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A. Johnston
WorldCom
S. Donovan
R. Sparks
C. Cunningham
dynamicsoft
K. Summers
Sonus
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Session Initiation Protocol Basic Call Flow Examples

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Abstract

This informational document gives examples of Session Initiation Protocol (SIP) call flows. Elements in these call flows include SIP User Agents and Clients, SIP Proxy and Redirect Servers. Scenarios include SIP Registration and SIP session establishment. Call flow diagrams and message details are shown.

Conventions used in this document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC-2119](#) [1].

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[1.](#) Overview

The call flows shown in this document were developed in the design of a carrier-class SIP IP Telephony network. They represent an example minimum set of functionality for SIP to be used in IP Telephony applications.

It is the hope of the authors that this document will be useful for SIP implementors, 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 interoperable

SIP IP Telephony implementation.

These call flows are based on the current version 2.0 of SIP in [RFC 3261](#)[2] with SDP usage described in [RFC 3264](#)[3].

Call flow examples of SIP interworking with the PSTN through gateways are contained in a companion document, RFC xxxx[4].

[1.1](#) General Assumptions

A number of architecture, network, and protocol assumptions underly the call flows in this document. Note that these assumptions are not requirements. They are outlined in this section so that they may be taken into consideration and to aid in the understanding of the call flow examples.

The authentication of SIP User Agents in these example call flows is performed using SIP Digest as defined in [3] and [5].

Some Proxy Servers in these call flows insert Record-Route headers into requests to ensure that they are in the signaling path for future message exchanges.

These flows show UDP for transport. Other transport schemes could also be used.

[1.2](#) Legend for Message Flows

Dashed lines (---) represent signaling messages that are mandatory to the call scenario. These messages can be SIP or PSTN signaling. The arrow indicates the direction of message flow.

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

Messages with parentheses around their name represent optional messages.

Messages are identified in the Figures as F1, F2, etc. This references the message details in the list that follows the Figure. Comments in the message details are shown in the following form:

/* Comments. */

[1.3](#) SIP Protocol Assumptions

This document is informational only and is NOT NORMATIVE in any sense.

For simplicity in reading and editing the document, there are a number of differences between some of the examples and actual SIP messages. For example, the SIP Digest responses are not actual MD5 encodings. Call-IDs are often repeated, and CSeq counts often begin at 1. Header fields are usually shown in the same order. Usually only the minimum required header field set is shown, others that

would normally be present such as Accept, Supported, Allow, etc are not shown.

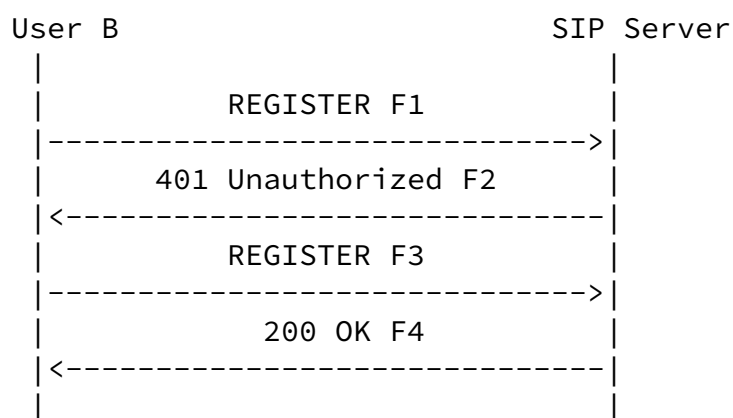
Actors:

Element	Display Name	URI	IP Address
-----	-----	---	-----
User Agent	BigGuy	UserA@atlanta.com	192.168.100.101
User Agent	LittleGuy	UserB@biloxi.com	192.168.200.201
User Agent		UserB@chicago.com	192.168.200.100
Proxy Server		ss1.atlanta.com	192.168.255.111
Proxy/Registrar		ss2.biloxi.com	192.168.156.222
Proxy Server		ss3.chicago.com	192.168.182.333
ALG		alg1.atlanta.com	192.168.255.128

[2.](#) SIP Registration

Registration binds a particular device Contact URI with a SIP user AOR (Address of Record).

[2.1](#) Successful New Registration



User B sends a SIP REGISTER request to the SIP server. The request

includes the user's contact list. The SIP server provides a challenge to User B. User B enters her/his valid user ID and password. User B's SIP client encrypts the user information according to the challenge issued by the SIP server and sends the response to the SIP server. The SIP server validates the user's credentials. It registers the user in its contact database and returns a response (200 OK) to User B's SIP client. The response includes the user's current contact list in Contact headers. The format of the authentication shown is SIP digest. It is assumed that User B has not previously registered with this Server.

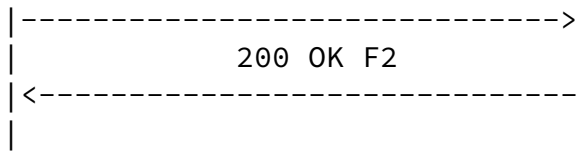
Message Details

F1 REGISTER B -> SIP Server

```
REGISTER sip:ss2.biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@biloxi.com>;tag=a73kszlfl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 1j9FpLxk3uxtm8tn@biloxi.com
CSeq: 1 REGISTER
Contact: <sip:UserB@192.168.200.201>
Content-Length: 0
```

F2 401 Unauthorized SIP Server -> User B

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
;received=192.168.200.201
From: LittleGuy <sip:UserB@biloxi.com>;tag=a73kszlfl
To: LittleGuy <sip:UserB@biloxi.com>;tag=1410948204
Call-ID: 1j9FpLxk3uxtm8tn@biloxi.com
CSeq: 1 REGISTER
WWW-Authenticate: Digest realm="atlanta.com", qop="auth",
nonce="ea9c8e88df84f1cec4341ae6cbe5a359",
opaque="", stale=FALSE, algorithm=MD5
Content-Length: 0
```

User B wishes to update the list of addresses where the SIP server will redirect or forward INVITE requests.

User B sends a SIP REGISTER request to the SIP server. User B's request includes an updated contact list. Since the user already has authenticated with the server, the user supplies authentication credentials with the request and is not challenged by the server. The SIP server validates the user's credentials. It registers the user in its contact database, updates the user's contact list, and returns a response (200 OK) to User B's SIP client. The response includes the user's current contact list in Contact headers.

Message Details

F1 REGISTER B -> SIP Server

```

REGISTER sip:ss2.biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@biloxi.com>;tag=a73kszlfl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 1j9FpLxk3uxtm8tn@biloxi.com
CSeq: 1 REGISTER
Contact: mailto:UserB@biloxi.com
Authorization: Digest username="UserB", realm="atlanta.com",
  qop="auth", nonce="1cec4341ae6cbe5a359ea9c8e88df84f", opaque="",
  uri="sip:ss2.biloxi.com",
  response="71ba27c64bd01de719686aa4590d5824"
Content-Length: 0
  
```

F2 200 OK SIP Server -> B

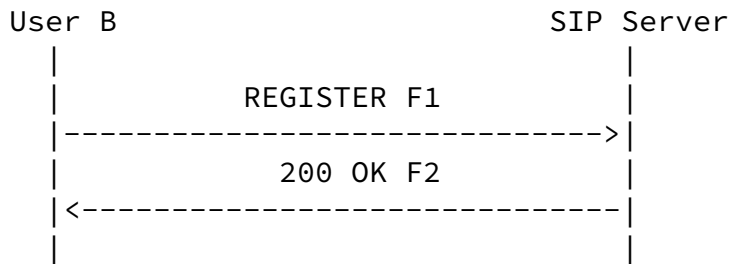
```

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


;received=192.168.200.201
From: LittleGuy <sip:UserB@biloxi.com>;tag=a73kszlfl
To: LittleGuy <sip:UserB@biloxi.com>;tag=34095828jh
Call-ID: 1j9FpLxk3uxtm8tn@biloxi.com
CSeq: 1 REGISTER
Contact: <sip:UserB@192.168.200.201>;expires=3600
Contact: <mailto:UserB@biloxi.com>;expires=4294967295
Content-Length: 0

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2.3 Request for Current Contact List

User B sends a register request to the Proxy Server containing no Contact headers, indicating the user wishes to query the server for the user's current contact list. Since the user already has authenticated with the server, the user supplies authentication credentials with the request and is not challenged by the server. The SIP server validates the user's credentials. The server returns a response (200 OK) which includes the user's current registration list in Contact headers.

Message Details

F1 REGISTER B -> SIP Server

```

REGISTER sip:ss2.biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@biloxi.com>;tag=a73kszlfl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 1j9FpLxk3uxtm8tn@biloxi.com
CSeq: 1 REGISTER
Authorization: Digest username="UserB", realm="atlanta.com",
  nonce="df84f1cec4341ae6cbe5ap359a9c8e88", opaque="",
  uri="sip:ss2.biloxi.com",
  response="aa7ab4678258377c6f7d4be6087e2f60"
Content-Length: 0
  
```

F2 200 OK SIP Server -> B

SIP/2.0 200 OK

Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
;received=192.168.200.201
From: LittleGuy <sip:UserB@biloxi.com>;tag=a73kszlfl
To: LittleGuy <sip:UserB@biloxi.com>;tag=jqoiweu75
Call-ID: 1j9FpLxk3uxtm8tn@biloxi.com
CSeq: 1 REGISTER

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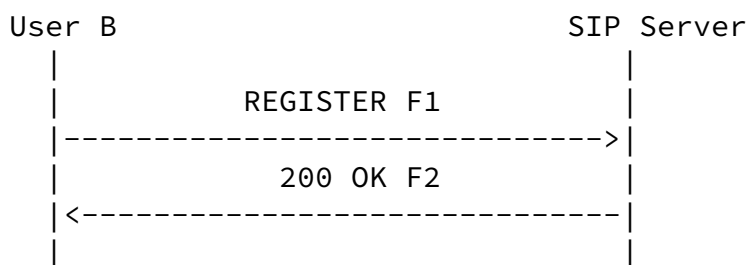
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Contact: <sip:UserB@192.168.200.201>;expires=3600
Contact: <mailto:UserB@biloxi.com>;expires=4294967295
Content-Length: 0

2.4 Cancellation of Registration



User B wishes to cancel their registration with the SIP server. User B sends a SIP REGISTER request to the SIP server. The request has an expiration period of 0 and applies to all existing contact locations. Since the user already has authenticated with the server, the user supplies authentication credentials with the request and is not challenged by the server. The SIP server validates the user's credentials. It clears the user's contact list, and returns a response (200 OK) to User B's SIP client.

Message Details

F1 REGISTER B -> SIP Server

```
REGISTER sip:ss2.biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
```

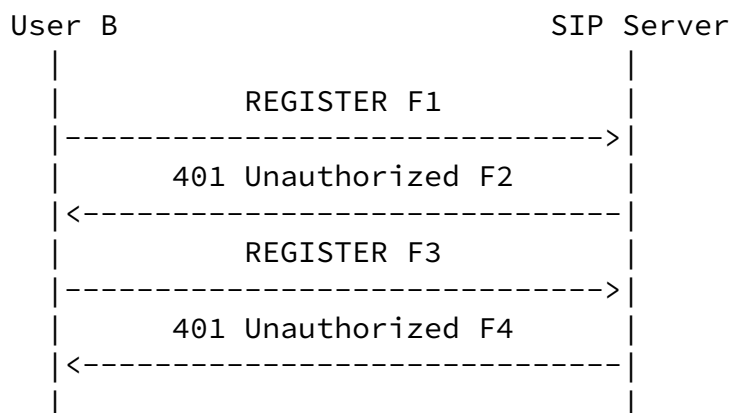
From: LittleGuy <sip:UserB@biloxi.com>;tag=a73kszlfl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 1j9FpLxk3uxtm8tn@biloxi.com
CSeq: 1 REGISTER
Expires: 0
Contact: *
Authorization: Digest username="UserB", realm="atlanta.com",
nonce="88df84f1cac4341aea9c8ee6cbe5a359", opaque="",
uri="sip:ss2.biloxi.com",
response="ff0437c51696f9a76244f0cf1dbabbea"
Content-Length: 0

F2 200 OK SIP Server -> B

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
;received=192.168.200.201
From: LittleGuy <sip:UserB@biloxi.com>;tag=a73kszlfl
To: LittleGuy <sip:UserB@biloxi.com>;tag=1418nmhsrf

Call-ID: 1j9FpLxk3uxtm8tn@biloxi.com
CSeq: 1 REGISTER
Content-Length: 0

[2.5](#) Unsuccessful Registration



User B sends a SIP REGISTER request to the SIP Server. The SIP server provides a challenge to User B. User B enters her/his user ID and password. User B's SIP client encrypts the user information according to the challenge issued by the SIP server and sends the response to the SIP server. The SIP server attempts to validate the user's credentials, but they are not valid (the user's password does not match the password established for the user's account). The server returns a response (401 Unauthorized) to User B's SIP client.

