

High-Level Requirements for Tightly Coupled SIP Conferencing

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Abstract

This document examines a wide range of conferencing requirements for tightly coupled SIP conferences. Separate documents will map the requirements to existing protocol primitives, define new protocol extensions, and introduce new protocols as needed. Together, these documents will provide a guide for building interoperable SIP conferencing applications.

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1. Introduction

This document examines a wide range of conferencing requirements for tightly coupled SIP (RFC 3261 [2]) conferencing.

The requirements are grouped by subjects in various areas allowing solutions to progress in parallel.

Separate documents will map the requirements to existing protocol primitives, define new protocol extensions, and introduce new protocols as needed.

Together, these documents will provide a guide for building interoperable SIP conferencing applications.

The terms "MAY", "SHOULD", and "MUST" are to be interpreted as described in RFC 2119 [1].

2. An Overview

A SIP conference is an association of SIP user agents (i.e., conference participants) with a central point (i.e., a conference focus), where the focus has direct peer-wise relationships with the participants by maintaining a separate SIP dialog with each.

The focus is a SIP user agent that has abilities to host SIP conferences including their creation, maintenance, and manipulation using SIP call control means and potentially other non-SIP means.

In this tightly coupled model, the SIP conference graph is always a star. The conference focus maintains the correlation among conference's dialogs internally.

The conference focus can be implemented either by a participant or by a separate application server.

In the first case, a focus is typically capable of hosting a simple ad hoc conference only. We envision that such basic conference can be established using SIP call control primitives only.

A dedicated conference server, in addition to the basic features, offers richer functionality including simultaneous conferences, large scalable conferences, reserved conferences, and managed conferences. A conferencing server can support any subset of the advanced conferencing functions presented in this document.

The media graph of a SIP conference can be centralized, decentralized, or any combination of both, and potentially differ per media type. In the centralized case, the media sessions are established between the focus and each one of the participants. In the de-centralized (i.e., distributed) case, the media graph is a (multicast or multi-unicast) mesh among the participants. Consequently, the media processing (e.g., mixing) can be performed either by the focus alone or by the participants.

Conference participants and third parties can have different roles and privileges in a certain conference. For example, conferencing policy can state that the rights to disconnect from and to invite to a conference are limited to the conference chair only.

Throughout the document, by conference policies we mean a set of parameters and rules (e.g., maximum number of participants, needs chair-person supervision or not, password protected or not, duration, or a way of media mixing) that are defined at the onset of a conference. Typically, conference policies would be specified by a conference creator and need special privileges to be manipulated.

Throughout the document, by a conference state we mean a set of information describing the conference in progress. This includes participants' information (such as dialog identifiers), media sessions in progress, the current loudest speaker, the current chair, etc.

3. High-Level Requirements

In addition to the requirements presented in this document, supplementary requirements for conferencing policy, media mixing and other manipulations, floor control, privilege control, etc. will be discussed in separate documents.

3.1. Discovery Phase

Some of the requirements presented in this section can be met either by configuration means or by using proprietary conventions. Nevertheless, there is consensus that standard means for implementing these functions by automata **MUST** be defined.

REQ-1: Discovery of a location of an arbitrary SIP conferencing server(s).

REQ-2: Given a SIP Address-of-Record (AOR) of a certain entity, resolution whether the SIP entity has focus capabilities.

REQ-3: Given a global identifier of a particular conference, locating the conference focus.

REQ-4: Given a global identifier of a particular conference, obtaining the conference properties.

REQ-5: Given a global identifier of a particular conference, obtaining the conference state information.

3.2. Conference Creation

Given a focus location, a means **MUST** be defined for an interested entity (including a user agent) to implement the procedures below:

REQ-1: Creation of an ad-hoc conference identifier and the conference with specified properties.

REQ-2: Creation of a reserved conference identifier for a conference with specified properties.

REQ-3: Specifying properties upon conference creation in any of the following ways: default, profiles, and explicitly.

3.3. Conference Termination

REQ-1: Given a conference identifier, a means **MUST** be defined for a user agent to disconnect all participants from the conference and terminate the conference including the release of the associated resources.

REQ-2: A means **MAY** be defined for requesting a focus to revert a two-party conference to a basic SIP point-to-point session including the release of the associated conferencing resources.

3.4. Participants' Manipulations

Some of the requirements presented in this section can be met by human intervention, configuration means, or proprietary conventions. Nevertheless, there is consensus that standard means for implementing these functions by automata **MUST** be defined.

