Kamailio And Next Generation Emergency Services

Kamailio World Conference & Exhibition 2017

Wolfgang Kampichler

Frequentis AG, EENA Technical Committee

09.05.2017

Disclaimer: The views and opinions expressed in this presentation are those of the author and do not necessarily represent official policy or position of EENA or Frequentis AG

Content

Next Generation Emergency Calling

Step-by-Step Emergency Call

Simple Configuration Example

Summary

This Is How It Begun

- In November 2011, I joined an interop. test event on NG emergency calling
- Some functional elements for SIP routing were tested ... but there was no support for (mandatory) service URNs
- Thus I was wondering if Kamailio could do the job and a few weeks later – plus support from Klaus ☺ – the URN patch was ready:

```
parser/uri: support for URN

- uri parser has support for URNs (e.g. urn:service:sos.fire)
- t_relay does not break on RURI with URNs
- PVs are set as follows:
$ru= "urn:service:sos.fire"
$rz= "urn"
$rU= "service"
$rd= "sos.fire"
- refer to http://tools.ietf.org/html/draft-ietf-ecrit-framework-13#page-29 for SIP signaling
     requirements for SIP proxy servers.
- patch by Wolfgang Kampichler, closes FS#201
Daniel-Constantin Mierla authored on 08/02/2012 09:19:00
```

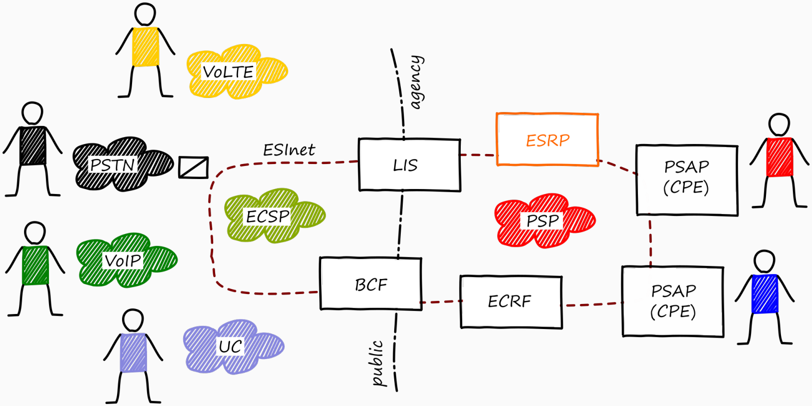
Next Generation Emergency Calling

Next Generation Emergency Calling

- NG emergency calling intends to enable the public to contact an emergency center via audio, text, images, video and data
- Location information is used for routing and dispatching purposes
- IETF ECRIT work as technical baseline (SIP, RTP, HELD and LoST)
- ETSI SC EMTEL recently started a new work item
    - TS: NG Core Services
    - TR: Interoperability Testing (ETSI Plugtest #1/2016 and #2/2017)
- NENA (National Emergency Number Association) and EENA (European Emergency Number Association) have published long term definition (LTD) architecture documents

http://c.ymcdn.com/sites/www.nena.org/resource/resmgr/standards/NENA-STA-010.2_i3_Architectu.pdf
http://www.eena.org/uploads/gallery/files/pdf/2013-03-15-eena_ng_longtermdefinitionupdated.pdf

