SIP Conferencing

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17 January 2003

Upperside SIP 2003 - Paris

IETF Conferencing

- Packet multimedia experiments since the 1980s
  - Audio/video tools + protocols for A/V over IP
  - Conference announcement and control protocols
- First IETF Audiocast (1992)
  - Mbone-based audio transmission from selected IETF working groups
- Since then: IETF sessions on the Mbone
  - Audio + video (+ sometimes slides)
  - Enabling remote participation (even talks)
- Other uses of Mbone conferencing
  - Broadcasting NASA missions, concerts, …
  - Lectures, seminars, project meetings, …

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Traditional IETF Conferencing Concept

- Multicast-based
- Loosely-coupled conferences
  - no membership control
  - inexact information about participants
    - provided on a voluntary basis
  - security by encryption
- Public announcements and invitations
  - Convey session parameters, then get out of the way
    - Session Announcement Protocol (SAP)
    - Session Initiation Protocol (SIP)
- Conference control
  - Some need perceived; several attempts; insufficient real interest

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Some Historic (IETF) Conferencing Protocols…

- MMCC / CCP (early 1990s)
  - Control for a distributed packet-based conferencing system
- Agreement Protocol (1995)
  - State synchronization in multicast groups
- Conference Control Channel Protocol (CCCP) (1995)
  - Communicating state and events between local and remote entities
  - Support for modular systems (media engines, controllers, UIs, …)
- SCCP (1996; revision 2001)
  - Distribution of conference + media session state
  - Makes use of reliable multicast
- Some other protocols…

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Some Historic (IETF) Conferencing Protocols…

- **MMCC / CCP (early 1990s)**
  - **Control for a distributed packet-based conferencing system**
- **Agreement Protocol (1995)**

All protocols were based on IP Multicast!

- **SCCP (1996; revision 2001)**
  - **Distribution of conference + media session state**
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- **Some other protocols…**

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SIP and Conferencing over Time…

- **Origin: MMUSIC:** Multiparty Multimedia Session Control

From Invitation…	**to initiation, modification, and termination**
From Multiparty…	**to point-to-point-focused**
From Multimedia…	**to voice-centric**

Now: **Multiparty & multimedia rediscovered**

But: **Don't believe in multicast (anymore)!**

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"More recent" Conferencing Models (2000/2001)

- SIP signaling relationships
  - Centralized (bridge, endpoint) vs. mesh of SIP dialogs
- Media distribution
  - Unicast vs. multicast
- Media mixing
  - Centralized (bridge, endpoint) vs. decentralized
- Conference creation
  - ad-hoc vs. scheduled
  - "dial-in" vs. "dial-out"
- How much functionality to provide in SIP?
  - Join / leave
  - Membership management? ...?

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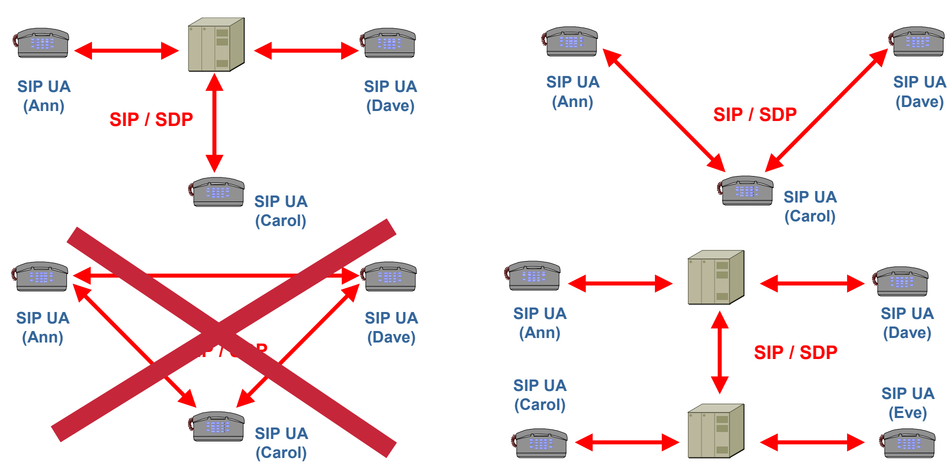
SIP Signaling Relationships



