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Session Initiation Protocol Service Examples

Status of This Memo

This document specifies an Internet Best Current Practices for the Internet Community, and requests discussion and suggestions for improvements. Distribution of this memo is unlimited.

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

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

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

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 [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 [RFC3261] with Session Description Protocol (SDP) usage described in RFC 3264 [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) [RFC3725] or Back-to-Back User Agents (B2BUAs) 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 [FRAMEWORK].

These flows assume the functionality described in the SIP Call Flow Examples document [RFC3665], which explores basic SIP behavior. Some of the scenarios described herein make use of the SIP method extension REFER [RFC3515], the SIP header extension Replaces [RFC3891], and the SIP header extension Join [RFC3911]. The SIP Events document [RFC3265] describes the use of SUBSCRIBE and NOTIFY, while the SIP Dialog Event Package document [RFC4235] describes the dialog event package. Some examples make use of the GRUU (Globally Routable User Agent URI) extension [GRUU].

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].

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.

For simplicity in reading and editing the document, there are a number of differences between some of the examples and actual SIP messages. For example, the HTTP Digest responses are not actual MD5 encodings. Call-IDs are often repeated, and CSeq counts often begin at 1. Header fields are usually shown in the same order. Usually only the minimum required header field set is shown. Also, message body content lengths are often not calculated, but instead shown as "..." where the actual octet count would be.

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 parentheses around the 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.

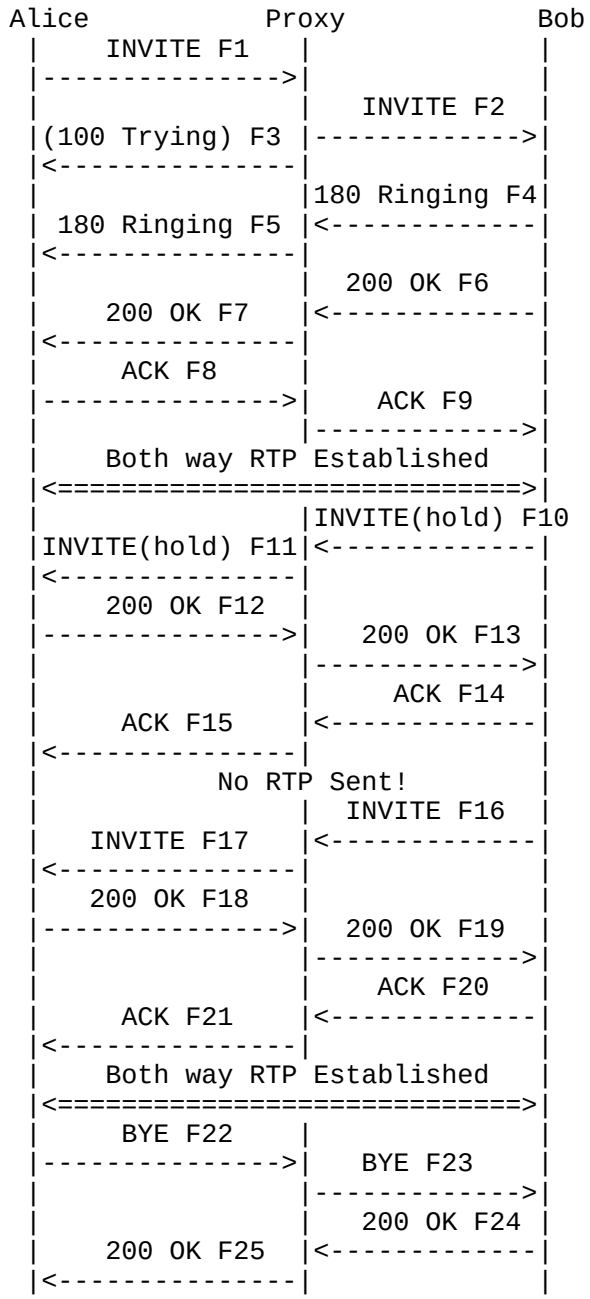
Lines longer than 72 characters are handled using the <allOneLine> convention defined in Section 2.1 of RFC 4475 [RFC4475].

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

/* Comments. */

2. Service Examples

2.1. Call Hold



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 or using the a=inactive SDP attribute if no media is sent, or the a=sendonly attribute if media is still sent.

