SatNOGS

a global open source ground station network

2015-09-10 - 7th European Cubesat Symposium

Pierros Papadeas et al.

Hello

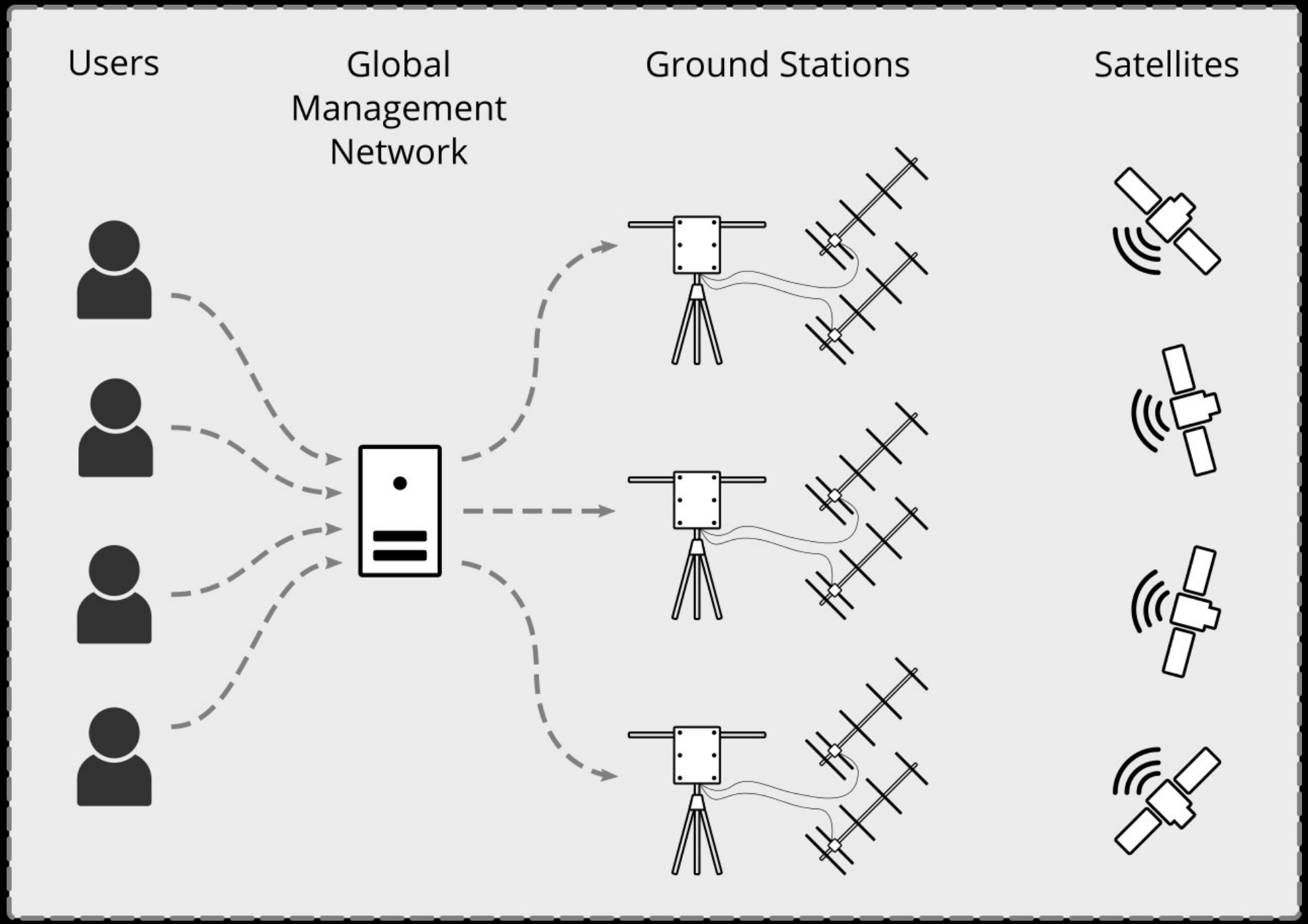
- We are a group of satellite enthusiasts, makers and developers based in various hackerspaces around the world
- Core team in Athens, Greece
- A Libre Space Foundation project
- Started February 2014

What is SatNOGS?

