



# ***3GPP support for IP based Emergency Calls***

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- Development of support for IP Based Emergency Calls has been ongoing in 3GPP since March 2003
- Development scope covers IP based emergency calls originated from 3GPP associated wireless networks and from ETSI TISPAN defined fixed broadband networks
- Development started with a Technical Report (3GPP TR 23.867) in 3GPP TSG SA2 which evaluated requirements and different solutions
- Development has now progressed to a design specification (stage 2 – 3GPP TS 23.167) in SA2 that is over 80% complete and associated IMS/SIP signaling enhancements in CT1 (stage 3 – 3GPP TS 24.229)
- This presentation focuses on the content of TS 23.167
- This specification (and others) are freely available at <ftp.3gpp.org>
- The presentation, though intended to be accurate, balanced and objective, contains the views of the author only and has not been seen or endorsed by 3GPP

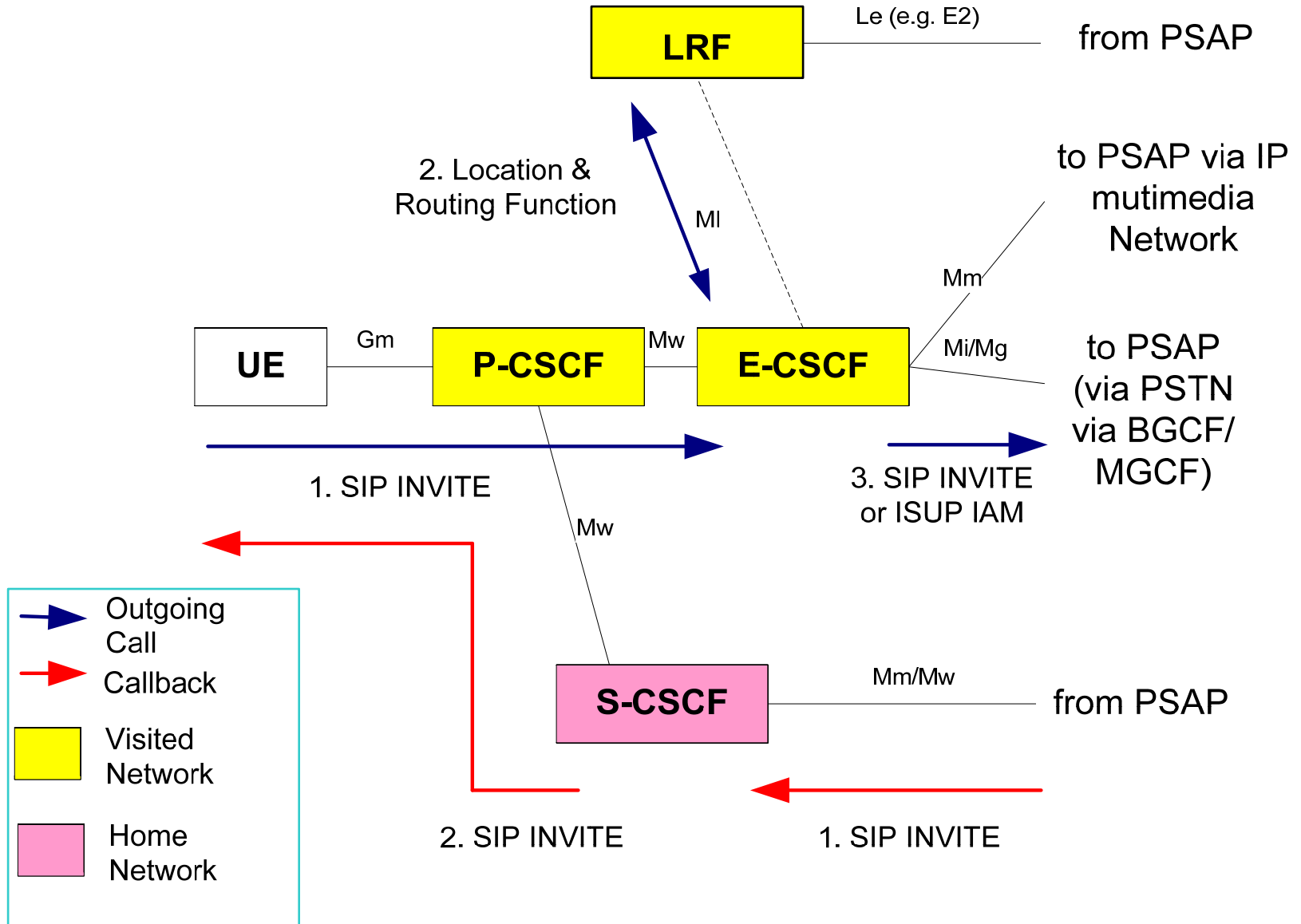
# Abbreviations

|        |  |
|--------|--|
| 3GPP   | 3rd Generation Partnership Project                   |
| BGCF   | Breakout Gateway Control Function                    |
| CS     | Circuit Switched                                     |
| CSCF   | Call Session Control Function                        |
| CT1    | 3GPP Core Network and Terminals TSG Working Group 1  |
| E-CSCF | Emergency-CSCF                                       |
| EMC    | Emergency Services Call                              |
| ESQK   | Emergency Service Query Key                          |
| GMLC   | Gateway Mobile Location Center                       |
| IBCF   | Interconnection Border Control Function              |
| I-CSCF | Interrogating CSCF                                   |
| IMS    | IP Multimedia Core Network Subsystem                 |
| IP-CAN | IP Connectivity Access Network                       |
| LRF    | Location Retrieval Function                          |
| MGCF   | Media Gateway Control Function                       |
| MGW    | Media Gateway  |
| P-CSCF | Proxy CSCF   |
| PS     | Packet Switched                                      |
| RDF    | Routing Determination Function                       |
| S-CSCF | Serving CSCF   |
| SA2    | 3GPP Services and System Aspects TSG Working Group 2 |
| TSG    | Technical Specification Group                        |
| UE     | User Equipment                                       |

# Key Assumptions

- Use the CS domain for EMC if not specifically guided to use the PS domain
- Solution mostly independent of the access network type
- Support cellular access, fixed broadband, WLAN, nomadic access
- Support a variety of emergency SIP/TEL URIs (as in 3GPP TS 22.101)
- Prioritize an EMC
- UE normally detects an EMC but network must be able to detect also
- Support an unregistered (unauthenticated) UE where regulations allow
- Support is mostly in the visited (serving) network
- PSAP can be IP capable or PSTN legacy
- Support callback to a registered UE
- Support location provision to a PSAP
- Support a location query key (e.g. ESQK in the US)

