SOS Alarm Sweden on transition from Circuit-to-Packet Switched and implementation of PIDF-LO

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Agenda

- Overview of Sweden’s transition to IMS-based emergency communications
- Implementation Strategy for SIP PIDF-LO, drivers, testing and timelines
- Collaboration and Stakeholder Involvement

Circuit to Packet switched communication

- Preparations started in 2018 and transition in 2021
- Transition maybe easier in Sweden than other countries since SOS Alarm is the only PSAP org receiving emergency calls
- Lots of testing to secure functionality and redundancy towards each interconnected MNO (Mobile Network Operator)
- PSAP back-end servers developed for PS (SIP)
- Fully operational PS in Nov 2022 with all four of MNO´s with own network
- Other phone operators can join, though costly because of redundancy demands and they have so far chosen to go via the four MNO´s
- Approach/strategy: “Just do it!”

Learnings during transition to PS

- MNO´s has different prerequisites and conditions due to different hardware, timers and so on. Therefore, hard to line them up = four different config´s
- Network redundancy towards MNO is important to test periodically
- Traffic redundancy, re-routing of calls towards different endpoints during service and/or outage of some sort
- SIM cards from respectively MNO for testing is vital
- Test numbers from each connected MNO for E2E-testing. And in backend have IVR capabilities for testing
- Very useful to have “SBC” that can SIP header manipulation rules, HMR

Location through PIDF-LO

Importance of location

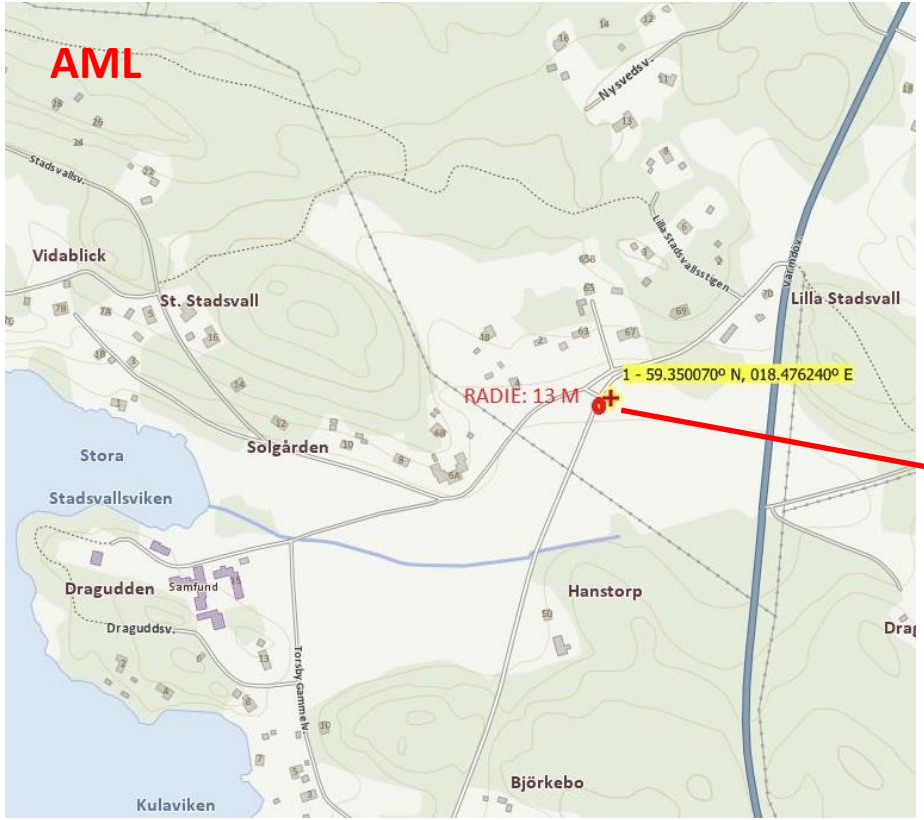
- Initial question in an emergency call: “What has happened and where?”
- Without the “where” it is impossible to rescue
- Important factors:
  - Accuracy – correct location, as exact and small radius as possible
  - Reliability – always available, at best in every emergency call (AML in Sweden in 80 % of calls to 112)
- Early location, even a large radius/polygon, indicates municipality which together with what has happened gives call taker action plans to handle the case

