

SIP for Mobility

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Overview

- next-generation wireless systems
- mobility modes and application-layer mobility
- mobile code
- signaling, inter-domain events and messaging

Third-Generation wireless

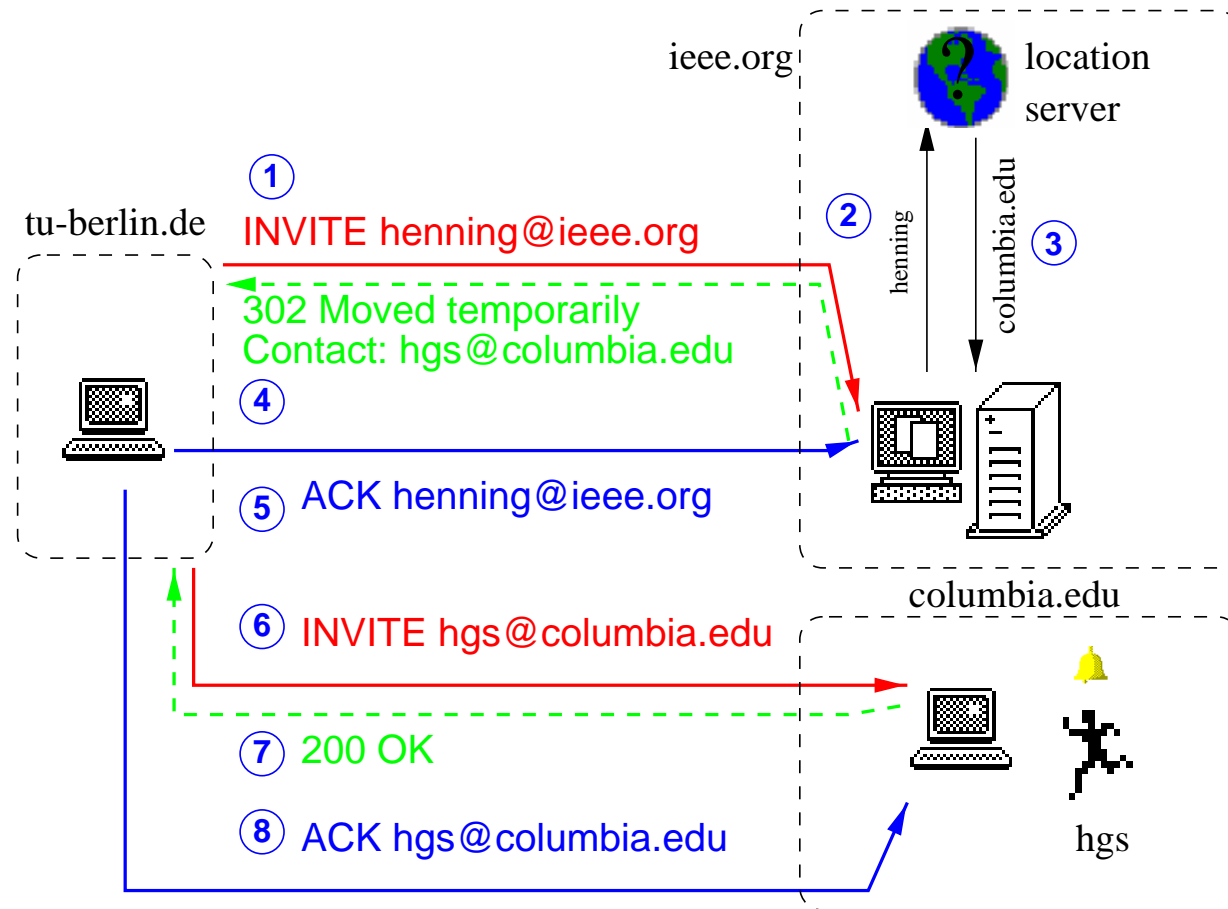
- goal: 144 kb/s moving, 384 kb/s stationary, 2 Mb/s indoors
- based on GSM or wideband CDMA
- implement IP(v6) in the hand set
- SIP as signaling system for voice calls in 3GPP
- in standardization now, deployment \approx 2003

