



MT Tracker use case

MobiSpaces Webinar

October 31st 2023

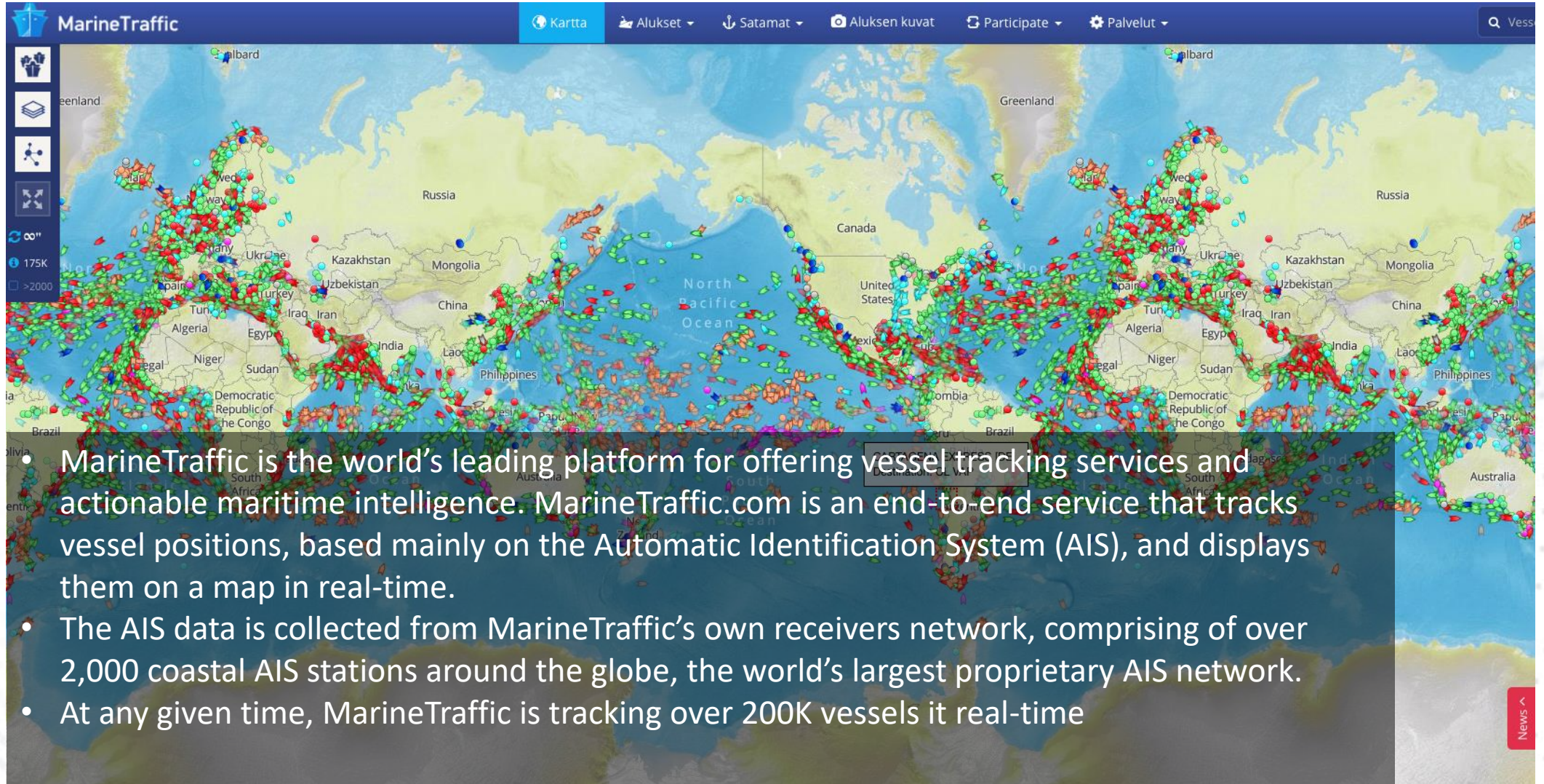


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MT Tracker

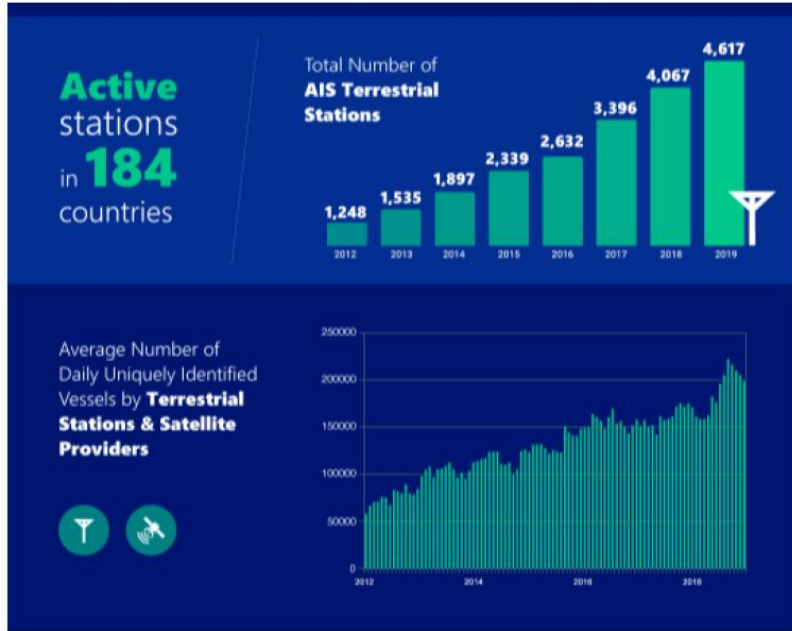
Konstantina Bereta, MarineTraffic (Kpler)



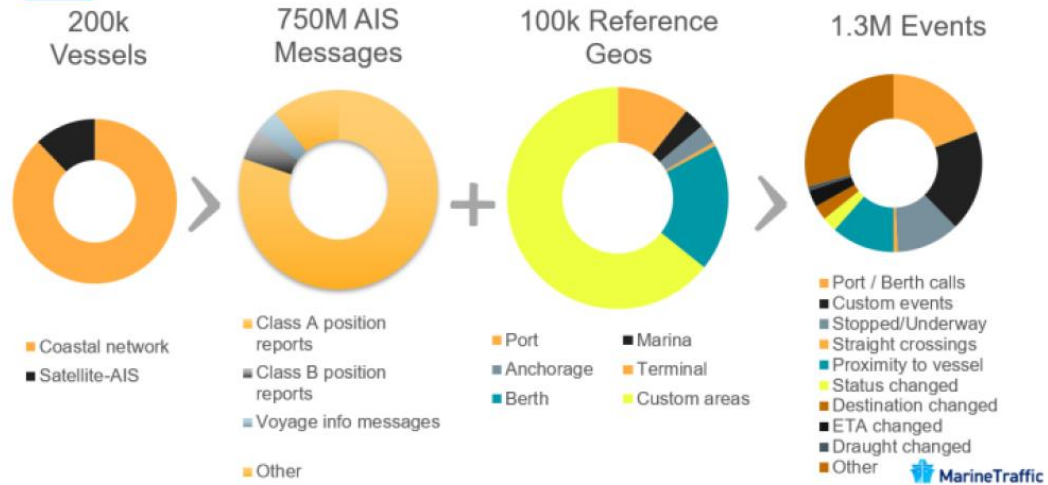
MarineTraffic

Kartta Alukset Satamat Aluksen kuvat Participate Palvelut Vess

- MarineTraffic is the world's leading platform for offering vessel tracking services and actionable maritime intelligence. MarineTraffic.com is an end-to-end service that tracks vessel positions, based mainly on the Automatic Identification System (AIS), and displays them on a map in real-time.
- The AIS data is collected from MarineTraffic's own receivers network, comprising of over 2,000 coastal AIS stations around the globe, the world's largest proprietary AIS network.
- At any given time, MarineTraffic is tracking over 200K vessels in real-time