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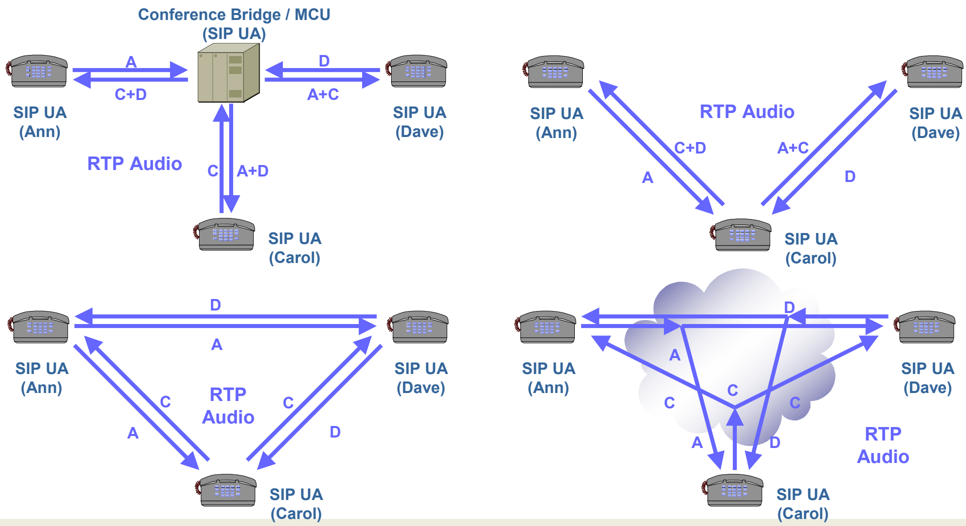
(RTP) Media Sessions



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Current SIP Conferencing Framework

- **Motivators: n-way calling, video conferencing, …**
  - Tightly coupled conferences
- **Recent conferencing models preserved**
  - Except for “fully meshed” conference: complexity just not worth it!
- **Terminology**
  - Trying to avoid already overloaded terms as much as possible
- **Functional entities in a “system model”**
  - Plus implementations examples
- **Set of protocols**
  - Definition of basic building blocks (SIP and other)
  - Sample combinations to implement conferencing services

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Conference Participants

- MUST work with basic SIP support only
  - No awareness of conference
  - Just a point-to-point call with minimal means for control
- Member types (SIP UA)
  - Basic participant: plain-old SIP device
  - Complex participant: supports conferencing features
  - Focus: (one) center of a conference
  - Anonymous: Visible but unidentified participant
  - Invisible: Participant whose presence is not known

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Conferences

- Conference types
  - Basic: just plain SIP, no further means for control
  - Complex: some conferencing features provided
  - Cascaded: several foci concatenated in a conference
  - Sidebar: conference as (logical) part of another
- Focus: Signaling center of a conference
- Conference URI: Identifies a focus (isFocus parameter may indicate this)
- Factory URI: for automated conference creation
  - Yields a dynamically generated conference URI in return

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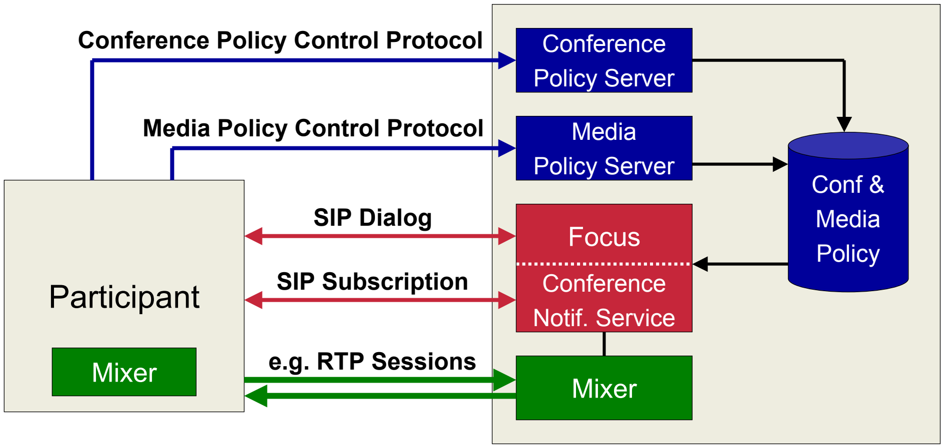
Terminology and Model