SIP Components

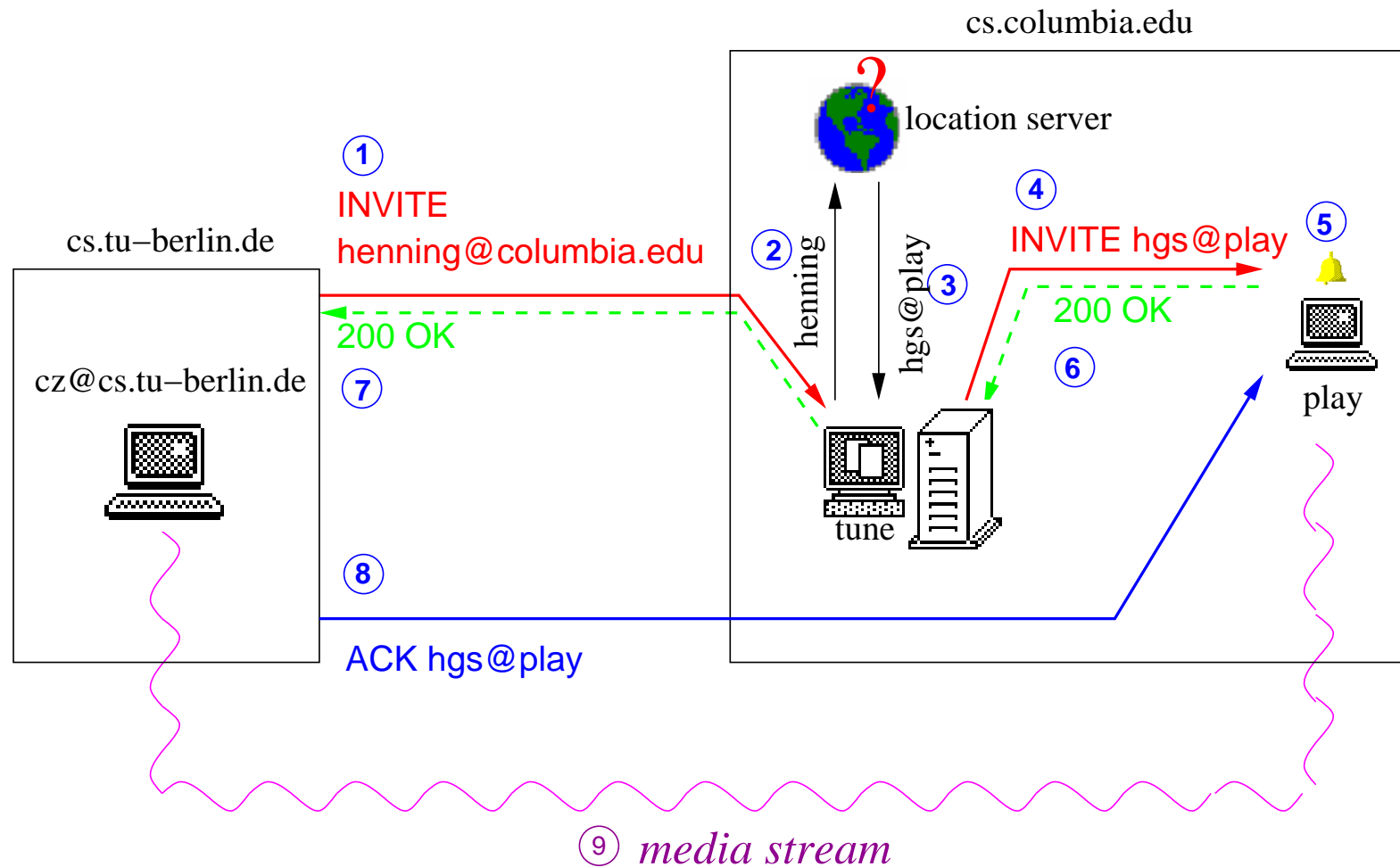
entity	does	examples
proxy server	forward calls	firewall controller, “call router”
redirect server		“application server”
user agent	end system	SIP phone, gateway, “softswitch”
registrar	location mgt.	mobility support