Message Details

F1 REGISTER B -> SIP Server

```
REGISTER sip:ss2.biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@biloxi.com>;tag=a73kszlfl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 1j9FpLxk3uxtm8tn@biloxi.com
CSeq: 1 REGISTER
Contact: <sip:UserB@192.168.200.201>
Content-Length: 0
```

F2 Unauthorized SIP Server -> User B

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
;received=192.168.200.201
```

```
From: LittleGuy <sip:UserB@biloxi.com>;tag=a73kszlfl
To: LittleGuy <sip:UserB@biloxi.com>;tag=1410948204
Call-ID: 1j9FpLxk3uxtm8tn@biloxi.com
CSeq: 1 REGISTER
WWW-Authenticate: Digest realm="atlanta.com", qop="auth",
  nonce="f1cec4341ae6ca9c8e88df84be55a359",
  opaque="", stale=FALSE, algorithm=MD5
Content-Length: 0
```

F3 REGISTER B -> SIP Server

```
REGISTER sip:ss2.biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@biloxi.com>;tag=JueHGuidj28dfga
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 1j9FpLxk3uxtm8tn@biloxi.com
CSeq: 2 REGISTER
Contact: <sip:UserB@192.168.200.201>
Authorization: Digest username="UserB", realm="atlanta.com",
  nonce="f1cec4341ae6ca9c8e88df84be55a359", opaque="",
  uri="sip:ss2.biloxi.com",
  response="61f8470ceb87d7ebf508220214ed438b"
Content-Length: 0
```

/* The response above encodes the incorrect password */

F4 401 Unauthorized SIP Server -> User B

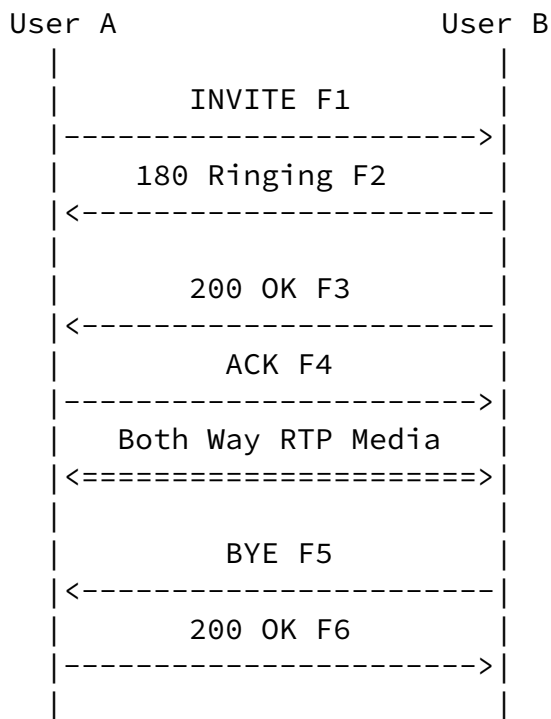
```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
  ;received=192.168.200.201
From: LittleGuy <sip:UserB@biloxi.com>;tag=JueHGuidj28dfga
To: LittleGuy <sip:UserB@biloxi.com>;tag=1410948204
Call-ID: 1j9FpLxk3uxtm8tn@biloxi.com
CSeq: 2 REGISTER
WWW-Authenticate: Digest realm="atlanta.com", qop="auth",
  nonce="84f1c1ae6cbe5ua9c8e88dfa3ecm3459",
  opaque="", stale=FALSE, algorithm=MD5
Content-Length: 0
```


3. SIP Session Establishment

This section details session establishment between two SIP User Agents (UAs): User A and User B. User A (LittleGuy sip:UserA@atlanta.com) and User B (BigGuy sip:UserB@biloxi.com) are assumed to be SIP phones or SIP-enabled devices. The successful calls show the initial signaling, the exchange of media information in the form of SDP payloads, the establishment of the media session, then finally the termination of the call.

SIP digest authentication is used by Proxy Servers to authenticate the caller User A. It is assumed that User B has registered with Proxy Server Proxy 2 as per [Section 2](#) to be able to receive the calls via the Proxy.

3.1 Successful Session Establishment



In this scenario, User A completes a call to User B directly.

Message Details

F1 INVITE User A -> User B

```
INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
```

```
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 3848276298220188511@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Type: application/sdp
Content-Length: 147
```

```
v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F2 180 Ringing User B -> User A

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=8321234356
Call-ID: 3848276298220188511@atlanta.com
CSeq: 1 INVITE
Content-Length: 0
```

F3 200 OK User B -> User A

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=8321234356
Call-ID: 3848276298220188511@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Type: application/sdp
Content-Length: 145
```

```
v=0
o=UserB 2890844527 2890844527 IN IP4 client.biloxi.com
s=-
c=IN IP4 192.168.200.201
```

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

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F4 ACK User A -> User B

```
ACK sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=8321234356
Call-ID: 3848276298220188511@atlanta.com
CSeq: 1 ACK
Content-Length: 0
```

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

/* User B Hangs Up with User A. Note that the CSeq is NOT 2, since User A and User B maintain their own independent CSeq counts. (The INVITE was request 1 generated by User A, and the BYE is request 1 generated by User B) */

F5 BYE User B -> User A

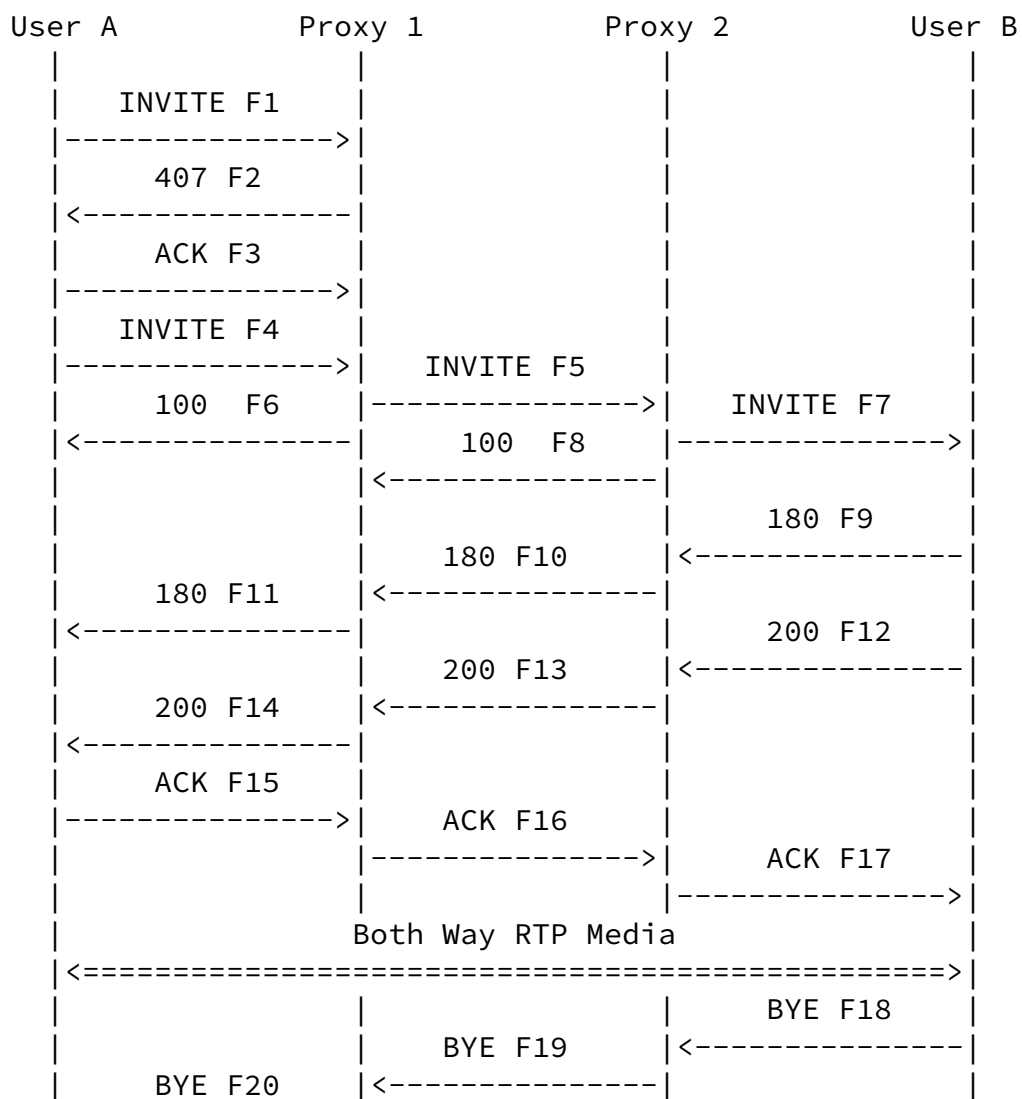
```
BYE sip:UserA@192.168.100.101 SIP/2.0
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
From: LittleGuy <sip:UserB@biloxi.com>;tag=8321234356
To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
Call-ID: 3848276298220188511@atlanta.com
CSeq: 1 BYE
Content-Length: 0
```

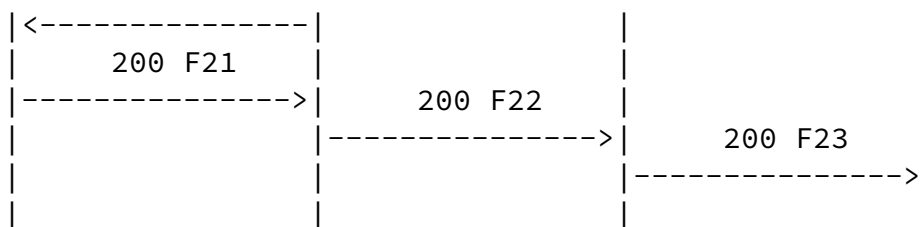
F6 200 OK User A -> User B

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
;received=192.168.200.201
From: LittleGuy <sip:UserB@biloxi.com>;tag=8321234356
```

To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
 Call-ID: 3848276298220188511@atlanta.com
 CSeq: 1 BYE
 Content-Length: 0

[3.2](#) Session Establishment Through Two Proxies





In this scenario, User A completes a call to User B using two proxies Proxy 1 and Proxy 2. The initial INVITE (F1) contains a pre-loaded Route header with the address of Proxy 1 (Proxy 1 is configured as a default outbound proxy for User A). The request does not contain the Authorization credentials Proxy 1 requires, so a 407 Proxy Authorization response is sent containing the challenge information. A new INVITE (F4) is then sent containing the correct credentials and the call proceeds. The call terminates when User B disconnects by initiating a BYE message.

Proxy 1 inserts a Record-Route header into the INVITE message to ensure that it is present in all subsequent message exchanges. Proxy 2 also inserts itself into the Record-Route header. The ACK (F15) and BYE (F18) both have a Route header.

Message Details

F1 INVITE A -> Proxy 1