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Conferencing Scenarios (1)

- **Simple conferencing scenarios**
  - **Plain SIP only (RFC 3261, 3264)**
- **Extend point-to-point call**
  - **Works only with local focus; otherwise, new call required**
- **Ad-hoc conference**
  - **Automated creation at focus**
  - **IVR / DTMF for control**
  - **Audio for information about the conference and its members**
- **Reserved conference**
  - **Same as ad-hoc**
  - **Use external means for reservation and configuration (e.g. web)**

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Conferencing Scenarios (2)

- Advanced conferencing scenarios:
  - Support for Call Transfer
  - Support means to communicate information from focus to UA
  - Optional: means to manipulate conference and media policy
- Extend point-to-point call
- Join / create a conference based upon an existing dialog
- Ad-hoc conference
- Reserved conference
- Make use of additional conferencing features

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Sample Conferencing Features

- Invite participants (dial-in, dial-out), expel participants
- Authenticate new participants by members
- Obtain conference and media policy information
- Manipulate conference policy
  - Participant privileges, participant management (black list, white list, …)
  - Floor control,
- Explicit media control (media policy)
  - Configure media distribution
  - Add / remove media sessions
- Create, control, and terminate sidebars
  - Separate conference vs. media policy
- …

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Conference Policy

Define, retrieve/notify, modify, and act upon…

- Formal rules for the conference
  - Conference creation, termination, (policy) modification
  - Access control: black list, white list, rules for authentication
  - Privileges of individual participants
  - Visibility of the conference and its members
  - Access to floor and media policy (defined separately)
- General conference attributes
- Participant management
  - Invite, expel
- …

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Media Policy

- Mixer model
  - Input switch: collecting & selecting input streams from partcipants
    - Possibly transcoding and other per-media functions
  - Mixing topologies describing mixing policies
  - Output switch: selecting & distributing output streams to participants
    - Possibly transcoding and other per-media functions
- Mixer may be centralized or not
- Media policy defines how incoming streams are processed, combined, and then distributed
  - Individual mixing functions may be defined per participant
  - Common mixing functions may be defined for the conference
  - Mixing function may take into account “events” from other components

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SIP Signaling Building Blocks

- Membership control
  - Initiation of conferences: INVITE
  - Inviting / adding to conferences: INVITE, REFER
  - Leaving a conference: BYE
  - Expelling from a conference: REFER (method="BYE")
- Conference control
  - State change notifications: SUBSCRIBE / NOTIFY
    - Dialog package, conference package, ...
  - Conference / media policy control
    - Might use data manipulation framework discussed in SIMPLE context
- Other
  - Determine focus URI OPTIONS
  - ...

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Signaling Building Blocks using other Protocols

- Conference Policy Control Protocol (CPCP)
- Media Policy Control Protocol (MPCP)
- Floor control protocol

- Common baseline:
  - Request-response protocol (RPC-style)
  - May be strictly client – server
  - Asynchronous notifications provided by SIP
  - HTTP/HTML access to a web page for human interaction
  - SOAP RPCs e.g. over HTTP