- A full ground station stack
- A network (server-client) model for coordinating ground station jobs
- An extensible platform that is focused on modularity
- A global open source community developing the above

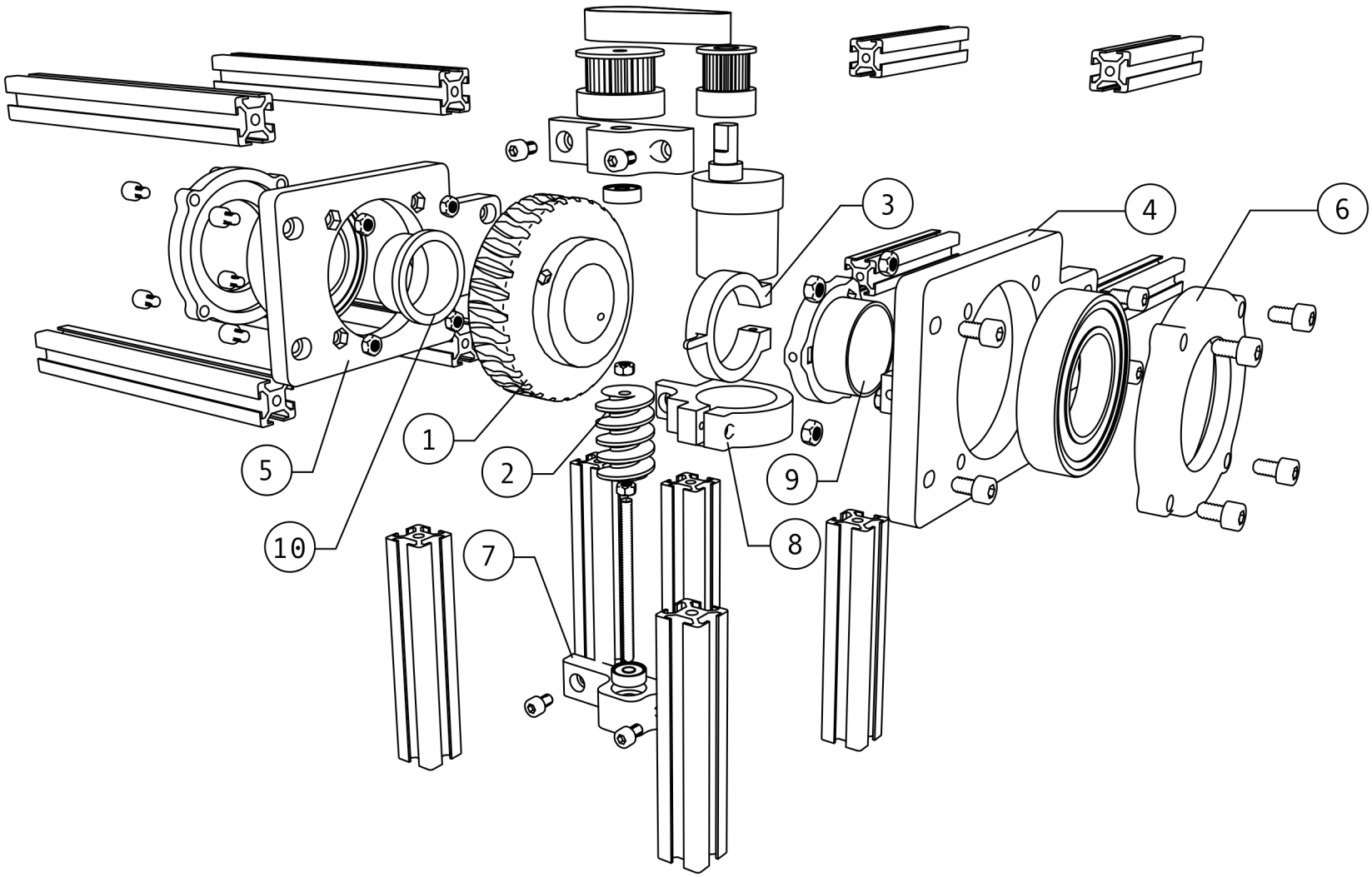
Another Ground Station (network)?

