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Alan Johnston

WorldCom

Robert Sparks

Chris Cunningham

Steve Donovan

dynamicsoft

Kevin Summers

Sonus

Session Initiation Protocol Service Examples

Status of this Memo

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Abstract

This informational document gives examples of Session Initiation Protocol (SIP) services. This covers most features offered in so-called 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 headers. These features are not intended to be an exhaustive set, but rather show implementations of common features likely to be implemented on SIP IP telephones in a business environment.

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1 Overview

This informational document provides 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
Single-Line Extension	3-way Call
Incoming Call Screening	Find-Me
Call Pickup	Call Park
Outgoing Call Screening	Automatic Redial

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 use SIP as defined by [RFC 3261](#) [2] and SDP usage defined by [RFC 3264](#) [8]. Note that this document is informational, and nothing stated here should be taken as normative. 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) or Back-to-Back User Agents (B2BUA) may be more appropriate in some circumstances. The design and principles of these service examples are described in the the Multiparty Framework document [[12](#)].

These flows assume the functionality described in the SIP Basic Call Flow Examples document [[3](#)], which explores basic behavior. Some of the scenarios described herein make use of the SIP method extension REFER [[4](#)] and the SIP header extension Replaces [[5](#)], the SIP header extension Join [[6](#)], and some of the concepts in the 3pcc (third party call control) document [[7](#)]. The SIP Events document [[11](#)] describes the use of SUBSCRIBE and NOTIFY while the SIP Call Package document [[10](#)] describes the dialog event package.

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. To improve the clarity of this document, authentication of

User Agents is not explicitly shown in all flows, except where authentication directly relates to the service example.

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 or PSTN 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. Comments in the message details are shown in the following form:

```
/* Comments. */
```

1.2 Document History

The first version of this document was the Internet-Draft "[draft-sparks-sip-service-examples.txt](#)" October 1999.

The next version was combined with the SIP Telephony Call Flows document into the "[draft-ietf-sip-call-flows-00.txt](#)" April 2000.

This version is based on [Section 7](#) of that document with many of the examples extensively rewritten using the REFER method.

1.3 Changes to 00

- Modified all REFER flows to include 202 Accepted and NOTIFY result message.
- Removed "Telephony" from title of document.
- Added note on 2.9 on use of REFER to exit 3-way conference.
- Modified Music on Hold/Call Park flow (2.2).
- Modified order of messages in transfers (2.4 and 2.5) to more closely resemble PSTN experience.
- Added Call Pickup flow (2.13).

- Added editorial notes on usefulness of Replaces header.

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[1.4](#) Changes to 01

- Added Replaces header to flows.
- Changed handling of call hold.
- Added Contact and Referred-By headers and ref parameters to REFER messages.
- Changed some Contacts, Routes, and Request-URIs to IP addresses.
- Incremented o= line when SDP is updated with hold.
- Added From tags throughout.
- Renamed Music On Hold/Call Park to Call Park and added new Music On Hold call flow using 3pcc.

[1.5](#) Changes to 02

- Changed call hold flows to show sendonly attribute based on [\[8\]](#).
- Removed ref parameter from the Referred-By headers since it is now just a generic paramter in the latest draft [\[4\]](#). (Note that if the ref parameter stays, additional characters such as "<", "@", and ">" must be escaped.)
- Removed tags in CANCEL requests and responses.

[1.6](#) Changes to sipping-00

- Added Max-Forwards
- Added branch parm and received param to Vias
- Changed Record-Route and Route behavior to show loose routing.
- Added Record-Route and Contact to 18x responses
- Changed Call Pickup to show Replaces with an early dialog
- Changed description of Single Line Extension service
- Changed Call Park and Pickup flow to show a different user picking up the call.
- Added Allow and Supported headers to REFER and replaces flows.

[1.7](#) Changes to -01

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- Added SIP Events and dialog event package to Call Pickup flow.
- Added Auto Redial call flows
- Updated based on new Replaces draft with 481 behavior instead of using Accept-Contact in attended transfer.
- Added Single Line Extension call flow.
- Added Error-Info in call screening flows.

1.8 Changes to -02

- Added 3-way call flows showing transition from 2 party call.

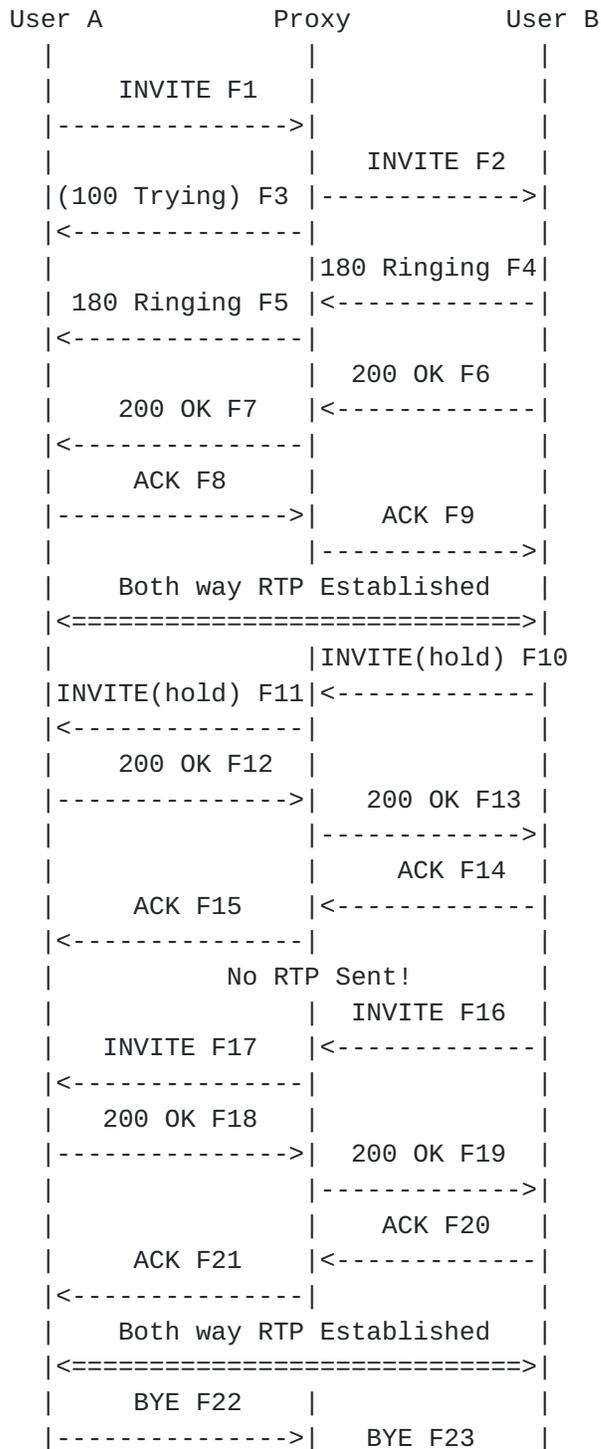
1.9 Changes to -03

- Fixed owner/version SDP errors in hold SDP.
- Add Notification of remote-URI in Call Pickup scenario
- Updated 3-way conference flows to show just internal User Agent mixing
- Added FQDNs in Contacts and SDP, changed example addresses
- Replaced use of Accept-Contact header with Contact URI
- Updated for refer-06 changes

2 IP Telephony Services Features Call Flows

These call flows show how a number of standard telephony features can be implemented using SIP. They are not meant to represent a complete set. Some calls make use of SIP extensions.

2.1 Call Hold



```
| |----->|
| 200 OK F24 |
| 200 OK F25 |<-----|
```

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```

|<-----|           |
|         |           |

```

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

Message Details

F1 INVITE A -> Proxy 1

```

INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345601@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000

```

F2 INVITE Proxy 1 -> B

```

INVITE sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345601@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.here.com>
Content-Type: application/sdp
Content-Length: ...

```

v=0

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o=UserA 2890844526 2890844526 IN IP4 client.here.com
s=Session SDP
c=IN IP4 client.here.com
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 client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345601@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;branch=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345601@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content Length:0

F5 180 Ringing Proxy 1 -> A

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345601@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content Length: 0

F6 200 OK B -> Proxy 1

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```
SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
    ;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
    ;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345601@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.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 client.there.com
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 client.here.com:5060;branch=z9hG4bK74bf9
    ;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345601@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.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 client.there.com
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

```
F8 ACK A -> Proxy 1
```

```
ACK sip:UserB@client.there.com SIP/2.0
```

Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70

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From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345601@here.com
CSeq: 1 ACK
Content-Length: 0

F9 ACK Proxy 1 -> B

ACK sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345601@here.com
CSeq: 1 ACK
Content-Length: 0

/* User B places User A on hold. Note that the version is
incremented in the o= field of the SDP */

F10 INVITE B -> Proxy 1

INVITE sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345601@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 2890844527 2890844528 IN IP4 client.there.com
s=Session SDP
c=IN IP4 client.there.com
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
a=sendonly

F11 INVITE Proxy 1 -> A

INVITE sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1

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Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
Record-Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 69
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345601@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 2890844527 2890844528 IN IP4 client.there.com
s=Session SDP
c=IN IP4 client.there.com
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
a=sendonly

/* A replies with normal SDP */

F12 200 OK A -> Proxy 1

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
Record-Route: <sip:ss1.wcom.com;lr>
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345601@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
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

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```
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
Record-Route: <sip:ss1.wcom.com;lr>
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345601@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F14 ACK B -> Proxy 1

```
ACK sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345601@here.com
CSeq: 1 ACK
Content-Length: 0
```

F15 ACK Proxy 1 -> A

```
ACK sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
Max-Forwards: 69
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345601@here.com
CSeq: 1 ACK
Content-Length: 0
```

/* User B takes the call off hold */

F16 INVITE B -> Proxy 1

INVITE sip:UserA@client.here.com SIP/2.0

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Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345601@here.com
CSeq: 2 INVITE
Contact: <sip:UserB@client.there.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 2890844527 2890844529 IN IP4 client.there.com
s=Session SDP
c=IN IP4 client.there.com
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F17 INVITE Proxy 1 -> A

INVITE sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
Record-Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 69
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345601@here.com
CSeq: 2 INVITE
Contact: <sip:UserB@client.there.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 2890844527 2890844529 IN IP4 client.there.com
s=Session SDP
c=IN IP4 client.there.com
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F18 200 OK A -> Proxy 1

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1

;received=192.0.2.54
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105

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Record-Route: <sip:ss1.wcom.com;lr>
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345601@here.com
CSeq: 2 INVITE
Contact: <sip:UserA@client.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 client.here.com
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F19 200 OK Proxy 1 -> B

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
Record-Route: <sip:ss1.wcom.com;lr>
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345601@here.com
CSeq: 2 INVITE
Contact: <sip:UserA@client.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 client.here.com
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F20 ACK B -> Proxy 1

ACK sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567

Call-ID: 12345601@here.com
CSeq: 2 ACK
Content-Length: 0

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F21 ACK Proxy 1 -> A

ACK sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
Max-Forwards: 69
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345601@here.com
CSeq: 2 ACK
Content-Length: 0

/* RTP Media stream re-established. User A disconnects. */

F22 BYE A -> Proxy 1

BYE sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345601@here.com
CSeq: 2 BYE
Content-Length: 0

F23 BYE Proxy 1 -> B

BYE sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345601@here.com
CSeq: 2 BYE
Content-Length: 0

F24 200 OK B -> Proxy 1

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
;received=192.0.2.54

Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103

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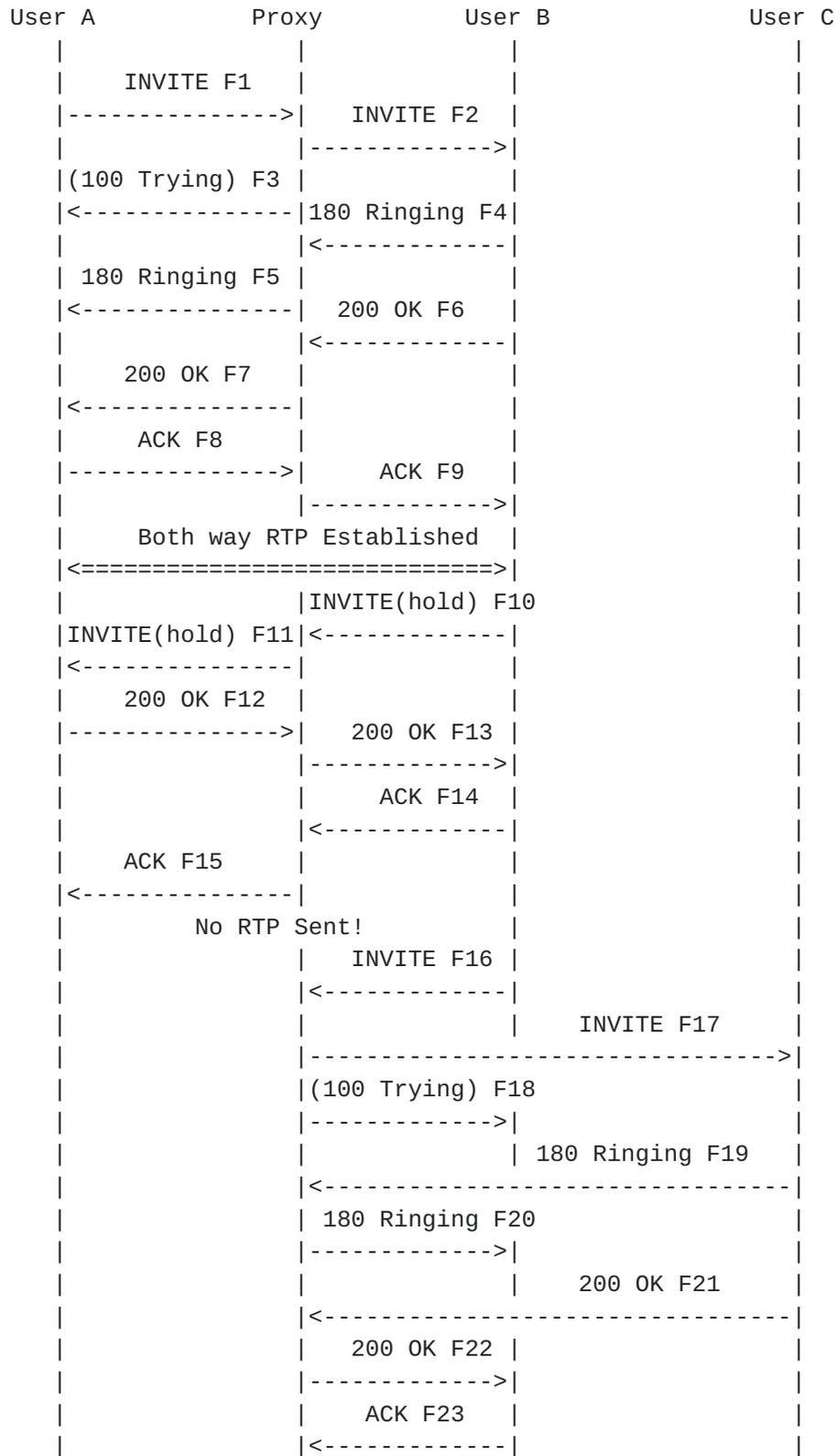
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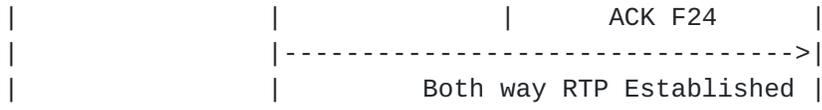
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345601@here.com
CSeq: 2 BYE
Content-Length: 0

F25 200 OK Proxy 1 -> A

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345601@here.com
CSeq: 2 BYE
Content-Length: 0

2.2 Consultation Hold

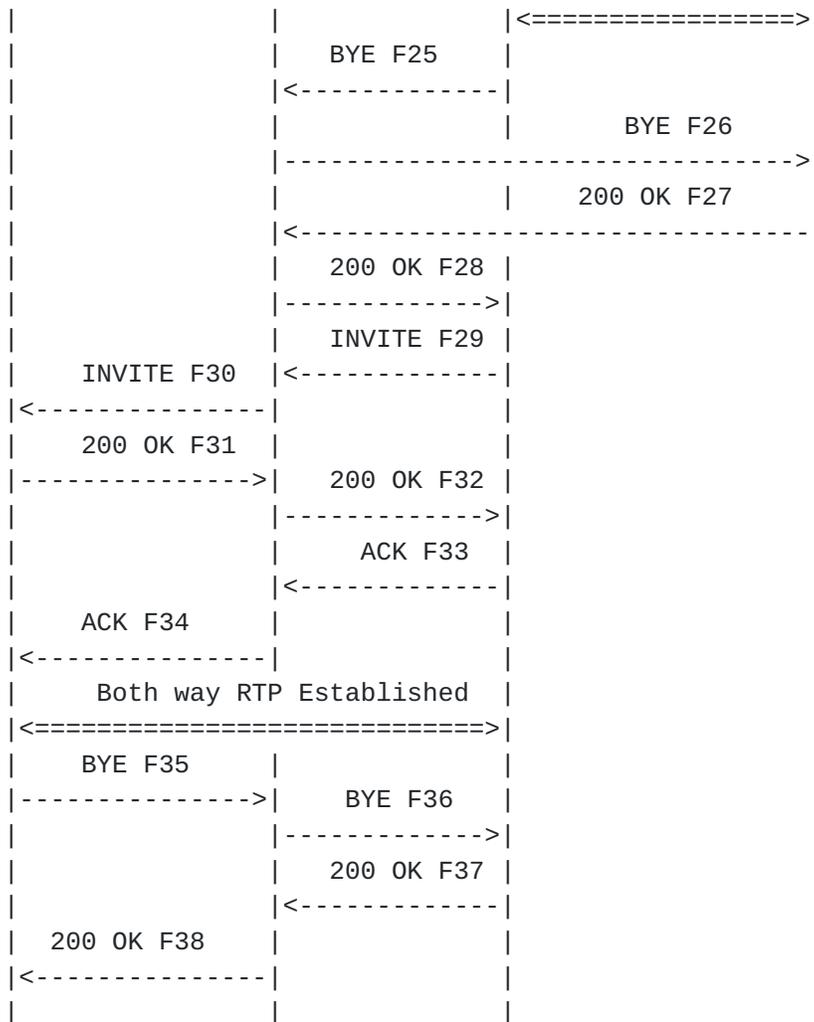




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User A calls user B. User B places call on hold. User B calls User C. User B then disconnects with C, then takes the call with User A off hold. The call ends with B hangs up.

Message Details

F1 INVITE A -> Proxy 1

```

INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.here.com>
Content-Type: application/sdp
Content-Length: ...
    