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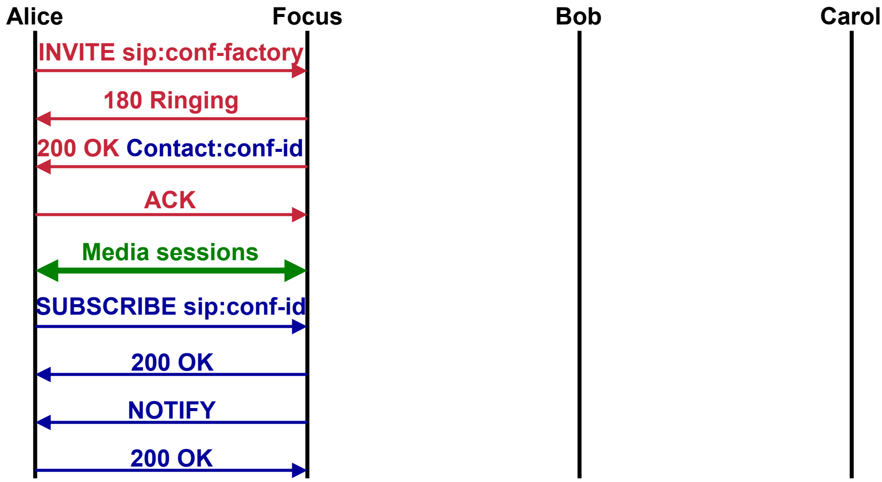
Call Flow Example: Conference Creation



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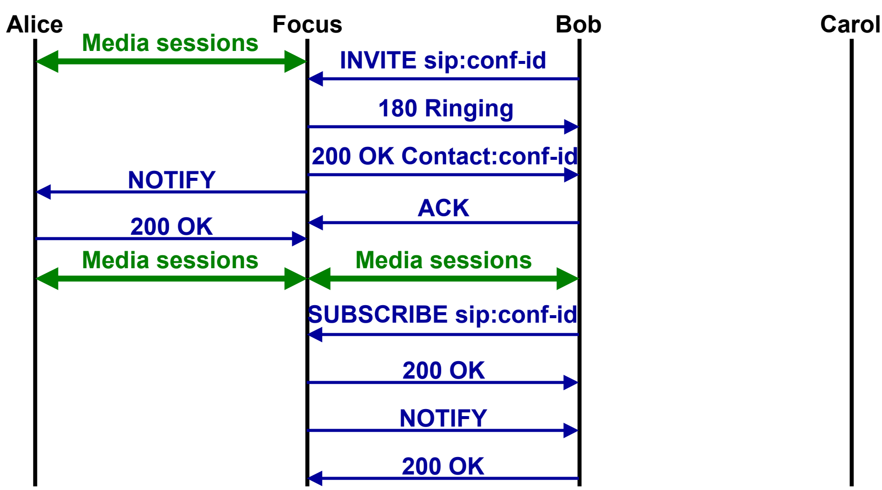
Call Flow Example: User Joining



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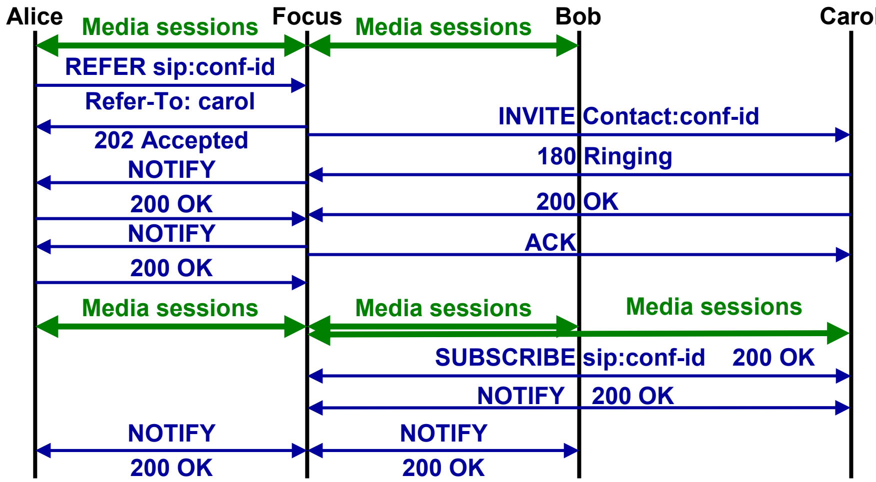
Call Flow Example: Adding a User



