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Session Initiation Protocol Call Control - Conferencing for User Agents

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Abstract

This document describes providing Conferencing call control capabilities in the Session Initiation Protocol (SIP). This document builds on the Conferencing Requirements and Framework documents to show how a tightly coupled SIP conference will work. The approach is explored from a user agent (UA) perspective. Three types of UAs are described: a conferencing unaware UA, one capable of being a full member of a conference, and one also capable of hosting a conference. The use of URIs in conferencing, OPTIONS for capability discovery, and call control using REFER are covered in detail with example call flow diagrams.

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 [2].

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1. Introduction

This document uses the concepts and definitions in the Session Initiation Protocol(SIP) [3] conferencing framework document [4] and the requirements in [5]. The call control and dialog manipulation approach is based on that outlined in the Multiparty Framework document [6]. That document defines the basic approach of service design adopted for SIP which includes:

- Definition of primitives, not services

- Participant oriented
- Signaling model independent
- Invoker oriented
- Primitives make full use of URIs
- Include authentication, authorization, logging, etc. policies
- Define graceful fallback to baseline SIP.

The use of opaque URIs and the ability to communicate call control context information within a URI (as opposed to service-related header fields), as discussed in RFC 3087 [7], is fundamental to this document.

All cases begin with an assumption that a URI is known to a user agent. Some SIP mechanisms for URI discovery are described here, including the use of OPTIONS and extracting URIs from Contact header fields. However, other methods can be used and may be developed. For example, current work in the ENUM working group described in RFC 2916bis [8] to include service tags in addition to protocols to map to a URI. For further study is the idea to use a DNS SRV-like process to discover URIs relating to conferencing services. Another idea is to use Service Location Protocol RFC 2608 [9] for this purpose.

2. SIP Conferencing Vocabulary

For the terminology and assumptions used in this document, refer to the conferencing requirements [5] and framework [4] documents.

This document presents the basic call control (dial-in and dial-out) conferencing building blocks from the UA perspective. For illustration of the possible applications we refer to the application vocabulary of ad-hoc, scheduled, server and end user.

3. Conferencing URIs

A user agent that hosts conferences can have three types of URIs that resolve to it: a general URI, a focus URI and conference URIs. All three types assist in supporting different conferencing scenarios. The latter two are dedicated to conferencing.

The general URI and focus URI are likely to be well known URIs in that they would be published

3.1 Use of a General URI in Conferencing

Using a general URI (typically referred as the userÆs address of record), a focus can support creation, control, and manipulation of a conference in a similar manner to that common in PSTN today.

In this kind of scenario, inclusion of the general URI in the Request-URI would lead to a human user (in an end point) or to an IVR service (in a conferencing server) for INVITEs generated from a conferencing unware UA as will be shown in the following sections.

3.2 Focus SIP URI

Another type of URI is what we will call the focus URI. An INVITE sent to the focus URI is a request to setup an ad-hoc conference, as will be shown in the following sections.

3.3 Conference SIP URI

As specified in the conferencing framework document [4], the conference ID is a SIP URI. A URI which represents a particular conference instance is referred to as a conference URI. A request sent to this URI will result in a member being added (or removed, depending on the method) to (or from) a particular conference.

As will be shown later, it can be discovered from Contact header field in an INVITE or 200 OK in the dialog establishment with a focus. It can then be used in a Request-URI or Refer-To header field to add members to the conference.

3.4 Globally Routable Contact Requirements

As was specified before, the Conference URI MUST be globally routable. Since, according to this document, the Contact header field is used to convey this URI, this requires that Contact URIs from a focus be globally routable URIs.

This requirement is identical to that in Section 8.1.1.8 in RFC 3261 [3]. However, the specified use in conferencing of the Contact URI outside of a dialog makes satisfying this requirement critical.

If the focus requires that all requests be routed through a proxy server, then special care MUST be taken with the creation of this Contact URI. To satisfy this requirement, the Contact URI MUST either route to the proxy server or resolve to the proxy server, with an additional SIP registration step being required to further resolve this URI to the specific device.