# Architectural Model



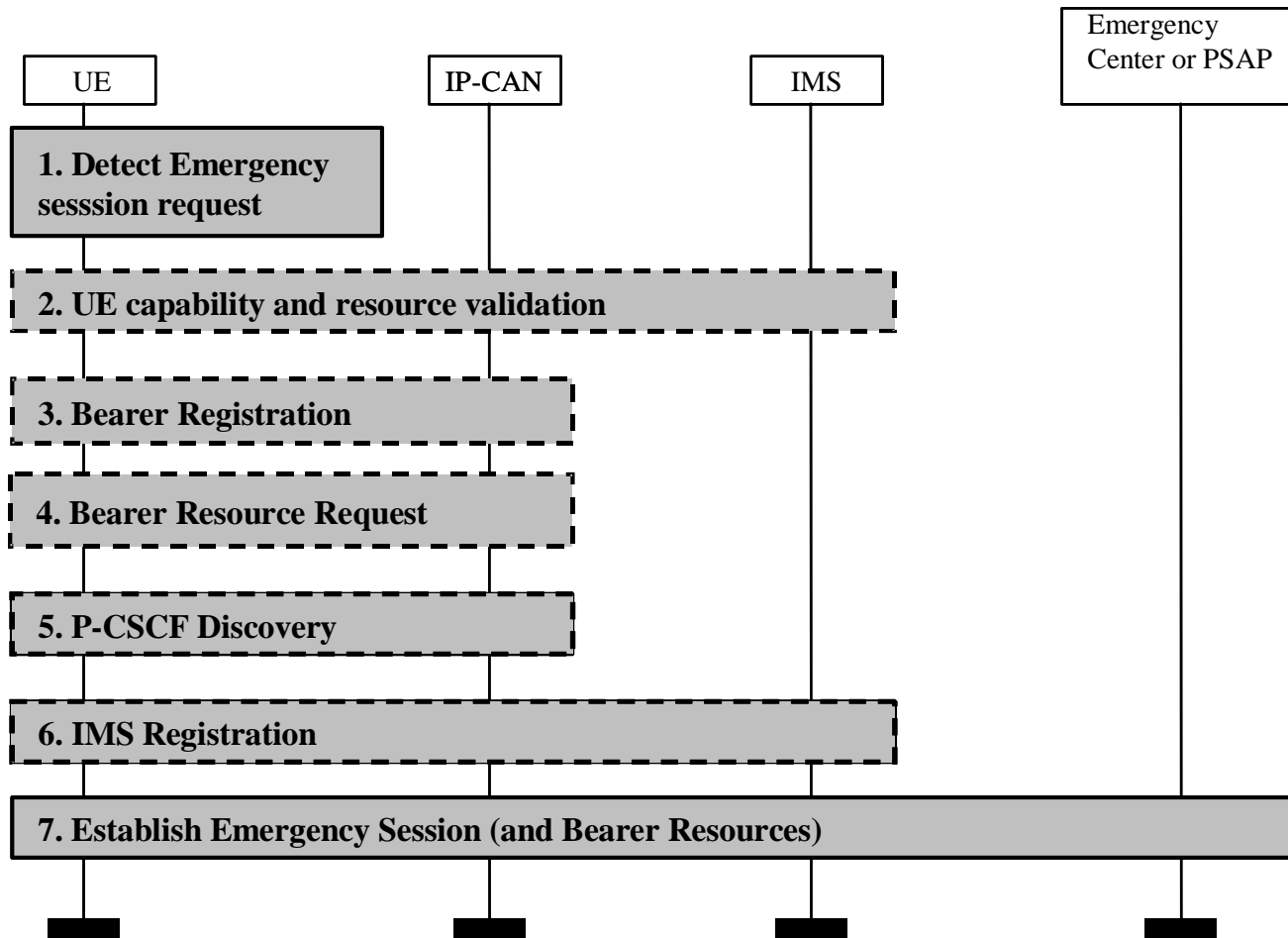
- Handle registration requests (with an emergency Public User Identifier) like any other registration request and forward the request to the IBCF or I-CSCF in the user's home network.
- Detect an emergency session establishment request.
- Reject/allow emergency requests unmarked by the UE
- Reject/allow anonymous emergency requests
  - Note that an unregistered UE would include an "anonymous user" indication and an EMC indication in the SIP INVITE
- Select the E-CSCF in the same network to handle the EMC
- Prioritize the EMC (implementation dependent)
- Validate any Tel URI provided by the UE
- Provide the Tel URI if aware of the Tel URI associated with the UE's emergency Public User Identifier (if the UE provides no Tel URI)

- Located in the visited network
- Performs specialized S-CSCF type functions
- Receive an EMC establishment request from a P-CSCF.
- Can query an LRF to retrieve location and/or routing information and determine the correct PSAP
- Route EMC establishment requests to the correct PSAP including anonymous EMC requests (e.g. unregistered UE)
- Routing and/or location retrieval functionality could also be integrated in the E-CSCF

- Can support location retrieval and routing determination
- Can contain an RDF (routing determination function) and a location server (e.g. GMLC)
- The RDF provides the correct PSAP address to the E-CSCF (Tel URI or SIP URI)
- The RDF could also manage ESQK allocation in the US
- LRF may retrieve or use an interim location (for routing)
- LRF can be used for subsequent accurate location
  - LRF stores a record of the EMC
  - E-CSCF notifies the LRF when EMC is released
  - LRF provides correlation information to the E-CSCF for transfer to the PSAP in the EMC establishment request (e.g. an ESQK)
  - PSAP uses correlation information when requesting location directly from the LRF

