IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS

METASWITCH NETWORKS LTD,

Plaintiff,

v.

GENBAND US LLC,

Defendant,

GENBAND US LLC,

Counterclaim Plaintiff,

v.

METASWITCH NETWORKS LTD AND METASWITCH NETWORKS CORP.,

Counterclaim Defendants.

Civil Action No.: 2:14-cv-744

DECLARATION OF THE INTERNET ENGINEERING TASK FORCE, AN ORGANIZED ACTIVITY OF THE INTERNET SOCIETY

I, Alexa Morris, based on my personal knowledge and information, hereby declare as follows:

1. I am Executive Director of the Internet Engineering Task Force ("IETF") and have held this position since January 1, 2008.
2. Among my responsibilities as Executive Director, I act as the custodian of Internet-Drafts for the IETF.
3. I make this declaration based on my personal knowledge and information contained in the business records of the IETF, or confirmation with other responsible IETF personnel with such knowledge.

4. It is the regular practice of the IETF to publish Internet-Drafts and make them available to the public on its website at www.ietf.org. The IETF maintains copies of Internet-Drafts in the ordinary course of its regularly conducted activities.

5. Attachment A hereto lists three Internet-Drafts, true and correct copies of which are included as Exhibit 1-3.

6. I personally reviewed the documents included as Exhibit 1-3.

7. I hereby certify, in accordance with the requirements of Federal Rule of Evidence 902, that Exhibit 1-3 attached therein constitute a record of regularly conducted business activity which was (A) made at or near the time of the occurrence of the matters set forth by, or from information transmitted by, a person with knowledge of those matters; (B) kept in the course of the regularly conducted activity; and (C) made by the regularly conducted activity as a regular practice.

8. Based on a search of IETF records, I have determined that the IETF maintained copies of Exhibit 1-3 in the ordinary course of its regularly conducted activities.

9. Based on a search of IETF records and the IETF's course of conduct in publishing Internet-Drafts, I have also determined that Exhibit 1-3 were published on the IETF website (www.ietf.org) on or about the dates referenced in Attachment A. At such times, these documents were reasonably accessible to the public, and were disseminated or otherwise available to the extent that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence could have located them by searching the IETF website for the filenames of the documents.

10. Based on a search of IETF records, I hereby certify that the document listed in Attachment B is not contained in IETF records and cannot be authenticated by me.

Pursuant to Section 1746 of Title 28 of United States Code, I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct and that the foregoing is based upon personal knowledge and information and is believed to be true.

Date: October 28, 2015 By: _____

Alexa Morris

ATTACHMENT A

Authenticated Documents

Exhibit No.	Title	File Name	Publication Date
1	Session Initiation Protocol Service Examples	draft-ietf-sipping-service-examples-15	July 11, 2008
2	SIP Call Control - Framework	draft-ietf-sip-cc-framework	July 17, 2001
3	SIP Telephony Service Examples With Call Flows	draft-sparks-sip-service-examples-00	October 22, 1999

ATTACHMENT B

Document that Could Not Be Authenticated

Exhibit No.	Title	File Name	Publication Date
1	SIP Call Control : Transfer	Draft-sparks-ietf-sip-cc-transfer-00	March 2000

SIPPING Working Group A. Johnston, Ed.
Internet-Draft Avaya
Intended status: BCP R. Sparks
Expires: January 12, 2009 Estacado Systems
C. Cunningham
S. Donovan
Cisco Systems
K. Summers
Sonus
July 11, 2008

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

Status of this Memo

The list of Internet-Draft Shadow Directories can be accessed at http://www.ietf.org/shadow.html.

This Internet-Draft will expire on January 12, 2009.

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.

Table of Contents

1. Overview

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

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

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

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

It is the hope of the authors that this document will be useful for SIP implementers, designers, and protocol researchers alike and will help further the goal of a standard implementation of RFC 3261 [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 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 (B2BUA) can be used. This specification does not preclude these or other approaches for implementing such services. The peer-to-peer design and principles of these service examples are described in the Multiparty Framework document [I-D.ietf-sipping-cc-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] and 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 [RFC4235] document describes the dialog event package. Some examples make use of the GRUU (Globally Routable User Agent URI) [I-D.ietf-sip-gruu] extension.

These flows were prepared assuming a network of proxies, registrars, and other SIP servers. The use of Secure SIP URIs (sips) is shown throughout this document, implying TLS transport on each hop with assumed certificate validation. However, other security approaches can be used. The use of Digest authentication is shown in some examples.

The emphasis in these call flows is the SIP signaling exchange. As a result, only very simple SDP offer/answer exchanges are shown with audio media. These flows apply equally well for other media and multi-media 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.

1.1 Legend for Message Flows

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

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

Messages with parenthesis around name represent optional control messages.

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

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

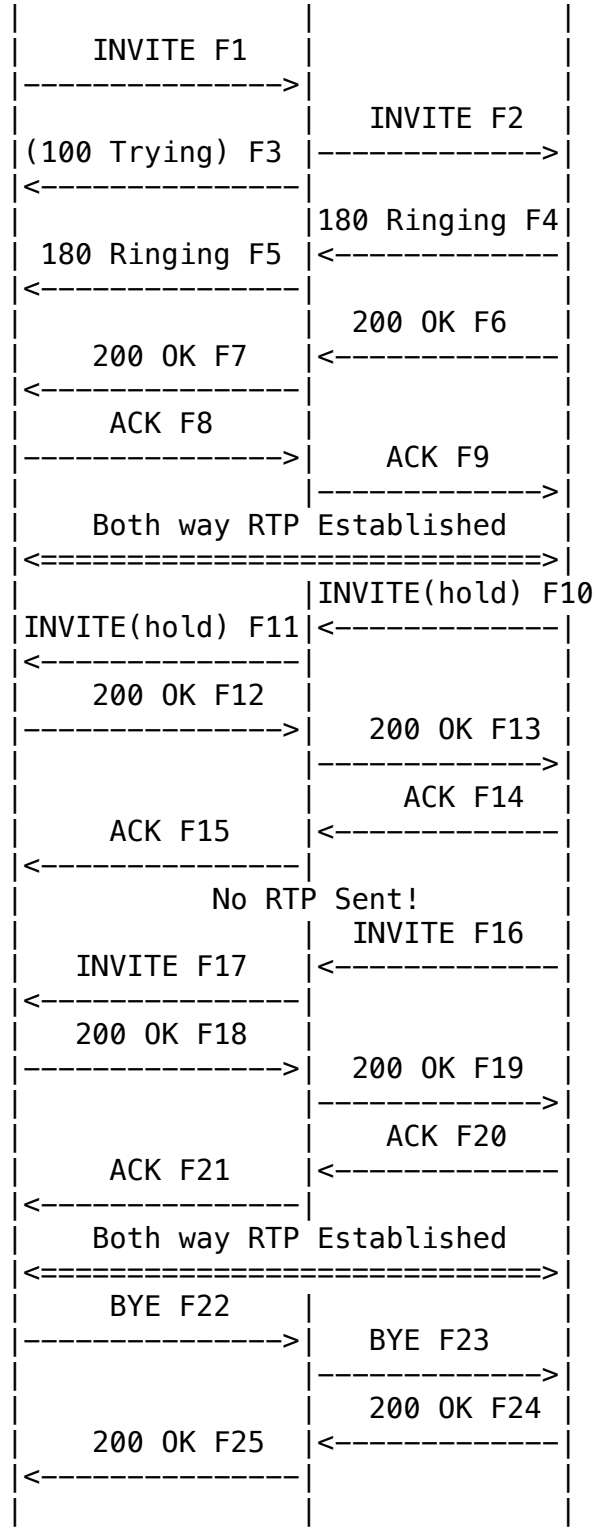
Comments in the message details are shown in the following form:

/* Comments. */

2. Service Examples

2.1. Call Hold

Alice Proxy Bob



In this scenario, Alice calls Bob, then Bob places the call on hold.

Bob then takes the call off hold, then Alice hangs up the call. Note that hold is unidirectional in nature. However, a UA that places the other party on hold will generally also stop sending media, resulting in no media exchange between the UAs. Older UAs may set the connection address to 0.0.0.0 when initiating hold. However, this behavior has been deprecated in favor of using the a=sendonly SDP attribute.

Also note the use of the rendering feature tag defined in RFC 4235 [RFC4235] used in F10 and F11 to indicate in that Bob's UA is no longer rendering media to Bob, i.e. that Bob has placed the call on hold.

Message Details

F1 INVITE Alice -> Proxy 1

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

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

```
a=rtpmap:0 PCMU/8000


F2 INVITE Proxy 1 -> Bob

INVITE sips:bob@client.biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS ss1.example.com:5061
 ;branch=z9hG4bK83749.1
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bf9
```



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

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


F3 (100 Trying) Proxy 1 -> Alice

SIP/2.0 100 Trying
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bf9
 ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
```

```
To: Bob <sips:bob@biloxi.example.com>
Call-ID: 12345601@atlanta.example.com
CSeq: 1 INVITE
Content-Length: 0
```

F4 180 Ringing Bob -> Proxy 1

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



```
CSeq: 1 INVITE
Contact: <sips:bob@client.biloxi.example.com>
Content Length:0
```

F5 180 Ringing Proxy 1 -> Alice

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

F6 200 OK Bob -> Proxy 1

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

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


F7 200 OK Proxy 1 -> Alice

```
SIP/2.0 200 OK
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bf9
 ;received=192.0.2.103
Record-Route: <sips:ss1.example.com;lr>
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=314159
Call-ID: 12345601@atlanta.example.com
CSeq: 1 INVITE
```

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

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

F8 ACK Alice -> Proxy 1

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

F9 ACK Proxy 1 -> Bob

```
ACK sips:bob@client.biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS ss1.example.com:5061
 ;branch=z9hG4bK837492.1
Via: SIP/2.0/TLS client.atlanta.example.com:5061
```



```
 ;branch=z9hG4bK74bf92
 ;received=192.0.2.103
```

```
      Max-Forwards: 69
      From: Alice <sips:alice@atlanta.example.com>;tag=1234567
      To: Bob <sips:bob@biloxi.example.com>;tag=314159
      Call-ID: 12345601@atlanta.example.com
      CSeq: 1 ACK
      Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
      Supported: replaces
      Content-Length: 0


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

      F10 INVITE Bob -> Proxy 1

      INVITE sips:alice@client.atlanta.example.com SIP/2.0
      Via: SIP/2.0/TLS client.biloxi.example.com:5061
       ;branch=z9hG4bKnashds7
      Route: <sips:ss1.example.com;lr>
      Max-Forwards: 70
      From: Bob <sips:bob@biloxi.example.com>;tag=314159
      To: Alice <sips:alice@atlanta.example.com>;tag=1234567
      Call-ID: 12345601@atlanta.example.com
      CSeq: 1 INVITE
      Contact: <sips:bob@client.biloxi.example.com>;
+sip.rendering="no"
      Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
      Supported: replaces
      Content-Type: application/sdp
      Content-Length: ...

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


      F11 INVITE Proxy 1 -> Alice

      INVITE sips:alice@client.atlanta.example.com SIP/2.0
      Via: SIP/2.0/TLS ss1.example.com:5061
       ;branch=z9hG4bK83749.1
      Via: SIP/2.0/TLS client.biloxi.example.com:5061
```

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

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


      /* Alice replies to hold */

      F12 200 OK Alice -> Proxy 1

      SIP/2.0 200 OK
      Via: SIP/2.0/TLS ss1.example.com:5061
       ;branch=z9hG4bK83749.1
       ;received=192.0.2.54
      Via: SIP/2.0/TLS client.biloxi.example.com:5061
       ;branch=z9hG4bKnashds7
       ;received=192.0.2.105
      Record-Route: <sips:ss1.example.com;lr>
      From: Bob <sips:bob@biloxi.example.com>;tag=314159
      To: Alice <sips:alice@atlanta.example.com>;tag=1234567
      Call-ID: 12345601@atlanta.example.com
      CSeq: 1 INVITE
      Contact: <sips:alice@client.atlanta.example.com>
```

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

      v=0
      o=alice 2890844526 2890844527 IN IP4 client.atlanta.example.com
```



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


      F13 200 OK Proxy 1 -> Bob

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

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

```
a=recvonly


F14 ACK Bob -> Proxy 1

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



```
Content-Length: 0


F15 ACK Proxy 1 -> Alice

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


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

F16 INVITE Bob -> Proxy 1

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

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


F17 INVITE Proxy 1 -> Alice

```
INVITE sips:alice@client.atlanta.example.com SIP/2.0
Via: SIP/2.0/TLS ss1.example.com:5061
 ;branch=z9hG4bK837493.1
Via: SIP/2.0/TLS client.biloxi.example.com:5061
 ;branch=z9hG4bKnashds73
 ;received=192.0.2.105
Record-Route: <sips:ss1.example.com;lr>
Max-Forwards: 69
From: Bob <sips:bob@biloxi.example.com>;tag=314159
To: Alice <sips:alice@atlanta.example.com>;tag=1234567
Call-ID: 12345601@atlanta.example.com
CSeq: 2 INVITE
```

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

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

F18 200 OK Alice -> Proxy 1

```
SIP/2.0 200 OK
Via: SIP/2.0/TLS ss1.example.com:5061
 ;branch=z9hG4bK837493.1
 ;received=192.0.2.54
Via: SIP/2.0/TLS client.biloxi.example.com:5061
 ;branch=z9hG4bKnashds73
 ;received=192.0.2.105
Record-Route: <sips:ss1.example.com;lr>
From: Bob <sips:bob@biloxi.example.com>;tag=314159
To: Alice <sips:alice@atlanta.example.com>;tag=1234567
Call-ID: 12345601@atlanta.example.com
CSeq: 2 INVITE
Contact: <sips:alice@client.atlanta.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...
```



```
v=0
o=alice 2890844526 2890844528 IN IP4 client.atlanta.example.com
s=
c=IN IP4 client.atlanta.example.com
t=0 0
```

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


F19 200 OK Proxy 1 -> Bob

SIP/2.0 200 OK
Via: SIP/2.0/TLS client.biloxi.example.com:5061
 ;branch=z9hG4bKnashds73
 ;received=192.0.2.105
Record-Route: <sips:ss1.example.com;lr>
From: Bob <sips:bob@biloxi.example.com>;tag=314159
To: Alice <sips:alice@atlanta.example.com>;tag=1234567
Call-ID: 12345601@atlanta.example.com
CSeq: 2 INVITE
Contact: <sips:alice@client.atlanta.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...

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


F20 ACK Bob -> Proxy 1

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

```
      Content-Length: 0


      F21 ACK Proxy 1 -> Alice

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


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

      F22 BYE Alice -> Proxy 1

      BYE sips:bob@client.biloxi.example.com SIP/2.0
      Via: SIP/2.0/TLS client.atlanta.example.com:5061
       ;branch=z9hG4bK74bf97
      Route: <sips:ss1.example.com;lr>
      Max-Forwards: 70
      From: Alice <sips:alice@atlanta.example.com>;tag=1234567
      To: Bob <sips:bob@biloxi.example.com>;tag=314159
      Call-ID: 12345601@atlanta.example.com
      CSeq: 2 BYE
      Content-Length: 0


      F23 BYE Proxy 1 -> Bob

      BYE sips:bob@client.biloxi.example.com SIP/2.0
      Via: SIP/2.0/TLS ss1.example.com:5061
       ;branch=z9hG4bK837497.1
      Via: SIP/2.0/TLS client.atlanta.example.com:5061
       ;branch=z9hG4bK74bf97
       ;received=192.0.2.103
      Max-Forwards: 69
```

```
      From: Alice <sips:alice@atlanta.example.com>;tag=1234567
      To: Bob <sips:bob@biloxi.example.com>;tag=314159
```



```
      Call-ID: 12345601@atlanta.example.com
      CSeq: 2 BYE
      Content-Length: 0
```

F24 200 OK Bob -> Proxy 1

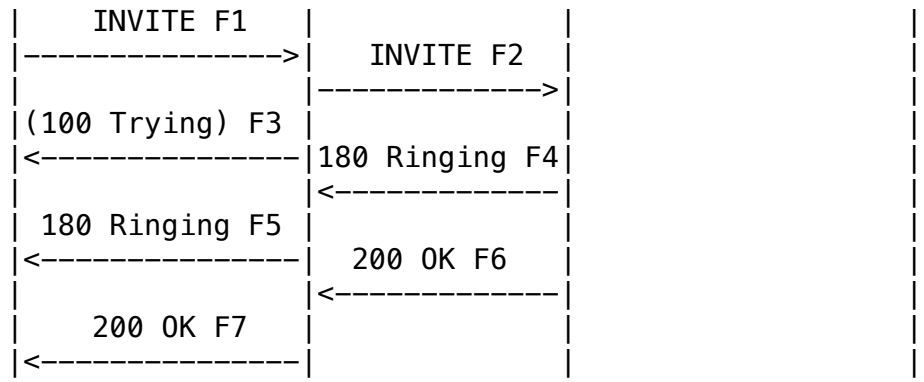
```
      SIP/2.0 200 OK
      Via: SIP/2.0/TLS ss1.example.com:5061
       ;branch=z9hG4bK837497.1
       ;received=192.0.2.54
      Via: SIP/2.0/TLS client.atlanta.example.com:5061
       ;branch=z9hG4bK74bf97
       ;received=192.0.2.103
      From: Alice <sips:alice@atlanta.example.com>;tag=1234567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

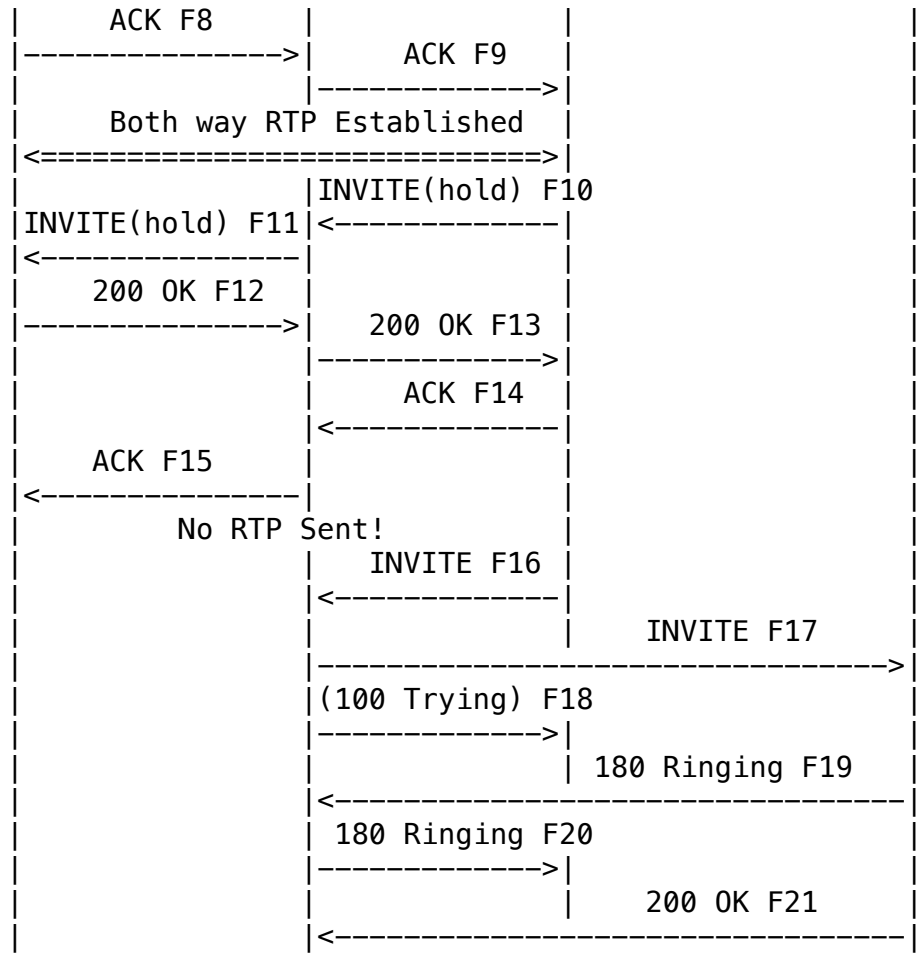
F25 200 OK Proxy 1 -> Alice

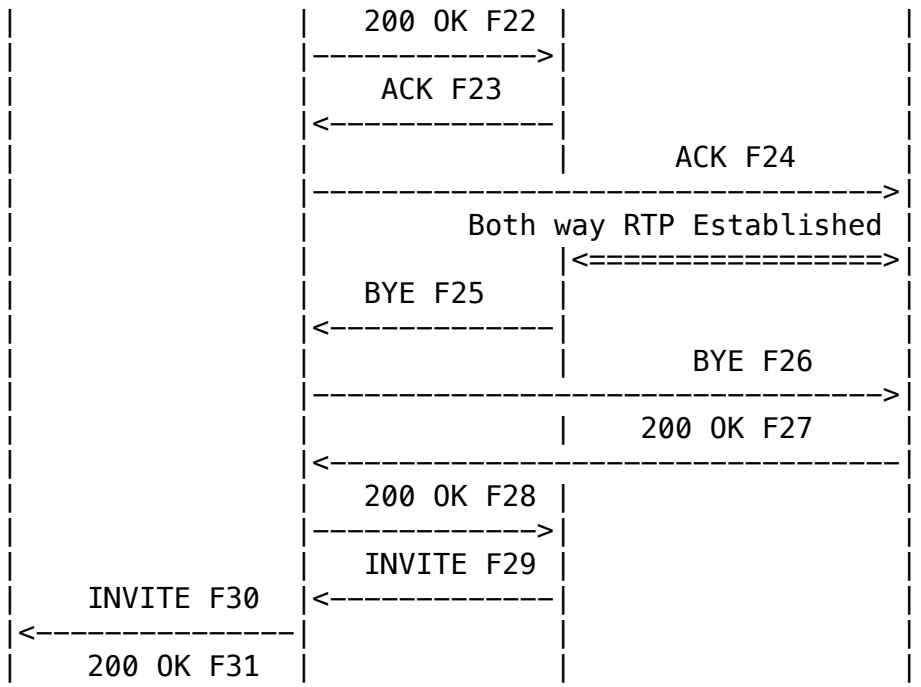
```
      SIP/2.0 200 OK
      Via: SIP/2.0/TLS client.atlanta.example.com:5061
       ;branch=z9hG4bK74bf97
       ;received=192.0.2.103
      From: Alice <sips:alice@atlanta.example.com>;tag=1234567
      To: Bob <sips:bob@biloxi.example.com>;tag=314159
      Call-ID: 12345601@atlanta.example.com
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

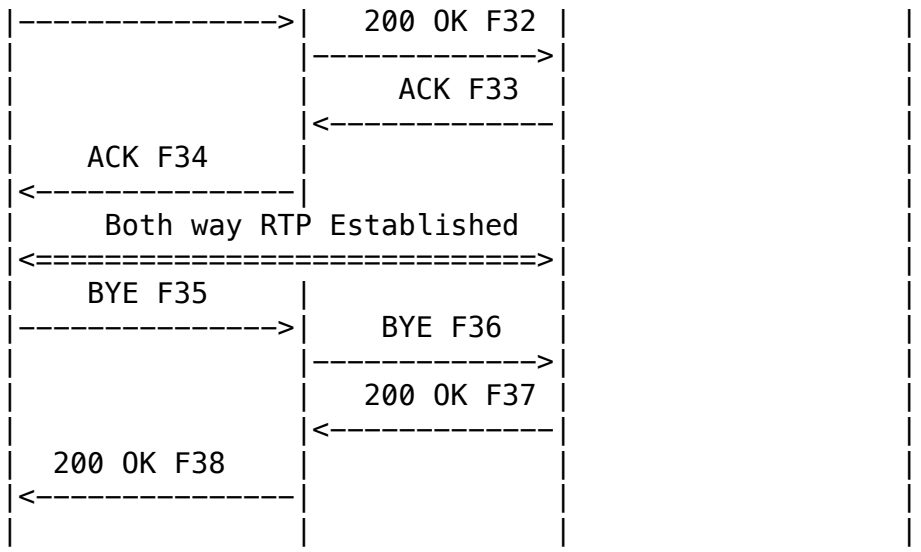
2.2. Consultation Hold