Next Generation Emergency Calling Core Services



ECSP...Emergency Call Service Provider

PSP...PSAP Service Provider

LIS...Location Information Service

ESRP...Emergency Service Routing Proxy

PSAP...Public Safety Answering Point

ECRF...Emergency Call Routing Function

BCF...Border Control Function

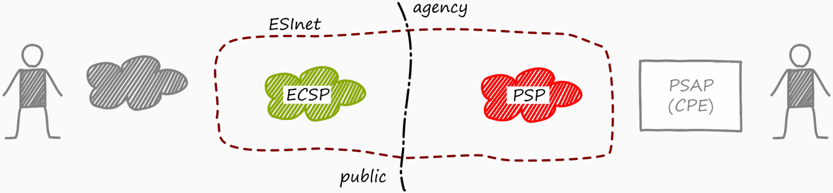
UC...Unified Communication

VoIP...Voice over IP

PSTN...Public Switched Telephone Network

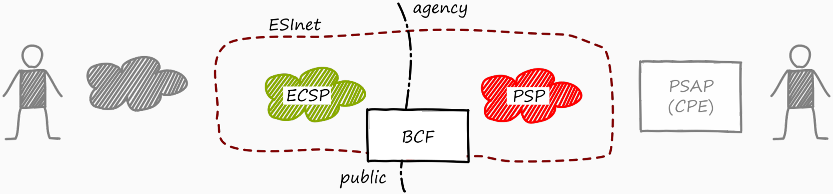
VoLTE...Voice over LTE

Emergency Service IP Network – ESInet



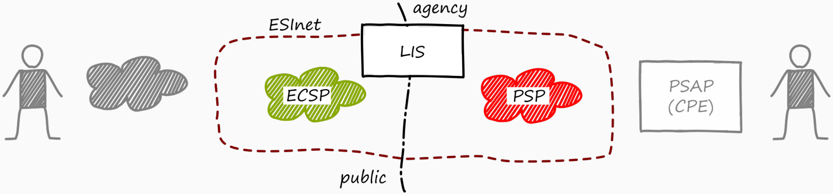
- Managed IP network
- ECSP and PSP are part of it, but with different scope of responsibilities
- ECSP acts as transit network and provides security perimeter (1^{st} line of defense)
- PSP provides additional services generic and/or specific to PSAP models

Border Control Function – BCF



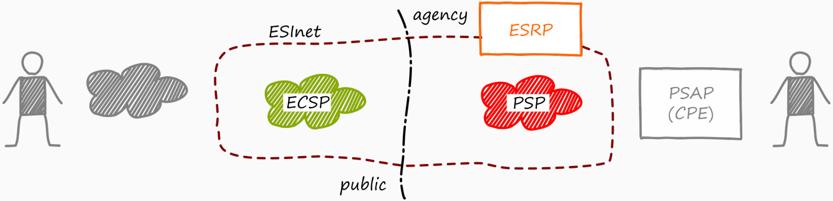
- Application Layer Gateway and POI (Point of Interconnection)
- Protocol sanitizing and topology / feature hiding (e.g. call transfer)
- Secure entry plus additional functions to block specific call sources

Location Information Service – LIS



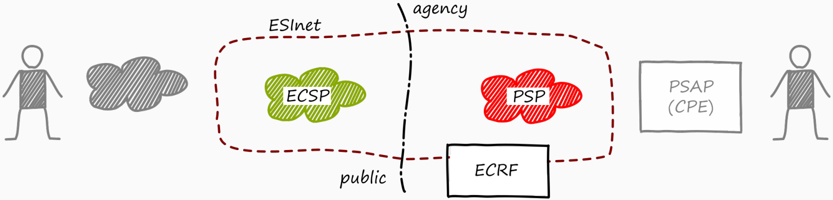
- Stores location against some kind of key (network address, phone number, URI ...)
- Returns a PIDF/LO (civic address, geodetic) either as reference and/or value
- May receive Advanced Mobile Location (AML) messages from Android smartphones supporting Google Emergency Location Service (ELS)

Emergency Service Routing Proxy – ESRP



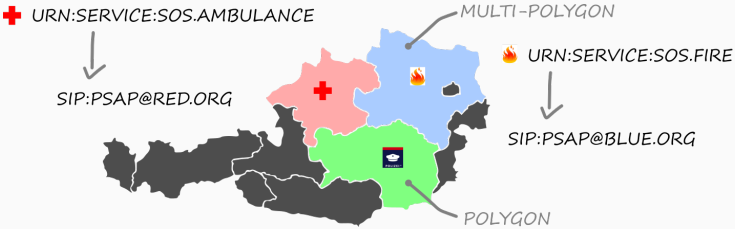
- Call routing engine (that’s where Kamailio comes in)
- Uses the ECRF to choose the nominal next hop, and applies route policy of the nominal next hop to determine actual next hop
- Policies may take into account the state of an emergency center, time-of-day, . . .
- Route decision can be: next ESRP, nominal/diversion emergency center, . . .