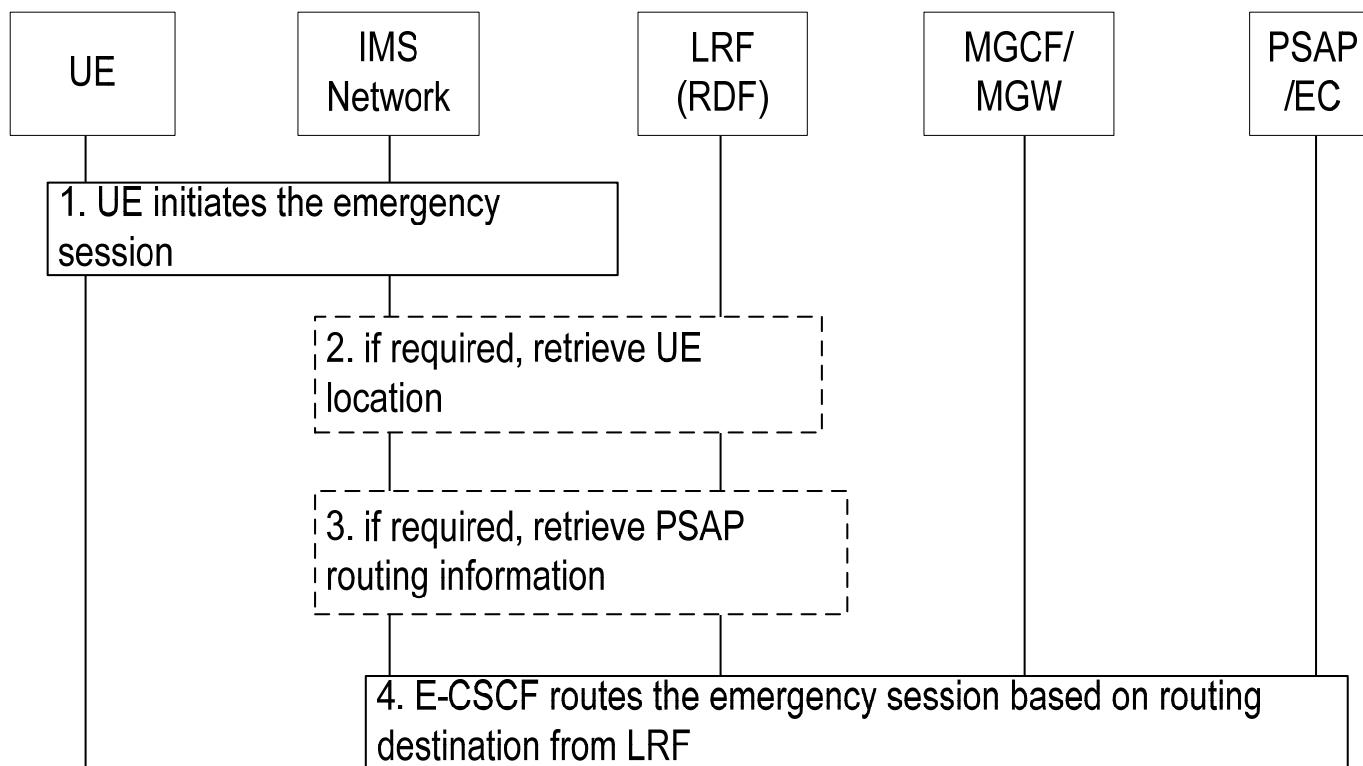


# EMC Establishment



- Step 6: Registration is in the home network – UE provides an Emergency Public User Identity
- Step 6 is skipped by a UE with insufficient credentials for authentication and may be skipped by a UE that is already IMS registered (e.g. if served by the home network)
- In step 7, the UE includes an emergency service indication and/or an emergency public user identity