Roles are changeable, on a request-by-request basis

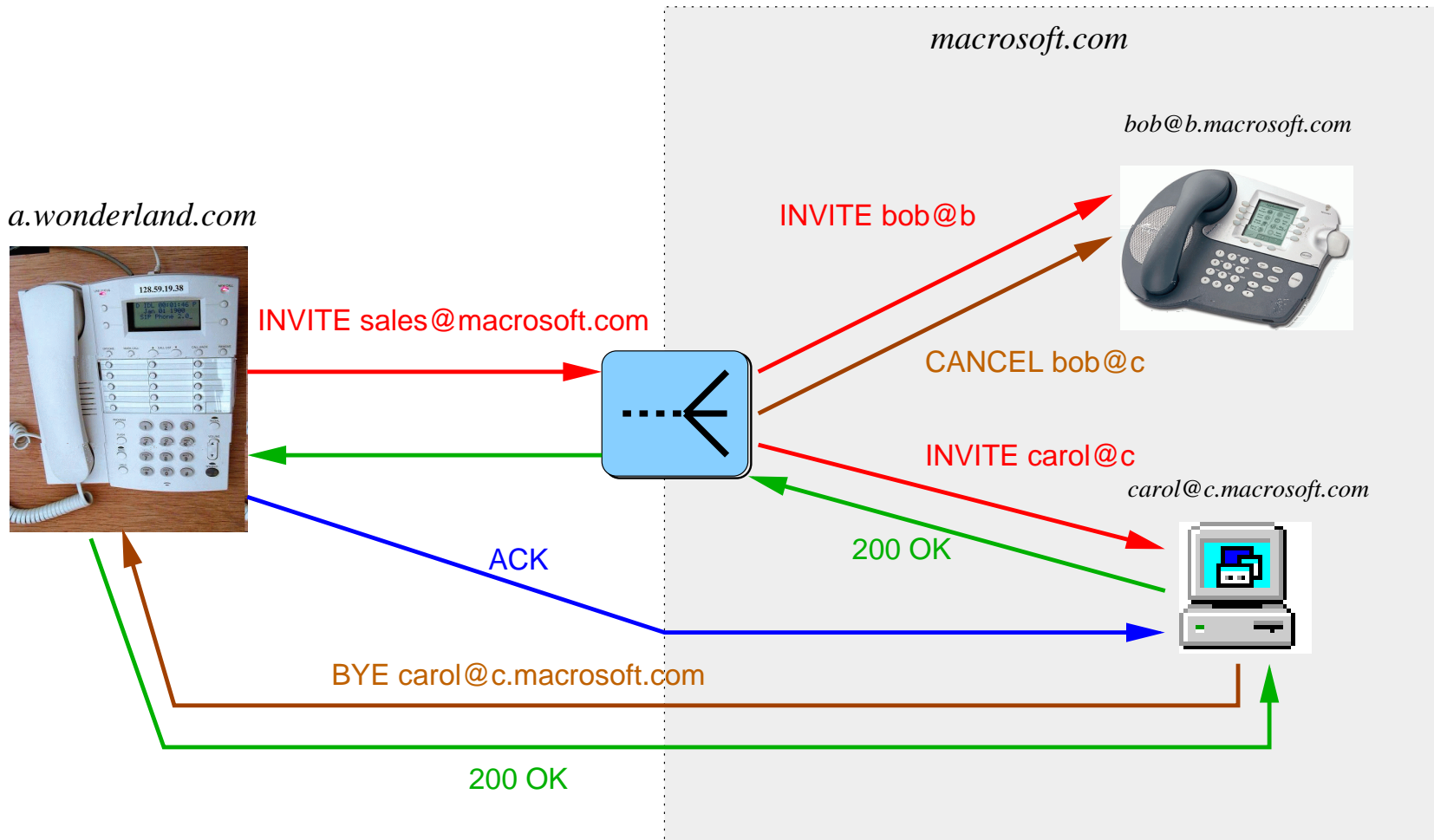
SIP example: redirection



SIP example: proxying



SIP forking proxies



Mobility in an IP environment