```

v=0

o=UserA 2890844526 2890844526 IN IP4 client.here.com

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

F2 INVITE Proxy 1 -> B

```
INVITE sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
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 client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <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;branch=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
```

;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>

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From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content Length:0

F5 180 Ringing Proxy 1 -> A

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content Length: 0

F6 200 OK B -> Proxy 1

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.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 client.there.com
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 client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103

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```
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.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 client.there.com
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F8 ACK A -> Proxy 1

```
ACK sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bK74bf9
Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <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@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0
```

/* User B places User A on hold. */

F10 INVITE B -> Proxy 1

```
INVITE sip:UserA@client.there.com SIP/2.0
```

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Route: <sip:ss1.wcom.com;lr>

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Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 2890844527 2890844528 IN IP4 client.there.com
s=Session SDP
c=IN IP4 client.there.com
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
a=sendonly

F11 INVITE Proxy 1 -> A

INVITE sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
Record-Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 69
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 2890844527 2890844528 IN IP4 client.there.com
s=Session SDP
c=IN IP4 client.there.com
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
a=sendonly

F12 200 OK A -> Proxy 1

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1

;received=192.0.2.54
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105

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Record-Route: <sip:ss1.wcom.com;lr>
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
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 client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
Record-Route: <sip:ss1.wcom.com;lr>
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F14 ACK B -> Proxy 1

ACK sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567

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

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F15 ACK Proxy 1 -> A

```
ACK sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
Max-Forwards: 69
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <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@anywhere.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <sip:UserC@anywhere.com>
Call-ID: 9876543210@there.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content-Type: application/sdp
Content-Length: ...
```

```
v=0
o=UserB 2890844834 2890844834 IN IP4 client.there.com
s=Session SDP
c=IN IP4 client.there.com
t=3034423619 0
m=audio 50170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F17 INVITE Proxy 1 -> C

```
INVITE sip:UserC@client.anywhere.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
Record-Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 69
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <sip:UserC@anywhere.com>
Call-ID: 9876543210@there.com
CSeq: 1 INVITE
```

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

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Content-Length: ...

```
v=0
o=UserB 2890844834 2890844834 IN IP4 client.there.com
s=Session SDP
c=IN IP4 client.there.com
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 client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <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;branch=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
Record-Route: <sip:ss1.wcom.com;lr>
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <sip:UserC@anywhere.com>;tag=456654
Call-ID: 9876543210@here.com
CSeq: 1 INVITE
Contact: <sip:UserC@client.anywhere.com>
Content Length:0
```

F20 180 Ringing Proxy 1 -> B

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=client.anywhere.com
Record-Route: <sip:ss1.wcom.com;lr>
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <sip:UserC@anywhere.com>;tag=456654
Call-ID: 9876543210@there.com
CSeq: 1 INVITE
Contact: <sip:UserC@client.anywhere.com>
```

Content Length: 0

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F21 200 OK C -> Proxy 1

SIP/2.0 200 OK

Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
;received=192.0.2.54

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105

Record-Route: <sip:ss1.wcom.com;lr>

From: LittleGuy <sip:UserB@there.com>;tag=8675309

To: OtherGuy <sip:UserC@anywhere.com>;tag=456654

Call-ID: 9876543210@there.com

CSeq: 1 INVITE

Contact: <sip:UserC@client.anywhere.com>

Content-Type: application/sdp

Content-Length: ...

v=0

o=UserC 2890844922 2890844922 IN IP4 client.anywhere.com

s=Session SDP

c=IN IP4 client.anywhere.com

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 client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105

Record-Route: <sip:ss1.wcom.com;lr>

From: LittleGuy <sip:UserB@there.com>;tag=8675309

To: OtherGuy <sip:UserC@anywhere.com>;tag=456654

Call-ID: 9876543210@there.com

CSeq: 1 INVITE

Contact: <sip:UserC@client.anywhere.com>

Content-Type: application/sdp

Content-Length: ...

v=0

o=UserC 2890844922 2890844922 IN IP4 client.anywhere.com

s=Session SDP

c=IN IP4 client.anywhere.com

t=3034423619 0

m=audio 3456 RTP/AVP 0

a=rtpmap:0 PCMU/8000

F23 ACK B -> Proxy 1

ACK sip:UserC@client.anywhere.com SIP/2.0

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Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <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@client.anywhere.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
Max-Forwards: 69
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <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@client.anywhere.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <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@client.anywhere.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
Max-Forwards: 69
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <sip:UserC@anywhere.com>;tag=456654
Call-ID: 9876543210@there.com
CSeq: 2 BYE
Content-Length: 0

F27 200 OK C -> Proxy 1

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```
SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
    ;received=192.0.2.54
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
    ;received=192.0.2.105
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <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 client.there.com:5060;branch=z9hG4bKnashds7
    ;received=192.0.2.105
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <sip:UserC@anywhere.com>;tag=456654
Call-ID: 9876543210@there.com
CSeq: 2 BYE
Content-Length: 0
```

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

```
F29 INVITE B -> Proxy 1
```

```
INVITE sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 2 INVITE
Contact: <sip:UserB@client.there.com>
Content-Type: application/sdp
Content-Length: ...
```

```
v=0
o=UserB 2890844527 2890844529 IN IP4 client.there.com
s=Session SDP
c=IN IP4 client.there.com
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F30 INVITE Proxy 1 -> A

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```
INVITE sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
Record-Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 69
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 2 INVITE
Contact: <sip:UserB@client.there.com>
Content-Type: application/sdp
Content-Length: ...
```

```
v=0
o=UserB 2890844527 2890844529 IN IP4 client.there.com
s=Session SDP
c=IN IP4 client.there.com
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;branch=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
Record-Route: <sip:ss1.wcom.com;lr>
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 2 INVITE
Contact: <sip:UserA@client.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 client.here.com
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 client.there.com:5060;branch=z9hG4bKnashds7

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;received=192.0.2.105
Record-Route: <sip:ss1.wcom.com;lr>
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 2 INVITE
Contact: <sip:UserA@client.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 client.here.com
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F33 ACK B -> Proxy 1

ACK sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <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@client.here.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
Max-Forwards: 69
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <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@client.there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9

Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70

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From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <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@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345600@here.com
CSeq: 2 BYE
Content-Length: 0

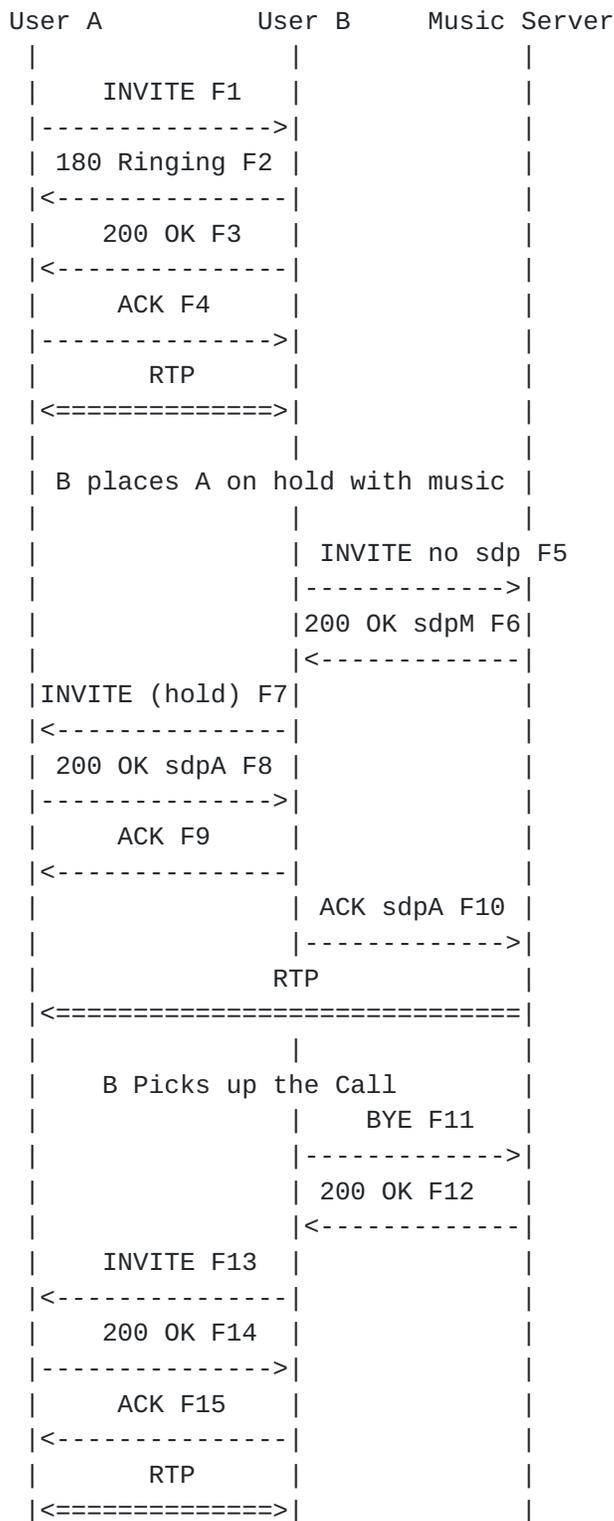
F37 200 OK B -> Proxy 1

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <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 client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345600@here.com
CSeq: 2 BYE
Content-Length: 0

2.3 Music On Hold



In this flow, B places A on hold with music. This is performed by B

acting as a B2BUA (Back-to-Back User Agent) using 3pcc (third party call control) [7] to INVITE a Music Server into the session, which

sends RTP music to A. B picks the call up from hold by sending a BYE to the music server and taking A off of hold.

Note that if A responds to the INVITE with hold SDP with hold SDP in the 200 OK, this call flow will not work properly.

Note also that A will receive RTP packets from two different IP addresses during this call flow.

Message Details

F1 INVITE A -> B

```
INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F2 180 Ringing B -> A

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content-Length: 0
```

F3 200 OK B -> A

SIP/2.0 200 OK

Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9

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```
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.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 client.there.com
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F4 ACK A -> B

```
ACK sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0
```

/* User B places A on hold with music by acting as a B2BUA and sending an INVITE to the Music Server */

F5 INVITE B -> Music Server

```
INVITE sip:music@server.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: Music <sip:music@server.com>
Call-ID: sdjfdjfskdf@there.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content-Length: 0
```

F6 200 OK C -> B

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
```

;received=192.0.2.105
From: LittleGuy <sip:UserB@there.com>;tag=8675309

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To: Music <sip:music@server.com>;tag=90210
Call-ID: sdjfdjfskdf@there.com
CSeq: 1 INVITE
Contact: <sip:music@server.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=MusicServer 2890844576 2890844577 IN IP4 music.server.com
s=Session SDP
c=IN IP4 music.server.com
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
a=sendonly

/* B re-INVITES A on hold */

F7 INVITE B -> A

INVITE sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
To: BigGuy <sip:UserA@here.com>;tag=1234567
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 2890844527 2890844528 IN IP4 music.server.com
s=Session SDP
c=IN IP4 music.server.com
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
a=sendonly

/* A responds with normal SDP */

F8 200 OK A -> B

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
To: BigGuy <sip:UserA@here.com>;tag=1234567
From: LittleGuy <sip:UserB@there.com>;tag=23431

Call-ID: 12345600@here.com
CSeq: 1 INVITE

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Contact: <sip:UserB@client.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 client.here.com
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F9 ACK B -> A

ACK sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
To: BigGuy <sip:UserA@here.com>;tag=1234567
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0

/* B passes SDP of A to the Music Server to allow music to be sent
from B to A */

F10 ACK B -> Music Server

ACK sip:music@server.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: Music <sip:music@server.com>;tag=90210
Call-ID: sdjfdjfskdf@there.com
CSeq: 1 ACK
Content-Type: application/sdp
Content-Length: ...

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

/* RTP music is now sent from the Music Server to A */

/* B picks up the call from the Music Server */

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F11 BYE B -> Music Server

```
BYE sip:music@server.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: Music <sip:music@server.com>;tag=90210
Call-ID: sdjfdjfskdf@there.com
CSeq: 2 BYE
Content-Length: 0
```

F12 200 OK Music Server -> B

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: Music <sip:music@server.com>;tag=90210
Call-ID: sdjfdjfskdf@there.com
CSeq: 2 BYE
Content-Length:0
```

/* B re-INVITES taking A off hold */

F13 INVITE B -> A

```
INVITE sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
To: BigGuy <sip:UserA@here.com>;tag=1234567
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: 12345600@here.com
CSeq: 2 INVITE
Contact: <sip:UserB@client.there.com>
Content-Type: application/sdp
Content-Length: ...
```

v=0

```
o=UserB 2890844527 2890844529 IN IP4 client.there.com
s=Session SDP
c=IN IP4 client.there.com
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F14 200 OK A -> B

SIP/2.0 200 OK

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Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
To: BigGuy <sip:UserA@here.com>;tag=1234567
From: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: 12345600@here.com
CSeq: 2 INVITE
Contact: <sip:UserB@client.here.com>
Content-Type: application/sdp
Content-Length: ...

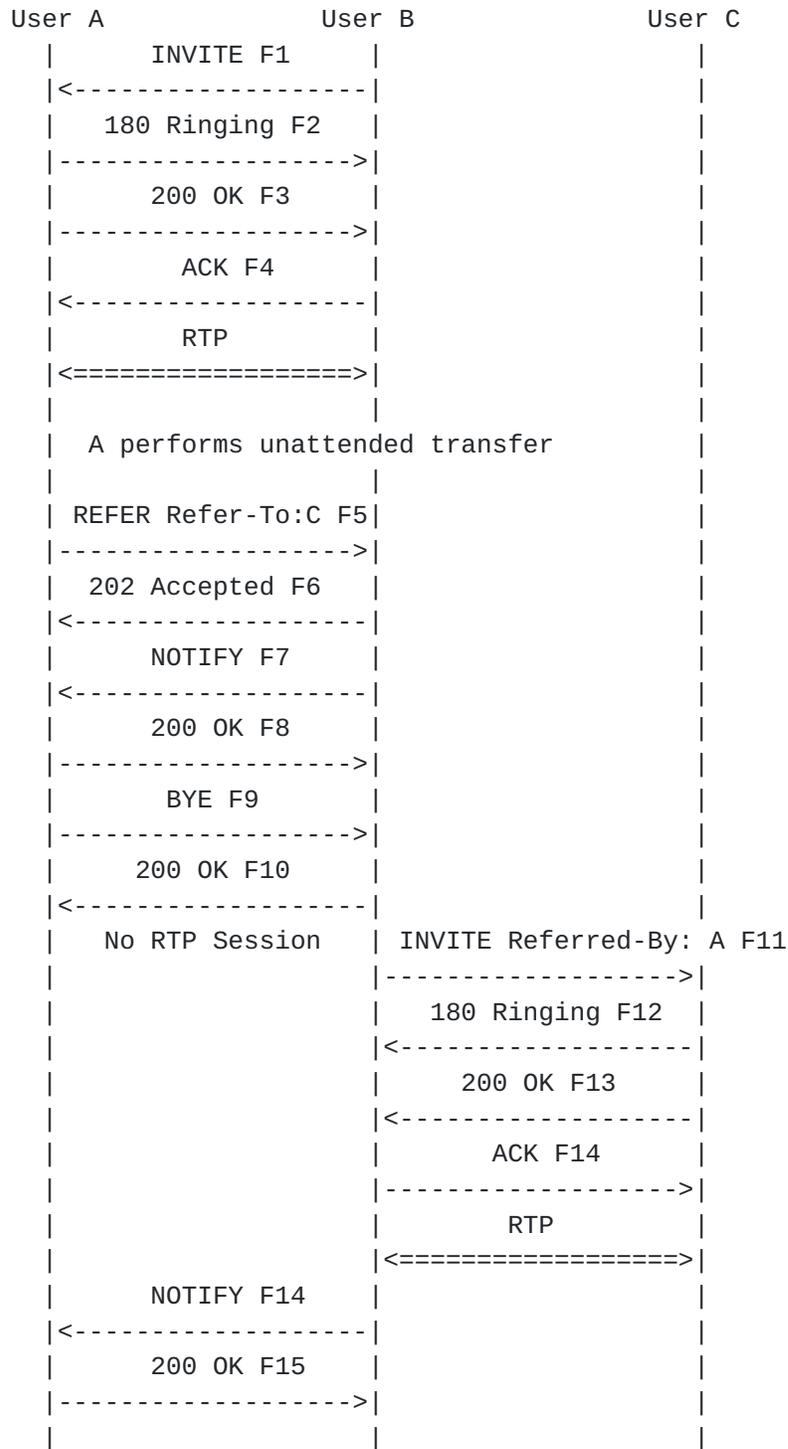
v=0
o=UserA 2890844526 2890844526 IN IP4 client.here.com
s=Session SDP
c=IN IP4 client.here.com
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F15 ACK B -> A

ACK sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
To: BigGuy <sip:UserA@here.com>;tag=1234567
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: 12345600@here.com
CSeq: 2 ACK
Content-Length: 0

/* Normal media session between A and B is resumed */

2.4 Unattended Transfer



User B call User A. User A then transfers User B to User C, then User A disconnects with User B. User B establishes the session to C

then reports the success back to A in the NOTIFY. If the transfer fails, User B can send a new INVITE back to A to re-establish the session.

