

SIP Emergency Calling

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Overview

- PSTN emergency calling operation
- opportunities for new services
- finding the emergency calling center
- identifying user location

Current E911/112 operation

- caller dials 911 (U.S., Canada) or 112 (EU) or similar national emergency number
- local switch looks up Public Safety Answering Point (PSAP) based on address associated with phone number
- call gets delivered to PSAP or backup (“secondary”) PSAP
- PSAP is responsible for several police/fire departments (ESZ), identified by an Emergency Service Number (ESN)
- ESZ defined by Master Street Address Guide (MSAG)
- different agencies (police, fire) have different geographic reach
- cell phones must be able to reach 911 even if not a registered subscriber
- Automatic Location Identification (ALI) database maps numbers to addresses
- number is delivered even if caller has disabled caller ID delivery (CLID)

Opportunities

- multimedia communications: video medical instruction
- support for people with disabilities: TTY → text chat, video for sign language
- commodity technology ⇒ PSAP only requires an Internet connection ⇒ easy backup during catastrophes
- Accept-Language can route calls to operator speaking caller's language
- universal availability ⇒ same number(s)

Separate issue: emergency communications

Opportunities

Re-use 911 location services for other things:

User location: location-aware services:

- find out that it's 3 am at the caller's *current* location
- pizza delivery
- traffic menu customization

Service location:

- call nearest pizza delivery place
- call closest taxi

Emergency call requirements

- similar behavior to legacy PSTN for phone devices
- must work across systems, e.g., IM/chat, conference systems, PBX
- difficult: re-use old PSAP or parallel systems?

Issues

Need emergency access for all-IP environments – tel:911 is not a solution (and may have unintended side effects...)

- emergency address (network, application)
- find PSAP
- obtain caller civil/geo address

Will focus on SIP layer issues

Emergency address

- could define address at network layer (anycast, multicast) and/or application layer
- but: anycast and multicast not widely available; multicast precludes TCP
- similar to `postmaster`, `webmaster`, etc.
- can have several, e.g., 911, 110 (Europe), `help`, ...

Finding the iPSAP

- should work even if only local Internet is available ▯▯▯▯▯ avoid central mapping databases
- minimize delay ▯▯▯▯▯ one translation step
- avoid need for cooperation of end system owners to track changes
- must be automatically testable
- must correspond to physical (visited) network, not logical (home) network – hotmail.com doesn't have a fire department
- can be done either by end system or outbound proxy
- options: proxy configuration, multicast, DNS, SLP, DHCP, LDAP, SIP
- about 250,000 emergency calls/day in U.S.

Finding the iPSAP via multicast or anycast

- designate scoped multicast address to find iPSAP
- but: network boundaries don't conform to civic boundaries, except for corporate campuses
- not much difference from using standard SIP multicast address
- doesn't work well for other applications

Finding the iPSAP via DNS

- map civil name, e.g., `leonia.nj.us.911.arpa`, or postal code, e.g., `07605.us.911.arpa` to IP address, as long as each town or city has one iPSAP
- geographic addressing by longitude/latitude doesn't work since points close by may be in different states (e.g., Manhattan and New Jersey)
- use DNS SRV records to find different services
- potential difficulties with DNS availability

Finding the iPSAP via SLP

- service location protocol – local mapping from service name to set of server addresses
- same problem as multicast location – needs local configuration
- proxy can do the same operations, so doesn't add much value

Finding the iPSAP via DHCP

- also requires local configuration
- source of IP address may be very far removed from physical location
- thus, likely to be useful only for campus networks, not consumer ISPs

User location

- if provided by end user or end system,
 - subject to misconfiguration (phone moved)
 - intentional interference
- thus, “network” needs to map station and “wire” identity to location
- for dial-in, network attachment point has little to do with physical location
- GPS is not sufficient:
 - doesn’t work in buildings or in city canyons
 - limited altitude resolution for high-rise buildings
- for 802.11b, see Microsoft RADAR project for determining location within a few feet, but coverage area is small anyway

User location: Ethernet switches

for Ethernet switches, can often determine physical port for MAC address, but

- need to track mapping wires \leftrightarrow port
- hard to find IP address for switches
- works only for (some?) managed switches
- should be queryable at layer-2