Also note the use of the rendering feature tag defined in RFC 4235 [RFC4235] used in F10 and F11 to indicate 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
```

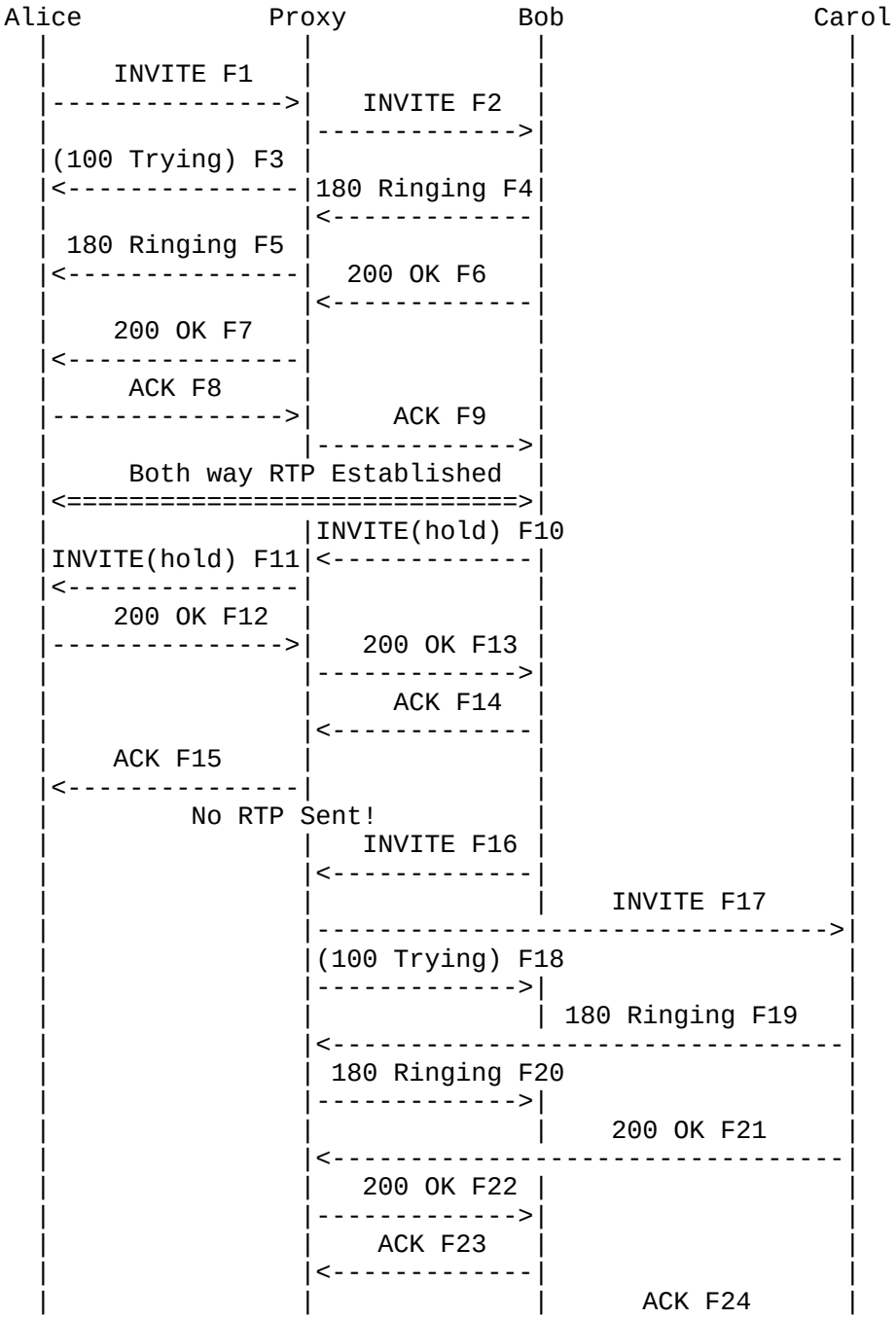
F24 200 OK Bob -> Proxy 1

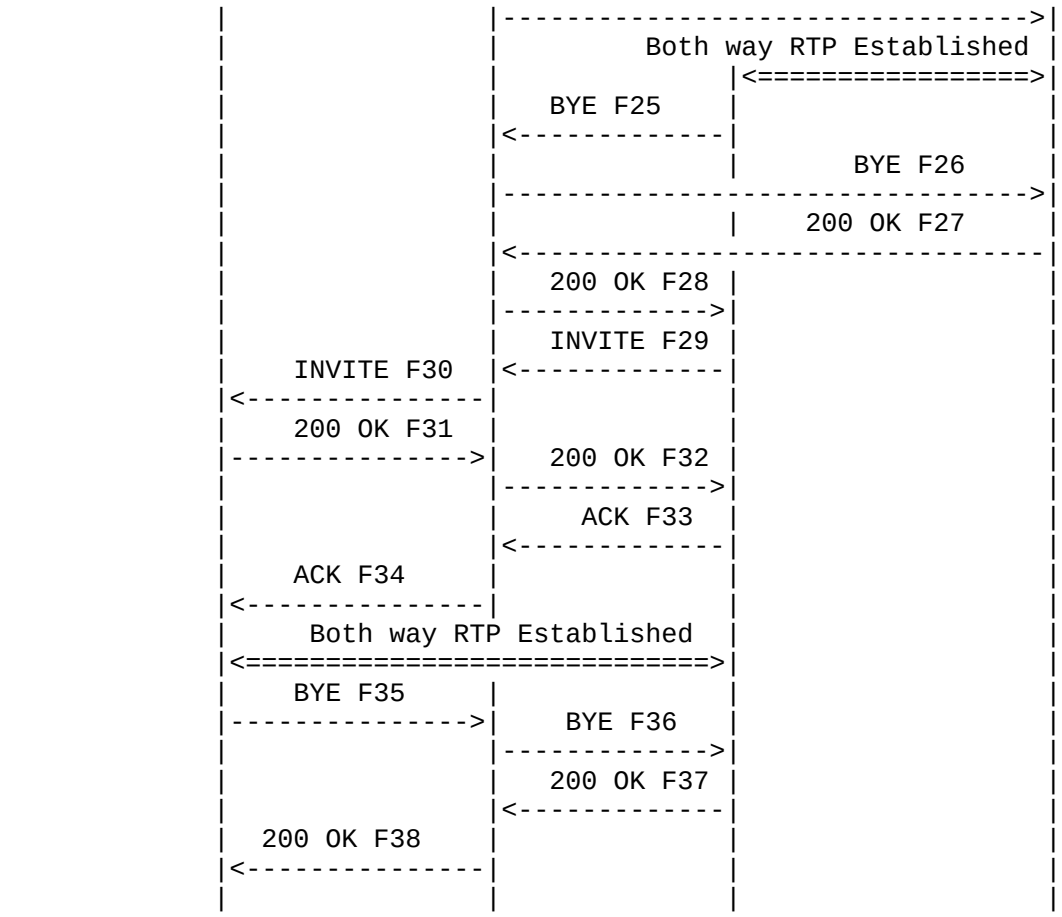
```
SIP/2.0 200 OK
Via: SIP/2.0/TLS ss1.example.com:5061
 ;branch=z9hG4bK837497.1
 ;received=192.0.2.54
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bf97
 ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=314159
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
```

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] used in F10 to indicate 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: 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 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
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
```

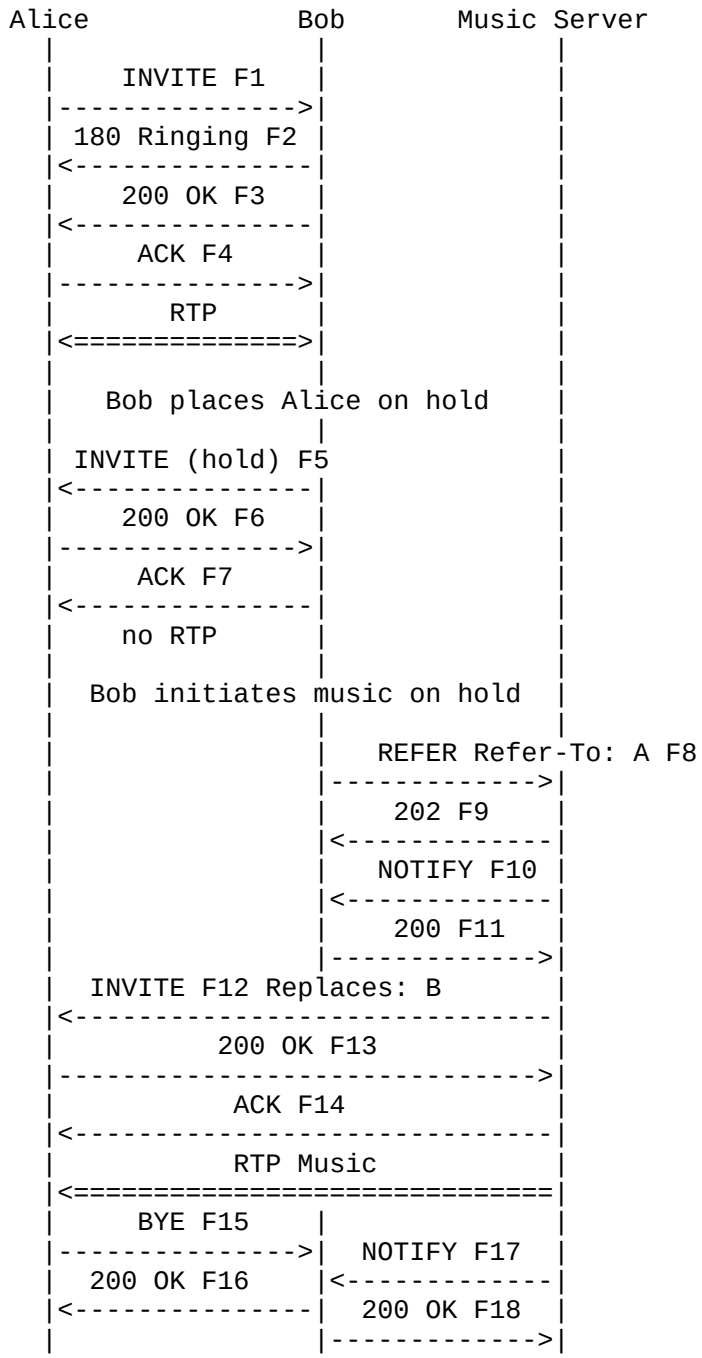
F37 200 OK Bob -> Proxy 1

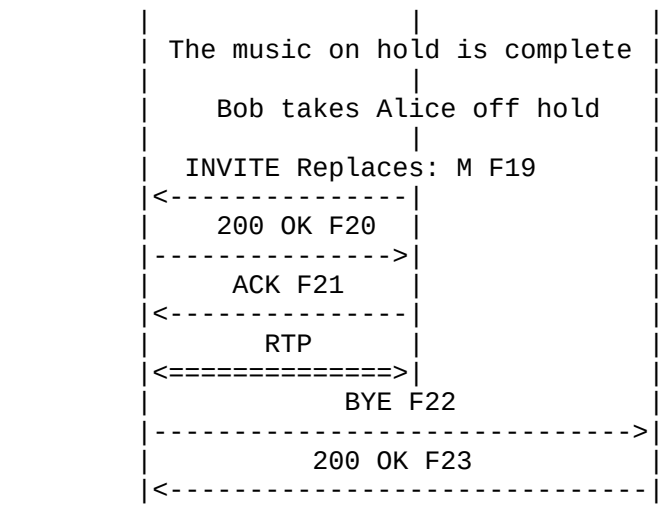
```
SIP/2.0 200 OK
Via: SIP/2.0/TLS ss1.example.com:5061
 ;branch=z9hG4bK8379.1
 ;received=192.0.2.54
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bf10
 ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=314159
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





In this flow, Bob places Alice on hold with music. This is performed by Bob sending a REFER to a Music Server that 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] used in F5 to indicate 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]) and byeless feature tags (defined in RFC 4235 [RFC4235]) 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
```