Roaming users: logging in away from home network: hotel, home office

Terminal mobility: terminal moves between subnets

Personal mobility: different terminals, same address

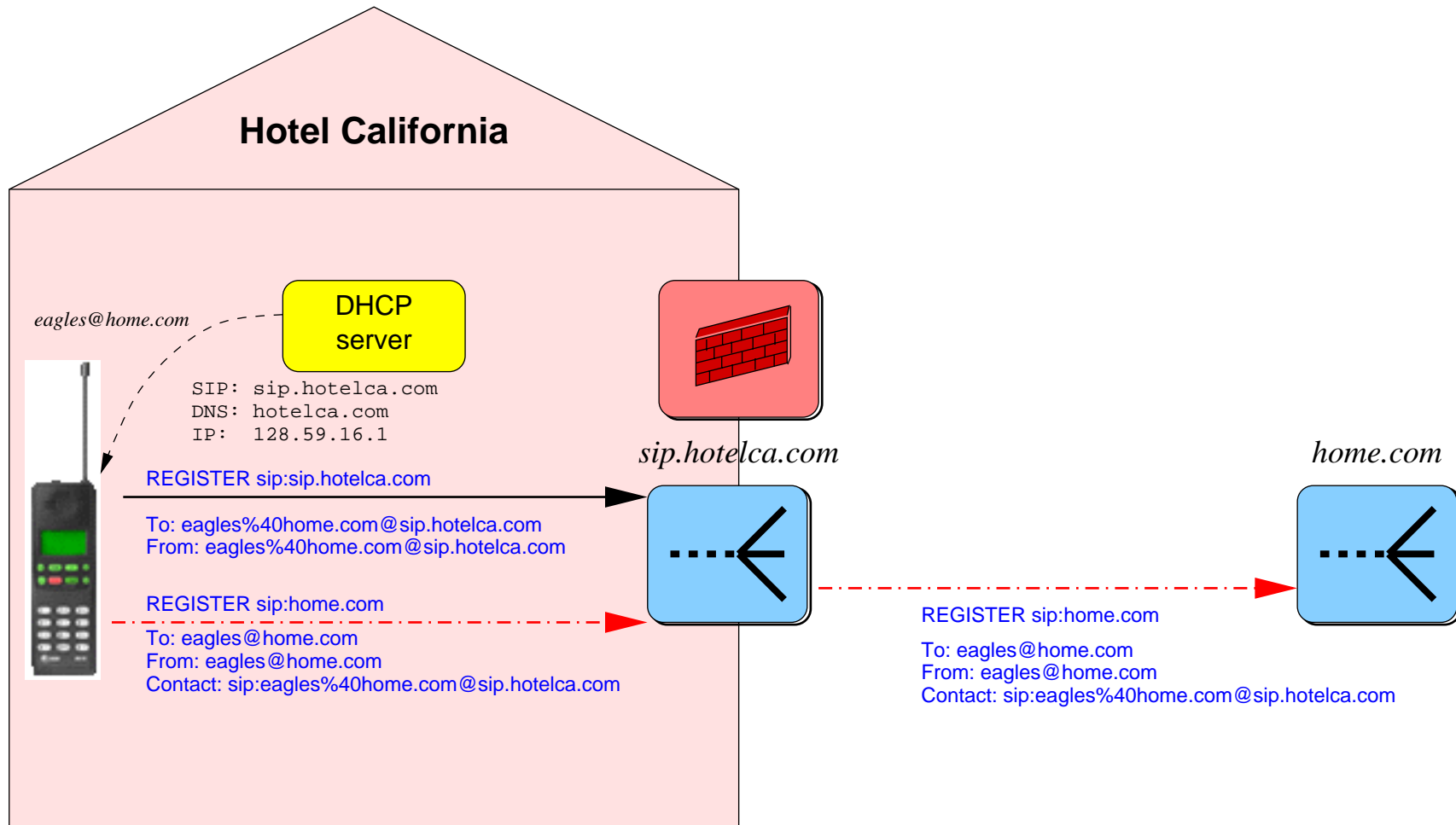
Service mobility: keep same services while mobile