# EMC Establishment using the LRF

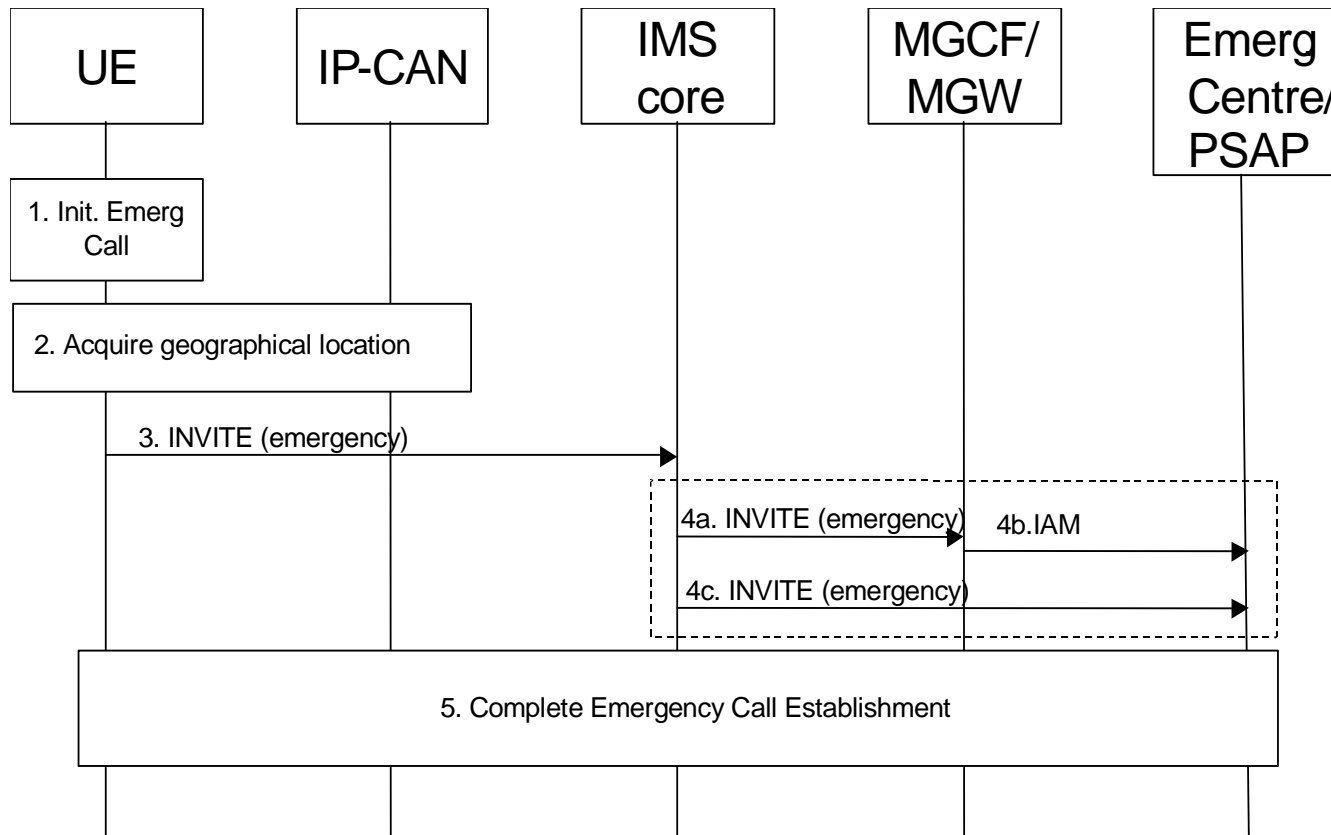


- Step 1 – SIP INVITE sent from UE to the P-CSCF and then E-CSCF
- Step 2 – E-CSCF may query LRF for location information
- Step 3 – LRF can invoke RDF to determine PSAP
- Step 4 – LRF returned information used to route the EMC