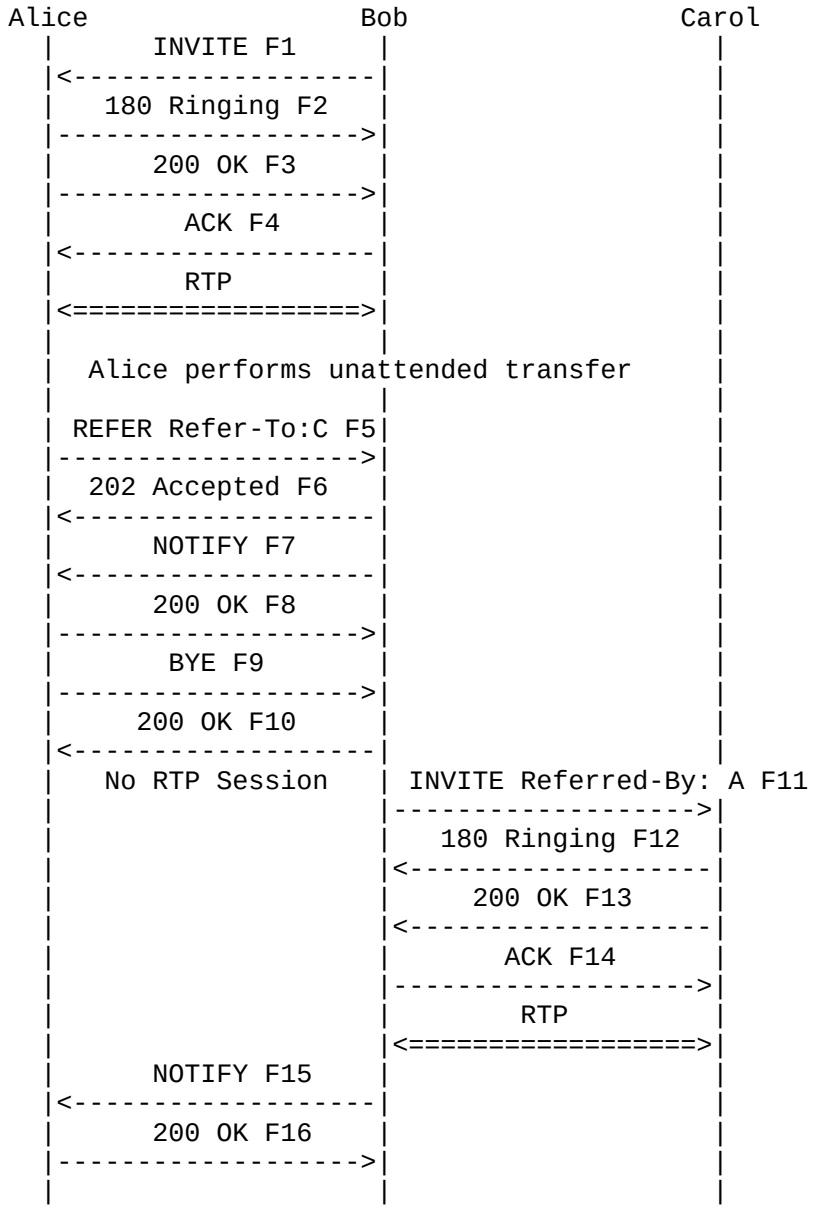
```
To: <sips:music@server.example.com>;tag=0111
From: <sips:a8342043f@atlanta.example.com;gr>;tag=098594
Call-ID: a5-75-34-12-76@server.example.com
CSeq: 15 BYE
Content-Length: 0
```

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. */
```

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 document [TRANSFER].

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
```

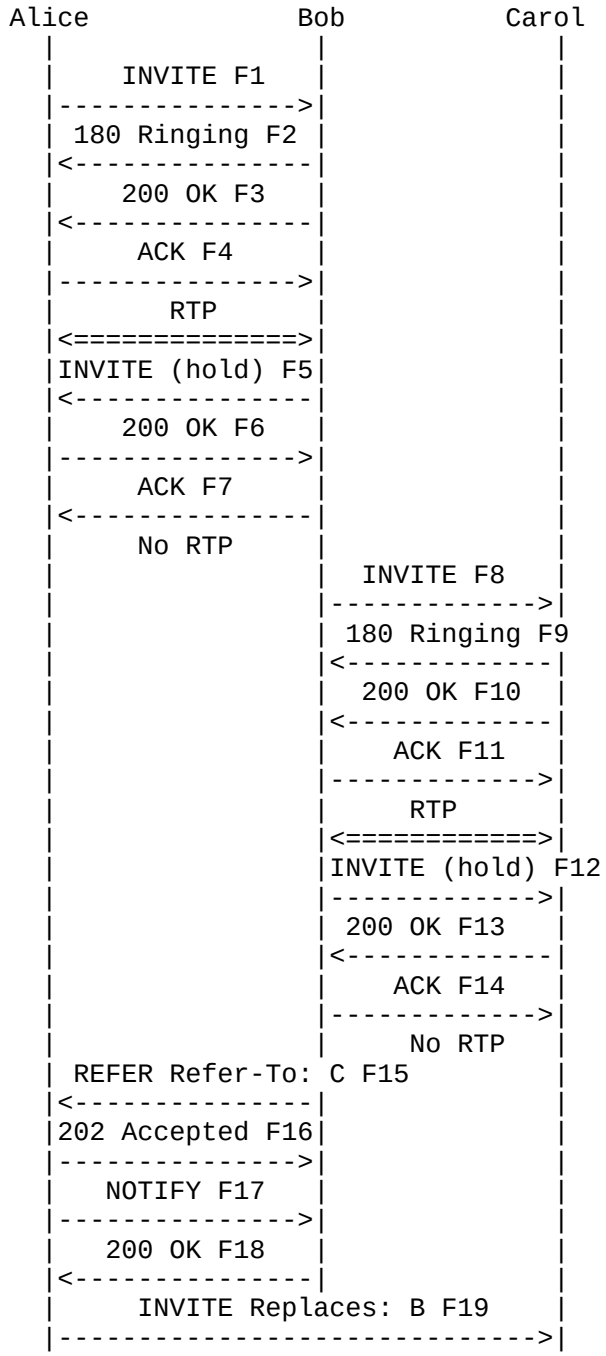
```
Call-ID: 7436222@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:carol@client.chicago.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...

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
```

