# 3GPP Standards Extension or Other Alternatives for Crowd-Sourced Jammer Detection

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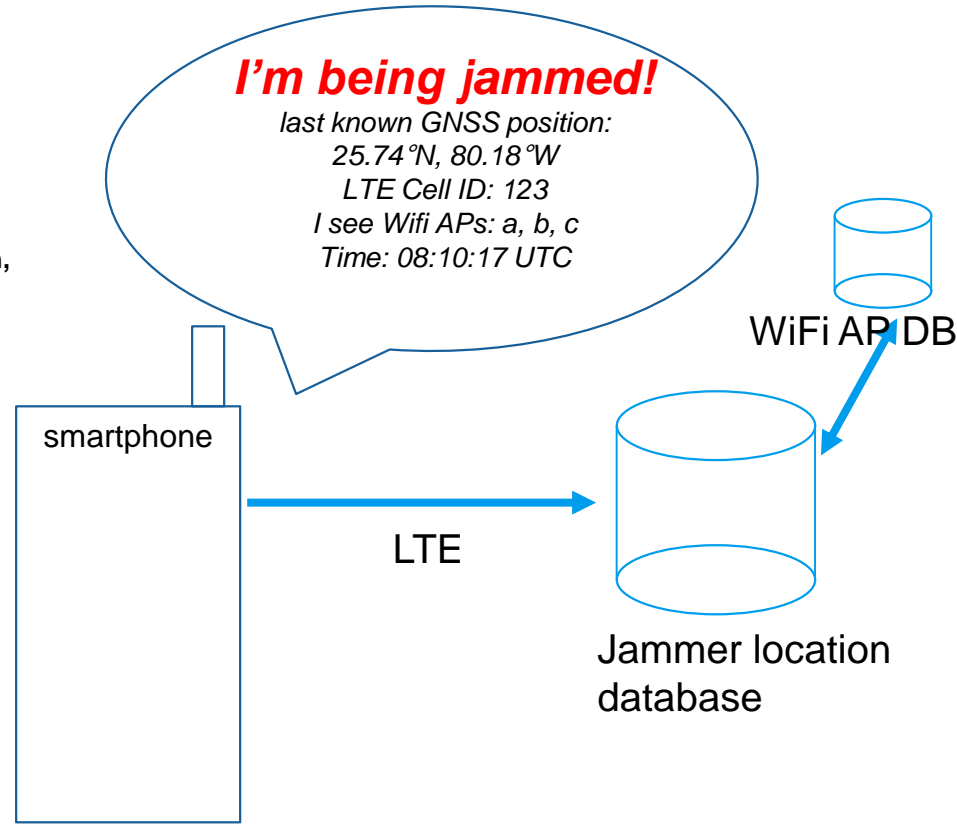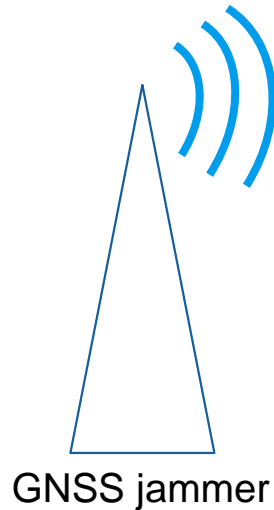Rohde & Schwarz

Goal: Real-time **jamming detection** using mobile **crowd sourcing**

- Based upon proposals:
  - Logan Scott in 2010
    - http://gpsworld.com/j911-fast-jammer-detection-10720/
  - Michel Monnerat (Thales Alenia) in 6th (2017) IDM workshop
- Idea: Map of jammers
  - Very dense sensor network (>1000 sensors/km^2)
  - For Authorities
  - Using mobile's measurements
    - AGC (Automatic Gain Control) value
    - Comparison between GNSS vs. Wi-Fi
- →GNSS community knows what is needed
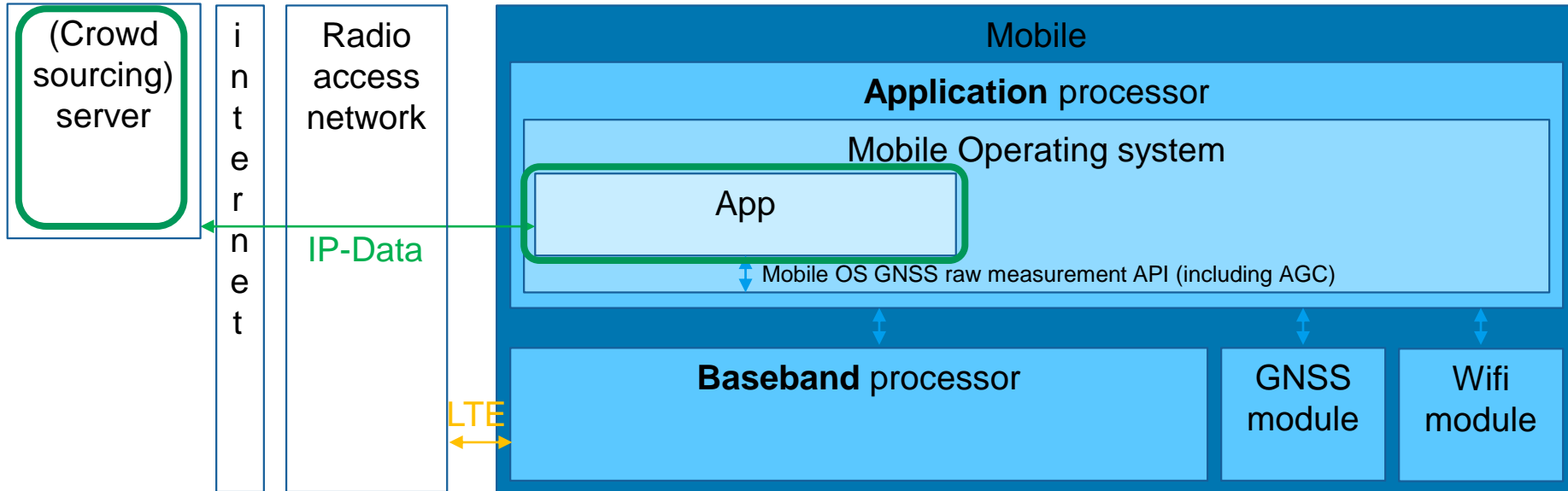 - Getting it in mobiles is the challenge

