

ICAO EUR/MID Radio Navigation Symposium

Use of ADS-B to detect GNSS Interference

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Antalya, Turkiye
(6-8 February 2024)

Use of ADS-B to detect GNSS Interference

01

SecureTrack System Overview

System has been operational for over 1.5 years

02

ADS-B-based GPS Interference Detection

Measuring NIC to identify anomalies

03

NIC *Anomalies* are not necessarily caused by RFI

Identifying True GPS RF Interference Incidents

04

Detected Jamming Activity in Europe Over 1 Year

Key Insights about Interference in the area

05

ADS-B-based Jammer Localization

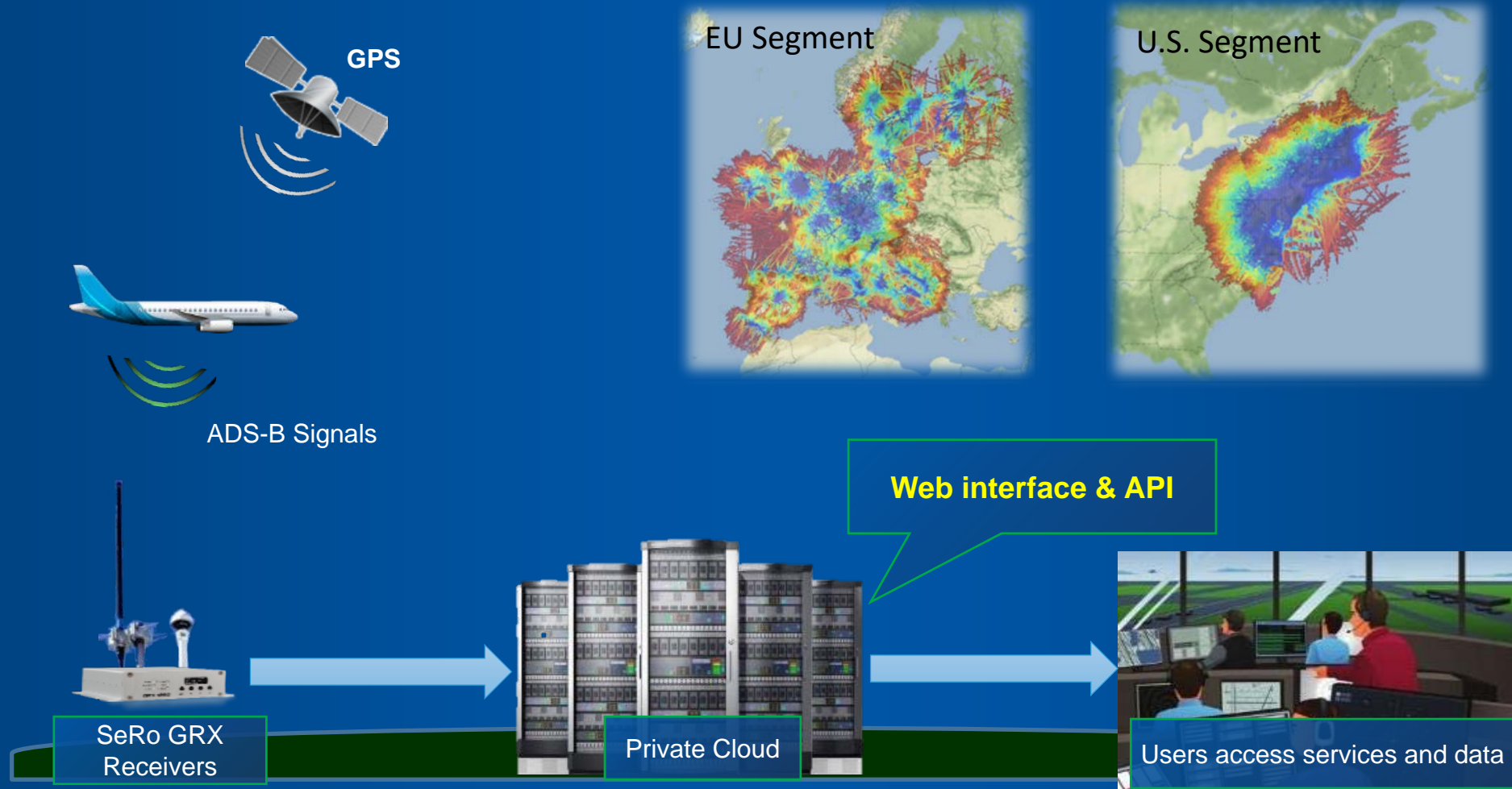
Approaches to locate the source of jamming

