SIP Telephony Service Examples With Call Flows

STATUS OF THIS MEMO

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Abstract

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

1 Overview:.................................................................................3

2 Call Flows - IP Desktop Services Features...........................4

  2.1 Call Hold.........................................................................4
  2.2 Consultation Hold..........................................................16
  2.3 Unattended Transfer.......................................................32
  2.4 Attended Transfer............................................................48
  2.5 Call Forwarding Unconditional........................................48
  2.6 Call Forwarding - Busy..................................................54
  2.7 Call Forwarding Â» No Answer.........................................61
  2.8 3-way Call......................................................................67
  2.9 Single Line Extension......................................................67
  2.10 Find-Me..........................................................................68
  2.11 Call Management (Incoming Call Screening)....................77
  2.12 Call Management (Outgoing Call Screening)....................80

3 Author’s Addresses.................................................................83

4 Acknowledgments.....................................................................83

5 References...............................................................................84
Overview:

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

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

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

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

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

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

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

Each call flow is presented with a textual description of the scenario, a message flow diagram showing the messages exchanged between separate network elements, and the detailed contents of each message shown in the diagram.
Legend for Message Flows:

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

Example: Invite

------------->

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

Example: Both way RTP established

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

2 Call Flows - IP Desktop Services Features

2.1 Call Hold


<table>
<thead>
<tr>
<th>User A</th>
<th>Proxy</th>
<th>User B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>INVITE F1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>---------------&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>407 Proxy Authorization F2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>---------------&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ACK F3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>---------------&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>INVITE F4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>---------------&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(100 Trying) F6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>---------------&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>180 Ringing F7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>---------------&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>180 Ringing F8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>---------------&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>200 OK F10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>---------------&gt;</td>
<td></td>
</tr>
</tbody>
</table>

MCI WorldCom
ACK F11
---------------> ACK F12

Both way RTP Established
<-m-m-m-m-m-m-m-m-m-m-m-m-m-m->

INVITE (c=0) F13
<---------------

INVITE (c=0) F14
<--------------

200 OK F15
---------------> 200 OK F16

ACK F17
<---------------

ACK F18
<--------------

No RTP Sent!

INVITE F19
<--------------

200 OK F21
---------------> 200 OK F22

ACK F23
<--------------

ACK F24
<--------------

Both way RTP Established
<-m-m-m-m-m-m-m-m-m-m-m-m-m-m->

INVITE F20
<--------------

200 OK F21
---------------> 200 OK F22

ACK F23
<--------------

ACK F24
<--------------

Both way RTP Established
<-m-m-m-m-m-m-m-m-m-m-m-m-m-m->

BYE F25
---------------> BYE F26

200 OK F28
<--------------

200 OK F27
<---------------

F1
Invite
A->Proxy1
INVITE sip:UserB@ssl.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Content-Type: application/sdp
Content-Length: ...

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

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

SIP/2.0 407 Proxy Authorization Required
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Proxy-Authenticate: Digest realm="MCI WorldCom SIP",
domain="wcom.com", nonce="ea9c8e88df84f1cecc4341ae6cbe5a359",
opaque="", stale="FALSE", algorithm="MD5"
Content-Length: 0

F3
ACK
A -> Proxy 1

ACK sip:UserB@ssl.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0
F4 /* User A responds be re-sending the INVITE with authentication credentials in it. */
Invite
A -> Proxy 1

```
INVITE sip:UserB@ssl.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345601@here.com
CSeq: 1 INVITE
Proxy-Authorization: DIGEST username="UserA", realm="MCI WorldCom SIP", nonce="ea9c8e88df84f1cecc4341ae6cbe5a359", opaque="", uri="sip:ssl.wcom.com", response="dfe56131d1958046689cd83306477ecc"
Content-Type: application/sdp
Content-Length: ...
```

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

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

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

F6
(100 Trying)
Proxy 1-> A

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

F7
180 Ringing
B->Proxy 1

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345601@here.com
CSeq: 1 INVITE
Content-Length: 0