```

INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
Route: <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 3848276298220188511@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Type: application/sdp
Content-Length: 147
  
```

v=0

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

s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000

/* Proxy 1 challenges User A for authentication */

F2 407 Proxy Authorization Required Proxy 1 -> User A

SIP/2.0 407 Proxy Authorization Required
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=3flal12sf
Call-ID: 3848276298220188511@atlanta.com
CSeq: 1 INVITE
Proxy-Authenticate: Digest realm="atlanta.com", qop="auth",
nonce="f84f1cec41e6cbe5aea9c8e88d359",
opaque="", stale=FALSE, algorithm=MD5
Content-Length: 0

F3 ACK A -> Proxy 1

ACK sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=3flal12sf
Call-ID: 3848276298220188511@atlanta.com
CSeq: 1 ACK
Content-Length: 0

/* User A responds by re-sending the INVITE with authentication
credentials in it. */

F4 INVITE A -> Proxy 1

INVITE sip:UserB@biloxi.com SIP/2.0

Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
Route: <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 3848276298220188511@atlanta.com
CSeq: 2 INVITE
Contact: <sip:UserA@192.168.100.101>
Proxy-Authorization: Digest username="UserA", realm="atlanta.com",
nonce="wf84f1ceczx41ae6cbe5aea9c8e88d359", opaque="",
uri="sip:UserB@biloxi.com", response="42ce3cef44b22f50c6a6071bc8"
Content-Type: application/sdp
Content-Length: 147

v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000

/* Proxy 1 accepts the credentials and forwards the INVITE to Proxy
2. Proxy 1 is assumed to have been authenticated by Proxy 2 using
IPSec. Client for A prepares to receive data on port 49172 from the
network. */

F5 INVITE Proxy 1 -> Proxy 2

INVITE sip:UserB@biloxi.com SIP/2.0

Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Max-Forwards: 69
Record-Route: <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 3848276298220188511@atlanta.com
CSeq: 2 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Type: application/sdp

Content-Length: 147

v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F6 100 Trying Proxy 1 -> User A

SIP/2.0 100 Trying
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 3848276298220188511@atlanta.com
CSeq: 2 INVITE
Content-Length: 0

F7 INVITE Proxy 2 -> B

INVITE sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Max-Forwards: 68
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 3848276298220188511@atlanta.com
CSeq: 2 INVITE
Contact: <sip:UserA@192.168.100.101>

Content-Type: application/sdp
Content-Length: 147

v=0

o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F8 100 Trying Proxy 2 -> Proxy 1

SIP/2.0 100 Trying
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 3848276298220188511@atlanta.com
CSeq: 2 INVITE
Content-Length: 0

F9 180 Ringing B -> Proxy 2

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
;received=192.168.156.222
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 3848276298220188511@atlanta.com
Contact: <sip:UserB@192.168.200.201>
CSeq: 2 INVITE
Content-Length: 0

F10 180 Ringing Proxy 2 -> Proxy 1

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111

Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 3848276298220188511@atlanta.com
Contact: <sip:UserB@192.168.200.201>
CSeq: 2 INVITE
Content-Length: 0

F11 180 Ringing Proxy 1 -> A

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 3848276298220188511@atlanta.com
Contact: <sip:UserB@192.168.200.201>
CSeq: 2 INVITE
Content-Length: 0

F12 200 OK B -> Proxy 2

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
;received=192.168.156.222
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 3848276298220188511@atlanta.com
CSeq: 2 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Type: application/sdp
Content-Length: 145

v=0

o=UserB 2890844527 2890844527 IN IP4 client.biloxi.com

s=-

c=IN IP4 192.168.200.201

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

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a=rtpmap:0 PCMU/8000

F13 200 OK Proxy 2 -> Proxy 1

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 3848276298220188511@atlanta.com
CSeq: 2 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Type: application/sdp
Content-Length: 145

v=0
o=UserB 2890844527 2890844527 IN IP4 client.biloxi.com
s=-
c=IN IP4 192.168.200.201
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F14 200 OK Proxy 1 -> A

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 3848276298220188511@atlanta.com
CSeq: 2 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Type: application/sdp

Content-Length: 145

v=0
o=UserB 2890844527 2890844527 IN IP4 client.biloxi.com
s=-
c=IN IP4 192.168.200.201
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

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F15 ACK A -> Proxy 1

ACK sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
Route: <sip:ss1.atlanta.com;lr>, <sip:ss2.biloxi.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 3848276298220188511@atlanta.com
CSeq: 2 ACK
Content-Length: 0

F16 ACK Proxy 1 -> Proxy 2

ACK sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Max-Forwards: 69
Route: <sip:ss2.biloxi.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 3848276298220188511@atlanta.com
CSeq: 2 ACK
Content-Length: 0

F17 ACK Proxy 2 -> B

ACK sip:UserB@192.168.200.201 SIP/2.0

Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Max-Forwards: 68
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 3848276298220188511@atlanta.com
CSeq: 2 ACK
Content-Length: 0

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

/* User B Hangs Up with User A. */

/* Again, note that the CSeq is NOT 3. User A and User B maintain their own separate CSeq counts */

F18 BYE User B -> Proxy 2

BYE sip:UserA@192.168.100.101 SIP/2.0
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: LittleGuy <sip:UserB@biloxi.com>;tag=314159
To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
Call-ID: 3848276298220188511@atlanta.com
CSeq: 1 BYE
Content-Length: 0

F19 BYE Proxy 2 -> Proxy 1

BYE sip:UserA@192.168.100.101 SIP/2.0
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
;received=192.168.200.201
Max-Forwards: 69
Route: <sip:ss1.atlanta.com;lr>
From: LittleGuy <sip:UserB@biloxi.com>;tag=314159

To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
Call-ID: 3848276298220188511@atlanta.com
CSeq: 1 BYE
Content-Length: 0

F20 BYE Proxy 1 -> User A

BYE sip:UserA@192.168.100.101 SIP/2.0
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
;received=192.168.156.222
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
;received=192.168.200.201
Max-Forwards: 68
From: LittleGuy <sip:UserB@biloxi.com>;tag=314159
To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
Call-ID: 3848276298220188511@atlanta.com
CSeq: 1 BYE
Content-Length: 0

F21 200 OK User A -> Proxy 1

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
;received=192.168.156.222
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
;received=192.168.200.201
From: LittleGuy <sip:UserB@biloxi.com>;tag=314159
To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
Call-ID: 3848276298220188511@atlanta.com
CSeq: 1 BYE
Content-Length: 0

F22 200 OK Proxy 1 -> Proxy 2

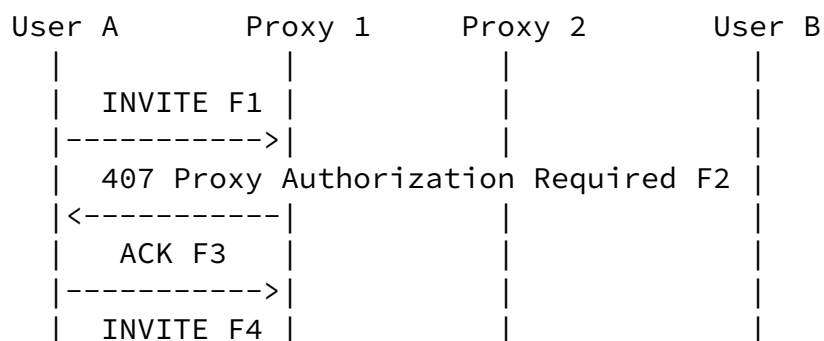
SIP/2.0 200 OK
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1

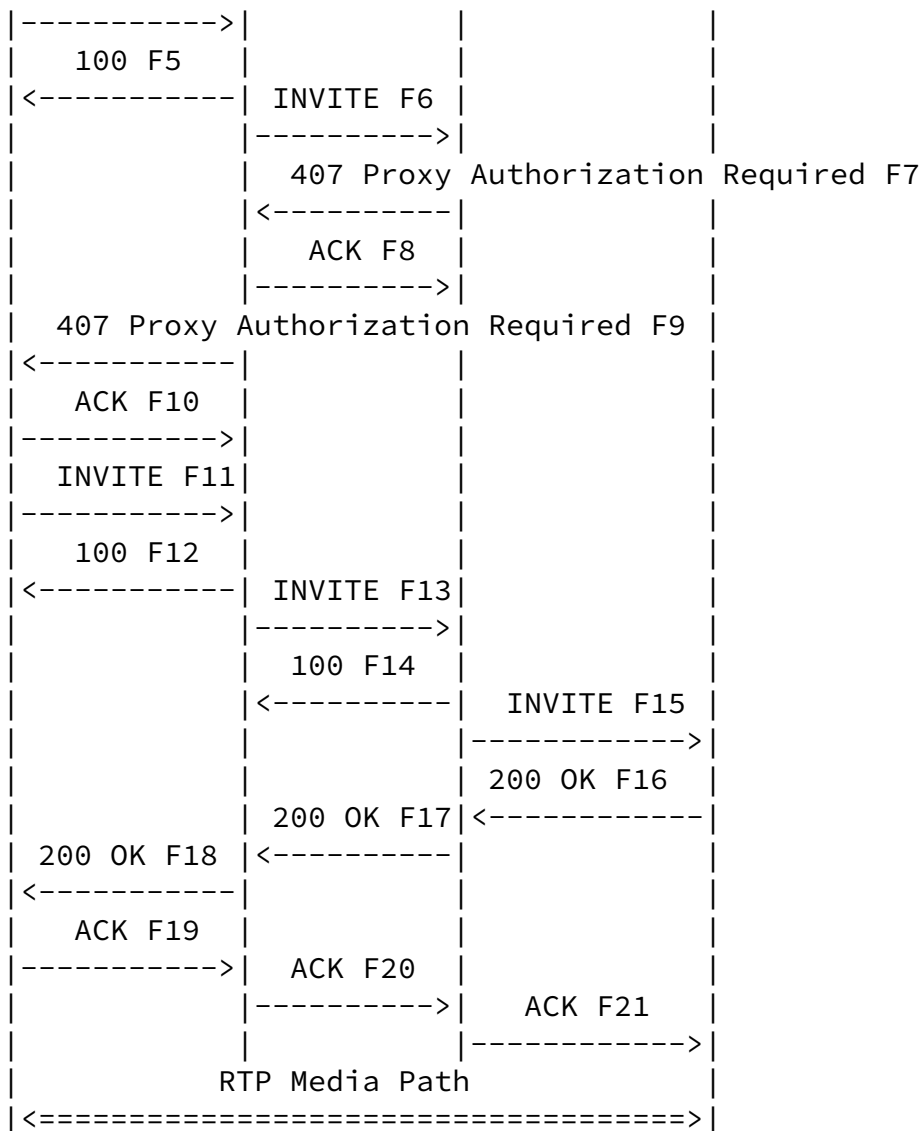
;received=192.168.156.222
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
;received=192.168.100.101
From: LittleGuy <sip:UserB@biloxi.com>;tag=314159
To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
Call-ID: 3848276298220188511@atlanta.com
CSeq: 1 BYE
Content-Length: 0

F23 200 OK Proxy 2 -> User B

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
;received=192.168.200.201
From: LittleGuy <sip:UserB@biloxi.com>;tag=314159
To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
Call-ID: 3848276298220188511@atlanta.com
CSeq: 1 BYE
Content-Length: 0

[3.3](#) Session with Multiple Proxy Authentication





In this scenario, User A completes a call to User B using two proxies Proxy 1 and Proxy 2. User A has valid credentials in both domains. Since the initial INVITE (F1) does not contain the Authorization credentials Proxy 1 requires, so a 407 Proxy Authorization response is sent containing the challenge information. A new INVITE (F4) is then sent containing the correct credentials and

the call proceeds after Proxy 2 challenges and receives valid credentials. The call terminates when User B disconnects by initiating a BYE message.

Proxy 1 inserts a Record-Route header into the INVITE message to

ensure that it is present in all subsequent message exchanges. Proxy 2 also inserts itself into the Record-Route header.

Message Details

F1 INVITE A -> Proxy 1

```
INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
Route: <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Type: application/sdp
Content-Length: 147
```

```
v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

/* Proxy 1 challenges User A for authentication */

F2 407 Proxy Authorization Required Proxy 1 -> User A

```
SIP/2.0 407 Proxy Authorization Required
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=876321
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Proxy-Authenticate: Digest realm="atlanta.com", qop="auth",
nonce="wf84f1cczx41ae6cbeaea9ce88d359",
```

opaque="", stale=FALSE, algorithm=MD5
Content-Length: 0

F3 ACK A -> Proxy 1

ACK sip:UserB@biloxi.com SIP/2.0
Max-Forwards: 70
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=876321
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 ACK
Content-Length: 0

/* User A responds by re-sending the INVITE with authentication
credentials in it. The same Call-ID is used, so the CSeq is
increased. */

F4 INVITE A -> Proxy 1

INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
Route: <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 2 INVITE
Contact: <sip:UserA@192.168.100.101>
Proxy-Authorization: Digest username="UserA", realm="atlanta.com",
nonce="wf84f1ceczx41ae6cbe5aea9c8e88d359", opaque="",
uri="sip:UserB@biloxi.com", response="42ce3cef44b22f50c6a6071bc8"
Content-Type: application/sdp
Content-Length: 147

v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000

/* Proxy 1 accepts the credentials and forwards the INVITE to Proxy
2. Proxy 1 is assumed to have been authenticated by Proxy 2 using
IPSec. Client for A prepares to receive data on port 49172 from the

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```
network. */
```

```
F5 100 Trying Proxy 1 -> User A
```

```
SIP/2.0 100 Trying
```

```
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9  
;received=192.168.100.101
```

```
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
```

```
To: LittleGuy <sip:UserB@biloxi.com>
```

```
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
```

```
CSeq: 2 INVITE
```

```
Content-Length: 0
```

```
F6 INVITE Proxy 1 -> Proxy 2
```

```
INVITE sip:UserB@biloxi.com SIP/2.0
```

```
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK230f2.1
```

```
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9  
;received=192.168.100.101
```

```
Max-Forwards: 69
```

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

```
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
```

```
To: LittleGuy <sip:UserB@biloxi.com>
```

```
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
```

```
CSeq: 2 INVITE
```

```
Contact: <sip:UserA@192.168.100.101>
```

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

```
Content-Length: 147
```

```
v=0
```

```
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
```

```
s=-
```

```
c=IN IP4 192.168.100.101
```

```
t=0 0
```

```
m=audio 49172 RTP/AVP 0
```

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

