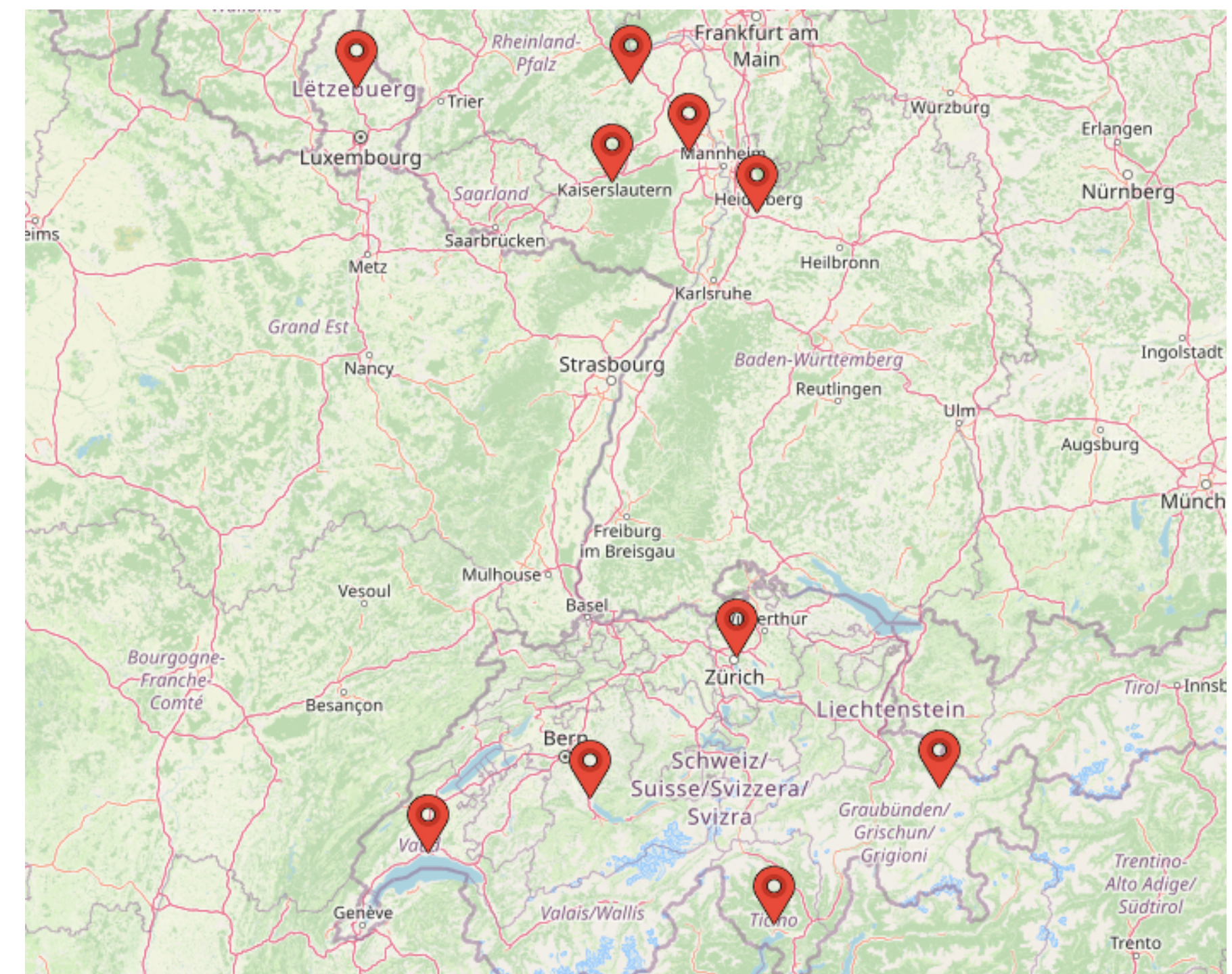


What & Why?

