



# Core VoIP and 911 issues and alternatives

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# Crucial differences between VoIP and traditional landline PSTN

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- All devices should be treated as mobile, even if they are desk phones
  - Users can take phone home and maintain identity
- Long-term, users may not have E.164 numbers
- E.164 numbers may not reflect geographic area
  - Area code can be arbitrary
- There are no central “switches”
  - Maybe gateways
- There is no technical need for telephone carriers
  - we don’t have “email carriers” either
  - just ISPs (who do not need to know that some packets carry voice)



# Core issues

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- Identifying emergency calls
- Identifying the right PSAP
- Conveying location information to PSAP



# Identifying emergency calls

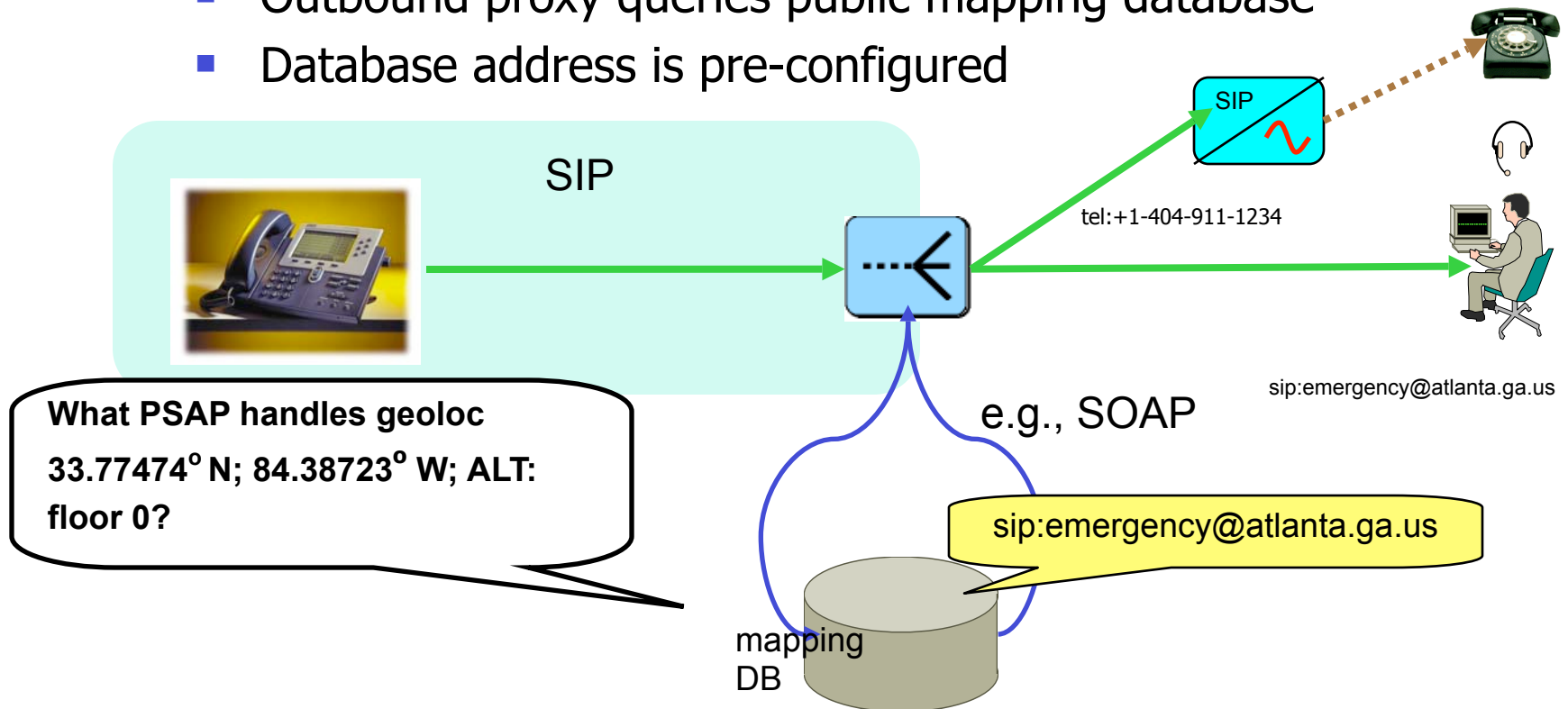
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- Outbound proxy must be able to reliably identify emergency calls
  - for routing and special handling
- Despite different naming conventions
  - caller may be “roaming”
- Suggestion:
  - sip:sos@home-domain
  - tel:112
- Local dialplan on phone translates dialed digits to common identifier (e.g., 112, 911, 9-911, etc.)