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Note that the BYE could be sent by A after the NOTIFY. Also, if A has flushed all state information, the NOTIFY may receive a 481 Call Leg Does Not Exist.

Message Details

F1 INVITE B -> A

```
INVITE sip:UserA@here.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>
Call-ID: 12345601@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...
```

v=0

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

F2 180 Ringing A -> B

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.113
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345601@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.there.com>
Content-Length: 0
```

F3 200 OK A -> B

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.113
```

From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567

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Call-ID: 12345601@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.here.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...

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

F4 ACK B -> A

ACK sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345601@here.com
CSeq: 1 ACK
Content-Length: 0

/* Session is established between A and B. */

/* A performs unattended transfer of B to C */

F5 REFER A -> B

REFER sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345601@here.com
CSeq: 2 REFER
Refer-To: <sip:UserC@anywhere.com>
Referred-By: <UserA@here.com>
Contact: <sip:UserA@client.here.com>
Content-Length: 0

F6 202 Accepted B -> A

SIP/2.0 202 Accepted

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7

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```
;received=192.0.2.113
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345601@here.com
CSeq: 2 REFER
Content-Length: 0
```

F7 NOTIFY B -> A

```
NOTIFY sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345601@here.com
CSeq: 2 NOTIFY
Event: refer
Subscription-State: active;expires=60
Content-Type: message/sipfrag
Content-Length: ...
```

SIP/2.0 100 Trying

F8 200 OK A -> B

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.113
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345601@here.com
CSeq: 2 NOTIFY
Content-Length: 0
```

/* A now disconnects with B */

F9 BYE A -> B

```
BYE sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345601@here.com
CSeq: 3 BYE
Content-Length: 0
```


F10 200 OK B -> A

SIP/2.0 200 OK

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105

From: BigGuy <sip:UserA@here.com>;tag=1234567

To: LittleGuy <sip:UserB@there.com>;tag=314159

Call-ID: 12345601@here.com

CSeq: 3 BYE

Content-Length: 0

/* B attempts the transfer to C */

F11 INVITE B -> C

INVITE sip:UserC@anywhere.com SIP/2.0

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7

Max-Forwards: 70

From: LittleGuy <sip:UserB@there.com>;tag=8675309

To: OtherGuy <sip:UserC@anywhere.com>

Call-ID: 7436222@here.com

CSeq: 1 INVITE

Contact: <sip:UserB@client.there.com>

Referred-By: <UserA@here.com>

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

Supported: replaces

Content-Type: application/sdp

Content-Length: ...

v=0

o=UserB 2890844539 2890844539 IN IP4 client.there.com

s=Session SDP

c=IN IP4 client.there.com

t=3034423821 0

m=audio 3458 RTP/AVP 0

a=rtpmap:0 PCMU/8000

F12 180 Ringing C -> B

SIP/2.0 180 Ringing

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.113

From: LittleGuy <sip:UserB@there.com>;tag=8675309

To: OtherGuy <sip:UserC@anywhere.com>;tag=928287

Call-ID: 7436222@here.com

CSeq: 1 INVITE

Contact: <sip:UserC@client.anywhere.com>

Content-Length: 0

F13 200 OK C -> B

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.113
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <sip:UserC@anywhere.com>;tag=928287
Call-ID: 7436222@here.com
CSeq: 1 INVITE
Contact: <sip:UserC@client.anywhere.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...

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

F14 ACK B -> C

ACK sip:UserC@client.anywhere.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <sip:UserC@anywhere.com>;tag=928287
Call-ID: 7436222@here.com
CSeq: 1 ACK
Content-Length: 0

/* B and C now have established a session. B reports success to A
which A probably ignores. */

F15 NOTIFY B -> A

NOTIFY sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=314159
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345601@here.com
CSeq: 3 NOTIFY
Event: refer
Subscription-State: terminated;reason=noresource

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

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SIP/2.0 200 OK

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.113

From: LittleGuy <sip:UserB@there.com>;tag=8675309

To: OtherGuy <sip:UserC@anywhere.com>;tag=928287

Call-ID: 7436222@here.com

CSeq: 1 INVITE

Contact: <sip:UserC@client.anywhere.com>

Content-Type: application/sdp

Content-Length: ...

F16 200 OK A -> B

SIP/2.0 200 OK

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.113

From: LittleGuy <sip:UserB@there.com>;tag=314159

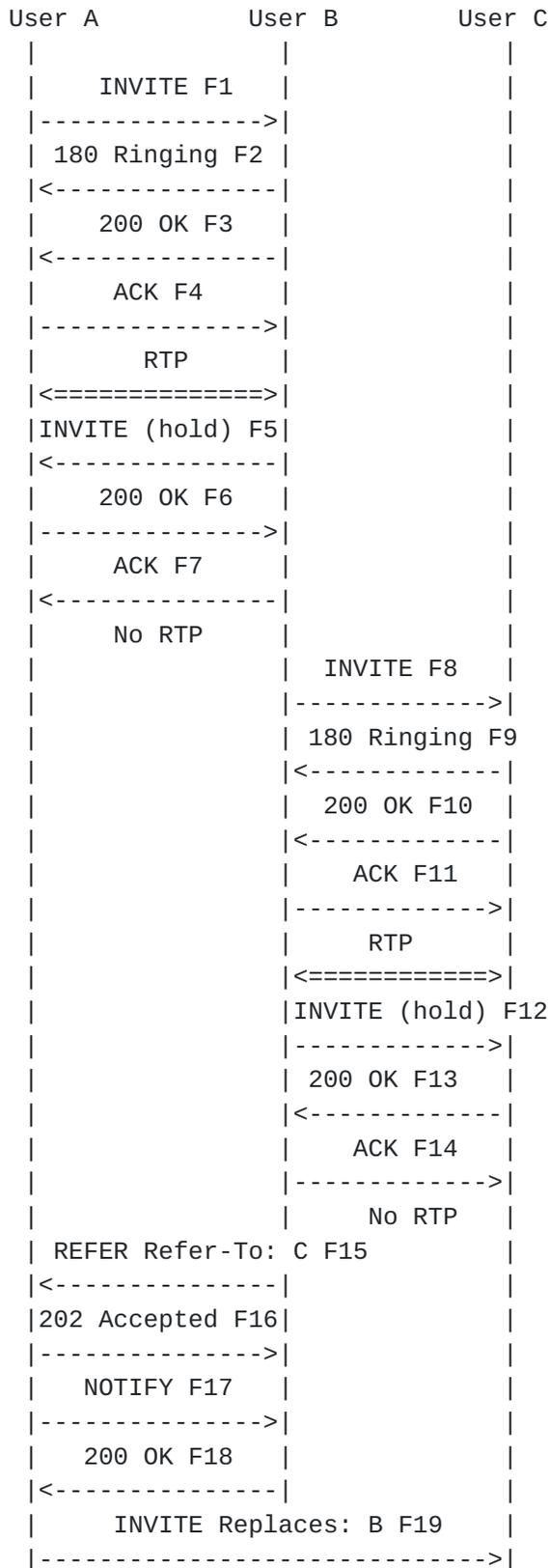
To: BigGuy <sip:UserA@here.com>;tag=1234567

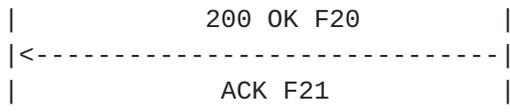
Call-ID: 12345601@here.com

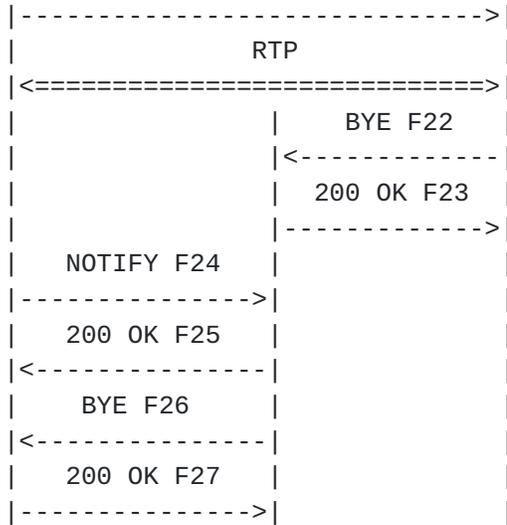
CSeq: 3 NOTIFY

Content-Length: 0

2.5 Attended Transfer







User A calls User B. User B puts User A on hold then calls User C to announce transfer, then places C on hold. User B transfers User A to User C which replaces the session between B and C. C then disconnects session with B. A reports success of transfer to B, who then disconnects with A. In this example, the Replaces header [5] is inserted into the Refer-To URL by B. Note that the Refer-To URI is the Contact URI returned by C in the 200 OK response F10. This ensures that only the correct instance of User C is reached. If the triggered INVITE had failed, B would have retried the REFER with a Refer-To URI of the URI used to reach User C but with a Require: replaces header escaped in the Refer-To header field, as discussed in [9].

Message Details

F1 INVITE A -> B

```

INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.here.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...
    
```

v=0

o=UserA 2890844526 2890844526 IN IP4 client.here.com

s=Session SDP
c=IN IP4 client.here.com
t=3034423619 0

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

F2 180 Ringing B -> A

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content-Length: 0

F3 200 OK B -> A

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...

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

F4 ACK A -> B

ACK sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: 12345600@here.com
CSeq: 1 ACK

Content-Length: 0

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/* User A and User B have established a session. User B puts User A on Hold */

F5 INVITE B -> A

```
INVITE sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=23431
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 1024 INVITE
Contact: <sip:UserB@client.there.com>
Content-Type: application/sdp
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Length: ...
```

```
v=0
o=UserB 2890844527 2890844528 IN IP4 client.there.com
s=Session SDP
c=IN IP4 client.there.com
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
a=sendonly
```

F6 200 OK A -> B

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.113
From: LittleGuy <sip:UserB@there.com>;tag=23431
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 1024 INVITE
Contact: <sip:UserA@client.here.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...
```

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

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

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F7 ACK B -> A

```
ACK sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=23431
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 1024 ACK
Content-Length: 0
```

/* User B calls User C */

F8 INVITE B -> C

```
INVITE sip:UserC@anywhere.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <sip:UserC@anywhere.com>
Call-ID: sdjfdjfskdf@there.com
CSeq: 42 INVITE
Contact: <sip:UserB@client.there.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...
```

v=0

```
o=UserB 28908445834 2890844834 IN IP4 client.there.com
s=Session SDP
c=IN IP4 client.there.com
t=3034423645 0
m=audio 3458 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F9 180 Ringing C -> B

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.113
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <sip:UserC@anywhere.com>;tag=5f35a3
Call-ID: sdjfdjfskdf@there.com
CSeq: 42 INVITE
Contact: <sip:UserC@client.anywhere.com>
Content-Length: 0
```


F10 200 OK C -> B

SIP/2.0 200 OK

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.113

From: LittleGuy <sip:UserB@there.com>;tag=8675309

To: OtherGuy <sip:UserC@anywhere.com>;tag=5f35a3

Call-ID: sdjfdjfskdf@there.com

CSeq: 42 INVITE

Contact: <sip:UserC@client.anywhere.com>

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

Supported: replaces

Content-Type: application/sdp

Content-Length: ...

v=0

o=UserC 2890844922 2890844922 IN IP4 client.anywhere.com

s=Session SDP

c=IN IP4 client.anywhere.com

t=3034423619 0

m=audio 3456 RTP/AVP 0

a=rtpmap:0 PCMU/8000

F11 ACK B -> C

ACK sip:UserC@client.anywhere.com SIP/2.0

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7

Max-Forwards: 70

From: LittleGuy <sip:UserB@there.com>;tag=8675309

To: OtherGuy <sip:UserC@anywhere.com>;tag=5f35a3

Call-ID: sdjfdjfskdf@there.com

CSeq: 42 ACK

Content-Length: 0

/* User B puts User C on hold */

F12 INVITE B -> C

INVITE sip:UserC@client.anywhere.com SIP/2.0

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7

Max-Forwards: 70

From: LittleGuy <sip:UserB@there.com>;tag=8675309

To: OtherGuy <sip:UserC@anywhere.com>;tag=5f35a3

Call-ID: sdjfdjfskdf@there.com

CSeq: 43 INVITE

Contact: <sip:UserB@client.there.com>

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

Supported: replaces

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

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```
v=0
o=UserB 289084834 2890844835 IN IP4 client.there.com
s=Session SDP
c=IN IP4 client.there.com
t=3034423645 0
m=audio 3458 RTP/AVP 0
a=rtpmap:0 PCMU/8000
a=sendonly
```

```
F13 200 OK C -> B
```

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.113
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <sip:UserC@anywhere.com>;tag=5f35a3
Call-ID: sdjfdjfskdf@there.com
CSeq: 43 INVITE
Contact: <sip:UserC@client.anywhere.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...
```

```
v=0
o=UserC 2890844922 2890844922 IN IP4 client.anywhere.com
s=Session SDP
c=IN IP4 client.anywhere.com
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

```
F14 ACK B -> C
```

```
ACK sip:UserC@client.anywhere.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <sip:UserC@anywhere.com>;tag=5f35a3
Call-ID: sdjfdjfskdf@there.com
CSeq: 43 ACK
Content-Length: 0
```

```
/* User B Transfers User A to User C. */
```

```
F15 REFER B -> A
```

REFER sip:UserA@client.here.com SIP/2.0

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7

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Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=23431
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345678900@here.com
CSeq: 1025 REFER
Refer-To: <sip:UserC@client.anywhere.com?Replaces=
sdjfdjfskdf@there.com%3Bto-tag%3D5f35a3%3Bfrom-tag%3D8675309>
Referred-By: <sip:UserB@there.com>
Contact: <sip:UserB@client.there.com>
Content-Length: 0

F16 202 Accepted A -> B

SIP/2.0 202 Accepted
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.113
From: LittleGuy <sip:UserB@there.com>;tag=1234567
To: BigGuy <sip:UserA@here.com>;tag=23431
Call-ID: 12345678900@here.com
CSeq: 1025 REFER
Content-Length: 0

F17 NOTIFY A -> B

NOTIFY sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: 12345678900@here.com
CSeq: 2 NOTIFY
Event: refer
Subscription-State: active;expires=60
Content-Type: message/sipfrag
Content-Length: ...