F8
180 Ringing
Proxy 1->A

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

F9
200 OK
B->Proxy 1

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

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

F10
200 OK
Proxy 1-> A

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

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

F11
ACK
A->Proxy 1

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

F12
ACK
Proxy 1->B

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

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

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

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

F14
INVITE
Proxy 1 -> A

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

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

F15
200 OK
A -> Proxy 1

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

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

F16
200 OK
Proxy 1 -> B

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

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

ACK
B-> Proxy 1

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

Proxy 1 -> A

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

/* User B takes the call off hold */

INVITE
B -> Proxy 1

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

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

F20
INVITE
Proxy 1 -> A

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

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

F21
200 OK
A -> Proxy 1

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

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

F22
200 OK
Proxy 1 -> B

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

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

F23
ACK
B -> Proxy1

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

F24
ACK
Proxy 1 -> A
ACK sip: UserA@here.com SIP/2.0
Via: SIP/2.0/UDP ssl1.wcom.com:5060
Via: SIP/2.0/UDP there.com:5060
From: TheLittleGuy <sip:UserB@there.com>;tag=314159
To: TheBigGuy <sip:UserA@here.com>;tag=1234567
Call-Id: 12345601@here.com
CSeq: 2 ACK
Content-Length: 0

F25
BYE
A -> Proxy 1

BYE sip: UserB@ssl1.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
Route: <sip:userB@there.com>
From: TheBigGuy <sip:UserA@here.com>;tag=1234567
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345601@here.com
CSeq: 2 BYE
Content-Length: 0

F26
BYE
Proxy 1 -> B

BYE sip: UserB@there.com SIP/2.0
Via: SIP/2.0/UDP ssl1.wcom.com:5060
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>;tag=1234567
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345601@here.com
CSeq: 2 BYE
Content-Length: 0

F27
200 OK
B -> Proxy 1

SIP/2.0 200 OK
Via: SIP/2.0/UDP ssl1.wcom.com:5060
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>;tag=1234567
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345601@here.com
CSeq: 2 BYE
Content-Length: 0
2.2 Consultation Hold

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

<table>
<thead>
<tr>
<th>User A</th>
<th>Proxy</th>
<th>User B</th>
<th>User C</th>
</tr>
</thead>
<tbody>
<tr>
<td>INVITE F1</td>
<td>-------------&gt;</td>
<td>INVITE F2</td>
<td></td>
</tr>
<tr>
<td>(100 Trying) F3</td>
<td>&lt;---------------</td>
<td>180 Ringing F4</td>
<td></td>
</tr>
<tr>
<td>180 Ringing F5</td>
<td>&lt;---------------</td>
<td>200 OK F6</td>
<td></td>
</tr>
<tr>
<td>200 OK F7</td>
<td>&lt;---------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACK F8</td>
<td>------------&gt;</td>
<td>ACK F9</td>
<td></td>
</tr>
<tr>
<td>Both way RTP Established</td>
<td>&lt;---------------</td>
<td>INVITE (c=0) F10</td>
<td></td>
</tr>
<tr>
<td>INVITE (c=0) F11</td>
<td>&lt;---------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200 OK F12</td>
<td>&lt;---------------</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
F1

Invite
A -> Proxy 1

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

v=0
o=UserA 2890844526 2890844526 IN IP4 client.here.com
s=Session SDP
c=IN IP4 100.101.102.103
t=3034423619 0
F2 /* Proxy 1 accepts the credentials and forwards the INVITE User B. Client for A prepares to receive data on port 49170 from the network. */

Invite
Proxy 1 -> B

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

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

F3
(100 Trying)
Proxy 1-> A

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

F4
180 Ringing
B->Proxy 1

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

F5
180 Ringing
Proxy 1->A

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

F6
200 OK
B->Proxy 1

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

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

F7
200 OK
Proxy 1-> A

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

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

F8
ACK
A->Proxy 1

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

F9
ACK
Proxy 1->B

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

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

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

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

F11
INVITE
Proxy 1 -> A

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

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

F12
200 OK
A -> Proxy 1

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

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

F13
200 OK
Proxy 1 -> B

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

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

F14
ACK
B-> Proxy 1

ACK sip:UserA@ssl.wcom.com SIP/2.0
Via: SIP/2.0/UDP there.com:5060
Route: <sip:UserA@here.com>
From: TheLittleGuy <sip:UserB@there.com>;tag=314159
To: TheBigGuy <sip:UserA@here.com>;tag=1234567
Call-ID: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0
F15
ACK
Proxy 1 -> A