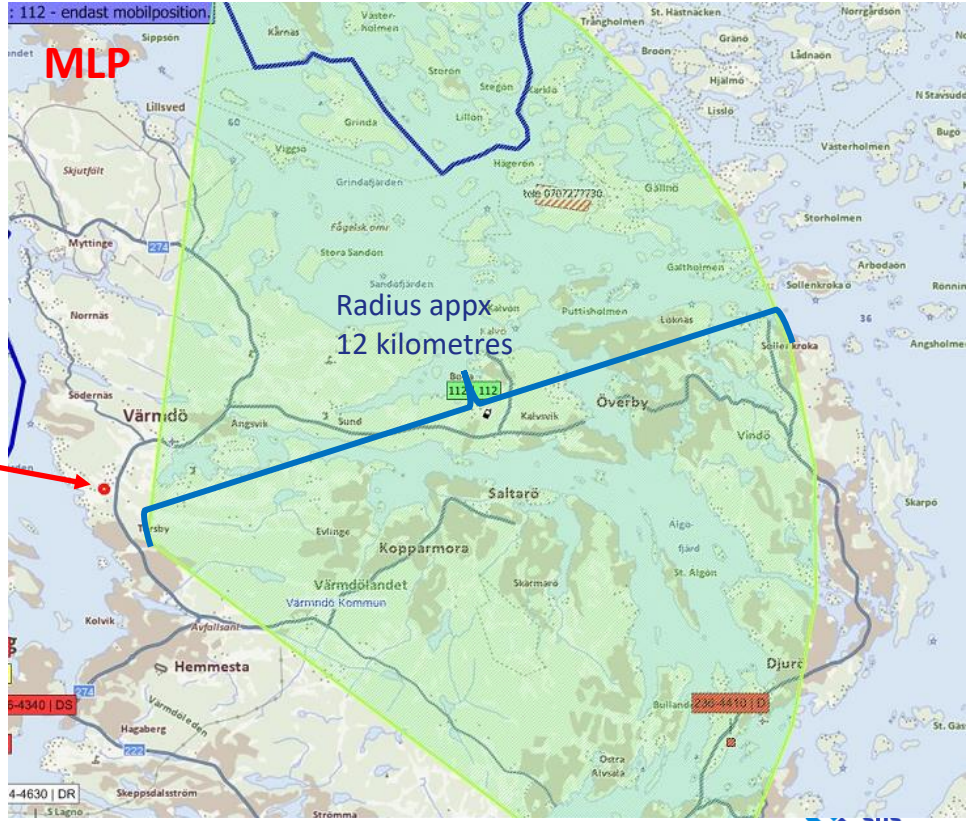
Location in emergencies

- Implemented ways of locating emergencies:
  - Address database (fixed landlines)
  - MLP = Mobile Location Protocol (Mobile networks, Network induced)
  - AML = Advanced Mobile Location (Device location; GPS/GNSS, wifi, Cell)
  - eCall (manual or automatic calls from cars)
  - 112-app (Device location)
  - HTML5 (weblink via SMS sent out by call taker)
  - PIDF-LO (Device location via SIP)

- According to new regulation from Swedish Post- and Telecom Authority: “The most accurate position information transmitted […] may deviate by no more than 100 metres from the actual position of the terminal equipment in at least 80 per cent.”