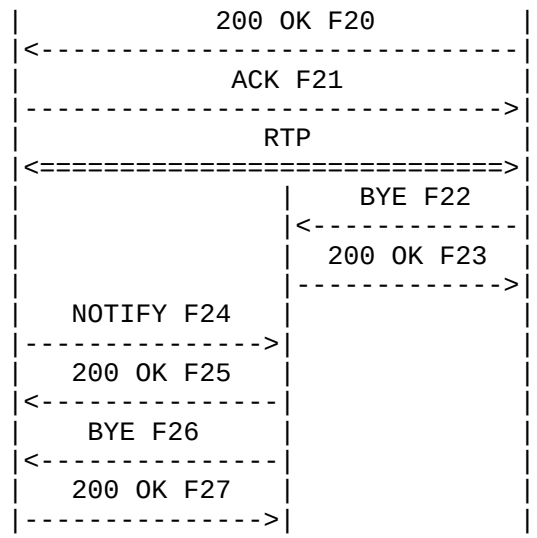
```
Content-Length: ...

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





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 [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 [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 document [TRANSFER].

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

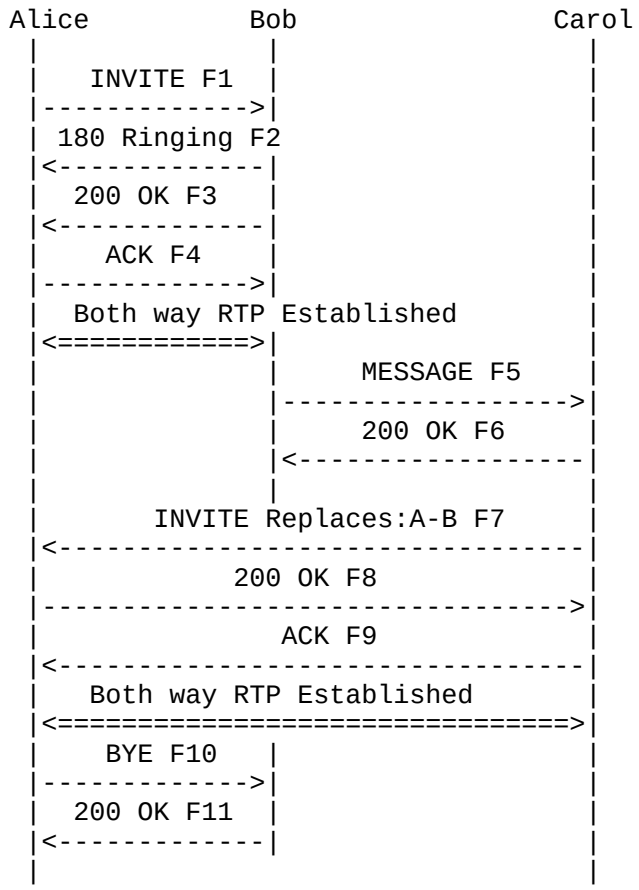
```
ACK sips:39itp34klkd@chicago.example.com;gr SIP/2.0
Via: SIP/2.0/TLS chicago.example.com:5061
 ;branch=z9hG4bKadfe4kU3
To: Carol <sips:39itp34klkd@chicago.example.com>;tag=ff3a
Max-Forwards: 70
From: Alice <sips:alice@atlanta.example.com>;tag=3461
Call-ID: 9435674543@atlanta.example.com
CSeq: 1 ACK
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 and 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 [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
```

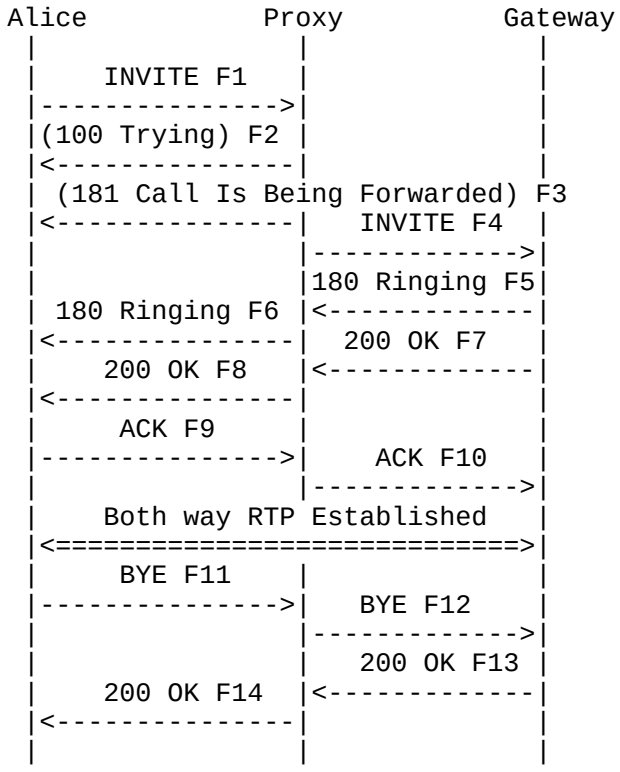
```
F3 200 OK Bob -> Alice

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



Bob wants all calls forwarded to the Public Switched Telephone Network (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 is shown as sent by the proxy. Strictly speaking, the proxy is behaving as a user agent in this case as a proxy cannot 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 sips:+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

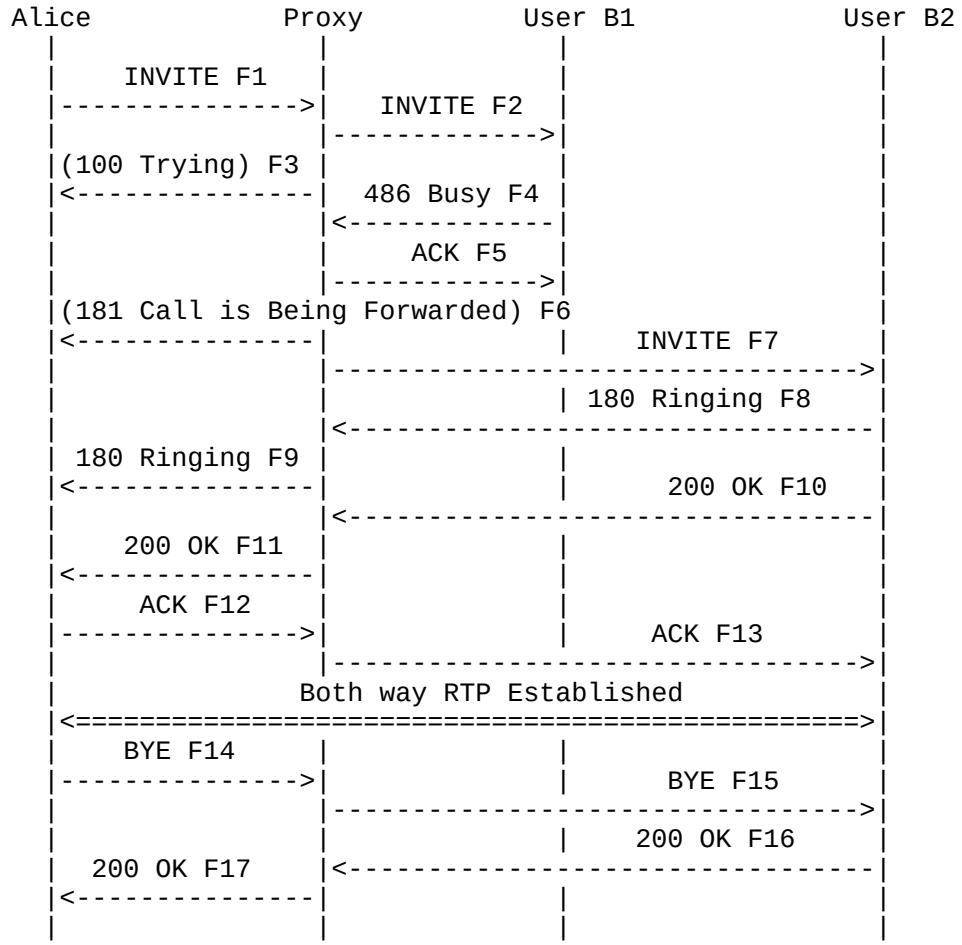
```
SIP/2.0 200 OK
Via: SIP/2.0/TLS ss1.example.com:5061
 ;branch=z9hG4bK83749G1
 ;received=192.0.2.54
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bfJe
 ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=314159
```

```
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



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
```