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

F16
Invite
B -> Proxy 1

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

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

F17
Invite
Proxy 1 -> C

INVITE sip:UserC@anywhere.com SIP/2.0
Via: SIP/2.0/UDP ssl1.wcom.com:5060
Via: SIP/2.0/UDP there.com:5060
Record-Route: <sip:ss1.wcom.com>
From: TheLittleGuy <sip:UserB@there.com>
To: TheOtherGuy <sip:UserC@anywhere.com>
Call-Id: 9876543210@there.com
CSeq: 1 INVITE
Internet Draft Service Examples October 1999

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

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

F18
(100 Trying)
Proxy 1--B

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

F19
180 Ringing
C--Proxy 1

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

F20
180 Ringing
Proxy 1--B

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

MCI WorldCom [Page 25]
F21
200 OK
C->Proxy 1

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

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

F22
200 OK
Proxy 1-> B

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

v=0
o=UserC 2890844527 2890844527 IN IP4 client.anywhere.com
s=Session SDP
c=IN IP4 120.121.122.123
t=3034423619 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
F23
ACK
B->Proxy 1
ACK sip:UserC@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP there.com:5060
Route: <sip:UserC@anywhere.com>
From: TheLittleGuy <sip:UserB@there.com>
To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
Call-Id: 9876543210@there.com
CSeq: 1 ACK
Content-Length: 0

F24
ACK
Proxy 1->C
ACK sip: UserC@anywhere.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP there.com:5060
From: TheLittleGuy <sip:UserB@there.com>
To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
Call-Id: 9876543210@there.com
CSeq: 1 ACK
Content-Length: 0

F25
BYE
B -> Proxy 1
BYE sip: UserC@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP there.com:5060
Route: <sip:userC@anywhere.com>
From: TheLittleGuy <sip:UserB@there.com>
To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
Call-Id: 9876543210@there.com
CSeq: 2 BYE
Content-Length: 0

F26
BYE
Proxy 1 -> C
BYE sip: UserC@anywhere.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP there.com:5060
From: TheLittleGuy <sip:UserB@there.com>
To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
Call-Id: 9876543210@there.com
CSeq: 2 BYE
Content-Length: 0

F27
200 OK
C -> Proxy 1

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

F28
200 OK
Proxy 1 -> B

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

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

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

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

F30
INVITE
Proxy 1 -> A

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

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

F31
200 OK
A -> Proxy 1

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

v=0
o=UserA 2890844526 2890844526 IN IP4 client.here.com
s=Session SDP
c=IN IP4 100.101.102.103
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
200 OK
Proxy 1 -> B

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

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

ACK
B -> Proxy1

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

ACK
Proxy 1 -> A

ACK sip: UserA@here.com SIP/2.0
Via: SIP/2.0/UDP ssl.wcom.com:5060
Via: SIP/2.0/UDP there.com:5060
From: TheLittleGuy <sip:UserB@there.com>;tag=314159
To: TheBigGuy <sip:UserA@here.com>;tag=1234567
Call-Id: 12345600@here.com
CSeq: 2 ACK
Content-Length: 0
F35
BYE
A -> Proxy 1

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

F36
BYE
Proxy 1 -> B

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

F37
200 OK
B -> Proxy 1

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

User A call user B. User A then transfers User B to user C. User C then transfers User B to User D. User B hangs up the call.
INVITE (ReqBy A) F14

INVITE (ReqBy A) F15

(100 Trying) F16

180 Ringing F17

180 Ringing F18

200 OK F19

200 OK F20

ACK F21

ACK F22

Both way RTP Established

BYE (Also D) F23

BYE (Also D) F24

200 OK F25

200 OK F26

INVITE (ReqBy C) F27

INVITE (ReqBy C) F28

(100 Trying) F29

180 Ringing F30
F1
Invite
A -> Proxy 1

INVITE sip:UserB@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Proxy-Authorization: DIGEST username="UserA", realm="MCI WorldCom SIP", nonce="ea9c8e88df84f1ce4341ae6cbe5a359", opaque=", uri="sip:ss1.wcom.com",
response="dfe56131d1958046689cd83306477ecc"
Content-Type: application/sdp
Content-Length: ...