- No complete open source stack
- No community (ecosystem) around it
- Existing solutions either too expensive or too undocumented (and closed)
- Other network approaches abandoned


Users
Global
Management
Network
Ground Stations
Satellites

Rotator

- Fully open source and built from readily available materials
- 3 iterations so far
- 2 configurations available (X-Y or Alt/Az)
- Specifications
  - 20 deg/sec
  - Holding torque 64Nm, Rated torque ~2Nm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7th ECS
Liege - 2015

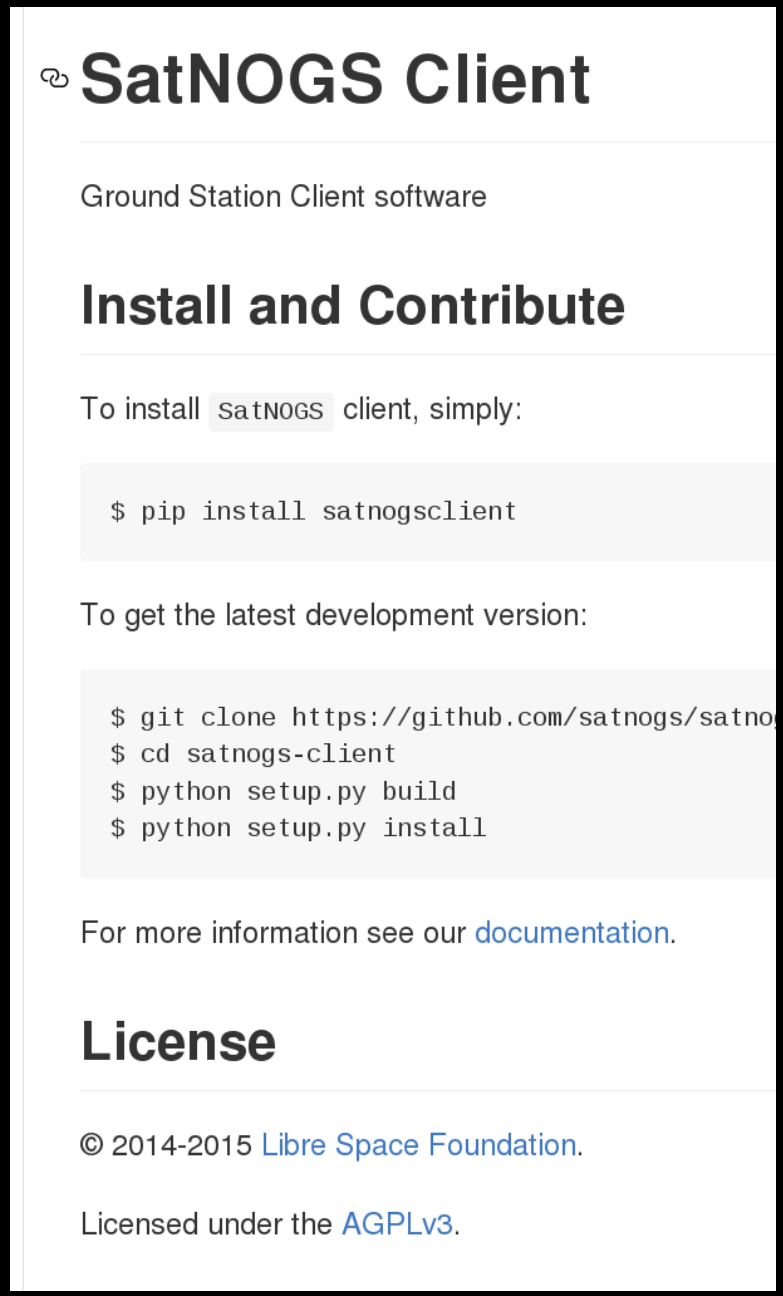
SatNOGS

Focus on modularity

- Rotator+RF controlled through HAMLIB
  - RigCtl & RotCtl
- Replace any part of the stack with COTS equipment
  - Antennas, LNAs, rig (radios), gnuradio supported SDRs, rotators, controllers