A day at MarineTraffic - serving 550k users



70GB Streams of AIS data need to be processed every day for **1 million** users

Automatic Identification System (AIS)

- Collaborative, self-reporting system that allows marine vessels to broadcast their information to nearby vessels and on-ground base stations.
- It is based on VHF and it is used for vessel traffic monitoring and maritime event detection
- However:
 - Not mandatory for all vessels
 - Some vessels may switch-off their AIS transponder intentionally (**dark vessels**)



- Develop a robust and accurate vessel tracker (**MT Tracker**) to resolve measurement-to-object association ambiguities, especially in cluttered multi-object scenarios.
- Develop techniques for multi-sensor (AIS, RF) multi-object tracking in order to enrich information coming from different sources (e.g., vessels that cannot be tracked via AIS).
- Combine the results at a regional level providing macro analytics on aggregated data from the edge devices, reducing costly data transferred to centralized infrastructures.

DATA

Dynamic messages – attributes

MMSI (Maritime Mobile Service ID)

Position (LAT, LONG coordinates)

Speed over Ground (SoG)

Course over Ground (CoG)

Heading

Navigational status:

Under way using engine

Anchored

Restricted manoeuvrability

Rate of turn

Static messages- attributes

IMO (Int. Maritime Org. number)

Call Sign

Name

Type

Dimensions

Location of Antenna

Draught

Destination

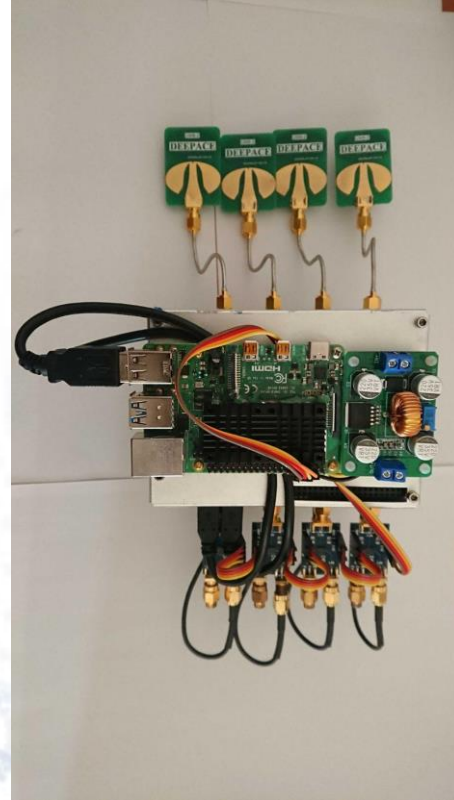
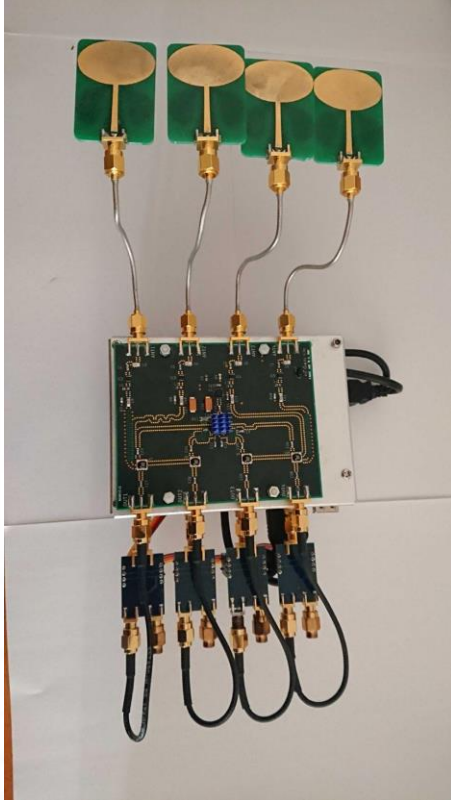
ETA (estimated time of arrival)