For example, consider a focus with a hostname server51.chicago.com which creates a conference URI. A normal Contact could be of the form:

```
Contact: <sip:389390542457@serv51.chicago.com>;isFocus
```

(The "isFocus" parameter is described in Section 5.2 below.) However, if this focus requires that all requests come through a proxy server at p1.chicago.com then this Contact will not work as the proxy will be bypassed. One approach is to include an escaped loose Route header field in the Contact URI:

```
 Contact: <sip:389390542457@serv51.chicago.com
                          ?Route=sip:p1.chicago.com;lr>;isFocus
```

This would result in a request being sent to sip:389390542457@serv51.chicago.com with a loose Route header forcing routing to sip:p1.chicago.com first.

> EditorÆs Note: Open Issue: This syntax, while allowed in a redirection, is not permitted in an INVITE or 200 OK response per Table 1 in RFC 3261.

Another approach would involve a Contact of the form:

```
Contact: <sip:389390542457@chicago.com>;isFocus
```

in which this sip:389390542457@chicago.com URI would be registered by the focus against a Contact:

```
Contact: <sip:389390542457@serv51.chicago.com>
```

which resolves directly to the focus. Other approaches may also be used to generate this globally routable Contact URI.

4. SIP User Agent Conferencing Capability Types

We can identify three different SIP user agent (UA) applications regarding their conferencing capabilities.

4.1 Type I - Conference Unaware UA

The simplest user agent can participate in a conference ignoring all SIP conferencing-related information. The simplest user agent is able to dial into a conference and to be invited to a conference. All conferencing information (if any) is conveyed to it using non-SIP means. Such s user agent would not usually host a conference (at least, not using SIP explicitly). A Type I UA need only support RFC 3261 [3]. Call flows for Type I UAs are not shown in general in this document as they would be identical to those in the SIP Call Flows document [10].

4.2 Type II - Conference Member Capable UA

A Type II user agent can support SIP conferencing conventions and extensions merely as a conference member. Such user agents do not have focus capabilities.

From a SIP requirements perspective, a Type II UA would support REFER [11], SIP Events [12], the conferencing package [13], and the conventions of conferencing call control defined in this document, in addition to support of RFC 3261.

4.3 Type III - Conference Member and/or Focus Capable UA

The next level of user agents is capable of both being a conference member and a conference focus. This is a special capability and can be discovered using the techniques described in Section 5.

A user agent of this type could be implemented in end user equipment and would be used for ad-hoc creation of small to middle size conferences.

Alternatively, a type III UA could be a dedicated conferencing server whose primary task is to host conferences of any type and size. Note that a certain conference instance can bridge members having different capabilities who have joined the conference by different means (i.e. dial-in, dial-out, scheduled and ad-hoc).

A conference server typically will not be a single device but a function decomposed into media servers, IVR systems, etc as described in the Application Components document [14]. In this document, however, it will be discussed as if it were a UA with certain focus capabilities.

A conference server will likely have all three types of URIs (as specified above) that resolve to it: a general URI, a focus URI, and conference URIs.

5. Discovery of Conferencing Capabilities using OPTIONS

The general means of capability discovery in SIP is the OPTIONS method as detailed in Section 11 of RFC 3261 [3]. This same method can be used by a user agent to discover conferencing capabilities.

5.1 Requirements Review

Currently the only requirement is to distinguish between Type I/II vs. Type III user agents. Should additional conferencing extensions defined in future, means to distinguish between Type I vs. Type II user agents may be required.

5.2 Definitions

A UA MAY send an OPTIONS request to discover the conferencing capabilities of another UA. If the UA responding to the query has conferencing-related capabilities and wants to share this information, it can do so in the reply to the OPTIONS request.

If the UA identified by the general URI in the OPTIONS request has an ability to act as a focus, the OPTIONS response SHOULD indicate this by the inclusion of the focus URI with "isFocus" caller prefs parameter [15] in a Contact header field.

> EditorÆs Note: This Contact header field "isFocus" parameter is currently not defined in the base caller prefs [Error! Bookmark not defined.] document, but needs be added as an extension.

This OPTIONS request can be sent outside a dialog (pre-call) or within an established dialog (mid-call). In both cases, inclusion of the "isFocus" parameter in a Contact header in the reply to the OPTIONS request expresses the ability of the UA to host a conference (i.e. having focus capabilities) as opposite to having a focus active for this call.

A UA receiving an OPTIONS request SHOULD generate a well-formed response containing Allow, Accept, Allow-Events, and Supported, and Contact header fields.