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

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

Invite
Proxy 1 -> B

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

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

F3
(100 Trying)
Proxy 1 -> A

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

F4
180 Ringing
B->Proxy 1

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

F5
180 Ringing
Proxy 1->A

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

F6
200 OK
B->Proxy 1

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

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

F7
200 OK
Proxy 1-> A
SIP/2.0 200 OK
Via: SIP/2.0/UDP here.com:5060
Record-Route: <sip:ss1.wcom.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheLittleGuy <sip:UserB@there.com>
Content-Type: application/sdp
Content-Length: ...

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

F8
ACK
A->Proxy 1

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

F9
ACK
Proxy 1->B

ACK sip: UserB@there.com SIP/2.0
Via: SIP/2.0/UDP ssl1.wcom.com:5060
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345600@here.com
CSeq: 1 ACK
Content-Length:0

F10 /* User A transfers User B to User C */
BYE
A -> Proxy 1
BYE sip: UserB@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
Route: <sip:userB@there.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345600@here.com
CSeq: 2 BYE
Also: TheOtherGuy <sip:UserC@anywhere.com>
Content-Length: 0

F11
BYE
Proxy 1 -> B

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

F12
200 OK
B -> Proxy 1

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

F13
200 OK
Proxy 1 -> A

SIP/2.0 200 OK
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345600@here.com
CSeq: 2 BYE
Content-Length: 0
Invite
B -> Proxy 1

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

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

Invite
Proxy 1 -> C

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

v=0
o=UserB 2890844526 2890844526 IN IP4 client.there.com
s=Session SDP
c=IN IP4 110.111.112.113
t=3034423619 0
m=audio 50170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
F16
(100 Trying)
Proxy 1-> B

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

F17
180 Ringing
C->Proxy 1

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

F18
180 Ringing
Proxy 1-> B

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

F19
200 OK
C-> Proxy 1

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

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

F20
200 OK
Proxy 1-> B

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

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

F21
ACK
B->Proxy 1

ACK sip:UserC@ssl.wcom.com SIP/2.0
Via: SIP/2.0/UDP there.com:5060
Route: <sip:UserC@anywhere.com>
From: TheLittleGuy <sip:UserB@there.com>
To: TheOtherGuy <sip:UserC@anywhere.com>;tag=456654
Call-Id: 9876543210@there.com
CSeq: 1 ACK
Content-Length: 0
F22
ACK
Proxy 1->C

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

F23
BYE
B -> Proxy 1

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

F24
BYE
Proxy 1 -> C

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

F25
200 OK
C -> Proxy 1

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

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

F26
200 OK
Proxy 1 -> B

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

F27
Invite
B -> Proxy 1

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

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

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

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

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

F29
(100 Trying)
Proxy 1-> B

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

F30
180 Ringing
D->Proxy 1

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

F31
180 Ringing
Proxy 1->B

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

F32
200 OK
D->Proxy 1

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

v=0
o=UserD 2890844527 2890844527 IN IP4 client.nowhere.com
s=Session SDP
c=IN IP4 150.151.152.153
t=3094598698 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F33
200 OK
Proxy 1-> B

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

v=0
o=UserD 2890844527 2890844527 IN IP4 client.nowhere.com
s=Session SDP
c=IN IP4 150.151.152.153
t=3094598698 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F34
ACK
B->Proxy 1