Session mobility: move active session between terminals

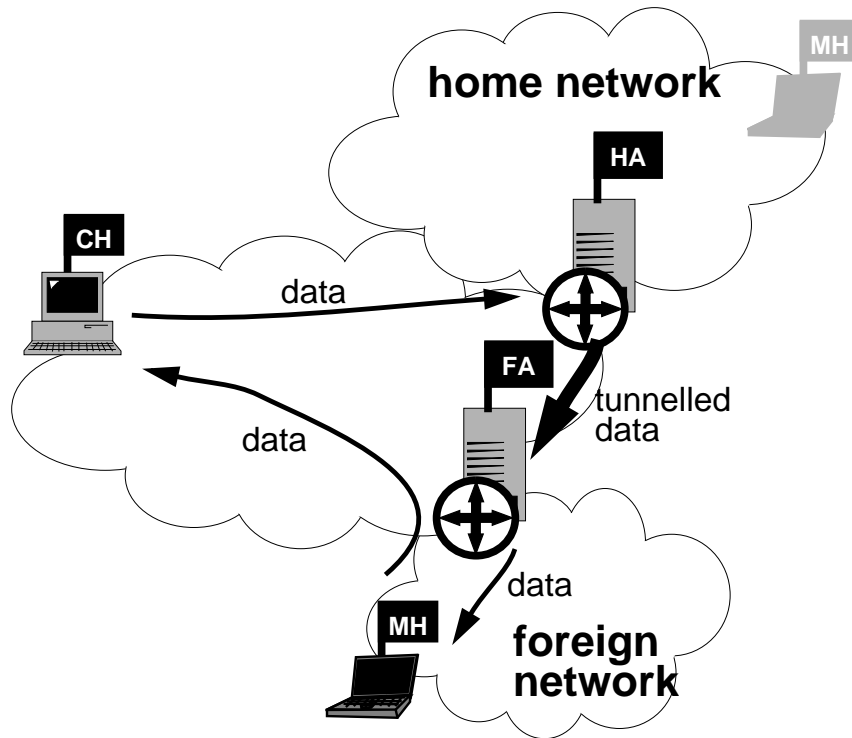
Simple mobility: roaming users





- users visit other networks: laptop, PDA, hotel phone, ...
- want to maintain external identity
- usually, just pass IP address to home registrar
- difficult if firewalls and NATs
 - requests need to use local proxy
 - thus, need to register locally

Roaming Users – Dual Registration



Terminal mobility – mobile IP



-  mobile host
-  correspondent host
-  router with home agent functionality
-  router with foreign agent functionality

Terminal mobility – mobile IP difficulties

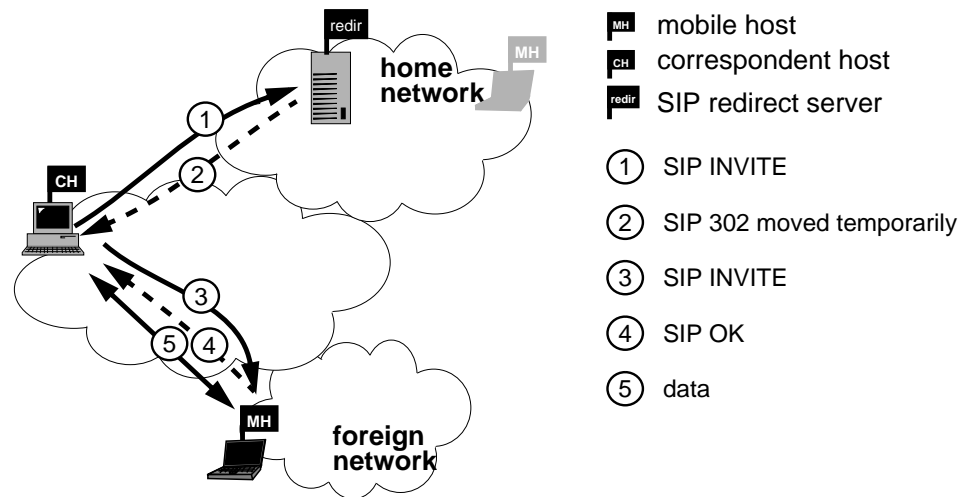
- domain of IEEE 802.11 (link layer), 3GPP (radio access network), mobile IP (network layer), ...
- network-layer mobility has problems:
 - lack of deployment – home provider has no interest
 - need two addresses – home and visiting
 - dog-legged routing in IPv4
 - may not work with IP address filtering except through triangle routing
 - encapsulation overhead for voice: 8–20 bytes/packet for a 50-byte payload
 - authentication of redirection

SIP terminal mobility overview

- pre-call mobility \Rightarrow SIP proxy, redirect
- mid-call mobility \Rightarrow SIP re-INVITE, RTP
- recovery from disconnection