```
           Alice            Proxy           Bob                Carol
             |                |              |                   |
```


INVITE F1
INVITE F2
(100 Trying) F3
180 Ringing F4
180 Ringing F5
200 OK F6
200 OK F7


ACK F8
ACK F9
Both way RTP Established
INVITE(hold) F10
INVITE(hold) F11
200 OK F12
200 OK F13
ACK F14
ACK F15
No RTP Sent!
INVITE F16
INVITE F17
(100 Trying) F18
180 Ringing F19
180 Ringing F20
200 OK F21





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 in that Bob's UA is no longer rendering media to Bob, i.e. that Bob has placed the call on hold.

Message Details

F1 INVITE Alice -> Proxy 1

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

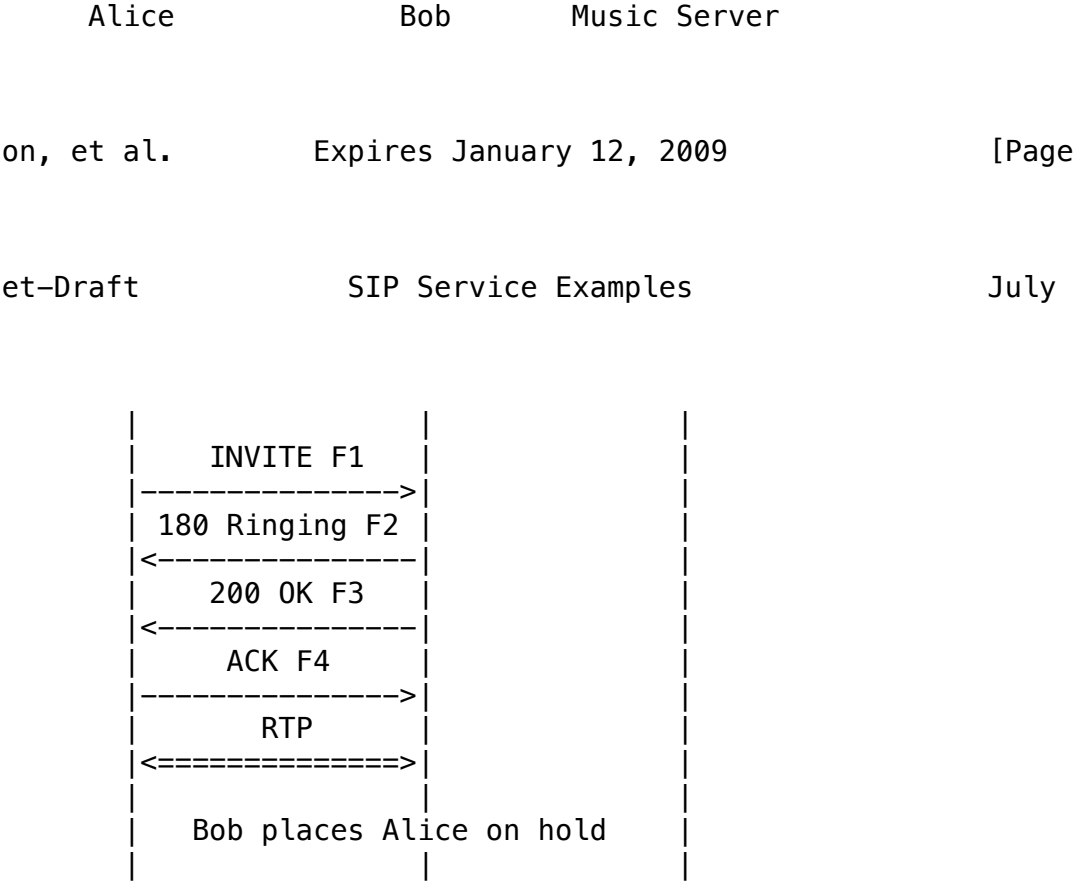
```
SIP/2.0 200 OK
Via: SIP/2.0/TLS ss1.example.com:5061
 ;branch=z9hG4bK8379.1
 ;received=192.0.2.54
Via: SIP/2.0/TLS client.atlanta.example.com:5061
```

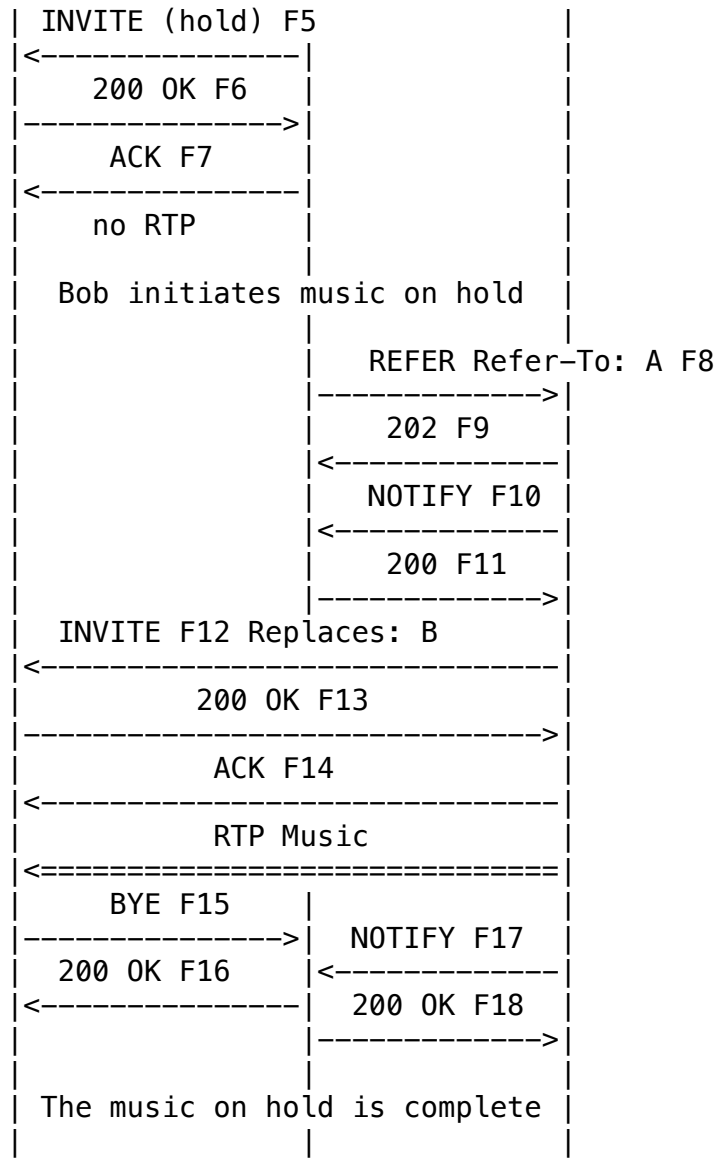
```
 ;branch=z9hG4bK74bf10
 ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=314159
Call-ID: 12345600@atlanta.example.com
CSeq: 2 BYE
Content-Length: 0
```

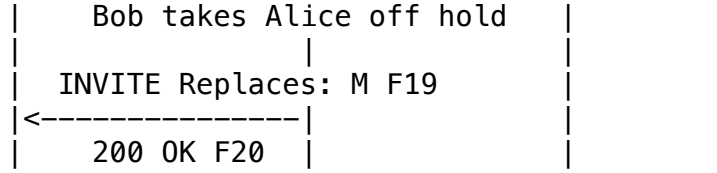
F38 200 OK Proxy 1 -> Alice

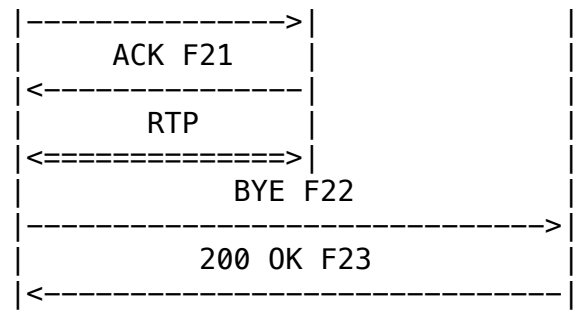
```
SIP/2.0 200 OK
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bf10
 ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=314159
Call-ID: 12345600@atlanta.example.com
CSeq: 2 BYE
Content-Length: 0
```

2.3. Music On Hold




INVITE (hold) F5
200 OK F6
ACK F7
no RTP
Bob initiates music on hold
REFER Refer-To: A F8
202 F9
NOTIFY F10
200 F11
INVITE F12 Replaces: B
200 OK F13
ACK F14
RTP Music
BYE F15
200 OK F16
NOTIFY F17
200 OK F18
The music on hold is complete


Bob takes Alice off hold
INVITE Replaces: M F19
200 OK F20



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

Note the use of the rendering feature tag defined in RFC 4235 [RFC4235] used in F5 to indicate in that Bob's UA is no longer rendering media to Bob, i.e. that Bob has placed the call on hold. Feature tags are also used in F12 with the automaton (defined in RFC 3840 [RFC3840]) 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

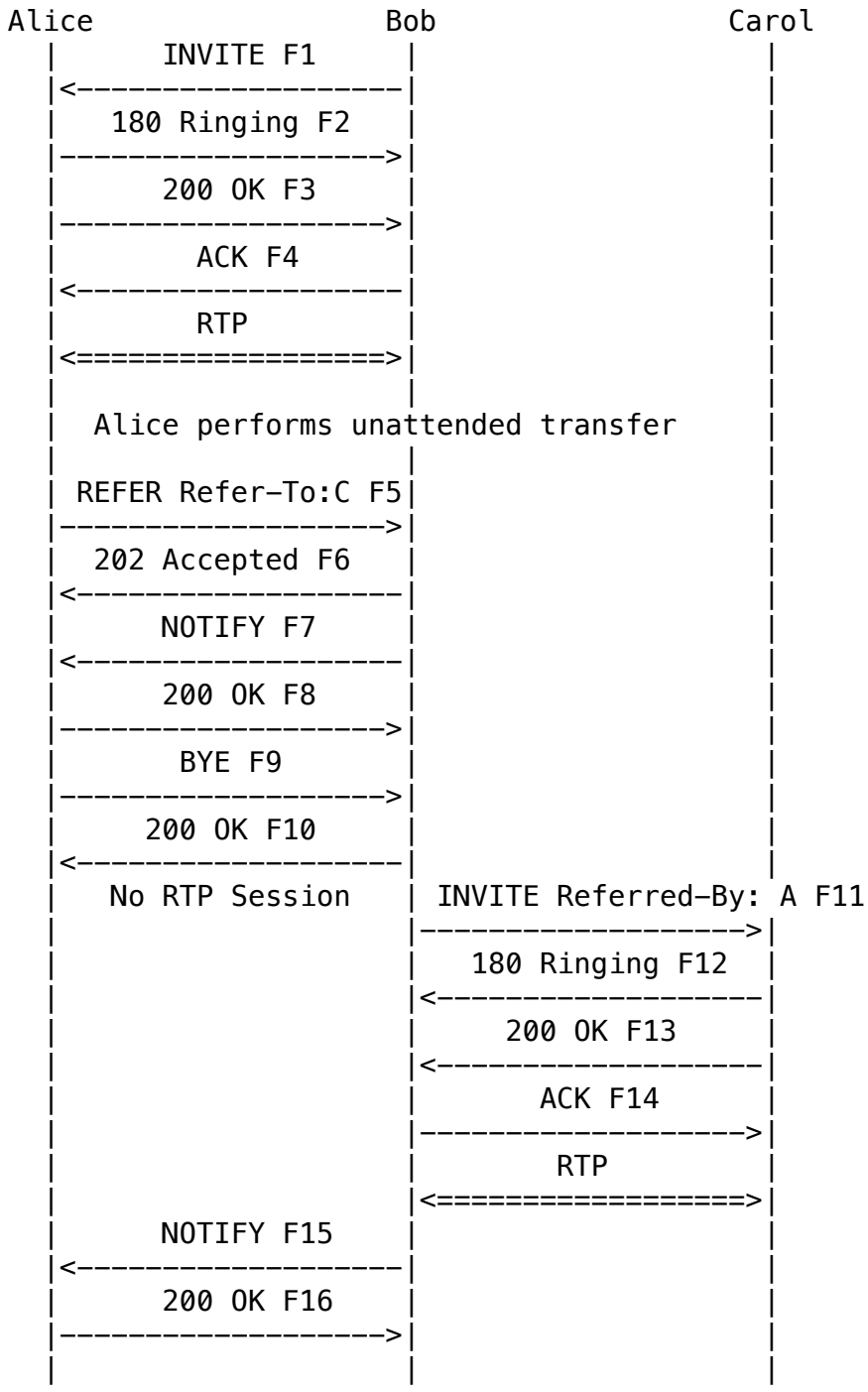
```
BYE sips:music@server.example.com SIP/2.0
Max-Forwards: 70
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74rf
To: <sips:music@server.example.com>;tag=0111
From: <sips:a8342043f@atlanta.example.com;gr>;tag=098594
Call-ID: a5-75-34-12-76@server.example.com
CSeq: 15 BYE
Content-Length: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

Message Details

F1 INVITE Bob -> Alice

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

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

F2 180 Ringing Alice -> Bob

```
SIP/2.0 180 Ringing
Via: SIP/2.0/TLS client.biloxi.example.com:5061
 ;branch=z9hG4bKnashds7
 ;received=192.0.2.113
From: Bob <sips:bob@biloxi.example.com>;tag=314159
To: Alice <sips:alice@atlanta.example.com>;tag=1234567
```



```
Call-ID: 12345601@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:alice@client.atlanta.example.com>
Content-Length: 0
```

F3 200 OK Alice -> Bob

```
SIP/2.0 200 OK
Via: SIP/2.0/TLS client.biloxi.example.com:5061
 ;branch=z9hG4bKnashds7
 ;received=192.0.2.113
From: Bob <sips:bob@biloxi.example.com>;tag=314159
To: Alice <sips:alice@atlanta.example.com>;tag=1234567
Call-ID: 12345601@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:alice@client.atlanta.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...

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

F4 ACK Bob -> Alice

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

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

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

F5 REFER Alice -> Bob

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

F6 202 Accepted Bob -> Alice

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

F7 NOTIFY Bob -> Alice

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



```
SIP/2.0 100 Trying
```

F8 200 OK Alice -> Bob

```
SIP/2.0 200 OK
Via: SIP/2.0/TLS client.biloxi.example.com:5061
 ;branch=z9hG4bKnashds32
 ;received=192.0.2.113
From: Bob <sips:bob@biloxi.example.com>;tag=314159
To: Alice <sips:alice@atlanta.example.com>;tag=1234567
```

```
Call-ID: 12345601@atlanta.example.com
CSeq: 2 NOTIFY
Content-Length: 0


/* Alice now disconnects with Bob. */

F9 BYE Alice -> Bob

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


F10 200 OK Bob -> Alice

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


/* Bob attempts the transfer to Carol */

F11 INVITE Bob -> Carol
```



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

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

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


F12 180 Ringing Carol -> Bob

SIP/2.0 180 Ringing
Via: SIP/2.0/TLS client.biloxi.example.com:5061
 ;branch=z9hG4bKnashds1
 ;received=192.0.2.113
From: Bob <sips:bob@biloxi.example.com>;tag=8675309
To: Carol <sips:carol@chicago.example.com>;tag=928287
Call-ID: 7436222@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:carol@client.chicago.example.com>
Content-Length: 0


F13 200 OK Carol -> Bob

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

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

v=0
o=carol 2890944542 2890844542 IN IP4 client.chicago.example.com
s=
c=IN IP4 client.chicago.example.com
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000


F14 ACK Bob -> Carol

ACK sips:carol@client.chicago.example.com SIP/2.0
Via: SIP/2.0/TLS client.biloxi.example.com:5061
 ;branch=z9hG4bKnashds9
Max-Forwards: 70
From: Bob <sips:bob@biloxi.example.com>;tag=8675309
To: Carol <sips:carol@chicago.example.com>;tag=928287
Call-ID: 7436222@atlanta.example.com
CSeq: 1 ACK
Content-Length: 0


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

F15 NOTIFY Bob -> Alice

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

```
      Contact: <sips:bob@client.biloxi.example.com>
      Content-Type: message/sipfrag
      Content-Length: ...

      SIP/2.0 200 OK
```

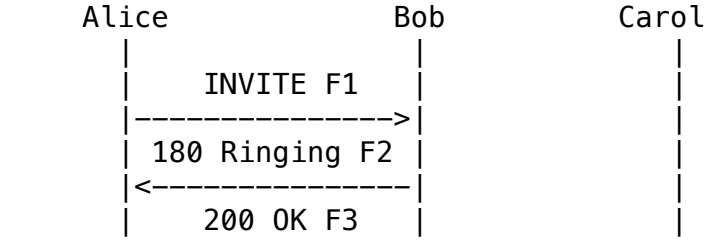


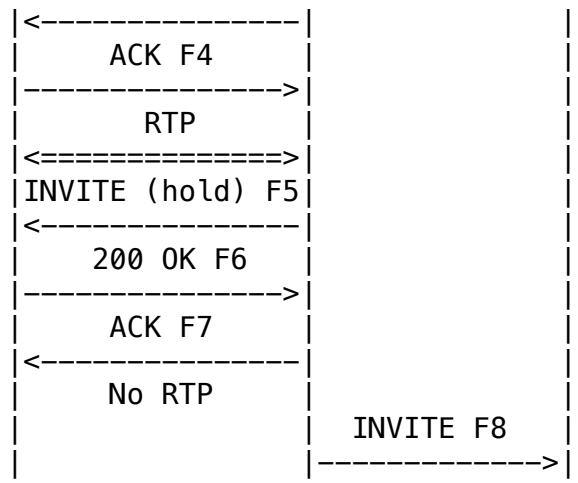
```
      Via: SIP/2.0/TLS client.biloxi.example.com:5061
       ;branch=z9hG4bKnashds1
       ;received=192.0.2.113
      From: Bob <sips:bob@biloxi.example.com>;tag=8675309
      To: Carol <sips:carol@chicago.example.com>;tag=928287
      Call-ID: 7436222@atlanta.example.com
      CSeq: 1 INVITE
 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

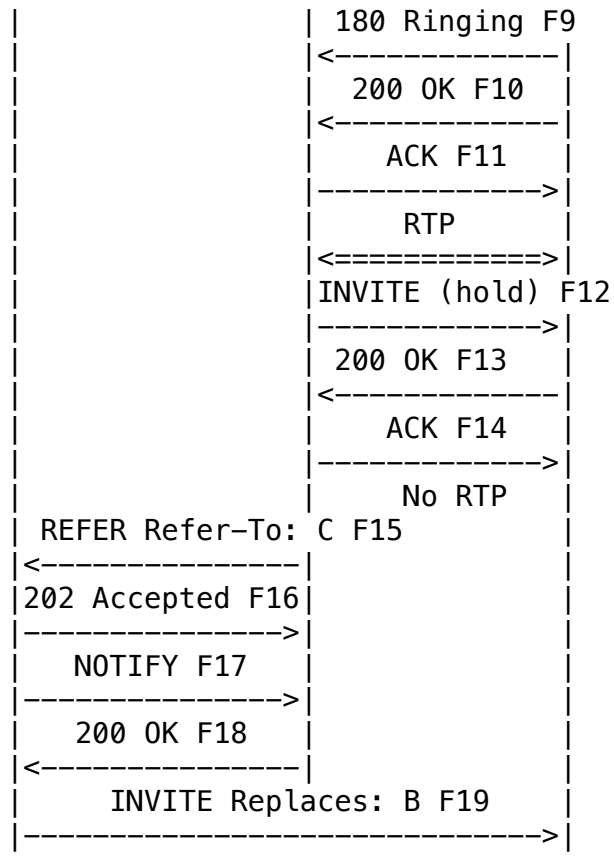
F16 200 OK Alice -> Bob

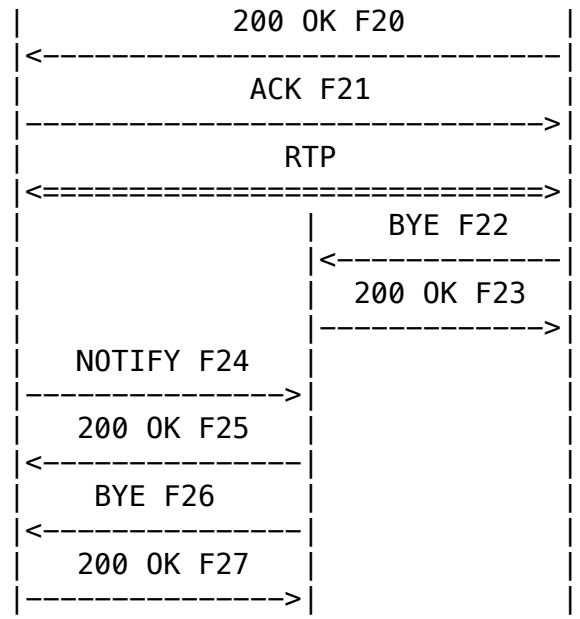
```
      SIP/2.0 200 OK
      Via: SIP/2.0/TLS client.biloxi.example.com:5061
       ;branch=z9hG4bKnashds6
       ;received=192.0.2.113
      From: Bob <sips:bob@biloxi.example.com>;tag=314159
      To: Alice <sips:alice@atlanta.example.com>;tag=1234567
      Call-ID: 12345601@atlanta.example.com
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

2.5. Transfer - Attended




ACK F4
RTP
INVITE (hold) F5
200 OK F6
ACK F7
No RTP
INVITE F8


180 Ringing F9
200 OK F10
ACK F11
RTP
INVITE (hold) F12
200 OK F13
ACK F14
No RTP
REFER Refer-To: C F15
202 Accepted F16
NOTIFY F17
200 OK F18
INVITE Replaces: B F19



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 [I-D.ietf-sip-gruu] and will be globally routable outside of the
dialog. Without knowing the Contact URI is a gruu, Bob must be
prepared, if the triggered INVITE had failed, to retry the REFER

with
   a Refer-To URI of the URI used to reach Carol but with a Require:
   replaces header escaped in the Refer-To header field, as discussed
in
   the transfer [I-D.ietf-sipping-cc-transfer] document.

   Message Details

      F1 INVITE Alice -> Bob

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

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

      F2 180 Ringing Bob -> Alice

      SIP/2.0 180 Ringing
      Via: SIP/2.0/TLS client.atlanta.example.com:5061
       ;branch=z9hG4bK74bf9
       ;received=192.0.2.103

```
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=23431
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:bob@client.biloxi.example.com>
Content-Length: 0
```

F3 200 OK Bob -> Alice

```
SIP/2.0 200 OK
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bf9
 ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=23431
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:bob@client.biloxi.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...

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

F4 ACK Alice -> Bob

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

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

      F5 INVITE Bob -> Alice

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

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


      F6 200 OK Alice -> Bob

      SIP/2.0 200 OK
      Via: SIP/2.0/TLS client.biloxi.example.com:5061
       ;branch=z9hG4bKnashds7
       ;received=192.0.2.113
      From: Bob <sips:bob@biloxi.example.com>;tag=23431
      To: Alice <sips:alice@atlanta.example.com>;tag=1234567
      Call-ID: 12345600@atlanta.example.com
      CSeq: 1024 INVITE
```

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

v=0
o=alice 2890844526 2890844527 IN IP4 client.atlanta.example.com
s=
```



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


F7 ACK Bob -> Alice

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


/* Bob calls Carol  */

F8 INVITE Bob -> Carol

INVITE sips:carol@chicago.example.com SIP/2.0
Via: SIP/2.0/TLS client.biloxi.example.com:5061
 ;branch=z9hG4bKnash
Max-Forwards: 70
From: Bob <sips:bob@biloxi.example.com>;tag=8675309
To: Carol <sips:carol@chicago.example.com>
```

```
Call-ID: sdjfdjfskdf@biloxi.example.com
CSeq: 42 INVITE
Contact: <sips:bob@client.biloxi.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...

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

F9 180 Ringing Carol -> Bob


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

F10 200 OK Carol -> Bob

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

```
CSeq: 42 INVITE
Contact: <sips:39itp34klkd@chicago.example.com;gr>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces, gruu
Content-Type: application/sdp
Content-Length: ...

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


F11 ACK Bob -> Carol

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



```
/* Bob puts Carol on hold */

F12 INVITE Bob -> Carol

INVITE sips:39itp34klkd@chicago.example.com;gr SIP/2.0
Via: SIP/2.0/TLS client.biloxi.example.com:5061
 ;branch=z9hG4bKnashds0
Max-Forwards: 70
From: Bob <sips:bob@biloxi.example.com>;tag=8675309
To: Carol <sips:carol@chicago.example.com>;tag=5f35a3
Call-ID: sdjfdjfskdf@biloxi.example.com
CSeq: 43 INVITE
```

```
      Contact: <sips:bob@client.biloxi.example.com>;
+sip.rendering="no"
      Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
      Supported: replaces
      Content-Type: application/sdp
      Content-Length: ...

      v=0
      o=bob 289084834 2890844835 IN IP4 client.biloxi.example.com
      s=
      c=IN IP4 client.biloxi.example.com
      t=0 0
      m=audio 3458 RTP/AVP 0
      a=rtpmap:0 PCMU/8000
      a=sendonly


      F13 200 OK Carol -> Bob

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

      v=0
      o=carol 2890844922 2890844923 IN IP4 client.chicago.example.com
      s=
      c=IN IP4 client.chicago.example.com
```



```
      t=0 0
      m=audio 3456 RTP/AVP 0
```

```
    a=rtpmap:0 PCMU/8000
    a=recvonly


    F14 ACK Bob -> Carol

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


    /* Bob  Transfers  Alice to Carol.  */

    F15 REFER Bob -> Alice

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


    F16 202 Accepted Alice -> Bob

    SIP/2.0 202 Accepted
    Via: SIP/2.0/TLS client.biloxi.example.com:5061
     ;branch=z9hG4bKnashds2g
     ;received=192.0.2.113
    From: Bob <sips:bob@biloxi.example.com>;tag=23431
```

```
To: Alice <sips:alice@atlanta.example.com>;tag=1234567
Call-ID: 12345600@atlanta.example.com
Contact: <sips:alice@client.atlanta.example.com>
CSeq: 1025 REFER
Content-Length: 0


F17 NOTIFY Alice -> Bob

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

SIP/2.0 100 Trying


F18 200 OK Bob -> Alice

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


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

F19 INVITE Alice -> Carol
```

```
INVITE sips:39itp34klkd@chicago.example.com;gr SIP/2.0
Via: SIP/2.0/TLS chicago.example.com:5061
 ;branch=z9hG4bKadfe4ko
To: Carol <sips:39itp34klkd@chicago.example.com>
```



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

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

F20 200 OK Carol -> Alice

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

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

v=0
o=carol 2890844221 2890844221 IN IP4 client.chicago.example.com
s=
c=IN IP4 client.chicago.example.com
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```



```
F21 ACK Alice -> Carol

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


/* Carol then disconnects from Bob */

F22 BYE Carol -> Bob

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

```
Call-ID: sdjfdjfskdf@biloxi.example.com
CSeq: 1 BYE
Content-Length: 0


F23 200 OK Bob -> Carol

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


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

F24 NOTIFY Alice -> Bob
```



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

SIP/2.0 200 OK
Via: SIP/2.0/TLS chicago.example.com:5061
```

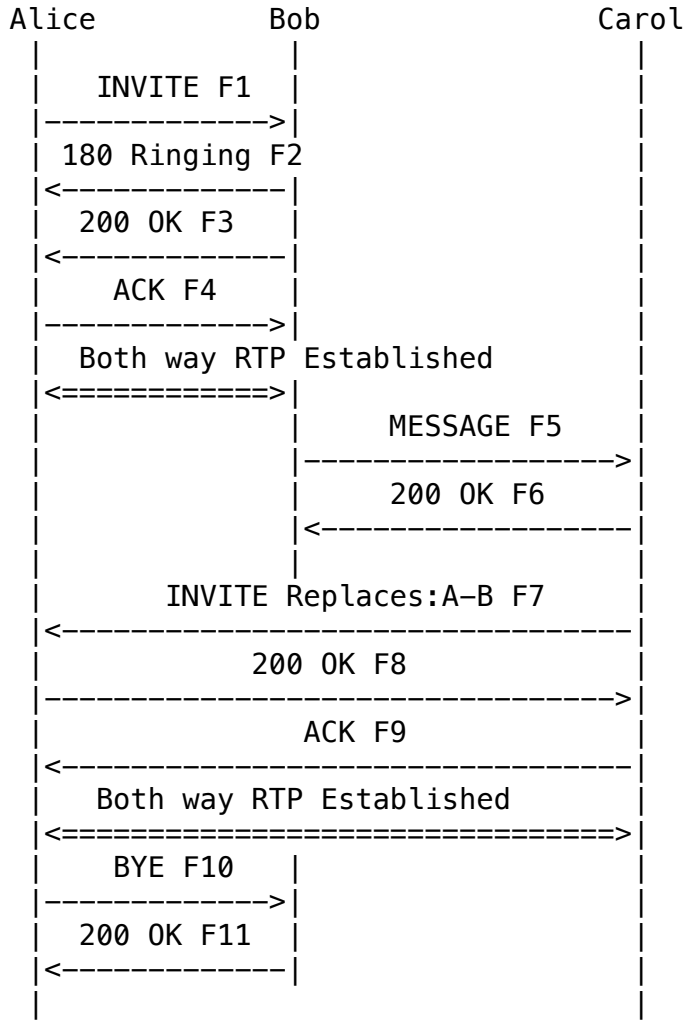
```
 ;branch=z9hG4bKadfe4ko
 ;received=192.0.2.103
To: Carol <sips:39itp34klkd@chicago.example.com>;tag=ff3a
From: Alice <sips:alice@atlanta.example.com>;tag=3461
Call-ID: 9435674543@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:39itp34klkd@chicago.example.com>


F25 200 OK Bob -> Alice

SIP/2.0 200 OK
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bf9
 ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=23431
Call-ID: 12345600@atlanta.example.com
CSeq: 3 NOTIFY
Content-Length: 0


/* Bob disconnects with  Alice */

F26 BYE Bob -> Alice

BYE sips:alice@client.atlanta.example.com SIP/2.0
Via: SIP/2.0/TLS client.biloxi.example.com:5061
 ;branch=z9hG4bKnashds7P
Max-Forwards: 70
From: Bob <sips:bob@biloxi.example.com>;tag=23431
To: Alice <sips:alice@atlanta.example.com>;tag=1234567
```



```
Call-ID: 12345600@atlanta.example.com
CSeq: 1026 BYE
Content-Length: 0


F27 200 OK Alice -> Bob
```

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

2.6. Transfer - Instant Messaging



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

This scenario shows the use of the SIP MESSAGE [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
```

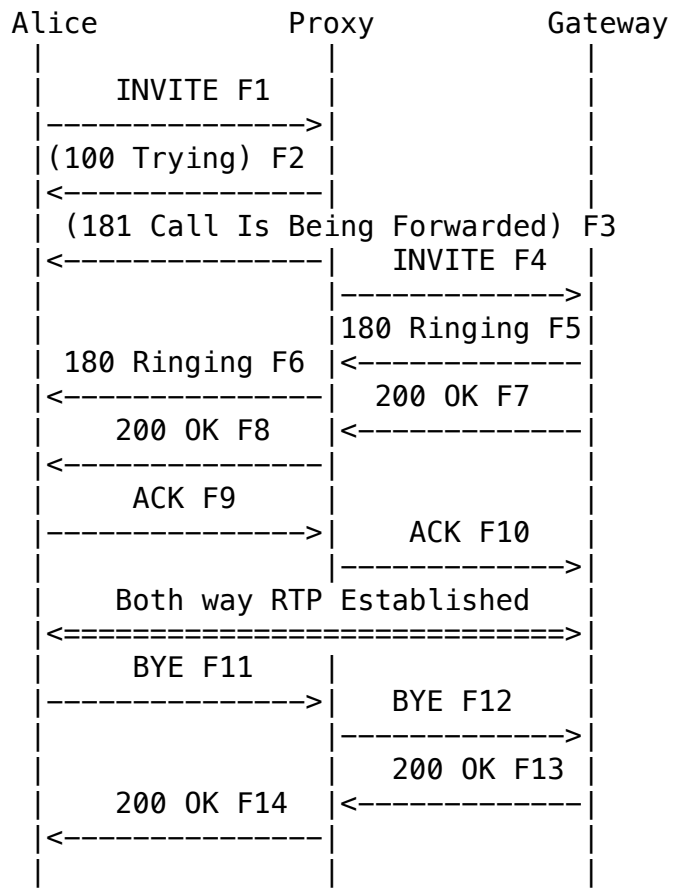
```
SIP/2.0 200 OK
Via: SIP/2.0/TLS pc.biloxi.example.com:5061
 ;branch=z9hG4bK74HH
 ;received=192.0.2.114
From: Carol <sips:carol@chicago.example.com>;tag=8675310
To: Alice <sips:a8342043f@atlanta.example.com;gr>;tag=131256
Call-ID: 563456212@b2.chicago.example.com
CSeq: 1 INVITE
Contact: <sips:a8342043f@atlanta.example.com;gr>
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 PSTN (which is just another URI to the proxy server). Alice calls Bob. The proxy server rewrites the Request URI, and forwards the INVITE to a Gateway. Details of messaging behind the Gateway are not shown.

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

responses.

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

Message Details

F1 INVITE Alice -> Proxy


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

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

F2 (100 Trying) Proxy -> Alice

```
SIP/2.0 100 Trying
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bf9
 ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
```

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


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

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



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

F4 INVITE Proxy -> Gateway

INVITE 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

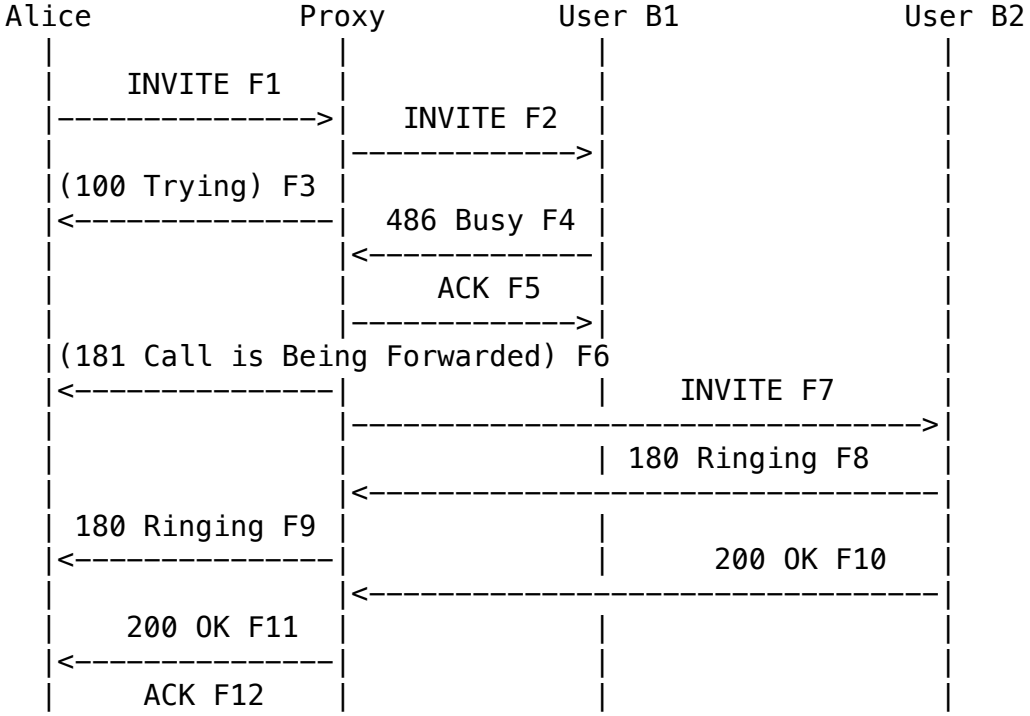
```
SIP/2.0 200 OK
Via: SIP/2.0/TLS ss1.example.com:5061
 ;branch=z9hG4bK83749G1
 ;received=192.0.2.54
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bfJe
 ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=314159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