SIP/2.0 100 Trying

F18 200 OK B -> C

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
To: LittleGuy <sip:UserB@there.com>;tag=1234567
From: OtherGuy <sip:UserC@anywhere.com>;tag=5f35a3
Call-ID: 12345678900@here.com
CSeq: 2 NOTIFY

Content-Length: 0

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```
/* User A establishes session with User C which replaces the session
between User B and User C */
```

```
F19 INVITE A -> C
```

```
INVITE sip:UserC@client.anywhere.com SIP/2.0
Via: SIP/2.0/UDP client.anywhere.com:5060;branch=z9hG4bKadfe4ko
To: OtherGuy <sip:UserC@client.anywhere.com>
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=3461
Call-ID: 9435674543@here.com
CSeq: 1 INVITE
Referred-By: <sip:UserB@there.com>
Replaces: 12345600@here.com;to-tag=23431;from-tag=8675309
Contact: <sip:UserA@client.here.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...
```

```
v=0
```

```
o=UserA 2890844989 2890844989 IN IP4 client.here.com
s=Session SDP
c=IN IP4 client.here.com
t=3034423643 0
m=audio 3458 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

```
F20 200 OK C -> A
```

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP client.anywhere.com:5060;branch=z9hG4bKadfe4ko
;received=192.0.2.123
To: OtherGuy <sip:UserC@client.anywhere.com>;tag=ff3a
From: BigGuy <sip:UserA@here.com>;tag=3461
Call-ID: 9435674543@here.com
CSeq: 1 INVITE
Contact: <sip:UserC@client.anywhere.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...
```

```
v=0
```

```
o=UserA 2890844221 2890844221 IN IP4 client.anywhere.com
s=Session SDP
c=IN IP4 client.anywhere.com
```

t=3034423452 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000

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F21 ACK A -> C

ACK sip:UserC@client.anywhere.com SIP/2.0
Via: SIP/2.0/UDP client.anywhere.com:5060;branch=z9hG4bKadfe4ko
To: OtherGuy <sip:UserC@client.anywhere.com>;tag=ff3a
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=3461
Call-ID: 9435674543@here.com
CSeq: 1 INVITE
Content-Length: 0

/* User C then disconnects from User B */

F22 BYE C -> B

BYE sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
To: LittleGuy <sip:UserB@there.com>;tag=8675309
Max-Forwards: 70
From: OtherGuy <sip:UserC@anywhere.com>;tag=5f35a3
Call-ID: sdjfdjfskdf@there.com
CSeq: 1 BYE
Content-Length: 0

F23 200 OK B -> C

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
To: LittleGuy <sip:UserB@there.com>;tag=8675309
From: OtherGuy <sip:UserC@anywhere.com>;tag=5f35a3
Call-ID: sdjfdjfskdf@there.com
CSeq: 1 BYE
Content-Length: 0

/* User A tells User B that the call has been successfully
transferred */

F24 NOTIFY A -> B

NOTIFY sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=23431

Call-ID: 12345678900@here.com
CSeq: 3 NOTIFY

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Event: refer
Subscription-State: terminated;reason=noresource
Content-Type: message/sipfrag
Content-Length: ...

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.anywhere.com:5060;branch=z9hG4bKadfe4ko
;received=192.0.2.123
From: OtherGuy <sip:UserC@anywhere.com>;tag=ff3a
To: BigGuy <sip:UserA@here.com>;tag=3461
Call-ID: 9435674543@anywhere.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.here.com>

F25 200 OK B -> C

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
To: LittleGuy <sip:UserB@there.com>;tag=1234567
From: OtherGuy <sip:UserC@anywhere.com>;tag=5f35a3
Call-ID: 12345678900@here.com
CSeq: 3 NOTIFY
Content-Length: 0

/* User B disconnects with User A */

F26 BYE B -> A

BYE sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=23431
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345678900@here.com
CSeq: 1026 BYE
Content-Length: 0

F27 200 OK A -> B

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.113
From: LittleGuy <sip:UserB@there.com>;tag=23431
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345678900@here.com
CSeq: 1026 BYE

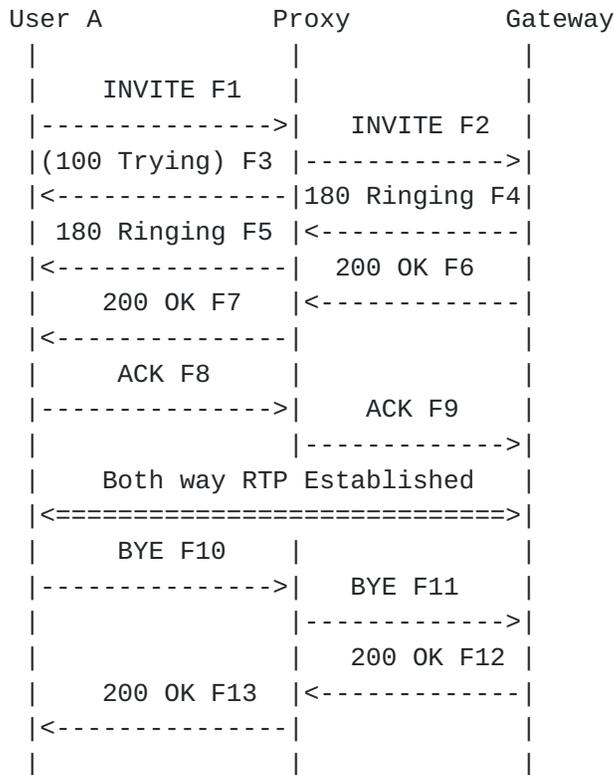
Content-Length: 0

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2.6 Call Forwarding Unconditional



User B wants all calls forwarded to the PSTN. User A calls User B. The Proxy server rewrites the request URI, and forwards the INVITE to a Gateway. Details of messaging behind the Gateway are not shown.

Message Details

F1 INVITE A -> Proxy

```

INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com

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

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

```
F2 INVITE Proxy -> Gateway
```

```
INVITE sip:+19727293660@gw1.wcom.com;user=phone SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
t=3034423619 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 client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Content-Length: 0
```

```
F4 180 Ringing Gateway -> Proxy
```

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
```

;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>

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From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:+19727293660@gw1.wcom.com;user=phone>
Content Length:0

F5 180 Ringing Proxy -> A

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:+19727293660@gw1.wcom.com;user=phone>
Content Length: 0

F6 200 OK Gateway -> Proxy

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:+19727293660@gw1.wcom.com;user=phone>
Content-Type: application/sdp
Content-Length: ...

v=0

o=GATEWAY1 2890844527 2890844527 IN IP4 gatewayone.wcom.com

s=Session SDP

c=IN IP4 gatewayone.wcom.com

t=0 0

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 client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103

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Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:+19727293660@gw1.wcom.com;user=phone>
Content-Type: application/sdp
Content-Length: ...

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

F8 ACK A -> Proxy

ACK sip:+19727293660@gw1.wcom.com;user=phone SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0

F9 ACK Proxy -> Gateway

ACK sip:+19727293660@gw1.wcom.com;user=phone SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0

F10 BYE A -> Proxy 1

BYE sip:+19727293660@gw1.wcom.com;user=phone SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Route: <sip:+19727293660@gw1.wcom.com;user=phone>

Max-Forwards: 70

From: BigGuy <sip:UserA@here.com>;tag=1234567

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To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345600@here.com
CSeq: 2 BYE
Content-Length: 0

F11 BYE Proxy 1 -> Gateway

BYE sip:+19727293660@gw1.wcom.com;user=phone SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345600@here.com
CSeq: 2 BYE
Content-Length: 0

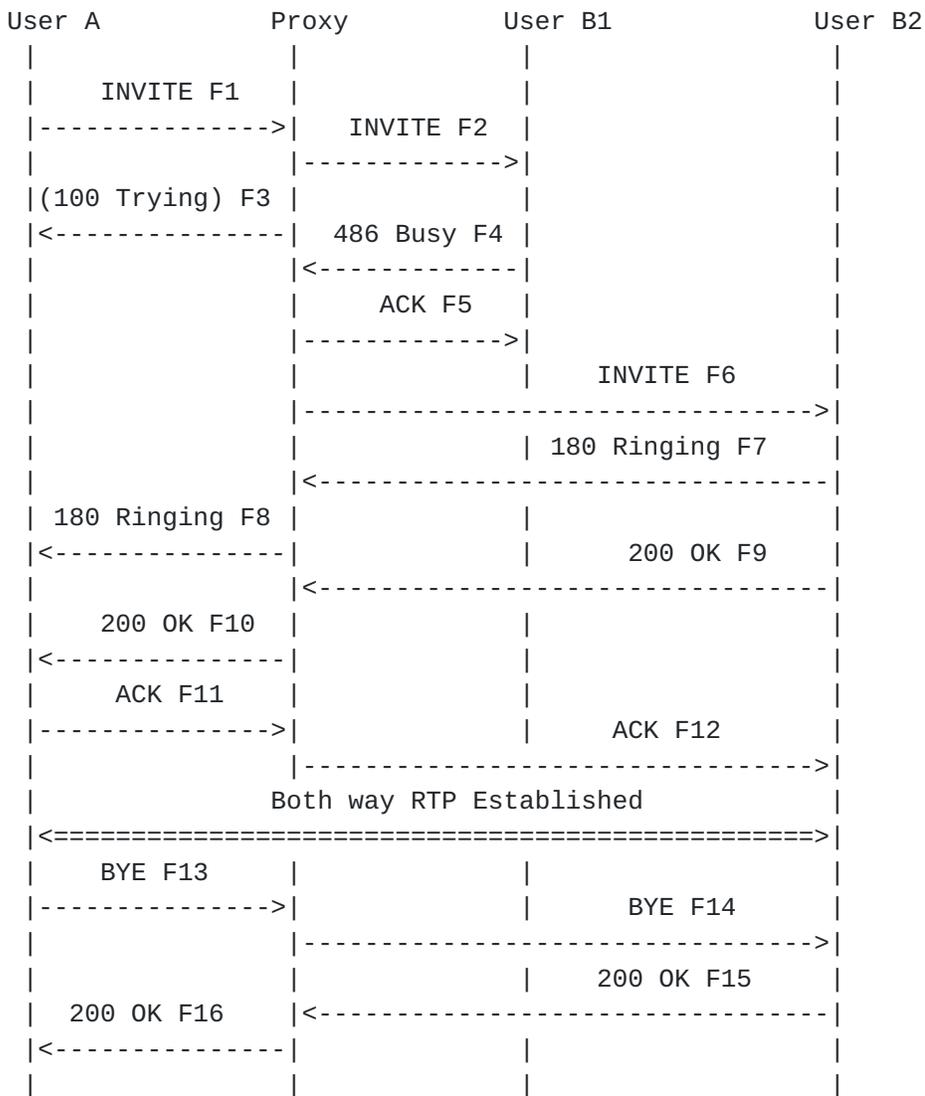
F12 200 OK Gateway -> Proxy 1

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <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 client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345600@here.com
CSeq: 2 BYE
Content-Length: 0

2.7 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.

Message Details

F1 INVITE A -> Proxy

```

INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
  
```

Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.here.com>

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

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

F2 INVITE Proxy -> B1

INVITE sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
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 client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <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

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```
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Content-Length: 0
```

F5 ACK Proxy -> B1

```
ACK sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0
```

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

F6 INVITE Proxy -> B2

```
INVITE sip:UserB2@client2.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.2
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
t=0 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F7 180 Ringing B2 -> Proxy

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SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.2
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7654321
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB2@client2.there.com>
Content-Length: 0

F8 180 Ringing Proxy -> A

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7654321
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB2@client2.there.com>
Content-Length: 0

F9 200 OK B2 -> Proxy

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.2
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7654321
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB2@client2.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 client2.there.com

t=0 0

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

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F10 200 OK Proxy -> A

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7654321
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB2@client2.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 client2.there.com
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F11 ACK A -> Proxy

ACK sip:UserB2@client2.there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7654321
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0

F12 ACK Proxy -> B2

ACK sip:UserB2@client2.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7654321
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0

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

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```
/* User A eventually hangs up with User B2. */
```

```
F13 BYE A -> Proxy
```

```
BYE sip:UserB2@client2.there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7654321
Call-ID: 12345600@here.com
CSeq: 2 BYE
Content-Length: 0
```

```
F14 BYE Proxy -> B2
```

```
BYE sip:UserB2@client2.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <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;branch=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <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 client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
```

To: LittleGuy <sip:UserB@there.com>;tag=7654321
Call-ID: 12345600@here.com

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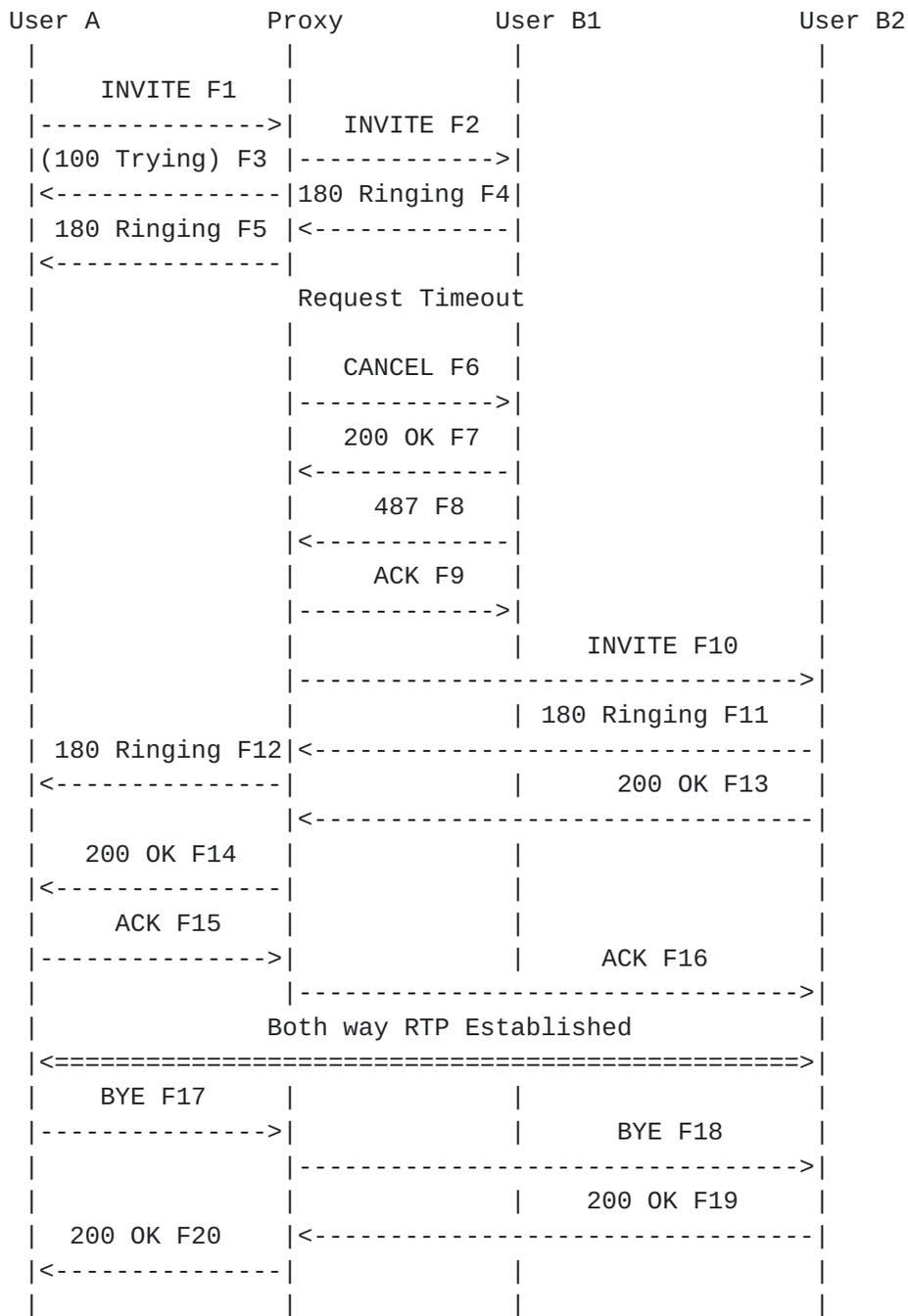
Internet Draft

SIP Service Examples

November 2002

CSeq: 2 BYE
Content-Length: 0

2.8 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.

Message Details

F1 INVITE A -> Proxy

INVITE sip:UserB@there.com SIP/2.0

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Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
t=0 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F2 INVITE Proxy -> B1

INVITE sip:UserB1@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
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 client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103

From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com

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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=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=3145678
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB1@client.there.com>
Content-Length: 0

F5 180 Ringing Proxy -> A

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=3145678
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB1@client.there.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 sip:UserB1@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>
To: LittleGuy <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

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Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
;received=192.0.2.54
From: BigGuy <sip:UserA@here.com>
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 CANCEL
Content-Length: 0

F8 487 Request Terminated B1 -> Proxy

SIP/2.0 487 Request Terminated
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=3145678
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Content-Length: 0

F9 ACK Proxy -> B1

ACK sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=3145678
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0

F10 INVITE Proxy -> B2

INVITE sip:UserB2@client2.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.2
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.here.com>
Content-Type: application/sdp
Content-Length: ...

v=0

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

F11 180 Ringing B2 -> Proxy

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.2
    ;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
    ;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB2@client2.there.com>
Content-Length: 0
```

F12 180 Proxy -> A

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
    ;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB2@client2.there.com>
Content-Length: 0
```

F13 200 OK B2 -> Proxy

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.2
    ;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
    ;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 1 INVITE
```

Contact: <sip:UserB2@client2.there.com>
Content-Type: application/sdp

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Content-Length: ...

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

F14 200 OK Proxy -> A

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB2@client2.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 client2.there.com
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F15 ACK A -> Proxy

```
ACK sip:UserB2@client2.there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0
```

F16 ACK Proxy -> B2

```
ACK sip:UserB2@client2.there.com SIP/2.0
```

Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9

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```
;received=192.0.2.103
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0
```

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

```
F17 BYE A -> Proxy
```

```
BYE sip:UserB2@client2.there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 2 BYE
Content-Length: 0
```

```
F18 BYE Proxy -> B2
```

```
BYE sip:UserB2@client2.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 2 BYE
Content-Length: 0
```

```
F19 200 OK B2 -> Proxy
```