Emergency Call Routing Function – ECRF



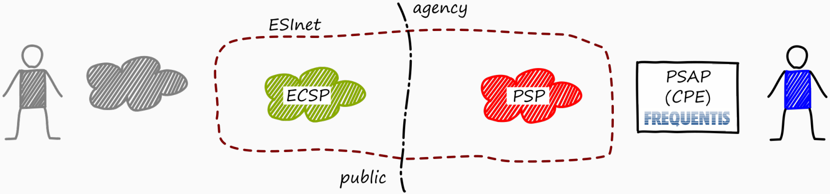
- Mapping database used for all emergency calls
- Queried using the IETF LoST protocol
  input: location plus 'service urn' / output: URI of the next hop
- Maintains emergency center service boundaries (polygons) for police, fire, ems, poison control, roadside assistance . . .

Service Boundaries – Example



- Austrian states are responsible for the provision of emergency services
- Emergency response organizations (EROs) run own emergency center (SIP URI)
- Service boundaries are Austrian state borders (polygons)

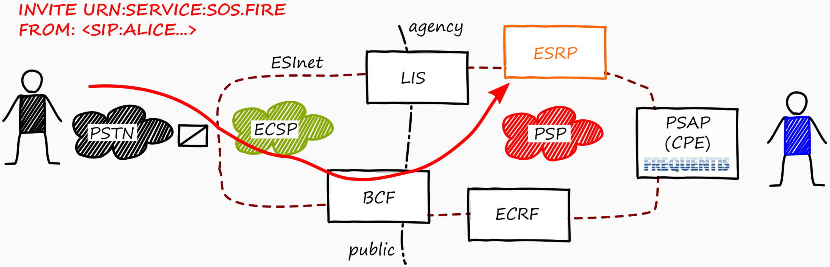
Emergency Center



- Public Safety Answering Point (PSAP)
- Receives emergency calls with location (reference or value)
- May use ECRF/ESRP policies to route to queues of call takers
- Multimedia capable: voice, video, real-time text, and messaging

Step-by-Step Emergency Call

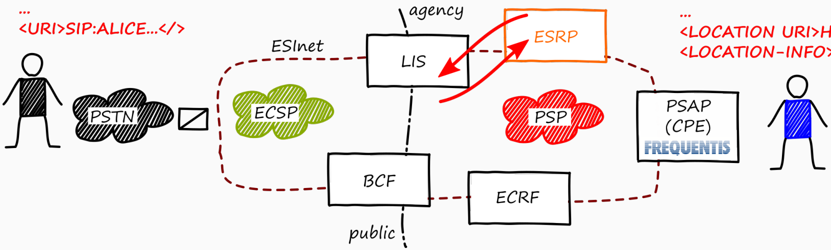
Emergency Call – 1



- Alice dials emergency number of the fire department (Austria: 122)
- Legacy SIP gateway converts to service urn and SIP signaling passes the BCF

Emergency Call – 2

```
POST /HELD HTTP/1.1
HOST: LIS:8000
CONTENT-TYPE: APPLICATION/HELD+XML
...
<URI>SIP:ALICE...</>
```



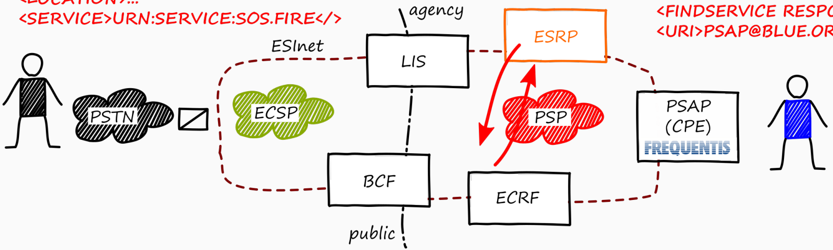
```
HTTP/1.1 200 OK
SERVER: LIS V0.1
CONTENT-TYPE: APPLICATION/HELD+XML
...
<LOCATION URI>HTTP://LIS:8000/ECILA
<LOCATION-INFO>...
```

- ESRP receives emergency call and gets location from the LIS using Alice' identity
- Location is either by value (LbV), by reference (LbR) or even both
- LIS may receive accurate location updates via AML (MSISDN as reference)