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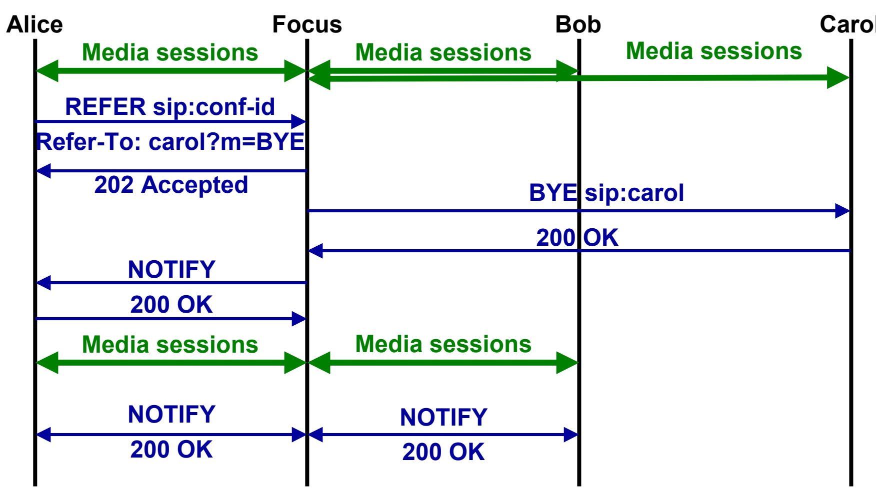
Call Flow Example: Removing a User



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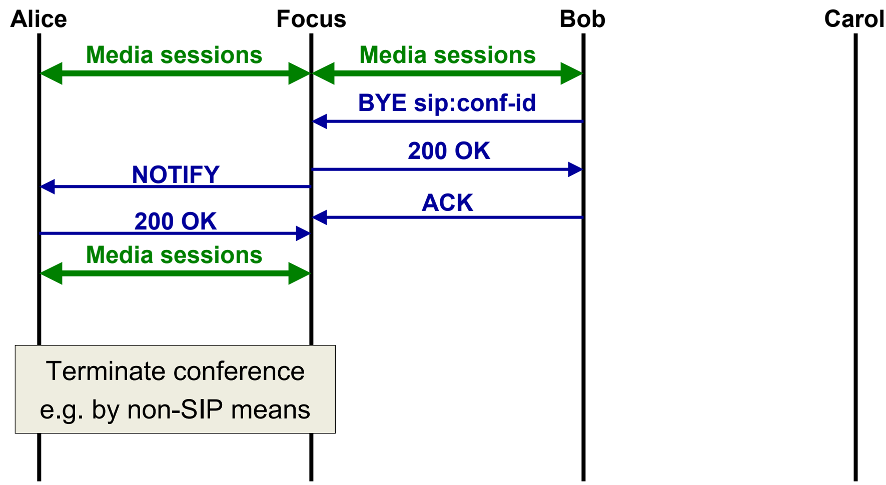
Call Flow Example: User Leaving



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A Bit of Status

- Framework: done
- Scenarios: agreed upon
  - Issue: sidebar conferences
- Requirements: nearing completion for many areas
- SIP Support: largely “complete”
  - Still some minor issues

- Conference and media control: moving ahead
  - Requirements well advanced; protocol ideas progressing
- Media control (e.g. “FIR”, Picture Freeze, …)?
- …

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Conclusion

- After ~10 years of consideration, IETF conferencing seems to finally make it.
- Shift towards a more realistic target
- SIP as strong, commercially accepted base protocol
- Further control protocols developed at aggressive schedule
- Looking for further standardized applications

- Work in Progress
- Further info:
  http://www.softarmor.com/sipping/teams/conf/

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