3.4.1. Participation of a Conference-Unaware User Agent

- REQ-1: Focus **MUST** be able to invite and disconnect an RFC 3261 compliant only SIP user agent to and from a SIP conference.
- REQ-2: An RFC 3261 compliant only SIP user agent **MUST** be able to dial-in to a particular SIP conference. In this case, only the human knows that he/she is connected to the conference.

3.4.2. Dial-Out Scenarios

- REQ-1: A means **MUST** be defined for a focus to invite another user agent to one of the focus' conferences. This procedure **MUST** result in the establishment of a single SIP dialog between the two.
- REQ-2: Given an existing SIP dialog between two user agents, if at least one user agent has focus capabilities, a means **MUST** be defined for the conference focus to invite the other user agent to one of the focus' conferences without additional SIP dialog establishment.
- REQ-3: An invitation to a user agent to join a conference **MUST** include a standard indication that it is a conference and the conference identifier.

3.4.3. Dial-In Scenarios

- REQ-1: A means **MUST** be defined for a user agent to create an ad hoc conference with default properties (as per "Conference Creation" REQ-1 above) and to become a participant using a single SIP dialog.
- REQ-2: Given a reserved conference identifier, a means **MUST** be defined for a user agent to activate the conference and to become a participant using a single SIP dialog.
- REQ-3: Given a conference identifier of an active conference, a means **MUST** be defined for a user agent to dial-in the conference and to become a participant using a single SIP dialog between the two.
- REQ-4: Given an identifier of one of the dialogs of a particular active conference, a means **MUST** be defined for a user agent to dial-in the conference and to become a participant.

3.4.4. Third-Party Invitation to a Conference

- REQ-1: Given a conference identifier, a means **MUST** be defined for a user agent to invite another user agent to this conference.
- REQ-2: Given an identifier of one of the dialogs of a particular active conference, a means **MUST** be defined for a user agent to invite another user agent to this conference.
- REQ-3: Given a conference identifier, a means **SHOULD** be defined for a user agent to invite a list of user agents to this conference (a so-called "mass invitation").

3.4.5. Participants' Removal

- REQ-1: A means **MUST** be defined for a conference focus to remove a conference participant from the conference.
- REQ-2: Given a conference identifier, a means **MUST** be defined for a user agent to remove a participant from the conference.
- REQ-3: Given an identifier of one of the dialogs of a particular active conference, a means **MUST** be defined for a user agent to remove a participant from the conference.
- REQ-4: Given a conference identifier, a means **MUST** be defined for a user agent to remove all the participants from the conference.
- REQ-5: Given a conference identifier and a sub-list of participants, a means **MAY** be defined for a user agent to remove the specified participants from the conference (a so-called "mass ejection").

3.4.6. Participants' Privacy

A conference focus **SHOULD** support the procedures described in this section. A conference participant **MAY** support the procedures described in this section. The requirements imply that "anonymizing" operations **MUST** be performed on all: the call control, the media control, and the media content when appropriate.

- REQ-1: A conference participant joins the conference "anonymously"; that is, his/her presence can be announced but without disclosing his/her identity.
- REQ-2: A conference participant requests a focus for anonymous participation in the conference.

REQ-3: A conference participant joins a conference in a "hidden mode"; that is, his/her presence and identity are not to be disclosed to other participants.

REQ-4: A conference participant requests a focus for participation in the conference in a hidden mode.

3.5 Conference State Information

3.5.1. Description

By a conference state, we mean a virtual database describing the conference in progress. This includes different conference aspects: participants' information (such as dialog identifiers and state), media sessions in progress (such as current stream contributing sources and encoding schemes), the current loudest speaker, the current chair, etc. Conference state is the latest conference snapshot triggered by changes in participants' state, conference policy changes, etc.

REQ-1: A conference state virtual database **MUST** have a modular definition that is, it **MUST** be possible to access different conference aspects independently.

REQ-2: It **MUST** be possible to aggregate information relating to different conference aspects in a single report.

REQ-3: A mechanism for extensible definition and registration of conference state evolving aspects **MUST** be present.

REQ-4: A default conference state report **MUST** be defined. It **SHOULD** contain a minimal useful set of information (e.g., a list of current conference participants).

3.5.2. Dissemination of Changes

REQ-1: A means **MUST** be defined for reporting the conference state changes to interested parties (including non-conference participants) in a timely manner.