08:15:23UTC

08:10:17UTC

08:23:59UTC
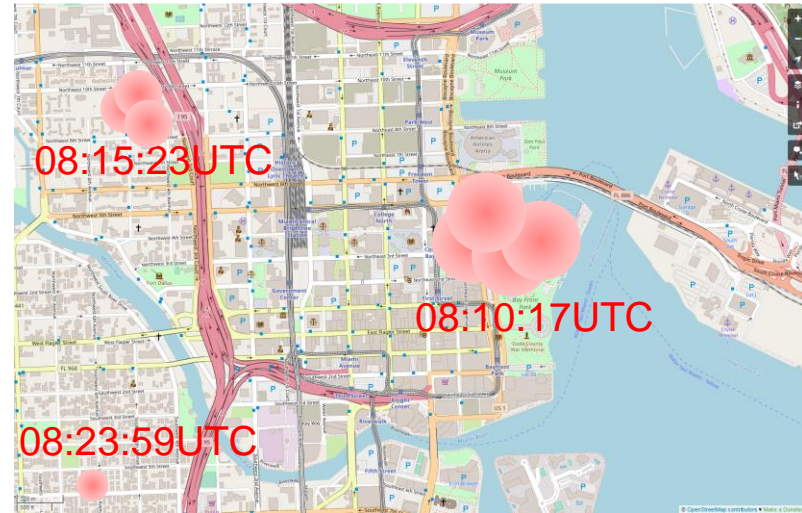
Requirements for crowd sourcing

- Common framework to collect measurements
- **Significant number of participating mobiles**
  - **Rough estimate (according to Logan Scott's simulations):**
    To get 90% probability of 100m radial error in jamming detection,
    10% of phones need to crowd source

I'm being jammed!
last known GNSS position:
25.74°N, 80.18°W
LTE Cell ID: 123
I see Wifi APs: a, b, c
Time: 08:10:17 UTC

WiFi AP DB

smartphone

LTE

Jammer location
database

GNSS jammer

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Support in mobile phones

▮ Simplified architecture of a modern smartphone

Potential solution A: App-based

- **App-based**
  - Large user base required (~10% of phones based on Logan Scott's research):
    - Talk to popular **commercial 911/Public Warning App** vendors to integrate feature
      - Could be a business case to provide jammer map via subscription
    - Develop a **Firstnet app (U.S. only)**?
      - https://developer.firstnet.com
      - First responders collect data → Lower number of devices, but devices are trusted
      - First responders still need to install the app manually
    - **AML/ELS-**like mobile OS extension (like 911 caller location integrated in Android&iOS)