An OPTIONS query sent to either a general or focus URIs would likely return Contact URIs listing both the general URI and the focus URI.

An OPTIONS query to the general or focus URI would not return a list of active conference URIs hosted by the server. This information can be retrieved using a method TBD.

> OPEN ISSUE: In general, nothing in this specification prohibits conference URIs discovery using the OPTIONS method. That being said, currently, there is no way to distinguish between focus URI and conference URI: an OPTIONS sent to a particular conference URI would return a response containing that conference URI in a Contact containing the "isFocus" parameter, same as for a focus URI.

> OPEN ISSUE: Should an OPTIONS request sent to a conference URI not return the focus URI? Or the general URI?

Note that the Allow, Accept, Allow-Events, and Supported header fields should be present in an INVITE from a focus or a 200 OK answer from the focus to an INVITE as a part of a normal dialog establishment process. Inclusion of the Contact header with "isFocus"

parameter by the focus signals to a UA that the dialog is a part of a conference identified by the URI in the Contact header.

5.3 Examples

This section contains an example response to an OPTIONS request sent by Alice to Carol (sent to Carol's address of record, i.e. general URI). Based on the response, Alice's UA learns that Carol's UA has conferencing and focus capabilities (Type III UA), and learns the focus URI which could be used later to invoke conferencing services.

The response details are as follows:

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP pc33.atlanta.com;branch=z9hG4bKhjhs8ass877
 ;received=192.0.2.4
To: <sip:carol@chicago.com>;tag=93810874
From: Alice <sip:alice@atlanta.com>;tag=1928301774
Call-ID: a84b4c76e66710
CSeq: 63104 OPTIONS
Contact: <sip:carol@chicago.com>
Contact: <sip:carolsfocus@chicago.com>;isFocus
Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER,
 SUBSCRIBE, NOTIFY
Allow-Events: refer, conference
Accept: application/sdp, application/conference-info+xml,
 message/sipfrag
Accept-Language: en
Supported: pref, replaces
Content-Type: application/sdp
Content-Length: 274

(SDP not shown)
```

Useful information from each of these headers is detailed in the next sections.

Allow. The support of methods such as REFER, SUBSCRIBE, and NOTIFY indicate that the user agent supports call control and SIP Events.

Accept. The support of bodies such as message/sipfrag, application/conference-info+xml also indicates support of call control and conferencing.

Allow-Events. The support of event packages such as refer, conference.

Supported. The support of extensions such as caller prefs [Error! Bookmark not defined.] and replaces [16].

Editor's Note: If an extension tag for some TBD conferencing related extensions is defined, it would be present here.

Contact. This OPTIONS response contains two Contact header fields. The first one is just Carol's address of record (i.e. the general URI) for session establishment, etc. The second Contact URI is the URI of Carol's focus. This can be determined by the presence of the "isFocus" caller preferences [Error! Bookmark not defined.] parameter. The presence of a Contact with this parameter confirms that Carol's UA is a Type III UA.

6. SIP Conferencing Implementation

Note that most the scenarios described below apply equally for ad-hoc or reserved conference, with the exception of Sections 6.2 and 6.3 on creating a conference which does not apply to a reserved conference.

6.1 SIP Conferencing Building Blocks

The scenarios presented below are the call control building blocks for various SIP tight conferencing applications as described in the conferencing requirements [5] and framework documents [4]. In the sections below we present typical SIP conferencing call control flows and discuss the applicability of each for different conferencing situations. The major design goal is that the same SIP conferencing building blocks would be used by user agents having different conferencing capabilities and comprising different applications.

6.2 Creating a Conference

This section addresses creating an ad-hoc conference by interaction with a focus URI with the focus being responsible for the conference ID generation.

This approach requires awareness of conferencing information from the members. Only a Type II UA will know to retrieve the conference information (from the Contact header) and use it for adding new members.

The benefit of this approach is that the details and conventions of the deployed conferencing infrastructure are transparent to the members (and the participating users), since they treat the Conference ID merely as an opaque URI. That allows for building automated end user applications in a play-and-plug manner.

To create a conference, a UA SHOULD send an INVITE (with the Request-URI set to the focus URI) to the focus that will host the conference.

The SIP URI of the focus can be provisioned in the UA or can be discovered using any of the means described earlier in this document.

The focus can distinguish this INVITE request as a request to create a new ad-hoc conference from a request to join an existing conference by the Request-URI. In this flow, the focus is a Type III UA, so it maintains different types of URIs as discussed in the previous sections.

Assuming that all security and policy requirements have been met, the focus SHOULD create the conference with the Contact URI returned in the 200 OK being the conference URI. The Contact header field SHOULD contain the "isFocus" parameter to indicate that this URI is for a conference.

The UA creating the conference SHOULD send a SUBSCRIBE to the conference URI with the conference event package.

An example call flow is shown in Figure 1. Note that Focus is shorthand for the focus URI and Conf-ID Is short for the conference URI. In this flow, Alice creates a conference by sending an INVITE to the focus URI. Once the media session is established, Alice subscribes to the conference URI obtained through the Contact in the 200 OK response from the focus.