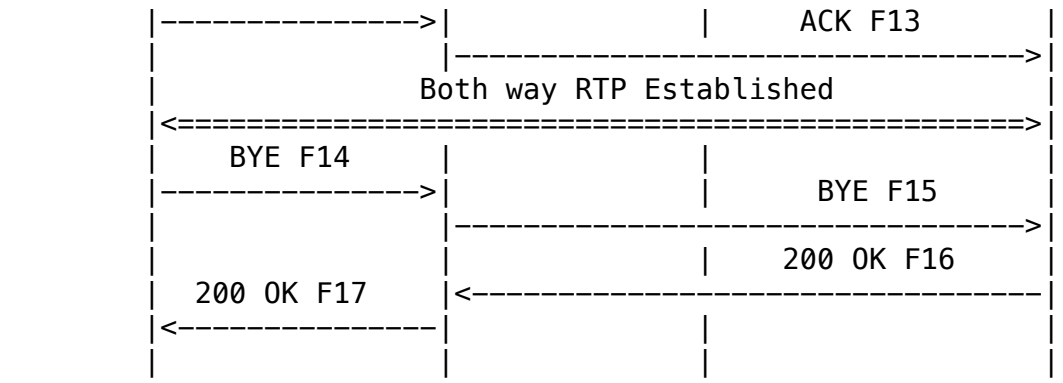
```
Content-Length: 0
```

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 A and B2 */

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

F14 BYE Alice -> Proxy

BYE sips:bob@client2.biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bW4
Route: <sips:ss1.example.com;lr>
Max-Forwards: 70
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
```

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

F15 BYE Proxy -> B2

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


F16 200 OK B2 -> Proxy

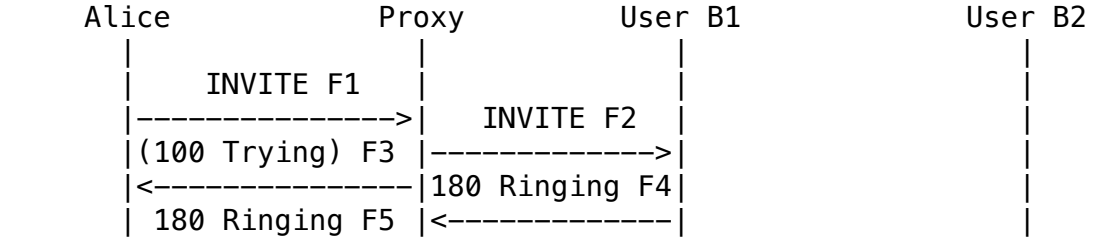
```
SIP/2.0 200 OK
Via: SIP/2.0/TLS ss1.example.com:5061
 ;branch=z9hG4bK837493
 ;received=192.0.2.54
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bW4
 ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=7654321
Call-ID: 12345600@atlanta.example.com
CSeq: 2 BYE
Content-Length: 0
```

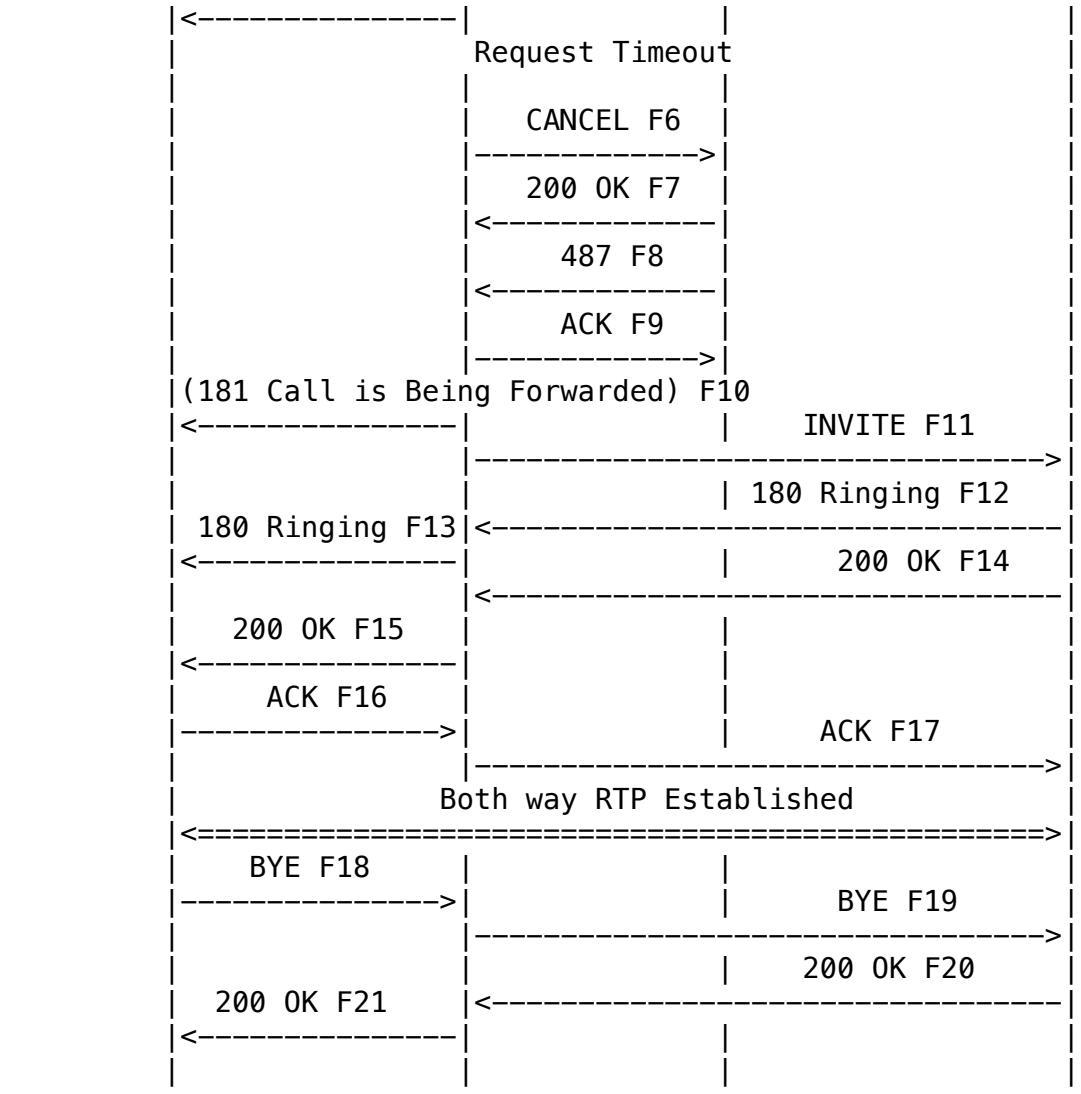
F17 200 OK Proxy -> Alice

```
SIP/2.0 200 OK
```

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


2.9. Call Forwarding - No Answer





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

Message Details

F1 INVITE Alice -> Proxy

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

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

F2 INVITE Proxy -> B1

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

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

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

F3 (100 Trying) Proxy -> Alice

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

F4 180 Ringing B1 -> Proxy

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

F5 180 Ringing Proxy -> Alice

```
SIP/2.0 180 Ringing
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bf9
 ;received=192.0.2.103
Record-Route: <sips:ss1.example.com;lr>
```

```
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=3145678
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:bob@client.biloxi.example.com>
Content-Length: 0
```



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

F6 CANCEL Proxy -> B1

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


F7 200 OK B1 -> Proxy

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


F8 487 Request Terminated B1 -> Proxy

SIP/2.0 487 Request Terminated
Via: SIP/2.0/TLS ss1.example.com:5061
```

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


F9 ACK Proxy -> B1

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



```
Via: SIP/2.0/TLS ss1.example.com:5061
 ;branch=z9hG4bK83749.1
Max-Forwards: 70
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=3145678
Call-ID: 12345600@atlanta.example.com
CSeq: 1 ACK
Content-Length: 0


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

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


F11 INVITE Proxy -> B2
```

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

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



```
a=rtpmap:0 PCMU/8000
```

F12 180 Ringing B2 -> Proxy

```
SIP/2.0 180 Ringing
Via: SIP/2.0/TLS ss1.example.com:5061
 ;branch=z9hG4bK83749.2
 ;received=192.0.2.54
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bf9
 ;received=192.0.2.103
Record-Route: <sips:ss1.example.com;lr>
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=765432
```

```
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:bob@client2.biloxi.example.com>
Content-Length: 0


F13 180 Proxy -> Alice

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


F14 200 OK B2 -> Proxy

SIP/2.0 200 OK
Via: SIP/2.0/TLS ss1.example.com:5061
 ;branch=z9hG4bK83749.2
 ;received=192.0.2.54
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bf9
 ;received=192.0.2.103
Record-Route: <sips:ss1.example.com;lr>
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=765432
```



```
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:bob@client2.biloxi.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Content-Type: application/sdp
Content-Length: ...
```

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


F15 200 OK Proxy -> Alice

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

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


F16 ACK Alice -> Proxy

ACK sips:bob@client2.biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bf3
Route: <sips:ss1.example.com;lr>
Max-Forwards: 70
```

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


F17 ACK Proxy -> B2

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


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

F18 BYE Alice -> Proxy

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


F19 BYE Proxy -> B2

BYE sips:bob@client2.biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS ss1.example.com:5061
 ;branch=z9hG4bK837.1
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74b3f
```

```
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
```

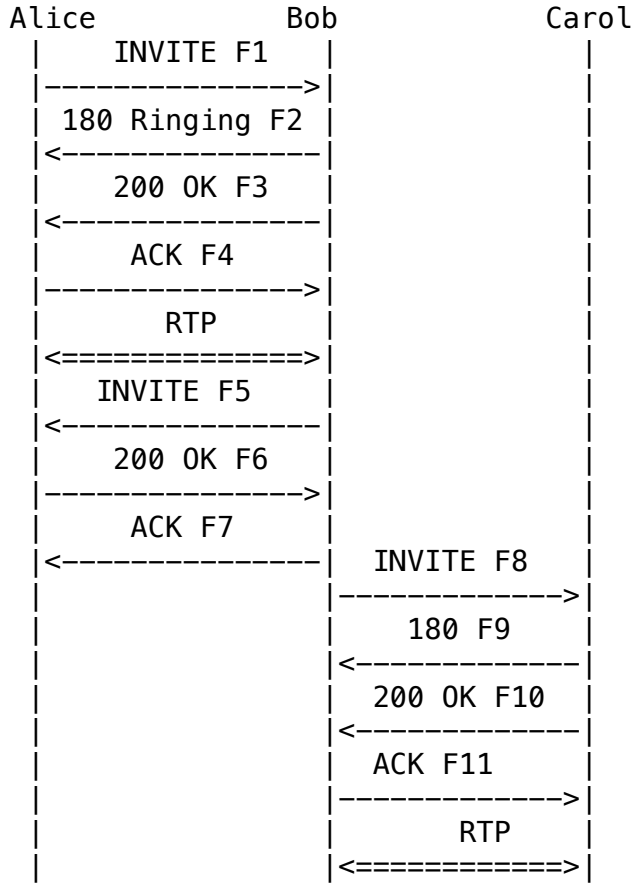
F20 200 OK B2 -> Proxy

```
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
```

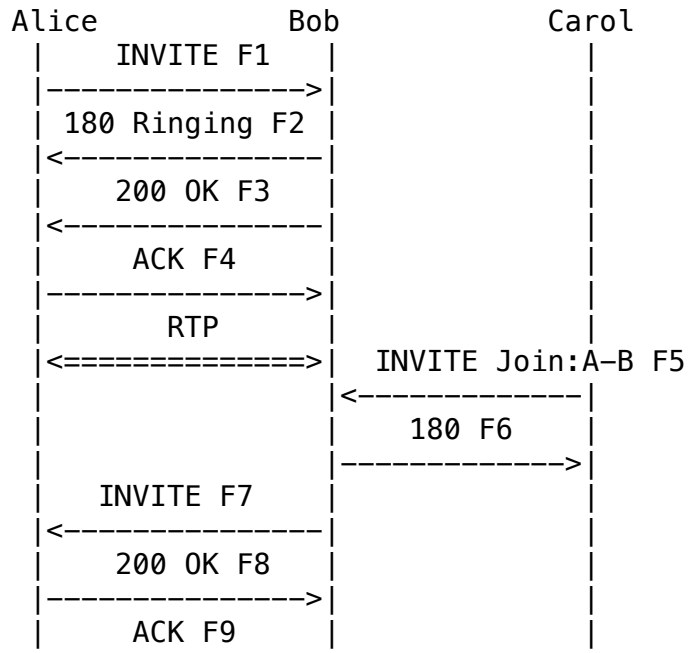


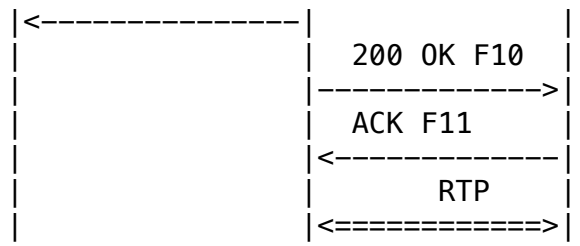
```
CSeq: 42 INVITE
Contact: <sips:carol@client.chicago.example.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...

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

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

2.11. 3-way Conference - Third Party Joins





In this scenario, Alice and Bob are in a 2 party call and Carol wishes to join resulting in a three party call. Carol could have learned Bob's dialog identifier using some non-SIP means, or possibly from a NOTIFY with the dialog package sent by Bob. Carol sends an INVITE to Bob containing a Join header identifying the dialog between Alice and Bob. Bob re-INVITEs Alice to switch to focus mode and includes the "isfocus" feature tag [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
```

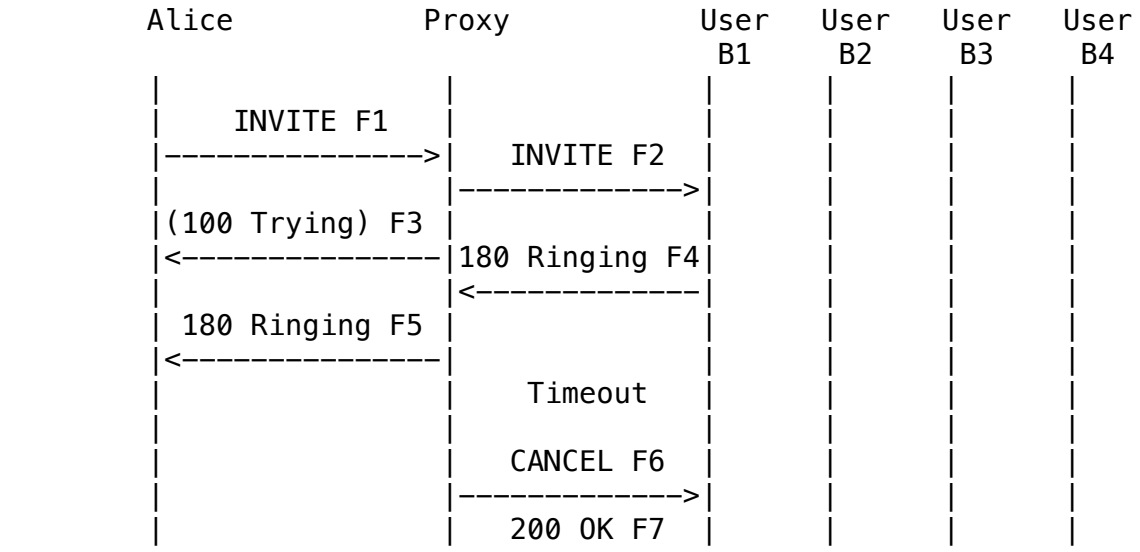
```
      Content-Length: 0


      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
```

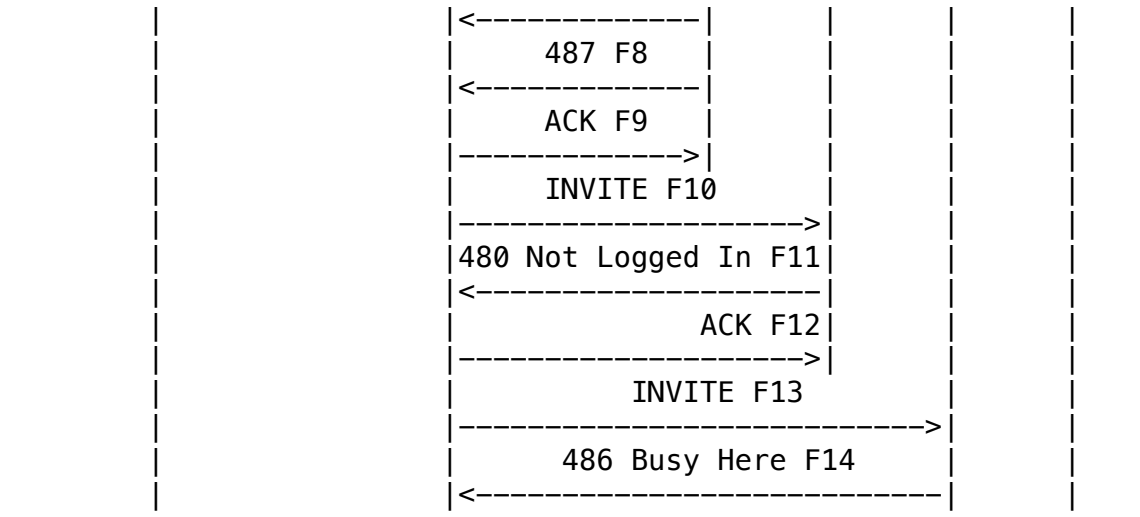


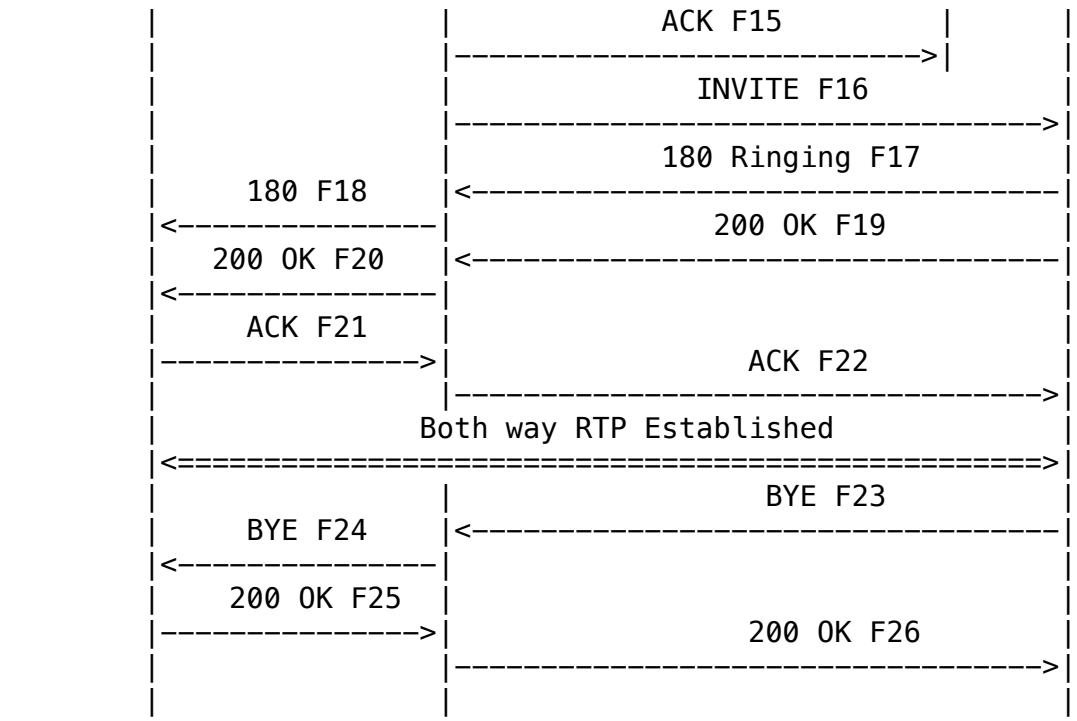
```
      Supported: replaces, join, gruu
      Content-Type: application/sdp
      Content-Length: ...

      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's call to Bob will result in an attempt to locate that user by calling locations from a list of contacts. The location to answer the call becomes the active set, no other sets may join the call.

While this flow shows a sequential search, the search could be accomplished using parallel forking, as in the previous example.

Message Details

F1 INVITE Alice -> Proxy


```
INVITE 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 A and B4*/

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

F23 BYE B4 -> Proxy

```
BYE sips:alice@client.atlanta.example.com SIP/2.0
Via: SIP/2.0/TLS client4.biloxi.example.com:5061
 ;branch=z9hG4bKnashds7
Route: <sips:ss1.example.com;lr>
Max-Forwards: 70
```

```
From: Bob <sips:bob@biloxi.example.com>;tag=7137136
To: Alice <sips:alice@atlanta.example.com>;tag=1234567
Call-ID: 12345600@atlanta.example.com
CSeq: 1 BYE
Content-Length: 0
```

F24 BYE Proxy -> Alice

```
BYE sips:alice@client.atlanta.example.com SIP/2.0
Via: SIP/2.0/TLS ss1.example.com:5061
 ;branch=z9hG4bK83754
Via: SIP/2.0/TLS client4.biloxi.example.com:5061
 ;branch=z9hG4bKnashds7
 ;received=192.0.2.105
```



```
Max-Forwards: 69
From: Bob <sips:bob@biloxi.example.com>;tag=7137136
To: Alice <sips:alice@atlanta.example.com>;tag=1234567
Call-ID: 12345600@atlanta.example.com
CSeq: 1 BYE
Content-Length: 0
```

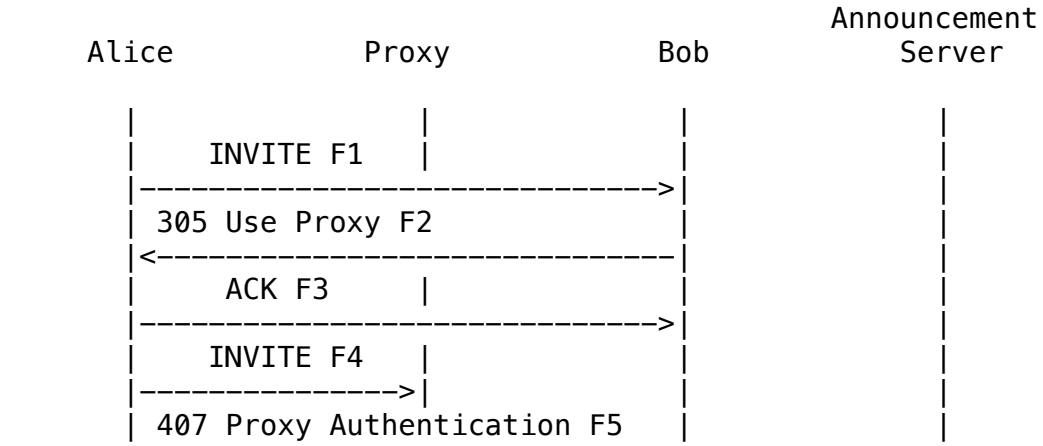
F25 200 OK Alice -> Proxy

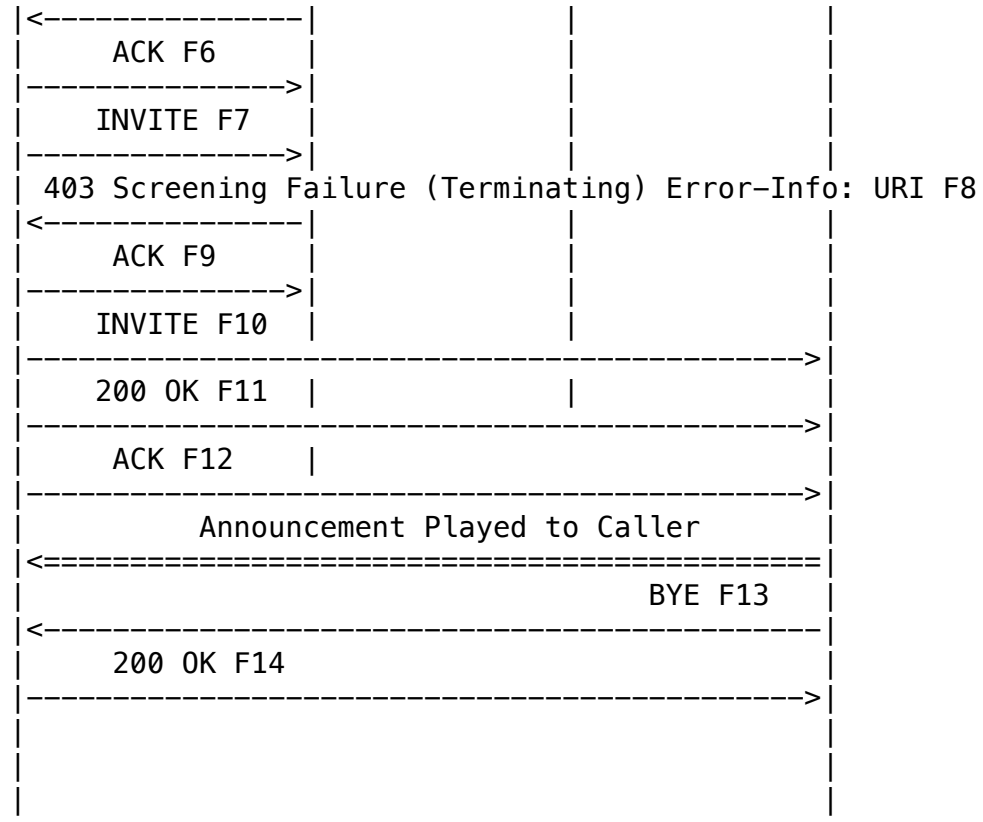
```
SIP/2.0 200 OK
Via: SIP/2.0/TLS ss1.example.com:5061
 ;branch=z9hG4bK83754
 ;received=192.0.2.54
Via: SIP/2.0/TLS client4.biloxi.example.com:5061
 ;branch=z9hG4bKnashds7
 ;received=192.0.2.105
From: Bob <sips:bob@biloxi.example.com>;tag=7137136
To: Alice <sips:alice@atlanta.example.com>;tag=1234567
Call-ID: 12345600@atlanta.example.com
CSeq: 1 BYE
Content-Length: 0
```

F26 200 OK Proxy -> B4

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


2.13. Call Management (Incoming Call Screening)





Bob has an incoming call screening list, Alice is included on the list of addresses Bob will not accept calls from. Alice attempts to call Bob. Messages F1, F2, and F3 are included to show that Bob does not accept INVITEs that have not been screened by the proxy.

Note that call screening can not be done using the From header - instead some form of authentication credentials must be used.

The screening proxy inserts an announcement URI in an Error-Info header field which Alice accesses by sending an INVITE to listen to the Announcement. The Announcement Server uses the automaton and rendering feature tags in F12 and F13 to indicate that it is a

media
   server only capability of playing announcements.

   Message Details

```
      F1 INVITE Alice -> Bob

      INVITE 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, qop="auth", algorithm=MD5
Content-Length: 0
```

F6 ACK Alice -> Proxy 1

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

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

F7 INVITE Alice -> Proxy 1

```
INVITE sips:bob@biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bf2
Max-Forwards: 70
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>
```

```
Call-ID: 12345600@atlanta.example.com
CSeq: 3 INVITE
Contact: <sips:alice@client.atlanta.example.com>
Proxy-Authorization: Digest username="alice",
 realm="example.com", qop="auth",
 nc=00000001, cnonce="4gr84543ft2",
 nonce="ae9137be1c87d175c2dd63302a0d6e0a",
 opaque="", uri="sips:bob@biloxi.example.com",
 response="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

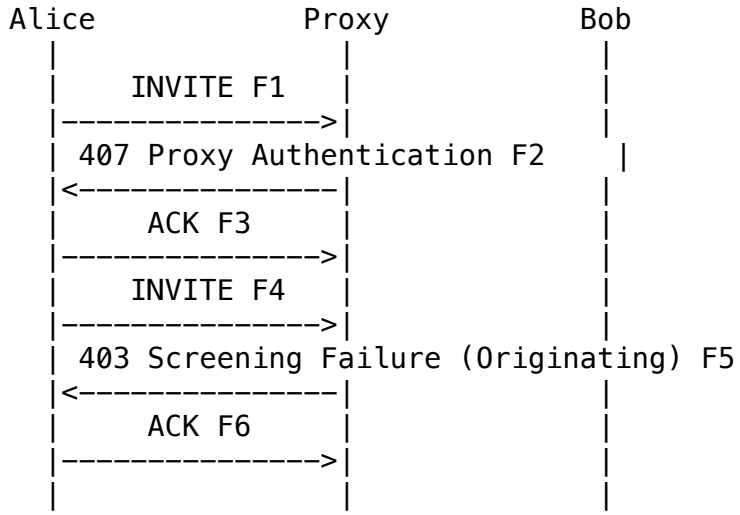
```
ACK sips:ms.biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74b32
```



```
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 Alice will not be able to place a call to. Alice attempts to call Bob.