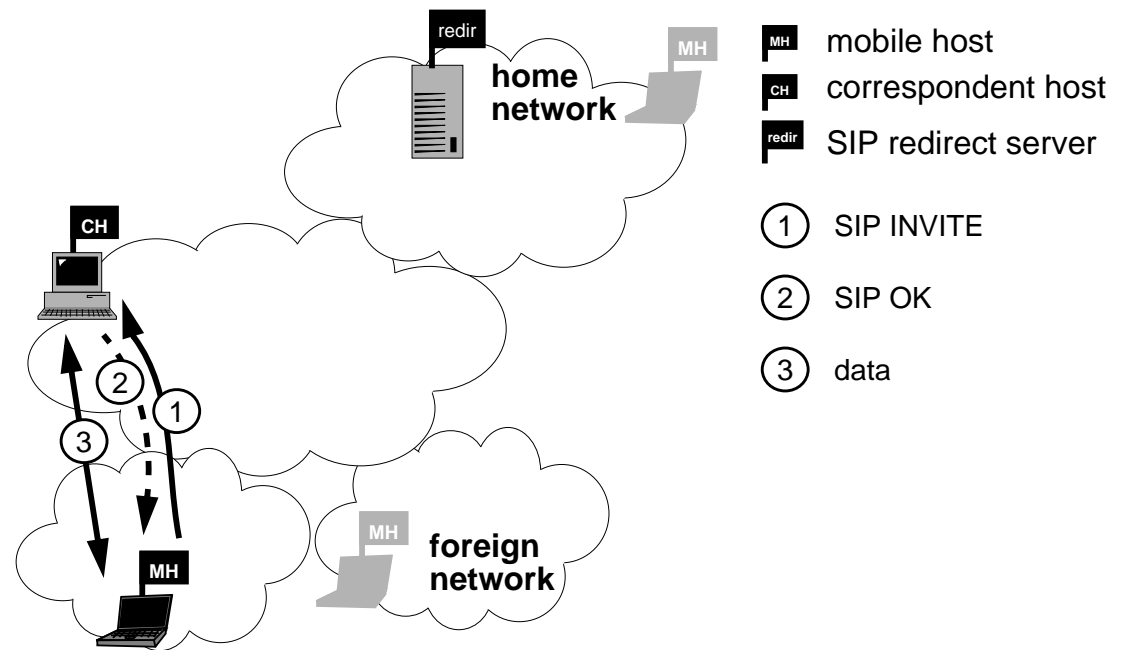
SIP terminal mobility: pre-call

- MH acquires IP address via DHCP
- optional: MH finds SIP server via multicast REGISTER
- MH updates home SIP server – deregister old, register new
- optimization: hierarchical LR (later)