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

F35
ACK
Proxy 1->D

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

F36
BYE
B -> Proxy 1

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

F37
BYE
Proxy 1 -> D

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

F38
200 OK
D -> Proxy 1

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

F39
200 OK
Proxy 1 -> B

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

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

2.5 Call Forwarding Unconditional

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

```
User A          Proxy          Gateway
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>INVITE F1</td>
<td>------</td>
<td>INVITE F2</td>
</tr>
<tr>
<td>--------------</td>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>(100 Trying) F3</td>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>&lt;------------</td>
<td>------</td>
<td>180 Ringing F4</td>
</tr>
<tr>
<td>180 Ringing F5</td>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>&lt;------------</td>
<td>------</td>
<td>200 OK F6</td>
</tr>
<tr>
<td>200 OK F7</td>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>&lt;------------</td>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>ACK F8</td>
<td>------</td>
<td>ACK F9</td>
</tr>
<tr>
<td>--------------</td>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>Both way RTP Established</td>
<td>------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
|<-m-m-m-m-m-m-m-m-m-m-m->
<table>
<thead>
<tr>
<th>BYE F10</th>
<th>------</th>
<th>BYE F11</th>
</tr>
</thead>
<tbody>
<tr>
<td>--------------</td>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>200 OK F12</td>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>&lt;------------</td>
<td>------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
```
INVITE
INVITE sip:UserB@ssl.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Proxy-Authorization: DIGEST username="UserA", realm="MCI WorldCom SIP", nonce="ea9c8e88df84f1cc4341ae6cbe5a359", opaque="", uri="sip:ssl.wcom.com", response="dfe56131d1958046689cd83306477ecc"
Content-Type: application/sdp
Content-Length: ...

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

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

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

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

F3
(100 Trying)
Proxy->A

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

F4
180 Ringing
B2->Proxy

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

F5
180 Ringing
Proxy -> A

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

F6
200 OK
B2->Proxy

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP here.com:5060
Record-Route: <sip:ss1.wcom.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: <sip:7773660,phone-context=p1234@gw1.wcom.com;user=phone>
Content-Type: application/sdp
Content-Length: ...

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

F7
200 OK
Proxy-->A

SIP/2.0 200 OK
Via: SIP/2.0/UDP here.com:5060
Record-Route: <sip:ss1.wcom.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheLittleGuy <sip:7773660,phone-context=p1234@gw1.wcom.com;user=phone>
Content-Type: application/sdp
Content-Length: ...

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

F8
ACK
A-->Proxy

ACK sip:7773660,phone-context=p1234@gw1.wcom.com;user=phone
SIP/2.0
Via: SIP/2.0/UDP here.com:5060
Route: < sip:7773660,phone-context=p1234@gw1.wcom.com;user=phone >
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0

F9
ACK
Proxy->B4

ACK sip:7773660,phone-context=p1234@gw1.wcom.com;user=phone
SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0

F10
BYE
A -> Proxy 1

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

F11
BYE
Proxy 1 -> B2

BYE sip:7773660,phone-context=p1234@gw1.wcom.com;user=phone
SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=314159
Call-Id: 12345600@here.com
CSeq: 2 BYE
Content-Length: 0
F12
200 OK
B2 -> Proxy 1

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

F13
200 OK
Proxy 1 -> A

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

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

```
User A | Proxy | User B1 | User B2

INVITE F1 ---------> INVITE F2
(100 Trying) F3

<-------------- 486 Busy Here F4
<---------------

ACK F5

INVITE F6

<---------------

180 Ringing F7

<---------------

180 Ringing F8

<---------------

200 OK F9

200 OK F10

<---------------

ACK F11

<---------------

ACK F12

Both way RTP Established

<---------------

200 OK F16

<---------------

200 OK F15
```

MCI WorldCom
F1
INVITE
A->Proxy

INVITE sip:UserB@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Proxy-Authorization: DIGEST username="UserA", realm="MCI WorldCom SIP", nonce="ea9c8e88df84f1ec4341ae6cbe5a359", opaque="", uri="sip:ss1.wcom.com", response="dfe56131d1958046689cd83306477ecc"
Content-Type: application/sdp
Content-Length: ...