06

Spoofing Detection

SecureTrack ADS-B data validation

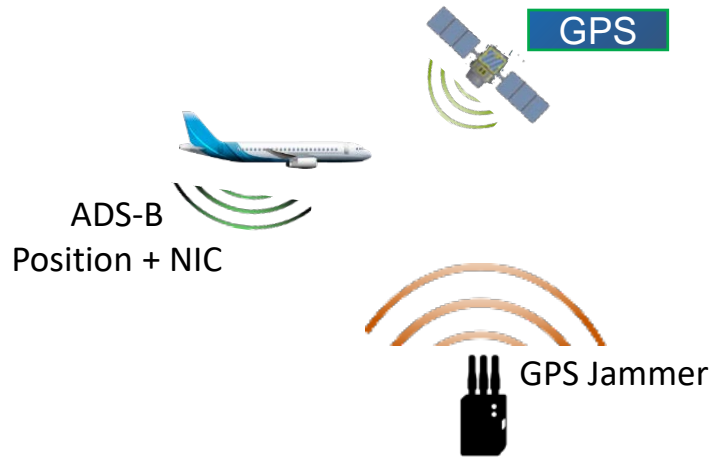
SecureTrack System Overview



ADS-B-based GPS Interference Detection

Navigation Integrity Category (NIC)

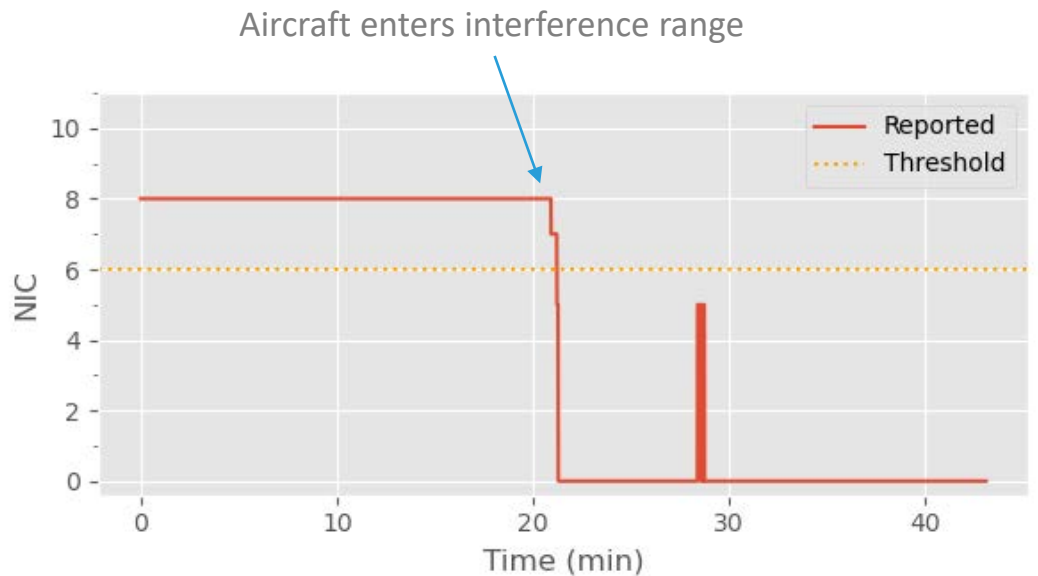
- NIC reported along with all positions (twice per second)
- Indicates Containment Radius for reported position



NIC behavior under interference

- Under normal conditions: NIC = 7-10
- Interference: NIC values drops
- NIC = 0 when no GPS fix at all