```
/* Proxy 2 challenges User A for authentication */
```

```
F7 407 Proxy Authorization Required Proxy 2 -> Proxy 1
```

SIP/2.0 407 Proxy Authorization Required
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK230f2.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl

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To: LittleGuy <sip:UserB@biloxi.com>;tag=838209
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 2 INVITE
Proxy-Authenticate: Digest realm="biloxi.com", qop="auth",
nonce="c1e22c41ae6cbe5ae983a9c8e88d359",
opaque="", stale=FALSE, algorithm=MD5
Content-Length: 0

F8 ACK Proxy 1 -> Proxy 2

ACK sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=838209
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 2 ACK
Content-Length: 0

/* Proxy 1 forwards the challenge to User A for authentication from
Proxy 2 */

F9 407 Proxy Authorization Required Proxy 1 -> User A

SIP/2.0 407 Proxy Authorization Required
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=838209
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 2 INVITE
Proxy-Authenticate: Digest realm="biloxi.com", qop="auth",
nonce="c1e22c41ae6cbe5ae983a9c8e88d359",

opaque="", stale=FALSE, algorithm=MD5
Content-Length: 0

F10 ACK User A -> Proxy 1

ACK sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=838209
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 2 ACK
Content-Length: 0

/* User A responds by re-sending the INVITE with authentication
credentials for Proxy 1 AND Proxy 2. */

F11 INVITE A -> Proxy 1

INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 3 INVITE
Contact: <sip:UserA@192.168.100.101>
Proxy-Authorization: Digest username="UserA", realm="atlanta.com",
nonce="wf84f1ceczx41ae6cbe5aea9c8e88d359", opaque="",
uri="sip:UserB@biloxi.com", response="42ce3cef44b22f50c6a6071bc8"
Proxy-Authorization: Digest username="UserA", realm="biloxi.com",
nonce="c1e22c41ae6cbe5ae983a9c8e88d359", opaque="",
uri="sip:UserB@biloxi.com", response="f44ab22f150c6a56071bce8"
Content-Type: application/sdp
Content-Length: 147

v=0

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

s=-

c=IN IP4 192.168.100.101

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

/* Proxy 1 finds its credentials and authorizes User A, forwarding
the INVITE to Proxy. */

F12 100 Trying Proxy 1 -> User A

SIP/2.0 100 Trying
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 3 INVITE
Content-Length: 0

F13 INVITE Proxy 1 -> Proxy 2

INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK230f2.1
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Max-Forwards: 69
Record-Route: <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 3 INVITE
Contact: <sip:UserA@192.168.100.101>
Proxy-Authorization: Digest username="UserA", realm="biloxi.com",
nonce="c1e22c41ae6cbe5ae983a9c8e88d359", opaque="",
uri="sip:UserB@biloxi.com", response="f44ab22f150c6a56071bce8"
Content-Type: application/sdp
Content-Length: 147

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

s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000

/* Proxy 2 finds its credentials and authorizes User A, forwarding
the INVITE to User B. */

F14 100 Trying Proxy 2 -> Proxy 1

SIP/2.0 100 Trying
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK230f2.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 3 INVITE
Content-Length: 0

F15 INVITE Proxy 2 -> User B

INVITE sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK31972.1

Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK230f2.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Max-Forwards: 68
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 3 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Type: application/sdp
Content-Length: 147

v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000

/* User B answers the call immediately */

F16 200 OK User B -> Proxy 2

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK31972.1
;received=192.168.156.222
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK230f2.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=9103874
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 3 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Type: application/sdp
Content-Length: 145

v=0
o=UserB 2890844527 2890844527 IN IP4 client.biloxi.com
s=-
c=IN IP4 192.168.200.201
t=0 0
m=audio 3456 RTP/AVP 0

a=rtpmap:0 PCMU/8000

F17 200 OK Proxy 2 -> Proxy 1

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK230f2.1

;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=9103874
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 3 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Type: application/sdp
Content-Length: 145

v=0
o=UserB 2890844527 2890844527 IN IP4 client.biloxi.com
s=-
c=IN IP4 192.168.200.201
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F18 200 OK Proxy 1 -> User A

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=9103874
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 3 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Type: application/sdp
Content-Length: 145

v=0
o=UserB 2890844527 2890844527 IN IP4 client.biloxi.com
s=-
c=IN IP4 192.168.200.201
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F19 ACK User A -> Proxy 1

ACK sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
Route: <sip:ss1.atlanta.com;lr>, <sip:ss2.biloxi.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=9103874
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 3 ACK
Content-Length: 0

F20 ACK Proxy 1 -> Proxy 2

ACK sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK230f2.1
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Max-Forwards: 69
Route: <sip:ss2.biloxi.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=9103874
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 3 ACK
Contact: <sip:UserB@192.168.200.201>
Content-Length: 0

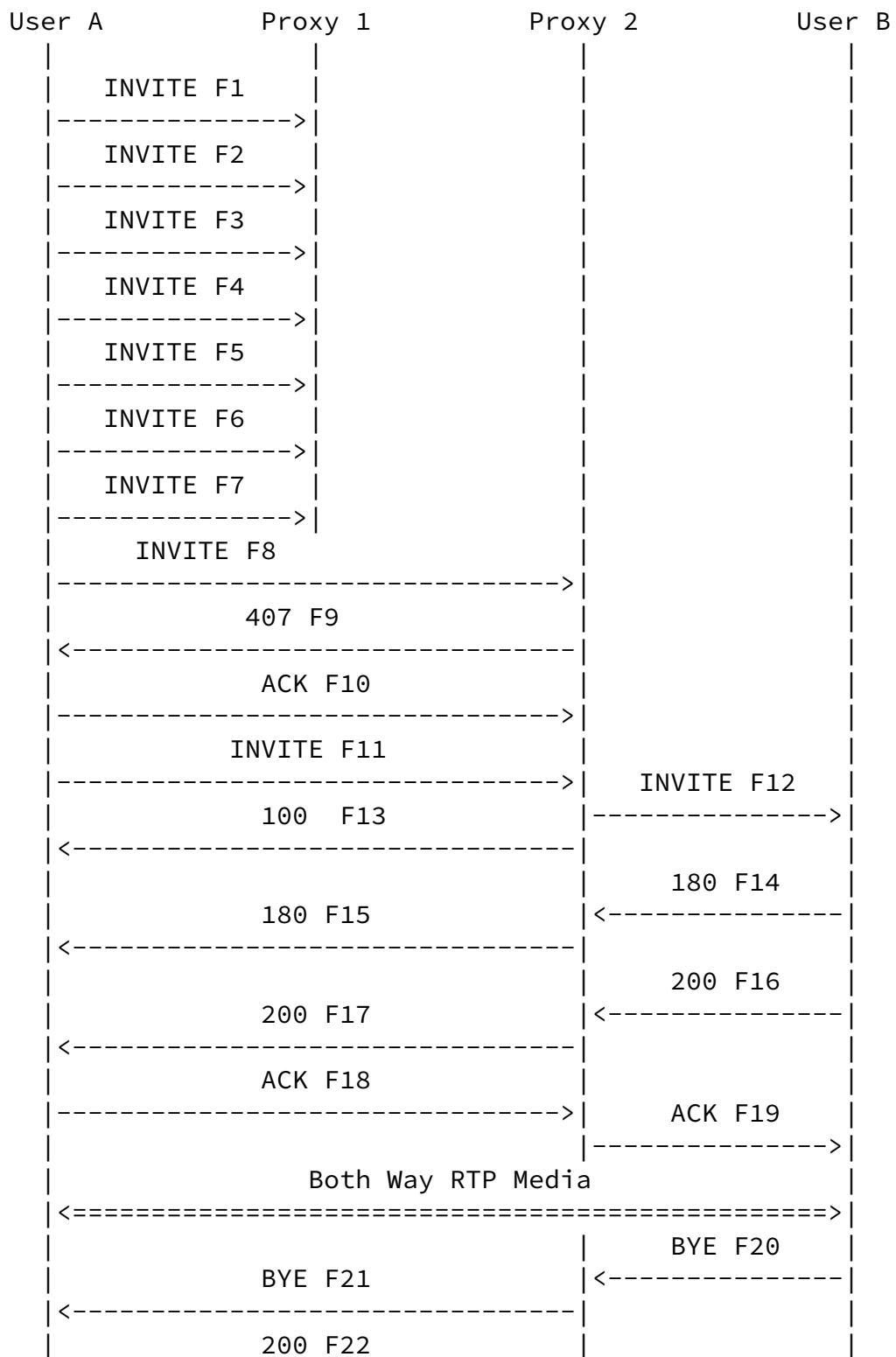
F21 ACK Proxy 2 -> User A

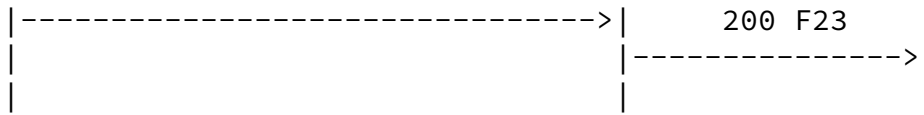
ACK sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK31972.1
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK230f2.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Max-Forwards: 68
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=9103874
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 3 ACK
Contact: <sip:UserB@192.168.200.201>
Content-Length: 0

SIP Basic Call Flow Examples

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3.4 Successful Session with Proxy Failure





SIP Basic Call Flow Examples

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In this scenario, User A completes a call to User B via a Proxy Server. User A is configured for a primary SIP Proxy Server Proxy 1 and a secondary SIP Proxy Server Proxy 2 (Or is able to use DNS SRV records to locate Proxy 1 and Proxy 2). User A has valid credentials for both domains. Proxy 1 is out of service and does not respond to INVITEs (it is reachable, but unresponsive). User A then completes the call to User B using Proxy 2.

Message Details

F1 INVITE A -> Proxy 1

```

INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK465bf9
Max-Forwards: 70
Route: <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Type: application/sdp
Content-Length: 147
  
```

```

v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000
  
```

F2 INVITE A -> Proxy 1

Same as Message F1

F3 INVITE A -> Proxy 1

Same as Message F1

F4 INVITE A -> Proxy 1

Same as Message F1

F5 INVITE A -> Proxy 1

Same as Message F1

F6 INVITE A -> Proxy 1

Same as Message F1

F7 INVITE A -> Proxy 1

Same as Message F1

/* User A gives up on the unresponsive proxy */

F8 INVITE A -> Proxy 2

```
INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 4Fde34wkd11wsGFds3@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
```

Content-Type: application/sdp
Content-Length: 147

v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000

/* Proxy 2 challenges User A for authentication */

F9 407 Proxy Authorization Required Proxy 2 -> User A

SIP/2.0 407 Proxy Authorization Required
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl

To: LittleGuy <sip:UserB@biloxi.com>;tag=2421452
Call-ID: 4Fde34wkd11wsGFDS3@atlanta.com
CSeq: 1 INVITE
Proxy-Authenticate: Digest realm="biloxi.com", qop="auth",
nonce="1ae6cbe5ea9c8e8df84fqnllec434a359",
opaque="", stale=FALSE, algorithm=MD5
Content-Length: 0

F10 ACK A -> Proxy 2

ACK sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=2421452
Call-ID: 4Fde34wkd11wsGFDS3@atlanta.com
CSeq: 1 ACK
Content-Length: 0

/* User A responds by re-sending the INVITE with authentication

credentials in it. */

F11 INVITE A -> Proxy 2

```
INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 4Fde34wkd11wsGFDS3@atlanta.com
CSeq: 2 INVITE
Contact: <sip:UserA@192.168.100.101>
Proxy-Authorization: Digest username="UserA", realm="biloxi.com",
  nonce="1ae6cbe5ea9c8e8df84fqnllec434a359", opaque="",
  uri="sip:UserB@biloxi.com",
  response="8a880c919d1a52f20a1593e228adf599"
Content-Type: application/sdp
Content-Length: 147
```

```
v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

/* Proxy 2 accepts the credentials and forwards the INVITE to User B. Client for A prepares to receive data on port 49172 from the network. */

F12 INVITE Proxy 2 -> B

```
INVITE sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
  ;received=192.168.100.101
Max-Forwards: 69
Record-Route: <sip:ss2.biloxi.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
```

Call-ID: 4Fde34wkd11wsGFds3@atlanta.com
CSeq: 2 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Type: application/sdp
Content-Length: 147

v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F13 100 Trying Proxy 2 -> User A

SIP/2.0 100 Trying
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 4Fde34wkd11wsGFds3@atlanta.com
CSeq: 2 INVITE
Content-Length: 0

F14 180 Ringing B -> Proxy 2

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
;received=192.168.156.222
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101

Record-Route: <sip:ss2.biloxi.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 4Fde34wkd11wsGFds3@atlanta.com
CSeq: 2 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Length: 0