Provide caller identity and location

- use caller-identity proposal
- caller provides in SIP request

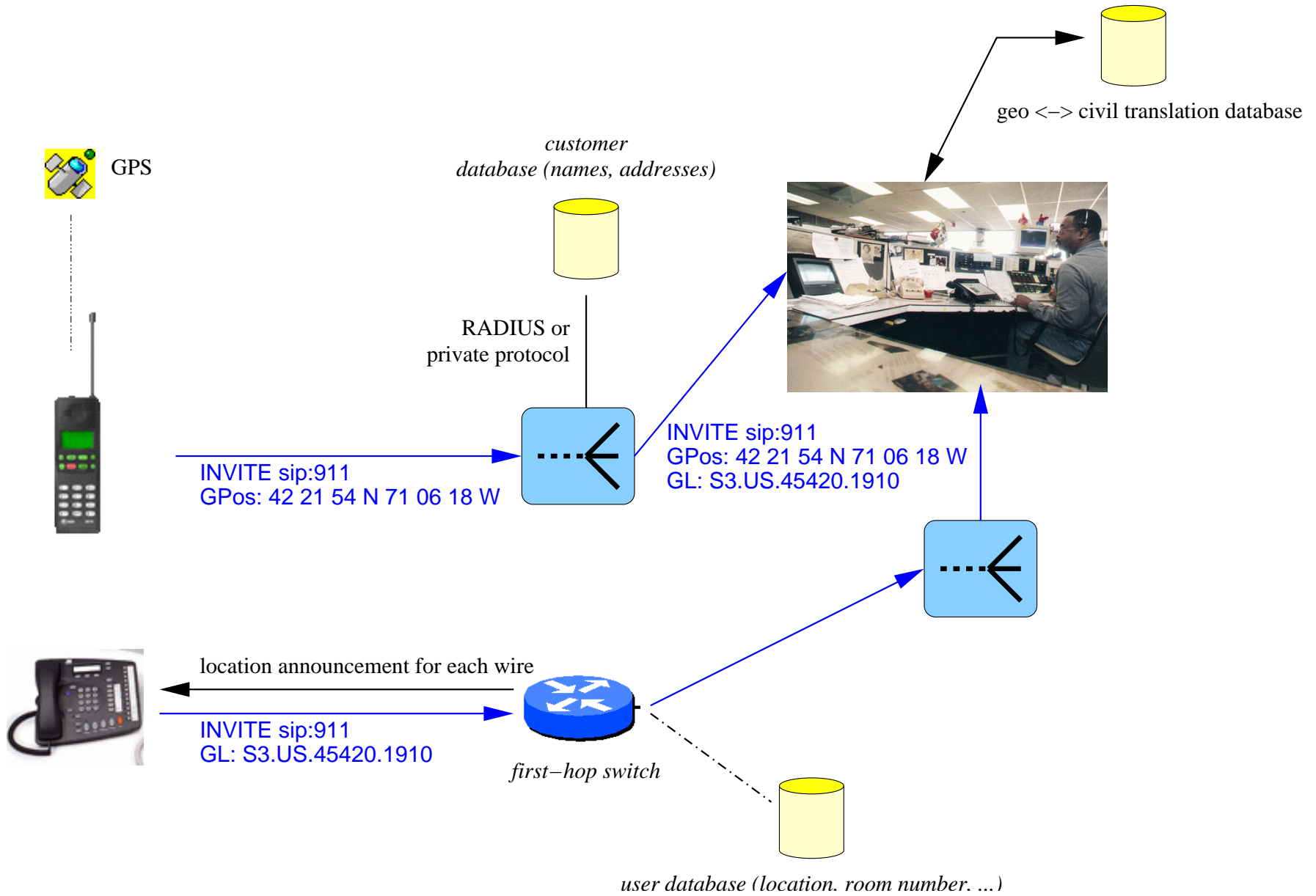
GPOs: 42 21 54 N 71 06 18 W -24m 30m

GL: S3.US.45420.1910 "1425 Arbor Avenue, Dayton OH"

- use same format as wireless systems
- iPSAP queries caller
- iPSAP queries third party based on caller identity

Privacy issues

- caller doesn't want to reveal information except to PSAP
- only include during emergency calls: sign with public key of PSAP
- if stored in end system, subject to intentional or accidental interference



Conclusion

- need to supply emergency calling for first-line services
- harder than PSTN:
 - no global identity like a calling line number
 - no trusted network
- opportunity for other location-aware services