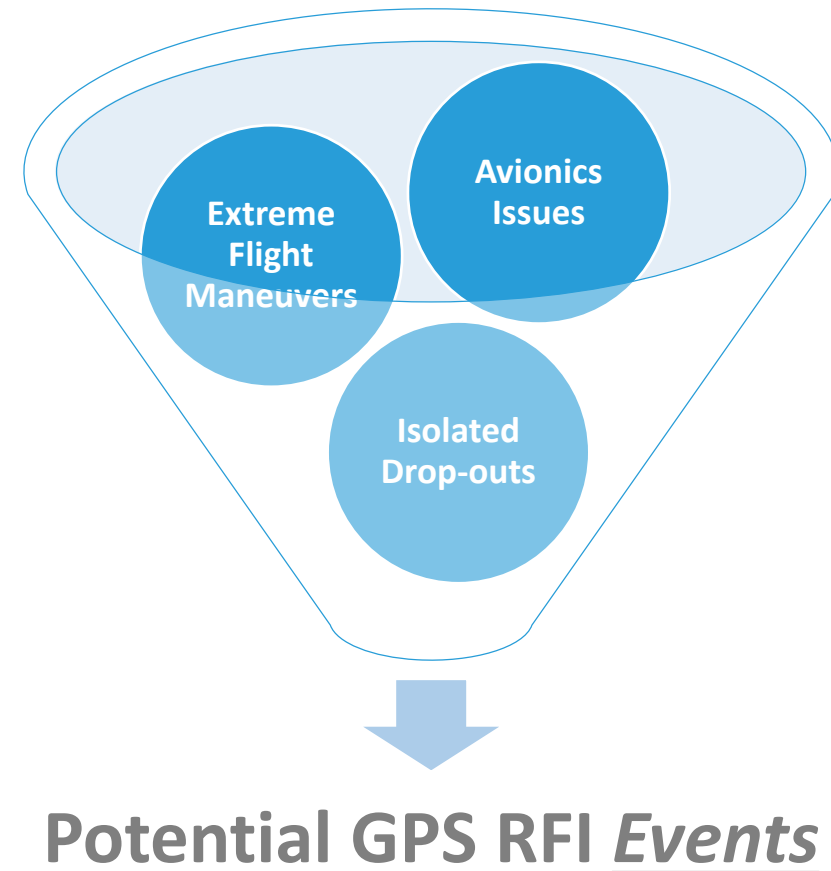
We consider drop of NIC value below 6 an anomaly



NIC Anomalies are not necessarily caused by RFI

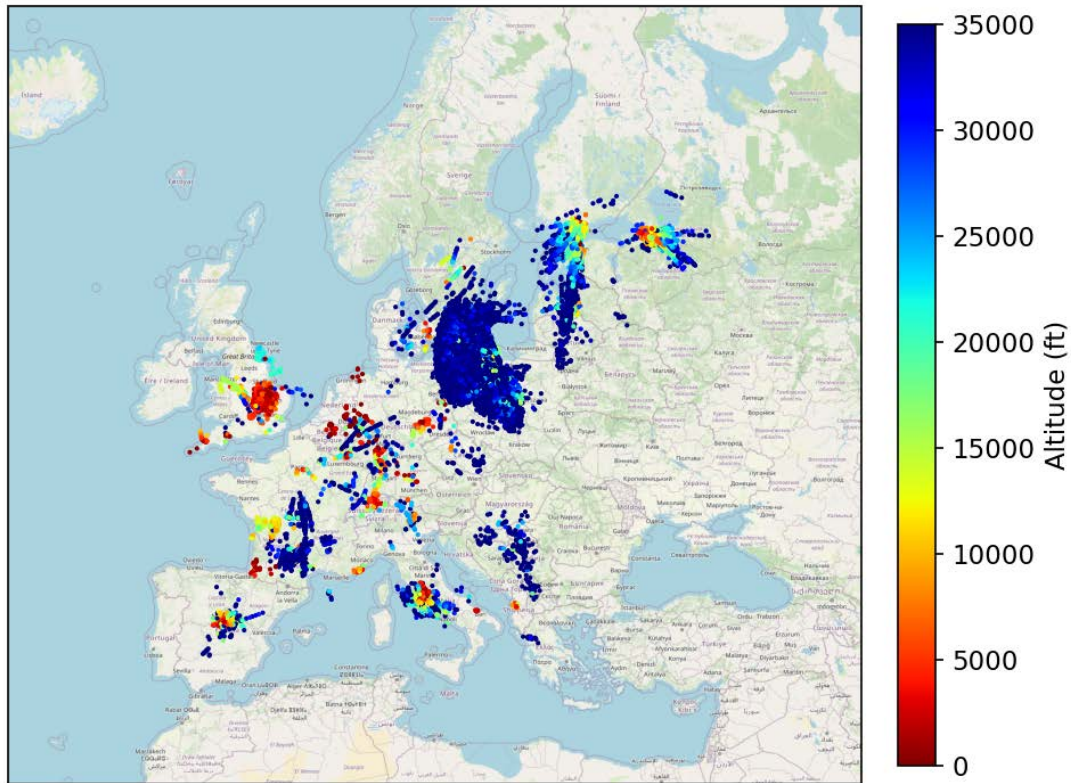
GNSS RFI Event Detection:

1. Detect and remove aircraft with avionics issues
2. Detect and remove aircraft performing extreme flight maneuvers
3. Perform clustering to detect and remove single isolated events (both in space and time)