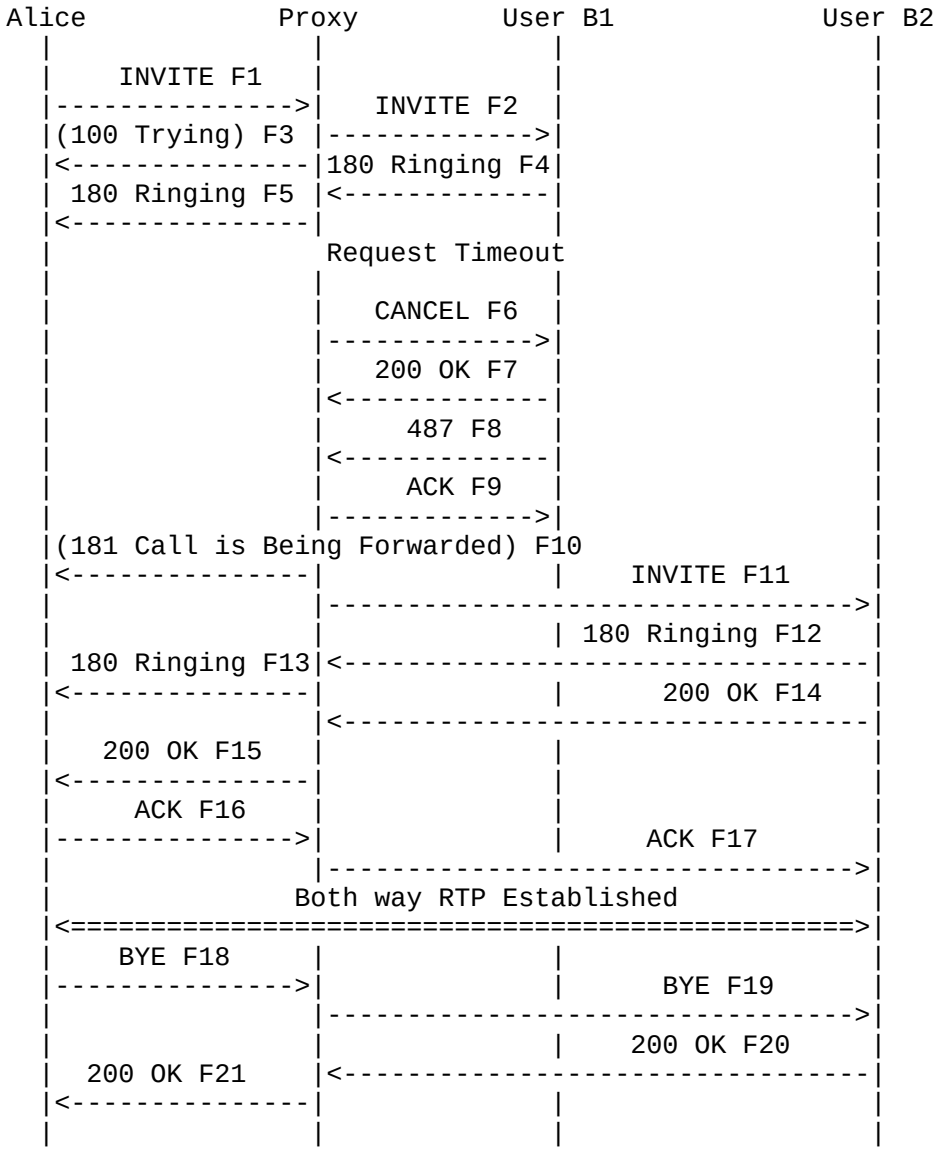
```
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=7654321
Call-ID: 12345600@atlanta.example.com
CSeq: 1 ACK
Content-Length: 0

/* RTP streams are established between Alice 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
```

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 Alice 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
```

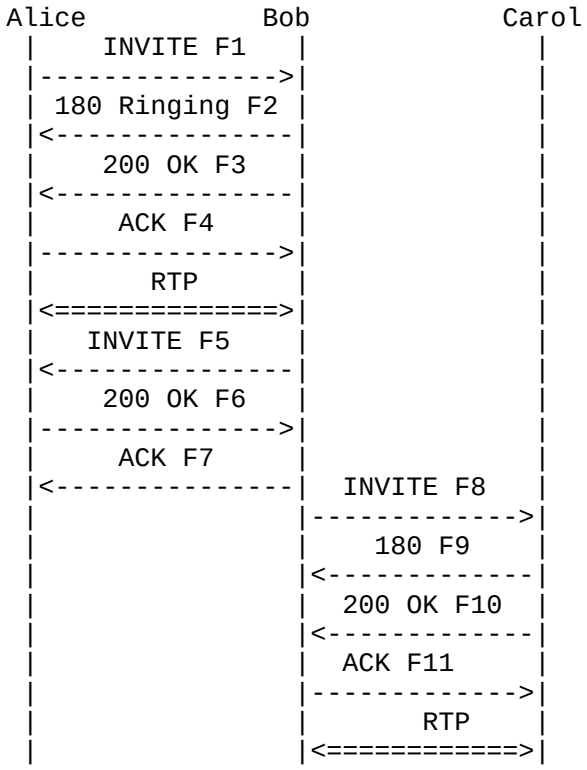
F20 200 OK B2 -> Proxy

```
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



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 [RFC3840] as described in [RFC4579]. 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

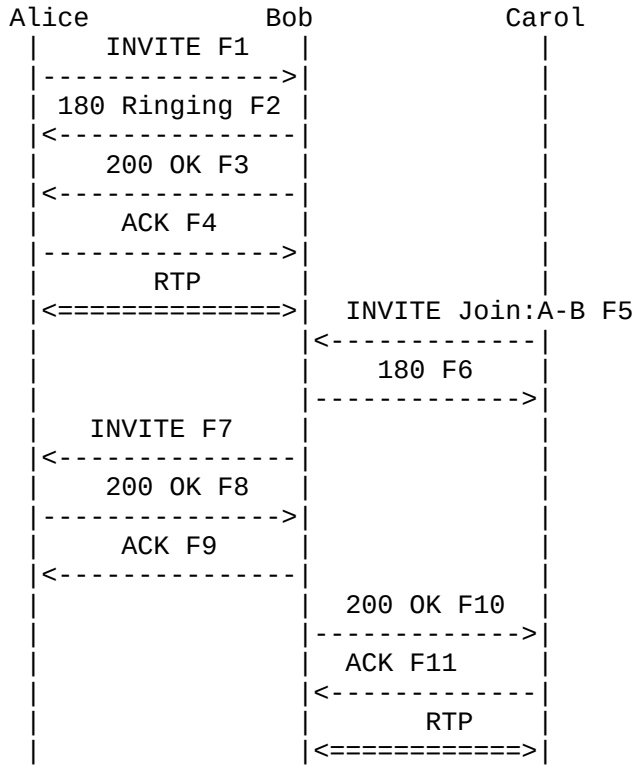
```
SIP/2.0 200 OK
Via: SIP/2.0/TLS client.biloxi.example.com:5061
 ;branch=z9hG4bKnashJfd
 ;received=192.0.2.113
From: Bob <sips:bob@biloxi.example.com>;tag=8675309
To: Carol <sips:carol@chicago.example.com>;tag=341313
Call-ID: sdjfdjfskdf@biloxi.example.com
CSeq: 42 INVITE
Contact: <sips:carol@client.chicago.example.com>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


/* Bob's mixer now mixes media from both Alice and Carol
   to create the 3-way conference. */
```