Type of positioning system (e.g.,
GPS)

<https://zenodo.org/record/3754481#.Y0lOjy0Ro8Q>

RF DATA

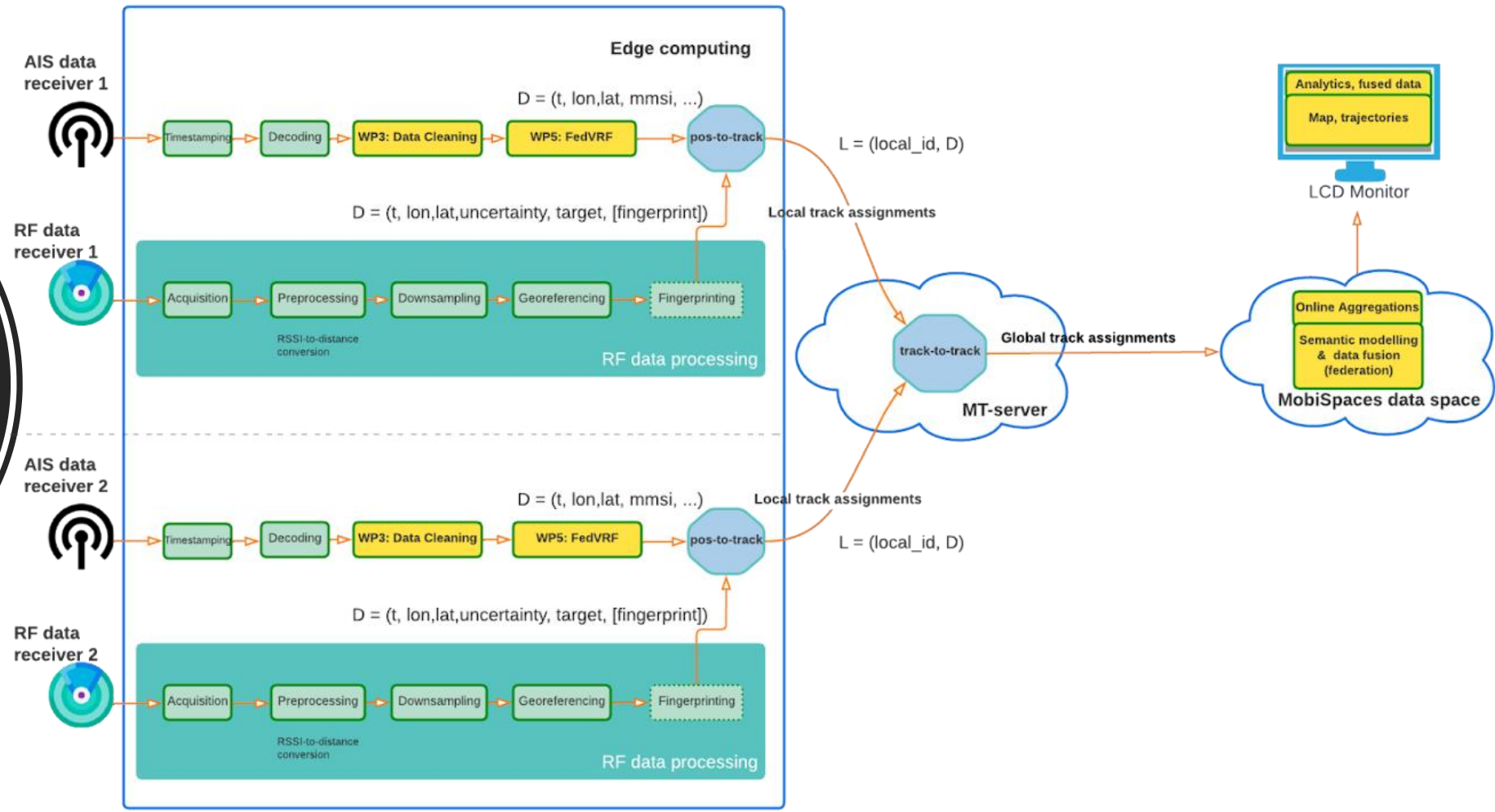
RADAR Tx Direction Of Arrival detection



Rev 1

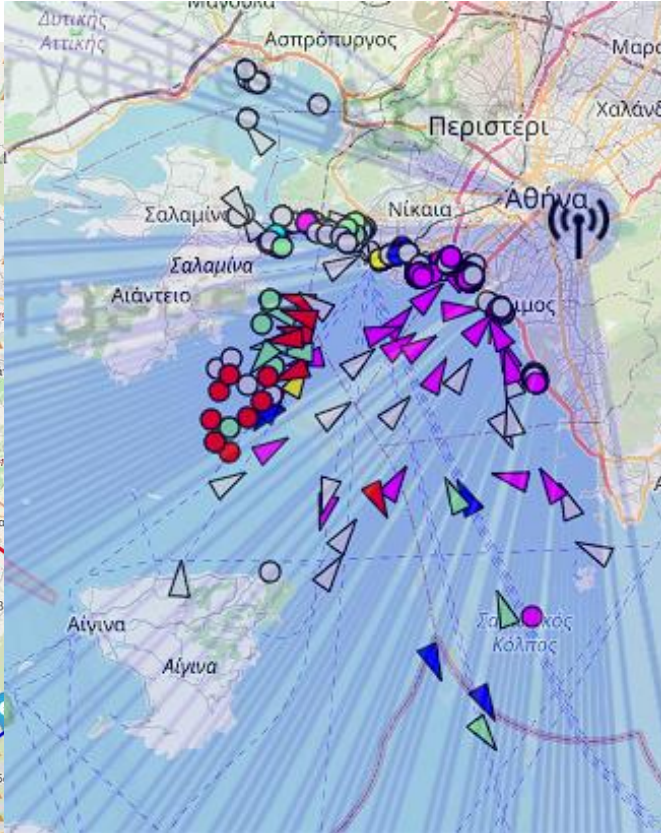
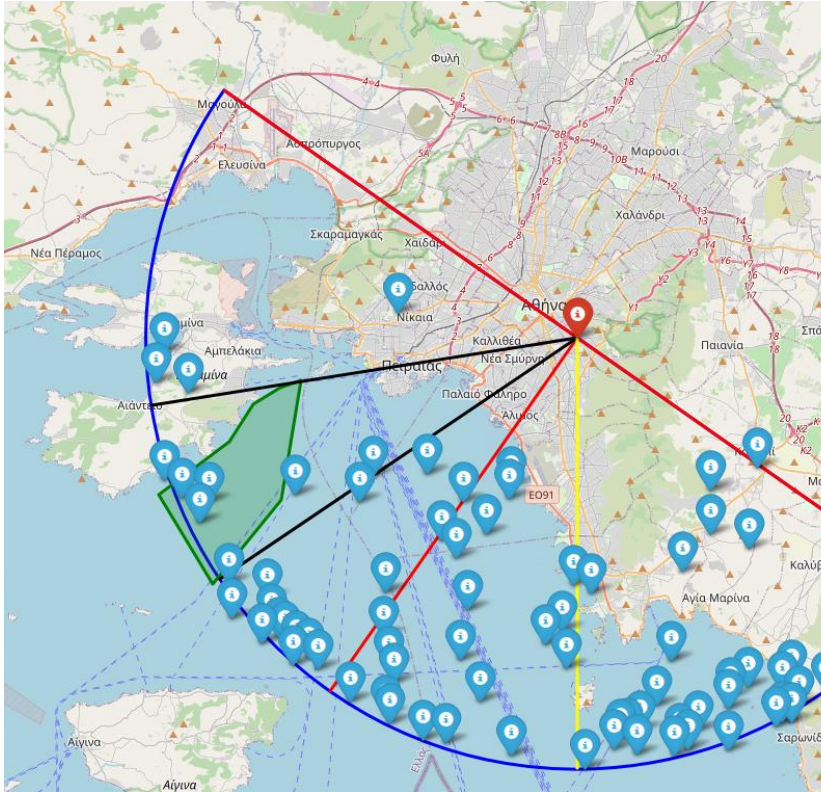
- Detect nearby RADAR transmissions in the X-Band and S-Band (bearing + distance from receiver)
- Correlate detected incidents with AIS in real-time to reveal “dark vessels” in the area
- Edge computing (perform multi-sensor multi-object data fusion on edge)
- Fingerprinting the RADAR transmissions (associate the RF signal unique characteristics with a specific vessel without the use of AIS)