```
  Alice                Focus                 Bob                Carol
    |                    |                    |                    |
    | Alice creates the conference.           |                    |
    |                    |                    |                    |
    | INVITE sip:Focus F1|                    |                    |
    |------------------->|                    |                    |
    |   180 Ringing F2   |                    |                    |
    |<-------------------|                    |                    |
    |   200 OK Contact:Conf-ID;isFocus F3     |                    |
    |<-------------------|                    |                    |
    |        ACK F4      |                    |                    |
    |------------------->|                    |                    |
    |        RTP         |                    |                    |
    |<==================>|                    |                    |
    |                    |                    |                    |
    | Alice subscribes to the conference URI. |                    |
    |                    |                    |                    |
    | SUBSCRIBE sip:Conf-ID F5                |                    |
    |------------------->|                    |                    |
    |     200 OK F6      |                    |                    |
    |<-------------------|                    |                    |
    |     NOTIFY F7      |                    |                    |
       |<--------------------|                    |                    |
       |     200 OK F8      |                    |                    |
       |------------------->|                    |                    |
```

Figure 1. Creation of a Conference.

6.3 Creating a Conference by a Type I UA

It is a requirement that a Type I UA be able to create and add participants to a conference without understanding any of the conferencing conventions or extensions (such as in Section 6.2 above). The only way to accomplish this is for the participant (human) to choose the conference URI in the domain of the focus URI. The disadvantages of this approach are discussed later in the section.

A user (human) would choose a conference URI according to system rules and insert it into the Request-URI of the INVITE. This same URI is echoed by a focus adhering to certain conventions (discussed below) in the Contact header by the focus. Additional members could be added by non-SIP means (publication of the chosen conference URI using web pages, email, IM, etc.). Alternatively, the Type I UA could then add other participants to the conference using SIP call control by establishing a session with them, then transferring them to the conference URI [17]. Note that only the participant (human) is aware of the conferencing application, and the Type I UA only need support RFC 3261 and optionally call transfer.

Making this work does impose certain requirements on a focus. As a service/implementation choice, a focus could allow the creator of the conference to choose the user portion of the conference URI. However, this requires URI and behavior conventions to be used by both members and the focus.

For example, a service might reserve the domain conf.example.com for all conference URIs. The focus URI could be sip:focus@conf.example.com. The focus could be configured to interpret an unknown Request-URI in the conf.example.com domain as a request for a conference to be created with the conference URI as the Request-URI. For example, an INVITE sent with a Request-URI of sip:k32934208ds72@conf.example.com could be routed to the focus who would then create a conference. This conference URI should be registered by the focus to become routable as a conference URI within the conf.example.com domain. The returned Contact would look as follows: <sip:k32934208ds72@conf.example.com>;isFocus. Note, however, that this approach relies on conventions adopted between the participant (human) and the focus.

As a result, the method of the conference URI as an opaque URI being generated by the focus (as per Section 6.2) is preferred.

To join an existing specific conference a UA SHOULD send an INVITE to the conference URI chosen by the first participant. The rest of this scenario is shown in Section 6.4.

An example call flow is shown in Figure 2. The participant Alice creates the conference URI (using some convention agreed to with the focus domain) and sends an INVITE to that URI which reaches the focus. The focus creates the conference and returns the same conference URI in the 200 OK answer to the INVITE (which is ignored by the Type I UA).