Detected Jamming Activity in Europe Over 1 Year

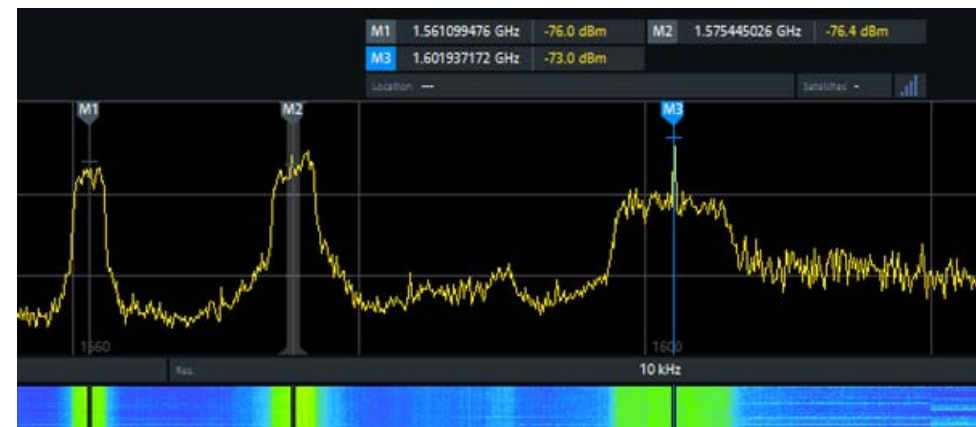
January 30th 2023 – January 30th 2024



Key Insights

Within our coverage

- Interference detected on 287 of the 365 days
- Small-scale interference events happen everywhere
- Large-scale (EW) interference in North East + Poland
- Entire upper L-band affected in NE Europe:



ADS-B-based Jammer Localization

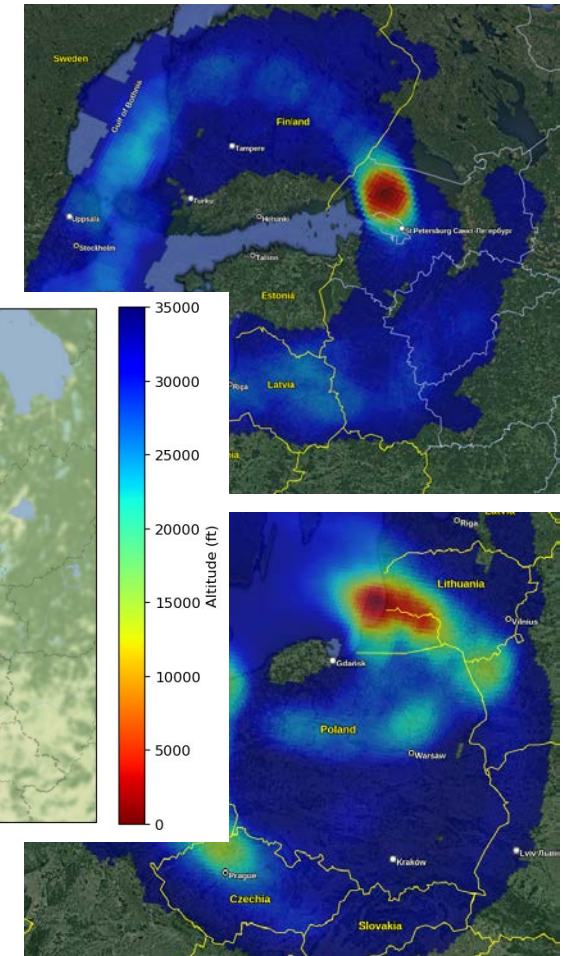
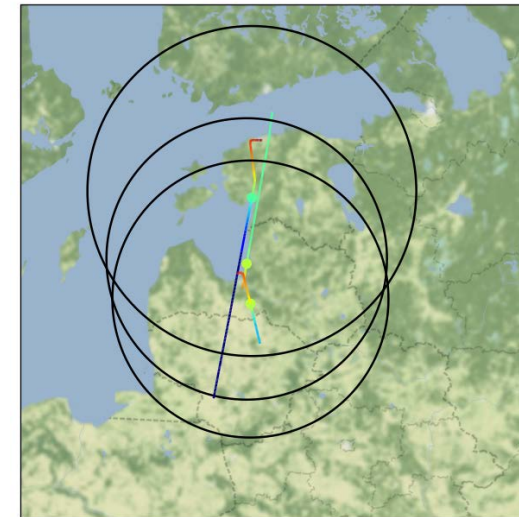
3 different approaches

- Try to map NIC to jammer signal strength
- Determine centroid of affected region
- Calculate radio horizon intersections