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 2 BYE
```

Content-Length: 0

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F20 200 OK Proxy -> A

SIP/2.0 200 OK

Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9

;received=192.0.2.103

From: BigGuy <sip:UserA@here.com>;tag=1234567

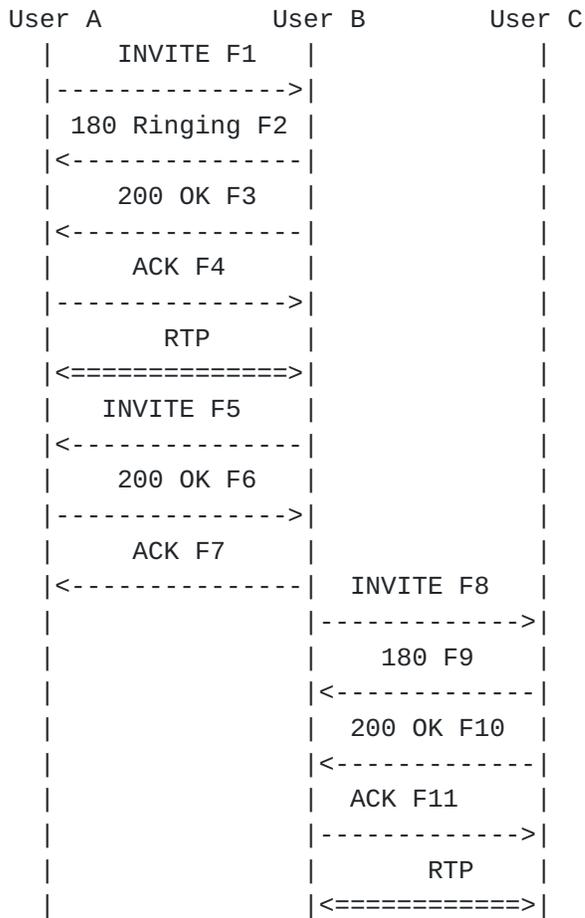
To: LittleGuy <sip:UserB@there.com>;tag=765432

Call-ID: 12345600@here.com

CSeq: 2 BYE

Content-Length: 0

2.9 3-way Conference - Third Party is Added



In this scenario, A and B are in a 2-party call (session) when B wishes to add C into the conversation. B is capable of media mixing in a 3-party call. B first sends a re-INVITE to A changing Contact URIs to one that indicates A's mixer. B then INVITEs C using the same Contact URI.

Message Details

F1 INVITE A -> B

```

INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
    
```

Contact: <sip:UserA@client.here.com>

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

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

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

F2 180 Ringing B -> A

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content-Length: 0

F3 200 OK B -> A

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...

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

F4 ACK A -> B

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```
ACK sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0
```

```
/* User A and User B have established a session. User B re-INVITES
changing Contact URIs */
```

```
F5 INVITE B -> A
```

```
INVITE sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=23431
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 1024 INVITE
Contact: <sip:UserB-Mixer@client.there.com>
Content-Type: application/sdp
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Length: ...
```

```
v=0
o=UserB 2890844527 2890844528 IN IP4 client.there.com
s=Session SDP
c=IN IP4 client.there.com
t=3034423619 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000
a=sendonly
```

```
F6 200 OK A -> B
```

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.113
From: LittleGuy <sip:UserB@there.com>;tag=23431
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 1024 INVITE
Contact: <sip:UserA@client.here.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
```

Supported: replaces
Content-Type: application/sdp

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Content-Length: ...

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

F7 ACK B -> A

```
ACK sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=23431
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 1024 ACK
Content-Length: 0
```

/* User B calls C */

F8 INVITE B -> C

```
INVITE sip:UserC@anywhere.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <sip:UserC@anywhere.com>
Call-ID: sdjfdjfskdf@there.com
CSeq: 42 INVITE
Contact: <sip:UserB-Mixer@client.there.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...
```

```
v=0
o=UserB 28908445834 2890844834 IN IP4 client.there.com
s=Session SDP
c=IN IP4 client.there.com
t=3034423645 0
m=audio 48174 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F9 180 Ringing C -> B

SIP/2.0 200 OK

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```
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.113
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <sip:UserC@anywhere.com>;tag=341313
Call-ID: sdjfdjfskdf@there.com
CSeq: 42 INVITE
Contact: <sip:UserC@client.anywhere.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Length: 0
```

```
F10 200 OK C -> B
```

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.113
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <sip:UserC@anywhere.com>;tag=341313
Call-ID: sdjfdjfskdf@there.com
CSeq: 42 INVITE
Contact: <sip:UserC@client.anywhere.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...
```

```
v=0
o=UserC 2890844922 2890844922 IN IP4 client.anywhere.com
s=Session SDP
c=IN IP4 client.anywhere.com
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

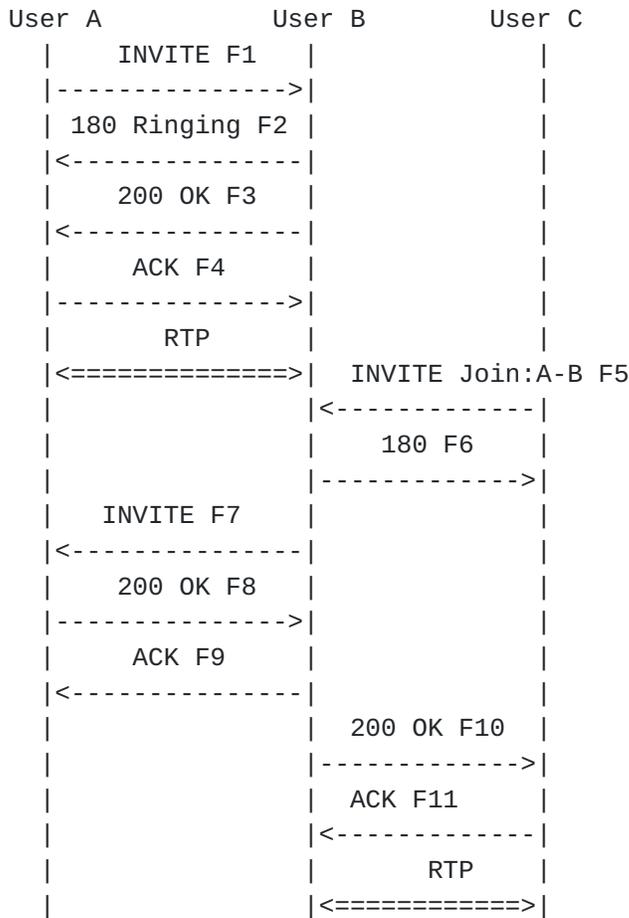
```
F11 ACK B -> C
```

```
ACK sip:UserC@client.anywhere.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=8675309
To: OtherGuy <sip:UserC@anywhere.com>;tag=341313
Call-ID: sdjfdjfskdf@there.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. */
```


2.10

3-way Conference û Third Party Joins



In this scenario, A and B are in a 2 party call and C wishes to join resulting in a three party call. C could have learned B's conference URI using some non-SIP means, or possibly from a NOTIFY with the dialog package sent by B. C sends an INVITE to B containing a Join header identifying the dialog between A and B. B re-INVITES A to switch to B's mixer then accepts the INVITE from C, resulting in the 3-way call.

Message Details

F1 INVITE A -> B

INVITE sip:UserB@there.com SIP/2.0
 Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9

Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>

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Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.here.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...

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

F2 180 Ringing B -> A

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content-Length: 0

F3 200 OK B -> A

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces, join
Content-Type: application/sdp
Content-Length: ...

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

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

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F4 ACK A -> B

```
ACK sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0
```

/* User A and User B have established a session. User C requests to join the session */

F5 INVITE C -> B

```
INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.anywhere.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: OtherGuy <sip:UserC@anywhere.com>;tag=8675309
To: LittleGuy <sip:UserB@there.com>
Call-ID: 452k499sk@anywhere.com
CSeq: 99 INVITE
Contact: <sip:UserC@client.anywhere.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces, join
Join: 12345600@here.com;from-tag=1234567;to-tag=23431
Content-Type: application/sdp
Content-Length: ...
```

```
v=0
o=UserC 2890844922 2890844922 IN IP4 client.anywhere.com
s=Session SDP
c=IN IP4 client.anywhere.com
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F6 180 Ringing C -> B

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP client.anywhere.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.120
From: OtherGuy <sip:UserC@anywhere.com>;tag=8675309
```

To: LittleGuy <sip:UserB@there.com>;tag=0982
Call-ID: 452k499sk@anywhere.com

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CSeq: 99 INVITE
Contact: <sip:UserB-Mixer@client.there.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Length: 0

F7 INVITE B -> A

INVITE sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=23431
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 1024 INVITE
Contact: <sip:UserB-Mixer@client.there.com>
Content-Type: application/sdp
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Length: ...

v=0
o=UserB 2890844527 2890844528 IN IP4 client.there.com
s=Session SDP
c=IN IP4 client.there.com
t=3034423619 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000
a=sendonly

F8 200 OK A -> B

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.113
From: LittleGuy <sip:UserB@there.com>;tag=23431
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 1024 INVITE
Contact: <sip:UserA@client.here.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...

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

s=Session SDP
c=IN IP4 client.here.com
t=3034423619 0

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

F9 ACK B -> A

ACK sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=23431
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 1024 ACK
Content-Length: 0

F10 200 OK C -> B

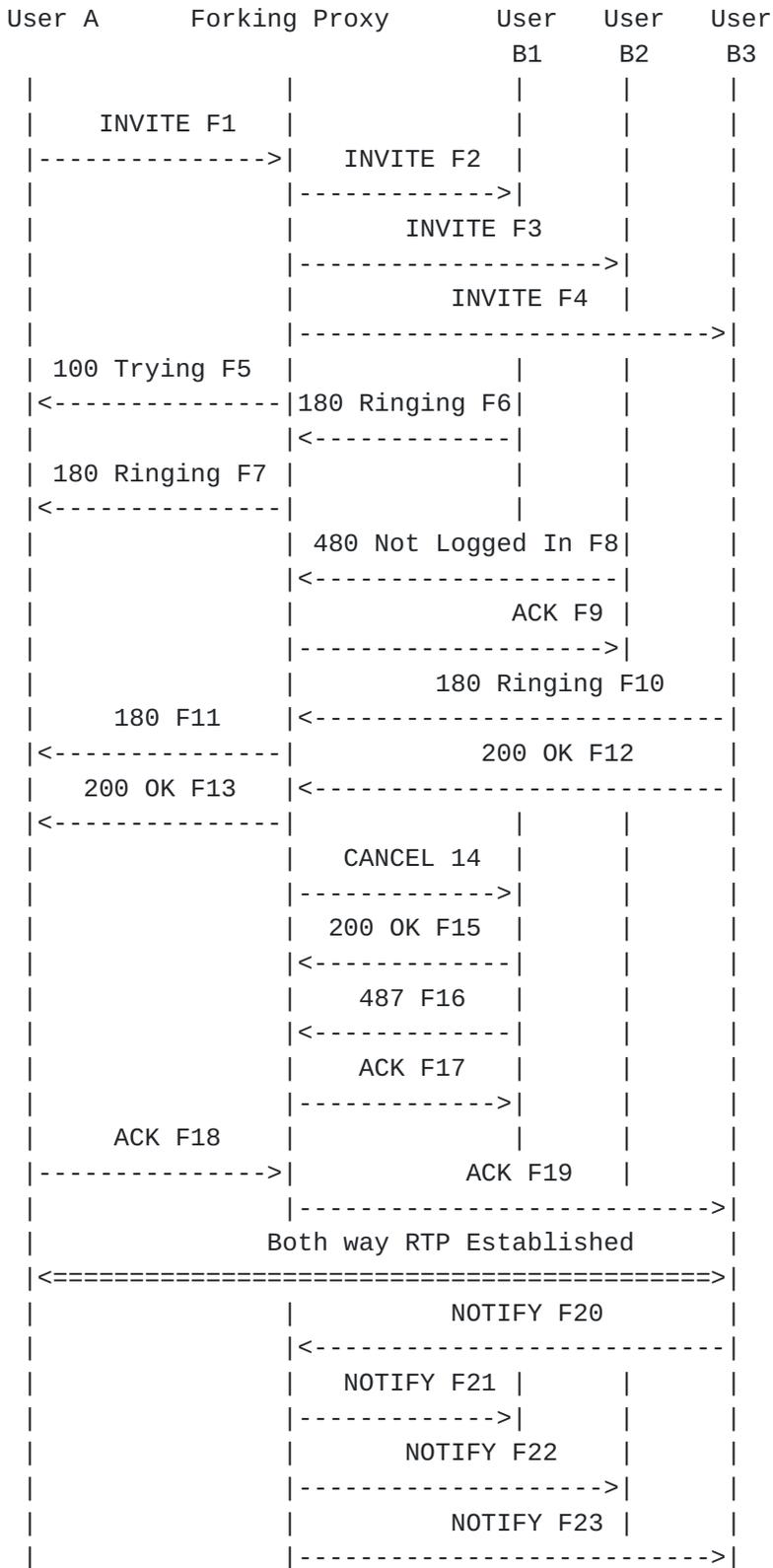
SIP/2.0 200 OK
Via: SIP/2.0/UDP client.anywhere.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.120
From: OtherGuy <sip:UserC@anywhere.com>;tag=8675309
To: LittleGuy <sip:UserB@there.com>;tag=0982
Call-ID: 452k499sk@anywhere.com
CSeq: 99 INVITE
Contact: <sip:UserB-Mixer@client.there.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 28908445834 2890844834 IN IP4 client.there.com
s=Session SDP
c=IN IP4 client.there.com
t=3034423645 0
m=audio 48174 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F11 ACK OK B -> C

ACK sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.anywhere.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: OtherGuy <sip:UserC@anywhere.com>;tag=8675309
To: LittleGuy <sip:UserB@there.com>;tag=0982
Call-ID: 452k499sk@anywhere.com
CSeq: 99 ACK
Content-Length:0

2.11 Single Line Extension



```
|      |      200 OK F24 |      |      |
|      |      <-----|      |      |
|      |      200 OK F25 |      |      |
```

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```

|                                     |----->|
|                                     | 200 OK F26 |
|                                     |<-----|
|                                     | 482 Loop Detected F27 |
|                                     |<-----|
|                                     |
| User B2 wants to join the call |
|                                     |
|                                     | INVITE Join:A-B3 F28 |
|                                     |<-----|
|                                     | INVITE Join: A-B3 F29 |
|                                     |----->|
|                                     | INVITE Join: A-B3 F30 |
|                                     |----->|
|                                     | INVITE Join: A-B3 F31 |
|                                     |----->|
|                                     | 100 Trying F32 |
|                                     |----->|
|                                     | 481 Dialog Does Not Exist F33 |
|                                     |<-----|
|                                     | ACK F34 |
|                                     |----->|
|                                     | 482 Loop Detected F35 |
|                                     |<-----|
|                                     | ACK F36 |
|                                     |----->|
|                                     | 200 OK F37 |
|                                     |<-----|
|                                     | 200 OK F38 |
|                                     |----->|
|                                     | ACK F39 |
|                                     |----->|
|                                     | Both way RTP Established |
|                                     |<====>| B3 mixes RTP
|                                     |

```

In Single Line Extension a call will ring several extensions at the same time (forking). The extension to answer the call becomes the active set. If other extensions pick up, the call becomes a conference call.

In this flow, A calls B which results in the INVITE being forked to three devices, B1, B2, and B3. B3 answers the call and is connected to A. B3 sends a NOTIFY containing the dialog information to B, which is forked to B1 and B2. A user at B2 wishes to join the call and sends an INVITE with a Join header field to B to request this. This INVITE is forked and is accepted by B3 who then performs the mixing function.

Note that if B3 is not capable of mixing the media, B3 would transfer both A and B2 to a conferencing bridge which would perform the mixing.

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The use of SUBSCRIBE and NOTIFY is defined in [11] while the dialog Event package is defined in [10].