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

F2
INVITE
Proxy->B1

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

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

F3
(100 Trying)
Proxy->A

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

F4
486 Busy Here
B1->Proxy

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

F5
ACK
Proxy->B1

   ACK sip: UserB1@ss1.wcom.com SIP/2.0
   Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=1
   From: TheBigGuy <sip:UserA@here.com>
   To: TheLittleGuy <sip:UserB@there.com>;tag=123456
   Call-Id: 12345600@here.com
   CSeq: 1 ACK
   Content-Length: 0

F6
INVITE
Proxy->B2

   INVITE sip:UserB2@there.com SIP/2.0
   Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=2
   Via: SIP/2.0/UDP here.com:5060
   Record-Route: <sip:ss1.wcom.com>
   From: TheBigGuy <sip:UserA@here.com>
   To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Content-Type: application/sdp
Content-Length: ...

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

F7
180 Ringing
B4->Proxy

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

F8
180 Ringing
Proxy -> A

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

F9
200 OK
B2->Proxy

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=2
Via: SIP/2.0/UDP here.com:5060
Record-Route: <sip:ss1.wcom.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheLittleGuy <sip:UserB2@there.com>
Content-Type: application/sdp
Content-Length: ...

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

F10
200 OK
Proxy->A

SIP/2.0 200 OK
Via: SIP/2.0/UDP here.com:5060
Record-Route: <sip:ssl.wcom.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheLittleGuy <sip:UserB2@there.com>
Content-Type: application/sdp
Content-Length: ...

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

F11
ACK
A->Proxy

ACK sip:UserB2@there.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
Route: <sip:UserB2.there.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
Call-Id: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0
ACK
Proxy->B2

ACK sip: UserB2@there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
Call-Id: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0

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

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

F14
BYE
Proxy->B2

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

F15
200 OK
B2->Proxy

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
Call-Id: 12345600@here.com
CSeq: 2 BYE
Content-Length: 0

F16
200 OK
Proxy->A

SIP/2.0 200 OK
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
Call-Id: 12345600@here.com
CSeq: 2 BYE
Content-Length: 0
2.7 Call Forwarding "No Answer"

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

<table>
<thead>
<tr>
<th>User A</th>
<th>Proxy</th>
<th>User B1</th>
<th>User B2</th>
</tr>
</thead>
<tbody>
<tr>
<td>INVITE F1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(100 Trying) F3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180 Ringing F5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Request Timeout

|                  |                |             |             |
| CANCEL F6       |                |             |             |
| 200 OK F7       |                |             |             |

INVITE F8

|                  |                |             |             |
| 180 Ringing F9   |                |             |             |

200 OK F10

|                  |                |             |             |
| ACK F12          |                |             |             |

Both way RTP Established

|                  |                |             |             |
| BYE F14          |                |             |             |

200 OK F17

|                  |                |             |             |
|                  |                |             |             |
|                  |                |             |             |
F1
INVITE
A->Proxy

INVITE sip:UserB@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Proxy-Authorization: DIGEST username="UserA", realm="MCI WorldCom SIP", nonce="ea9c8e88df84f1cecc4341ae6cbe5a359", opaque="", uri="sip:ss1.wcom.com", response="dfe56131d1958046689cd83306477ecc"
Content-Type: application/sdp
Content-Length: ...

F2
INVITE
Proxy->B1

INVITE sip:UserB1@there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=1
Via: SIP/2.0/UDP here.com:5060
Record-Route: <sip:ss1.wcom.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Content-Type: application/sdp
Content-Length: ...
F3
(100 Trying)
Proxy->A

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

F4
180 Ringing
B1->Proxy

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

F5
180 Ringing
Proxy->A

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

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

CANCEL sip:UserB1@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=1
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=3145678
Call-Id: 12345600@here.com
CSeq: 1 CANCEL
Content-Length: 0

F7

200 OK
B1->Proxy

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

F8

INVITE
Proxy->B2

INVITE sip:UserB4@there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060;branch=2
Via: SIP/2.0/UDP here.com:5060
Record-Route: <sip:ss1.wcom.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Content-Type: application/sdp
Content-Length: ...