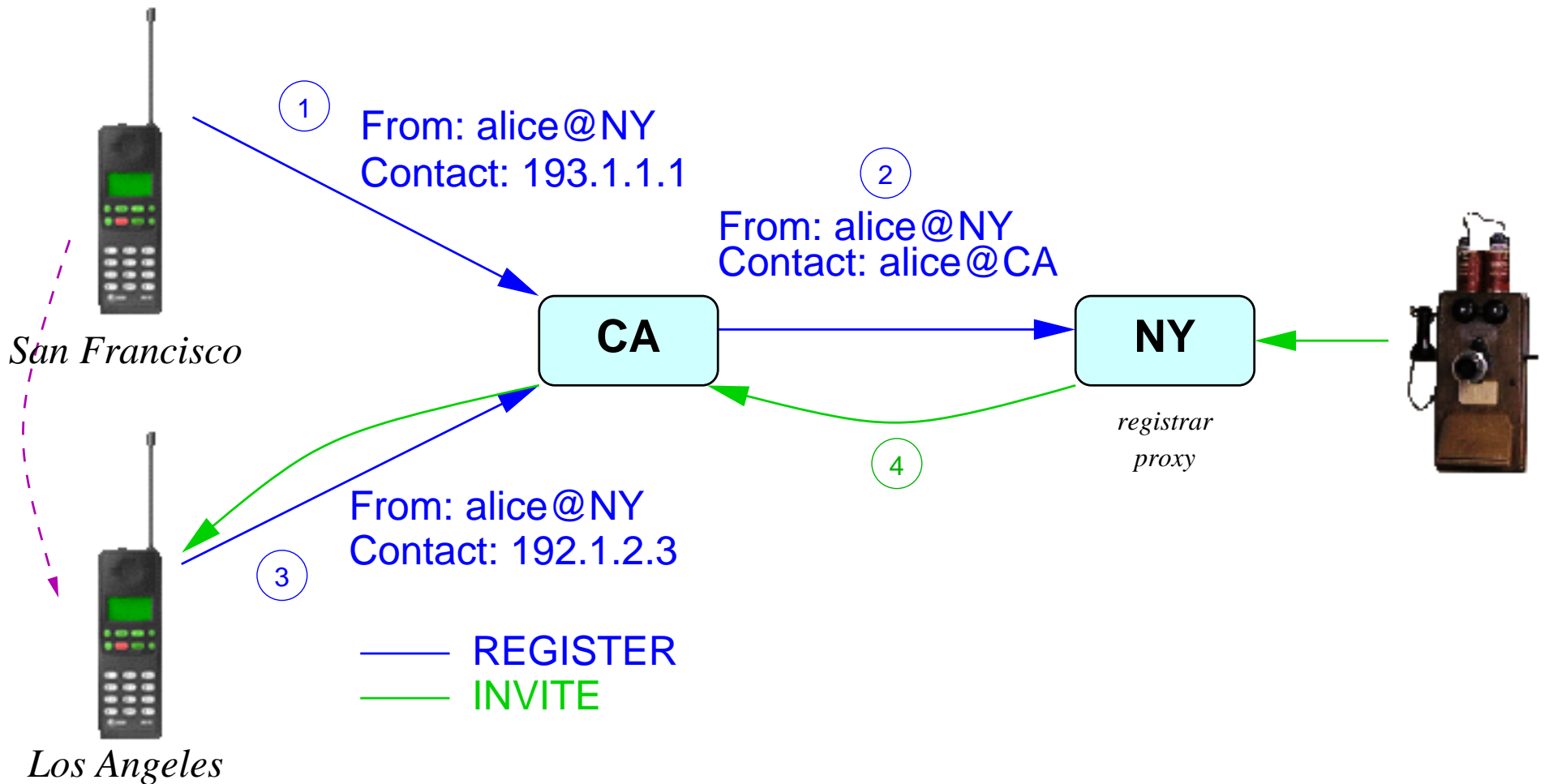
SIP terminal mobility: mid-call

- MH→CH: new INVITE, with Contact header and updated SDP
- re-registers with home registrar
- requires one one-way delay