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

Message Details

F1 INVITE Alice -> Proxy 1

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

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

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


/* Proxy 1 challenges  Alice for authentication */

F2 407 Proxy Authentication Required Proxy 1 -> Alice

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


F3 ACK Alice -> Proxy 1

ACK sips:bob@biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74bf9
Max-Forwards: 70
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=90210
Call-ID: 12345600@atlanta.example.com
CSeq: 1 ACK
Content-Length: 0


/*  Alice responds 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

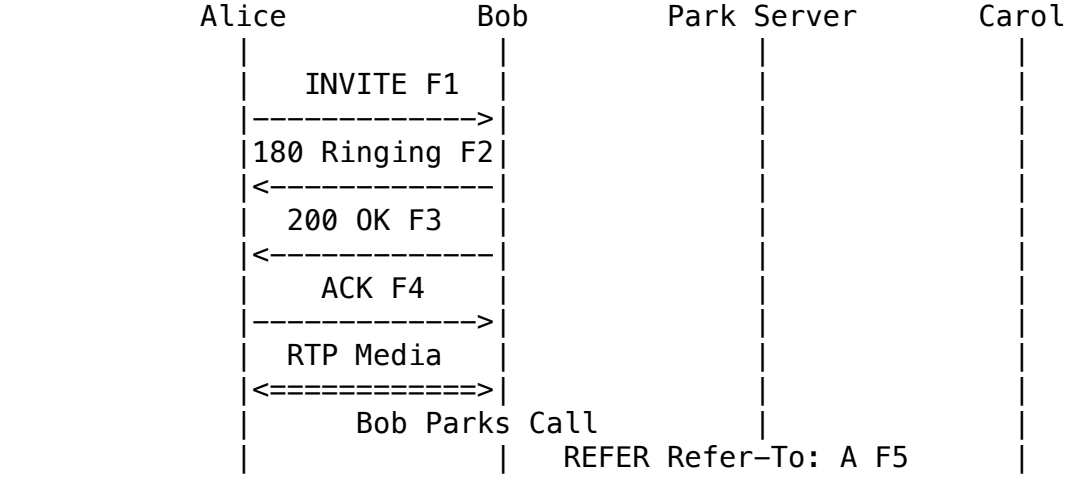
```
SIP/2.0 403 Screening Failure (Originating)
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK74b4
 ;received=192.0.2.103
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=18017
Call-ID: 12345600@atlanta.example.com
```

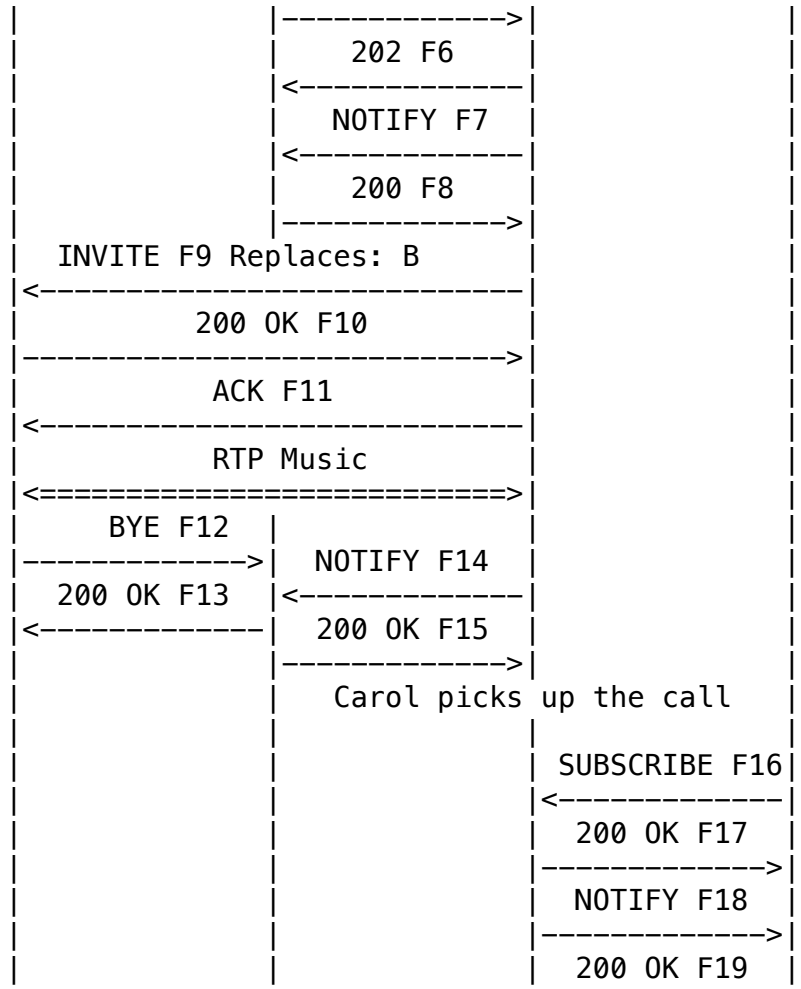
```
      CSeq: 2 INVITE
      Error-Info: <sips:screen-fail-orig-ann@announcement.example.com>
      Content-Length: 0


      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"
```

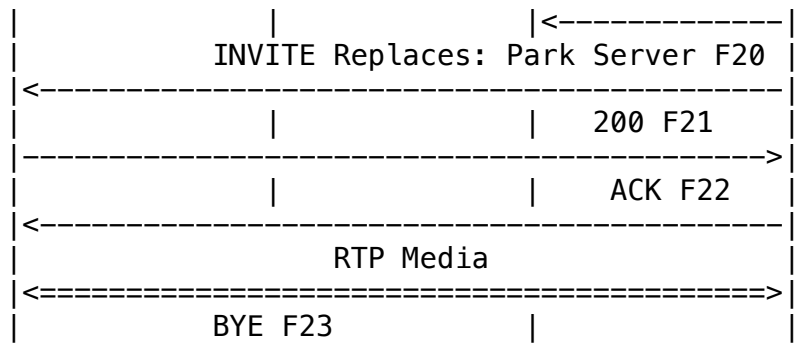


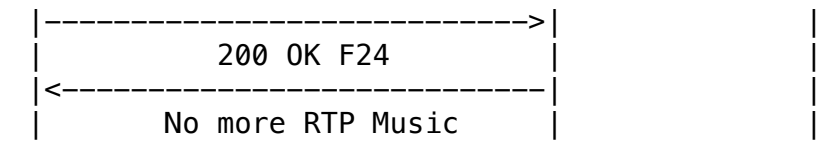
```
      Content-Length: 0
```

2.15. Call Park




202 F6
NOTIFY F7
200 F8
INVITE F9 Replaces: B
200 OK F10
ACK F11
RTP Music
BYE F12
200 OK F13
NOTIFY F14
200 OK F15
Carol picks up the call
SUBSCRIBE F16
200 OK F17
NOTIFY F18
200 OK F19


INVITE Replaces: Park Server F20
200 F21
ACK F22
RTP Media
BYE F23



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

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

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

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

Message Details.

F1 INVITE Alice -> Bob

```
INVITE sips:bob@biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS client.alice.example.com:5061
 ;branch=z9hG4bKnashds7
Max-Forwards: 70
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>
Call-ID: 12345601@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:a8342043f@atlanta.example.com;gr>
```

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

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


   F2 180 Ringing Bob -> Alice

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


   F3 200 OK Bob -> Alice

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

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

```
   s=
   c=IN IP4 client.biloxi.example.com
```



```
   t=0 0
   m=audio 3456 RTP/AVP 0
   a=rtpmap:0 PCMU/8000


   F4 ACK Alice -> Bob

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


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

   F5 REFER Bob -> Park Server

   REFER sips:park@server.example.com SIP/2.0
   Via: SIP/2.0/TLS client.biloxi.example.com:5061
    ;branch=z9hG4bKnashds9
   Max-Forwards: 70
   From: Bob <sips:bob@biloxi.example.com>;tag=02134
   To: Park Server <sips:park@server.example.com>
   Call-ID: 4802029847@biloxi.example.com
   CSeq: 1 REFER
 <allOneLine>
   Refer-To: <sips:a8342043f@atlanta.example.com;gr?Replaces=
```

```
   12345601%40atlanta.example.com%3Bfrom-tag%3D314159
   %3Bto-tag%3D1234567&Require=replaces>
 </allOneLine>
   Referred-By: <sips:bob@biloxi.example.com>
   Contact: <sips:bob@client.biloxi.example.com>
   Content-Length: 0


   F6 202 Accepted Park Server -> Bob

   SIP/2.0 202 Accepted
```



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


   F7 NOTIFY Park Server -> Bob

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

   SIP/2.0 100 Trying
```

```
   F8 200 OK Bob -> Park Server

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


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

   F9 INVITE Park Server -> Alice
```



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

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


   F10 200 OK Alice -> Park Server

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

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



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


   F11 ACK Park Server -> Alice

   ACK sips:a8342043f@atlanta.example.com;gr SIP/2.0
   Via: SIP/2.0/TLS server.example.com:5061
```

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

F12 BYE Alice -> Bob

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

F13 200 OK Bob -> Alice

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

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


F14 NOTIFY Park Server -> Bob

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

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


F15 200 OK Bob -> Park Server

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


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

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

F16 SUBSCRIBE Carol -> Park Server

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

F17 200 OK Park Server -> Carol

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

F18 NOTIFY Park Server -> Carol

```
NOTIFY sips:carol@client.example.com SIP/2.0
Via: SIP/2.0/TLS server.example.com:5061
 ;branch=z9hG4bK74b8skd
Max-Forwards: 70
To: Carol <sips:carol@chicago.example.com>;tag=158x93461
From: <sips:park@server.example.com>;tag=3213j
Call-ID: 2d6485356dfaj34dsf
CSeq: 1 NOTIFY
```

```
   Contact: <sips:park@server.example.com>;automaton
       ;+sip.byeless;+sip.rendering="no"
   Event: dialog
   Subscription-State: terminated;reason=timeout
   Content-Type: application/dialog-info+xml
   Content-Length: ...
```



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

```
   F19 200 OK Carol -> Park Server

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

```
   F20 INVITE Carol -> Alice

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



```
    SUBSCRIBE, NOTIFY
   Supported: replaces
   Content-Type: application/sdp
   Content-Length: ...

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


   F21 200 OK Alice -> Carol

   SIP/2.0 200 OK
   Via: SIP/2.0/TLS client.chicago.example.com:5061
    ;branch=z9hG4bK74bQ2
    ;received=192.0.2.105
   From: Carol <sips:carol@chicago.example.com>;tag=5893461
   To: Alice <sips:alice@atlanta.example.com>;tag=222
```

```
   Call-ID: 6485356@chicago.example.com
   CSeq: 1 INVITE
   Contact: <sips:a8342043f@atlanta.example.com;gr>
   Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, SUBSCRIBE, NOTIFY
   Supported: replaces, gruu
   Content-Type: application/sdp
   Content-Length: ...

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


   F22 ACK Carol -> Alice

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



```
   CSeq: 1 ACK
   Content-Length: 0


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

   F23 BYE Alice -> Park Server

   BYE sips:park@server.example.com SIP/2.0
   Via: SIP/2.0/TLS client.atlanta.example.com:5061
    ;branch=z9hG4bK74b4N
```

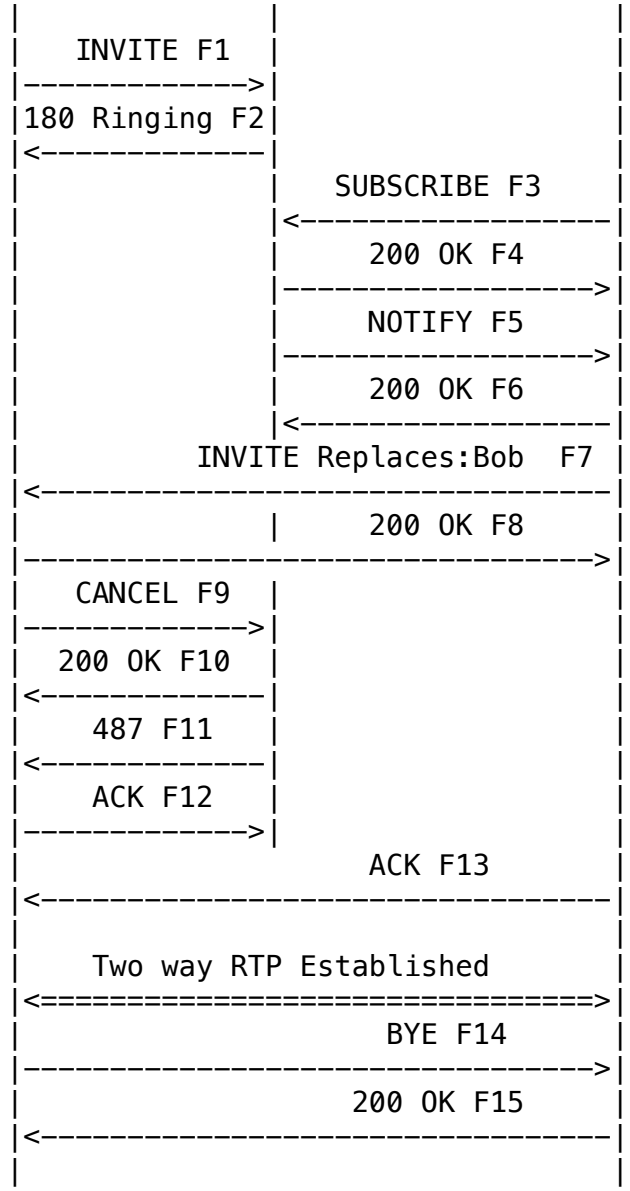
```
Max-Forwards: 70
From: Alice <sips:alice@atlanta.example.com>;tag=098594
To: <sips:park@server.example.com>;tag=0111
Call-ID: a5-75-34-12-76@server.example.com
CSeq: 1 BYE
Content-Length: 0
```

F24 200 OK Park Server -> Alice

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


2.16. Call Pickup

Alice Bob Bill



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
```

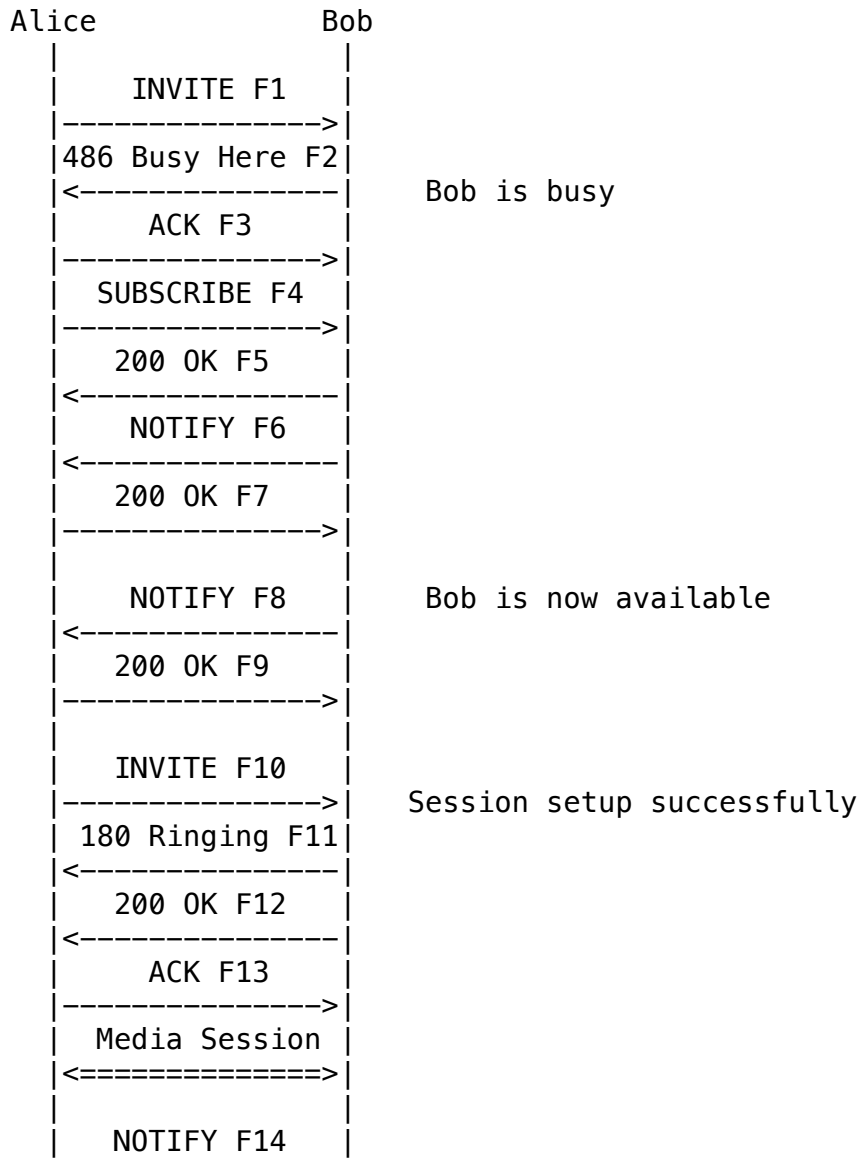
F12 ACK Alice -> Bob

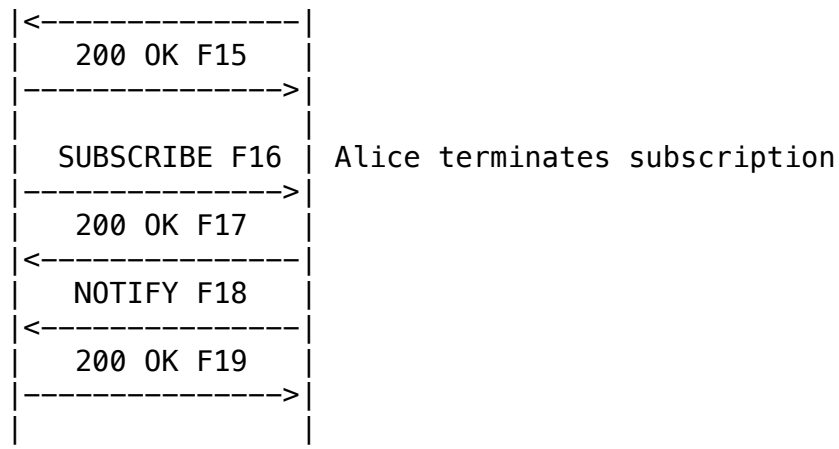
```
ACK sips:bob@client.biloxi.example.com SIP/2.0
Via: SIP/2.0/TLS client.atlanta.example.com:5061
 ;branch=z9hG4bK83749.1
Max-Forwards: 70
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=3145678
Call-ID: 12345600@atlanta.example.com
```

```
   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 Bob. */

   F14 BYE Alice -> Bill

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


   F15 200 OK Bill -> Alice

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

```
   Content-Length: 0
```

2.17. Automatic Redial





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
```

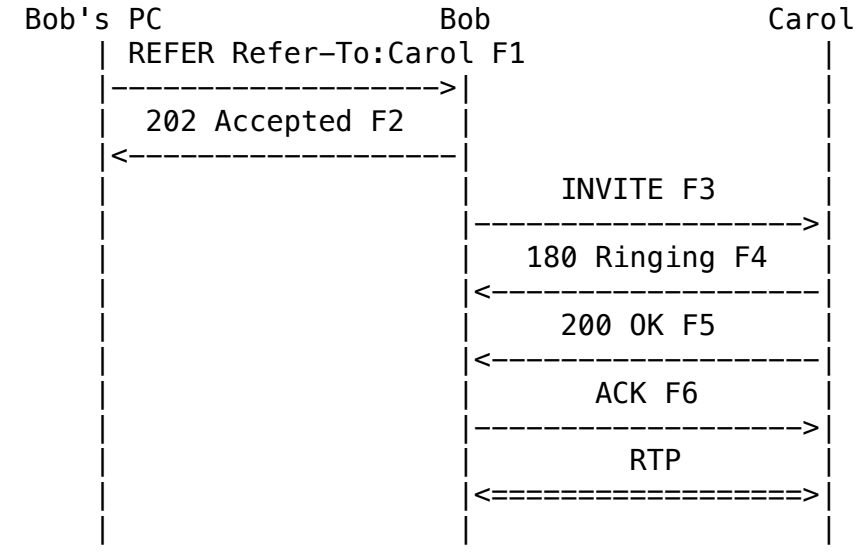
```
    ;branch=z9hG4bK474b8
    ;received=192.0.2.103
   From: Alice <sips:alice@atlanta.example.com>;tag=837348234
   To: Bob <sips:bob@biloxi.example.com>;tag=341123
   Call-ID: 4524526232@atlanta.example.com
   Expires: 0
   CSeq: 2 SUBSCRIBE
   Contact: sips:bob@client.biloxi.example.com
   Content-Length: 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 is necessary.

Message Details

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

F1 REFER PC -> Bob

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

F2 202 Accepted Bob -> PC

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

F3 INVITE Bob -> Carol

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

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

F4 180 Ringing Carol -> Bob

```
SIP/2.0 180 Ringing
Via: SIP/2.0/TLS client.biloxi.example.com:5061
 ;branch=z9hG4bKnashdK9
 ;received=192.0.2.113
From: Bob <sips:bob@biloxi.example.com>;tag=8675309
To: Carol <sips:carol@chicago.example.com>;tag=928287
Call-ID: 7436222@atlanta.example.com
CSeq: 1 INVITE
Contact: <sips:carol@client.chicago.example.com>
Content-Length: 0
```

F5 200 OK Carol -> Bob

```
SIP/2.0 200 OK
Via: SIP/2.0/TLS client.biloxi.example.com:5061
 ;branch=z9hG4bKnashdK9
 ;received=192.0.2.113
From: Bob <sips:bob@biloxi.example.com>;tag=8675309
To: Carol <sips:carol@chicago.example.com>;tag=928287
Call-ID: 7436222@atlanta.example.com
CSeq: 1 INVITE
```



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

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

F6 ACK Bob -> Carol

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

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

3. Security Considerations

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

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

The service examples in this document make extensive use of the SIP call control primitives REFER, Replaces, Join, and the dialog package. The security considerations associated with each of these extensions [RFC3515], [RFC3891], [RFC3911], [RFC4235] apply to the scenarios in this document.

4. IANA Considerations

None.

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Authors' Addresses

Alan Johnston (editor)
Avaya
St. Louis, MO 63124

Email: alan@sipstation.com

Robert J. Sparks
Estacado Systems

Email: RjS@estacado.net

Chris Cunningham
Cisco Systems

Email: chrcunni@cisco.com

Steve Donovan
Cisco Systems

Email: srd@cisco.com

Kevin Summers
Sonus
Plano, TX 75093

Email: ksummers@sonusnet.com

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SIP Call Control - Framework
draft-ietf-sip-cc-framework-00

Status of this Memo

Copyright Notice

Abstract

This document proposes that SIP call control features be added in a modular fashion, using an open-ended framework of extensions instead of a single extension. This memo proposes a modular design philosophy for call control extensions, and lists current work-in-progress call control related drafts.

Table of Contents

1. Introduction

Most conventional telephony applications provide some level of support for modifying an in-progress call, or call control. Simple examples include call transfer and three way calling. More complex examples include conferencing and third party control.

The baseline SIP protocol[1]provides some limited support for call control, in that a call-leg participant can terminate the call leg, put it on hold, or modify the characteristics of its media stream.

However, many common call control applications require extensions to SIP in order to accomplish tasks such as referring a call to a new end point, or joining an existing call.

This memo proposes a modular approach to call control extension.

2. Changes from Previous Version

This revision has only minor changes from the previous version:

- Removed open item concerning usage of the term "attended transfer."
- Renamed file to reflect status as a SIP working group item.
- Added references to the Call Control Model draft.[3]
- Added a section listing Call Control drafts that are currently in process.
- Removed discussion of original SIP call control draft.
- Made minor editorial revisions to improve clarity.

3. Call Control Feature Examples

The following examples are call features for which extensions are currently under development, or may require extensions in the near future. These are examples only, and should not be considered authoritative; a formal treatment of call control features and terminology can be found in [3].

Transfer with Consultation Hold - The transferring party establishes a session with the transfer target before completing the transfer (Currently proposed in [4]).

Attended transfer - the transferring party establishes a session with the target and mixes both sessions together so that all three

parties can participate, then disconnects leaving the transferee and transfer target with an active session.

Conference Bridge - Callers join a conference on a centralized bridge.

Fully meshed conference - Callers establish sessions with all other callers on the conference. Each client mixes media streams.

Call Park - Call participant transfers a call to a call park, then retrieves it at a later time.

Call Pick - A party picks up a call that was ringing at another station.

Call Monitoring - A call center supervisor joins an in-progress call for monitoring purposes.

These examples are not exhaustive; we expect that more call control feature requirements will be proposed as SIP usage matures. Therefore it is not possible for this document to enumerate all call control extensions in advance.

4. A Modular Approach

We propose the SIP call control extensions be handled in a modular fashion. Instead of having a single unified call control extension, we should instead have a framework of extensions. Each of these extensions would focus on a bounded and coherent requirement (or extension) set.

A framework approach allows SIP entities to negotiate feature support with more granularity. For example, an implementation could assert that it supports call transfer without implying that it also supports conferencing.

5. Call Control Extension Design Philosophy

Each call control extension should address a coherent group of requirements that are most likely to be needed as a set. If implementers find themselves having to add features that would not normally be required by their application just because they are defined by the extension, it is probably to big.

The negotiated support of one call control extension MUST not imply

the support of other extensions. While multiple extensions MAY share extended methods or headers, they MUST NOT do so unless the semantics are identical for all extensions.

Call Control extension designers SHOULD NOT overload existing methods and headers, unless the new function is actually a logical extension of the method or header in question.

Overloaded headers and extension create complications for protocol implementations. For example, if an extension overloads INVITE by adding a new header, the implementation must check every INVITE for the presence of the header before taking action.
If the implementation supports many extensions that each overload INVITE, the decision logic becomes complex.

Subject to the limitation on overloading methods and headers, extensions should be as simple as possible and reuse existing SIP related features whenever appropriate.

6. Extension Negotiation

Since call control actions could conceivably be initiated by any user agent, SIP entities MUST follow the guidelines concerning feature negotiation described in the draft,"Guidelines for the Authors of SIP Extensions"[2].

If a SIP entity receives a message containing a call control extension method or header that normally requires negotiation but has not been properly negotiated, it SHOULD behave as if it had no knowledge of the extension in question, regardless of whether the entity is capable of supporting it.

It is tempting to suggest that if an entity recognized an un-negotiated extension, it should go ahead and act on it. However, it is dangerous for an entity to assume it understands the intent behind an extension without explicit negotiation. If two extensions were to use the same keyword for an extended

feature with different semantics, the receiving entity would have no way to guess the intent of the sending entity.

7. Adding New Call Control Operations

Additional call control operations SHOULD be implemented as additional SIP extension methods. Each such extension method MUST progress through the standards process as per other IETF standards.

Such extensions SHOULD include motivations, requirements, specification of syntax and semantics, and detailed usage examples. Additionally, it SHOULD describe how to specifically apply the negotiation guidelines in [2].

8. Call Control Documents

Work is in progress on the following documents which fit into this framework:

"SIP Call Control - Model"[3]

"SIP Call Control - Transfer"[4]

9. Security Considerations

Each call control extension SHOULD describe mechanisms to prevent unauthorized parties to invoke the extensions. Any extension that allows entities not party to a call to invoke call control operations MUST describe said mechanisms.

10. Acknowledgments

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Author's Address

Ben Campbell
dynamicsoft
5100 Tennyson Parkway
Suite 1200
Plano, TX 75024

email: bcampbell@dynamicsoft.com

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SIP Telephony Service Examples With Call Flows

STATUS OF THIS MEMO

Abstract

This is an informational draft showing one implementation of a set of traditional telephony services using the Session Initiation Protocol. Diagrams of the SIP conversations and the complete SIP messages are provided.

Table of Contents:

1 Overview:

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

Call Hold	Consultation Hold
Unattended Transfer	Attended Transfer
Unconditional Call Forwarding	Busy Call Forwarding
No Answer Call Forwarding	3-way Call
Single-Line Extension	Find-Me
Incoming Call Screening	Outgoing Call Screening

It is the hope of the authors that this document will be useful for SIP implementors, users, designers, and protocol researchers alike and will help further the goal of a standard SIP implementation for IP Telephony. It is envisioned that as changes to the standard and additional RFCs are added that this document will reflect those changes and represent the current state of a standard SIP IP

Telephony implementation.

These flows assume the functionality described in "SIP Telephony Call Flow Examples" [2], which explores basic behavior and PSTN internetworking. Some of the scenarios described herein make use of "SIP Call Control Services" [3].

These flows were prepared assuming a network of proxies, registrars, PSTN gateways, and other SIP servers that have a pre-established trust relationship with each other, secured through other means than SIP. User agents wishing to use the services in this network are required to authenticate themselves with an edge proxy using SIP Digest. All communication between these user agents and the remaining network elements MUST occur through the edge proxy. To improve the clarity of this document, this authentication step is not explicitly shown in all flows.

These flows use SIP as defined by RFC2543 [4] with the following changes/extensions assumed throughout:

- A Contact header is included with every INVITE and 200 OK.
- A Content-Length header is present in every message, set to zero if there is no message body.
- The final entry in a Route header is always the Contact information obtained from the INVITE or 200 OK messages.

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.

Legend for Message Flows:

Dashed lines represent SIP messages. Optional messages have their labels surrounded with parenthesis. The direction of the message is indicated with < or >.

Example: Invite

```
              ------------>
```

Media paths are denoted with alternating dashes and ms. Direction is indicated as above.

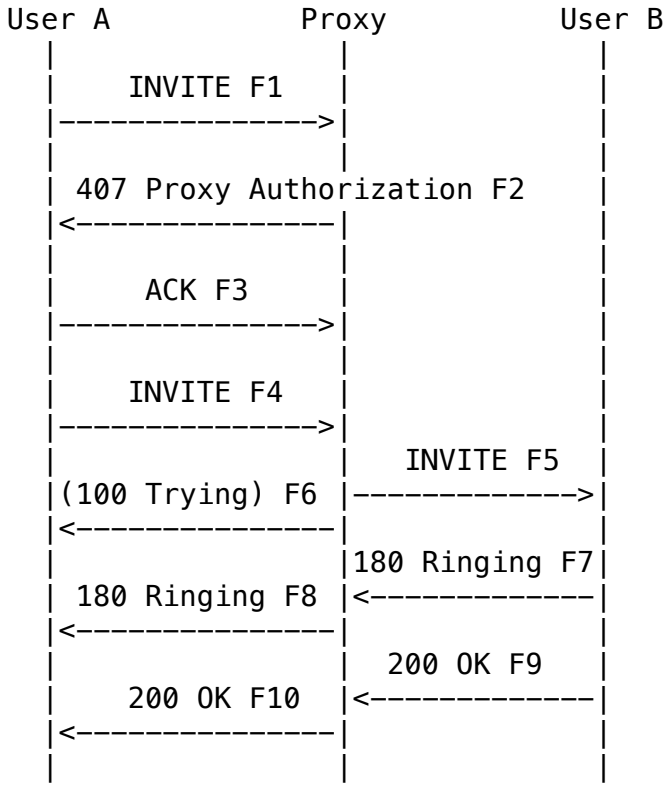
Example: Both way RTP established

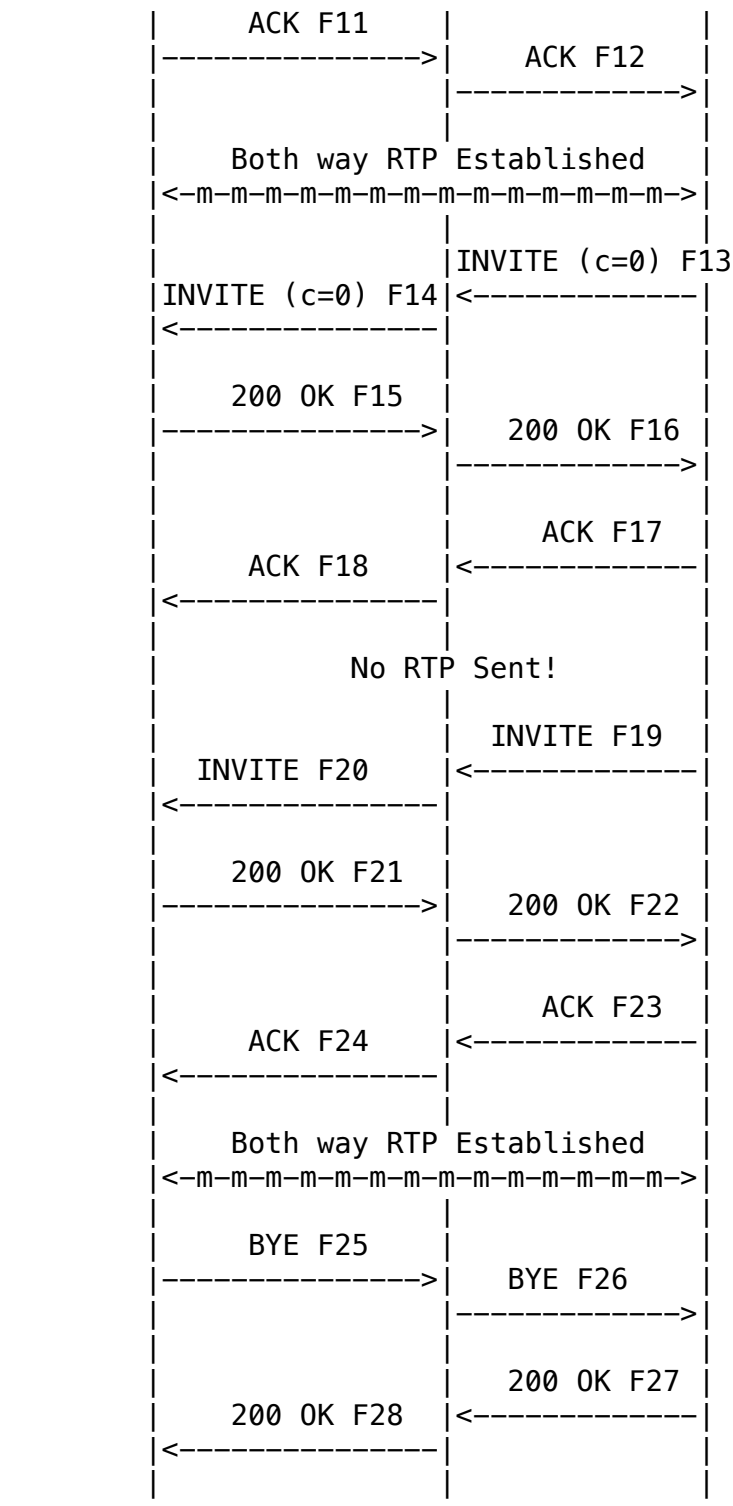
```
            <-m-m-m-m-m-m-m-m-m-m-m-m-m-m-m-m->
```

2 Call Flows - IP Desktop Services Features

2.1 Call Hold

User A calls User B, User B places call on hold. User B then takes call off hold. User A hangs up call.




ACK F11
ACK F12
Both way RTP Established
INVITE (c=0) F13
INVITE (c=0) F14
200 OK F15
200 OK F16
ACK F17
ACK F18
No RTP Sent!
INVITE F19
INVITE F20
200 OK F21
200 OK F22
ACK F23
ACK F24
Both way RTP Established
BYE F25
BYE F26
200 OK F27
200 OK F28

F1
Invite

A->Proxy1