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

F9

180 Ringing
B2->Proxy

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=2
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=123456
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Content-Length: 0

F10
200 OK
B2->Proxy

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

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

F11
200 OK
Proxy->A

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

v=0
o= UserB 2890844527 2890844527 IN IP4 client2.there.com
s=Session SDP
c=IN IP4 110.111.112.114
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
Internet Draft  Service Examples  October 1999

F12
ACK
A->Proxy

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

F13
ACK
Proxy->B2

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

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

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

F15
BYE
Proxy->B2

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

F16
200 OK
B2->Proxy

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

F17
200 OK
Proxy->A

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

2.8 3-way Call

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

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

2.9 Single Line Extension

Single Line Extension (Sequential, First Wins implementation), a call will ring several extensions in sequence. The extension to
answer the call becomes the active set, no other sets may join the call. The signalling for this implementation of Single Line Extension and Find-Me is the same, the difference may be in the provisioning of the service.

2.10 Find-Me

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

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

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

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

F2
INVITE
Proxy->B1

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

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

F3
(100 Trying)
Proxy->A

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

F4
180 Ringing
B1->Proxy

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=1
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=123456
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Content-Length: 0

F5
180 Ringing
Proxy->A

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

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

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

F7
200 OK
B1->Proxy

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

F8
INVITE
Proxy->B2

INVITE sip:UserB2@there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060; branch=2
Via: SIP/2.0/UDP here.com:5060
Record-Route: <sip:ss1.wcom.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Content-Type: application/sdp
Content-Length: ...

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

F9
480 Not Logged In
B2->Proxy

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

F10
ACK
Proxy->B2

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

F11
INVITE
Proxy->B3

INVITE sip:UserB3@there.com SIP/2.0
Via: SIP/2.0/UDP ssl.wcom.com:5060; branch=3
Via: SIP/2.0/UDP here.com:5060
Record-Route: <sip:ssl.wcom.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Content-Type: application/sdp
Content-Length: ...

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

F12
486 Busy Here
B3->Proxy

SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP ssl1.wcom.com:5060; branch=3
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Content-Length: 0

F13
ACK
Proxy->B3

ACK sip: UserB3@ssl1.wcom.com SIP/2.0
Via: SIP/2.0/UDP ssl1.wcom.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=7654321
Call-Id: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0

F14
INVITE
Proxy->B4

INVITE sip:UserB4@there.com SIP/2.0
Via: SIP/2.0/UDP ssl1.wcom.com:5060;branch=4
Via: SIP/2.0/UDP here.com:5060
Record-Route: <sip:ss1.wcom.com>
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Content-Type: application/sdp
Content-Length: ...

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

F15
180 Ringing
B4->Proxy

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

F16
200 OK
B4->Proxy

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

v=0
o=UserB 2890844527 2890844527 IN IP4 client4.there.com
s=Session SDP
c=IN IP4 110.111.112.116
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
F17
200 OK
Proxy->A

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

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

F18
ACK
A->Proxy

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

F19
ACK
Proxy->B4

ACK sip: UserB4@there.com SIP/2.0
Via: SIP/2.0/UDP ss1.wcom.com:5060
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>;tag=7137136
Call-Id: 12345600@here.com
CSeq: 1 ACK
Content-Length: 0
F20 /* RTP streams are established between A and B4*/
/* User B4 Hangs Up with User A. */
BYE
B4->Proxy

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

F21
BYE
Proxy->A

   BYE sip: UserA@here.com SIP/2.0
   Via: SIP/2.0/UDP ssl1.wcom.com:5060
   Via: SIP/2.0/UDP there.com:5060
   From: TheLittleGuy <sip:UserB@there.com>;tag=7137136
   To: TheBigGuy <sip:UserA@here.com>;tag=1234567
   Call-Id: 12345600@here.com
   CSeq: 2 BYE
   Content-Length: 0