```
     Alice                Focus                 Bob                Carol
       |                    |                    |                    |
       | Alice creates the conference and chooses the conference URI. |
       |                    |                    |                    |
       | INVITE sip:Conf-ID F1                   |                    |
       |------------------->|                    |                    |
       |   180 Ringing F2   |                    |                    |
       |<-------------------|                    |                    |
       |   200 OK Contact:Conf-ID;isFocus F3     |                    |
       |<-------------------|                    |                    |
       |        ACK F4      |                    |                    |
       |------------------->|                    |                    |
       |        RTP         |                    |                    |
       |<==================>|                    |                    |
```

Figure 2. A Conferencing Unaware (Type I) UA Creates a Conference

6.4   Dialing into a Conference by Conference URI

In this section a UA knows the conference URI and "dials in" to join this conference. The conference URI can be reserved using non-SIP mechanisms, or generated using the methods of Sections 6.2 or 6.3.

If the UA is the first member of the conference to dial in, it is likely that this INVITE will "create" the conference. However, the conference URI must have been created prior to its use.

When the conference is up and running already, the dialing-in member is joined to the conference by a focus.

To join an existing specific conference a UA SHOULD send an INVITE to the conference URI.

Assuming that all security and policy requirements have been met, the focus SHOULD establish the session with the UA and "mix" the media appropriately with existing conference members.

The UA SHOULD subscribe to the conference URI with the conference event package.

The focus SHOULD notify other members that a new member has been added.

An example call flow is shown in Figure 3. It is assumed that Alice is already in the conference (has a session established with the focus).

```
     Alice                Focus                 Bob                 Carol
       |                    |                                          |
       |<==================>|                                          |
       |                    |    Carol "dials in" to the conference    |
       |                    |                                          |
       |                    |              INVITE sip:Conf-ID F1       |
       |                    |<-----------------------------------------|
       |                    |               180 Ringing F2             |
       |                    |----------------------------------------->|
       |                    |     200 OK Contact:Conf-ID;isFocus F3    |
       |                    |----------------------------------------->|
       |                    |                   ACK F4                 |
       |                    |<-----------------------------------------|
       |                    |                    RTP                   |
       |                    |<========================================>|
       |                    |           SUBSCRIBE sip:Conf-ID F5       |
       |                    |<-----------------------------------------|
       |                    |                  200 OK F6               |
       |                    |----------------------------------------->|
       |                    |                NOTIFY F7                 |
       |                    |----------------------------------------->|
       |                    |                  200 OK F8               |
       |                    |<-----------------------------------------|
       |     NOTIFY F9      |                                          |
       |<-------------------|                                          |
       |     200 OK F10     |                                          |
       |------------------->|                                          |
```

Figure 3. A member "dials in" to an existing conference.

6.5   Dial out - Added by the Focus

This section is equally applicable for both ad-hoc and reserved conferences.

To directly add a member to a conference, a focus SHOULD send an INVITE to the member containing a Contact header field with the conference URI and the ôisFocusö header parameter. The resulting media session SHOULD be appropriately mixed with the media from the other members.

The new member SHOULD subscribe to the conference ID from the Contact from the INVITE.

The simplest UA (as in Type I) would simply ignore the conferencing information and treat the session (from a SIP perspective) as a point to point session.

The focus SHOULD notify other participants that a new member has been added.

An example call flow is shown in Figure 4. It is assumed that Alice is already a member of the conference. The focus invites Carol to the conference by sending an INVITE. After the session is established, Carol subscribes to the conference URI.