# Emergency Services Registration

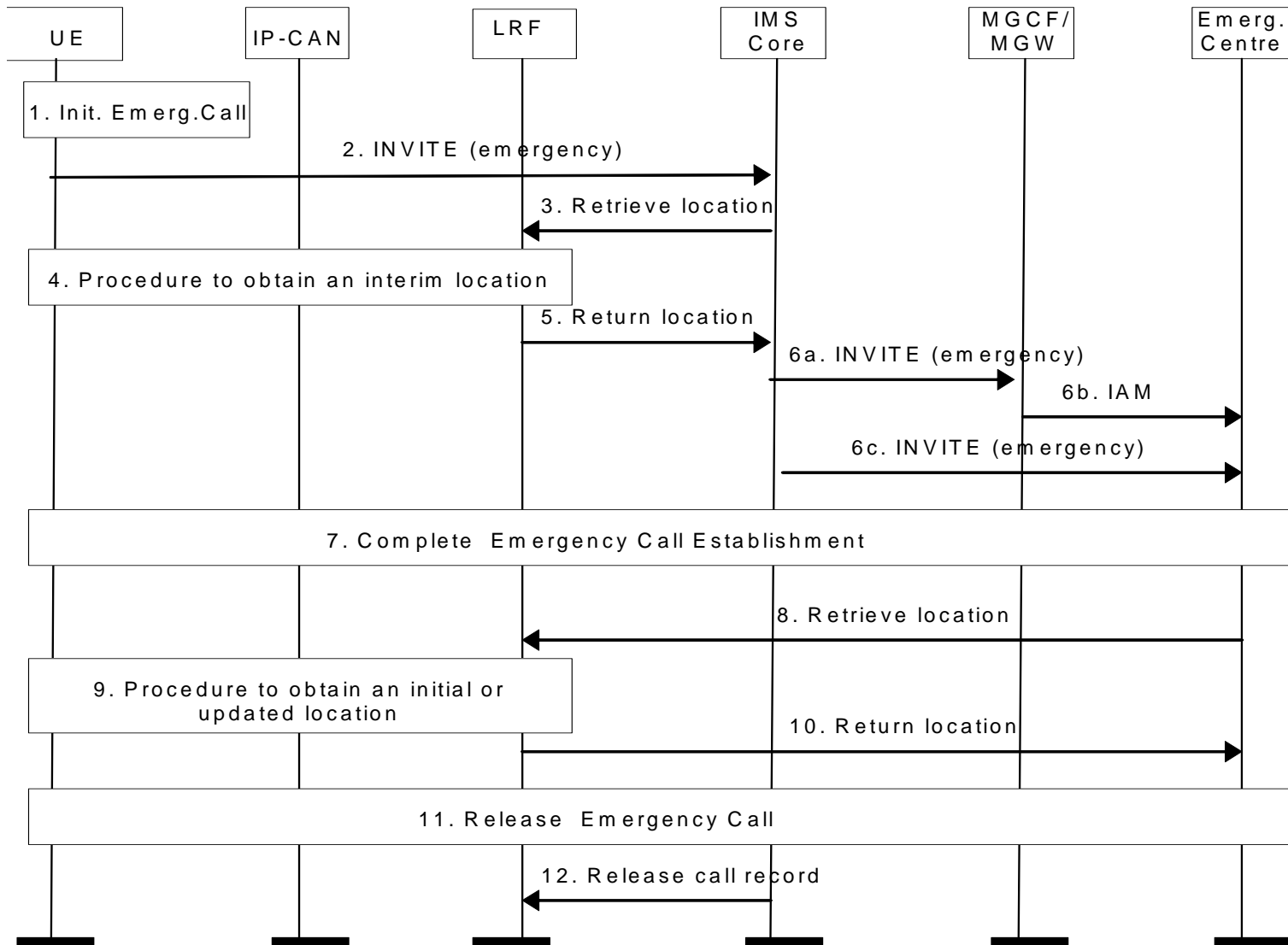
- Similar to but distinct from normal registration (e.g. both may occur)
- Required if the UE has sufficient credentials to authenticate with the IMS network and is not served by the home network
- UE inserts an emergency Public User Identifier in the registration request (format TBD)
- The Registration is sent to the Visited Network P-CSCF and then Home Network (e.g. S-CSCF)
- The main purposes are:
  - Authenticate the UE identity at the IMS level in the visited network
  - Obtain a verified callback address (SIP URI or Tel URI)
  - Ensure that callback via the home network will succeed
  - Enable the home network to suppress supplementary services on callback (e.g. call waiting)
  - Enable provision of EMC service to roaming users (including authentication and callback) where no normal roaming agreement exists between the visited and home networks
- But there are some issues
  - Must be completed before call origination can start (hence adds delay)
  - May not be needed in all cases (e.g. possibly if the UE has already registered via the P-CSCF)
  - Might occur in parallel with call origination (one suggestion at last SA2 meeting)
  - Might be avoided with a revised architectural model (another suggestion at the last SA2)

# Location Retrieval by the UE



- Provides one option for location support and is the default for fixed broadband access