F15 180 Ringing Proxy 2 -> A

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 4Fde34wkd11wsGFDS3@atlanta.com
CSeq: 2 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Length: 0
```

F16 200 OK B -> Proxy 2

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
;received=192.168.156.222
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 4Fde34wkd11wsGFDS3@atlanta.com
CSeq: 2 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Type: application/sdp
Content-Length: 145
```

```
v=0
o=UserB 2890844527 2890844527 IN IP4 client.biloxi.com
s=-
c=IN IP4 192.168.200.201
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F17 200 OK Proxy 2 -> A

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 4Fde34wkd11wsGFDS3@atlanta.com
CSeq: 2 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Type: application/sdp
Content-Length: 145

v=0
o=UserB 2890844527 2890844527 IN IP4 client.biloxi.com
s=-
c=IN IP4 192.168.200.201
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F18 ACK A -> Proxy 2

ACK sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
Route: <sip:ss2.biloxi.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 4Fde34wkd11wsGFDS3@atlanta.com
CSeq: 2 ACK
Content-Length: 0

F19 ACK Proxy 2 -> B

ACK sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Max-Forwards: 69
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 4Fde34wkd11wsGFDS3@atlanta.com
CSeq: 2 ACK
Content-Length: 0

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

/* User B Hangs Up with User A. */

F20 BYE User B -> Proxy 2

BYE sip:UserA@192.168.100.101 SIP/2.0
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
Max-Forwards: 70
Route: <sip:ss2.biloxi.com;lr>
From: LittleGuy <sip:UserB@biloxi.com>;tag=314159
To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
Call-ID: 4Fde34wkd11wsGFDS3@atlanta.com
CSeq: 1 BYE
Content-Length: 0

F21 BYE Proxy 2 -> User A

BYE sip:UserA@192.168.100.101 SIP/2.0
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
;received=192.168.200.201
Max-Forwards: 69
From: LittleGuy <sip:UserB@biloxi.com>;tag=314159
To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
Call-ID: 4Fde34wkd11wsGFDS3@atlanta.com
CSeq: 1 BYE
Content-Length: 0

F22 200 OK User A -> Proxy 2

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
;received=192.168.156.222
Via: SIP/2.0/UDP client.biloxi.com:5060;branch=z9hG4bKnashds7
;received=192.168.200.201
From: LittleGuy <sip:UserB@biloxi.com>;tag=314159
To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
Call-ID: 4Fde34wkd11wsGFDS3@atlanta.com
CSeq: 1 BYE
Content-Length: 0

F23 200 OK Proxy 2 -> User B

SIP/2.0 200 OK

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

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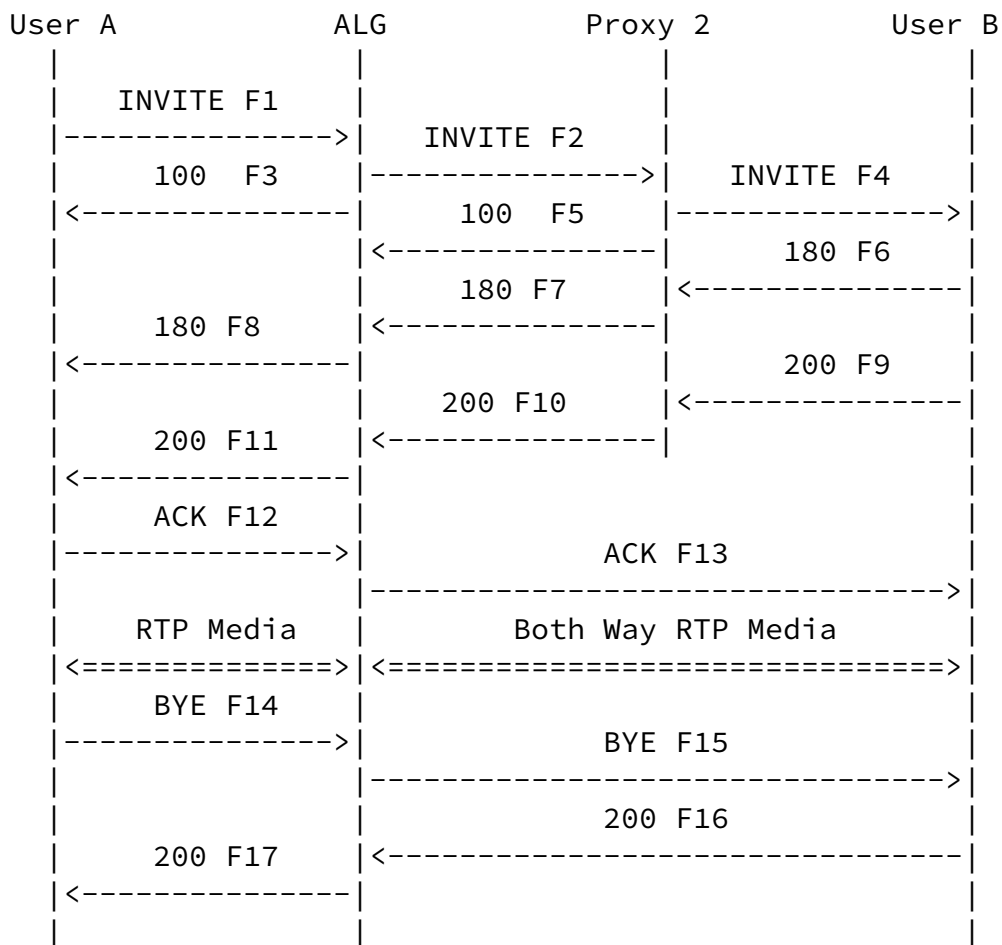
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```
;received=192.168.200.201
From: LittleGuy <sip:UserB@biloxi.com>;tag=314159
To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
Call-ID: 4Fde34wkd11wsGFds3@atlanta.com
CSeq: 1 BYE
Content-Length: 0
```

3.5 Session Through a SIP ALG



User A completes a call to User B through a ALG (Application Layer Gateway) and a SIP Proxy. The routing through the ALG is

accomplished using a pre-loaded Route header in the INVITE F1. Note that the media stream setup is not end-to-end - the ALG terminates both media streams and bridges them. This is done by the ALG modifying the SDP in the INVITE (F1) and 200 OK (F10) messages, and possibly any 18x or ACK messages containing SDP.

In addition to firewall traversal, this Back-to-Back User Agent (B2BUA) could be used as part of an anonymizer service (in which all identifying information on User A would be removed), or to perform codec media conversion, such as mu-law to A-law conversion of PCM on an international call.

Also note that Proxy 2 does not Record-Route in this call flow.

Message Details

F1 INVITE A -> SIP ALG

```
INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSjt55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Route: <sip:alg1.atlanta.com;lr>
Proxy-Authorization: Digest username="UserA", realm="biloxi.com",
  nonce="85b4f1cen4341ae6cbe5a3a9c8e88df9", opaque="",
  uri="sip:UserB@biloxi.com",
  response="b3f392f9218a328b9294076d708e6815"
Content-Type: application/sdp
Content-Length: 147
```

```
v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

/* Client for A prepares to receive data on port 49172 from the network. */

F2 INVITE SIP ALG -> Proxy 2

```
INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP alg1.atlanta.com:5060;branch=z9hG4bK739578.1
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
    ;received=192.168.100.101
Max-Forwards: 69
Record-Route: <sip:alg1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Proxy-Authorization: Digest username="UserA", realm="biloxi.com",
    nonce="85b4f1cen4341ae6cbe5a3a9c8e88df9", opaque="",
    uri="sip:UserB@biloxi.com",
    response="b3f392f9218a328b9294076d708e6815"
Content-Type: application/sdp
Content-Length: 146
```

```
v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.255.128
t=0 0
m=audio 2000 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F3 100 Trying SIP ALG -> A

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
    ;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
```

CSeq: 1 INVITE
Content-Length: 0

/* SIP ALG prepares to proxy data from port 192.168.255.128/2000 to 192.168.100.101/49172. Proxy 2 uses a Location Service function to determine where B is located. Based upon location analysis the call is forwarded to User B */

F4 INVITE Proxy 2 -> B

INVITE sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK2d4790.1
Via: SIP/2.0/UDP alg1.atlanta.com:5060;branch=z9hG4bK739578.1
;received=192.168.255.128
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Max-Forwards: 68
Record-Route: <sip:alg1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Type: application/sdp
Content-Length: 146

v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.255.128

t=0 0
m=audio 2000 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F5 100 Trying Proxy 2 -> SIP ALG

SIP/2.0 100 Trying
Via: SIP/2.0/UDP alg1.atlanta.com:5060;branch=z9hG4bK739578.1
;received=192.168.255.128
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9

;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Content-Length: 0

F6 180 Ringing B -> Proxy 2

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.156.222
Via: SIP/2.0/UDP alg1.atlanta.com:5060;branch=z9hG4bK739578.1
;received=192.168.255.128
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:alg1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Length: 0

F7 180 Ringing Proxy 2 -> SIP ALG

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP alg1.atlanta.com:5060;branch=z9hG4bK739578.1
;received=192.168.255.128
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:alg1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE

Contact: <sip:UserB@192.168.200.201>
Content-Length: 0

F8 180 Ringing SIP ALG -> A

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:alg1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Length: 0

F9 200 OK B -> Proxy 2

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.156.222
Via: SIP/2.0/UDP alg1.atlanta.com:5060;branch=z9hG4bK739578.1
;received=192.168.255.128
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:alg1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Type: application/sdp
Content-Length: 145

v=0
o=UserB 2890844527 2890844527 IN IP4 client.biloxi.com
s=-
c=IN IP4 192.168.200.201
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F10 200 OK Proxy 2 -> SIP ALG

SIP/2.0 200 OK
Via: SIP/2.0/UDP alg1.atlanta.com:5060;branch=z9hG4bK739578.1

```
;received=192.168.255.128
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:alg1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Type: application/sdp
Content-Length: 145
```

```
v=0
o=UserB 2890844527 2890844527 IN IP4 client.biloxi.com
s=-
c=IN IP4 192.168.200.201
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

```
F11 200 OK SIP ALG -> A
```

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:alg1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Type: application/sdp
Content-Length: 145
```

```
v=0
o=UserB 2890844527 2890844527 IN IP4 client.biloxi.com
s=-
c=IN IP4 192.168.255.128
t=0 0
m=audio 1734 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

```
/* The ALG prepares to proxy packets from 192.168.255.128/
1734 to 192.168.200.201/3456 */
```

F12 ACK A -> SIP ALG

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```
ACK sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
Route: <sip:alg1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 ACK
Content-Length: 0
```

F13 ACK SIP ALG -> B

```
ACK sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP alg1.atlanta.com:5060;branch=z9hG4bK739578.1
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Max-Forwards: 69
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 ACK
Content-Length: 0
```

/* RTP streams are established between A and the ALG and
between the ALG and B*/

/* User A Hangs Up with User B. */

F14 BYE A -> SIP ALG