```
  Alice               Focus                 Bob                Carol
    |                    |                    |                    |
    |<==================>|                    |                    |
    |                    |                                         |
    |           Focus "dials out" to add Carol to the conference   |
    |                    |                                         |
    |                    |     INVITE Contact:Conf-ID;isFocus F1   |
    |                    |---------------------------------------->|
    |                    |               180 Ringing F2            |
    |                    |<----------------------------------------|
    |                    |                  200 OK F3              |
    |                    |<----------------------------------------|
    |                    |                   ACK F4                |
    |                    |---------------------------------------->|
    |                    |                    RTP                  |
    |                    |<=======================================>|
    |                    |           SUBSCRIBE sip:Conf-ID F5      |
    |                    |<----------------------------------------|
    |                    |                  200 OK F6              |
    |                    |---------------------------------------->|
    |                    |                NOTIFY F7                |
    |                    |---------------------------------------->|
    |                    |                  200 OK F8              |
    |                    |<----------------------------------------|
     |     NOTIFY F9      |                                        |
     |<-------------------|                                         |
     |     200 OK F10     |                                         |
     |------------------->|                                         |
```

Figure 4. Focus "dials out" to add Carol to the conference.

6.6 Requesting the Focus Add a New Resource to a Conference.

A SIP conference URI can be used to inject different kinds of information into the conference. Examples include new members, new real-time media sources, new IM messages, and pointers to passive information references (such as HTTP URIs).

To request the focus add a new information resource to the specified conference, any SIP UA can send a REFER to the conference URI with a Refer-To containing the URI of the new resource. Since this REFER is sent to the conference URI and not the focus URI, the semantics to the focus are to bring the resource into the conference and make it visible to the conference members. The resultant focus procedures are dependant both on the nature of the new resource (as expressed by its URI) and the own focus abilities regarding IM, central real time media processing, etc.

The flow for adding a new UA member is important to consider because it works even if the new member does not support REFER and transfer call control - only the requesting member and the focus need to support the call control.

Upon receipt of the REFER containing a Refer-To header with a SIP URI, the focus SHOULD send an INVITE to the new member identified by the Refer-To SIP URI containing a Contact header field with the conference URI and the "isFocus" header parameter. The resulting media session SHOULD be appropriately mixed with the media from the other members.

The new member SHOULD subscribe to the conference ID from the Contact from the INVITE.

The simplest UA (as in Type I) would simply ignore the conferencing information and treat the session (from a SIP perspective) as a point to point session.

The focus SHOULD notify other participants that a new member has been added.

An example call flow is shown in Figure 5. It is assumed that Alice is already a member of the conference. Alice sends a REFER to the conference URI. The focus invites Carol to the conference by sending

an INVITE. After the session is established, Carol subscribes to the conference URI.

```
  Alice                Focus                 Bob                Carol
    |                    |                    |                    |
    |<==================>|                    |                    |
    | REFER sip:Conf-ID Refer-To:Carol F1     |                    |
    |------------------->|                                         |
    |  202 Accepted F2   |                                         |
    |<-------------------|                                         |
    |                    |                                         |
    |           Focus "dials out" to add Carol to the conference   |
    |                    |                                         |
    |                    |     INVITE Contact:Conf-ID;isFocus F3   |
    |                    |---------------------------------------->|
    |                    |               180 Ringing F4            |
    |                    |<----------------------------------------|
    |                    |                  200 OK F5              |
    |                    |<----------------------------------------|
    |                    |                   ACK F6                |
    |                    |---------------------------------------->|
    |                    |                    RTP                  |
    |                    |<=======================================>|
    |     NOTIFY F7      |                                         |
    |<-------------------|                                         |
    |     200 OK F8      |                                         |
    |------------------->|                                         |
    |                    |           SUBSCRIBE sip:Conf-ID F9      |
    |                    |<----------------------------------------|
    |                    |                  200 OK F10             |
    |                    |---------------------------------------->|
    |                    |                NOTIFY F11               |
    |                    |---------------------------------------->|
    |                    |                  200 OK F12             |
    |                    |<----------------------------------------|
    |     NOTIFY F13     |                                         |
    |<-------------------|                                         |
    |     200 OK F14     |                                         |
    |------------------->|                                         |
```

Figure 5. Member Requests Focus add member to the conference.

6.7 Adding a 3rd Party Using Conference ID

This section is equally applicable for both ad-hoc and reserved conferences.

A member wishing to add a new member simply requests another participant to send an INVITE to the conference URI. This can be done using a non-SIP means (such as passing or publishing the conference URI in an email, IM, or web page). If a non-SIP means is used, then the flow and requirements are identical to Section 6.4.

The SIP mechanism to do this utilizes the REFER method.

A UA wishing to add a new member SHOULD send a REFER request to the member with a Refer-To header containing the conference URI.

The requirements are then identical to the "dial in" case of Section 6.4. The UA MAY receive notification through the REFER action that the new member has been added in addition to the notification received through the conference package.

An example is shown in Figure 6. In this call flow, it is assumed that Alice is already a member of the conference. Alice sends Bob an "out of band" REFER - that is, a REFER outside of an established dialog. Should Bob reject the REFER, Alice might try sending an INVITE to Bob to establish a session first, then send a REFER within the dialog, effectively transferring Bob into the conference [17].