SatNOGS client

- Two modes of operation:
  - Connected to Network
  - Single operator mode (local or remote)
- Python scheduler for polling and executing jobs
- Web interface for monitoring
- Works with most SDRs (gnuradio) and also facilitates pol-switching, antenna selection, decoding, and raw IQ recording
- Can run on embedded platfroms, server or PC



SatNOGS Client

Ground Station Client software

Install and Contribute

To install `SatNOGS` client, simply:

```
$ pip install satnogsclient
```

To get the latest development version:

```
$ git clone https://github.com/satnogs/satno
$ cd satnogs-client
$ python setup.py build
$ python setup.py install
```

For more information see our documentation.

License

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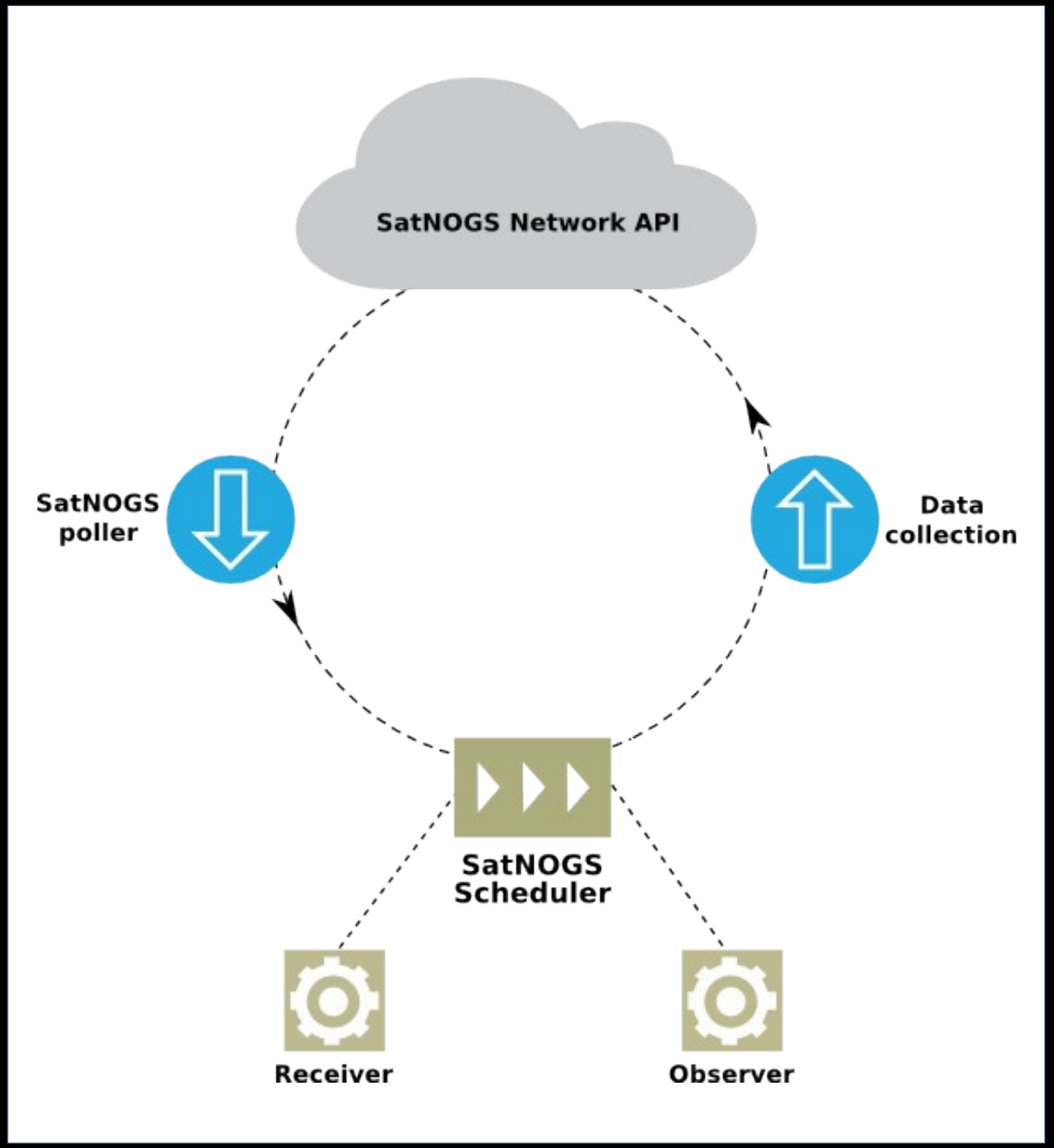
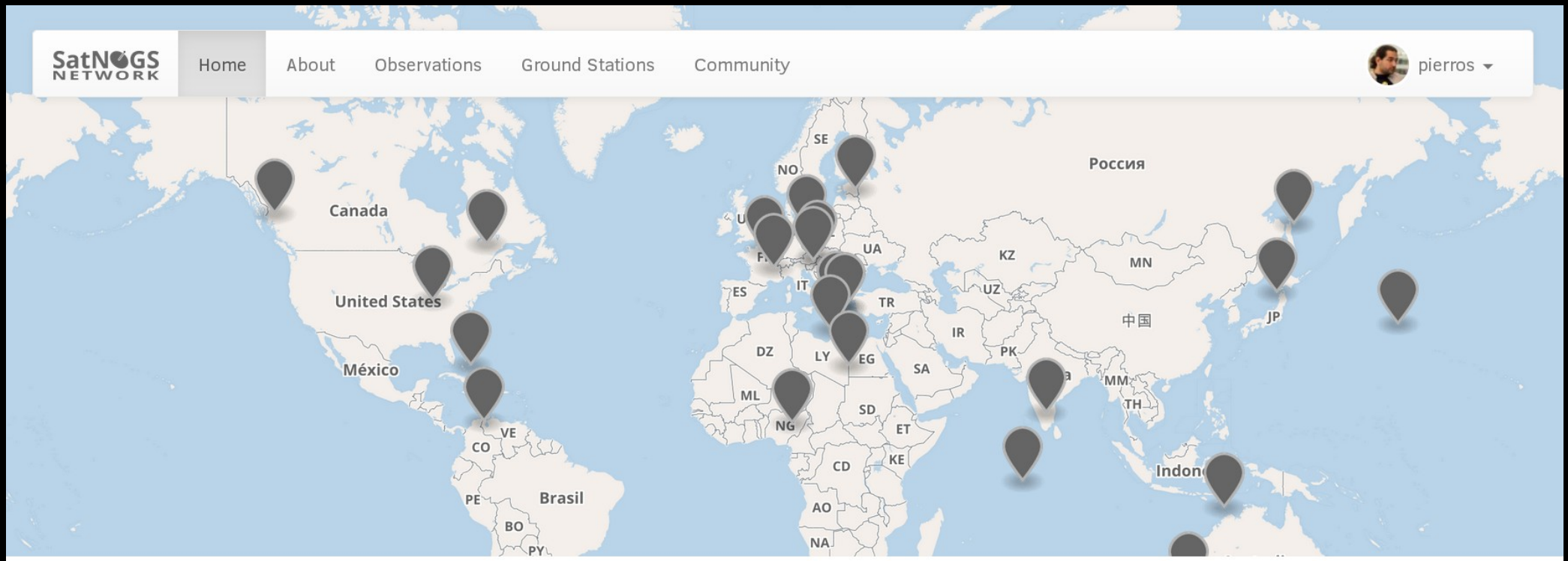

SatNOGS Network API
SatNOGS poller
Data collection
SatNOGS Scheduler
Receiver
Observer