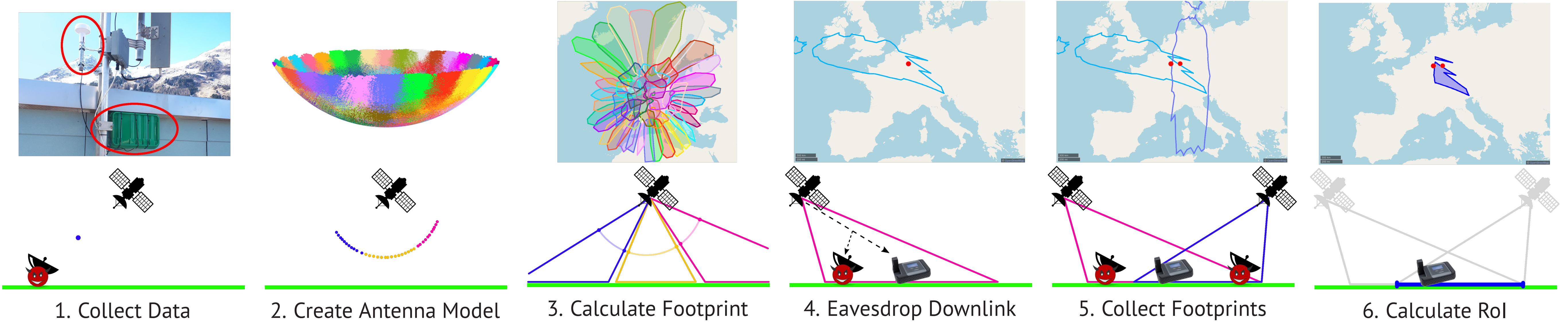
- Open Source & Low Cost
- Research Centered:
 - Easy Setup: Plug & Play, Adaptable, Reliable
 - Configurable Recordings for Measurement Campaigns
 - Assured Quality: Frame Loss, Timing & Frequency Accuracy
- Client-Server Architecture:
 - Control all Ground Stations via C&C Server
 - Local Signal Processing at Ground Stations
 - Automatic Data Upload to Server
- Distributed Measurements to Consider Satellite Spot Beams
- Time-Synchronized for Comparable Recordings

Ground Station Locations



Placement of the 10 European LeoCommon Ground Stations. Additional stations upcoming in Pune (India) and Montreal (Canada).

Research Example: RECORD Attack



The **RECORDing Only Region Determination** Attack is able to determine the region of a satellite terminal only by observing the downlink. The implementation of the attack was done with LeoCommon. With LeoCommon we collected the data (step 1) for the model. We also used LeoCommon to eavesdrop on the downlink of our terminal (step 4) at multiple locations simultaneously and collected thousands of footprints (step 5). The attack was published at Usenix Security conference 2024.

The LeoCommon network can also be used for various research areas such as large scale traffic analysis, physical layer fingerprinting or multi node based authentication.

Data & Facts

Stats:

- >500 Recordings
- >3400 Hours
- >80 GB Data

Supported LEO Systems:

- Iridium ✓
- Globalstar ⚙️
- Orbcom ⚙️
- Starlink 🤔
- OneWeb
- Qainfan
- ...