2.11. 3-Way Conference - Third Party Joins



In this scenario, Alice and Bob are in a 2-party call and Carol wishes to join, resulting in a 3-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 [RFC3840] as described in [RFC4579]. 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
```

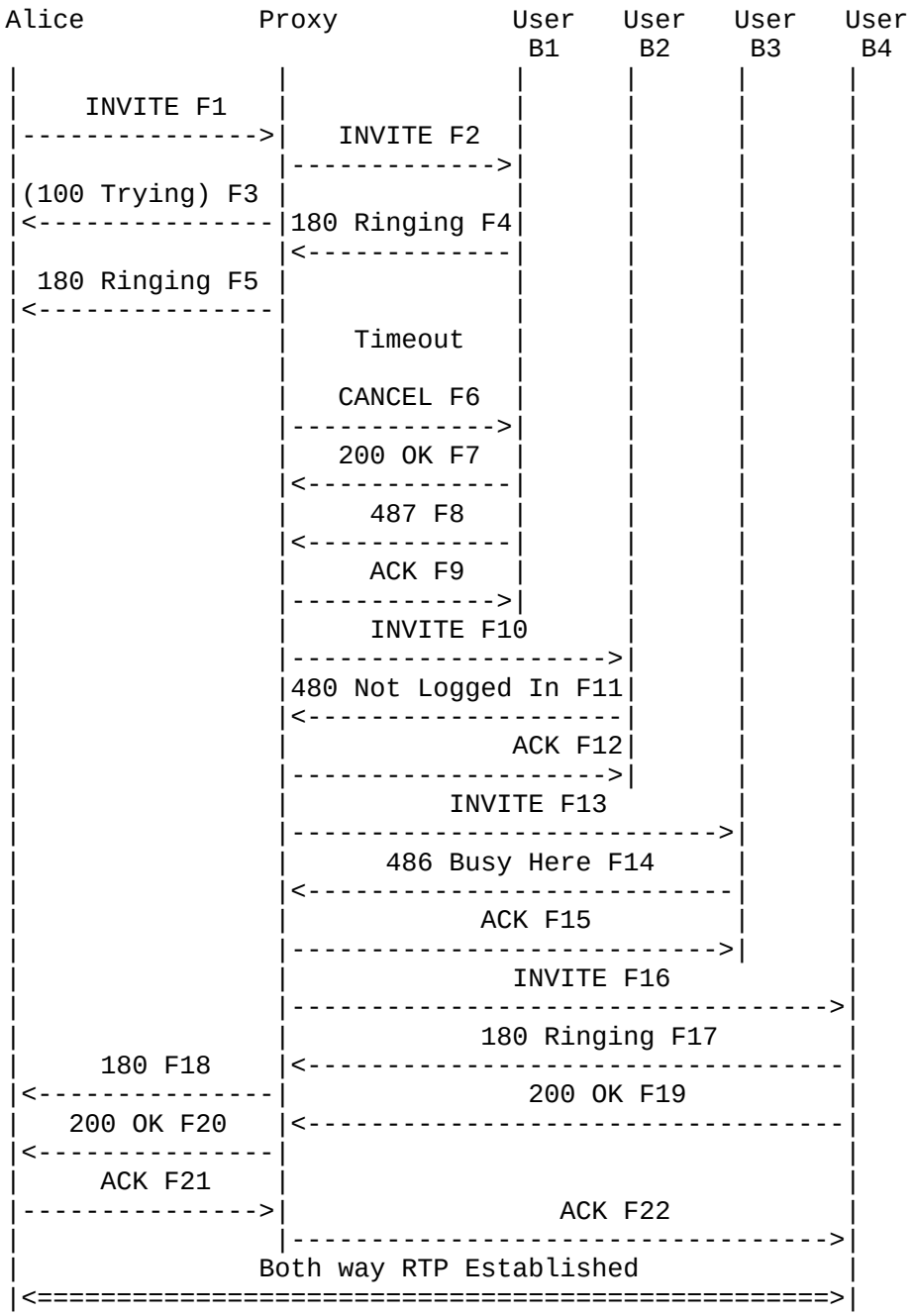
```
F8 200 OK Alice -> Bob
SIP/2.0 200 OK
Via: SIP/2.0/TLS client.biloxi.example.com:5061
 ;branch=z9hG4bKnashdyKL
 ;received=192.0.2.113
From: Bob <sips:bob@biloxi.example.com>;tag=23431
To: Alice <sips:alice@atlanta.example.com>;tag=1234567
Call-ID: 12345600@atlanta.example.com
CSeq: 1024 INVITE
Contact: <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
```

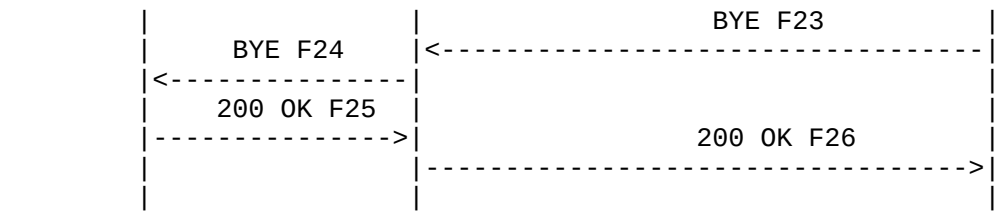
```
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces, join, gruu
Content-Type: application/sdp
Content-Length: ...

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
Proxy
User B1
User B2
User B3
User B4
INVITE F1
INVITE F2
(100 Trying) F3
180 Ringing F4
180 Ringing F5
Timeout
CANCEL F6
200 OK F7
487 F8
ACK F9
INVITE F10
480 Not Logged In F11
ACK F12
INVITE F13
486 Busy Here F14
ACK F15
INVITE F16
180 Ringing F17
180 F18
200 OK F19
200 OK F20
ACK F21
ACK F22
Both way RTP Established



Alice's call to Bob will result in an attempt to locate Bob 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.

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>
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>
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 Alice and B4. */