Message Details

F1 INVITE A -> Proxy

```
INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
t= 0 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F2 INVITE Proxy -> B1

```
INVITE sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
t= 0 0
m=audio 49170 RTP/AVP 0
```

a=rtpmap:0 PCMU/8000

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F3 INVITE Proxy -> B2

```
INVITE sip:UserB2@client2.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.2
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
t=0 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F4 INVITE Proxy -> B3

```
INVITE sip:UserB3@client3.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.3
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
t=0 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```


F5 100 Trying Proxy -> A

SIP/2.0 100 Trying
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Content-Length: 0

F6 180 Ringing B1 -> Proxy

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content-Length: 0

F7 180 Ringing Proxy -> A

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content-Length: 0

F8 480 Not Logged In B2 -> Proxy

SIP/2.0 480 Not Logged In
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.2
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314756

Call-ID: 12345600@here.com

CSeq: 1 INVITE

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Content-Length: 0

F9 ACK Proxy -> B2

ACK sip:UserB2@client2.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.2
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314756
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0

F10 180 Ringing B3 -> Proxy

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=83749.3
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7137136
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB3@client3.there.com>
Content-Length: 0

F11 180 Ringing B3 -> Proxy

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7137136
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB3@client3.there.com>
Content-Length: 0

F12 200 OK B3 -> Proxy

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=83749.3
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103

From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7137136

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Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB3@client3.there.com>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 2890844527 2890844527 IN IP4 client3.there.com
s=Session SDP
c=IN IP4 client3.there.com
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F13 200 OK Proxy -> A

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7137136
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB3@client.there.com.115>
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 2890844527 2890844527 IN IP4 client3.there.com
s=Session SDP
c=IN IP4 client3.there.com
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

/* Forking Proxy cancels pending branch B1 */

F14 CANCEL Proxy -> B1

CANCEL sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 CANCEL
Content-Length: 0

F15 200 OK B1 -> Proxy

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SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
;received=192.0.2.54
From: BigGuy <sip:UserA@here.com>
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 CANCEL
Content-Length: 0

F16 487 Request Terminated B1 -> Proxy

SIP/2.0 487 Request Terminated
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Content-Length: 0

F17 ACK Proxy -> B1

ACK sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0

F18 ACK A -> Proxy

ACK sip:UserB4@client3.there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7137136
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0

F19 ACK Proxy -> B3

ACK sip:UserB4@client3.there.com SIP/2.0

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```
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.3
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
    ;received=192.0.2.103
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7137136
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0
```

```
/* RTP streams are established between A and B3*/
```

```
/* User B3 sends a NOTIFY to the group with established dialog
information. */
```

```
F20 NOTIFY B3 -> Proxy
```

```
NOTIFY sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKq0qwli6ewlk
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=w2Hu8sj
To: LittleGuy <sip:UserB@there.com>
Call-ID: 8458999275@there.com
CSeq: 1 NOTIFY
Event: dialog
Subscription-State: active;expires=3600
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="partial" entity="sip:UserB@there.com">
  <dialog id="2393lds3204" call-id="12345600@here.com"
    local-tag="7137136" remote-tag="1234567" direction="recipient">
    <state event="2xx">confirmed</state>
  </dialog>
</dialog-info>
```

```
F21 NOTIFY Proxy -> B1
```

```
NOTIFY sip:UserB1@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK4558a.1
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKq0qwli6ewlk
    ;received=192.0.2.115
Max-Forwards: 69
From: LittleGuy <sip:UserB@there.com>;tag=w2Hu8sj
To: LittleGuy <sip:UserB@there.com>
Call-ID: 8458999275@there.com
```

CSeq: 1 NOTIFY
Event: dialog

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Subscription-State: active;expires=3600
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="partial" entity="sip:UserB@there.com">
  <dialog id="2393lds3204" call-id="12345600@here.com"
    local-tag="7137136" remote-tag="1234567" direction="recipient">
  <state event="2xx">confirmed</state>
</dialog>
</dialog-info>
```

F22 Proxy -> B2

NOTIFY sip:UserB1@client2.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK4558a.2
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKq0qwli6ewlk
;received=192.0.2.115
Max-Forwards: 69
From: LittleGuy <sip:UserB@there.com>;tag=w2Hu8sj
To: LittleGuy <sip:UserB@there.com>
Call-ID: 8458999275@there.com
CSeq: 1 NOTIFY
Event: dialog
Subscription-State: active;expires=3600
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="partial" entity="sip:UserB@there.com">
  <dialog id="2393lds3204" call-id="12345600@here.com"
    local-tag="7137136" remote-tag="1234567" direction="recipient">
  <state event="2xx">confirmed</state>
</dialog>
</dialog-info>
```

F23 NOTIFY Proxy-> B3

NOTIFY sip:UserB1@client3.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK4558a.3
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKq0qwli6ewlk
;received=192.0.2.115
Max-Forwards: 69
From: LittleGuy <sip:UserB@there.com>;tag=w2Hu8sj
To: LittleGuy <sip:UserB@there.com>

Call-ID: 8458999275@there.com

CSeq: 1 NOTIFY

Event: dialog

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Subscription-State: active;expires=3600
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="partial" entity="sip:UserB@there.com">
  <dialog id="2393lds3204" call-id="12345600@here.com"
    local-tag="7137136" remote-tag="1234567" direction="recipient">
  <state event="2xx">confirmed</state>
</dialog>
</dialog-info>
```

F24 200 OK B1 -> Proxy

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK4558a.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKq0qwli6ewlk
;received=192.0.2.115
From: LittleGuy <sip:UserB@there.com>;tag=w2Hu8sj
To: LittleGuy <sip:UserB@there.com>
Call-ID: 8458999275@there.com
CSeq: 1 NOTIFY
Content-Length: 0

F25 200 OK Proxy -> B3

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKq0qwli6ewlk
;received=192.0.2.115
From: LittleGuy <sip:UserB@there.com>;tag=w2Hu8sj
To: LittleGuy <sip:UserB@there.com>
Call-ID: 8458999275@there.com
CSeq: 1 NOTIFY
Content-Length: 0

F26 200 OK B2 -> Proxy

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK4558a.2
;received=192.0.2.54
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKq0qwli6ewlk
;received=192.0.2.115
From: LittleGuy <sip:UserB@there.com>;tag=w2Hu8sj
To: LittleGuy <sip:UserB@there.com>
Call-ID: 8458999275@there.com

CSeq: 1 NOTIFY
Content-Length: 0

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F27 200 OK B3 -> Proxy

SIP/2.0 482 Loop Detected

Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK4558a.3
;received=192.0.2.54

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKq0qwli6ewlk
;received=192.0.2.115

From: LittleGuy <sip:UserB@there.com>;tag=w2Hu8sj

To: LittleGuy <sip:UserB@there.com>

Call-ID: 8458999275@there.com

CSeq: 1 NOTIFY

Content-Length: 0

/* User B2 decided to join the call. */

F28 INVITE B2 -> Proxy

INVITE sip:UserB@there.com SIP/2.0

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKq0qwli6ewlk
Max-Forwards: 70

From: LittleGuy <sip:UserB@there.com>;tag=4524524312

To: LittleGuy <sip:UserB@there.com>

Call-ID: 524251233@there.com

CSeq: 1 INVITE

Contact: <sip:UserB2@client2.there.com>

Join: 12345600@here.com;to-tag=765432;from-tag=1234567

Content-Type: application/sdp

Content-Length: ...

v=0

o=UserB 2890844527 2890844527 IN IP4 client2.there.com

s=Session SDP

c=IN IP4 client2.there.com

t=0 0

m=audio 3458 RTP/AVP 0

a=rtpmap:0 PCMU/8000

F29 INVITE Proxy -> B1

INVITE sip:UserB1@client.there.com SIP/2.0

Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK4558a.1

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKq0qwli6ewlk
;received=192.0.2.114

Max-Forwards: 69

From: LittleGuy <sip:UserB@there.com>;tag=4524524312

To: LittleGuy <sip:UserB@there.com>

Call-ID: 524251233@there.com
CSeq: 1 INVITE

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Contact: <sip:UserB2@client2.there.com>
Join: 12345600@here.com;to-tag=765432;from-tag=1234567
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 2890844527 2890844527 IN IP4 client2.there.com
s=Session SDP
c=IN IP4 client2.there.com
t=0 0
m=audio 3458 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F30 INVITE Proxy -> B2

INVITE sip:UserB1@client2.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK4558a.2
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKq0qwli6ewlk
;received=192.0.2.114
Max-Forwards: 69
From: LittleGuy <sip:UserB@there.com>;tag=4524524312
To: LittleGuy <sip:UserB@there.com>
Call-ID: 524251233@there.com
CSeq: 1 INVITE
Contact: <sip:UserB2@client2.there.com>
Join: 12345600@here.com;to-tag=765432;from-tag=1234567
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 2890844527 2890844527 IN IP4 client2.there.com
s=Session SDP
c=IN IP4 client2.there.com
t=0 0
m=audio 3458 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F31 INVITE Proxy -> B1

INVITE sip:UserB1@client3.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK4558a.3
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKq0qwli6ewlk
;received=192.0.2.114
Max-Forwards: 69
From: LittleGuy <sip:UserB@there.com>;tag=4524524312
To: LittleGuy <sip:UserB@there.com>
Call-ID: 524251233@there.com

CSeq: 1 INVITE

Contact: <sip:UserB2@client2.there.com>

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```
Join: 12345600@here.com;to-tag=765432;from-tag=1234567
Content-Type: application/sdp
Content-Length: ...
```

```
v=0
o=UserB 2890844527 2890844527 IN IP4 client2.there.com
s=Session SDP
c=IN IP4 client2.there.com
t=0 0
m=audio 3458 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F32 100 Trying Proxy -> B2

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKq0qwli6ewlk
;received=192.0.2.114
From: LittleGuy <sip:UserB@there.com>;tag=4524524312
To: LittleGuy <sip:UserB@there.com>
Call-ID: 524251233@there.com
CSeq: 1 INVITE
Content-Length: 0
```

/* B1 does not have an established dialog, so it returns a 481 */

F33 481 Dialog Does Not Exist B1 -> Proxy

```
SIP/2.0 481 Dialog Does Not Exist
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK4558a.3
;received=192.0.2.54
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKq0qwli6ewlk
;received=192.0.2.114
From: LittleGuy <sip:UserB@there.com>;tag=4524524312
To: LittleGuy <sip:UserB@there.com>;tag=68324lk42jd
Call-ID: 524251233@there.com
CSeq: 1 INVITE
Content-Length: 0
```

F34 ACK Proxy -> B1

```
ACK sip:UserB1@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK4558a.3
From: LittleGuy <sip:UserB@there.com>;tag=4524524312
To: LittleGuy <sip:UserB@there.com>;tag=68324lk42jd
Call-ID: 524251233@there.com
CSeq: 1 ACK
Content-Length: 0
```


F35 482 Loop Detected B2 -> Proxy

SIP/2.0 482 Loop Detected

Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK4558a.2
;received=192.0.2.54

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKq0qwli6ewlk
;received=192.0.2.114

From: LittleGuy <sip:UserB@there.com>;tag=4524524312

To: LittleGuy <sip:UserB@there.com>;tag=134lkwe

Call-ID: 524251233@there.com

CSeq: 1 INVITE

Content-Length: 0

F36 ACK Proxy -> B2

ACK sip:UserB2@client2.there.com SIP/2.0

Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK4558a.2

From: LittleGuy <sip:UserB@there.com>;tag=4524524312

To: LittleGuy <sip:UserB@there.com>;tag=134lkwe

Call-ID: 524251233@there.com

CSeq: 1 ACK

Content-Length: 0

/* B3 has an existing dialog and agrees to mix B2 into the session.
*/

F37 200 OK User B3 -> Proxy

SIP/2.0 200 OK

Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK4558a.3
;received=192.0.2.54

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKq0qwli6ewlk
;received=192.0.2.114

From: LittleGuy <sip:UserB@there.com>;tag=4524524312

To: LittleGuy <sip:UserB@there.com>;tag=3891908734

Call-ID: 524251233@there.com

CSeq: 1 INVITE

Contact: <sip:UserB3@client3.there.com>

Content-Type: application/sdp

Content-Length: ...

v=0

o=UserB 2890844527 2890844527 IN IP4 client3.there.com

s=Session SDP

c=IN IP4 client3.there.com

t=0 0

m=audio 3460 RTP/AVP 0

a=rtpmap:0 PCMU/8000

F38 200 OK User B3 -> Proxy

SIP/2.0 200 OK

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKq0qwli6ewlk
;received=192.0.2.114

Max-Forwards: 69

From: LittleGuy <sip:UserB@there.com>;tag=4524524312

To: LittleGuy <sip:UserB@there.com>;tag=3891908734

Call-ID: 524251233@there.com

CSeq: 1 INVITE

Contact: <sip:UserB3@client3.there.com>

Content-Type: application/sdp

Content-Length: ...

v=0

o=UserB 2890844527 2890844527 IN IP4 client3.there.com

s=Session SDP

c=IN IP4 client3.there.com

t=0 0

m=audio 3460 RTP/AVP 0

a=rtpmap:0 PCMU/8000

F39 ACK B2 -> B3

ACK sip:UserB3@client3.there.com SIP/2.0

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKq0qwli6ewlk

Max-Forwards: 69

From: LittleGuy <sip:UserB@there.com>;tag=4524524312

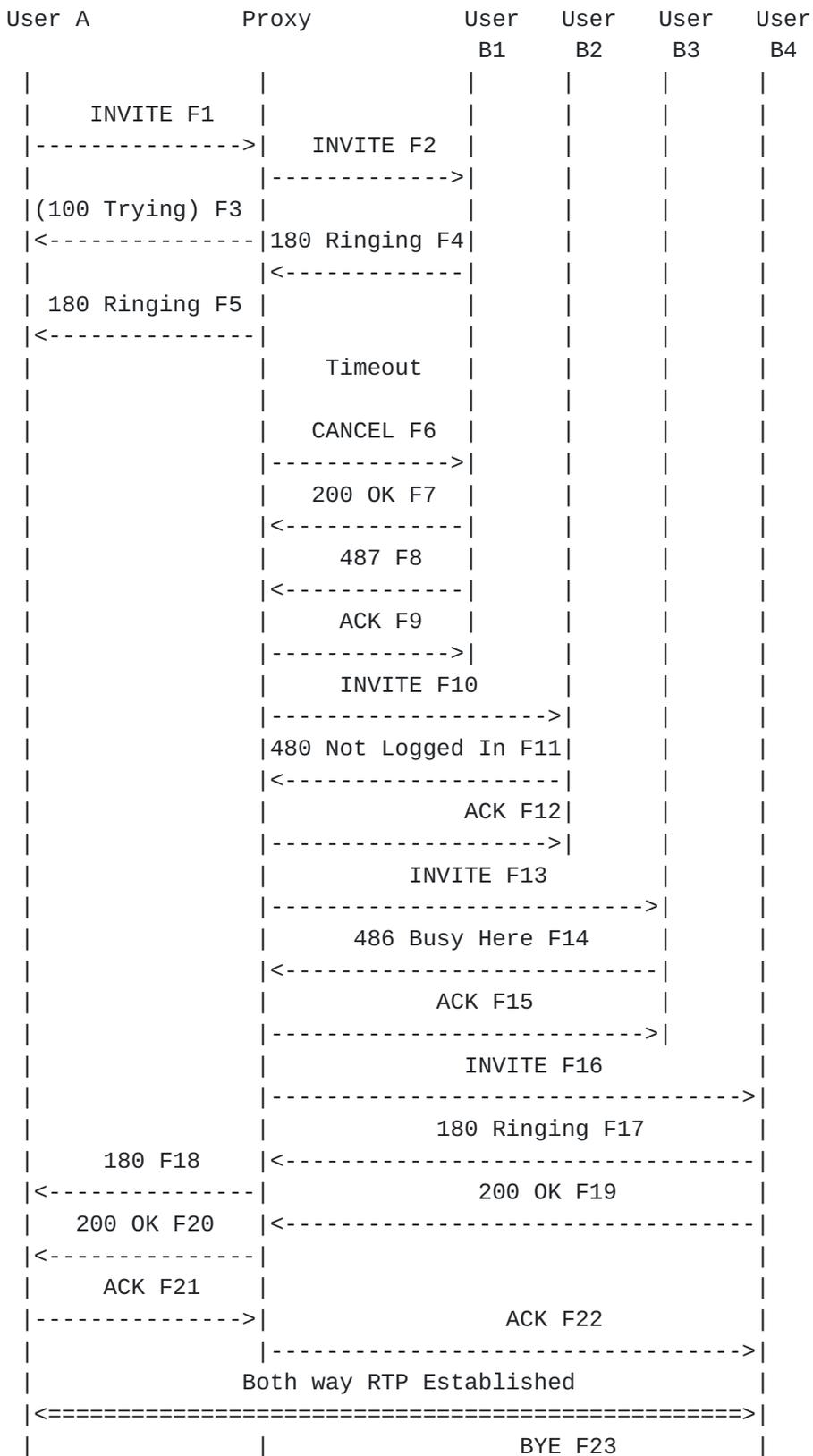
To: LittleGuy <sip:UserB@there.com>;tag=3891908734

Call-ID: 524251233@there.com

CSeq: 1 ACK

Content-Length: 0

2.12 Find-Me



```
|      BYE F24      |<-----| |
|<-----|         |         |
|      200 OK F25   |         |
```

```

|----->|
|         |----->|
|         |

```

```

200 OK F26

```

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.

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

Message Details

F1 INVITE A -> Proxy

```

INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
t= 0 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000

```

F2 INVITE Proxy -> B1

```

INVITE sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.here.com>
Content-Type: application/sdp

```

Content-Length: ...