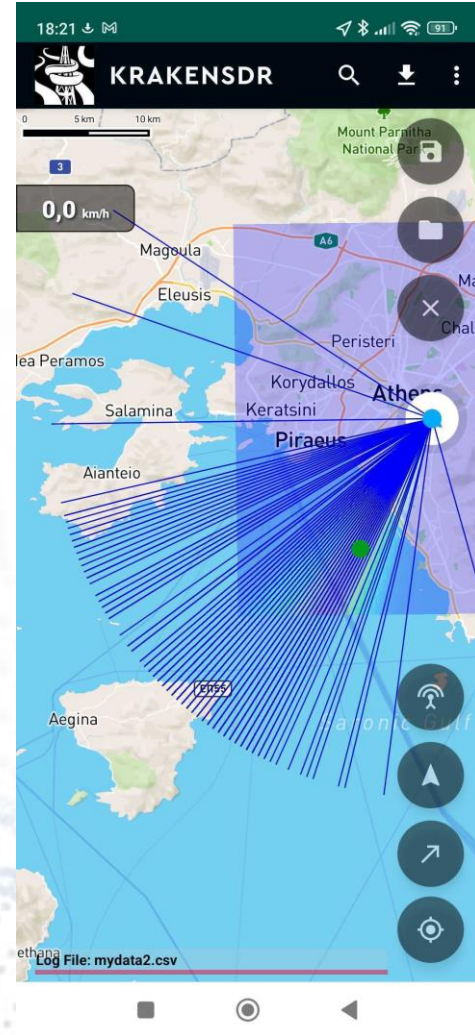
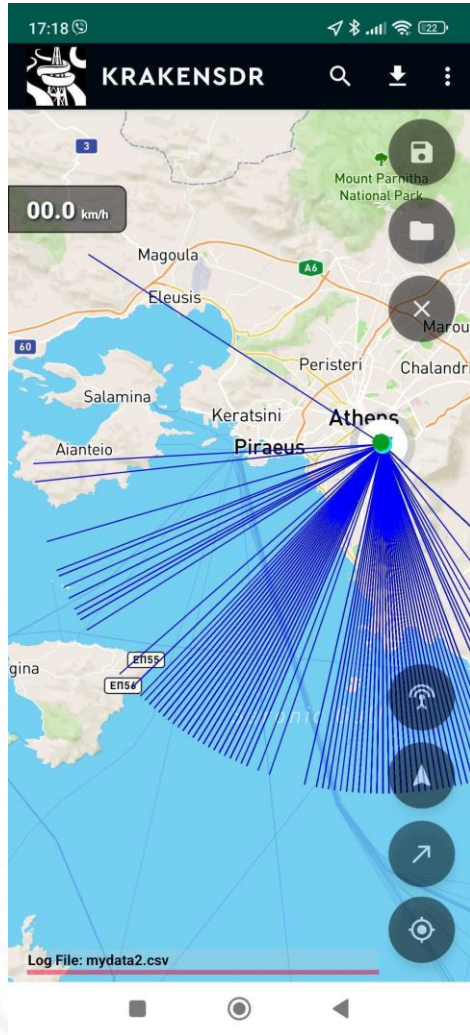
Architecture