```
BYE sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
Route: <sip:alg1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 2 BYE
```

Content-Length: 0

F15 BYE SIP ALG -> B

BYE sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP alg1.atlanta.com:5060;branch=z9hG4bK739578.1
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101

Max-Forwards: 69
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 2 BYE
Content-Length: 0

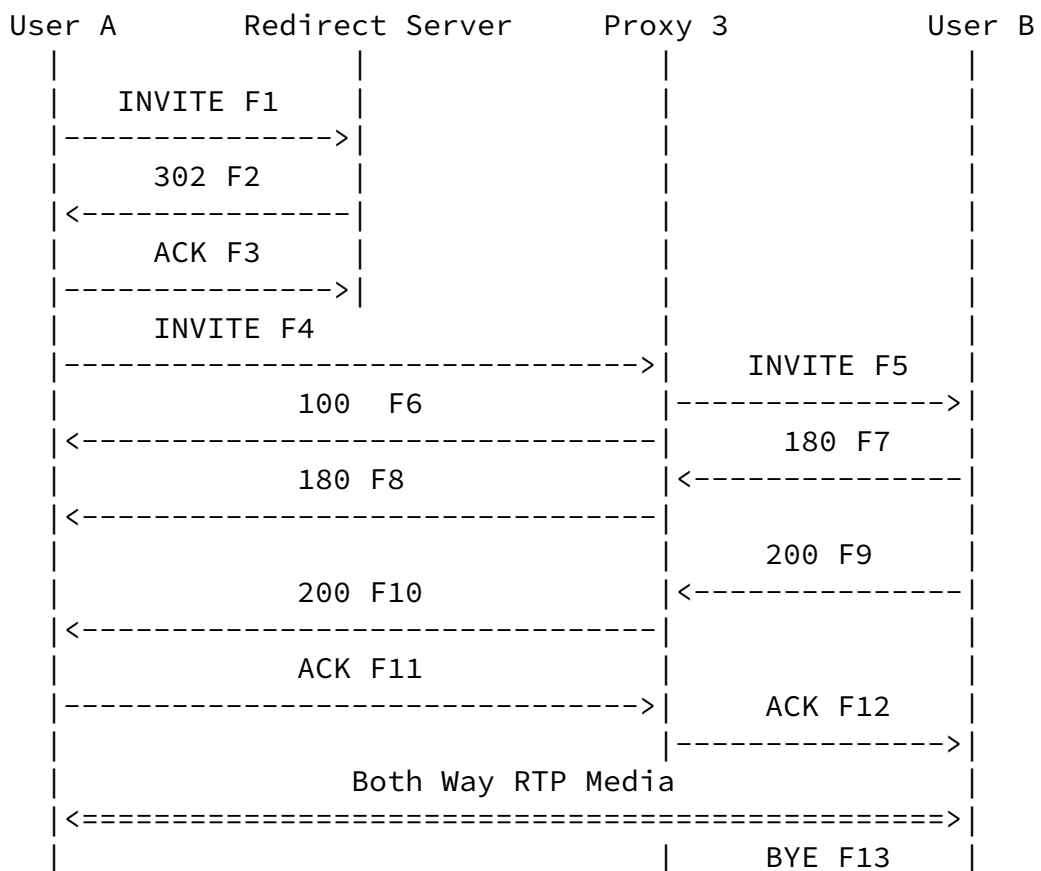
F16 200 OK B -> SIP ALG

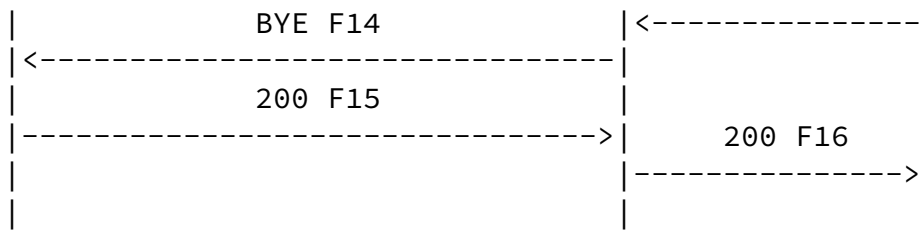
SIP/2.0 200 OK
Via: SIP/2.0/UDP alg1.atlanta.com:5060;branch=z9hG4bK739578.1
;received=192.168.255.128
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 2 BYE
Content-Length: 0

F17 200 OK SIP ALG -> A

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 2 BYE
Content-Length: 0

[3.6](#) Session via Redirect and Proxy Servers with SDP in ACK





In this scenario, User A places a call to User B using first a Redirect server then a Proxy Server. The INVITE message is first sent to the Redirect Server. The Server returns a 302 Moved Temporarily response (F2) containing a Contact header with User B's current SIP address. User A then generates a new INVITE and sends to User B via the Proxy Server and the call proceeds normally. In this example, no SDP is present in the INVITE, so the SDP is carried in the ACK message.

The call is terminated when User B sends a BYE message.

Message Details

F1 INVITE A -> Redirect Server

```

INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bKbf9f44
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Length: 0
  
```

F2 302 Moved Temporarily Redirect Proxy -> A

```

SIP/2.0 302 Moved Temporarily
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bKbf9f44
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=53fHlqlQ2
  
```

Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: sip:UserB@chicago.com
Content-Length: 0

F3 ACK A -> Redirect Server

ACK sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bKbf9f44
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=53fHlqlQ2
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 ACK
Content-Length: 0

F4 INVITE A -> Proxy 3

INVITE sip:UserB@chicago.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 2 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Length: 0

F5 INVITE Proxy 3 -> B

INVITE sip:UserB@192.168.200.100 SIP/2.0
Via: SIP/2.0/UDP ss3.chicago.com:5060;branch=z9hG4bK721e418c4.1
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Max-Forwards: 69
Record-Route: <sip:ss3.chicago.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com

CSeq: 2 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Length: 0

F6 100 Trying Proxy 3 -> A

SIP/2.0 100 Trying
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 2 INVITE
Content-Length: 0

F7 180 Ringing B -> Proxy 3

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss3.chicago.com:5060;branch=z9hG4bK721e418c4.1
;received=192.168.182.333
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss3.chicago.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 2 INVITE
Contact: <sip:UserB@192.168.200.100>
Content-Length: 0

F8 180 Ringing Proxy 3 -> A

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9

;received=192.168.100.101
Record-Route: <sip:ss3.chicago.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com

CSeq: 2 INVITE
Contact: <sip:UserB@192.168.200.100>
Content-Length: 0

F9 200 OK B -> Proxy 3

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss3.chicago.com:5060;branch=z9hG4bK721e418c4.1
;received=192.168.182.333
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss3.chicago.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 2 INVITE
Contact: <sip:UserB@192.168.200.100>
Content-Type: application/sdp
Content-Length: 146

v=0
o=UserB 2890844527 2890844527 IN IP4 client.chicago.com
s=-
c=IN IP4 192.168.200.100
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 client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss3.chicago.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 2 INVITE
Contact: <sip:UserB@192.168.200.100>
Content-Type: application/sdp
Content-Length: 146

v=0
o=UserB 2890844527 2890844527 IN IP4 client.chicago.com
s=-
c=IN IP4 192.168.200.100
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

/* ACK contains SDP of A since none present in INVITE */

F11 ACK A -> Proxy 3

ACK sip:UserB@192.168.200.100 SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
Route: <sip:ss3.chicago.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 2 ACK
Content-Type: application/sdp
Content-Length: 147

v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F12 ACK Proxy 3 -> B

ACK sip:UserB@111.112.112.114 SIP/2.0
Via: SIP/2.0/UDP ss3.chicago.com:5060;branch=z9hG4bK721e418c4.1
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Max-Forwards: 69
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 2 ACK
Content-Type: application/sdp
Content-Length: 147

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

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```
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000

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

/* User B Hangs Up with User A. */

F13 BYE B -> Proxy 3

BYE sip:UserA@192.168.100.101 SIP/2.0
Via: SIP/2.0/UDP client.chicago.com:5060;branch=z9hG4bKfgaw2
Max-Forwards: 70
Route: <sip:ss3.chicago.com;lr>
From: LittleGuy <sip:UserB@biloxi.com>;tag=314159
To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 BYE
Content-Length: 0

F14 BYE Proxy 3 -> A

BYE sip:UserA@192.168.100.101 SIP/2.0
Via: SIP/2.0/UDP ss3.chicago.com:5060;branch=z9hG4bK721e418c4.1
;received=192.168.200.100
Via: SIP/2.0/UDP client.chicago.com:5060;branch=z9hG4bKfgaw2
Max-Forwards: 69
From: LittleGuy <sip:UserB@biloxi.com>;tag=314159
To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 BYE
Content-Length: 0

F15 200 OK A -> Proxy 3

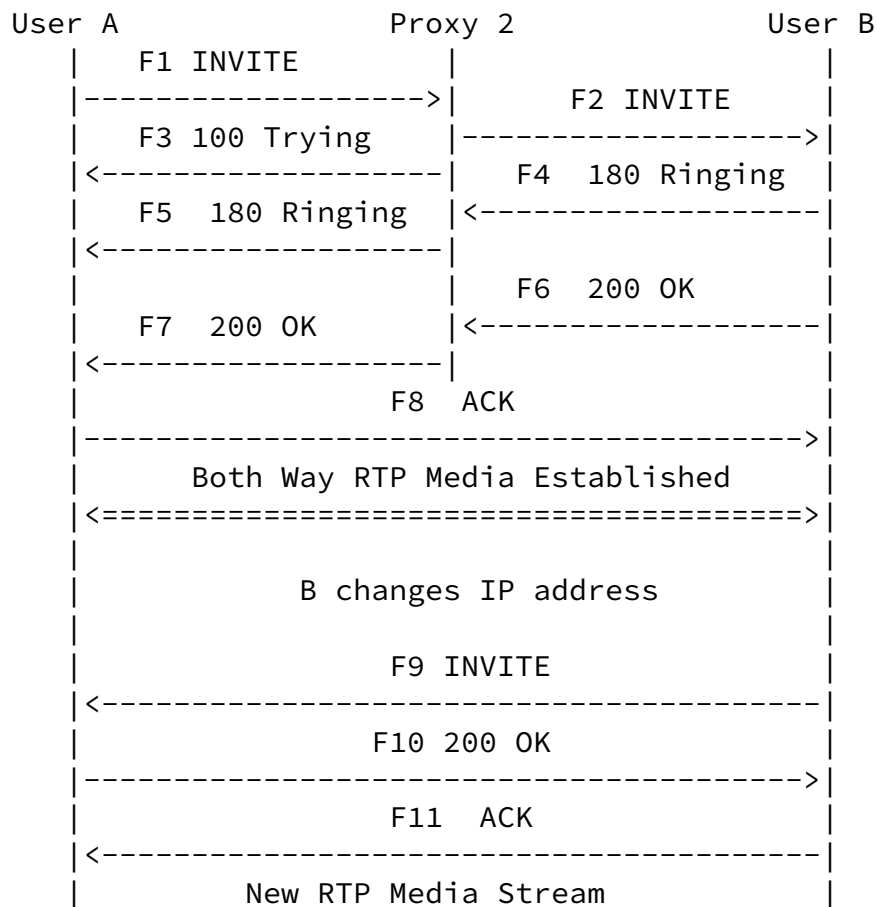
SIP/2.0 200 OK
Via: SIP/2.0/UDP ss3.chicago.com:5060;branch=z9hG4bK721e418c4.1
;received=192.168.182.333
```

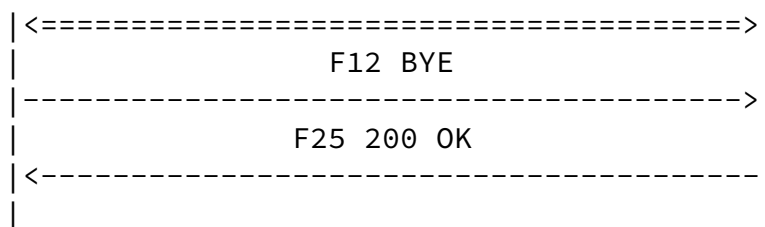
Via: SIP/2.0/UDP client.chicago.com:5060;branch=z9hG4bKfgaw2
;received=192.168.200.100
From: LittleGuy <sip:UserB@biloxi.com>;tag=314159
To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 BYE
Content-Length: 0

F16 200 OK Proxy 3 -> B

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.chicago.com:5060;branch=z9hG4bKfgaw2
;received=192.168.200.100
From: LittleGuy <sip:UserB@biloxi.com>;tag=314159
To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 BYE
Content-Length: 0

[3.7](#) Session with re-INVITE (IP Address Change)





This example shows a session in which the media is changes midway through the session. When User B's IP address changes during the session, User B sends a re-INVITE containing a new Contact and SDP (version number incremented) information to A. In this flow, the proxy does not Record-Route so is not in the SIP messaging path after the initial exchange.

Message Details

F1 INVITE A -> Proxy 2

INVITE sip:UserB@biloxi.com SIP/2.0

```

Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Type: application/sdp
Content-Length: 147

```

```

v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000

```

F2 INVITE Proxy 2 -> B

INVITE sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK2d4790.1
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Max-Forwards: 69
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Type: application/sdp
Content-Length: 147

v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F3 100 Trying Proxy 2 -> A

SIP/2.0 100 Trying
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl

To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Content-Length: 0

F4 180 Ringing B -> Proxy 2

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.156.222
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl

To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Length: 0

F5 180 Ringing Proxy 2 -> A

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Length: 0

F6 200 OK B -> Proxy 2

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.156.222
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Type: application/sdp
Content-Length: 145

v=0
o=UserB 2890844527 2890844527 IN IP4 client.biloxi.com
s=-
c=IN IP4 192.168.200.201
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F7 200 OK Proxy 2 -> A

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Type: application/sdp
Content-Length: 145

v=0
o=UserB 2890844527 2890844527 IN IP4 client.biloxi.com
s=-
c=IN IP4 192.168.200.201
t=0 0
m=audio 3456 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F8 ACK A -> B

ACK sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 ACK
Content-Length: 0

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

/* B changes IP address and re-INVITES A with new Contact and SDP */

F9 INVITE B -> A

INVITE sip:UserA@192.168.100.101 SIP/2.0
Via: SIP/2.0/UDP client.chicago.com:5060;branch=z9hG4bKlkld5l
Max-Forwards: 70
From: LittleGuy <sip:UserB@biloxi.com>;tag=314159
To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 14 INVITE
Contact: <sip:UserB@192.168.200.100>
Content-Type: application/sdp
Content-Length: 147

v=0
o=UserB 2890844527 2890844528 IN IP4 client.chicago.com
s=-
c=IN IP4 192.168.200.100
t=0 0
m=audio 47172 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F10 200 OK A ->B

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.chicago.com:5060;branch=z9hG4bKlkld5l
;received=192.168.200.100
Max-Forwards: 70
From: LittleGuy <sip:UserB@biloxi.com>;tag=314159
To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 14 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Type: application/sdp
Content-Length: 147

v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 1000 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F11 ACK B -> A