```
        INVITE sip:UserB@ss1.wcom.com SIP/2.0
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Contact: TheBigGuy <sip:UserA@here.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserA 2890844526 2890844526 IN IP4 client.here.com
        s=Session SDP
        c=IN IP4 100.101.102.103
        t=3034423619 0
        m=audio 49170 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F2 /* Proxy 1 challenges User A for authentication */
407 Proxy Authorization Required
Proxy 1 -> A

```
        SIP/2.0 407 Proxy Authorization Required
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Proxy-Authenticate: Digest realm="MCI WorldCom SIP",
        domain="wcom.com", nonce="ea9c8e88df84f1cec4341ae6cbe5a359",
        opaque="", stale="FALSE", algorithm="MD5"
        Content-Length: 0
```

F3
ACK
A -> Proxy 1

```
        ACK sip:UserB@ss1.wcom.com SIP/2.0
        Via: SIP/2.0/UDP here.com:5060
```

```
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 ACK
Content-Length:0
```


F4 /* User A responds be re-sending the INVITE with authentication credentials in it. */
Invite
A -> Proxy 1

```
INVITE sip:UserB@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345601@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Proxy-Authorization: DIGEST username="UserA", realm="MCI
WorldCom SIP", nonce="ea9c8e88df84f1cec4341ae6cbe5a359",
opaque="", uri="sip:ss1.wcom.com",
response="dfe56131d1958046689cd83306477ecc"
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserA 2890844526 2890844526 IN IP4 client.here.com
s=Session SDP
c=IN IP4 100.101.102.103
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F5 /* Proxy 1 accepts the credentials and forwards the INVITE User B. Client for A prepares to receive data on port 49170 from the network. */
Invite
Proxy 1 -> B

```
        INVITE sip:UserB@there.com SIP/2.0
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP here.com:5060
        Record-Route: <sip:ss1.wcom.com>
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>
        Call-Id: 12345601@here.com
        CSeq: 1 INVITE
        Contact: TheBigGuy <sip:UserA@here.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserA 2890844526 2890844526 IN IP4 client.here.com
        s=Session SDP
        c=IN IP4 100.101.102.103
```



```
        t=3034423619 0
        m=audio 49170 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F6
(100 Trying)
Proxy 1-> A

```
        SIP/2.0 100 Trying
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>
        Call-Id: 12345601@here.com
        CSeq: 1 INVITE
        Content-Length: 0
```

F7
180 Ringing
B->Proxy 1

```
        SIP/2.0 180 Ringing
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP here.com:5060
```

```
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=314159
        Call-Id: 12345601@here.com
        CSeq: 1 INVITE
        Content Length:0
```

F8
180 Ringing
Proxy 1->A

```
        SIP/2.0 180 Ringing
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=314159
        Call-Id: 12345601@here.com
        CSeq: 1 INVITE
        Content Length: 0
```

F9
200 OK
B->Proxy 1

```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP here.com:5060
```



```
        Record-Route: <sip:ss1.wcom.com>
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=314159
        Call-Id: 12345601@here.com
        CSeq: 1 INVITE
        Contact: TheLittleGuy <sip:UserB@there.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserB 2890844527 2890844527 IN IP4 client.there.com
        s=Session SDP
        c=IN IP4 110.111.112.113
        t=3034423619 0
        m=audio 3456 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F10
200 OK
Proxy 1-> A

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP here.com:5060
Record-Route: <sip:ss1.wcom.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345601@here.com
CSeq: 1 INVITE
Contact: TheLittleGuy <sip:UserB@there.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 2890844527 2890844527 IN IP4 client.there.com
s=Session SDP
c=IN IP4 110.111.112.113
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F11
ACK
A->Proxy 1

```
ACK sip:UserB@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
Route: <sip:UserB@there.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
```



```
Call-Id: 12345601@here.com
CSeq: 1 ACK
Content-Length:0
```

F12
ACK
Proxy 1->B

```
        ACK sip: UserB@there.com SIP/2.0
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=314159
        Call-Id: 12345601@here.com
        CSeq: 1 ACK
        Content-Length:0
```

```
F13 /* User B places User A on hold. */
INVITE
B -> Proxy 1

        INVITE sip:UserA@ss1.wcom.com SIP/2.0
        Via: SIP/2.0/UDP there.com:5060
        Route: <sip:UserA@here.com>
        From: TheLittleGuy <sip:UserB@there.com>;tag=314159
        To: TheBigGuy <sip:UserA@here.com>
        Call-Id: 12345601@here.com
        CSeq: 1 INVITE
        Contact: TheLittleGuy <sip:UserB@there.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserB 2890844527 2890844527 IN IP4 client.there.com
        s=Session SDP
        c=IN IP4 0.0.0.0
        t=3034423619 0
        m=audio 3456 RTP/AVP 0
        a=rtpmap:0 PCMU/8000

F14
INVITE
Proxy 1 -> A

        INVITE sip:UserA@here.com SIP/2.0
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP there.com:5060
```

```
       From: TheLittleGuy <sip:UserB@there.com>;tag=314159
       To: TheBigGuy <sip:UserA@here.com>
       Call-Id: 12345601@here.com
       CSeq: 1 INVITE
       Contact: TheLittleGuy <sip:UserB@there.com>
       Content-Type: application/sdp
       Content-Length: ...

       v=0
       o=UserB 2890844527 2890844527 IN IP4 client.there.com
       s=Session SDP
       c=IN IP4 0.0.0.0
       t=3034423619 0
       m=audio 3456 RTP/AVP 0
       a=rtpmap:0 PCMU/8000

F15
200 OK
A -> Proxy 1

       SIP/2.0 200 OK
       Via: SIP/2.0/UDP ss1.wcom.com:5060
       Via: SIP/2.0/UDP there.com:5060
       From: TheLittleGuy <sip:UserB@there.com>;tag=314159
       To: TheBigGuy <sip:UserA@here.com>;tag=1234567
       Call-Id: 12345601@here.com
       CSeq: 1 INVITE
       Contact: TheBigGuy <sip:UserA@there.com>
       Content-Type: application/sdp
       Content-Length: ...

       v=0
       o=UserA 2890844526 2890844526 IN IP4 client.here.com
       s=Session SDP
       c=IN IP4 0.0.0.0
       t=3034423619 0
       m=audio 49170 RTP/AVP 0
       a=rtpmap:0 PCMU/8000

F16
200 OK
Proxy 1 -> B

       SIP/2.0 200 OK
       Via: SIP/2.0/UDP there.com:5060
       From: TheLittleGuy <sip:UserB@there.com>;tag=314159
       To: TheBigGuy <sip:UserA@here.com>;tag=1234567
       Call-Id: 12345601@here.com
       CSeq: 1 INVITE
```

```
        Contact: TheBigGuy <sip:UserA@there.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserA 2890844526 2890844526 IN IP4 client.here.com
        s=Session SDP
        c=IN IP4 0.0.0.0
        t=3034423619 0
        m=audio 49170 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F17
ACK
B-> Proxy 1

```
        ACK sip:UserA@ss1.wcom.com SIP/2.0
        Via: SIP/2.0/UDP there.com:5060
        Route: <sip:UserB@there.com>
        From: TheLittleGuy <sip:UserB@there.com>;tag=314159
        To: TheBigGuy <sip:UserA@here.com>;tag=1234567
        Call-Id: 12345601@here.com
        CSeq: 1 ACK
        Content-Length: 0
```

F18
ACK
Proxy 1 -> A

```
        ACK sip: UserA@here.com SIP/2.0
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP there.com:5060
        From: TheLittleGuy <sip:UserB@there.com>;tag=314159
        To: TheBigGuy <sip:UserA@here.com>;tag=1234567
        Call-Id: 12345601@here.com
        CSeq: 1 ACK
        Content-Length: 0

        /* User B takes the call off hold */
```

F19
INVITE

B -> Proxy 1

```
INVITE sip:UserA@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP there.com:5060
Route: <sip:UserA@here.com>
From: TheLittleGuy <sip:UserB@there.com>;tag=314159
To: TheBigGuy <sip:UserA@here.com>;tag=1234567
```



```
Call-Id: 12345601@here.com
CSeq: 2 INVITE
Contact: TheLittleGuy <sip:UserB@there.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 2890844527 2890844527 IN IP4 client.there.com
s=Session SDP
c=IN IP4 110.111.112.113
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F20
INVITE
Proxy 1 -> A

```
INVITE sip:UserA@here.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP there.com:5060
From: TheLittleGuy <sip:UserB@there.com>;tag=314159
To: TheBigGuy <sip:UserA@here.com>;tag=1234567
Call-Id: 12345601@here.com
CSeq: 2 INVITE
Contact: TheLittleGuy <sip:UserB@there.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 2890844527 2890844527 IN IP4 client.there.com
s=Session SDP
c=IN IP4 110.111.112.113
t=3034423619 0
```

```
        m=audio 3456 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F21
200 OK
A -> Proxy 1

```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP there.com:5060
        From: TheLittleGuy <sip:UserB@there.com>;tag=314159
        To: TheBigGuy <sip:UserA@here.com>;tag=1234567
        Call-Id: 12345601@here.com
        CSeq: 2 INVITE
        Contact: TheBigGuy <sip:UserA@there.com>
```



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

        v=0
        o=UserA 2890844526 2890844526 IN IP4 client.here.com
        s= Session SDP
        c=IN IP4 100.101.102.103
        t=3034423619 0
        m=audio 49170 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F22
200 OK
Proxy 1 -> B

```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP there.com:5060
        From: TheLittleGuy <sip:UserB@there.com>;tag=314159
        To: TheBigGuy <sip:UserA@here.com>;tag=1234567
        Call-Id: 12345601@here.com
        CSeq: 2 INVITE
        Contact: TheBigGuy <sip:UserA@there.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
```

```
        o=UserA 2890844526 2890844526 IN IP4 client.here.com
        s=Session SDP
        c=IN IP4 100.101.102.103
        t=3034423619 0
        m=audio 49170 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F23
ACK
B -> Proxy1

```
        ACK sip:UserA@ss1.wcom.com SIP/2.0
        Via: SIP/2.0/UDP there.com:5060
        Route: <sip:UserA@here.com>
        From: TheLittleGuy <sip:UserB@there.com>;tag=314159
        To: TheBigGuy <sip:UserA@here.com>;tag=1234567
        Call-Id: 12345601@here.com
        CSeq: 2 ACK
        Content-Length: 0
```

F24
ACK
Proxy 1 -> A


```
        ACK sip: UserA@here.com SIP/2.0
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP there.com:5060
        From: TheLittleGuy <sip:UserB@there.com>;tag=314159
        To: TheBigGuy <sip:UserA@here.com>;tag=1234567
        Call-Id: 12345601@here.com
        CSeq: 2 ACK
        Content-Length: 0
```

F25
BYE
A -> Proxy 1

```
        BYE sip: UserB@ss1.wcom.com SIP/2.0
        Via: SIP/2.0/UDP here.com:5060
        Route: <sip:userB@there.com>
```

```
       From: TheBigGuy <sip:UserA@here.com>;tag=1234567
       To: TheLittleGuy <sip:UserB@there.com>;tag=314159
       Call-Id: 12345601@here.com
       CSeq: 2 BYE
       Content-Length: 0
```

F26
BYE
Proxy 1 -> B

```
       BYE sip: UserB@there.com SIP/2.0
       Via: SIP/2.0/UDP ss1.wcom.com:5060
       Via: SIP/2.0/UDP here.com:5060
       From: TheBigGuy <sip:UserA@here.com>;tag=1234567
       To: TheLittleGuy <sip:UserB@there.com>;tag=314159
       Call-Id: 12345601@here.com
       CSeq: 2 BYE
       Content-Length: 0
```

F27
200 OK
B -> Proxy 1

```
       SIP/2.0 200 OK
       Via: SIP/2.0/UDP ss1.wcom.com:5060
       Via: SIP/2.0/UDP here.com:5060
       From: TheBigGuy <sip:UserA@here.com>;tag=1234567
       To: TheLittleGuy <sip:UserB@there.com>;tag=314159
       Call-Id: 12345601@here.com
       CSeq: 2 BYE
       Content-Length: 0
```

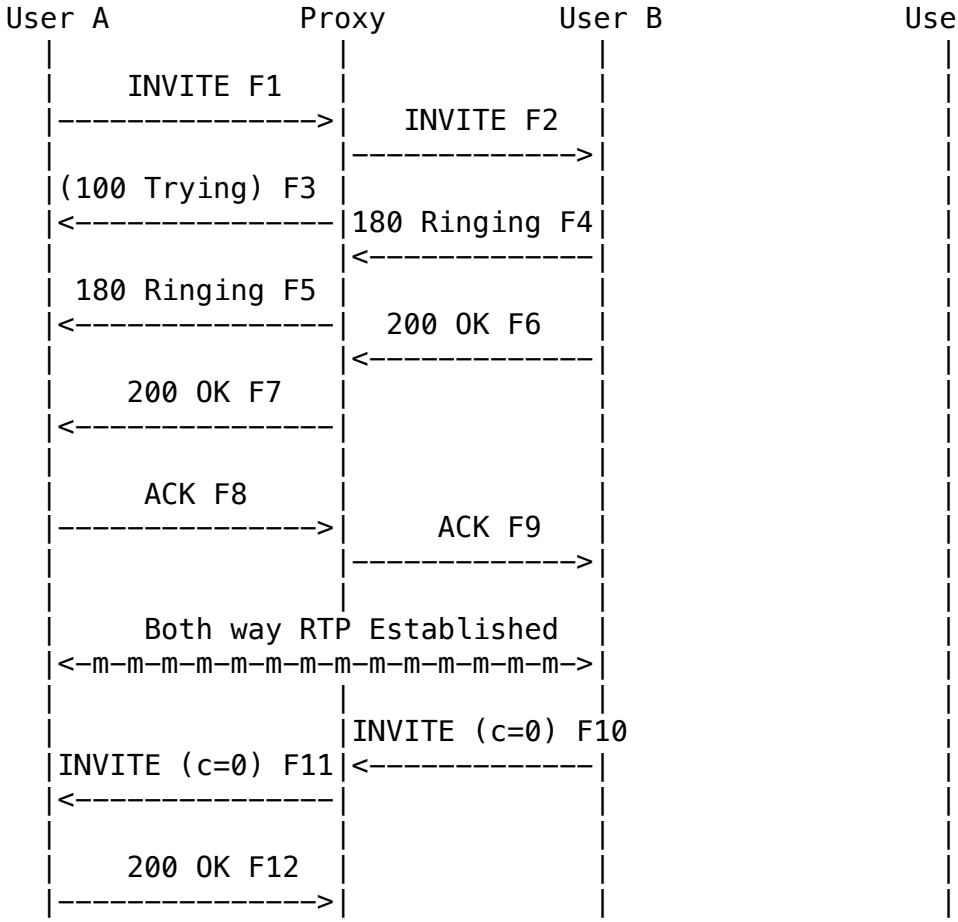

F28
200 OK
Proxy 1 -> A

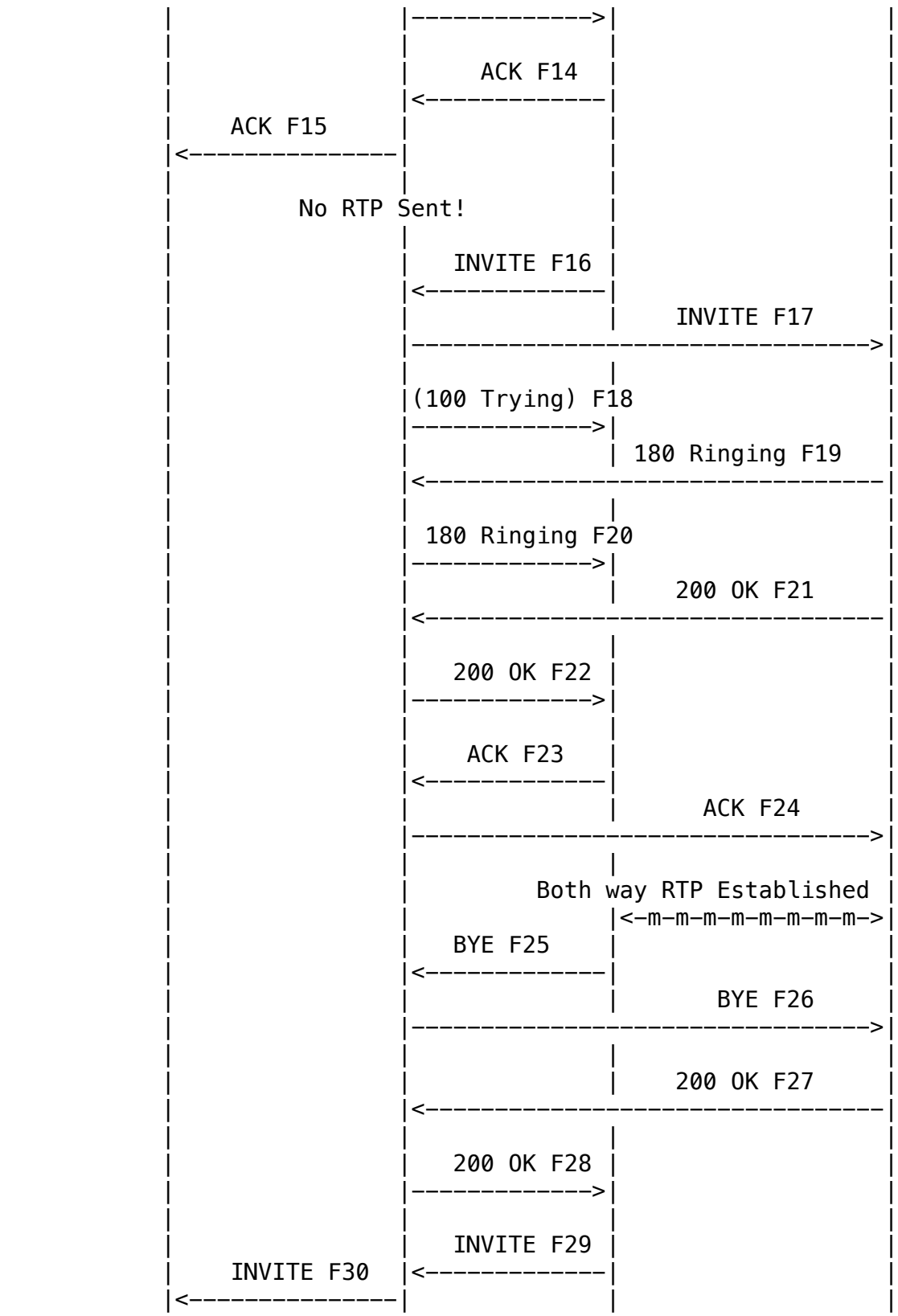
```
       SIP/2.0 200 OK
       Via: SIP/2.0/UDP here.com:5060
       From: TheBigGuy <sip:UserA@here.com>;tag=1234567
       To: TheLittleGuy <sip:UserB@there.com>;tag=314159
       Call-Id: 12345601@here.com
```

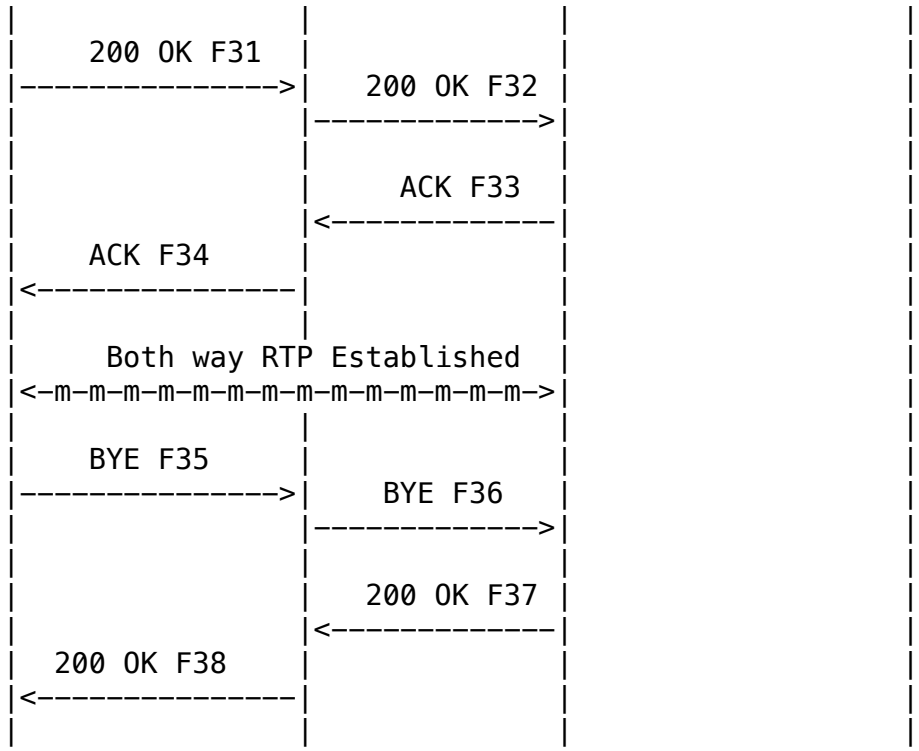
```
CSeq: 2 BYE
Content-Length: 0
```

2.2 Consultation Hold

User A calls user B. User B places call on hold. User B calls User C, after that call is finished User B take the call with User A off hold.




ACK F14
ACK F15
No RTP Sent!
INVITE F16
INVITE F17
(100 Trying) F18
180 Ringing F19
180 Ringing F20
200 OK F21
200 OK F22
ACK F23
ACK F24
Both way RTP Established
BYE F25
BYE F26
200 OK F27
200 OK F28
INVITE F29
INVITE F30



F1
Invite
A -> Proxy 1

```
INVITE sip:UserB@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Proxy-Authorization: DIGEST username="UserA", realm="MCI
WorldCom SIP", nonce="ea9c8e88df84f1cec4341ae6cbe5a359",
opaque="", uri="sip:ss1.wcom.com",
response="dfe56131d1958046689cd83306477ecc"
Content-Type: application/sdp
Content-Length: ...
```

```
        v=0
        o=UserA 2890844526 2890844526 IN IP4 client.here.com
        s=Session SDP
        c=IN IP4 100.101.102.103
        t=3034423619 0
```



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

F2 /* Proxy 1 accepts the credentials and forwards the INVITE User B. Client for A prepares to receive data on port 49170 from the network. */
Invite
Proxy 1 -> B

```
        INVITE sip:UserB@there.com SIP/2.0
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP here.com:5060
        Record-Route: <sip:ss1.wcom.com>
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Contact: TheBigGuy <sip:UserA@here.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserA 2890844526 2890844526 IN IP4 client.here.com
        s=Session SDP
        c=IN IP4 100.101.102.103
        t=3034423619 0
        m=audio 49170 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F3
(100 Trying)
Proxy 1-> A

```
        SIP/2.0 100 Trying
        Via: SIP/2.0/UDP here.com:5060
```

```
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Content-Length: 0
```

F4
180 Ringing
B->Proxy 1

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP here.com:5060
```



```
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Content Length:0
```

F5
180 Ringing
Proxy 1->A

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Content Length: 0
```

F6
200 OK
B->Proxy 1

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP here.com:5060
Record-Route: <sip:ss1.wcom.com>
From: TheBigGuy <sip:UserA@here.com>
```

```
        To: TheLittleGuy <sip:UserB@there.com>;tag=314159
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Contact: TheLittleGuy <sip:UserB@there.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserB 2890844527 2890844527 IN IP4 client.there.com
        s=Session SDP
        c=IN IP4 110.111.112.113
        t=3034423619 0
        m=audio 3456 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F7
200 OK
Proxy 1-> A

```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP here.com:5060
        Record-Route: <sip:ss1.wcom.com>
```



```
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=314159
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Contact: TheLittleGuy <sip:UserB@there.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserB 2890844527 2890844527 IN IP4 client.there.com
        s=Session SDP
        c=IN IP4 110.111.112.113
        t=3034423619 0
        m=audio 3456 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F8
ACK
A->Proxy 1

```
        ACK sip:UserB@ss1.wcom.com SIP/2.0
        Via: SIP/2.0/UDP here.com:5060
        Route: <sip:UserB@there.com>
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=314159
        Call-Id: 12345600@here.com
        CSeq: 1 ACK
        Content-Length:0

F9
ACK
Proxy 1->B

        ACK sip: UserB@there.com SIP/2.0
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=314159
        Call-Id: 12345600@here.com
        CSeq: 1 ACK
        Content-Length:0



F10 /* User B places User A on hold. */
INVITE
B -> Proxy 1

        INVITE sip:UserA@ss1.wcom.com SIP/2.0
```



```
        Via: SIP/2.0/UDP there.com:5060
        Route: <sip:UserA@here.com>
        From: TheLittleGuy <sip:UserB@there.com>;tag=314159
        To: TheBigGuy <sip:UserA@here.com>
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Contact: TheLittleGuy <sip:UserB@there.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
```

```
        o=UserB 2890844527 2890844527 IN IP4 client.there.com
        s=Session SDP
        c=IN IP4 0.0.0.0
        t=3034423619 0
        m=audio 3456 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F11
INVITE
Proxy 1 -> A

```
        INVITE sip:UserA@here.com SIP/2.0
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP there.com:5060
        From: TheLittleGuy <sip:UserB@there.com>;tag=314159
        To: TheBigGuy <sip:UserA@here.com>
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Contact: TheLittleGuy <sip:UserB@there.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserB 2890844527 2890844527 IN IP4 client.there.com
        s=Session SDP
        c=IN IP4 0.0.0.0
        t=3034423619 0
        m=audio 3456 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F12
200 OK
A -> Proxy 1

```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP there.com:5060
        From: TheLittleGuy <sip:UserB@there.com>;tag=314159
```



```
        To: TheBigGuy <sip:UserA@here.com>;tag=1234567
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
```

```
        Contact: TheBigGuy <sip:UserA@there.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserA 2890844526 2890844526 IN IP4 client.here.com
        s=Session SDP
        c=IN IP4 0.0.0.0
        t=3034423619 0
        m=audio 49170 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F13
200 OK
Proxy 1 -> B

```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP there.com:5060
        From: TheLittleGuy <sip:UserB@there.com>;tag=314159
        To: TheBigGuy <sip:UserA@here.com>;tag=1234567
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Contact: TheBigGuy <sip:UserA@there.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserA 2890844526 2890844526 IN IP4 client.here.com
        s=Session SDP
        c=IN IP4 0.0.0.0
        t=3034423619 0
        m=audio 49170 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F14
ACK
B-> Proxy 1

```
        ACK sip:UserA@ss1.wcom.com SIP/2.0
        Via: SIP/2.0/UDP there.com:5060
        Route: <sip:UserA@here.com>
        From: TheLittleGuy <sip:UserB@there.com>;tag=314159
        To: TheBigGuy <sip:UserA@here.com>;tag=1234567
        Call-Id: 12345600@here.com
        CSeq: 1 ACK
        Content-Length: 0
```

F15
ACK
Proxy 1 -> A

```
ACK sip: UserA@here.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP there.com:5060
From: TheLittleGuy <sip:UserB@there.com>;tag=314159
To: TheBigGuy <sip:UserA@here.com>;tag=1234567
Call-Id: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0
```

F16
Invite
B -> Proxy 1