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```
v=0
o=UserA 2890844526 2890844526 IN IP4 client.here.com
s=Session SDP
c=IN IP4 client.here.com
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 client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <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=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content-Length: 0
```

F5 180 Ringing Proxy -> A

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content-Length: 0
```

/* B1 rings for until a configurable timer in the Proxy expires. The

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Proxy then sends Cancel and proceeds down the list of routes. */

F6 CANCEL Proxy -> B1

```
CANCEL sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>
To: LittleGuy <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=z9hG4bK83749.1
;received=192.0.2.54
From: BigGuy <sip:UserA@here.com>
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 CANCEL
Content-Length: 0
```

F8 487 Request Terminated B1 -> Proxy

```
SIP/2.0 487 Request Terminated
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Content-Length: 0
```

F9 ACK Proxy -> B1

```
ACK sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=765432
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0
```


F10 INVITE Proxy -> B2

```
INVITE sip:UserB2@client2.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.2
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.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/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.2
;received=192.0.2.54
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314756
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Content-Length: 0
```

F12 ACK Proxy -> B2

```
ACK sip:UserB2@client2.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.2
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314756
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0
```

F13 INVITE Proxy -> B3

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```
INVITE sip:UserB3@client3.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.3
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.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/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.3
;received=192.0.2.54
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7654321
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Content-Length: 0
```

F15 ACK Proxy -> B3

```
ACK sip:UserB3@client3.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.3
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7654321
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0
```

F16 INVITE Proxy -> B4

INVITE sip:UserB4@client4.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=83749.4

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Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.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/UDP ss1.wcom.com:5060;branch=83749.4
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7137136
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB4@client4.there.com>
Content-Length: 0

F18 180 Ringing B4 -> Proxy

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7137136
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB4@client4.there.com>
Content-Length: 0

F19 200 OK B4 -> Proxy

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SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=83749.4
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7137136
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB4@client4.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 client4.there.com
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F20 200 OK Proxy -> A

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Record-Route: <sip:ss1.wcom.com;lr>
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7137136
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB4@client.there.com.116>
Content-Type: application/sdp
Content-Length: ...

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

F21 ACK A -> Proxy

ACK sip:UserB4@client4.there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9

Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567

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To: LittleGuy <sip:UserB@there.com>;tag=7137136
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0

F22 ACK Proxy -> B4

ACK sip:UserB4@client4.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
Max-Forwards: 69
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7137136
Call-ID: 12345600@here.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 sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Route: <sip:ss1.wcom.com;lr>
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=7137136
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 1 BYE
Content-Length: 0

F24 BYE Proxy -> A

BYE sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
Max-Forwards: 69
From: LittleGuy <sip:UserB@there.com>;tag=7137136
To: BigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 1 BYE
Content-Length: 0

F25 200 OK A -> Proxy

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SIP/2.0 200 OK

Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
;received=192.0.2.54

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105

From: LittleGuy <sip:UserB@there.com>;tag=7137136

To: BigGuy <sip:UserA@here.com>;tag=1234567

Call-ID: 12345600@here.com

CSeq: 1 BYE

Content-Length: 0

F26 200 OK Proxy -> B4

SIP/2.0 200 OK

Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105

From: LittleGuy <sip:UserB@there.com>;tag=7137136

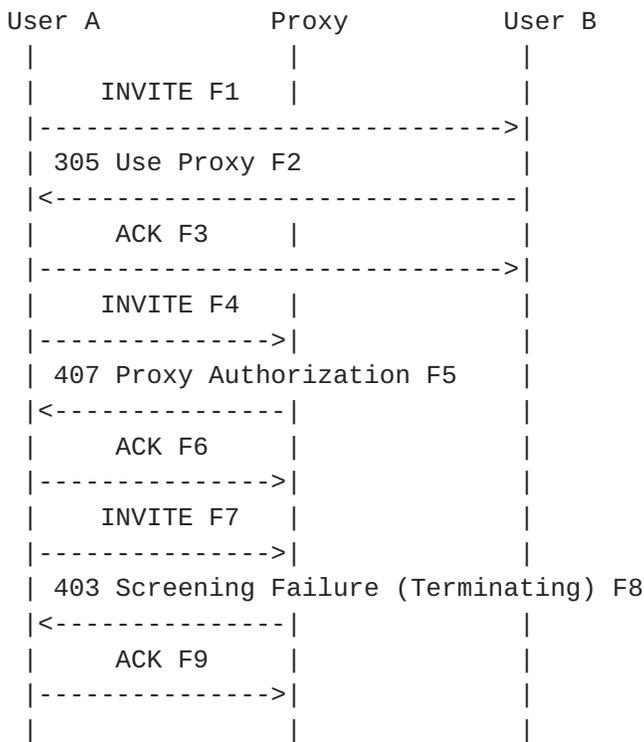
To: BigGuy <sip:UserA@here.com>;tag=1234567

Call-ID: 12345600@here.com

CSeq: 1 BYE

Content-Length: 0

2.13 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. Messages F1, F2, and F3 are included to show that User B does not accept INVITES that have not been screened by the proxy.

Note that call screening can not be done using the From header \hat{u} instead some form of authentication credentials must be used.

Message Details

F1 INVITE A -> B

```

INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.here.com>
Content-Type: application/sdp
Content-Length: ...

```

v=0

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

```
/* User B only accepts INVITES that have been screened by the proxy
*/
```

```
F2 305 Use Proxy B -> A
```

```
SIP/2.0 305 Use Proxy
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=342123
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:ss1.wcom.com>
Content-Length: 0
```

```
F3 ACK A -> B
```

```
ACK sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=342123
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0
```

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

```
F4 INVITE A -> Proxy 1
```

```
INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 2 INVITE
Contact: <sip:UserA@client.here.com>
Content-Type: application/sdp
Content-Length: ...
```

v=0

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

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

```
F5 407 Proxy Authorization Required Proxy 1 -> A
```

```
SIP/2.0 407 Proxy Authorization Required
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7886765
Call-ID: 12345600@here.com
CSeq: 2 INVITE
Proxy-Authenticate: Digest realm="wcom.com",
domain="sip:ss1.wcom.com", nonce="ea9c8e88df84f1cec4341ae6cbe5a359",
opaque="", stale=FALSE, algorithm=MD5
Content-Length: 0
```

```
F6 ACK A -> Proxy 1
```

```
ACK sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=7886765
Call-ID: 12345600@here.com
CSeq: 2 ACK
Content-Length: 0
```

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

```
F7 INVITE A -> Proxy 1
```

```
INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 3 INVITE
Contact: <sip:UserA@client.here.com>
```

Proxy-Authorization: Digest username="UserA",
realm="wcom.com", nonce="ae9137be1c87d175c2dd63302a0d6e0a",

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```
opaque="", uri="sip:UserB@there.com",
response="bbaec39f943bdcb3620d90afc548a45c"
Content-Type: application/sdp
Content-Length: ...
```

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

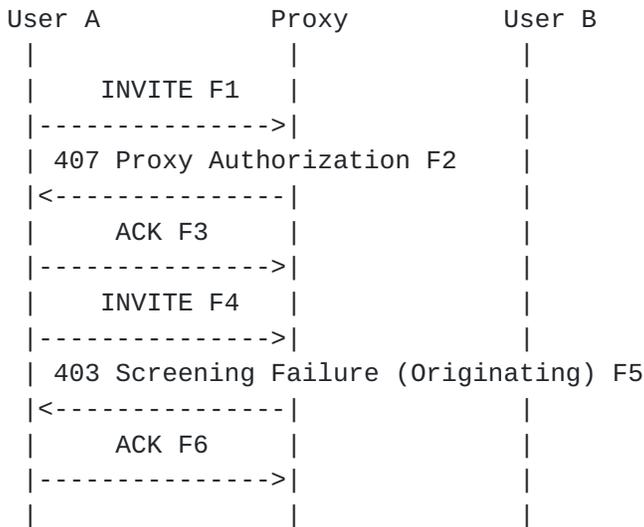
F8 403 Screening Failure (Terminating) Proxy 1 -> A

```
SIP/2.0 403 Screening Failure (Terminating)
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=ffe254
Call-ID: 12345600@here.com
CSeq: 3 INVITE
Error-Info: <sip:screen-failure-term-ann@annoucement.company.com>
Content-Length: 0
```

F9 ACK A -> Proxy 1

```
ACK sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=ffe254
Call-ID: 12345600@here.com
CSeq: 3 ACK
Content-Length: 0
```


2.14 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.

Message Details

F1 INVITE A -> Proxy 1

```

INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000

```

/* Proxy 1 challenges User A for authentication */

F2 407 Proxy Authorization Required Proxy 1 -> A

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```
SIP/2.0 407 Proxy Authorization Required
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
    ;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=90210
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Proxy-Authenticate: Digest realm="wcom.com",
    domain="sip:ss1.wcom.com", nonce="ea9c8e88df84f1cec4341ae6cbe5a359",
    opaque="", stale=FALSE, algorithm=MD5
Content-Length: 0
```

F3 ACK A -> Proxy 1

```
ACK sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=90210
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0
```

/* User A responds be sending an INVITE with authentication
credentials in it. */

F4 INVITE A -> Proxy 1

```
INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 2 INVITE
Contact: <sip:UserA@client.here.com>
Proxy-Authorization: Digest username="UserA", realm="wcom.com",
    nonce="cb360afc54bbaec39f943bd820d9a45c", opaque="",
    uri="sip:UserB@there.com",
    response="b9d2e5bcdec9f69ab2a9b44f270285a6"
Content-Type: application/sdp
Content-Length: ...
```

v=0

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

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

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

SIP/2.0 403 Screening Failure (Originating)

Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103

From: BigGuy <sip:UserA@here.com>;tag=1234567

To: LittleGuy <sip:UserB@there.com>;tag=18017

Call-ID: 12345600@here.com

CSeq: 2 INVITE

Error-Info: <sip:screen-failure-orig-ann@annoucement.company.com>

Content-Length: 0

F6 ACK A -> Proxy 1

ACK sip:UserB@there.com SIP/2.0

Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9

Max-Forwards: 70

From: BigGuy <sip:UserA@here.com>;tag=1234567

To: LittleGuy <sip:UserB@there.com>;tag=18017

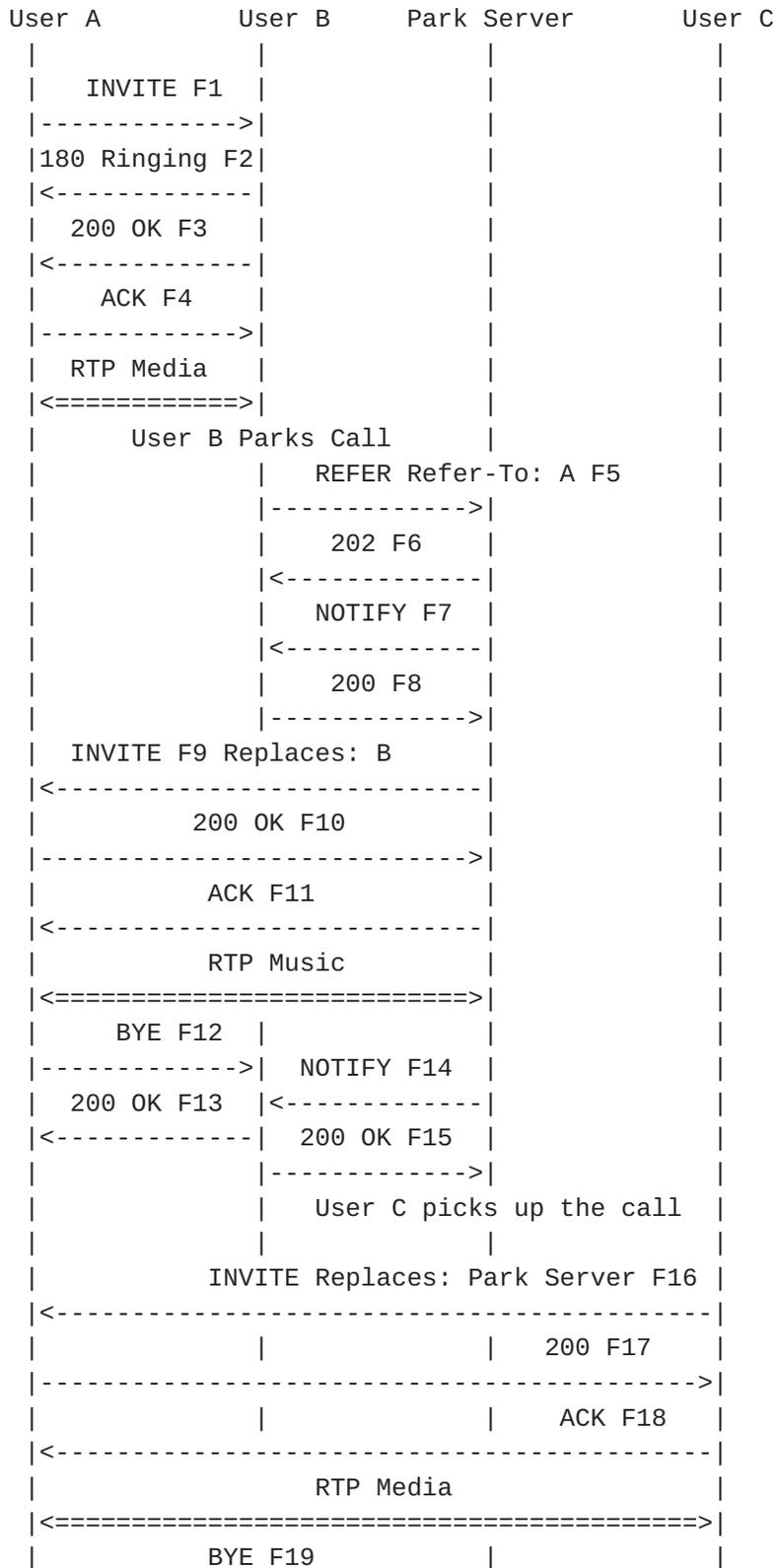
Call-ID: 12345600@here.com

CSeq: 2 ACK

Content-Length: 0

2.15

Call Park



```
|----->|
|      200 OK F20      |
|<-----|
|      No more RTP Music      |
```

```
|
|
|
|
```

In this example, User A calls User B. User B then parks the call at the Park Server by sending a REFER to the Park Server. The server sends an INVITE to A which replaces the session between A and B. The call is accepted by A and causes A to send a BYE to B. User B receives notification of the successful park, and also receives the Call-ID in the application/sip body of the NOTIFY response. User C wishes to retrieve the call, a new INVITE is sent to A which replaces the session with the Park Server. User A accepts the call and sends a BYE to the Park Server. Note that if the Park Server did not return the dialog identifiers (Call-ID, To and From tags) in the NOTIFY, C could send a SUBSCRIBE to retrieve this information.

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

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

Message Details.

F1 INVITE A -> B

```
INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345601@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.here.com>
Supported: replaces
Content-Type: application/sdp
Content-Length: ...
```

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

F2 180 Ringing B -> A

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
From: BigGuy <sip:UserA@here.com>;tag=1234567
```

To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345601@here.com

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CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content-Length: 0

F3 200 OK B -> A

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345601@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.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 client.there.com
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F4 ACK A -> B

ACK sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345601@here.com
CSeq: 1 ACK
Content-Length: 0

/* User B 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 B -> Park Server

REFER sip:park@server.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=02134
To: Park Server <sip:park@server.com>

Call-ID: 4802029847@there.com

CSeq: 1 REFER

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Refer-To: <sip:UserA@client.here.com?Replaces=
12345601@here.com%3Bfrom-tag%3D314159%3Bto-tag%3D1234567>
Referred-By: <sip:UserB@there.com>
Contact: <sip:UserB@client.there.com>
Content-Length: 0

F6 202 Accepted Park Server -> B

SIP/2.0 202 Accepted
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
From: LittleGuy <sip:UserB@there.com>;tag=02134
To: Park Server <sip:park@server.com>;tag=56323
Call-ID: 4802029847@there.com
CSeq: 1 REFER
Content-Length: 0

F7 NOTIFY Park Server -> B

NOTIFY sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
To: LittleGuy <sip:UserB@there.com>;tag=02134
Max-Forwards: 70
From: Park Server <sip:park@server.com>;tag=56323
Call-ID: 4802029847@there.com
CSeq: 1 NOTIFY
Event: refer
Subscription-State: active;expires=60
Content-Type: message/sipfrag
Content-Length: ...

SIP/2.0 100 Trying

F8 200 OK B -> Park Server

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
To: LittleGuy <sip:UserB@there.com>;tag=02134
From: Park Server <sip:park@server.com>;tag=56323
Call-ID: 4802029847@there.com
CSeq: 1 NOTIFY
Content-Length: 0

/* Park Server places call to User A to replace session between A and
B */

F9 INVITE Park Server -> A

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INVITE sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP server.com:5060
Max-Forwards: 70
From: <sip:park@server.com>;tag=0111
To: <sip:UserA@client.here.com>
Call-ID: a5-75-34-12-76@server.com
CSeq: 1 INVITE
Referred-By: <sip:UserB@there.com>
Contact: <sip:park@server.com>
Replaces: 12345601@here.com;from-tag=314159;to-tag=1234567
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Content-Type: application/sdp
Content-Length: ...

v=0
o=ParkServer 2890844576 2890844576 IN IP4 Park.server.com
s=Session SDP
c=IN IP4 music.server.com
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F10 200 OK A-> Park Server

SIP/2.0 200 OK
Via: SIP/2.0/UDP music.server.com:5060
From: <sip:park@server.com>;tag=0111
To: BigGuy <sip:UserA@client.here.com>;tag=098594
Call-ID: a5-75-34-12-76@server.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.here.com>
Supported: replaces
Content-Type: application/sdp
Content-Length: ...

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

F11 ACK Park Server -> A

ACK sip:UserA@client.here.com SIP/2.0

Via: SIP/2.0/UDP music.server.com:5060
Max-Forwards: 70

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From: <sip:park@server.com>;tag=0111
To: BigGuy <sip:UserA@client.here.com>;tag=098594
Call-ID: a5-75-34-12-76@server.com
CSeq: 1 ACK
Content-Length: 0

F12 BYE A -> B

ACK sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345601@here.com
CSeq: 2 BYE
Content-Length: 0

F13 200 OK B -> A

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.there.com:5060;branch=z9hG4bKnashds7
;received=192.0.2.105
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=314159
Call-ID: 12345601@here.com
CSeq: 2 BYE
Content-Length: 0

/* Park Server reports success back to B by returning all the SIP
headers in 200 OK response */

F14 NOTIFY Park Server -> B

NOTIFY sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
To: LittleGuy <sip:UserB@there.com>;tag=02134
Max-Forwards: 70
From: Park Server <sip:park@server.com>;tag=56323
Call-ID: 4802029847@there.com
CSeq: 1 NOTIFY
Event: refer
Subscription-State: terminated;reason=noresource
Content-Type: message/sipfrag
Content-Length: ...