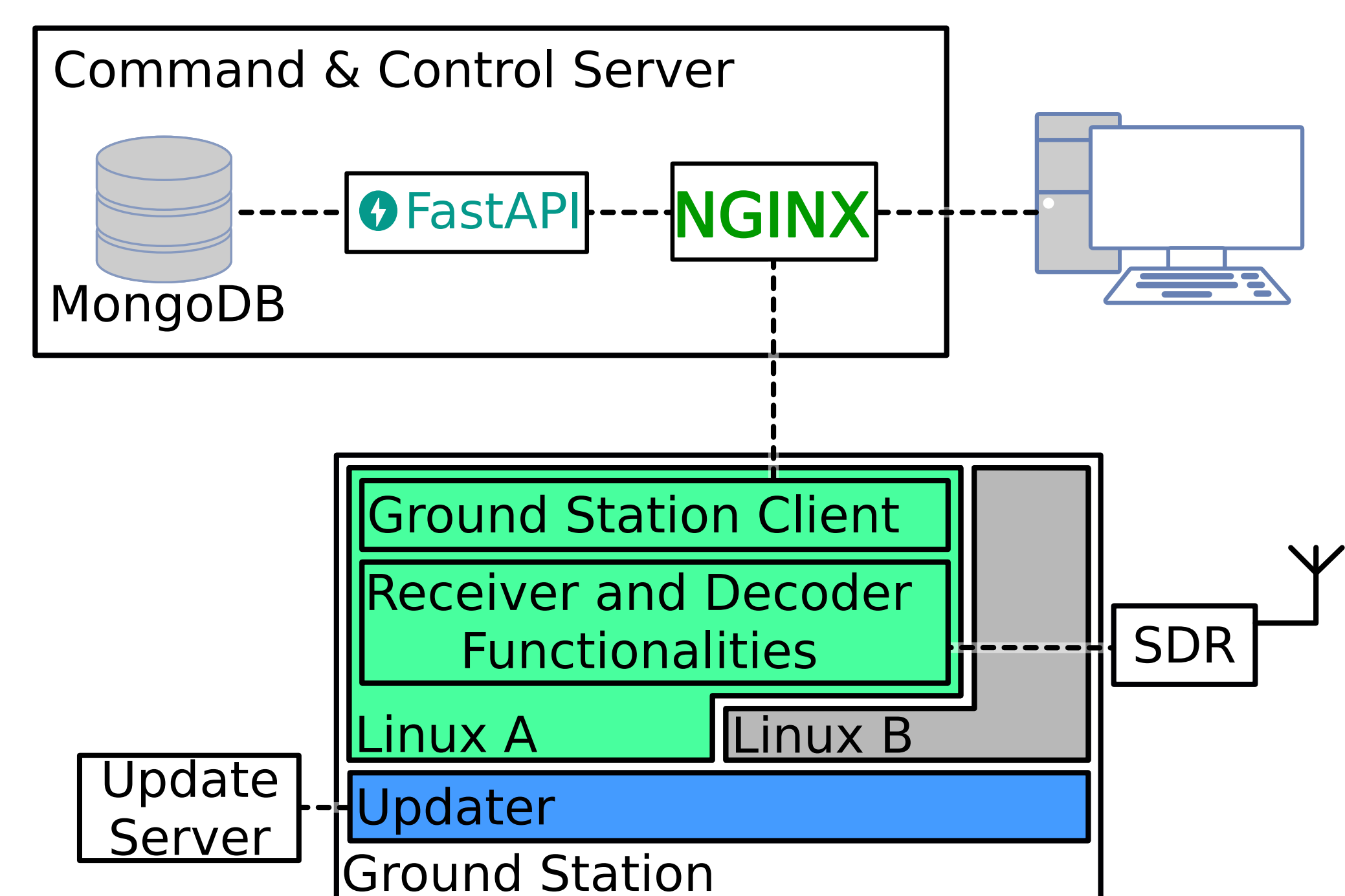
Cost:

- ≈500€ per Receiver
 - 300€ HackRF One
 - 110€ Iridium Antenna
 - 80€ Raspberry Pi 4/5

Recordings:

- Software is Open Source
- 1-2m GPS Accuracy
- 60ms Timing Accuracy
- Decoded and IQ
- Flexible Configuration

Architecture



- **Command & Control Server:** It provides the website for user interaction. One server handles all ground stations and schedules the recording tasks. Later it collects the recording results, so users can download them.
- **Ground Station:** It is designed to be very reliable with two independent operating systems and an underlying updater. Each station regularly pulls the C&C server for scheduled recording tasks, executes them, and uploads the result.

LeoCommon GitHub:



LeoCommon Paper:



Contact Eric Jedermann:

