringing  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashdk9  
;received=192.0.2.113  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=928287  
Call-ID: 7436222@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:carol@client.chicago.example.com>  
Content-Length: 0

F5 200 OK Carol -> Bob

SIP/2.0 200 OK  
Via: SIP/2.0/TLS client.biloxi.example.com:5061  
;branch=z9hG4bKnashdk9  
;received=192.0.2.113  
From: Bob <sips:bob@biloxi.example.com>;tag=8675309  
To: Carol <sips:carol@chicago.example.com>;tag=928287  
Call-ID: 7436222@atlanta.example.com  
CSeq: 1 INVITE  
Contact: <sips:carol@client.chicago.example.com>  
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY  
Supported: replaces  
Content-Type: application/sdp  
Content-Length: ...

v=0  
o=carol 2890844527 2890844527 IN IP4 client.chicago.example.com  
s=  
c=IN IP4 client.chicago.example.com  
t=0 0  
m=audio 3456 RTP/AVP 0  
a=rtpmap:0 PCMU/8000

F6 ACK Bob -> Carol



```
ACK sips:carol@client.chicago.example.com SIP/2.0
Via: SIP/2.0/TLS client.biloxi.example.com:5061
    ;branch=z9hG4bKnashd43
Max-Forwards: 70
From: Bob <sips:bob@biloxi.example.com>;tag=8675309
To: Carol <sips:carol@chicago.example.com>;tag=928287
Call-ID: 7436222@atlanta.example.com
CSeq: 1 ACK
Content-Length: 0
```

```
/* Bob and Carol now have established a session. */
```

---

### 3. Security Considerations

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Since many of the examples in this document involve SIP call control, either peer-to-peer or 3pcc, the security considerations in the [Multiparty Framework document \(Mahy, R., Sparks, R., Rosenberg, J., Petrie, D., and A. Johnston, "A Call Control and Multi-party usage framework for the Session Initiation Protocol \(SIP\)," December 2009.\)](#) [I-D.ietf-sipping-cc-framework] apply.

Many of the services shown in this document rely on a particular user agent being part of a group. Members of a group could be, for example, employees within a particular department, a set of home phone extensions, members of a call center, etc. As such, user agents which are part of the group permit other group members special privileges and features. For example, while a user agent may not in general allow another user agent to learn detailed dialog information, this information might be shared with another group member in order to facilitate a service such as call pickup. Group members must be authenticated using normal SIP means such as certificates or shared secrets.

The service examples in this document make extensive use of the SIP call control primitives REFER, Replaces, Join, and the dialog package. The security considerations associated with each of these extensions [\[RFC3515\] \(Sparks, R., "The Session Initiation Protocol \(SIP\) Refer Method," April 2003.\)](#), [\[RFC3891\] \(Mahy, R., Biggs, B., and R. Dean, "The Session Initiation Protocol \(SIP\) "Replaces" Header," September 2004.\)](#), [\[RFC3911\] \(Mahy, R. and D. Petrie, "The Session Initiation Protocol \(SIP\) "Join" Header," October 2004.\)](#), [\[RFC4235\] \(Rosenberg, J., Schulzrinne, H., and R. Mahy, "An INVITE-Initiated Dialog Event Package for the Session Initiation Protocol \(SIP\)," November 2005.\)](#) apply to the scenarios in this document.

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## 4. IANA Considerations

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None.

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