MMCC Evolution: Revisiting Session Control

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Goals of Discussion

- **Overview of MMCC: good, bad, ugly**
  - Architectural model
  - Protocol evolution
- **Interoperability and cross app comm:**
  - Comparison with CCCP, Synch Proto, etc.
  - MBone and MMusic influence
  - Relationship to RTCP
- **Future directions and open issues:**
  - Seamless policy choices
  - Adaptive protocol for scaling
  - Multicast questions

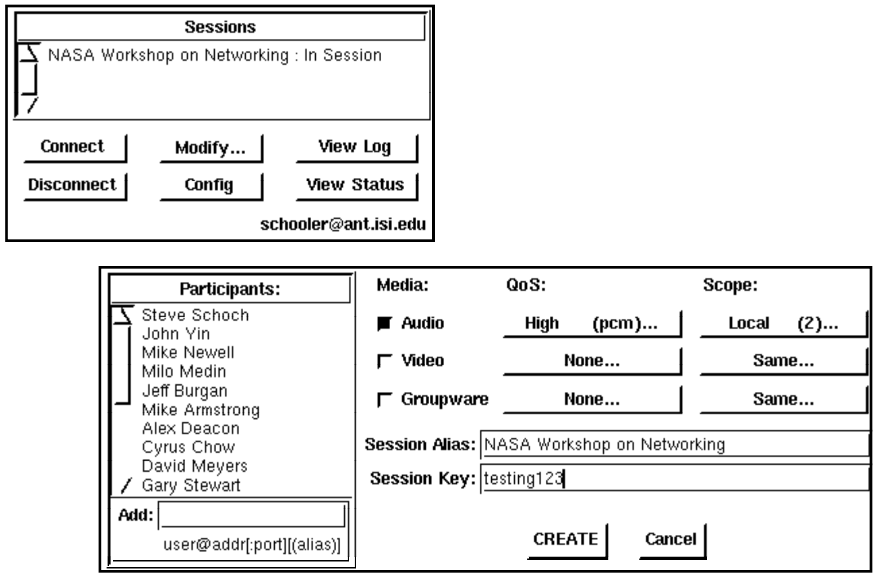
MMCC: Current functionality

- **Session orchestration tool:**
  - Spawns underlying Mbone tools
- **Rendez-vous mechanism:**
  - Explicit invitation
- **Unadvertized meetings**
- **Initiator-based application choices:**
  - Selects application suite
  - Allocates multicast addrs and ports
  - Distributes encryption key
  - Provides membership set

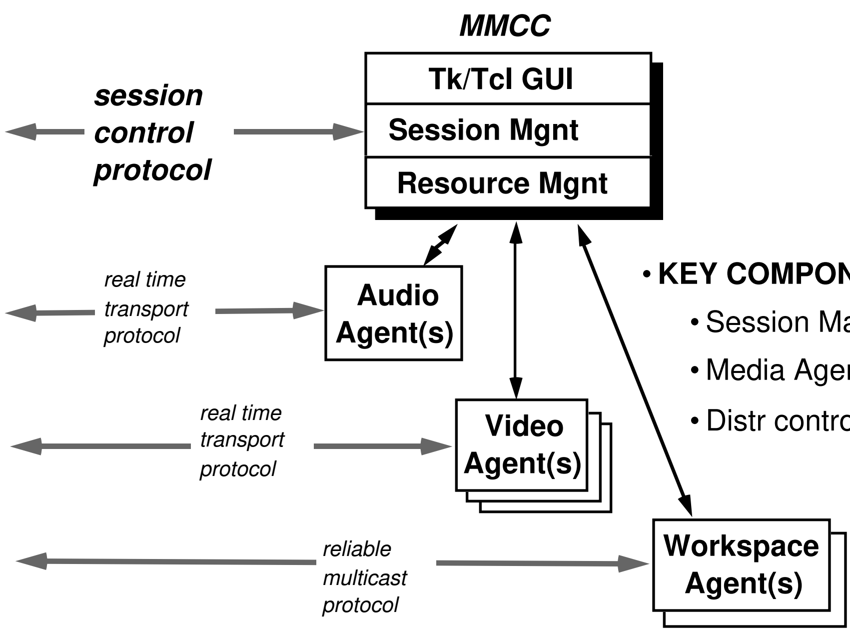
MMCC: Current Functionality (cont.)