```
INVITE sip:UserC@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP there.com:5060
From: TheLittleGuy <sip:UserB@there.com>
To: TheOtherGuy <sip:UserC@anywhere.com>
Call-Id: 9876543210@there.com
CSeq: 1 INVITE
Contact: TheLittleGuy <sip:UserB@there.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 2890844526 2890844526 IN IP4 client.there.com
s=Session SDP
c=IN IP4 110.111.112.113
t=3034423619 0
m=audio 50170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F17
Invite
Proxy 1 -> C

```
INVITE sip:UserC@anywhere.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP there.com:5060
Record-Route: <sip:ss1.wcom.com>
```

```
          From: TheLittleGuy <sip:UserB@there.com>
          To: TheOtherGuy <sip:UserC@anywhere.com>
          Call-Id: 9876543210@there.com
          CSeq: 1 INVITE
```



```
          Contact: TheLittleGuy <sip:UserB@there.com>
          Content-Type: application/sdp
          Content-Length: ...

          v=0
          o=UserB 2890844526 2890844526 IN IP4 client.there.com
          s=Session SDP
          c=IN IP4 110.111.112.113
          t=3034423619 0
          m=audio 50170 RTP/AVP 0
          a=rtpmap:0 PCMU/8000
```

F18
(100 Trying)
Proxy 1-> B

```
          SIP/2.0 100 Trying
          Via: SIP/2.0/UDP there.com:5060
          From: TheLittleGuy <sip:UserB@there.com>
          To: TheOtherGuy <sip:UserC@anywhere.com>
          Call-Id: 9876543210@there.com
          CSeq: 1 INVITE
          Content-Length: 0
```

F19
180 Ringing
C->Proxy 1

```
          SIP/2.0 180 Ringing
          Via: SIP/2.0/UDP ss1.wcom.com:5060
          Via: SIP/2.0/UDP there.com:5060
          From: TheLittleGuy <sip:UserB@there.com>
          To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
          Call-Id: 9876543210@here.com
          CSeq: 1 INVITE
          Content Length:0
```

F20
180 Ringing
Proxy 1->B

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP there.com:5060
From: TheLittleGuy <sip:UserB@there.com>
To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
Call-Id: 9876543210@there.com
CSeq: 1 INVITE
Content Length: 0
```


F21
200 OK
C->Proxy 1

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP there.com:5060
Record-Route: <sip:ss1.wcom.com>
From: TheLittleGuy <sip:UserB@there.com>
To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
Call-Id: 9876543210@there.com
CSeq: 1 INVITE
Contact: TheLittleGuy <sip:UserC@anywhere.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserC 2890844527 2890844527 IN IP4 client.anywhere.com
s=Session SDP
c=IN IP4 120.121.122.123
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F22
200 OK
Proxy 1-> B

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP there.com:5060
Record-Route: <sip:ss1.wcom.com>
From: TheLittleGuy <sip:UserB@there.com>
To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
Call-Id: 9876543210@there.com
CSeq: 1 INVITE
Contact: TheOtherGuy <sip:UserC@anywhere.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserC 2890844527 2890844527 IN IP4 client.anywhere.com
s=Session SDP
c=IN IP4 120.121.122.123
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```


F23
ACK
B->Proxy 1

```
ACK sip:UserC@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP there.com:5060
Route: <sip:UserC@anywhere.com>
From: TheLittleGuy <sip:UserB@there.com>
To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
Call-Id: 9876543210@there.com
CSeq: 1 ACK
Content-Length:0
```

F24
ACK
Proxy 1->C

```
ACK sip: UserC@anywhere.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP there.com:5060
From: TheLittleGuy <sip:UserB@there.com>
```

```
        To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
        Call-Id: 9876543210@there.com
        CSeq: 1 ACK
        Content-Length:0
```

F25
BYE
B -> Proxy 1

```
        BYE sip: UserC@ss1.wcom.com SIP/2.0
        Via: SIP/2.0/UDP there.com:5060
        Route: <sip:userC@anywhere.com>
        From: TheLittleGuy <sip:UserB@there.com>
        To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
        Call-Id: 9876543210@there.com
        CSeq: 2 BYE
        Content-Length: 0
```

F26
BYE
Proxy 1 -> C

```
        BYE sip: UserC@anywhere.com SIP/2.0
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP there.com:5060
        From: TheLittleGuy <sip:UserB@there.com>
        To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
```



```
        Call-Id: 9876543210@there.com
        CSeq: 2 BYE
        Content-Length: 0
```

F27
200 OK
C -> Proxy 1

```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP there.com:5060
        From: TheLittleGuy <sip:UserB@there.com>
        To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
```

```
       Call-Id: 9876543210@there.com
       CSeq: 2 BYE
       Content-Length: 0

   F28
   200 OK
   Proxy 1 -> B

       SIP/2.0 200 OK
       Via: SIP/2.0/UDP there.com:5060
       From: TheLittleGuy <sip:UserB@there.com>
       To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
       Call-Id: 9876543210@there.com
       CSeq: 2 BYE
       Content-Length: 0

   F29 /* User B takes the call off hold */
   INVITE
   B -> Proxy 1

       INVITE sip:UserA@ss1.wcom.com SIP/2.0
       Via: SIP/2.0/UDP there.com:5060
       Route: <sip:UserA@here.com>
       From: TheLittleGuy <sip:UserB@there.com>;tag=314159
       To: TheBigGuy <sip:UserA@here.com>;tag=1234567
       Call-Id: 12345600@here.com
       CSeq: 2 INVITE
       Contact: TheLittleGuy <sip:UserB@there.com>
       Content-Type: application/sdp
       Content-Length: ...

       v=0
       o=UserB 2890844527 2890844527 IN IP4 client.there.com
       s=Session SDP
       c=IN IP4 110.111.112.113
       t=3034423619 0
```



```
       m=audio 3456 RTP/AVP 0
       a=rtpmap:0 PCMU/8000

   F30
   INVITE
```

Proxy 1 -> A

```
INVITE sip:UserA@here.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP there.com:5060
From: TheLittleGuy <sip:UserB@there.com>;tag=314159
To: TheBigGuy <sip:UserA@here.com>;tag=1234567
Call-Id: 12345600@here.com
CSeq: 2 INVITE
Contact: TheLittleGuy <sip:UserB@there.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 2890844527 2890844527 IN IP4 client.there.com
s=Session SDP
c=IN IP4 110.111.112.113
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F31
200 OK
A -> Proxy 1

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP there.com:5060
From: TheLittleGuy <sip:UserB@there.com>;tag=314159
To: TheBigGuy <sip:UserA@here.com>;tag=1234567
Call-Id: 12345600@here.com
CSeq: 2 INVITE
Contact: TheBigGuy <sip:UserA@there.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserA 2890844526 2890844526 IN IP4 client.here.com
s=Session SDP
c=IN IP4 100.101.102.103
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F32
200 OK
Proxy 1 -> B

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP there.com:5060
From: TheLittleGuy <sip:UserB@there.com>;tag=314159
To: TheBigGuy <sip:UserA@here.com>;tag=1234567
Call-Id: 12345600@here.com
CSeq: 2 INVITE
Contact: TheBigGuy <sip:UserA@there.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserA 2890844526 2890844526 IN IP4 client.here.com
s=Session SDP
c=IN IP4 100.101.102.103
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F33
ACK
B -> Proxy1

```
ACK sip:UserA@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP there.com:5060
From: TheLittleGuy <sip:UserB@there.com>;tag=314159
To: TheBigGuy <sip:UserA@here.com>;tag=1234567
Call-Id: 12345600@here.com
CSeq: 2 ACK
Content-Length: 0
```

F34
ACK
Proxy 1 -> A

```
ACK sip: UserA@here.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP there.com:5060
From: TheLittleGuy <sip:UserB@there.com>;tag=314159
To: TheBigGuy <sip:UserA@here.com>;tag=1234567
Call-Id: 12345600@here.com
CSeq: 2 ACK
Content-Length: 0
```

F35
BYE
A -> Proxy 1

```
BYE sip: UserB@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
Route: <sip:userB@there.com>
From: TheBigGuy <sip:UserA@here.com>;tag=1234567
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345600@here.com
CSeq: 2 BYE
Content-Length: 0
```

F36
BYE
Proxy 1 -> B

```
BYE sip: UserB@there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>;tag=1234567
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345600@here.com
CSeq: 2 BYE
Content-Length: 0
```

F37
200 OK
B -> Proxy 1

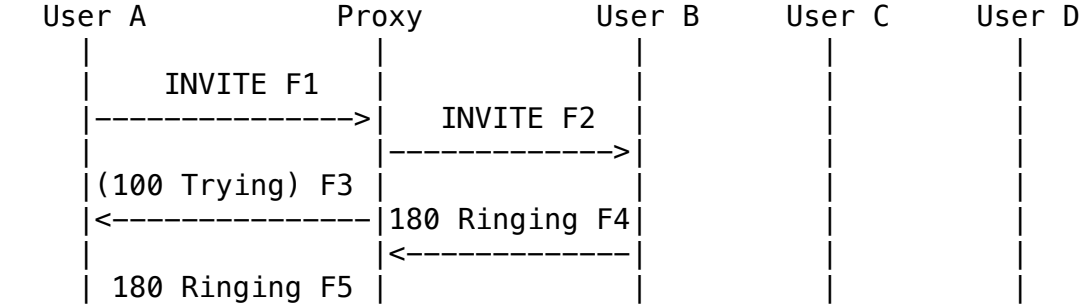
```
SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>;tag=1234567
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345600@here.com
CSeq: 2 BYE
Content-Length: 0
```

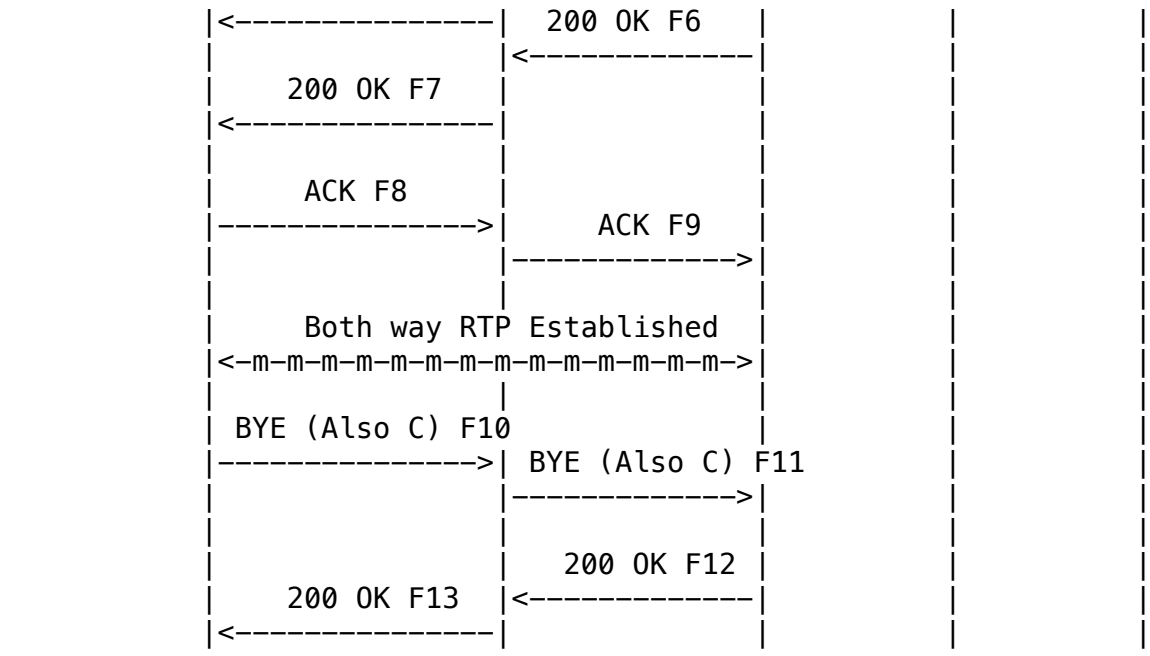
F38
200 OK
Proxy 1 -> A

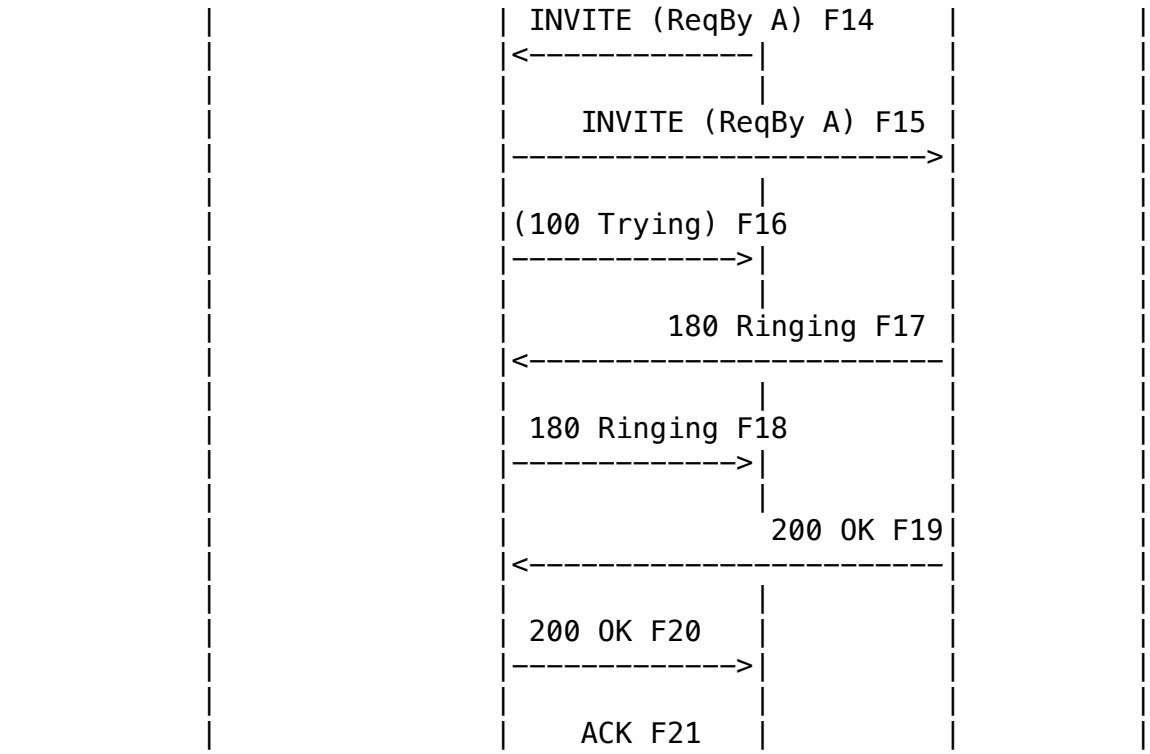
```
SIP/2.0 200 OK
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>;tag=1234567
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345600@here.com
CSeq: 2 BYE
Content-Length: 0
```

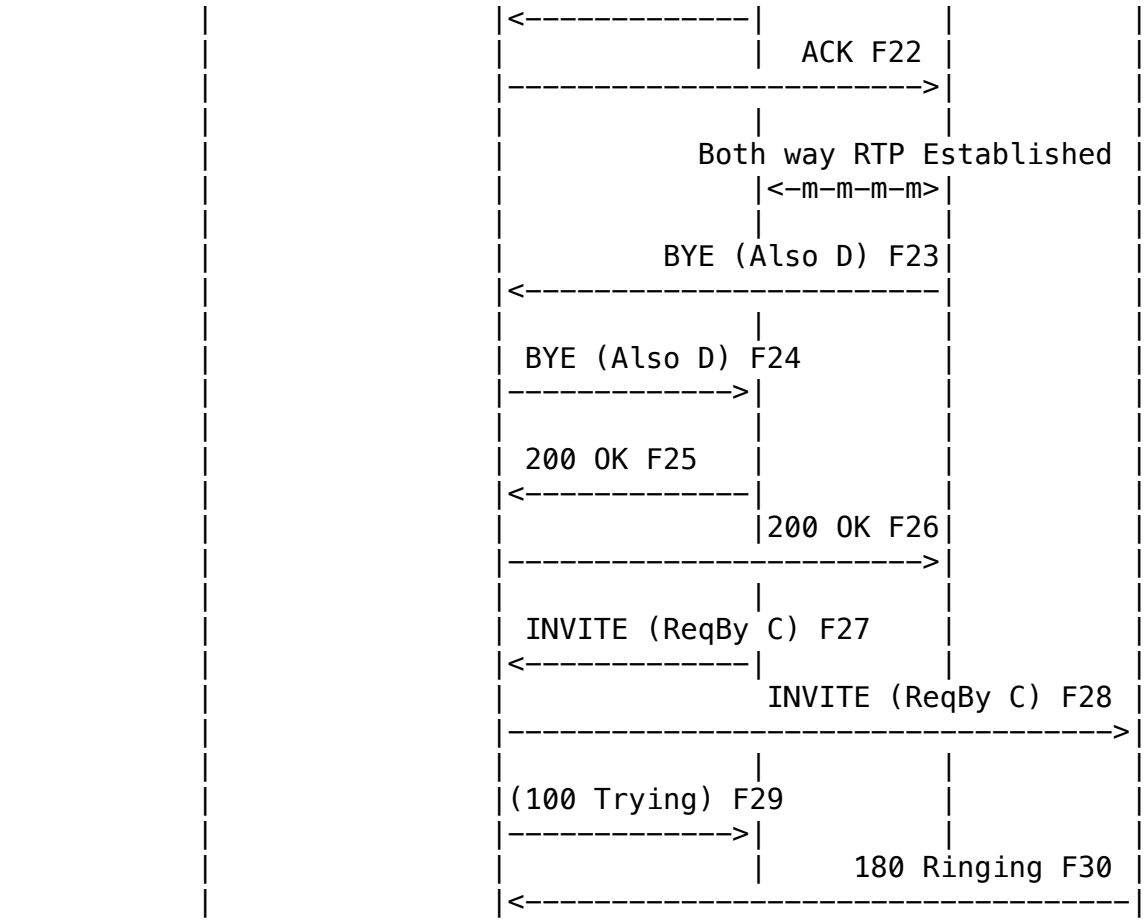
2.3 Unattended Transfer

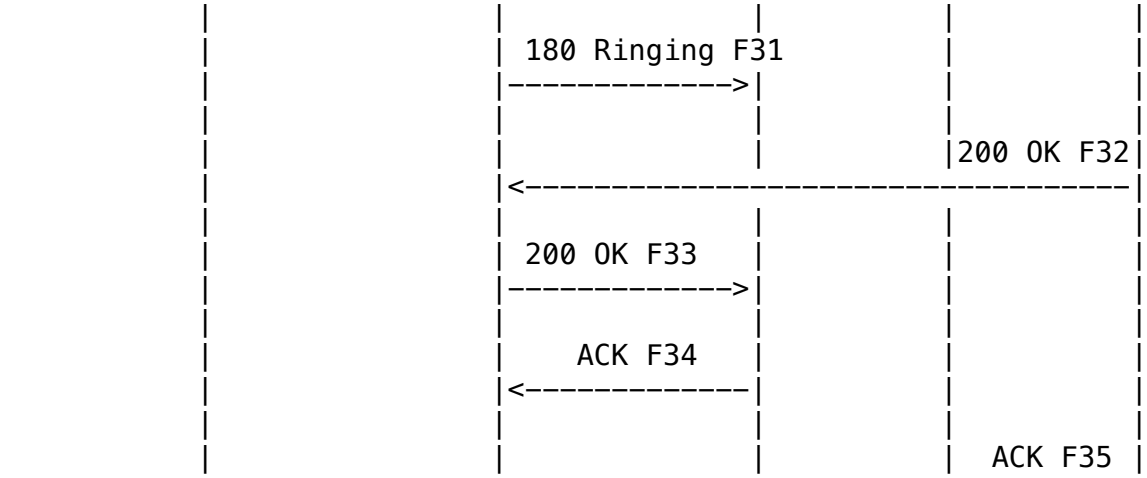
User A call user B. User A then transfers User B to user C. User C then transfers User B to User D. User B hangs up the call.

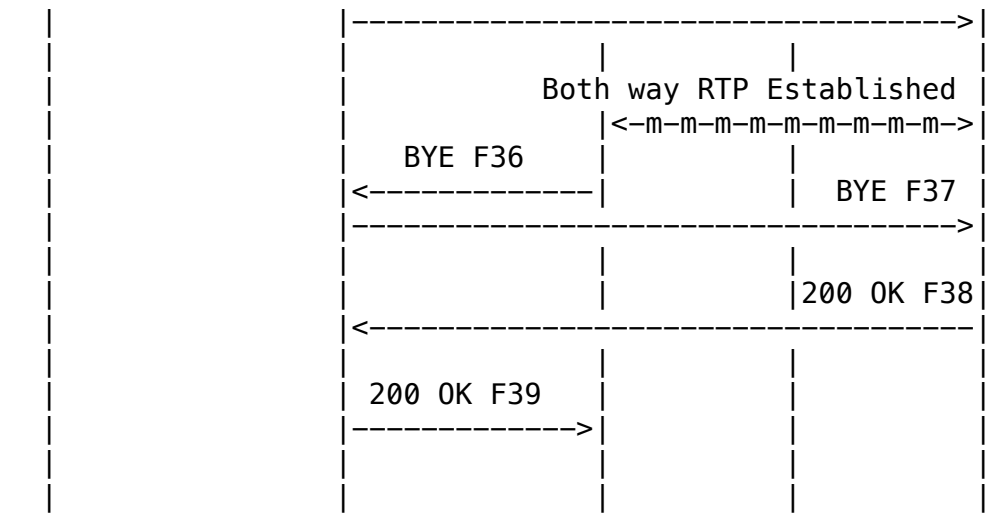



200 OK F6
200 OK F7
ACK F8
ACK F9
Both way RTP Established
BYE (Also C) F10
BYE (Also C) F11
200 OK F12
200 OK F13


INVITE (ReqBy A) F14
INVITE (ReqBy A) F15
(100 Trying) F16
180 Ringing F17
180 Ringing F18
200 OK F19
200 OK F20
ACK F21


ACK F22
Both way RTP Established
BYE (Also D) F23
BYE (Also D) F24
200 OK F25
200 OK F26
INVITE (ReqBy C) F27
INVITE (ReqBy C) F28
(100 Trying) F29
180 Ringing F30


180 Ringing F31
200 OK F32
200 OK F33
ACK F34
ACK F35



F1
Invite
A -> Proxy 1

```
INVITE sip:UserB@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Proxy-Authorization: DIGEST username="UserA", realm="MCI
WorldCom SIP", nonce="ea9c8e88df84f1cec4341ae6cbe5a359",
opaque="", uri="sip:ss1.wcom.com",
response="dfe56131d1958046689cd83306477ecc"
Content-Type: application/sdp
Content-Length: ...
```



```
v=0
o=UserA 2890844526 2890844526 IN IP4 client.here.com
s=Session SDP
c=IN IP4 100.101.102.103
t=3034423619 0
m=audio 49170 RTP/AVP 0
```

```
       a=rtpmap:0 PCMU/8000

   F2 /* Proxy 1 accepts the credentials and forwards the INVITE User
   B.  Client for A prepares to receive data on port 49170 from the
   network. */
   Invite
   Proxy 1 -> B

       INVITE sip:UserB@there.com SIP/2.0
       Via: SIP/2.0/UDP ss1.wcom.com:5060
       Via: SIP/2.0/UDP here.com:5060
       Record-Route: <sip:ss1.wcom.com>
       From: TheBigGuy <sip:UserA@here.com>
       To: TheLittleGuy <sip:UserB@there.com>
       Call-Id: 12345600@here.com
       CSeq: 1 INVITE
       Contact: TheBigGuy <sip:UserA@here.com>
       Content-Type: application/sdp
       Content-Length: ...

       v=0
       o=UserA 2890844526 2890844526 IN IP4 client.here.com
       s=Session SDP
       c=IN IP4 100.101.102.103
       t=3034423619 0
       m=audio 49170 RTP/AVP 0
       a=rtpmap:0 PCMU/8000

   F3
   (100 Trying)
   Proxy 1-> A

       SIP/2.0 100 Trying
       Via: SIP/2.0/UDP here.com:5060
       From: TheBigGuy <sip:UserA@here.com>
       To: TheLittleGuy <sip:UserB@there.com>
       Call-Id: 12345600@here.com
       CSeq: 1 INVITE
       Content-Length: 0

   F4
   180 Ringing
   B->Proxy 1
```

```
       SIP/2.0 180 Ringing
       Via: SIP/2.0/UDP ss1.wcom.com:5060
       Via: SIP/2.0/UDP here.com:5060
       From: TheBigGuy <sip:UserA@here.com>
       To: TheLittleGuy <sip:UserB@there.com>;tag=314159
       Call-Id: 12345600@here.com
       CSeq: 1 INVITE
       Content Length:0

F5
180 Ringing
Proxy 1->A

       SIP/2.0 180 Ringing
       Via: SIP/2.0/UDP here.com:5060
       From: TheBigGuy <sip:UserA@here.com>
       To: TheLittleGuy <sip:UserB@there.com>;tag=314159
       Call-Id: 12345600@here.com
       CSeq: 1 INVITE
       Content Length: 0

F6
200 OK
B->Proxy 1

       SIP/2.0 200 OK
       Via: SIP/2.0/UDP ss1.wcom.com:5060
       Via: SIP/2.0/UDP here.com:5060
       Record-Route: <sip:ss1.wcom.com>
       From: TheBigGuy <sip:UserA@here.com>
       To: TheLittleGuy <sip:UserB@there.com>;tag=314159
       Call-Id: 12345600@here.com
       CSeq: 1 INVITE
       Contact: TheLittleGuy <sip:UserB@there.com>
       Content-Type: application/sdp
       Content-Length: ...

       v=0
       o=UserB 2890844527 2890844527 IN IP4 client.there.com
       s=Session SDP
       c=IN IP4 110.111.112.113
       t=3034423619 0
       m=audio 3456 RTP/AVP 0
       a=rtpmap:0 PCMU/8000

F7
200 OK
```

Proxy 1-> A


```
SIP/2.0 200 OK
Via: SIP/2.0/UDP here.com:5060
Record-Route: <sip:ss1.wcom.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheLittleGuy <sip:UserB@there.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 2890844527 2890844527 IN IP4 client.there.com
s=Session SDP
c=IN IP4 110.111.112.113
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F8
ACK
A->Proxy 1

```
ACK sip:UserB@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
Route: <sip:UserB@there.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345600@here.com
CSeq: 1 ACK
Content-Length:0
```

F9
ACK
Proxy 1->B

```
ACK sip: UserB@there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP here.com:5060
```

```
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>;tag=314159
          Call-Id: 12345600@here.com
          CSeq: 1 ACK
          Content-Length:0

   F10 /* User A transfers User B to User C */
   BYE
   A -> Proxy 1
```



```
          BYE sip: UserB@ss1.wcom.com SIP/2.0
          Via: SIP/2.0/UDP here.com:5060
          Route: <sip:userB@there.com>
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>;tag=314159
          Call-Id: 12345600@here.com
          CSeq: 2 BYE
          Also: TheOtherGuy <sip:UserC@anywhere.com>
          Content-Length: 0

   F11
   BYE
   Proxy 1 -> B

          BYE sip: UserB@there.com SIP/2.0
          Via: SIP/2.0/UDP ss1.wcom.com:5060
          Via: SIP/2.0/UDP here.com:5060
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>;tag=314159
          Call-Id: 12345600@here.com
          CSeq: 2 BYE
          Also: TheOtherGuy <sip:UserC@anywhere.com>
          Content-Length: 0

   F12
   200 OK
   B -> Proxy 1

          SIP/2.0 200 OK
          Via: SIP/2.0/UDP ss1.wcom.com:5060
          Via: SIP/2.0/UDP here.com:5060
```

```
       From: TheBigGuy <sip:UserA@here.com>
       To: TheLittleGuy <sip:UserB@there.com>;tag=314159
       Call-Id: 12345600@here.com
       CSeq: 2 BYE
       Content-Length: 0
```

F13
200 OK
Proxy 1 -> A

```
       SIP/2.0 200 OK
       Via: SIP/2.0/UDP here.com:5060
       From: TheBigGuy <sip:UserA@here.com>
       To: TheLittleGuy <sip:UserB@there.com>;tag=314159
       Call-Id: 12345600@here.com
       CSeq: 2 BYE
       Content-Length: 0
```


F14
Invite
B -> Proxy 1

```
       INVITE sip:UserC@ss1.wcom.com SIP/2.0
       Via: SIP/2.0/UDP there.com:5060
       From: TheLittleGuy <sip:UserB@there.com>
       To: TheOtherGuy <sip:UserC@anywhere.com>
       Call-Id: 9876543210@there.com
       CSeq: 1 INVITE
       Contact: TheLittleGuy <sip:UserB@there.com>
       Content-Type: application/sdp
       Requested-By: TheBigGuy <sip:UserA@here.com>
       Content-Length: ...

       v=0
       o=UserB 2890844526 2890844526 IN IP4 client.there.com
       s=Session SDP
       c=IN IP4 110.111.112.113
       t=3034423619 0
       m=audio 50170 RTP/AVP 0
       a=rtpmap:0 PCMU/8000
```

F15
Invite
Proxy 1 -> C

```
INVITE sip:UserC@anywhere.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP there.com:5060
Record-Route: <sip:ss1.wcom.com>
From: TheLittleGuy <sip:UserB@there.com>
To: TheOtherGuy <sip:UserC@anywhere.com>
Call-Id: 9876543210@there.com
CSeq: 1 INVITE
Contact: TheLittleGuy <sip:UserB@there.com>
Content-Type: application/sdp
Requested-By: TheBigGuy<sip:UserA@here.com>
Content-Length: ...

v=0
o=UserB 2890844526 2890844526 IN IP4 client.there.com
s=Session SDP
c=IN IP4 110.111.112.113
t=3034423619 0
m=audio 50170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```


F16
(100 Trying)
Proxy 1-> B

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP there.com:5060
From: TheLittleGuy <sip:UserB@there.com>
To: TheOtherGuy <sip:UserC@anywhere.com>
Call-Id: 9876543210@there.com
CSeq: 1 INVITE
Content-Length: 0
```

F17
180 Ringing
C->Proxy 1

```
        SIP/2.0 180 Ringing
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP there.com:5060
        From: TheLittleGuy <sip:UserB@there.com>
        To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
        Call-Id: 9876543210@here.com
        CSeq: 1 INVITE
        Content Length:0

F18
180 Ringing
Proxy 1->B

        SIP/2.0 180 Ringing
        Via: SIP/2.0/UDP there.com:5060
        From: TheLittleGuy <sip:UserB@there.com>
        To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
        Call-Id: 9876543210@there.com
        CSeq: 1 INVITE
        Content Length: 0

F19
200 OK
C->Proxy 1

        SIP/2.0 200 OK
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP there.com:5060
        Record-Route: <sip:ss1.wcom.com>
        From: TheLittleGuy <sip:UserB@there.com>
        To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
        Call-Id: 9876543210@there.com
        CSeq: 1 INVITE
```