F22
200 OK
A->Proxy

   SIP/2.0 200 OK
   Via: SIP/2.0/UDP ssl1.wcom.com:5060
   Via: SIP/2.0/UDP there.com:5060
   From: TheLittleGuy <sip:UserB@there.com>;tag=7137136
   To: TheBigGuy <sip:UserA@here.com>;tag=1234567
   Call-Id: 12345600@here.com
   CSeq: 2 BYE
   Content-Length: 0

F23
200 OK
Proxy->B4

   SIP/2.0 200 OK
   Via: SIP/2.0/UDP there.com:5060
   From: TheLittleGuy <sip:UserB@there.com>;tag=7137136
   To: TheBigGuy <sip:UserA@here.com>;tag=1234567
2.11 Call Management (Incoming Call Screening)

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

User A          Proxy          User B

<table>
<thead>
<tr>
<th>INVITE F1</th>
<th></th>
<th></th>
</tr>
</thead>
</table>
<------------------|--------------|--------------|
| 407 Proxy Authorization F2 |
<------------------|--------------|--------------|
<table>
<thead>
<tr>
<th>ACK F3</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>INVITE F4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
</tbody>
</table>
<------------------|--------------|--------------|
| 403 Screening Failure (Terminating) F5 |
<------------------|--------------|--------------|
| ACK F3            |              |              |

F1
Invite
A->Proxy1

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

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

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

SIP/2.0 407 Proxy Authorization Required
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Proxy-Authenticate: Digest realm="MCI WorldCom SIP",
domain="wcom.com", nonce="ea9c8e88df84f1cecc4341ae6cbe5a359",
opaque="", stale="FALSE", algorithm="MD5"
Content-Length:0

F3
ACK
A -> Proxy 1

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

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

INVITE sip:UserB@ssl.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345601@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Proxy-Authentication: DIGEST username="UserA", realm="MCI
WorldCom SIP", nonce="ea9c8e88df84f1cecc4341ae6cbe5a359",
opaque="", uri="sip:ssl.wcom.com",
response="dfe56131d1958046689cd83306477ecc"
Content-Type: application/sdp
Content-Length: ...

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

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

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

F6
ACK
A -> Proxy 1

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

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

```
User A  Proxy  User B

F1  INVITE       User A           Proxy          User B
    ------------------->
    | 407 Proxy Authorization |              |
    |<------------------------|
    | ACK F3                  |
    |------------------------|
    | INVITE F4               |
    |------------------------|
    | 403 Screening Failure (Originating) |
    |<------------------------|
    | ACK F3                  |
    |------------------------|

F1 Invite
A->Proxy
```

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

v=0
o=UserA 2890844526 2890844526 IN IP4 client.here.com
s=Session SDP
c=IN IP4 100.101.102.103
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```
F2 /* Proxy 1 challenges User A for authentication */
407 Proxy Authorization Required
Proxy 1 -> A

SIP/2.0 407 Proxy Authorization Required
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345600@here.com
CSeq: 1 INVITE
Proxy-Authenticate: Digest realm="MCI WorldCom SIP",
domain="wcom.com", nonce="ea9c8e88df84f1cecc4341ae6cbe5a359",
opaque="", stale="FALSE", algorithm="MD5"
Content-Length:0

F3
ACK
A -> Proxy 1

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

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

INVITE sip:UserB@ss1.wcom.com SIP/2.0
Via: SIP/2.0/UDP here.com:5060
From: TheBigGuy <sip:UserA@here.com>
To: TheLittleGuy <sip:UserB@there.com>
Call-Id: 12345601@here.com
CSeq: 1 INVITE
Contact: TheBigGuy <sip:UserA@here.com>
Proxy-Authorization: DIGEST username="UserA", realm="MCI
WorldCom SIP", nonce="ea9c8e88df84f1cecc4341ae6cbe5a359",
opaque="", uri="sip:ss1.wcom.com",
response="dfe56131d1958046689cd83306477ecc"
Content-Type: application/sdp
Content-Length: ...

v=0
o=2890844526
s=Session SDP
MCI WorldCom
c=IN IP4 100.101.102.103
t=3034423619 0
m=audio 49170 RTP/AVP 0
a=rtpmap:0 PCMU/8000

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

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

F6
ACK
A -> Proxy 1

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