- ⊞ 1st version of RF-component of MT-Tracker implemented
- ⊞ 1st version of in-situ processing of AIS and RF data on edge completed
- ⊞ Edge devices deployed
- ⊞ 1st version of mobispaces components for MT Tracker use case:
 - ⊞ Data cleaning
 - ⊞ Cross-silo vessel route forecasting
 - ⊞ Visual analytics

Target detection in RF data

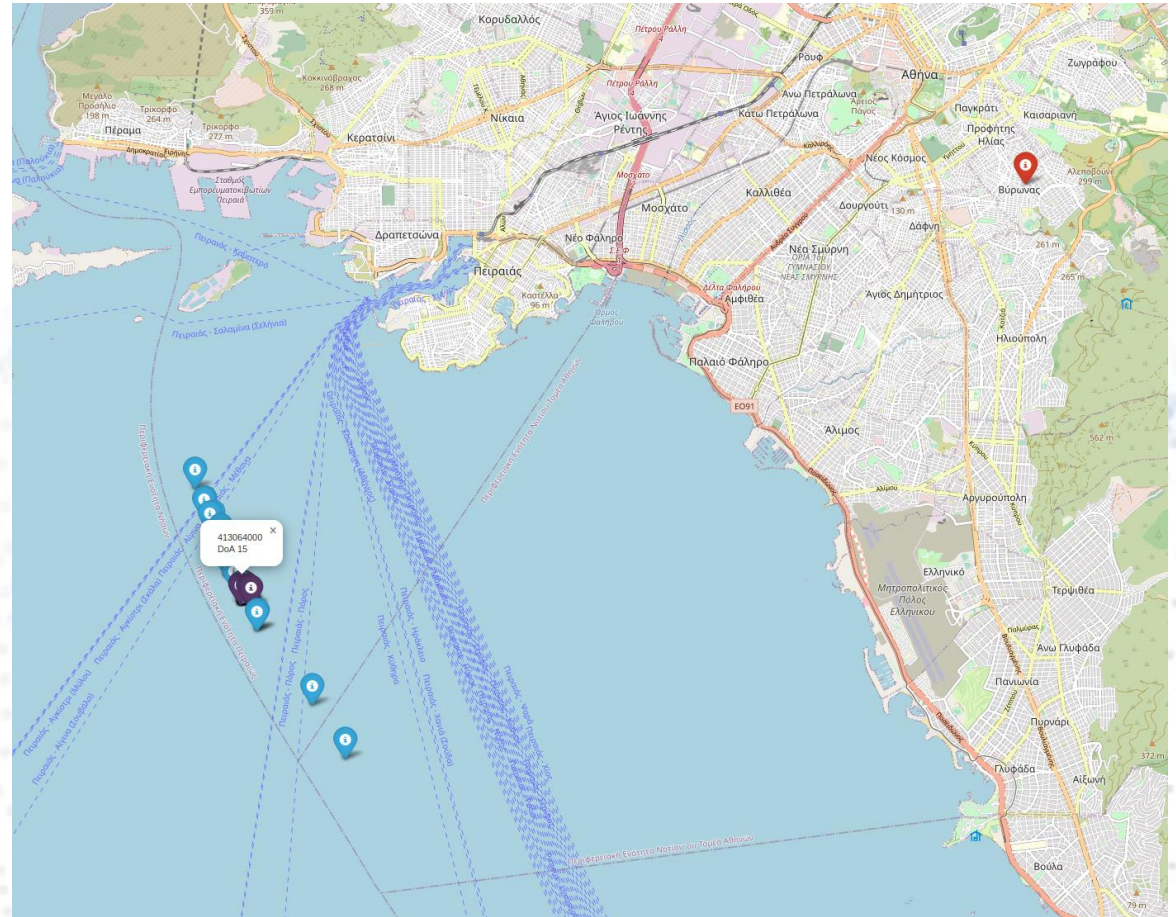
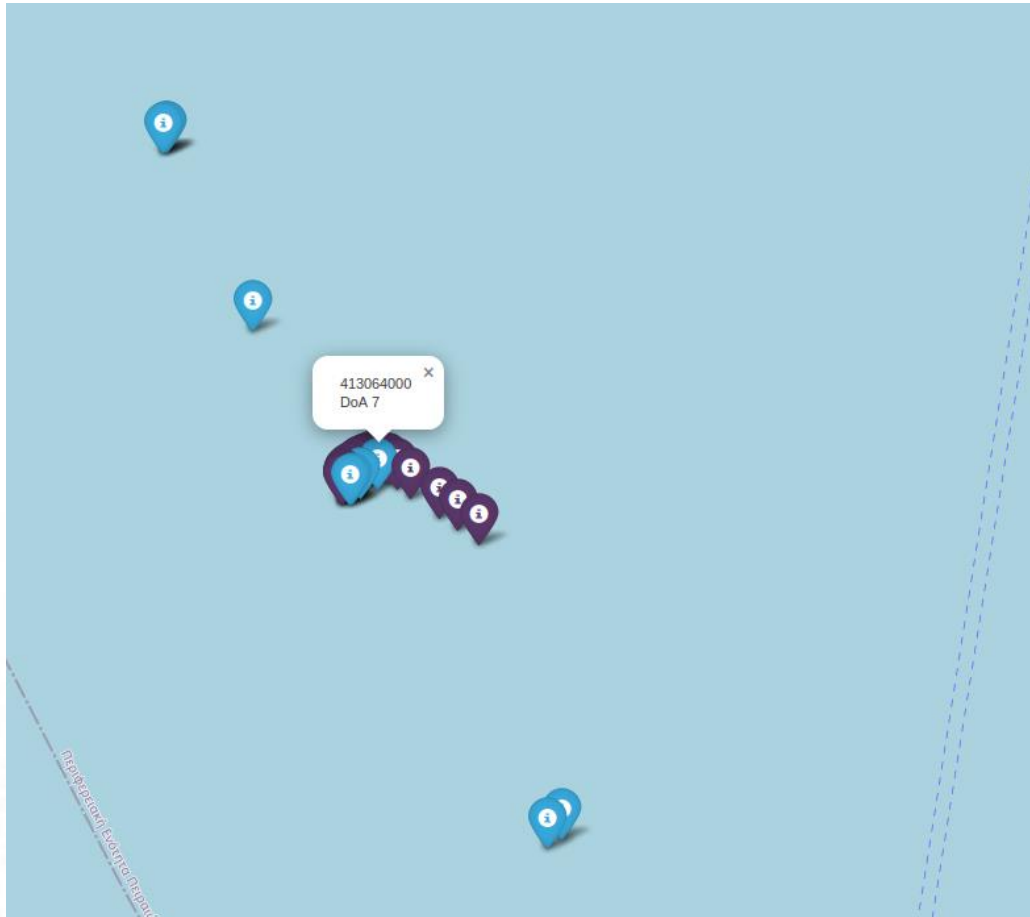




 Noise removal

 Accuracy improvement (due to phase shift)

RF targets vs AIS



- ⊞ Multi-sensor data fusion: position-to-track association on edge
- ⊞ Integration
- ⊞ Moving from AIS frequencies to X-Band and S-band
- ⊞ Evaluation



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