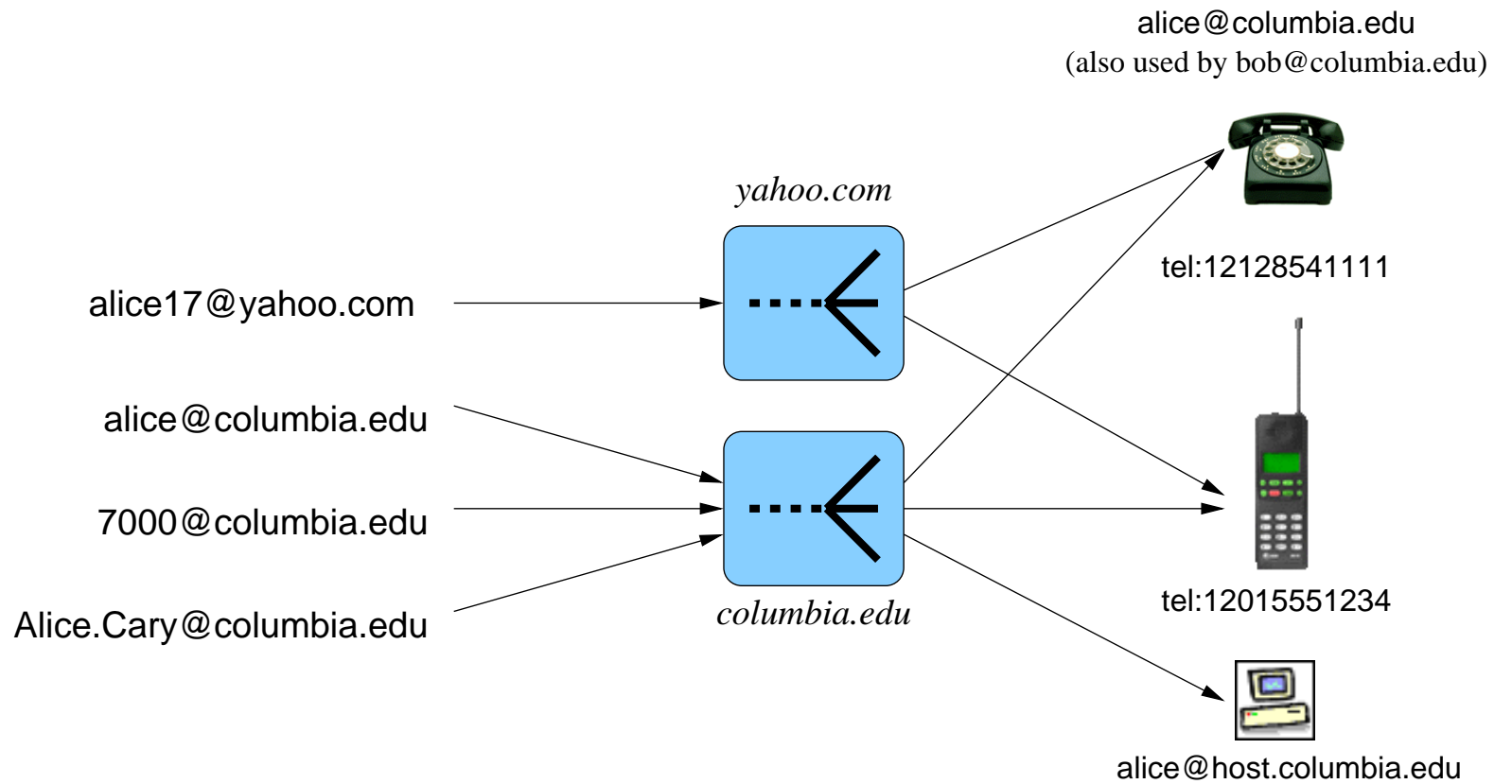


SIP terminal mobility: multi-stage registration

Don't want to bother home registrar with each move



Personal mobility



Personal mobility

- switch between PDA, cell phone, PC, Ethernet phone, Internet appliance, ...
- several “generic” addresses, one person/function, many terminals
- e.g., `tel:2129397042`, `hgs@cs.columbia.edu`,
`schulzrinne@yahoo.com` or `support@acme.com`
- SIP is designed for that – proxying and redirection does translation
- but: need mapping mechanisms to recognize registrations as belonging to the same person
- some possible solutions:
 - dip into LDAP personnel database or `/etc/passwd` to match phone number and variations of name (*J.Doe, John.Doe, Doe*)
 - need dialing plan to recognize `7042@cs.columbia.edu` and `tel:2129397042` as same

Service mobility

Examples:

- speed dial & address book
- media preferences
- special feature buttons (voice mail, do-not-disturb)
- incoming call handling instructions
- buddy lists
- features in home provider server

—→ independent of terminal (including pay phone!), across providers

Service mobility

- REGISTER can retrieve configuration information (e.g., speed dial settings, distinctive ringing or voice mail settings)
- but needs to be device-independent
- most such services (e.g., voicemail forwarding, call filtering) should remain on server(s)
- use SIP Route mechanism to direct path of outgoing calls via home server

Route: <sip:alice@home.net>, <sip:alice@services-r-us.com>

Service mobility – call handling

- need uniform basic service description model → Call Processing Language (CPL)
- CPL for local call handling
- update CPL from terminal: add telemarketer to block list
- harder: synchronize CPL changes across multiple providers
- one possibility: REGISTER updates information, but device needs to know that it has multiple identities
- merging of call logs

SIP and mobility: issues

- doesn't work for TCP applications – solutions:
 - punt: “don't type and drive”
 - application-layer awareness: restart web, email, ftp transfer – need for deep fade anyway...
 - TCP redirect (Snoeren/Balakrishnan)
 - NAT-style boxes controlled by SIP (see Telcordia ITSUMO project)
- fast hand-off via SIP proxies with media translators
- but: works nicely for “vertical handoff” between different technologies - e.g., transfer call from mobile handset to office videophone when arriving at work

Conclusion

- uniform solution for wired and wireless multimedia terminals
- network-layer mobility neither sufficient nor available
- many common services don't need network-layer support
- application-layer mobility for sessions
- one SIP-based approach for multimedia sessions, presence & events