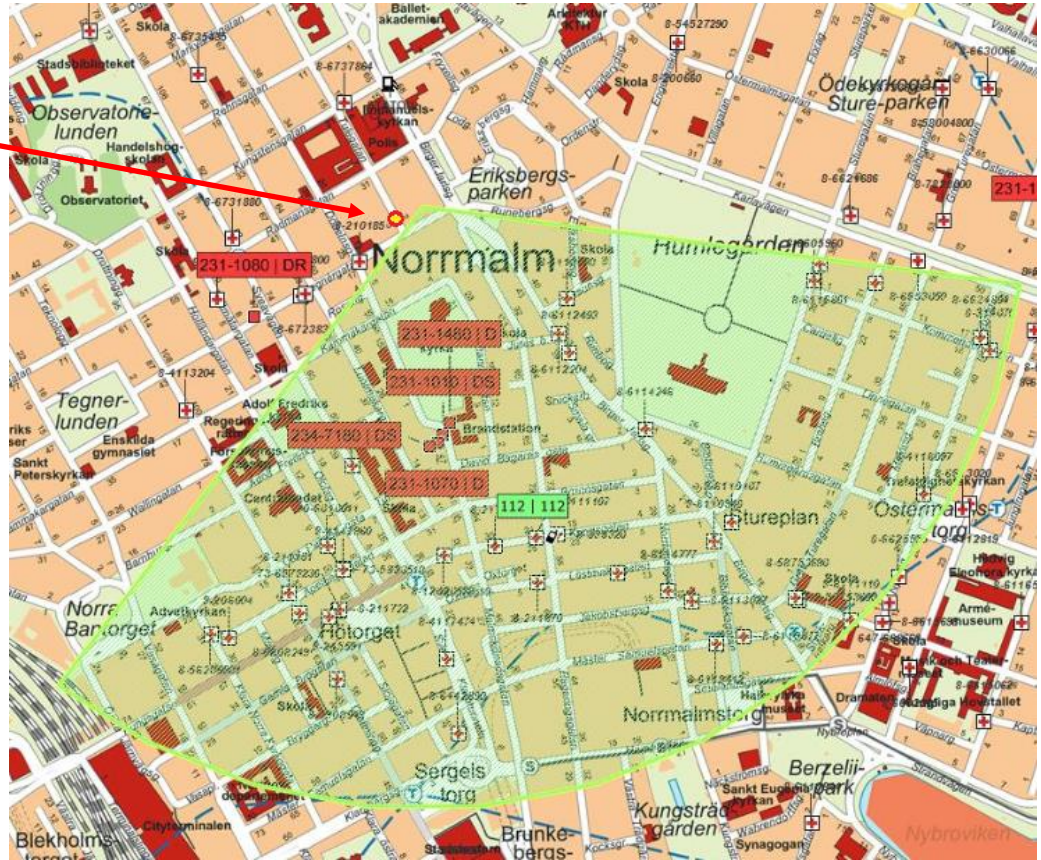
MLP compared to AML – rural environment





MLP compared to AML – city environment

Radius:
5 metres



PIDF-LO compared to AML

PIDF-LO compared to AML

- Basically the same
- PIDF-LO comes directly in the call = location radius is often large (Cell, wifi), but during the call (GPS/GNSS) will be quite precise.
- AML comes later in the call and will therefore be better from start.
- PIDF-LO though working with SIM-less calls to 112
- Will generally work better for foreign subscribers
- Can contain other data; municipality, postal code, address
- Though no IMSI and IMEI (parts of, like in AML) and originating MNO

Implementation of PIDF-LO

- Learning as we go by
- PIDF-LO still weighted lower than MLP and AML in our visualization to PSAP
- At this stage about 0,5 % of the calls to 112 contains PIDF-LO
- Our implementation not 100 % according to specification regarding updates
- Dialogue with all four MNO`s to see that they will let through PIDF-LO element
- PIDF-LO can affect PS since the packets might be larger
- Implementation done without disturbing call taking to 112

“Wishlist” to chipset/device manufacturers

1. PIDF-LO to work in VoLTE and Vowifi emergency calls to 112
2. Must be sent with INVITE
3. **Position updates should be sent with UPDATE or Re-INVITE (**subset of rfc6442 and deviation from 3GPP TS 24.229**)**
    a) **Every 30 seconds**
        - **Preferably only when position is changed.**
4. **GeoShapes, Subset of RFC 5491 regarding Shapes.**
    a) **Circle**
    b) **Point, 2D**
    c) **Point, 3D**
    d) **Ellipsoid**
5. Must work for all Mobile Network Operators in Sweden (mcc 240)
6. Should work for Inbound Roamers to Sweden
7. Must work for non-authenticated calls (sim-less emergency calls)

Collaboration with stakeholders

- Fruitful (☺) meetings with Apple to move forward (thanks guys!)
- Meetings with all four MNO´s
- Good collaboration with SOS Alarms supplier of CAD system: OMDA
- Varying collaboration with chipset manufacturers. Mostly due to lack of ways on how to contact them

Thank you!