# Finding the right PSAP Option

## 1: Query

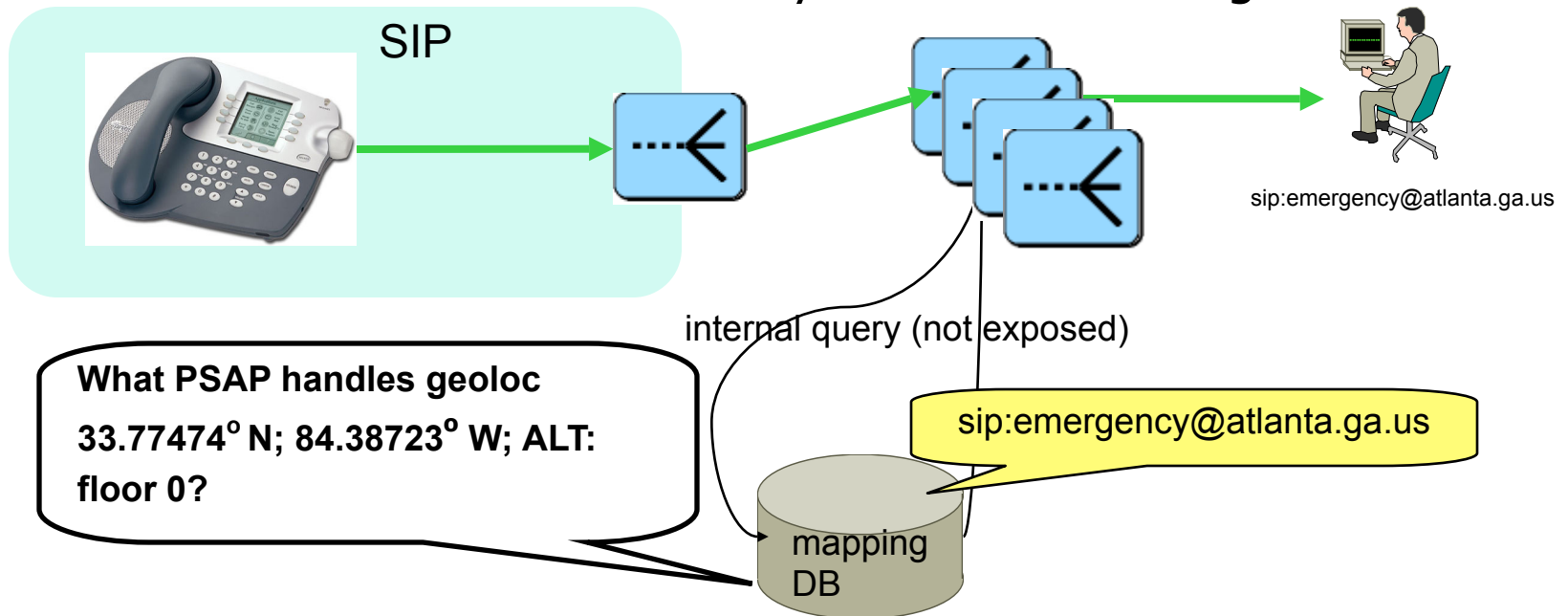
- Outbound proxy queries public mapping database
- Database address is pre-configured



# Finding the right PSAP Option

## 2: Proxy request

- Outbound proxy routes all requests to designated SIP proxy with well-known name (e.g., psap.us.info)
- DNS SRV allows redundancy and load balancing

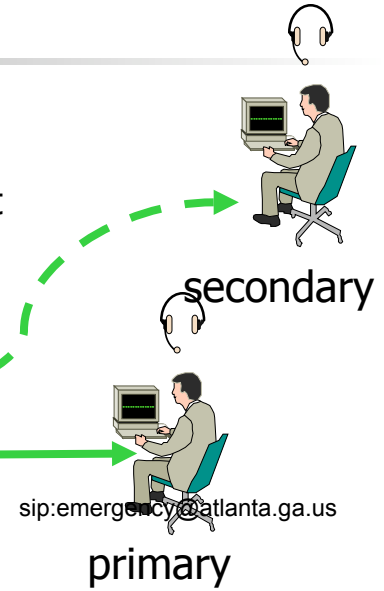


# Finding the right PSAP Option

## 3: fully distributed

- Outbound proxy routes all requests to PSAP
- All proxies subscribe to PSAP database updates (e.g., via SIP event notification)
- Updates are infrequent and database small in size

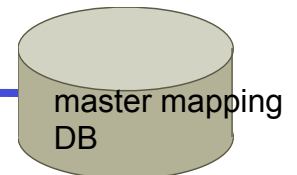
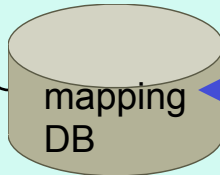
SIP



internal query (not exposed)

sip:emergency@atlanta.ga.us

What PSAP handles geoloc  
33.77474° N; 84.38723° W; ALT:  
floor 0?



periodic updates



# Finding the right PSAP, cont'd

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- Scaling is not a major issue
- 200 million 911 calls in 2002 → roughly 6 calls/second
- typical SIP proxies can handle app. 100 calls/second
- 6000 PSAPs → table easily fits into RAM
  - guess: 1000 bytes/entry → 6 MB
  - can store all in local table (option 3)
- thus, only need one server for whole US (+ backups)



# Conveying location information

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- Three options:
  - civil
  - geospatial
  - unique telephone number (ELIN - may not be dialable, just for ALI lookup)
    - worst option, since number may not be local



# IETF efforts related to emergency communications

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- SIP & SIPPING WG:
  - network-asserted identity → may be usable for identifying caller (RFC 3325)  

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P-Asserted-Identity: tel:+14085264000
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  - framework and requirements document for emergency calling
- GEOPRIV WG:
  - location object, using OpenGIS GML XML format
  - privacy rules for retention and distribution, both simple and detailed
  - civil and geospatial information in DHCP (auto-configuration)
  - soon: conveying location information in SIP requests
- IEPREP WG: disaster communications
  - priority for GETS-like calls at signaling and traffic level

# Protocol standardization needed



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- Approach: facilitate migration to all-IP environment
  - do not burden VoIP with legacy considerations
  - modular components →
    - don't assume mechanism used to determine location
    - allow multiple mechanisms (e.g., options 1-3)
  - have small number of gateways that translate between old and new
  - avoid national standards at all cost
- Needed (beyond in-progress work):
  - conventions for identifying emergency calls
  - updating PSAP mapping database