```
        Contact: TheLittleGuy <sip:UserC@anywhere.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserC 2890844527 2890844527 IN IP4 client.anywhere.com
        s=Session SDP
        c=IN IP4 120.121.122.123
```

```
        t=3034423619 0
        m=audio 3456 RTP/AVP 0
        a=rtpmap:0 PCMU/8000

   F20
   200 OK
   Proxy 1-> B

        SIP/2.0 200 OK
        Via: SIP/2.0/UDP there.com:5060
        Record-Route: <sip:ss1.wcom.com>
        From: TheLittleGuy <sip:UserB@there.com>
        To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
        Call-Id: 9876543210@there.com
        CSeq: 1 INVITE
        Contact: TheOtherGuy <sip:UserC@anywhere.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserC 2890844527 2890844527 IN IP4 client.anywhere.com
        s=Session SDP
        c=IN IP4 120.121.122.123
        t=3034423619 0
        m=audio 3456 RTP/AVP 0
        a=rtpmap:0 PCMU/8000

   F21
   ACK
   B->Proxy 1

        ACK sip:UserC@ss1.wcom.com SIP/2.0
        Via: SIP/2.0/UDP there.com:5060
        Route: <sip:UserC@anywhere.com>
        From: TheLittleGuy <sip:UserB@there.com>
        To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
        Call-Id: 9876543210@there.com
        CSeq: 1 ACK
        Content-Length:0
```

F22
ACK
Proxy 1->C

```
ACK sip: UserC@anywhere.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP there.com:5060
From: TheLittleGuy <sip:UserB@there.com>
To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
Call-Id: 9876543210@there.com
CSeq: 1 ACK
Content-Length:0
```

F23
BYE
B -> Proxy 1

```
BYE sip: UserB@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP anywhere.com:5060
Route: <sip:userB@there.com>
From: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
To: TheLittleGuy <sip:UserB@there.com>
Also: TheNewGuy<sip:UserD@nowhere.com>
Call-Id: 9876543210@there.com
CSeq: 200 BYE
Content-Length: 0
```

F24
BYE
Proxy 1 -> C

```
BYE sip: UserB@there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP anywhere.com:5060
From: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
To: TheLittleGuy <sip:UserB@there.com>;tag=1234567
Also: TheNewGuy<sip:UserD@nowhere.com>
Call-Id: 9876543210@there.com
CSeq: 200 BYE
Content-Length: 0
```

F25
200 OK
C -> Proxy 1

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP anywhere.com:5060
From: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
```

```
        To: TheLittleGuy <sip:UserB@there.com>;tag=1234567
        Call-Id: 9876543210@there.com
        CSeq: 200 BYE
        Content-Length: 0
```

F26
200 OK
Proxy 1 -> B

```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP anywhere.com:5060
        From: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
        To: TheLittleGuy <sip:UserB@there.com>;tag=1234567
        Call-Id: 9876543210@there.com
        CSeq: 200 BYE
        Content-Length: 0
```

F27
Invite
B -> Proxy 1

```
        INVITE sip:UserD@ss1.wcom.com SIP/2.0
        Via: SIP/2.0/UDP there.com:5060
        From: TheLittleGuy <sip:UserB@there.com>
        To: TheNewGuy <sip:UserD@nowhere.com>
        Call-Id: 123123123@there.com
        CSeq: 1 INVITE
        Contact: TheLittleGuy <sip:UserB@there.com>
        Content-Type: application/sdp
        Requested-By: TheOtherGuy <sip:UserC@here.com>
        Content-Length: ...

        v=0
        o=UserB 2890844526 2890844526 IN IP4 client.there.com
        s=Session SDP
        c=IN IP4 110.111.112.113
        t=3034423619 0
        m=audio 50170 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F28 /* Proxy 1 accepts the credentials and forwards the INVITE to User D. Client for B prepares to receive data on port 49170 from

```
   the network. */
   Invite
   Proxy 1 -> D

          INVITE sip:UserD@nowhere.com SIP/2.0
          Via: SIP/2.0/UDP ss1.wcom.com:5060
          Via: SIP/2.0/UDP there.com:5060
```



```
          Record-Route: <sip:ss1.wcom.com>
          From: TheLittleGuy <sip:UserB@there.com>
          To: TheNewGuy <sip:UserD@nowhere.com>
          Call-Id: 123123123@there.com
          CSeq: 1 INVITE
          Contact: TheLittleGuy <sip:UserB@there.com>
          Content-Type: application/sdp
          Requested-By: TheOtherGuy<sip:UserC@here.com>
          Content-Length: ...

          v=0
          o=UserB 2890844526 2890844526 IN IP4 client.there.com
          s=Session SDP
          c=IN IP4 110.111.112.113
          t=3034423619 0
          m=audio 50170 RTP/AVP 0
          a=rtpmap:0 PCMU/8000

   F29
   (100 Trying)
   Proxy 1-> B

          SIP/2.0 100 Trying
          Via: SIP/2.0/UDP there.com:5060
          From: TheLittleGuy <sip:UserB@there.com>
          To: TheNewGuy <sip:UserD@nowhere.com>
          Call-Id: 123123123@there.com
          CSeq: 1 INVITE
          Content-Length: 0

   F30
   180 Ringing
   D->Proxy 1
```

```
        SIP/2.0 180 Ringing
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP there.com:5060
        From: TheLittleGuy <sip:UserB@there.com>
        To: TheNewGuy <sip:UserD@nowhere.com>;tag=789789
        Call-Id: 123123123@there.com
        CSeq: 1 INVITE
        Content Length:0
```

F31
180 Ringing
Proxy 1->B

```
        SIP/2.0 180 Ringing
        Via: SIP/2.0/UDP there.com:5060
```



```
        From: TheLittleGuy <sip:UserB@there.com>
        To: TheNewGuy <sip:UserD@nowhere.com>;tag=789789
        Call-Id: 123123123@there.com
        CSeq: 1 INVITE
        Content Length: 0
```

F32
200 OK
D->Proxy 1

```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP there.com:5060
        Record-Route: <sip:ss1.wcom.com>
        From: TheLittleGuy <sip:UserB@there.com>
        To: TheNewGuy <sip:UserD@nowhere.com>;tag=789789
        Call-Id: 123123123@there.com
        CSeq: 1 INVITE
        Contact: TheNewGuy <sip:UserD@nowhere.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserD 2890844527 2890844527 IN IP4 client.nowhere.com
        s=Session SDP
        c=IN IP4 150.151.152.153
```

```
        t=3094598698 0
        m=audio 3456 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F33
200 OK
Proxy 1-> B

```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP there.com:5060
        Record-Route: <sip:ss1.wcom.com>
        From: TheLittleGuy <sip:UserB@there.com>
        To: TheNewGuy <sip:UserD@nowhere.com>;tag=789789
        Call-Id: 123123123@there.com
        CSeq: 1 INVITE
        Contact: TheNewGuy <sip:UserD@nowhere.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserD 2890844527 2890844527 IN IP4 client.nowhere.com
        s=Session SDP
        c=IN IP4 150.151.152.153
```



```
        t=3094598698 0
        m=audio 3456 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F34
ACK
B->Proxy 1

```
        ACK sip:UserD@ss1.wcom.com SIP/2.0
        Via: SIP/2.0/UDP there.com:5060
        Route: <sip:UserD@nowhere.com>
        From: TheLittleGuy <sip:UserB@there.com>
        To: TheNewGuy <sip:UserD@nowhere.com>;tag=789789
        Call-Id: 123123123@there.com
        CSeq: 1 ACK
        Content-Length:0
```

F35

```
   ACK
   Proxy 1->D

          ACK sip: UserD@nowhere.com SIP/2.0
          Via: SIP/2.0/UDP ss1.wcom.com:5060
          Via: SIP/2.0/UDP there.com:5060
          From: TheLittleGuy <sip:UserB@there.com>
          To: TheNewGuy <sip:UserD@nowhere.com>;tag=789789
          Call-Id: 123123123@there.com
          CSeq: 1 ACK
          Content-Length:0

   F36
   BYE
   B -> Proxy 1

          BYE sip: UserD@ss1.wcom.com SIP/2.0
          Via: SIP/2.0/UDP there.com:5060
          Route: <sip:userD@nowhere.com>
          From: TheLittleGuy <sip:UserB@there.com>
          To: TheNewGuy <sip:UserD@nowhere.com>;tag=789789
          Call-Id: 123123123@there.com
          CSeq: 2 BYE
          Content-Length: 0

   F37
   BYE
   Proxy 1 -> D

          BYE sip: UserD@nowhere.com SIP/2.0
          Via: SIP/2.0/UDP ss1.wcom.com:5060
```



```
          Via: SIP/2.0/UDP there.com:5060
          From: TheLittleGuy <sip:UserB@there.com>
          To: TheNewGuy <sip:UserD@nowhere.com>;tag=789789
          Call-Id: 123123123@there.com
          CSeq: 2 BYE
          Content-Length: 0

   F38
   200 OK
   D -> Proxy 1
```

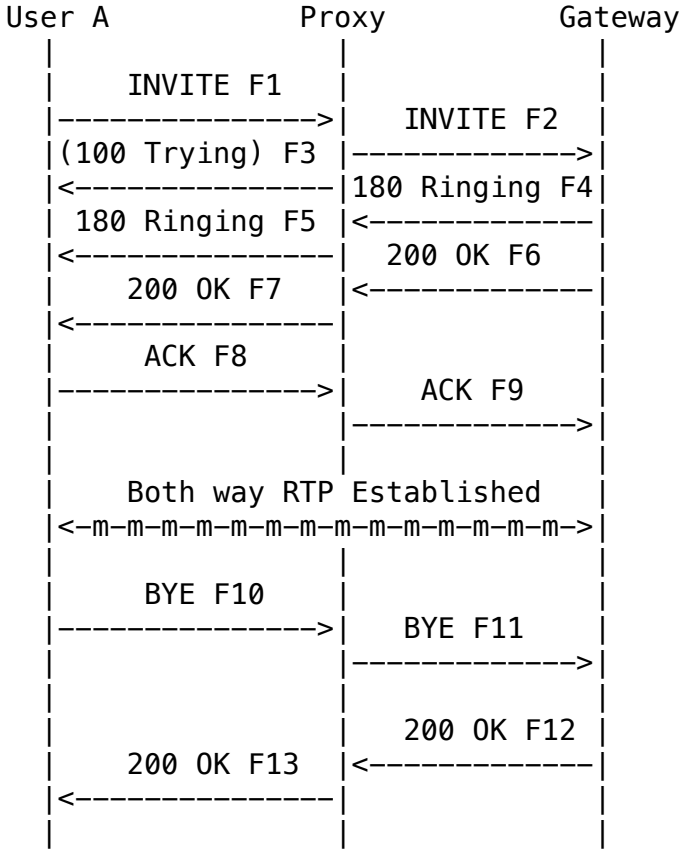
```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP there.com:5060
        From: TheLittleGuy <sip:UserB@there.com>
        To: TheNewGuy <sip:UserD@nowhere.com>;tag=789789
        Call-Id: 123123123@there.com
        CSeq: 2 BYE
        Content-Length: 0

F39
200 OK
Proxy 1 -> B

        SIP/2.0 200 OK
        Via: SIP/2.0/UDP there.com:5060
        From: TheLittleGuy <sip:UserB@there.com>
        To: TheNewGuy <sip:UserD@nowhere.com>;tag=789789
        Call-Id: 123123123@there.com
        CSeq: 2 BYE
        Content-Length: 0
```

2.4 Attended Transfer

User A calls user B. User A puts User B on hold, and Calls user C to announce transfer. User A terminates call with User C. User A transfers User B to User C. The call flow for this session would be a combination of Consultation Hold and Unattended Transfer.

2.5 Call Forwarding Unconditional

User B wants all calls forwarded to a Private Dialing Plan number 777-3660. (This information is known by the proxy). User A calls User B. The Proxy server rewrites the request URI, and forwards the INVITE to a gateway.



F1
INVITE
A->Proxy

```
INVITE sip:UserB@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Proxy-Authorization: DIGEST username="UserA", realm="MCI
WorldCom SIP", nonce="ea9c8e88df84f1cec4341ae6cbe5a359",
opaque="", uri="sip:ss1.wcom.com",
response="dfe56131d1958046689cd83306477ecc"
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserA 2890844526 2890844526 IN IP4 client.here.com
s=Session SDP
c=IN IP4 100.101.102.103
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F2 /* Proxy 1 accepts the credentials and forwards the INVITE the gateway for the extension that User B wants his calls forwarded to. Client for A prepares to receive data on port 49170 from the network. */
INVITE
Proxy->B2

```
INVITE sip:7773660,phone-
context=p1234@gw1.wcom.com;user=phone SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP here.com:5060
Record-Route: <sip:ss1.wcom.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
```

```
          Contact: TheBigGuy <sip:UserA@here.com>
          Content-Type: application/sdp
          Content-Length: ...

          v=0
          o=UserA 2890844526 2890844526 IN IP4 client.here.com
          c=IN IP4 100.101.102.103
```



```
          m=audio 49170 RTP/AVP 0
          a=rtpmap:0 PCMU/8000
          s=Session SDP
          t=3034423619 0

   F3
   (100 Trying)
   Proxy->A

          SIP/2.0 100 Trying
          Via: SIP/2.0/UDP here.com:5060
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>
          Call-Id: 12345600@here.com
          CSeq: 1 INVITE
          Content-Length: 0

   F4
   180 Ringing
   B2->Proxy

          SIP/2.0 180 Ringing
          Via: SIP/2.0/UDP ss1.wcom.com:5060
          Via: SIP/2.0/UDP here.com:5060
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>;tag=314159
          Call-Id: 12345600@here.com
          CSeq: 1 INVITE
          Content Length:0

   F5
   180 Ringing
   Proxy -> A
```

```
        SIP/2.0 180 Ringing
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=314159
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Content Length: 0
```

F6
200 OK
B2->Proxy

```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP here.com:5060
```



```
        Record-Route: <sip:ss1.wcom.com>
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=314159
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Contact:  <sip:7773660,phone-
        context=p1234@gw1.wcom.com;user=phone >
        Content-Type: application/sdp
        Content-Length: ...

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

F7
200 OK
Proxy->A

```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP here.com:5060
        Record-Route: <sip:ss1.wcom.com>
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=314159
```

```
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Contact: TheLittleGuy <sip:7773660,phone-
        context=p1234@gw1.wcom.com;user=phone >
        Content-Type: application/sdp
        Content-Length: ...

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

F8
ACK
A->Proxy

```
        ACK sip:7773660,phone-context=p1234@gw1.wcom.com;user=phone
        SIP/2.0
        Via: SIP/2.0/UDP here.com:5060
        Route: < sip:7773660,phone-
        context=p1234@gw1.wcom.com;user=phone >
```



```
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=314159
        Call-Id: 12345600@here.com
        CSeq: 1 ACK
        Content-Length:0
```

F9
ACK
Proxy->B4

```
        ACK sip:7773660,phone-context=p1234@gw1.wcom.com;user=phone
        SIP/2.0
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=314159
        Call-Id: 12345600@here.com
        CSeq: 1 ACK
```

```
        Content-Length:0

   F10
   BYE
   A -> Proxy 1

        BYE sip:7773660,phone-context=p1234@gw1.wcom.com;user=phone
        SIP/2.0
        Via: SIP/2.0/UDP here.com:5060
        Route: < sip:7773660,phone-
        context=p1234@gw1.wcom.com;user=phone >
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=314159
        Call-Id: 12345600@here.com
        CSeq: 2 BYE
        Content-Length: 0

   F11
   BYE
   Proxy 1 -> B2

        BYE sip:7773660,phone-context=p1234@gw1.wcom.com;user=phone
        SIP/2.0
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=314159
        Call-Id: 12345600@here.com
        CSeq: 2 BYE
        Content-Length: 0
```

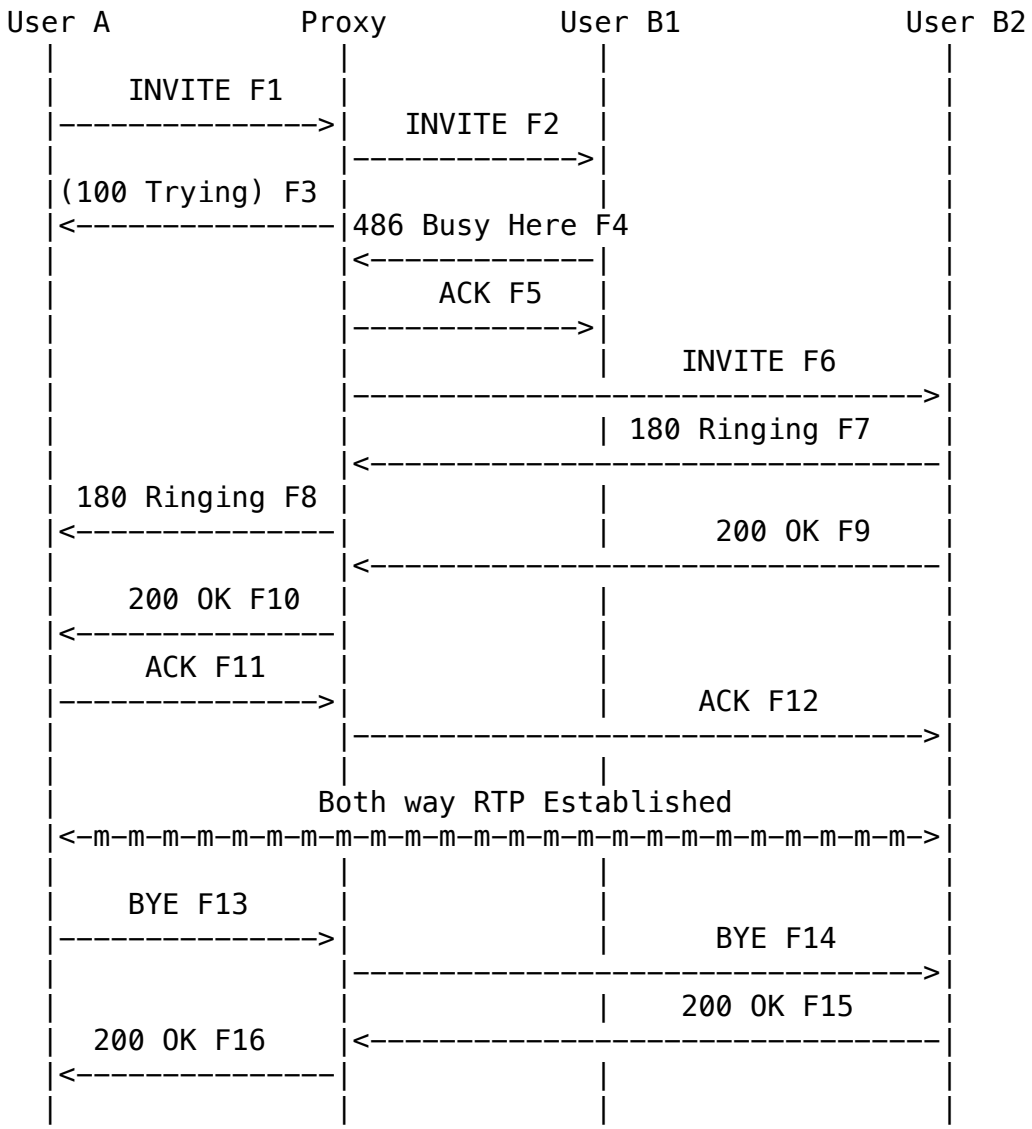


```
   F12
   200 OK
   B2 -> Proxy 1

        SIP/2.0 200 OK
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=314159
        Call-Id: 12345600@here.com
```

```
       CSeq: 2 BYE
       Content-Length: 0

F13
200 OK
Proxy 1 -> A

       SIP/2.0 200 OK
       Via: SIP/2.0/UDP here.com:5060
       From: TheBigGuy <sip:UserA@here.com>
       To: TheLittleGuy <sip:UserB@there.com>;tag=314159
       Call-Id: 12345600@here.com
       CSeq:  2 BYE
       Content-Length: 0
```


2.6 Call Forwarding - Busy

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



F1
INVITE
A->Proxy

```
INVITE sip:UserB@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Proxy-Authorization: DIGEST username="UserA", realm="MCI
WorldCom SIP", nonce="ea9c8e88df84f1cec4341ae6cbe5a359",
opaque="", uri="sip:ss1.wcom.com",
response="dfe56131d1958046689cd83306477ecc"
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserA 2890844526 2890844526 IN IP4 client.here.com
s= Session SDP
c=IN IP4 100.101.102.103
t=0 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F2
INVITE
Proxy->B1

```
INVITE sip:UserB1@ there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=1
Via: SIP/2.0/UDP here.com:5060
Record-Route: <sip:SS2@ss1.wcom.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Content-Type: application/sdp
Content-Length: ...

v=0
```

```
        o=UserA 2890844526 2890844526 IN IP4 client.here.com
        s=Session SDP
        c=IN IP4 100.101.102.103
        t=0 0
        m=audio 49170 RTP/AVP 0
```



```
        a=rtpmap:0 PCMU/8000
```

F3
(100 Trying)
Proxy->A

```
        SIP/2.0 100 Trying
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Content-Length: 0
```

F4
486 Busy Here
B1->Proxy

```
        SIP/2.0 486 Busy Here
        Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=1
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=123456
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Content-Length: 0
```

F5
ACK
Proxy->B1

```
        ACK sip: UserB1@ss1.wcom.com SIP/2.0
        Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=1
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=123456
        Call-Id: 12345600@here.com
```

```
        CSeq: 1 ACK
        Content-Length: 0
```

F6
INVITE
Proxy->B2

```
        INVITE sip:UserB2@ there.com SIP/2.0
        Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=2
        Via: SIP/2.0/UDP here.com:5060
        Record-Route: <sip:ss1.wcom.com>
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>
```



```
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Contact: TheBigGuy <sip:UserA@here.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserA 2890844526 2890844526 IN IP4 client.here.com
        s=Session SDP
        c=IN IP4 100.101.102.103
        t=0 0
        m=audio 49170 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F7
180 Ringing
B4->Proxy

```
        SIP/2.0 180 Ringing
        Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=2
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Content-Length: 0
```

F8

```
   180 Ringing
   Proxy -> A

          SIP/2.0 180 Ringing
          Via: SIP/2.0/UDP here.com:5060
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
          Call-Id: 12345600@here.com
          CSeq: 1 INVITE
          Content-Length: 0

   F9
   200 OK
   B2->Proxy

          SIP/2.0 200 OK
          Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=2
          Via: SIP/2.0/UDP here.com:5060
          Record-Route: <sip:ss1.wcom.com>
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
```



```
          Call-Id: 12345600@here.com
          CSeq: 1 INVITE
          Contact: TheLittleGuy <sip:UserB2@there.com>
          Content-Type: application/sdp
          Content-Length: ...

          v=0
          o=UserB 2890844527 2890844527 IN IP4 client2.there.com
          s=Session SDP
          c=IN IP4 110.111.112.114
          t=0 0
          m=audio 3456 RTP/AVP 0
          a=rtpmap:0 PCMU/8000

   F10
   200 OK
   Proxy->A

          SIP/2.0 200 OK
          Via: SIP/2.0/UDP here.com:5060
```

```
        Record-Route: <sip:ss1.wcom.com>
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Contact: TheLittleGuy <sip:UserB2@there.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserB 2890844527 2890844527 IN IP4 client2.there.com
        s=Session SDP
        c=IN IP4 110.111.112.114
        t=0 0
        m=audio 3456 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F11
ACK
A->Proxy

```
        ACK sip:UserB2@there.com SIP/2.0
        Via: SIP/2.0/UDP here.com:5060
        Route: <sip:UserB2.there.com>
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
        Call-Id: 12345600@here.com
        CSeq: 1 ACK
        Content-Length: 0
```


F12
ACK
Proxy->B2

```
        ACK sip: UserB2@there.com SIP/2.0
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
        Call-Id: 12345600@here.com
        CSeq: 1 ACK
```

```
       Content-Length: 0

   F13 /* RTP streams are established between A and B2 */
   /* User A eventually hangs up with User B2. */
   BYE
   A->Proxy

       BYE sip: UserB2@ss1.wcom.com SIP/2.0
       Via: SIP/2.0/UDP here.com:5060
       Route: <sip:userB2@there.com>
       From: TheBigGuy <sip:UserA@here.com>
       To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
       Call-Id: 12345600@here.com
       CSeq: 2 BYE
       Content-Length: 0

   F14
   BYE
   Proxy->B2

       BYE sip: UserB2@there.com SIP/2.0
       Via: SIP/2.0/UDP ss1.wcom.com:5060
       Via: SIP/2.0/UDP here.com:5060
       From: TheBigGuy <sip:UserA@here.com>
       To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
       Call-Id: 12345600@here.com
       CSeq: 2 BYE
       Content-Length: 0

   F15
   200 OK
   B2->Proxy

       SIP/2.0 200 OK
       Via: SIP/2.0/UDP ss1.wcom.com:5060
       Via: SIP/2.0/UDP here.com:5060
       From: TheBigGuy <sip:UserA@here.com>
```



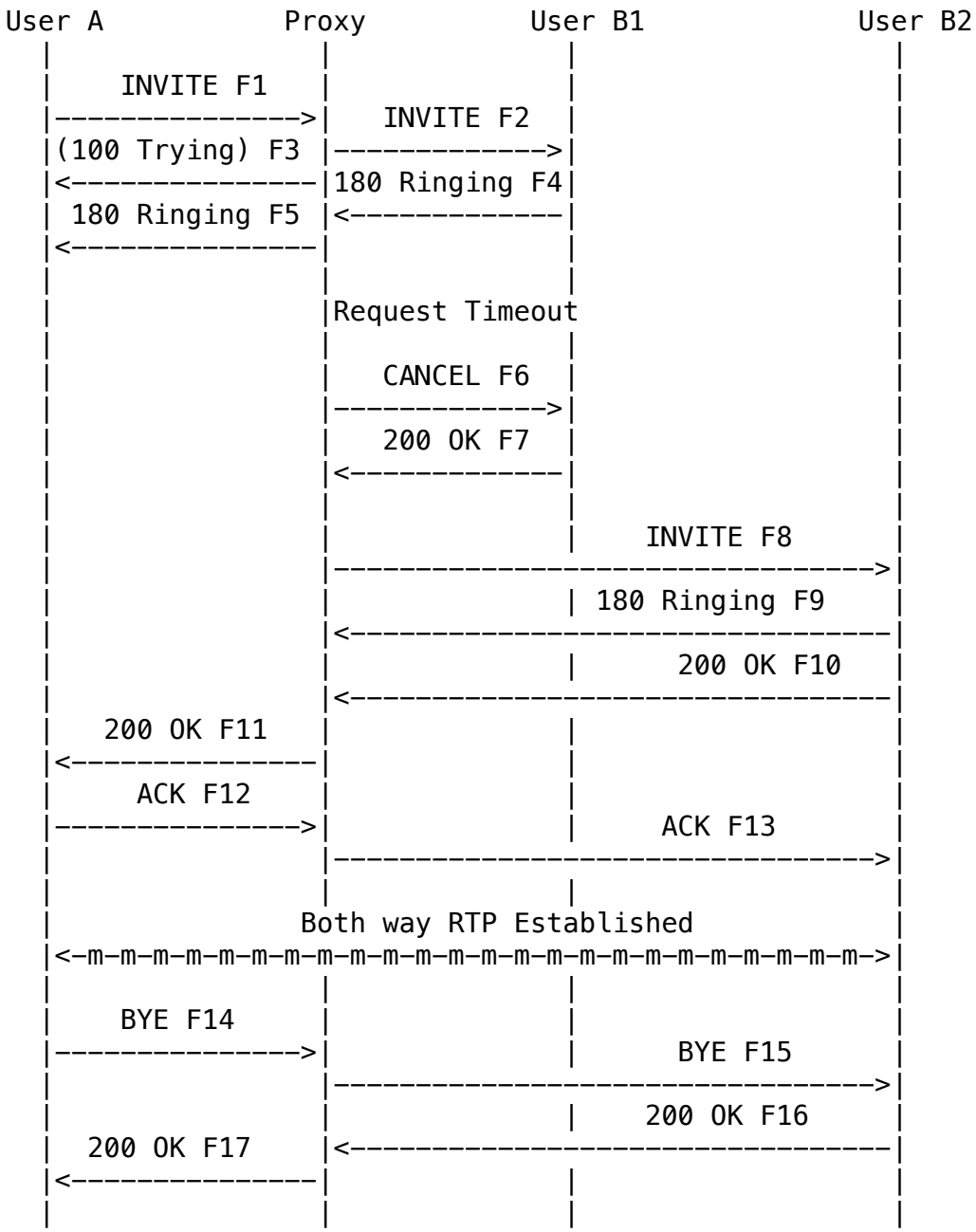
```
       To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
       Call-Id: 12345600@here.com
       CSeq: 2 BYE
       Content-Length: 0
```

F16
200 OK
Proxy->A

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
Call-Id: 12345600@here.com
CSeq:  2 BYE
Content-Length: 0
```

2.7 Call Forwarding ° No Answer

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



F1
INVITE
A->Proxy

```
INVITE sip:UserB@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Proxy-Authorization: DIGEST username="UserA", realm="MCI
WorldCom SIP", nonce="ea9c8e88df84f1cec4341ae6cbe5a359",
opaque="", uri="sip:ss1.wcom.com",
response="dfe56131d1958046689cd83306477ecc"
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserA 2890844526 2890844526 IN IP4 client.here.com
s=Session SDP
c=IN IP4 100.101.102.103
t=0 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F2
INVITE
Proxy->B1

```
INVITE sip:UserB1@ there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=1
Via: SIP/2.0/UDP here.com:5060
Record-Route: <sip:ss1.wcom.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
```

```
        Contact: TheBigGuy <sip:UserA@here.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserA 2890844526 2890844526 IN IP4 client.here.com
        s=Session SDP
        c=IN IP4 100.101.102.103
        t=0 0
        m=audio 49170 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```


F3
(100 Trying)
Proxy->A

```
        SIP/2.0 100 Trying
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Content-Length: 0
```

F4
180 Ringing
B1->Proxy

```
        SIP/2.0 180 Ringing
        Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=1
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=3145678
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Content-Length: 0
```