REQ-2: A means **MUST** be defined for a SIP user agent to express its interest in selected state changes only.

REQ-3: A means **MUST** be defined for a SIP user agent to express the minimum interval between receiving state change reports.

REQ-4: It **MUST** be possible to aggregate recent changes in a single reporting event.

REQ-5: Default conference state change reports **MUST** be defined. They **SHOULD** contain minimal useful to the participants information (e.g., participants' joining and leaving the conference).

3.5.3. On-demand Information Dissemination

REQ-1: A means **MUST** be defined to disseminate any conference state information to interested parties (including SIP user agents) on-demand.

REQ-2: A means **MUST** be defined for an interested party (including a SIP user agent) to request conference state information of a particular conference defined by the conference identifier.

REQ-3: A means **MUST** be defined for an interested party (including a SIP user agent) to specify the subset of the conference state information it wants and is capable of receiving.

3.6. Focus Role Migration

REQ-1: A procedure for delegating a focus role by the current focus to another participant **MUST** be defined.

REQ-2: A procedure for requesting a conference focus to transfer its role to another participant **MUST** be defined.

REQ-3: A procedure for on-demand unconditional transfer of the focus role to a different participant **MUST** be defined.

REQ-4: A detection procedure for a focus failure condition **MUST** be defined.

3.7. Side-bar Conferences

A standard means **MUST** be defined in order to implement the operations defined in this section below.

REQ-1: A user agent (not a conference participant) joins a side-bar within the conference by SIP means.

REQ-2: A user agent (not a conference participant) is invited to a side-bar within the conference by SIP means.

REQ-3: A conference participant creates a side-bar conference with one or more participants in a conference by SIP means.

REQ-4: A conference participant joins a side-bar within the conference by SIP means.

- REQ-5: A conference participant is invited to a side-bar within the conference by SIP means.
- REQ-6: A conference-unaware user agent (a participant or not) creates and participates in side-bar conferences. It MAY be achieved by non-SIP means.
- REQ-7: A conference participant creates side-bar conferences within the conference without establishing any additional SIP dialogs with the focus. It MAY be achieved by non-SIP means.
- REQ-8: A conference participant joins any number of side-bars within the conference without establishing any additional SIP dialogs with the focus. It MAY be achieved by non-SIP means.
- REQ-9: A conference participant is invited to any number of side-bars within the conference without establishing any additional SIP dialogs with the focus. It MAY be achieved by non-SIP means.

3.8. Cascading of Conferences

"Cascading of Conferences" is a term that has different meanings in different contexts. Some examples are listed below:

- Peer-to-peer chaining of signaling. (Many ways exist to build the media graph in this case.)
- Conferences have hierarchal signaling relations. (Many ways exists to build the media graph in this case.)
- "Cascading" is used to distribute the media "mixing" only. The distribution of signaling is not required.

As it can be seen from the examples, each will define a different set of requirements.

3.9. SIMPLE and SIP Conferencing Coordination

- REQ-1: SIMPLE-based Presence and Instant Messaging architecture SHOULD fit into the general SIP Conferencing architecture.
- REQ-2: A scenario where a multimedia SIP conference and a multiparty instant messaging conversation take place among the same group of participants MUST be addressed.
- REQ-3: A scenario where a side-bar and/or a sub-IM-conference is being held as a part of SIP conference MUST be addressed.

4. Security Considerations

This document discusses high-level requirements for SIP conferencing. Conferencing has some specific security requirements, which will be summarized here at a very high level.

All of the operations and functions described in this document need to be authorized by a focus or a participant. It is expected that conferences will be governed by a set of authorization rules defined as a part of the conference policy. In order for the conference policy to be implemented, the focus needs to be able to authenticate potential participants. Normal SIP mechanisms including Digest authentication and certificates can be used [2]. These conference-specific security requirements will be discussed in detail in the protocol documents.

Conferencing also has privacy implications. Some of these are discussed in this document. Standard SIP mechanisms for a user agent to request privacy should be utilized by a focus and will be detailed in the protocol documents.

5. Contributors

This work is based on the discussions among the members of the SIP Conferencing design team.

6. References

6.1. Normative References

- [1] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.
- [2] Rosenberg, J., Schulzrinne, H., Camarillo, G., Johnston, A., Peterson, J., Sparks, R., Handley, M. and E. Schooler, "SIP: Session Initiation Protocol", RFC 3261, June 2002.

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