- ***Stays in the loop*:**
  - QoS selection, modification, translation
- **User Addressing and Registration:**
  - Directory service for user addresses
  - Eventual support for user discovery, multi-homed users, and mobile users
- **Configurable Call Policies:**
  - Ring tones, call filtering, cross-app communication

MMCC: GUI



End-system Architecture



- **KEY COMPONENTS:**
  - Session Manager
  - Media Agents
  - Distr control proto

Session Manager Philosophy

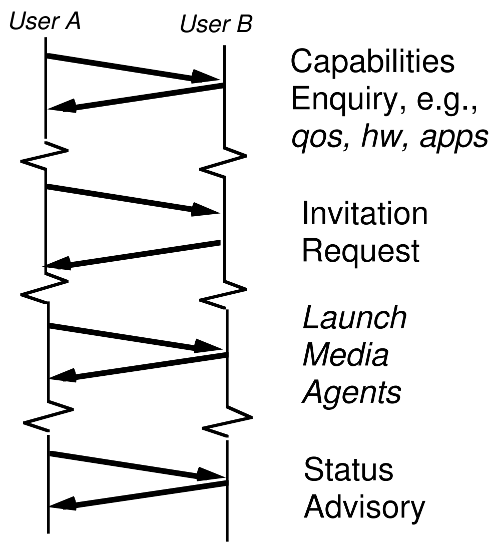
- **Separable from GUI and media transmission**
- **Facilitates *synchronization*:**
  - Inter-media and inter-site
- **Conduit through which control info flows:**
  - Locally at end-systems w/media agents
  - Remotely among peer session managers
- **Avoids duplication of effort:**
  - Participation, key distribution, authentication
- **Orchestration, termination, and *modification*:**
  - No distinction between fns available
  - Remain involved during a session

Distributed Session Control

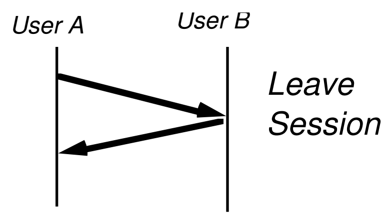
- **Protocol used among session managers**
  - Group messaging service: *unicast* UDP
  - Request-response paradigm
- **Present mmcc functions :**
  - Initiation and termination
- **Other mmcc incarnations:**
  - Dynamic membership: Invite and Join
  - Floor control: ipc with media agents

Session Initiation and Termination

Initiation



Termination



Basic Message Prefix

```
typedef struct {
   u_short vers;
   u_short seqno;
   NTP_TS timestamp;
   CCP_CONFID confid;
   u_long transid;
   u_long cmd_type;
   u_char user[LOGIN_ID_LEN];
   u_char alias[NAME_LEN];
   u_long num_conferees;
   CCP_PARTICIPANTS participants[1];
} CCP_PREFIX;
```

- **Classic pkt format approach**
- **Re-order for better demux**
- **Include sndr AND recvr info**
- **Move conferee info to cmd pkt**
- **RTCP confid?**

Confids and Participants

```
typedef struct {
   u_char user[LOGIN_ID_LEN];
   u_long ip_addr;
   u_long port;
   NTP_TS ts;
} CCP_CONFID

typedef struct {
   u_char user[LOGIN_ID_LEN];
   u_long ip_addr;
   u_long port;
   u_long state;
   u_char alias[NAME_LEN];
} CCP_PARTICIPANT
```

- **confid: uniqueness vs size**
- **Useful to include state in participant info; mute, sending, etc.**
- **May need finer granularity tho**
- **Other descriptive conferee info to disseminate**

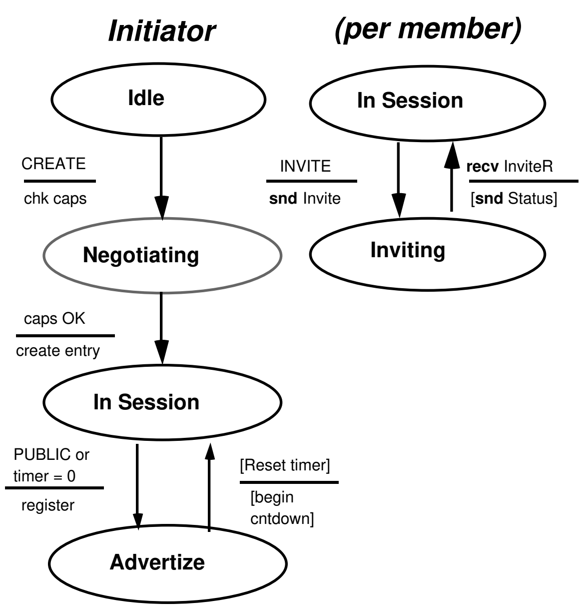
Packet Contents: Configuration

- **Session alias and pre-schedule flag**
- **Specification for 3 media agents:**
  - One of each type
  - Maps all to one multicast address
  - Maps all to one data encryption key
- **Per agent provisions:**
  - tool name
  - port number
  - time to live (ttl)
  - encoding, if necessary
  - flowspec when RSVP on

Session Protocol Revisited

- **Separate session creation from invitation:**
  - Allow users to respond at different times
  - Corollary: separate session termination from individual departures
  - Adopt *soft-state* approaches where appropriate
- **Break out initiation functions:**
  - Allow operations to be performed:
    - **Separately or together, in- or out-of-band**
- **Support missing control functionality!**
- **Same ctrl proto to comm w/media agents?**
- **Work with unicast and multicast**