SIP/2.0 200 OK
Via: SIP/2.0/UDP music.server.com:5060

From: <sip:park@server.com>;tag=0111

To: BigGuy <sip:UserA@client.here.com>;tag=098594

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Call-ID: a5-75-34-12-76@server.com
CSeq: 2 INVITE
Contact: <sip:UserA@client.here.com>

F15 200 OK B -> Park Server

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
To: LittleGuy <sip:UserB@there.com>;tag=02134
From: Park Server <sip:park@server.com>;tag=56323
Call-ID: 4802029847@there.com
CSeq: 2 NOTIFY
Content-Length: 0

/* User A is now parked at the Park Server */

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

F16 INVITE C -> A

INVITE sip:UserA@here.com SIP/2.0
Via: SIP/2.0/UDP client.anywhere.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: OtherGuy <sip:UserC@anywhere.com>;tag=5893461
To: BigGuy <sip:UserA@here.com>
Call-ID: 6485356@anywhere.com
CSeq: 1 INVITE
Contact: <sip:UserC@client.anywhere.com>
Replaces: a5-75-34-12-76@server.com;from-tag=098594;to-tag=0111
Content-Type: application/sdp
Content-Length: ...

v=0

o=UserC 2890844922 2890844922 IN IP4 client.anywhere.com
s=Session SDP
c=IN IP4 client.anywhere.com
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F17 200 OK A -> C

SIP/2.0 200 OK

Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.105

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From: OtherGuy <sip:UserC@anywhere.com>;tag=5893461
To: BigGuy <sip:UserA@here.com>;tag=222
Call-ID: 6485356@anywhere.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.here.com>
Supported: replaces
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserA 2890844527 2890844527 IN IP4 client.here.com
s=Session SDP
c=IN IP4 client.here.com
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F18 ACK C -> A

ACK sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: OtherGuy <sip:UserC@anywhere.com>;tag=5893461
To: BigGuy <sip:UserA@here.com>;tag=222
Call-ID: 6485356@anywhere.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 */

F19 BYE A -> Park Server

BYE sip:park@server.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=098594
To: <sip:park@server.com>;tag=0111
Call-ID: a5-75-34-12-76@server.com
CSeq: 1 BYE
Content-Length: 0

F20 200 OK Park Server -> A

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103

From: BigGuy <sip:UserA@here.com>;tag=098594
To: <sip:park@server.com>;tag=0111

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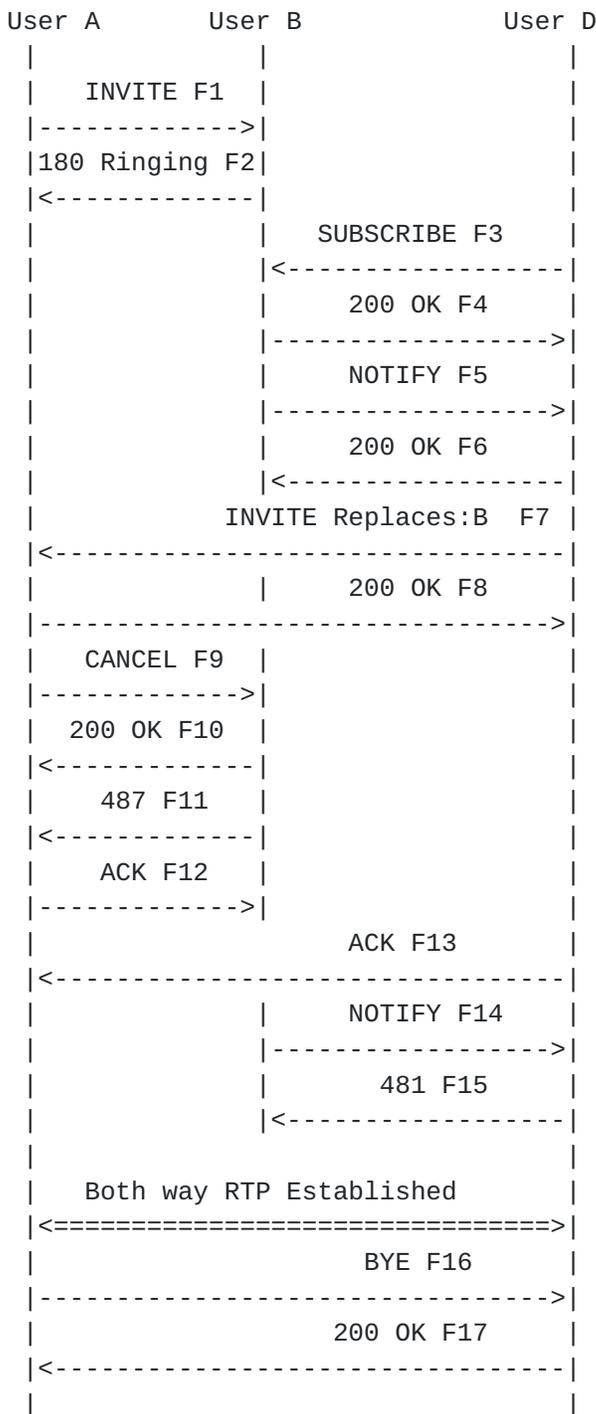
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Call-ID: a5-75-34-12-76@server.com

CSeq: 1 BYE

Content-Length: 0

2.16 Call Pickup



User B and D are part of a work group at client.there.com that can pick up each others calls. User A calls B who does not answer. User D wishes to pick up the call and sends a SUBSCRIBE to B to retrieve the dialog information. D then generates an INVITE with a Replaces to A. A answers the INVITE and sends a CANCEL to stop B's phone

ringing. Note that the order of the CANCEL/ACK sequence in F11 through F20 is not significant.

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Message Details

F1 INVITE A -> B

```
INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.here.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...
```

v=0

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

F2 180 Ringing B1 -> A

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=3145678
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@littleguy.there.com>
Content-Length: 0
```

/* User B decides to pick up the call */

F3 SUBSCRIBE D -> B

```
SUBSCRIBE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP smallguy.there.com:5060;branch=z9hG4bK74bf
Max-Forwards: 70
From: SmallGuy <sip:UserD@there.com>;tag=8675309
To: LittleGuy <sip:UserB@there.com>
```

Call-ID: rt4353gs2egg@smallguy.there.com
CSeq: 1 INVITE

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Contact: <sip:UserD@smallguy.there.com>
Event: dialog
Subscription-State: active;expires=3600
Accept: application/dialog-info+xml
Content-Length: 0

F4 200 OK B -> D

SIP/2.0 200 OK
Via: SIP/2.0/UDP smallguy.there.com:5060;branch=z9hG4bK74bf
;received=192.0.2.114
Max-Forwards: 70
From: SmallGuy <sip:UserD@there.com>;tag=8675309
To: LittleGuy <sip:UserB@there.com>;tag=31451098
Call-ID: rt4353gs2egg@smallguy.there.com
CSeq: 1 INVITE
Content-Length: 0

F5 NOTIFY B -> D

NOTIFY sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP littleguy.there.com:5060;branch=z9hG4bK74bf
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=31451098
To: SmallGuy <sip:UserD@there.com>;tag=8675309
Call-ID: rt4353gs2egg@smallguy.there.com
CSeq: 1 NOTIFY
Contact: <sip:UserD@littleguy.there.com>
Event: dialog
Subscription-State: active;expires=3600
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="sip:UserB@there.com">
  <dialog id="94992014524" call-id="12345600@here.com"
    local-tag="3145678" remote-tag="1234567" direction="recipient"
    remote-uri="UserA@here.com">
    <state>early</state>
  </dialog>
</dialog-info>
```

F6 200 OK D -> B

SIP/2.0 200 OK
Via: SIP/2.0/UDP littleguy.there.com:5060;branch=z9hG4bK74bf
From: LittleGuy <sip:UserB@there.com>;tag=31451098

To: SmallGuy <sip:UserD@there.com>;tag=8675309
Call-ID: rt4353gs2egg@smallguy.there.com

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CSeq: 1 NOTIFY
Contact: <sip:UserD@littleguy.there.com>
Content-Length: 0

F7 INVITE D -> A

INVITE sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP smallguy.there.com:5060;branch=z9hG4bK74bf
Max-Forwards: 70
From: SmallGuy <sip:UserD@there.com>;tag=8675309
To: BigGuy <sip:UserA@here.com>
Call-ID: 563456212@b2.there.com
CSeq: 1 INVITE
Replaces: 12345600@here.com;to-tag=314578;from-tag=1234567
Contact: <sip:UserB2@client2.there.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserB 2890843122 2890843122 IN IP4 smallguy.there.com
s=Session SDP
c=IN IP4 client2.there.com
t=3034423619 0
m=audio 5342 RTP/AVP 0
a=rtpmap:0 PCMU/8000

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

F8 200 OK A -> D

SIP/2.0 200 OK
Via: SIP/2.0/UDP smallguy.there.com:5060;branch=z9hG4bK74bf
;received=192.0.2.114
From: SmallGuy <sip:UserD@here.com>;tag=8675309
To: BigGuy <sip:UserA@here.com>;tag=131256
Call-ID: 563456212@b2.there.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.here.com>
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY
Supported: replaces
Content-Type: application/sdp
Content-Length: ...

v=0
o=UserA 289084543 289084543 IN IP4 client.here.com

s=Session SDP
c=IN IP4 client.here.com

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```
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

```
/* A stops B's phone from ringing by sending a CANCEL */
```

```
F9 CANCEL A -> B
```

```
CANCEL sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 CANCEL
Content-Length: 0
```

```
F10 200 OK B -> A
```

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 CANCEL
Content-Length: 0
```

```
F11 487 Request Terminated B1 -> Proxy
```

```
SIP/2.0 487 Request Terminated
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=3145678
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Content-Length: 0
```

```
F12 ACK A -> B
```

```
ACK sip:UserB1@client.there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=z9hG4bK83749.1
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
```

To: LittleGuy <sip:UserB@there.com>;tag=3145678
Call-ID: 12345600@here.com

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CSeq: 1 ACK
Content-Length: 0

Content-Length: 0

F13 ACK D -> A

ACK sip:UserA@client.here.com SIP/2.0
Via: SIP/2.0/UDP b2.there.com:5060;branch=z9hG4bK74bf
Max-Forwards: 70
From: LittleGuy <sip:UserB2@there.com>;tag=8675309
To: BigGuy <sip:UserA@here.com>;tag=131256
Call-ID: 563456212@b2.there.com
CSeq: 1 ACK
Content-Length: 0

F14 NOTIFY B -> D

NOTIFY sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP littleguy.there.com:5060;branch=z9hG4bK74bf
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=31451098
To: SmallGuy <sip:UserD@there.com>;tag=8675309
Call-ID: rt4353gs2egg@smallguy.there.com
CSeq: 2 NOTIFY
Contact: <sip:UserD@littleguy.there.com>
Event: dialog
Subscription-State: active;expires=3600
Content-Type: application/dialog-info+xml
Content-Length: ...

```
<?xml version="1.0"?>
<dialog-info xmlns="urn:ietf:params:xml:ns:dialog-info"
  version="1" state="partial" entity="sip:UserB@there.com">
  <dialog id="94992014524" call-id="12345600@here.com"
    local-tag="3145678" remote-tag="1234567" direction="recipient">
    <state>terminated</state>
  </dialog>
</dialog-info>
```

F15 481 Dialog Does Not Exist D -> B

SIP/2.0 481 Dialog Does Not Exist
Via: SIP/2.0/UDP littleguy.there.com:5060;branch=z9hG4bK74bf
From: LittleGuy <sip:UserB@there.com>;tag=31451098
To: SmallGuy <sip:UserD@there.com>;tag=8675309
Call-ID: rt4353gs2egg@smallguy.there.com

CSeq: 2 NOTIFY

Contact: <sip:UserD@littleguy.there.com>

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Content-Length: 0

/* RTP streams are established between A and D. User A Hangs Up
with User B. */

F16 BYE A -> Proxy

BYE sip:UserD@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
To: LittleGuy <sip:UserB2@there.com>;tag=8675309
From: BigGuy <sip:UserA@here.com>;tag=131256
Call-ID: 563456212@b2.there.com
CSeq: 2 BYE
Content-Length: 0

F17 200 OK D -> A

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
To: LittleGuy <sip:UserB2@there.com>;tag=8675309
From: BigGuy <sip:UserA@here.com>;tag=131256
Call-ID: 563456212@b2.there.com
CSeq: 2 BYE
Content-Length: 0

2.17 Automatic Redial

User A	User B
INVITE F1	
----->	
486 Busy Here F2	
<-----	User B is busy
ACK F3	
----->	
SUBSCRIBE F4	
----->	
200 OK F5	
<-----	
NOTIFY F6	
<-----	
200 OK F7	
----->	
NOTIFY F8	User B is now available
<-----	
200 OK F9	
----->	
INVITE F10	
----->	
180 Ringing F11	
<-----	
200 OK F12	
<-----	
ACK F13	
----->	
Media Session	
<=====	

User B is initially busy when User A calls. User A subscribes to User B's call state using a SUBSCRIBE F4. User B sends a NOTIFY F8 when User B is available. A is alerted, then User A sends an INVITE to B to establish the session.

Message Details

F1 INVITE A -> B

INVITE sip:UserB@there.com SIP/2.0

Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567

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To: LittleGuy <sip:UserB@there.com>
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.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 client.here.com
t=3034423619 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/UDP client.here.com:5060;branch=z9hG4bK74bf9
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=982039i4
Call-ID: 12345600@here.com
CSeq: 1 INVITE
Content-Length: 0

F3 ACK A -> B

INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=1234567
To: LittleGuy <sip:UserB@there.com>;tag=982039i4
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0

F4 SUBSCRIBE A -> B

SUBSCRIBE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=837348234
To: LittleGuy <sip:UserB@there.com>
Call-ID: 4524526232@here.com
CSeq: 1 SUBSCRIBE
Contact: UserA@client.here.com
Event: dialog

Subscription-State: active;expires=3600
Accept: application/dialog-info+xml

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Content-Length: 0

F5 200 OK B -> A

SIP/2.0 200 OK

Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9

From: BigGuy <sip:UserA@here.com>;tag=837348234

To: LittleGuy <sip:UserB@there.com>

Call-ID: 4524526232@here.com

CSeq: 1 SUBSCRIBE

Contact: UserB@client.there.com

Content-Length: 0

F6 NOTIFY B -> A

NOTIFY sip:UserA@here.com SIP/2.0

Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9

Max-Forwards: 70

From: LittleGuy <sip:UserB@there.com>;tag=341123

To: BigGuy <sip:UserA@here.com>;tag=837348234

Call-ID: 4524526232@here.com

CSeq: 1 NOTIFY

Event: dialog

Subscription-State: active;expires=3600

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="sip:UserB@there.com">
```

```
<dialog id="562623442g3">
```

```
<state>confirmed</state>
```

```
</dialog>
```

```
</dialog-info>
```

F7 200 OK A -> B

SIP/2.0 200 OK

Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9

From: LittleGuy <sip:UserB@there.com>;tag=341123

To: BigGuy <sip:UserA@here.com>;tag=837348234

Call-ID: 4524526232@here.com

CSeq: 1 NOTIFY

Content-Length: 0

```
/* User B is now available */
```

F8 NOTIFY B -> A

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NOTIFY sip:UserA@here.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: LittleGuy <sip:UserB@there.com>;tag=341123
To: BigGuy <sip:UserA@here.com>;tag=837348234
Call-ID: 4524526232@here.com
CSeq: 2 NOTIFY
Event: dialog
Subscription-State: active;expires=3600
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="sip:UserB@there.com">
  <dialog id="562623442g3">
    <state>terminated</state>
  </dialog>
</dialog-info>
```

F9 200 OK A -> B

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
From: LittleGuy <sip:UserB@there.com>;tag=341123
To: BigGuy <sip:UserA@here.com>;tag=837348234
Call-ID: 4524526232@here.com
CSeq: 2 NOTIFY
Content-Length: 0

Message Details

F10 INVITE A -> B

INVITE sip:UserB@there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=f23fkg14k
To: LittleGuy <sip:UserB@there.com>
Call-ID: aoij4i9okit@here.com
CSeq: 1 INVITE
Contact: <sip:UserA@client.here.com>
Content-Type: application/sdp
Content-Length: ...

v=0

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

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```
c=IN IP4 client.here.com
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F11 180 Ringing B -> A

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=f23fkg14k
To: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: aoij4i9okittr@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.there.com>
Content-Length: 0
```

F12 200 OK B -> A

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
;received=192.0.2.103
From: BigGuy <sip:UserA@here.com>;tag=f23fkg14k
To: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: aoij4i9okittr@here.com
CSeq: 1 INVITE
Contact: <sip:UserB@client.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 client.there.com
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F13 ACK A -> B

```
ACK sip:UserB@client.there.com SIP/2.0
Via: SIP/2.0/UDP client.here.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@here.com>;tag=f23fkg14k
To: LittleGuy <sip:UserB@there.com>;tag=23431
Call-ID: aoij4i9okittr@here.com
CSeq: 1 ACK
```

Content-Length: 0

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[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 [[12](#)] apply.

4 IANA Considerations

None.

5 Acknowledgements

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[7](#) Author's Addresses

Alan Johnston	Email: alan.johnston@wcom.com sip:alan.johnston@siptest.wcom.com
Robert Sparks	Email: rsparks@dynamicsoft.com
Chris Cunningham	Email: ccunningham@dynamicsoft.com
Steve Donovan	Email: sdonovan@dynamicsoft.com
Kevin Summers	Email: kevin.summers@sonusnet.com

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