```
  Alice                Focus                Bob                Carol
    |                    |                    |                    |
    |<==================>|                    |                    |
    |                    |                    |                    |
    |  Alice adds Bob into conference         |                    |
    |                    |                    |                    |
    | REFER Refer-To:Conf-ID F1               |                    |
    |---------------------------------------->|                    |
    |  202 Accepted F2   |                    |                    |
    |<----------------------------------------|                    |
    |     NOTIFY F3      |                    |                    |
    |<----------------------------------------|                    |
    |     200 OK F4      |                    |                    |
    |---------------------------------------->|                    |
    |                    | INVITE sip:Conf-ID F5                   |
    |                    |<-------------------|                    |
    |                    |   180 Ringing F6   |                    |
    |                    |------------------->|                    |
    |                    | 200 OK Contact:Conf-ID;isFocus F7       |
    |                    |------------------->|                    |
    |                    |       ACK F8       |                    |
    |                    |<-------------------|                    |
    |                    |        RTP         |                    |
    |                    |<==================>|                    |
        |                     |      NOTIFY F9     |                     |
        |<----------------------------------------|                    |
        |                    |      200 OK F10    |                    |
        |---------------------------------------->|                    |
        |      NOTIFY F11    |                    |                    |
        |<-------------------|                    |                    |
        |      200 OK F12    |                    |                    |
        |------------------->|                    |                    |
        |                    | SUBSCRIBE sip:Conf-ID F13               |
        |                    |<-------------------|                    |
        |                    |     200 OK F14     |                    |
        |                    |------------------->|                    |
        |                    |     NOTIFY F15     |                    |
        |                    |------------------->|                    |
        |                    |     200 OK F16     |                    |
        |                    |<-------------------|                    |
```

Figure 6. Adding a member to an existing conference.

6.8 Adding a 3rd Party Using Call ID

Under some circumstances, a member wanting to join a conference may only know a dialog ID of one of the legs of the conference and the focus URI, instead of the conference URI. The information may have been learned using the dialog package [18] or some non-SIP means. If

A UA can request to be added to a conference by sending a request to the focus containing a Join [19] header field containing a dialog ID of one leg of the conference (a dialog between a member and the focus).

There are other scenarios in which a Type III or even Type II UA which is capable of creating a conference can use the Join header for certain conferencing call control scenarios.

The Join header field is also useful in the transition of a two party call to a conference call, as described in [20].

To request a conference member to be added to the conference without knowing the conference URI, a UA SHOULD send an INVITE request to the focus URI containing a Join header field. The Join header field MUST contain the dialog identifier of a valid dialog between the focus and the member.

An example is shown in Figure 7. It is assumed that Alice is a member of the conference. The dialog identifier between Alice and the focus is abbreviated as A-F and is known by Bob. Bob requests to be added to the conference by sending an INVITE message F1 to the focus containing a Join header which contains the dialog identifier

A-F. Note that this dialog identifier could be learned through some non-SIP mechanism, or by use of SUBSCRIBE/NOTIFY and the dialog event package [21]. Bob is added into the conference by the focus.