/* User B4 hangs up with Alice. */


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

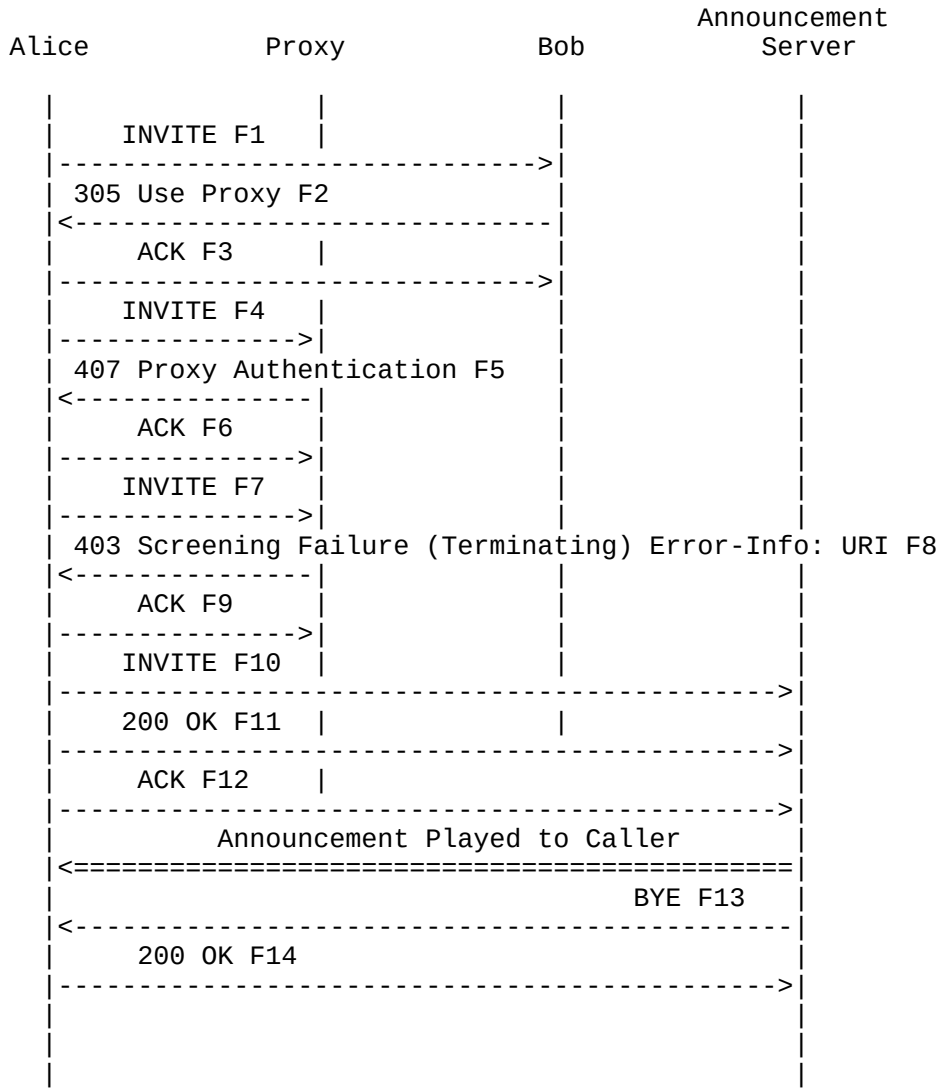
```
SIP/2.0 200 OK
Via: SIP/2.0/TLS ss1.example.com:5061
 ;branch=z9hG4bK83754
 ;received=192.0.2.54
Via: SIP/2.0/TLS client4.biloxi.example.com:5061
 ;branch=z9hG4bKnashds7
 ;received=192.0.2.105
From: Bob <sips:bob@biloxi.example.com>;tag=7137136
To: Alice <sips:alice@atlanta.example.com>;tag=1234567
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 from which Bob will not accept calls. 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 cannot 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 capable of playing announcements.

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
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 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=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, 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="bbaec39f943bdcb3620d90afc548a45c"
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

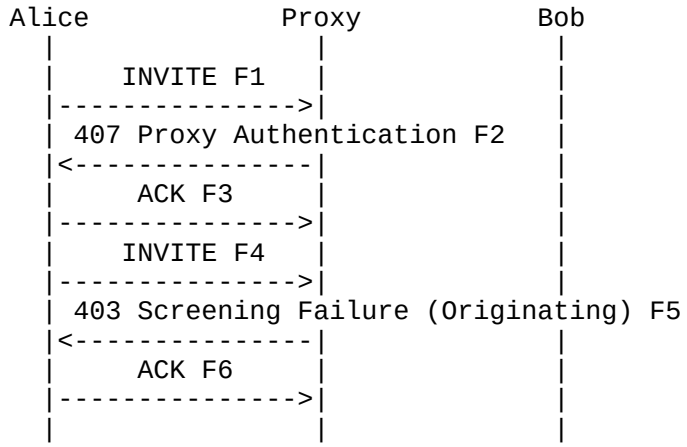
```
SIP/2.0 200 OK
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bfj
 ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=234934
Call-ID: 12345600@atlanta.example.com
CSeq: 4 INVITE
Contact: <sips:ms.biloxi.example.com>
 ;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)



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

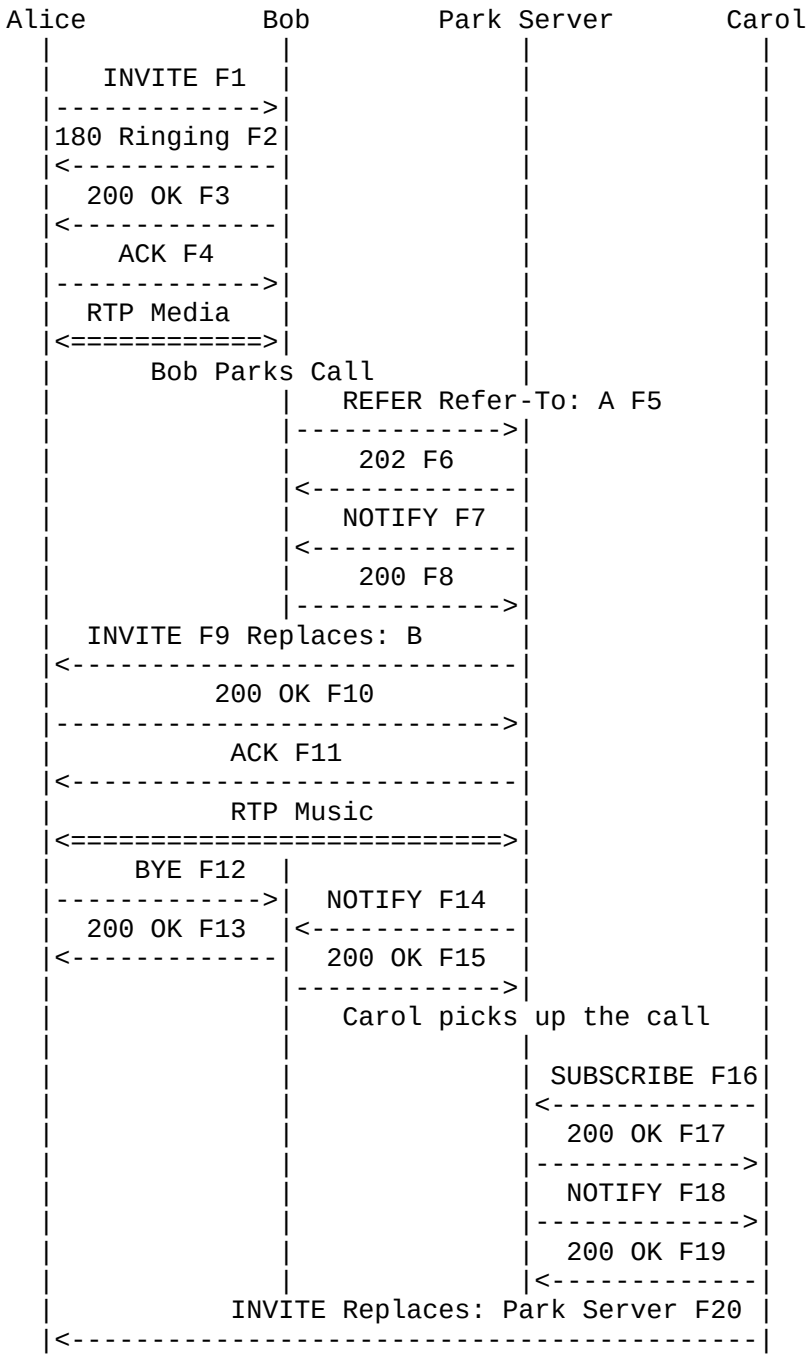
F5 403 Screening Failure (Originating) Proxy 1 -> Alice

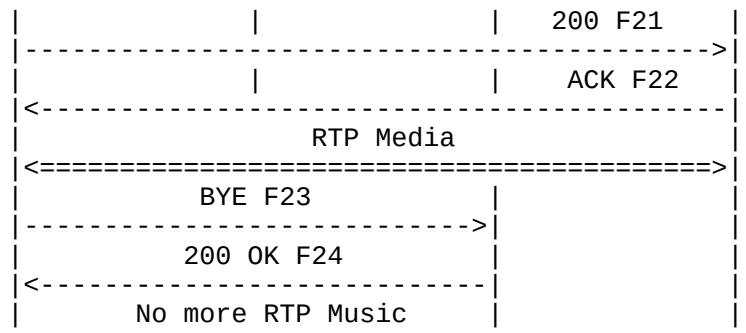
```
SIP/2.0 403 Screening Failure (Originating)
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74b4
 ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=18017
Call-ID: 12345600@atlanta.example.com
CSeq: 2 INVITE
Error-Info: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

2.15. Call Park





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 Alice,
      which replaces the established session between Alice and Bob.
      Note that there is no session established between Bob
      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 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. */
```