- Step 2 – UE obtains its own location if possible or obtains location from the IP-CAN (IP Connectivity Access Network) – e.g. using DHCP for fixed broadband access
- Step 3 – Location information included in the SIP INVITE (e.g. in a pidf-lo)
- Step 4 – Routing based on UE provided location

# Location Retrieval by the IMS Core



- Note: both location procedures may be combined in a later version of 23.167

- Additional Impacts are being defined to support EMCs in different 3GPP Access Networks
- The impacts mainly concern obtaining IP connectivity and support for unregistered UEs
- The impacted access networks comprise:
  - General Packet Radio Service (GPRS) – 3GPP TS 23.060
  - Interworking WLAN (I-WLAN) – 3GPP TS 23.234
  - Fixed Broadband Access in the EU (TISPAN)
- Compatibility with the NENA i2 solution is also being progressed

# Ongoing Issues

- Ongoing issues reflected in contributions to the last SA2 meeting (August 28-September 1) are summarized here
- Emergency Registration Procedure optimization or elimination
- How best to support Voice Call Continuity (VCC) following handover between different access types
- Support of privacy in some world regions
- Restricting IP access – e.g. for unregistered users
- Improving compatibility with NENA and IETF solutions
- More precise definition of the E-CSCF to LRF interface
- GPRS and I-WLAN access specific impacts
- The associated contributions and meeting report are available at:  
[ftp://ftp.3gpp.org/tsg\\_sa/WG2\\_Arch/TSGS2\\_54\\_Sophia\\_Antipolis/](ftp://ftp.3gpp.org/tsg_sa/WG2_Arch/TSGS2_54_Sophia_Antipolis/)