F5
180 Ringing
Proxy->A

```
          SIP/2.0 180 Ringing
          Via: SIP/2.0/UDP here.com:5060
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>;tag=3145678
          Call-Id: 12345600@here.com
          CSeq: 1 INVITE
          Content-Length: 0

   F6 /* B1 rings until a configurable timer expires in the Proxy. The
         Proxy sends Cancel and proceeds down the list of routes. */
   CANCEL
   Proxy->B1

          CANCEL sip:UserB1@ss1.wcom.com SIP/2.0
          Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=1
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>;tag=3145678
          Call-Id: 12345600@here.com
          CSeq: 1 CANCEL
```



```
          Content-Length: 0

   F7
   200 OK
   B1->Proxy

          SIP/2.0 200 OK
          Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=1
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>;tag=3145678
          Call-Id: 12345600@here.com
          CSeq: 1 CANCEL
          Content-Length: 0

   F8
   INVITE
   Proxy->B2

          INVITE sip:UserB4@ there.com SIP/2.0
          Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=2
          Via: SIP/2.0/UDP here.com:5060
          Record-Route: <sip:ss1.wcom.com>
```

```
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>
          Call-Id: 12345600@here.com
          CSeq: 1 INVITE
          Contact: TheBigGuy <sip:UserA@here.com>
          Content-Type: application/sdp
          Content-Length: ...

          v=0
          o=UserA 2890844526 2890844526 IN IP4 client.here.com
          s=Session SDP
          c=IN IP4 100.101.102.103
          t=0 0
          m=audio 49170 RTP/AVP 0
          a=rtpmap:0 PCMU/8000
```

F9
180 Ringing
B2->Proxy

```
          SIP/2.0 180 Ringing
          Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=2
          Via: SIP/2.0/UDP here.com:5060
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>;tag=123456
          Call-Id: 12345600@here.com
          CSeq: 1 INVITE
```



```
          Content-Length: 0
```

F10
200 OK
B2->Proxy

```
          SIP/2.0 200 OK
          Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=2
          Via: SIP/2.0/UDP here.com:5060
          Record-Route: <sip:ss1.wcom.com>
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>;tag=123456
          Call-Id: 12345600@here.com
          CSeq: 1 INVITE
```

```
        Contact: TheLittleGuy <sip:UserB2@there.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserB 2890844527 2890844527 IN IP4 client2.there.com
        s=Session SDP
        c=IN IP4 110.111.112.114
        t=0 0
        m=audio 3456 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F11
200 OK
Proxy->A

```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP here.com:5060
        Record-Route: <sip:ss1.wcom.com>
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=123456
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Contact: TheLittleGuy <sip:UserB2@there.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserB 2890844527 2890844527 IN IP4 client2.there.com
        s=Session SDP
        c=IN IP4 110.111.112.114
        t=0 0
        m=audio 3456 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```


F12
ACK
A->Proxy

```
        ACK sip:UserB2@there.com SIP/2.0
        Via: SIP/2.0/UDP here.com:5060
```

```
       Route: <sip:UserB2@there.com>
       From: TheBigGuy <sip:UserA@here.com>
       To: TheLittleGuy <sip:UserB@there.com>;tag=123456
       Call-Id: 12345600@here.com
       CSeq: 1 ACK
       Content-Length: 0

F13
ACK
Proxy->B2

       ACK sip: UserB2@there.com SIP/2.0
       Via: SIP/2.0/UDP ss1.wcom.com:5060
       Via: SIP/2.0/UDP here.com:5060
       From: TheBigGuy <sip:UserA@here.com>
       To: TheLittleGuy <sip:UserB@there.com>;tag=123456
       Call-Id: 12345600@here.com
       CSeq: 1 ACK
       Content-Length: 0

F14/* RTP streams are established between A and B2*/
   /* User A Hangs Up with User B2. */
BYE
A->Proxy

       BYE sip: UserB2@ss1.wcom.com SIP/2.0
       Via: SIP/2.0/UDP here.com:5060
       Route: <sip:userB2@there.com>
       From: TheBigGuy <sip:UserA@here.com>
       To: TheLittleGuy <sip:UserB@there.com>;tag=123456
       Call-Id: 12345600@here.com
       CSeq: 2 BYE
       Content-Length: 0

F15
BYE
Proxy->B2

       BYE sip: UserB2@there.com SIP/2.0
       Via: SIP/2.0/UDP ss1.wcom.com:5060
       Via: SIP/2.0/UDP here.com:5060
       From: TheBigGuy <sip:UserA@here.com>
       To: TheLittleGuy <sip:UserB@there.com>;tag=123456
```

```
        Call-Id: 12345600@here.com
        CSeq: 2 BYE
        Content-Length: 0
```

F16
200 OK
B2->Proxy

```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=123456
        Call-Id: 12345600@here.com
        CSeq: 2 BYE
        Content-Length: 0
```

F17
200 OK
Proxy->A

```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=123456
        Call-Id: 12345600@here.com
        CSeq:  2 BYE
        Content-Length: 0
```

2.8 3-way Call

User A calls User B, User B then invites user C to a 3-way call. User B will mix the audio streams (act as the conference bridge). If user B drops out of the call then the entire call is dropped. This is not a fully meshed conference, and does not make use of the concepts in the call control draft.

The signaling for this scenario is as follows: User A calls User B, this establishes the call between A and B. User B calls User C, this establishes the call between B and C. User B will mix the audio streams, sending media originating at A to C, and media originating at C to A. There is no SIP signalling relationship between User A and User C.

2.9 Single Line Extension

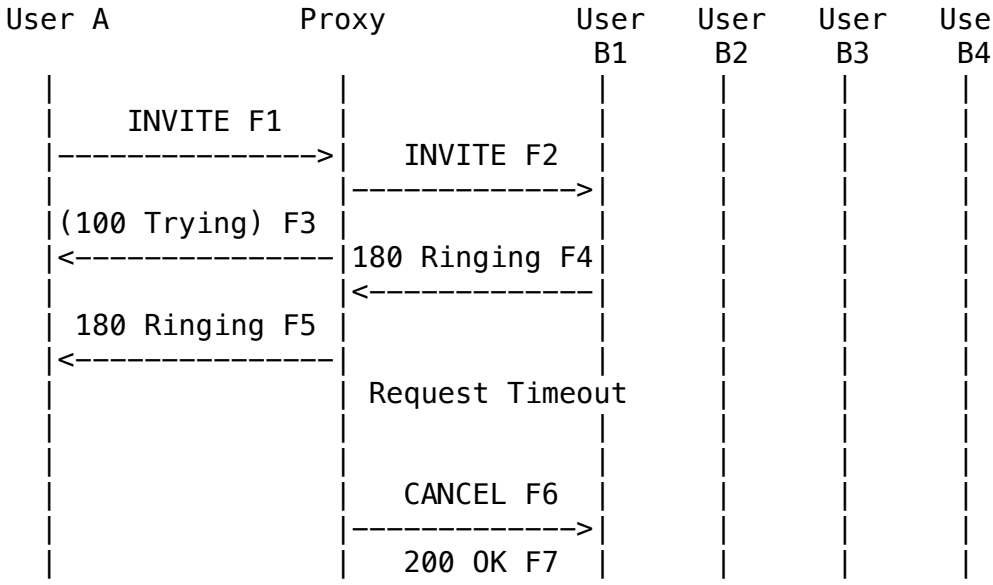
Single Line Extension (Sequential, First Wins implementation), a call will ring several extensions in sequence. The extension to

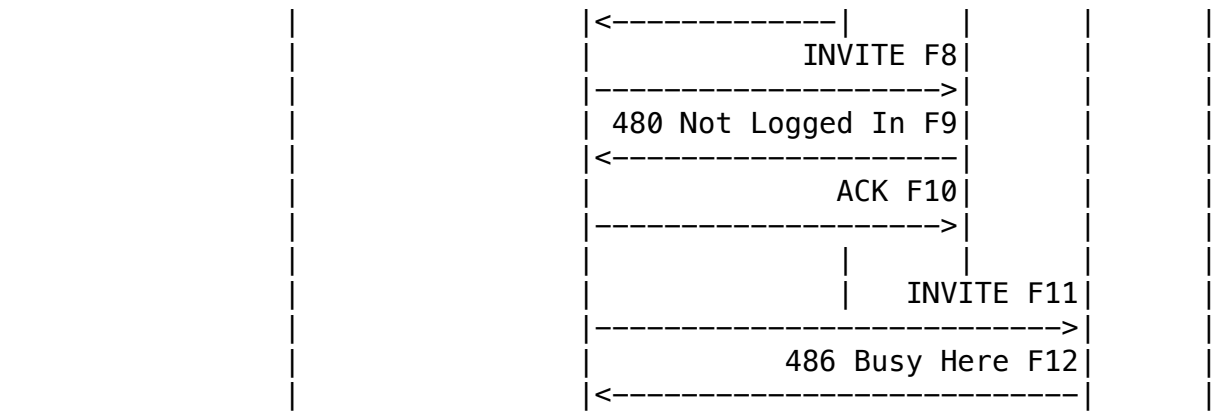
answer the call becomes the active set, no other sets may join the call. The signalling for this implementation of Single Line Extension and Find-Me is the same, the difference may be in the provisioning of the service.

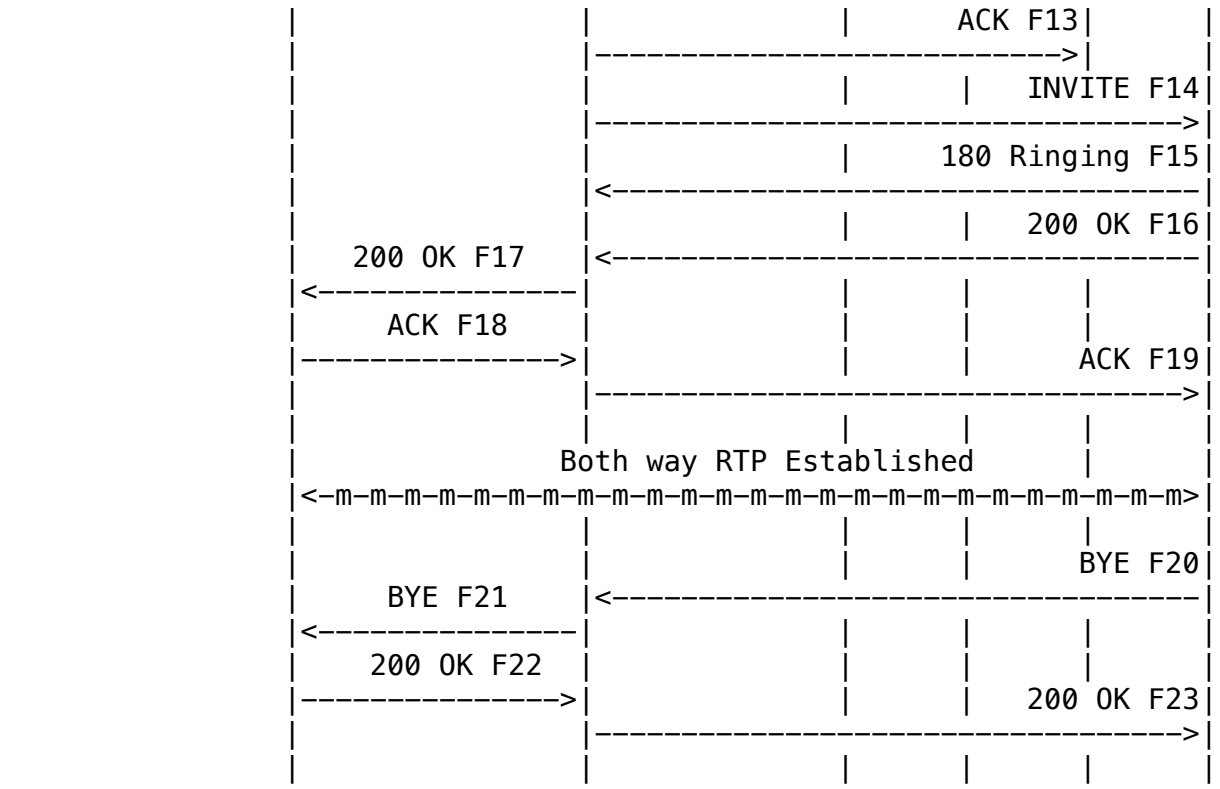
2.10 Find-Me

A call to a user will attempt to locate that user by calling locations from a list of contacts. The location to answer the call becomes the active set, no other sets may join the call.

It is anticipated that the Find-me feature will be associated with individual users. The signalling for the implementation of Single Line Extension and Find-Me is the same, the difference may be in the provisioning of the service.







F1
INVITE
A->Proxy

```
INVITE sip:UserB@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Proxy-Authorization: DIGEST username="UserA", realm="MCI
WorldCom SIP", nonce="ea9c8e88df84f1cec4341ae6cbe5a359",
opaque="", uri="sip:ss1.wcom.com",
response="dfe56131d1958046689cd83306477ecc"
Content-Type: application/sdp
Content-Length: ...

v=0
s= Session SDP
o=UserA 2890844526 2890844526 IN IP4 client.here.com
c=IN IP4 100.101.102.103
t=0 0
m=audio 49170 RTP/AVP 0
```



```
a=rtpmap:0 PCMU/8000
```

F2
INVITE
Proxy->B1

```
INVITE sip:UserB1@ there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=1
Via: SIP/2.0/UDP here.com:5060
Record-Route: <sip:ss1.wcom.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserA 2890844526 2890844526 IN IP4 client.here.com
s=Session SDP
```

```
        c=IN IP4 100.101.102.103
        t= 0 0
        m=audio 49170 RTP/AVP 0
        a=rtpmap:0 PCMU/8000

   F3
   (100 Trying)
   Proxy->A

        SIP/2.0 100 Trying
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Content-Length: 0

   F4
   180 Ringing
   B1->Proxy

        SIP/2.0 180 Ringing
        Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=1
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=123456
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
```



```
        Content-Length: 0
   F5
   180 Ringing
   Proxy->A

        SIP/2.0 180 Ringing
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=123456
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Content-Length: 0
```

```
   F6 /* B1 rings for until a configurable timer in the Proxy expires.
         The Proxy then sends Cancel and proceeds down the list of
         routes. */
   CANCEL
   Proxy->B1

          CANCEL sip:UserB1@ss1.wcom.com SIP/2.0
          Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=1
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>
          Call-Id: 12345600@here.com
          CSeq: 1 CANCEL
          Content-Length: 0

   F7
   200 OK
   B1->Proxy

          SIP/2.0 200 OK
          Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=1
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>
          Call-Id: 12345600@here.com
          CSeq: 1 CANCEL
          Content-Length: 0

   F8
   INVITE
   Proxy->B2

          INVITE sip:UserB2@ there.com SIP/2.0
          Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=2
          Via: SIP/2.0/UDP here.com:5060
          Record-Route: <sip:ss1.wcom.com>
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>
```



```
          Call-Id: 12345600@here.com
          CSeq: 1 INVITE
          Contact: TheBigGuy <sip:UserA@here.com>
          Content-Type: application/sdp
          Content-Length: ...
```

```
        v=0
        o=UserA 2890844526 2890844526 IN IP4 client.here.com
        s= Session SDP
        c=IN IP4 100.101.102.103
        t=0 0
        m=audio 49170 RTP/AVP 0
        a=rtpmap:0 PCMU/8000

F9
480 Not Logged In
B2->Proxy

        SIP/2.0 480 Not Logged In
        Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=2
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=314756
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Content-Length: 0

F10
ACK
Proxy->B2

        ACK sip: UserB2@ss1.wcom.com SIP/2.0
        Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=2
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=314756
        Call-Id: 12345600@here.com
        CSeq: 1 ACK
        Content-Length: 0

F11
INVITE
Proxy->B3

        INVITE sip:UserB3@ there.com SIP/2.0
        Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=3
        Via: SIP/2.0/UDP here.com:5060
        Record-Route: <sip:ss1.wcom.com>
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>
```

```
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Contact: TheBigGuy <sip:UserA@here.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserA 2890844526 2890844526 IN IP4 client.here.com
        s=Session SDP
        c=IN IP4 100.101.102.103
        t=0 0
        m=audio 49170 RTP/AVP 0
        a=rtpmap:0 PCMU/8000

F12
486 Busy Here
B3->Proxy

        SIP/2.0 486 Busy Here
        Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=3
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Content-Length: 0

F13
ACK
Proxy->B3

        ACK sip: UserB3@ss1.wcom.com SIP/2.0
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
        Call-Id: 12345600@here.com
        CSeq: 1 ACK
        Content-Length: 0

F14
INVITE
Proxy->B4

        INVITE sip:UserB4@ there.com SIP/2.0
        Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=4
        Via: SIP/2.0/UDP here.com:5060
        Record-Route: <sip:ss1.wcom.com>
        From: TheBigGuy <sip:UserA@here.com>
```

```
          To: TheLittleGuy <sip:UserB@there.com>
          Call-Id: 12345600@here.com
```



```
          CSeq: 1 INVITE
          Contact: TheBigGuy <sip:UserA@here.com>
          Content-Type: application/sdp
          Content-Length: ...

          v=0
          o=UserA 2890844526 2890844526 IN IP4 client.here.com
          s=Session SDP
          c=IN IP4 100.101.102.103
          t=0 0
          m=audio 49170 RTP/AVP 0
          a=rtpmap:0 PCMU/8000
```

F15
180 Ringing
B4->Proxy

```
          SIP/2.0 180 Ringing
          Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=4
          Via: SIP/2.0/UDP here.com:5060
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>;tag=7137136
          Call-Id: 12345600@here.com
          CSeq: 1 INVITE
          Content-Length: 0
```

F16
200 OK
B4->Proxy

```
          SIP/2.0 200 OK
          Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=4
          Via: SIP/2.0/UDP here.com:5060
          Record-Route: <sip:ss1.wcom.com>
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>;tag=7137136
          Call-Id: 12345600@here.com
          CSeq: 1 INVITE
          Contact: TheLittleGuy <sip:UserB4@there.com>
```

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

        v=0
        o=UserB 2890844527 2890844527 IN IP4 client4.there.com
        s=Session SDP
        c=IN IP4 110.111.112.116
        t=0 0
        m=audio 3456 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```


F17
200 OK
Proxy->A

```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP here.com:5060
        Record-Route: <sip:ss1.wcom.com>
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>;tag=7137136
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Contact: TheLittleGuy <sip:UserB4@there.com>
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserB 2890844527 2890844527 IN IP4 client4.there.com
        s=Session SDP
        c=IN IP4 110.111.112.116
        t=0 0
        m=audio 3456 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

F18
ACK
A->Proxy

```
        ACK sip:UserB4@there.com SIP/2.0
        Via: SIP/2.0/UDP here.com:5060
        Route: <UserB4@there.com>
```

```
       From: TheBigGuy <sip:UserA@here.com>
       To: TheLittleGuy <sip:UserB@there.com>;tag=7137136
       Call-Id: 12345600@here.com
       CSeq: 1 ACK
       Content-Length: 0

F19
ACK
Proxy->B4

       ACK sip: UserB4@there.com SIP/2.0
       Via: SIP/2.0/UDP ss1.wcom.com:5060
       Via: SIP/2.0/UDP here.com:5060
       From: TheBigGuy <sip:UserA@here.com>
       To: TheLittleGuy <sip:UserB@there.com>;tag=7137136
       Call-Id: 12345600@here.com
       CSeq: 1 ACK
       Content-Length: 0
```



```
F20 /* RTP streams are established between A and B4*/
    /* User B4 Hangs Up with User A. */
BYE
B4->Proxy

       BYE sip: UserA@here.com SIP/2.0
       Via: SIP/2.0/UDP there.com:5060
       Route: <sip:UserA@here.com>
       From: TheLittleGuy <sip:UserB@there.com>;tag=7137136
       To: TheBigGuy <sip:UserA@here.com>
       Call-Id: 12345600@here.com
       CSeq: 2 BYE
       Content-Length: 0

F21
BYE
Proxy->A

       BYE sip: UserA@here.com SIP/2.0
       Via: SIP/2.0/UDP ss1.wcom.com:5060
       Via: SIP/2.0/UDP there.com:5060
       From: TheLittleGuy <sip:UserB@there.com>;tag=7137136
```

```
        To: TheBigGuy <sip:UserA@here.com>;tag=1234567
        Call-Id: 12345600@here.com
        CSeq: 2 BYE
        Content-Length: 0
```

F22
200 OK
A->Proxy

```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP ss1.wcom.com:5060
        Via: SIP/2.0/UDP there.com:5060
        From: TheLittleGuy <sip:UserB@there.com>;tag=7137136
        To: TheBigGuy <sip:UserA@here.com>;tag=1234567
        Call-Id: 12345600@here.com
        CSeq: 2 BYE
        Content-Length: 0
```

F23
200 OK
Proxy->B4

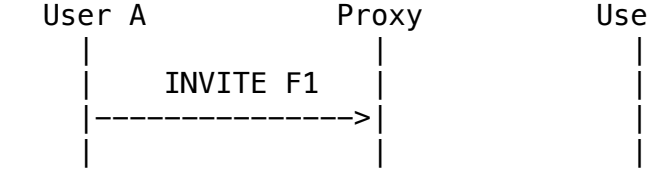
```
        SIP/2.0 200 OK
        Via: SIP/2.0/UDP there.com:5060
        From: TheLittleGuy <sip:UserB@there.com>;tag=7137136
        To: TheBigGuy <sip:UserA@here.com>;tag=1234567
```

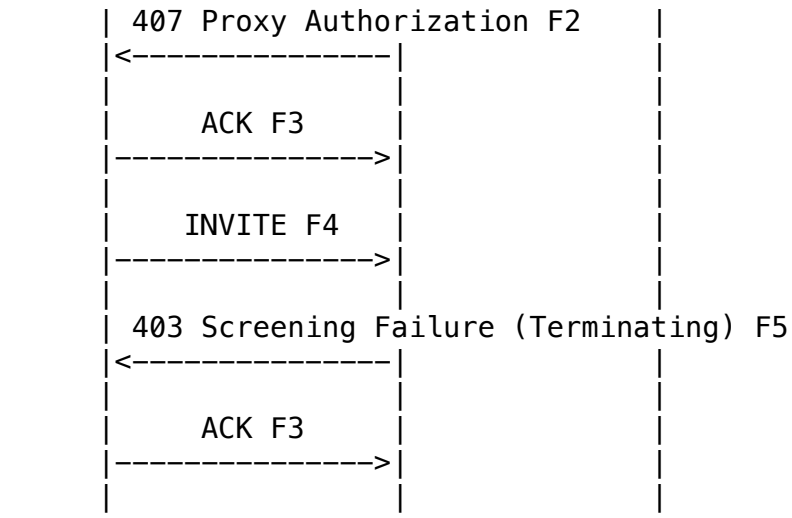


```
        Call-Id: 12345600@here.com
        CSeq: 2 BYE
        Content-Length: 0
```

2.11 Call Management (Incoming Call Screening)

User B has an incoming call screening list, User A is included on the list of addresses User B will not accept calls from. User A attempts to call user B.





F1
Invite
A->Proxy1

```
INVITE sip:UserB@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserA 2890844526 2890844526 IN IP4 client.here.com
```



```
c=IN IP4 100.101.102.103
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
s=Session SDP
t=3034423619 0
```

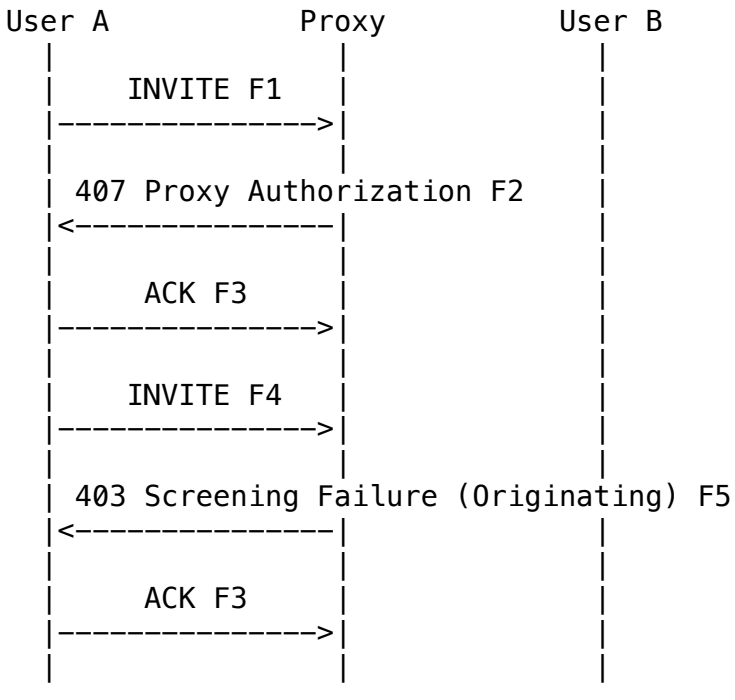
F2 /* Proxy 1 challenges User A for authentication */

```
   407 Proxy Authorization Required
   Proxy 1 -> A

          SIP/2.0 407 Proxy Authorization Required
          Via: SIP/2.0/UDP here.com:5060
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>
          Call-Id: 12345600@here.com
          CSeq: 1 INVITE
          Proxy-Authenticate: Digest realm="MCI WorldCom SIP",
          domain="wcom.com", nonce="ea9c8e88df84f1cec4341ae6cbe5a359",
          opaque="", stale="FALSE", algorithm="MD5"
          Content-Length:0

   F3
   ACK
   A -> Proxy 1

          ACK sip:UserB@ss1.wcom.com SIP/2.0
          Via: SIP/2.0/UDP here.com:5060
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>
          Call-Id: 12345600@here.com
          CSeq: 1 ACK
          Content-Length:0

   F4 /* User A responds by sending an INVITE with authentication
         credentials in it.  */
   Invite
   A -> Proxy 1

          INVITE sip:UserB@ss1.wcom.com SIP/2.0
          Via: SIP/2.0/UDP here.com:5060
          From: TheBigGuy <sip:UserA@here.com>
          To: TheLittleGuy <sip:UserB@there.com>
          Call-Id: 12345601@here.com
          CSeq: 1 INVITE
          Contact: TheBigGuy <sip:UserA@here.com>
          Proxy-Authorization: DIGEST username="UserA", realm="MCI
          WorldCom SIP", nonce="ea9c8e88df84f1cec4341ae6cbe5a359",
          opaque="", uri="sip:ss1.wcom.com",
          response="dfe56131d1958046689cd83306477ecc"
```

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

        v=0
        o=UserA 2890844526 2890844526 IN IP4 client.here.com
        s=Session SDP
        c=IN IP4 100.101.102.103
        t=3034423619 0
        m=audio 49170 RTP/AVP 0
        a=rtpmap:0 PCMU/8000

F5
403 Screening Failure (Terminating)
Proxy 1 -> A

        SIP/2.0 403 Screening Failure (Terminating)
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>
        Call-Id: 12345601@here.com
        CSeq: 1 INVITE
        Content-Length:0

F6
ACK
A -> Proxy 1

        ACK sip:UserB@there.com SIP/2.0
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>
        Call-Id: 12345601@here.com
        CSeq: 1 ACK
        Content-Length:0
```

2.12 Call Management (Outgoing Call Screening)

User A has an outgoing call screening list, User B is included on the list of addresses User A will not be able to place a call to. User A attempts to call user B.



F1
Invite
A->Proxy1

```
INVITE sip:UserB@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Content-Type: application/sdp
Content-Length: ...
```

```
        v=0
        o=UserA 2890844526 2890844526 IN IP4 client.here.com
        s=Session SDP
        c=IN IP4 100.101.102.103
        t=3034423619 0
        m=audio 49170 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```


F2 /* Proxy 1 challenges User A for authentication */
407 Proxy Authorization Required
Proxy 1 -> A

```
        SIP/2.0 407 Proxy Authorization Required
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>
        Call-Id: 12345600@here.com
        CSeq: 1 INVITE
        Proxy-Authenticate: Digest realm="MCI WorldCom SIP",
        domain="wcom.com", nonce="ea9c8e88df84f1cec4341ae6cbe5a359",
        opaque="", stale="FALSE", algorithm="MD5"
        Content-Length:0
```

F3
ACK
A -> Proxy 1

```
        ACK sip:UserB@ss1.wcom.com SIP/2.0
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>
        Call-Id: 12345600@here.com
        CSeq: 1 ACK
        Content-Length:0
```

F4 /* User A responds be sending an INVITE with authentication
credentials in it. */
Invite
A -> Proxy 1

```
        INVITE sip:UserB@ss1.wcom.com SIP/2.0
```

```
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>
        Call-Id: 12345601@here.com
        CSeq: 1 INVITE
        Contact: TheBigGuy <sip:UserA@here.com>
        Proxy-Authorization: DIGEST username="UserA", realm="MCI
        WorldCom SIP", nonce="ea9c8e88df84f1cec4341ae6cbe5a359",
        opaque="", uri="sip:ss1.wcom.com",
        response="dfe56131d1958046689cd83306477ecc"
        Content-Type: application/sdp
        Content-Length: ...

        v=0
        o=UserA 2890844526 2890844526 IN IP4 client.here.com
        s=Session SDP
```



```
        c=IN IP4 100.101.102.103
        t=3034423619 0
        m=audio 49170 RTP/AVP 0
        a=rtpmap:0 PCMU/8000
```

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

```
        SIP/2.0 403 Screening Failure (Originating)
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>
        Call-Id: 12345601@here.com
        CSeq: 1 INVITE
        Content-Length:0
```

F6
ACK
A -> Proxy 1

```
        ACK sip:UserB@there.com SIP/2.0
        Via: SIP/2.0/UDP here.com:5060
        From: TheBigGuy <sip:UserA@here.com>
        To: TheLittleGuy <sip:UserB@there.com>
```

```
Call-Id: 12345601@here.com
CSeq: 1 ACK
Content-Length:0
```


3 Author's Addresses

Robert Sparks
MCI WorldCom
2400 N Glenville Drive Phone: +1-972-729-5241
Richardson, TX 75082 Email: Robert.Sparks@wcom.com

Chris Cunningham
MCI WorldCom
400 International Parkway Phone: +1-972-729-3110
Richardson, TX 75081 Email: Chris.Cunningham@wcom.com

Alan Johnston
MCI WorldCom
100 S 4th Street Phone: +1-314-342-7360

St. Louis, MO 63104 Email: alan.johnston@wcom.com

Steve Donovan
MCI WorldCom
901 International Parkway Phone: +1-972-729-1621
Richardson, TX 65081 Email:
steven.r.donovan@wcom.com

Kevin Summers
MCI WorldCom
2400 N Glenville Drive Phone: +1-972-729-7976
Richardson, TX 75082 Email: Kevin.Summers@wcom.com

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