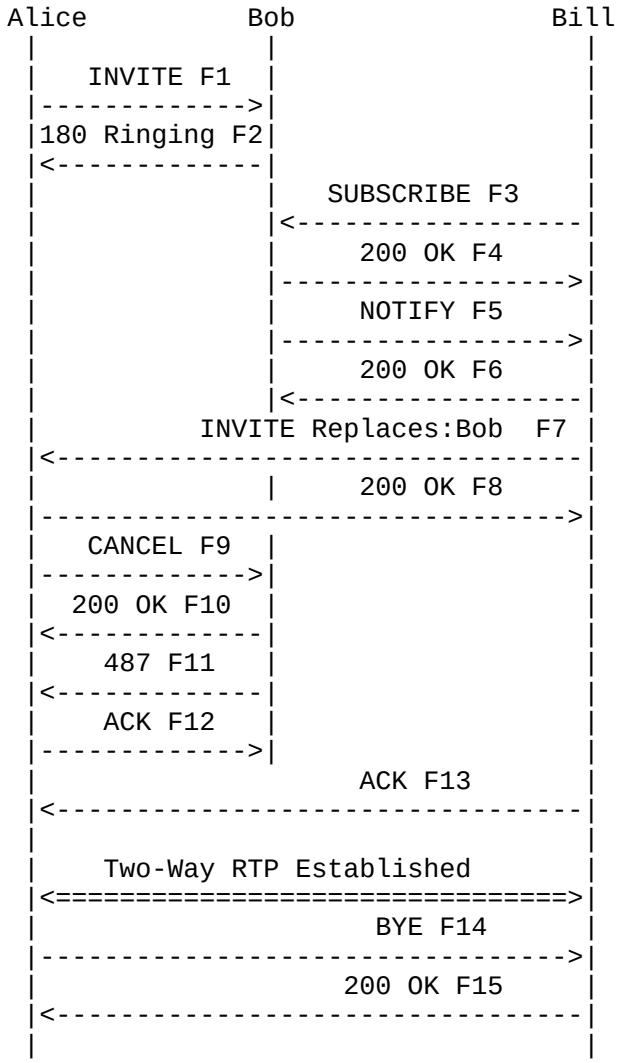
F23 BYE Alice -> Park Server

```
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



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] 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

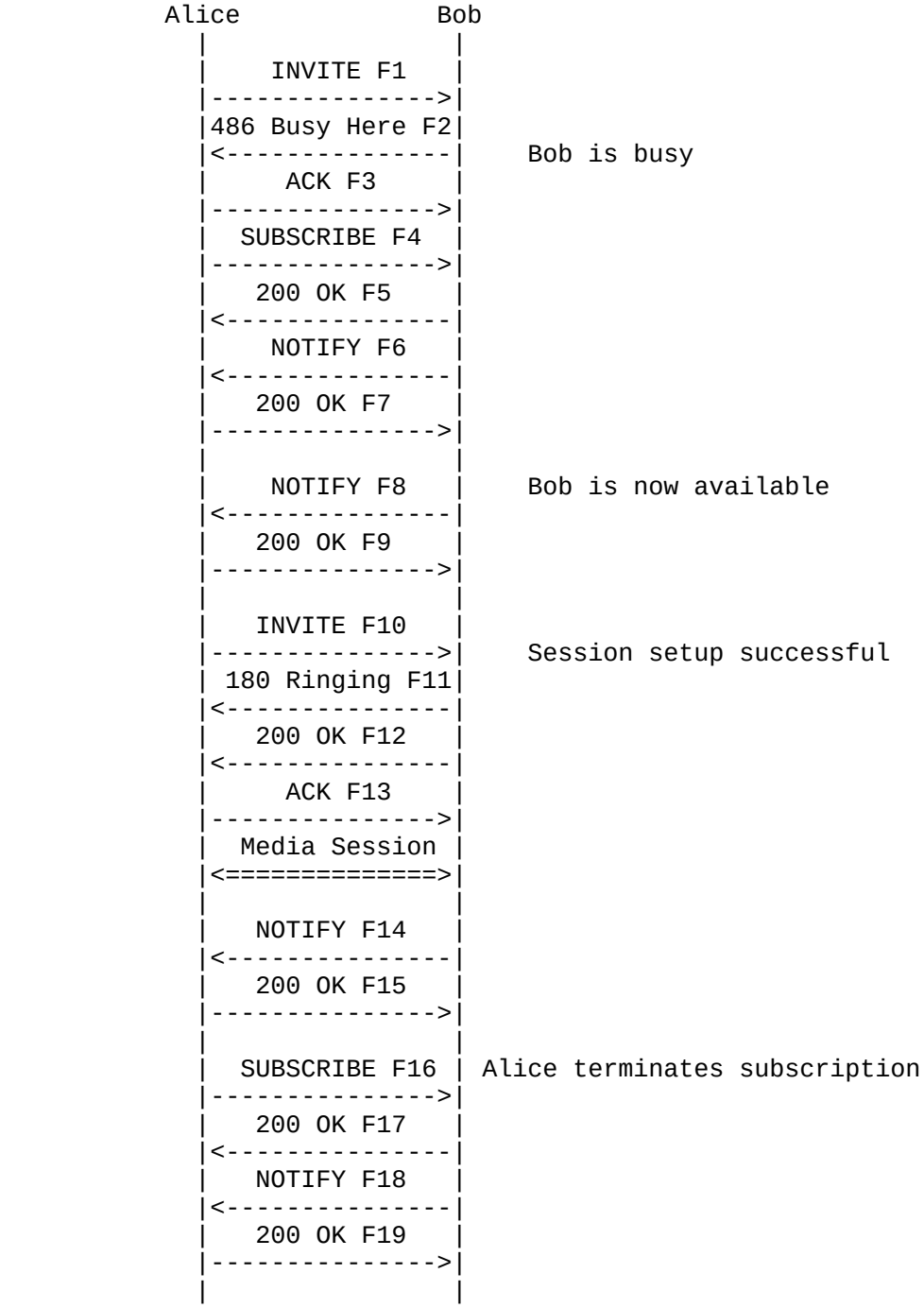
```
SIP/2.0 487 Request Terminated
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bf9
 ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=3145678
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Content-Length: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


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



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: aoij4i9okitr@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: aoij4i9okitr@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: aoij4i9okitr@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: aoij4i9okitr@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
```

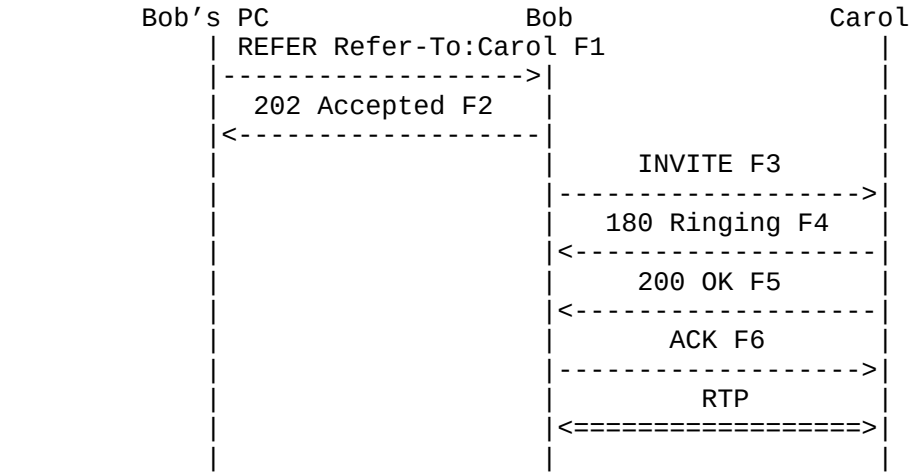
```
   Call-ID: 4524526232@atlanta.example.com
   CSeq: 3 NOTIFY
   Content-Length: 0

   /* 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
Content-Length: 0
```

2.18. Click to Dial



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].

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 are 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

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 [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 that 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], [RFC3891], [RFC3911], [RFC4235] apply to the scenarios in this document.

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