SIP: Status and Directions

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Sylantro
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Overview

- SIP overview/review
- SIP services
- SIP standardization status
- SIP bake-off
- SIP for notification
- SIP for mobility
Architecture

- MG
- MGC
- GK
- GK
- proxy
- proxy
- gateway
- Internet
- PSTN
- circuit-switched voice (POTS, ISDN)

Protocols:
- SIP
- RTP
- H.323
- Megaco/MGCP/MDCP

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SIP 101

1. SIP = signaling protocol for establishing sessions/calls/conferences/...

2. session = audio, video, game, chat, ...

3. called server may map name to user@host

4. callee accepts, rejects, forward (→ new address)

5. if new address, go to step 2

6. if accept, caller confirms

7. ...conversation ...

8. caller or callee sends BYE
SIP Operation in Proxy Mode

1. INVITE henning@columbia.edu
2. 200 OK
3. INVITE hgs@play
4. 200 OK
5. ACK hgs@play
6. play
7. media stream

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SIP Operation in Redirect Mode

1. INVITE henning@ieee.org
2. columbia.edu
3. henning@columbia.edu
4. 302 Moved temporarily
   Contact: hgs@columbia.edu
5. ACK henning@ieee.org
6. INVITE hgs@columbia.edu
7. 200 OK
8. ACK hgs@columbia.edu

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SIP Advanced Features

- operation over UDP or TCP
- multicast invitations ➠ basic ACD
- “interactive web response” (IWR)
- UA ↔ proxy = proxy/redirect ↔ proxy/redirect
- stateless proxies: self-routing responses
- forking proxies: call several in sequence and/or parallel
- security: basic (password), digest (challenge/response), PGP
More SIP Internet Telephony Services

- camp-on without holding a line
- short message service ("instant messaging")
- schedule call into the future
- call with expiration date
- add/remove parties to/from call ➔ mesh
- "buddy lists"
Internet Telephony – as Part of Internet

- email address = SIP address
- SIP URLs in web pages
- forward to email, web page, chat session, ...
- include web page in invitation response (“web IVR”)
- RTSP: choose your own music-on-hold
- include vCard, photo URL in invitation
SIP Extensibility

- headers that receiver may ignore, e.g., Photo
- new methods and inquire about those supported (OPTIONS)
- features that receivers needs to understand: Required $\rightarrow$ Unsupported
- e.g., Required: com.sylantro.feature
- proposed: features supported via Supported header
SIP Standardization Status

- Feb. 2, 1999: IETF Proposed Standard
- March 17, 1999: IETF RFC 2543
- eligible for Draft Standard: 6 months, 2 implementations √
- new SIP working group (move from mmusic)
- working on updated draft based on implementation experience
- mostly clarifications + optional headers, no new version
SIP Work Items

- sip-cgi
- call processing language (CPL)
- reliable provisional (1xx) responses
- caller preferences
- third-party call control
- SIP for subscribe/notify
- SIP–ISUP interworking
- SIP–H.323 interworking
- billing
- reverse channel setup for call progress tones
- pre-ringing resource reservation
SIP Bake-Off

- 3 bake-offs: April, August, December
- from 15 to 33 groups
- hardware, PSTN gateways, proxy/redirect servers, clients, test instrument, ...
### SIP Bake-Off Participants

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SIP Bake-Off Goals

- basic call set-up
- registration, user location
- proxies and redirect server operation
- advanced features: security
- identify implementation bugs and robustness issues
- identify spec ambiguities

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SIP Bake-Off Results

- almost all implementations could establish basic calls – either on arrival or after minor on-site fixes

- tested redirection, proxying, security, registration, ...

- generated interoperability test cases and tools

- will fold clarifications into Draft revision of RFC and web page at http://www.cs.columbia.edu/~hgs/sip

- install public testing mechanisms (Pulver OpenTestNet, www.siphappens.com)
Integrating Signaling and Instant Messaging: Some Ideas

- “reverse” signaling: callee indicates availability
- buddy lists = special case of event notification
- other events: “sensor 17 smells smoke”, “Beanie Babies are on sale”, “(voice) mail has arrived”, …
- subscribe – notify – set up call
- useful for call parking
- many SIP mechanisms apply: security, redirection, proxying, content negotiation, …
SIP for Event Notification

- add two methods: **SUBSCRIBE** and **NOTIFY**
- proxy server may intercept **SUBSCRIBE**
- use message body for event description
- default: presence, indicated by **REGISTER**
- one of *many* proposals for presence (IETF WG!)
SIP for Event Notification

publisher

Carol

subscriber

Alice

Bob

proxy

SUBSCRIBE

NOTIFY

SUBSCRIBE

NOTIFY

REGISTER
Mobility

- new network ➞ new IP address (DHCP)
- mobile IP hides addr. changes
- but: little deployment
- -: encapsulation overhead
- -: dog-legged routing
- -: IP address filtering

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SIP Mobility Overview

• pre-call mobility ⇒ SIP proxy, redirect
• mid-call mobility ⇒ SIP re-INVITE, RTP
• recovery from disconnection
SIP Mobility: Pre-call

- MH acquires IP address via DHCP
- optional: MH finds SIP server via multi-cast REGISTER
- MH updates home SIP server
- optimization: hierarchical LR (later)
SIP mobility: mid-call

- MH→CH: new INVITE, with Contact and updated SDP
- re-registers with home registrar
SIP mobility: multi-stage registration

Don’t want to bother home registrar with each move

REGISTER

INVITE

From: alice@NY
Contact: alice@CA

From: alice@NY
Contact: alice@CA

From: alice@NY
Contact: 193.1.1.1

Los Angeles

San Francisco

CA

NY
Conclusion

- SIP basic standard stable
- multiple interoperating implementations
- backward-compatible features:
  - interoperation with legacy signaling systems
  - mobility
  - caller preferences
  - call transfer
  - ...
- programming of services: cgi, CPL, applets
For more information…

**SIP:** http://www.cs.columbia.edu/sip

**RTP:** http://www.cs.columbia.edu/~hgs/rtp

**Papers:** http://www.cs.columbia.edu/IRT