Emergency Call – 3

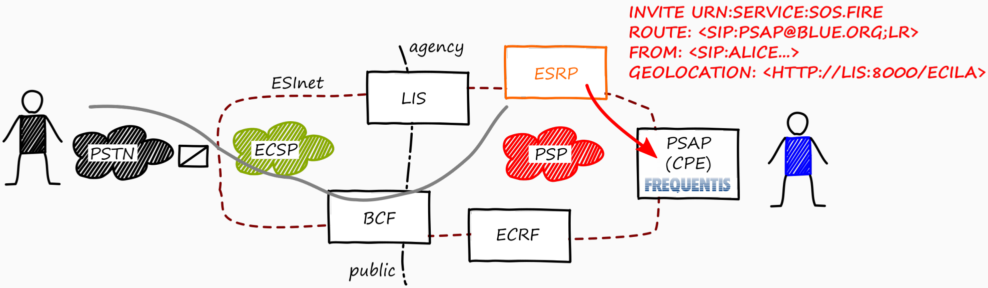
```
POST /LOST HTTP/1.1
HOST: ECRF:8000
CONTENT-TYPE: APPLICATION/LOST+XML
...
<FINDSERVICE>
<LOCATION>...
<SERVICE>URN:SERVICE:SOS.FIRE</>
```

```
HTTP/1.1 200 OK
SERVER: ECRF V0.1
CONTENT-TYPE: APPLICATION/LOST+XML
...
<FINDSERVICE RESPONSE>
<URI>PSAP@BLUE.ORG</>
```



- ESRP uses location and type of service (fire) to request next hop at the ECRF
- ECRF provides next hop URI and service boundary in the response
- GIS enabled database (point-in-polygon operation)

Emergency Call – 4



INVITE URN:SERVICE:SOS.FIRE
ROUTE: <SIP:PSAP@BLUE.ORG;LR>
FROM: <SIP:ALICE...>
GEOLOCATION: <HTTP://LIS:8000/ECILA>

- ESRP (Kamailio) adds Geolocation and Route header and relays to correct PSAP
- Call gets connected and location is immediately displayed (updates via LbR)

Simple Configuration Example

Pseudo Code Snippet: kamailio.cfg

```
...
request_route {
  # check for service urn
  route(URN);
...
route[URN] {
  # if its a urn then get next hop from external app
  if(!($rz=~"^urn$") && !is_method("INVITE|MESSAGE"))
    return;

  # get routing info - query.pl/lookuproute returns: $avp(dest_uri), $avp(route_hdr)
    if (!perl_exec("lookuproute", "500")) {
      xlog("L_ERR","perl_exec failed");
    }

  remove_hf("Route");
  $du = $avp(dest_uri);
  insert_hf("$avp(route_hdr)\r\n", "Via");
  route(RELAY);
  exit;
}
...
```

Note that this is just a basic example using an external routing app – certain other options are possible

Pseudo Code Snippet: query.pl

```
use LWP::UserAgent; use XML::Simple; use Kamailio::Constants;
...
my $lis_service = ’http://LIS:8000/held’;
my $ecrf_service = ’http://ECRF:8000/lost’;

sub lookuproute {
  my $m = shift;
  my $code = shift;
  # Import pseudo variables to perl script
  my $ru = $m->pseudoVar("\$ru");   # service urn -> findService request / next hop
  my $fu = $m->pseudoVar("\$fu");   # identity -> held request / location
  # Create a user agent object
  my $ua = LWP::UserAgent->new;
  $ua->agent(’query-kamailio/0.1’);
  # Create a request
  my $req = HTTP::Request->new(POST => $lis_service);
  $req->content_type(’application/held+xml’);
  $req->content("$xml");
  ...
  Kamailio::AVP::add("dest_uri", $myduri);
  Kamailio::AVP::add("route_hdr", $myrhdr);
  ...
}
```

Note that this is just a basic example using an external routing app – certain other options are possible

Summary

Summary

- Next Generation Emergency Services
  - provide location based and policy based call routing
  - allow a centralized routing and mapping process
  - and therefore support different originating networks
- Kamailio as the ESRP SIP routing engine, either simply combined with external routing application supporting HELD, LoST ... or perhaps with new modules
- Standardization and interoperability testing continues
- Austrian Pilot DEC112 (Chat App & Next Generation Emergency Services)

Thank You!

FREQUENTIS

wolfgang.kampichler@frequentis.com

112 SOS

wk@eena.org