Solution B: 3GPP based

- Basic Idea initially proposed by Logan Scott
- Usage of MDT framework proposed by Michel Monnerat (Thales Alenia)
- MDT supported in most new chipsets
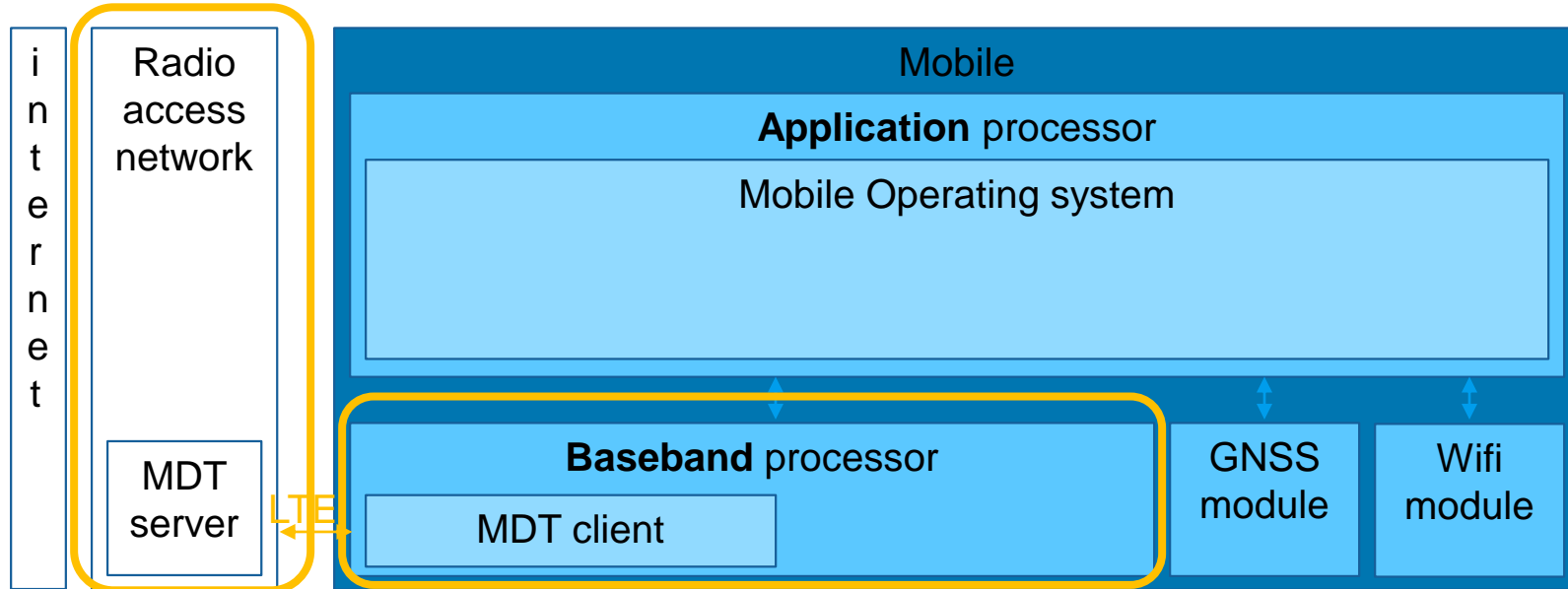
MDT: Minimized Drive test

Solution B: 3GPP MDT framework

- **3GPP Mobile-baseband approach**
  - logging and batch reporting framework: "Minimization of Drive tests" (3GPP spec 37.320)
    - Available today:
      - LTE: signal power & signal quality
      - GNSS position
      - Wi-Fi and Bluetooth
    - *Potential **extension** (earliest ~2020-2021 mobile phones & network equipment):*
      - *GNSS AGC value*

→Mobile network elements need to be upgraded as well

→As mobiles get replaced, installed base will increase automatically

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Solution B: Who to convince?

- Who to convince to add jamming detection to 3GPP specs :
  - **Network Operator(s)**
    - implement feature in their network (MDT is not a **mandatory** LTE feature!)
    - promote support in mobiles
  - **Chipset vendors**
  - **Infrastructure vendors**
- But:
  - No legal requirement
  - Considerable Effort for chipsets, network equipment vendors and network operators
  - **Where is the business case?**

3GPP organigram – where to start?

Proposal: Start here

Potential supporters:
U.S. DoT
Firstnet
BDBOS
FCC
U.S. Department of Commerce
RapidSOS
PSCE – Public Safety Communication Europe
TCCA – The critical comm. association

SA6: focus on safety-critical features

3GPP SA 6 – scope of the group

▮ SA 6 – Mission-critical applications
  - First goal: integrate mission-critical Push-to-Talk (MCPTT)
  - Planned to be used by Firstnet in the US
  - Also driven by non-US organizations (BDBOS in Germany)

  → Might be open to idea of adding crowd-sourced jamming and spoofing detection by first responders
  → Once integrated in 3GPP, could be enabled for regular users

Proposal how to move ahead for 3GPP-based solution

▪ Starting point SA6
- **SA Study Item proposal** at SA6
  - accepted → present to SA Plenary
    - accepted → conduct study and present results (e.g. standards impact, network load)
- **Work Item proposal at SA6** (based on study item)
  - accepted → present to SA Plenary
    - accepted → contribute to 3GPP requirements documents
- **Work Item proposal at RAN1** (based in SA requirements)
  - accepted → present to RAN Plenary
    - accepted → contribute to spec changes

Summary

▮ Two ways for crowd-sourced jamming detection:
1. App-based → faster
2. 3GPP-based → universal

▮ App-based
- AGC already supported by Android API
- Fast & easy to implement
- Challenge: How to bring app on many phones

▮ 3GPP
- Not clear if approach will be supported by 3GPP members →Supporters needed
- Challenge: feature addition is a long process →Volunteers wanted!
- Proposed starting point: 3GPP SA6
  - Next Meeting in Vilnius in October 2018
    - E-Mail list: https://list.etsi.org → 3GPP_TSG_SA_WG6
- R&S can advise, but not drive a 3GPP feature addition in SA groups
  - We can support later in RAN WG 4 and WG 5

Questions?

▮ Thank you for your attention

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