```
  Alice                Focus                 Bob                Carol
    |                    |                    |                    |
    |<==================>|                    |                    |
    |                    |                    |                    |
    |  Bob requests to be added to the conference.                 |
    |                    |                    |                    |
    |                    | INVITE sip:Focus Join:A-F  F1            |
    |                    |<-------------------|                    |
    |                    |   180 Ringing F2   |                    |
    |                    |------------------->|                    |
    |                    | 200 OK Contact:Conf-ID;isFocus F3       |
    |                    |------------------->|                    |
    |                    |       ACK F4       |                    |
    |                    |<-------------------|                    |
    |                    |        RTP         |                    |
    |                    |<==================>|                    |
    |                    | SUBSCRIBE sip:Conf-ID F5               |
    |                    |<-------------------|                    |
    |                    |     200 OK F6      |                    |
    |                    |------------------->|                    |
    |                    |     NOTIFY F7      |                    |
    |                    |------------------->|                    |
    |                    |     200 OK F8      |                    |
    |                    |<-------------------|                    |
```

Figure 7. Adding a member to an existing conference using Join.

6.9   Bringing a Point-to-Point Dialog into a Conference

A focus is capable of bringing an existing point-to-point dialog with another UA to a conference that the focus hosts. The focus would do it by sending re-INVITE changing the Contact URI to the conference URI with the ôisFocusö parameter. By doing this, the focus signals to the UA that it becomes a member of the conference, specified in the Contact header.

Currently, there is no way for a UA, being in an active point-to-point call with a focus, to express by SIP call control means a request to bridge its dialog with a specific conference or to create a new conference and include the dialog in this conference. Instead, a new dialog will need to be created. Even if the UA discovers that the other side has focus capabilities, the UA needs to close the old session and to establish a new session/dialog with the focus.

Editor's Note: Is this an issue?

Security Considerations

TBD

References

1 Bradner, S., "The Internet Standards Process -- Revision 3", BCP 9, RFC 2026, October 1996.

2 Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997

3 J. Rosenberg, H. Schulzrinne, G. Camarillo, A. Johnston, J. Peterson, R. Sparks, M. Handley, and E. Schooler, "SIP: Session Initiation Protocol", RFC 3261, June 2002.

4 J. Rosenberg, "A Framework for Conferencing with the Session Initiation Protocol," October 2002, Work in Progress.

5 O. Levin, R. Even, P. Koskelainen, S. Sen, "Requirements for Tightly Coupled SIP Conferencing," Internet Engineering Task Force, November 2002, Work in progress.

6 R. Mahy, B. Campbell, A. Johnston, D. Petrie, J. Rosenberg, and R. Sparks, "A Multi-party Application Framework for SIP," Internet Engineering Task Force, February 2002, Work in progress.

7 B. Campbell and R. Sparks, "Control of Service Context using SIP Request-URI," RFC 3087, April 2001.

8 P. Faltstrom and M. Mealing, "The E.164 to URI DDDS Application," Internet Engineering Task Force, June 2002, Work in progress.

9 E. Guttman, C. Perkins, J. Veizades, M. Day, "Service Location Protocol, Version 2," RFC 2608, June 1999.

10 A. Johnston, S. Donovan, R. Sparks, C. Cunningham, "SIP Basic Call Flow Examples", Internet Draft, Internet Engineering Task Force, October 2002, Work in Progress.

11 R. Sparks, "The Refer Method", Internet Draft, Internet Engineering Task Force, July 2002, Work in Progress.

12 A. Roach, "SIP-Specific Event Notification," RFC 3265, June 2002.

13 J. Rosenberg and H. Schulzrinne, "A Session Initiation Protocol (SIP) Event Package for Conference State," Internet Engineering Task Force, June 2002, Work in progress.

14 J. Rosenberg, P. Mataga, and H. Schulzrinne, "An application server component architecture for SIP," Internet Draft, Internet Engineering Task Force, Mar. 2001. Work in progress.

15 H. Schulzrinne and J. Rosenberg, "SIP Caller Preferences and Callee Capabilities," Internet Engineering Task Force, June 2001, Work in Progress.

16 R. Mahy , B. Biggs, and R. Dean, "The SIP Replaces header," Internet Draft, Internet Engineering Task Force, April 2002, Work in Progress.

17 R. Sparks and A. Johnston, "SIP Call Control û Transfer," Internet Engineering Task Force, October 2002, Work in progress.

18 J. Rosenberg and H. Schulzrinne, "A Session Initiation Protocol (SIP) Event Package for Dialog State," Internet Engineering Task Force, June 2002, Work in progress.

19 R. Mahy and D. Petrie, "The Session Initiation Protocol (SIP) 'Join' Header," Internet Engineering Task Force, June 2002, Work in progress.

20 A. Johnston, S. Donovan, R. Sparks, C. Cunningham, "SIP Service Examples", Internet Draft, Internet Engineering Task Force, October 2002, Work in Progress.

21 J. Rosenberg and H. Schulzrinne, "A Session Initiation Protocol (SIP) Event Package for Dialog State," Internet Engineering Task Force, June 2002, Work in progress.

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