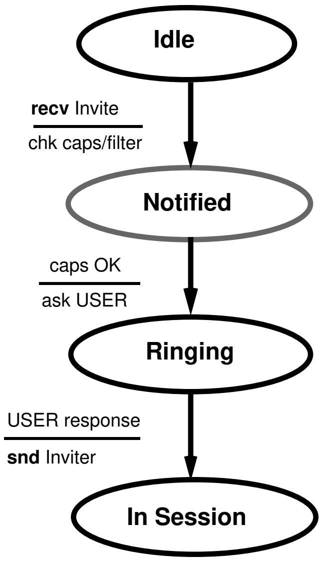
Proposed Creation/Invitation



- **Decouple session creation from dependency on remote users**
- **Negotiating is a local state**
- **If public, then make known by *advertizing,* possibly periodically**
- **May need to wait indefinitely for response to invite; per member state**
- **Status update could occur as hear back from {each,all}**
- **May be unicast or mcast communication**
- **If multicast by invitee then saves the iniator from reporting, at least to those already in session**
- **Would require sending status again later**

Explicit Invite: Potential Member

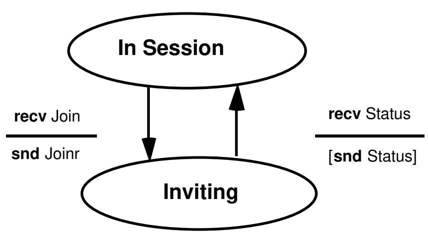
(per member)



- Notified is a local state
- may need to wait indefinitely for response to invitation, which may timeout
- Status update(s) could occur when in session, or could defer to session chair

Proposed Joins

(per member)



- Consider Join requests via sessio n address or via individual member
- Treat like receiving a Status message, but can subsequently turn down
- May need to protect against random Status messages glomming onto session -- Maven solution?
- Status update could occur as hear back from each remote site, or aggregated by designated member
- May be unicast or mcast communication
- If multicast by invitee then saves the iniator from reporting, at least to those already in session
- If no directory svc, then may need to share session info in Joinr reply

Usage of Soft-State Approach

- **When to use soft-state approach?**
  - When asynchrony can/should be tolerated
  - High dynamics
- **When not to use soft-state approach?**
  - When there is little change
  - Immediate need to know
  - Coordination required: queries, voting
  - Multicast not available?

Adaptive Periodic Refresh

- **Good for exchanging/building state:**
  - Local status or global approximation
- **Useful for scaling problem:**
  - Transparent to user and applications
- **Decrease frequency: *e.g., vat***
  - Figure ttl into algorithm for periodicity
  - Numbers of members:
    - **absolute periodicity until some threshold**
    - **diff back-off algs beyond diff thresholds**
  - Other data traffic or session patterns?
- **Decrease overhead: *e.g., ivs***
  - MPEG approach

Group Consensus Mechanisms

- **Query or coordination functions: *e.g.,***
  - Pre-session service enquiry
  - Mid-session encoding change
  - Synchronization initialization
- **Tie in with Synch protocol update periods:**
  - When a function takes effect
  - RTCP already includes the timestamp
  - Agreement protocol could use for eventual consistency
- **Build on top of unreliable, periodic delivery?**
  - Use same fns but toggle session-level ack/reply

Functional Suite

- **Session: Create/Terminate**
- **Membership: Invite/Join/Leave**
- **Media: Add/Delete/Modify Application**
  - Choice of application and settings
- **Policy: specify session type in mmcc?**
  - Characterizing control flow:
    - **Who can perform operations on session**
    - **Who must agree to a proposed change**
  - Dynamics of data flow topology
- **Status and modifications re any attribute**

Cross-Application Communication

- **Options: ipc, tk/tcl**
- **Easier at startup:**
  - Send available params on cmdline
  - Hard to abstractly describe apps
- **Mid-session functions: *Hold/Resume + Uplinks***
  - Put (multiple) media on hold: local interrupts
  - Session switching: channel surfing
  - Receive selection: only want some flows
  - Session-wide floor moderation: sndr impact
  - Video-follows-audio
  - QoS settings: adaptive
- **Who owns GUI?**

Relevant Papers

- **ftp.isi.edu:pub/hpcc-papers/mmc/jms.ps**
  - Schooler, E.M., "The Impact of Scaling on a Multimedia Connection Architecture", ACM Journal of Multimedia Systems, Vol.1, No.1, (July 1993)
- **ftp.isi.edu:pub/hpcc-papers/mmc/joi.ps**
  - Schooler, E.M., "Case Study: Multimedia Conference Control in a Packet-switched Teleconferencing System" Journal of Internetworking: Research and Experience, Vol.4, No.2 (June 1993)
- **ftp.isi.edu:confctrl/docs/agree.ps**
  - Shenker, S., Weinrib, A., "Managing Shared Ephemeral Teleconferencing State: Policy and Mechanism", Draft (Mar 1994)