ACK sip:UserA@192.168.100.101 SIP/2.0
Via: SIP/2.0/UDP client.chicago.com:5060;branch=z9hG4bKlkld5l
Max-Forwards: 70
From: LittleGuy <sip:UserB@biloxi.com>;tag=314159

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```
To: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 14 ACK
Content-Length: 0
```

```
/* New RTP stream established between A and B */
```

```
/* A hangs up with B */
```

```
F12 BYE A -> B
```

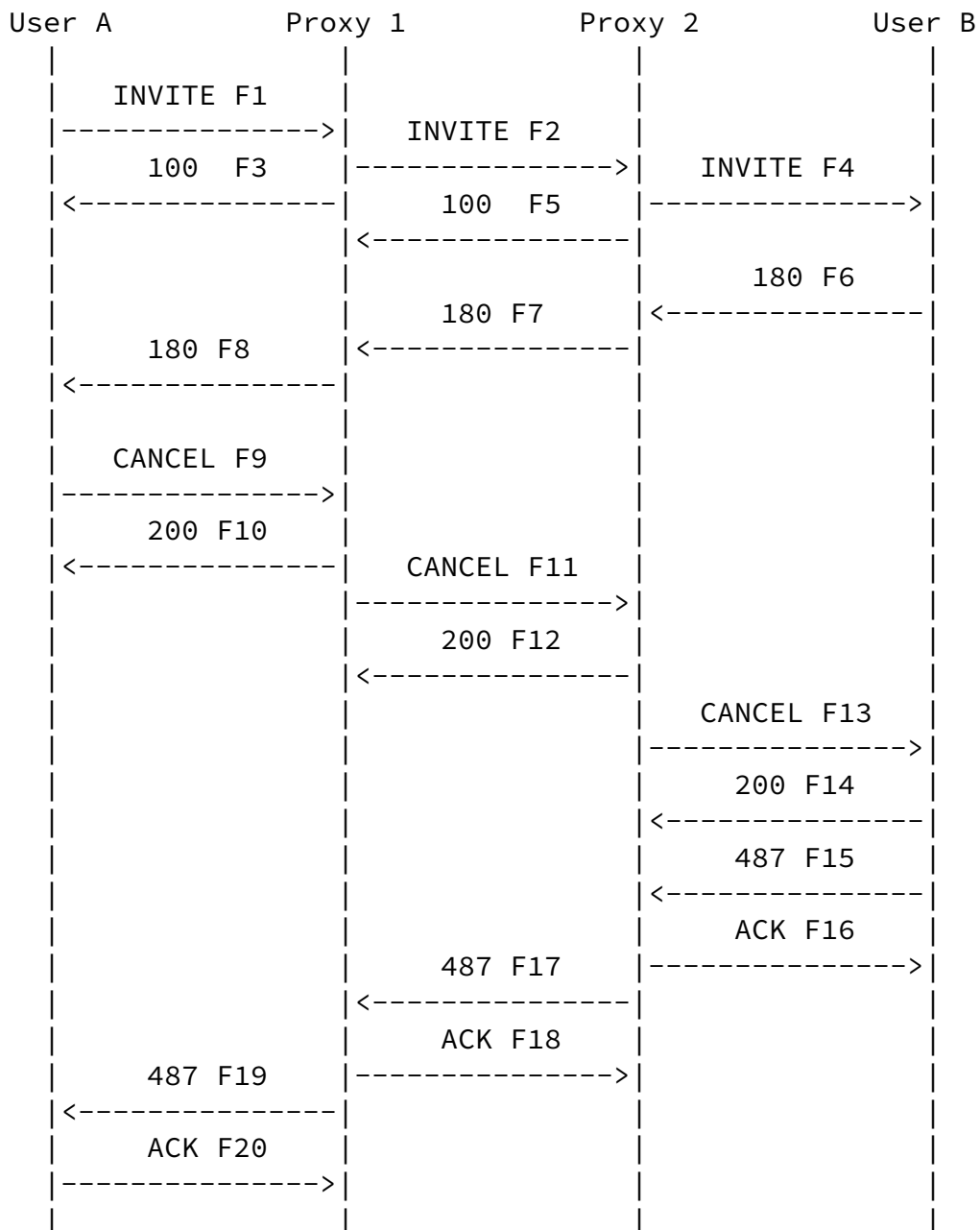
```
BYE sip:UserB@192.168.200.100 SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 2 BYE
Content-Length: 0
```

```
F13 200 OK B -> A
```

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 2 BYE
Content-Length: 0
```

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[3.8](#) Unsuccessful No Answer

In this scenario, User A gives up on the call before User B answers (sends a 200 OK response). User A sends a CANCEL (F9) since no final response had been received from User B. If a 200 OK to the INVITE had crossed with the CANCEL, User A would have sent an ACK then a BYE to User B in order to properly terminate the call.

Note that the CANCEL message is acknowledged with a 200 OK on a hop by hop basis, rather than end to end.

Message Details

F1 INVITE A -> Proxy 1

```
INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
Route: <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Proxy-Authorization: Digest username="UserA", realm="atlanta.com",
  nonce="ze7k1ee88df84f1cec431ae6cbe5a359", opaque="",
  uri="sip:UserB@biloxi.com",
  response="b00b416324679d7e243f55708d44be7b"
Content-Type: application/sdp
Content-Length: 147
```

```
v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

/*Client for A prepares to receive data on port 49172 from the network.*/

F2 INVITE Proxy 1 -> Proxy 2

```
INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
    ;received=192.168.100.101
Max-Forwards: 69
Record-Route: <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Type: application/sdp
Content-Length: 147
```

```
v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 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.atlanta.com:5060;branch=z9hG4bK74bf9
    ;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Content-Length: 0
```

F4 INVITE Proxy 2 -> B

```
INVITE sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP ss2.client.biloxi.com:5060;branch=z9hG4bK721e418c4.1
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
    ;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
    ;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
Max-Forwards: 68
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Type: application/sdp
Content-Length: 147
```

```
v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F5 100 Trying Proxy 2 -> Proxy 1

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
    ;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
    ;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Content-Length: 0
```

F6 180 Ringing B -> Proxy 2

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss2.client.biloxi.com:5060;branch=z9hG4bK721e418c4.1
;received=192.168.156.222
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Length: 0

F7 180 Ringing Proxy 2 -> Proxy 1

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Length: 0

F8 180 Ringing Proxy 1 -> A

SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com

CSeq: 1 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Length: 0

F9 CANCEL A -> Proxy 1

CANCEL sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 CANCEL
Content-Length: 0

F10 200 OK Proxy 1 -> A

SIP/2.0 200 OK
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 CANCEL
Content-Length: 0

F11 CANCEL Proxy 1 -> Proxy 2

CANCEL sip:UserA@atlanta.com SIP/2.0
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 CANCEL
Content-Length: 0

F12 200 OK Proxy 2 -> Proxy 1

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 CANCEL
Content-Length: 0

F13 CANCEL Proxy 2 -> B

CANCEL sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 CANCEL
Content-Length: 0

F14 200 OK B -> Proxy 2

SIP/2.0 200 OK
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
;received=192.168.156.222
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 CANCEL
Content-Length: 0

F15 487 Request Terminated B -> Proxy 2

SIP/2.0 487 Request Terminated
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
;received=192.168.156.222
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE

Content-Length: 0

F16 ACK Proxy 2 -> B

ACK sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 ACK
Content-Length: 0

F17 487 Request Terminated Proxy 2 -> Proxy 1

SIP/2.0 487 Request Terminated
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Content-Length: 0

F18 ACK Proxy 1 -> Proxy 2

ACK sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 ACK
Content-Length: 0

F19 487 Request Terminated Proxy 1 -> A

SIP/2.0 487 Request Terminated
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101

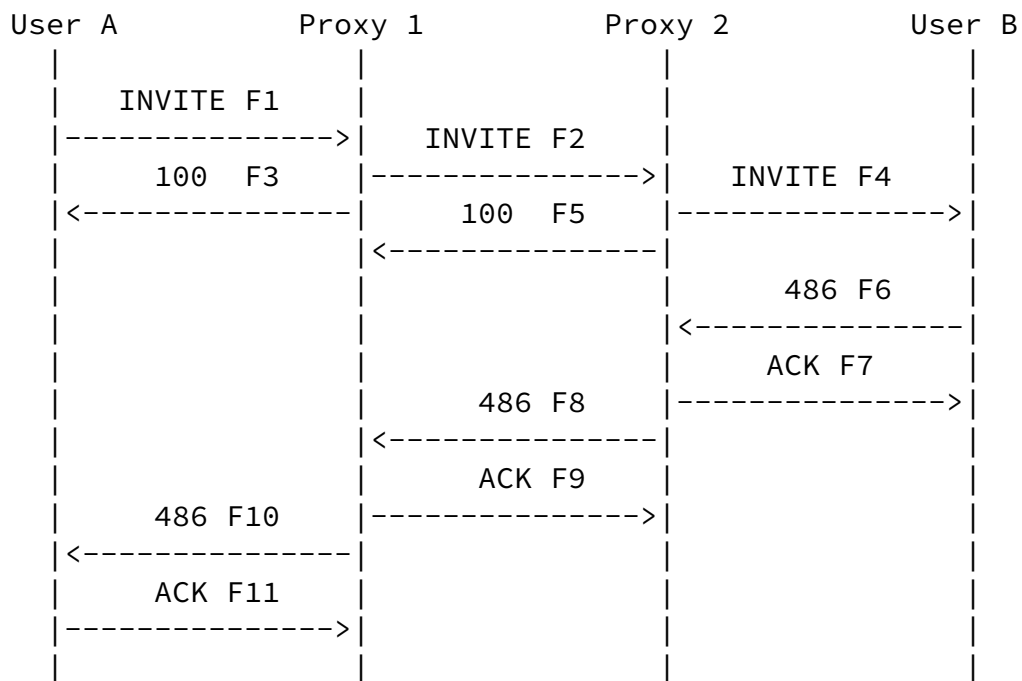
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com

CSeq: 1 INVITE

F20 ACK A -> Proxy 1

ACK sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 ACK
Content-Length: 0

3.9 Unsuccessful Busy



In this scenario, User B is busy and sends a 486 Busy Here response to User A's INVITE. Note that the non-2xx response is acknowledged on a hop-by-hop basis instead of end-to-end. Also note that many SIP UAs will not return a 486 response, as they have multiple line and other features.

Message Details

F1 INVITE User A -> Proxy 1

```
INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
Route: <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Proxy-Authorization: Digest username="UserA", realm="atlanta.com",
  nonce="dc3a5ab2530aa93112cf5904ba7d88fa", opaque="",
  uri="sip:UserB@biloxi.com",
  response="702138b27d869ac8741e10ec643d55be"
Content-Type: application/sdp
Content-Length: 147
```

```
v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

```
/*Client for A prepares to receive data on port 49172 from the
network.*/
```

F2 INVITE Proxy 1 -> Proxy 2

```
INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
  ;received=192.168.100.101
Max-Forwards: 69
Record-Route: <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
```

Contact: <sip:UserA@192.168.100.101>
Content-Type: application/sdp
Content-Length: 147

v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F3 100 Trying Proxy 1 -> User A

SIP/2.0 100 Trying
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Content-Length: 0

F4 INVITE Proxy 2 -> User B

INVITE sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Max-Forwards: 68
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Type: application/sdp
Content-Length: 147

v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000

F5 100 Trying Proxy 2 -> Proxy 1

SIP/2.0 100 Trying
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Content-Length: 0

F6 486 Busy Here User B -> Proxy 2

SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
;received=192.168.156.222
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111

Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Content-Length: 0

F7 ACK Proxy 2 -> User B

ACK sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 ACK
Content-Length: 0

F8 486 Busy Here Proxy 2 -> Proxy 1

SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Content-Length: 0

F9 ACK Proxy 1 -> Proxy 2

ACK sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 ACK
Content-Length: 0

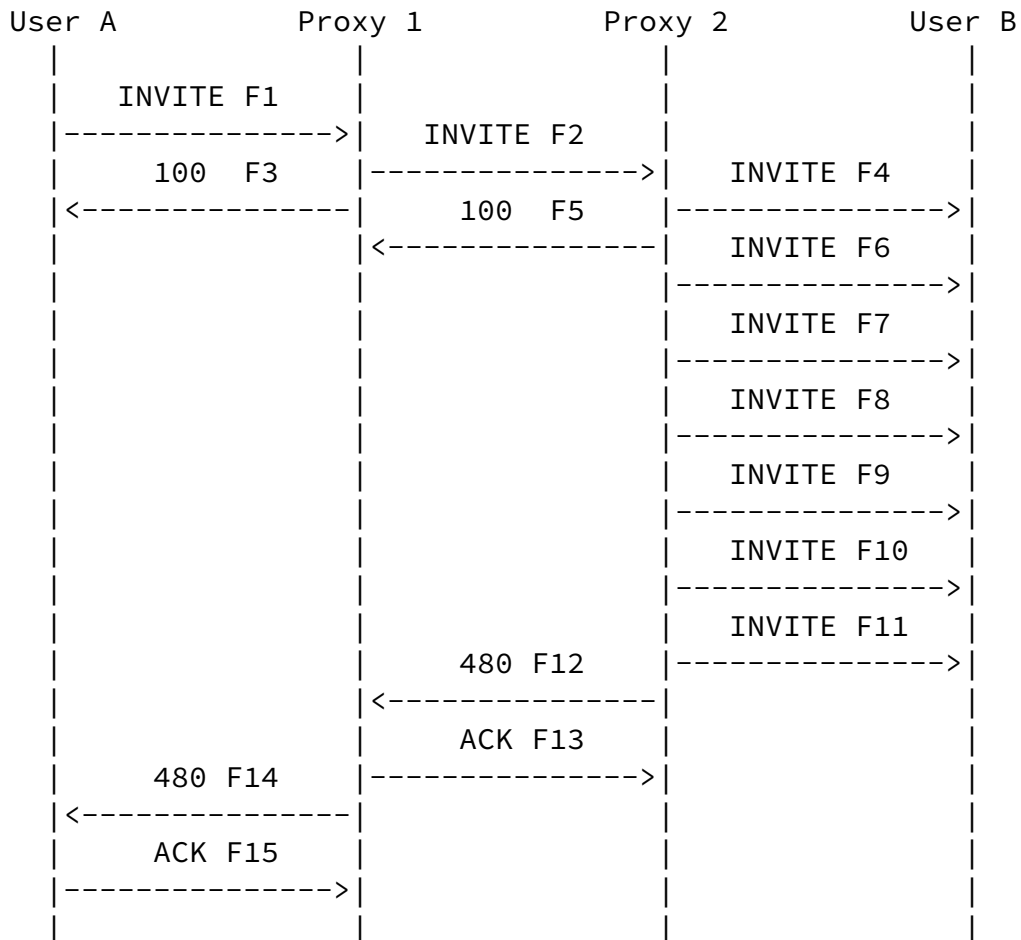
F10 486 Busy Here Proxy 1 -> User A

SIP/2.0 486 Busy Here
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl

To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Content-Length: 0

F11 ACK User A -> Proxy 1

ACK sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 ACK
Content-Length: 0

3.10 Unsuccessful No Response from User Agent

In this example, there is no response from User B to User A's INVITE messages being re-transmitted by Proxy 2. After the sixth re-transmission, Proxy 2 gives up and sends a 480 No Response to User A.

Message Details

F1 INVITE User A -> Proxy 1

```

INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
Route: <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
  
```

Proxy-Authorization: Digest username="UserA", realm="atlanta.com",
nonce="cf5904ba7d8dc3a5ab2530aa931128fa", opaque="",

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```
uri="sip:UserB@biloxi.com",  
response="7afc04be7961f053c24f80e7dbaf888f"  
Content-Type: application/sdp  
Content-Length: 147
```

```
v=0  
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com  
s=-  
c=IN IP4 192.168.100.101  
t=0 0  
m=audio 49172 RTP/AVP 0  
a=rtpmap:0 PCMU/8000
```

/*Client for A prepares to receive data on port 49172 from the
network.*/

F2 INVITE Proxy 1 -> Proxy 2

```
INVITE sip:UserB@biloxi.com SIP/2.0  
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1  
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9  
;received=192.168.100.101  
Max-Forwards: 69  
Record-Route: <sip:ss1.atlanta.com;lr>  
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl  
To: LittleGuy <sip:UserB@biloxi.com>  
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com  
CSeq: 1 INVITE  
Contact: <sip:UserA@192.168.100.101>  
Content-Type: application/sdp  
Content-Length: 147
```

```
v=0  
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com  
s=-  
c=IN IP4 192.168.100.101  
t=0 0  
m=audio 49172 RTP/AVP 0  
a=rtpmap:0 PCMU/8000
```

F3 100 Trying Proxy 1 -> User A

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
    ;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
```

```
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Content-Length: 0
```

F4 INVITE Proxy 2 -> User B

```
INVITE sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
    ;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
    ;received=192.168.100.101
Max-Forwards: 68
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Type: application/sdp
Content-Length: 147
```

```
v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F5 100 Trying Proxy 2 -> Proxy 1

SIP/2.0 100 Trying
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Content-Length: 0

F6 INVITE Proxy 2 -> User B

Resend of Message F4

F7 INVITE Proxy 2 -> User B

Resend of Message F4

F8 INVITE Proxy 2 -> User B

Resend of Message F4

F9 INVITE Proxy 2 -> User B

Resend of Message F4

F10 INVITE Proxy 2 -> User B

Resend of Message F4

F11 INVITE Proxy 2 -> User B

Resend of Message F4

/* Proxy 2 gives up */

F12 480 No Response Proxy 2 -> Proxy 1

SIP/2.0 480 No Response
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Content-Length: 0

F13 ACK Proxy 1 -> Proxy 2

ACK sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl

To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 ACK
Content-Length: 0

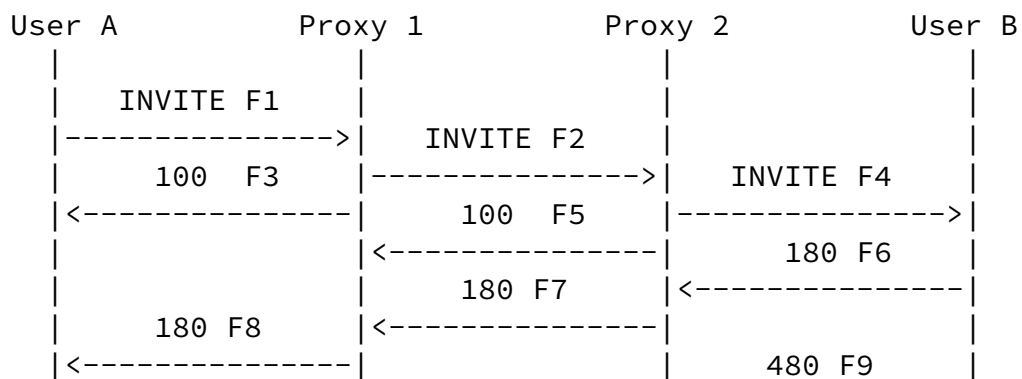
F14 480 No Response Proxy 1 -> User A

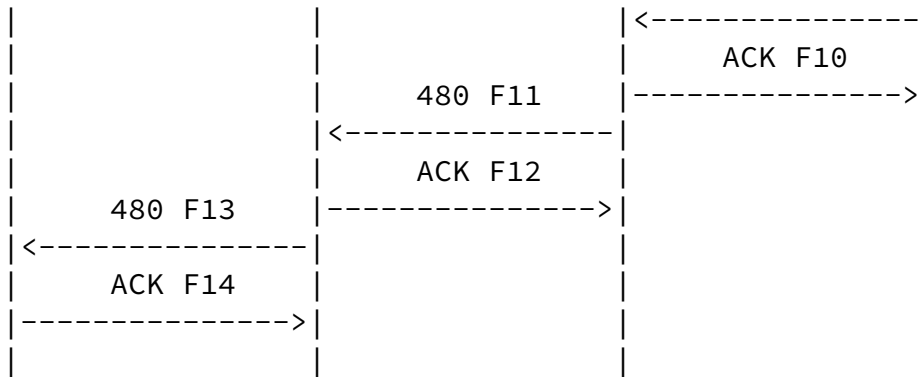
SIP/2.0 480 No Response
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Content-Length: 0

F15 ACK User A -> Proxy 1

ACK sip:UserB@biloxi.com SIP/2.0
 Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
 Max-Forwards: 70
 From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
 To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
 Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
 CSeq: 1 ACK
 Content-Length: 0

[3.11](#) Unsuccessful Temporarily Unavailable





In this scenario, User B initially sends a 180 Ringing response to User A, indicating that alerting is taking place. However, then a 480 Unavailable is then sent to User A. This response is acknowledged then proxied back to User A.

Message Details

F1 INVITE A -> Proxy 1

```

INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
Route: <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Proxy-Authorization: Digest username="UserA", realm="atlanta.com",
  nonce="aa9311cf5904ba7d8dc3a5ab253028fa", opaque="",
  uri="sip:UserB@biloxi.com",
  response="59a46a91bf1646562a4d486c84b399db"
Content-Type: application/sdp
  
```

Content-Length: 147

```

v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
  
```

c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000

/*Client for A prepares to receive data on port 49172 from the network.*/

F2 INVITE Proxy 1 -> Proxy 2

INVITE sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Max-Forwards: 69
Record-Route: <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Type: application/sdp
Content-Length: 147

v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 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.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Content-Length: 0

F4 INVITE Proxy 2 -> B

```
INVITE sip:UserB@192.168.200.201 SIP/2.0
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
    ;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
    ;received=192.168.100.101
Max-Forwards: 68
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserA@192.168.100.101>
Content-Type: application/sdp
Content-Length: 147
```

```
v=0
o=UserA 2890844526 2890844526 IN IP4 client.atlanta.com
s=-
c=IN IP4 192.168.100.101
t=0 0
m=audio 49172 RTP/AVP 0
a=rtpmap:0 PCMU/8000
```

F5 100 Trying Proxy 2 -> Proxy 1

```
SIP/2.0 100 Trying
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
    ;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
    ;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Content-Length: 0
```

F6 180 Ringing B -> Proxy 2

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
    ;received=192.168.156.222
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
```

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```
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Length: 0
```

F7 180 Ringing Proxy 2 -> Proxy 1

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Length: 0
```

F8 180 Ringing Proxy 1 -> A

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
Record-Route: <sip:ss2.biloxi.com;lr>, <sip:ss1.atlanta.com;lr>
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Contact: <sip:UserB@192.168.200.201>
Content-Length: 0
```

F9 480 Temporarily Unavailable B -> Proxy 2

SIP/2.0 480 Temporarily Unavailable

Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
;received=192.168.156.222

Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111

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Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101

From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl

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

Call-ID: 2xTb9vxSit55XU7p8@atlanta.com

CSeq: 1 INVITE

Content-Length: 0

F10 ACK Proxy 2 -> B

ACK sip:UserB@192.168.200.201 SIP/2.0

Via: SIP/2.0/UDP ss2.biloxi.com:5060;branch=z9hG4bK721e418c4.1
Max-Forwards: 70

From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl

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

Call-ID: 2xTb9vxSit55XU7p8@atlanta.com

CSeq: 1 ACK

Content-Length: 0

F11 480 Temporarily Unavailable Proxy 2 -> Proxy 1

SIP/2.0 480 Temporarily Unavailable

Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
;received=192.168.255.111

Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101

From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl

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

Call-ID: 2xTb9vxSit55XU7p8@atlanta.com

CSeq: 1 INVITE

Content-Length: 0

F12 ACK Proxy 1 -> Proxy 2

```
ACK sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP ss1.atlanta.com:5060;branch=z9hG4bK2d4790.1
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 ACK
Content-Length: 0
```

F13 480 Temporarily Unavailable Proxy 1 -> A

```
SIP/2.0 480 Temporarily Unavailable
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
;received=192.168.100.101
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 INVITE
Content-Length: 0
```

F14 ACK A -> Proxy 1

```
ACK sip:UserB@biloxi.com SIP/2.0
Via: SIP/2.0/UDP client.atlanta.com:5060;branch=z9hG4bK74bf9
Max-Forwards: 70
From: BigGuy <sip:UserA@atlanta.com>;tag=9fxced76sl
To: LittleGuy <sip:UserB@biloxi.com>;tag=314159
Call-ID: 2xTb9vxSit55XU7p8@atlanta.com
CSeq: 1 ACK
Content-Length: 0
```

Security Considerations

Since this document represents NON NORMATIVE examples of SIP session establishment, the security considerations in [RFC 3261](#) [3] apply.

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Author's Addresses

All listed authors actively contributed large amounts of text to this document.

Alan Johnston
WorldCom
100 South 4th Street
St. Louis, MO 63102
USA

E-Mail: alan.johnston@wcom.com

Steve Donovan
dynamicsoft, Inc.
5100 Tennyson Parkway
Suite 1200
Plano, Texas 75024
USA

E-Mail: sdonovan@dynamicsoft.com

Robert Sparks
dynamicsoft, Inc.
5100 Tennyson Parkway
Suite 1200
Plano, Texas 75024
USA

E-Mail: rsparks@dynamicsoft.com

Chris Cunningham
dynamicsoft, Inc.

5100 Tennyson Parkway
Suite 1200
Plano, Texas 75024
USA

EMail: ccunningham@dynamicsoft.com

Kevin Summers
Sonus
1701 North Collins Blvd, Suite 3000
Richardson, TX 75080
USA

Email: kevin.summers@sonusnet.com

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