Radio horizon method yields accuracy of a few 10s of km

Limits

- Localization not in all scenarios possible
- Lack of ground truth (but high confidence)



Spoofing Detection

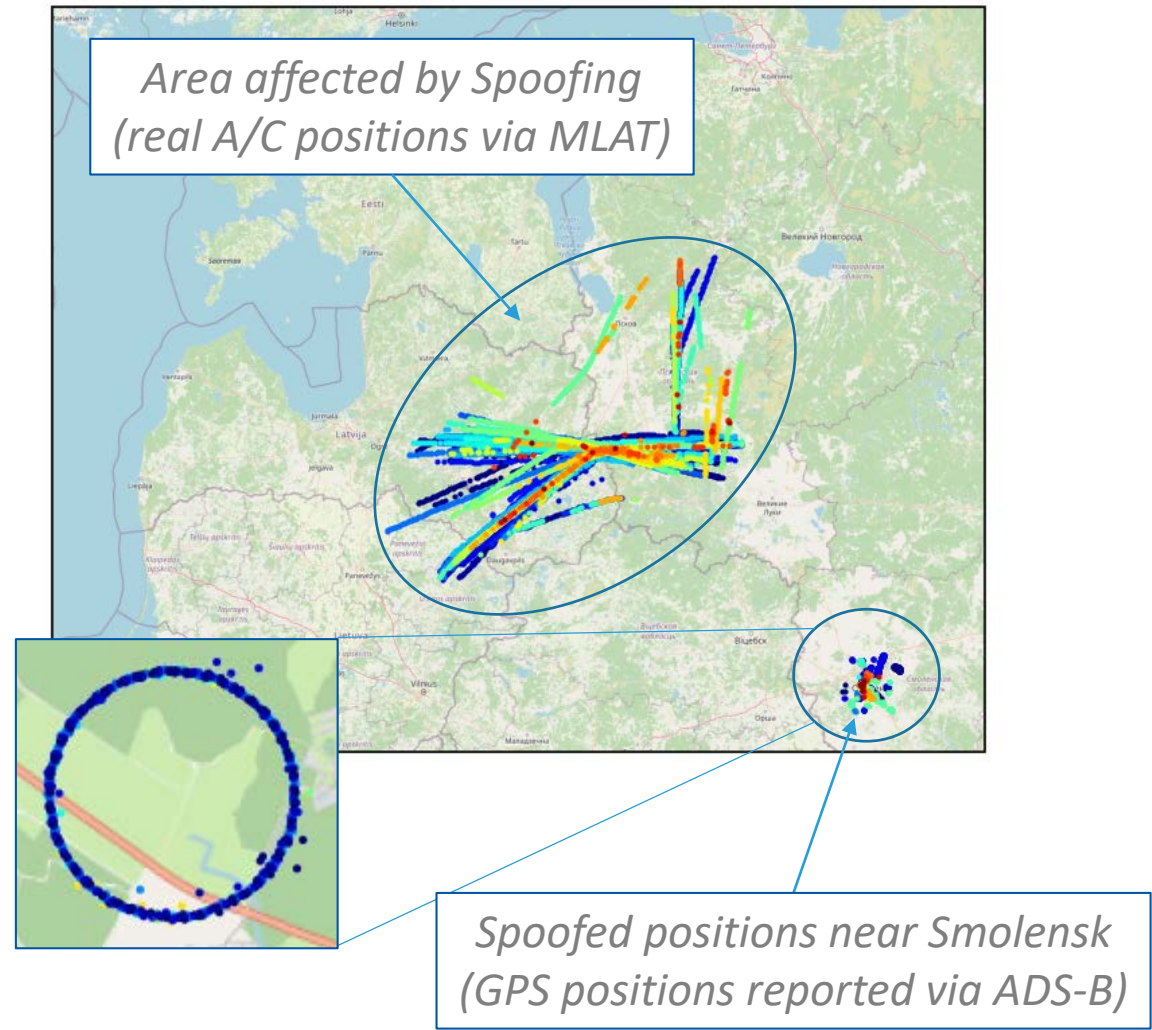
SecureTrack ADS-B data validation

- Spoofing results in false ADS-B position reports
- Immediately detected based on FDOA+TDOA
- MLAT provides real aircraft position

GPS spoofing observed since December 14, 2023

- Area affected: Pskov Oblast and Eastern Latvia
- Spoofing signals describe circular motion
- Avionics are not (yet) prepared for spoofing

GPS Spoofing (2023-12-14 - 2024-01-29)





Thank You!