SatNOGS NETWORK

Home | About | Observations | Ground Stations | Community | pierros



Featured Ground Station

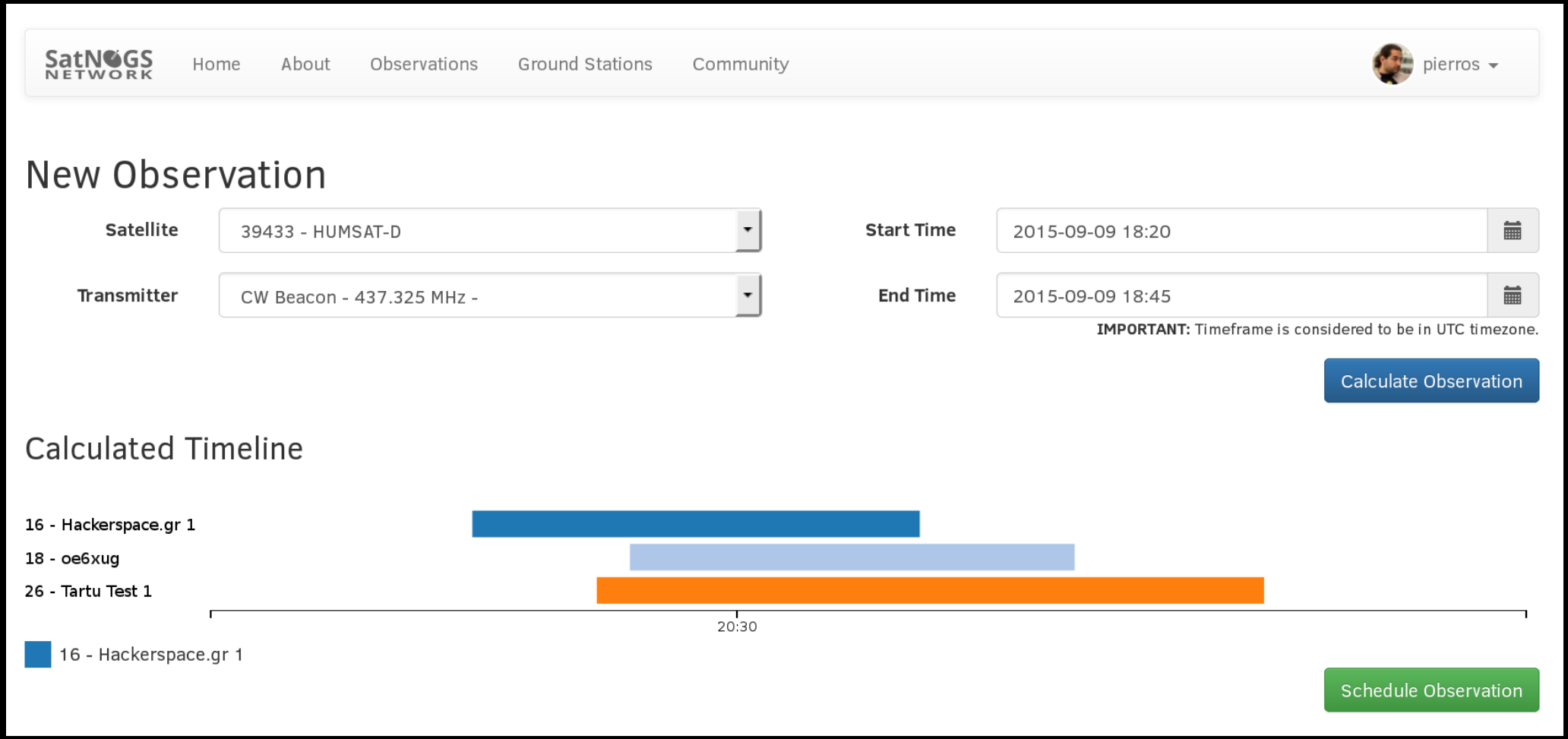
Hackerspace.gr 1

Owner	John Giannelos
Coordinates	23.73°, 38.02°
Antennas	UHF yagi

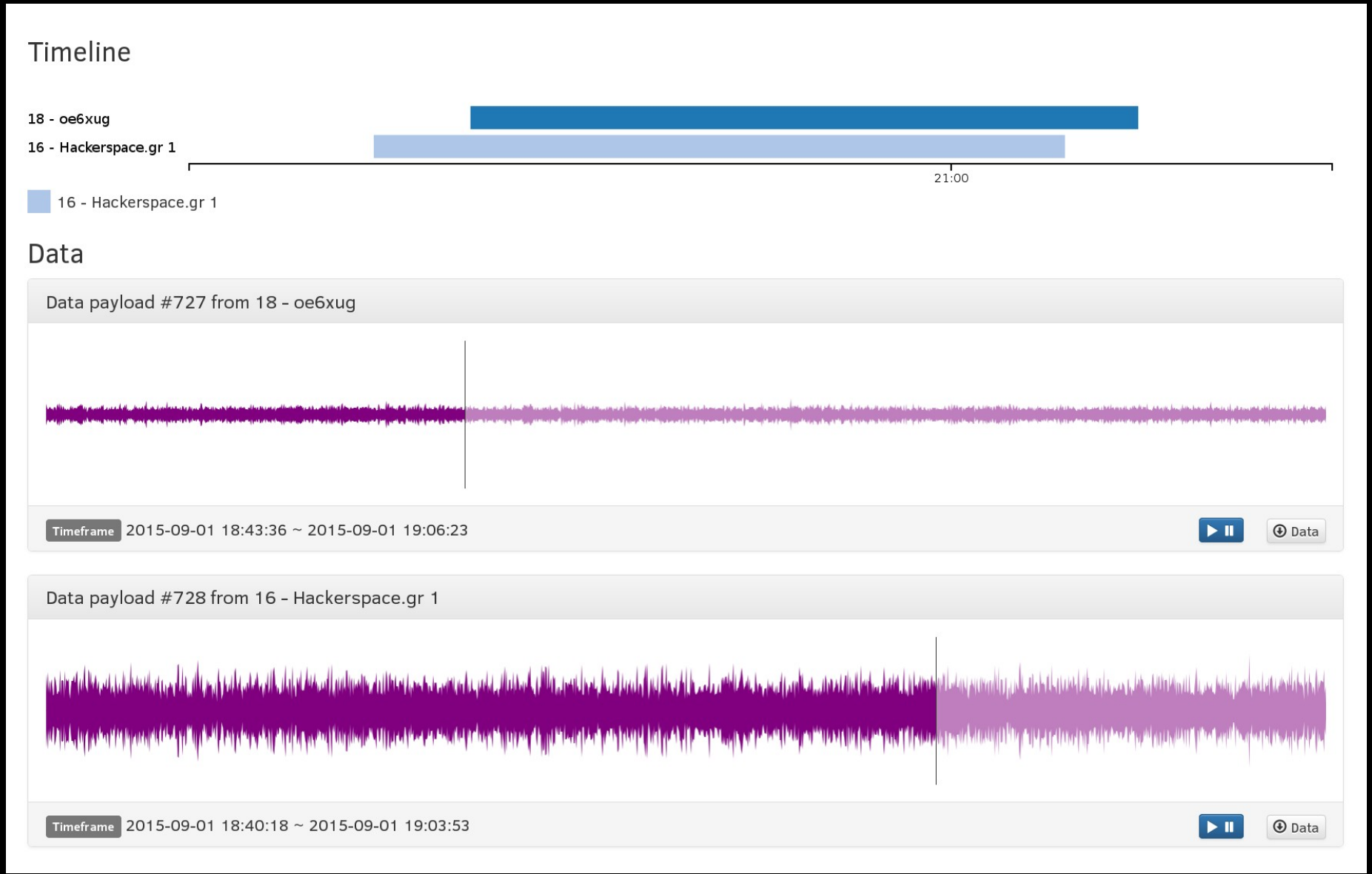
Latest Observations | Scheduled Observations

ID	Satellite	Frequency	Encoding	Timeframe	Observer
221	YUBILEINY (RS-30)	435.315 MHz	-	2015-09-01 20:39:00 2015-09-01 21:04:00	Robert OE6RKE
220	YUBILEINY (RS-30)	435.315 MHz	-	2015-09-01 18:34:00 2015-09-01 19:13:00	Pierros Papadeas
219	FUNCUBE-1 (AO-73)	145.815 MHz	-	2015-09-01 17:58:00 2015-09-01 18:15:00	Pierros Papadeas
218	SWISSCUBE	437.505 MHz	-	2015-09-01 11:57:00 2015-09-01 12:25:00	Pierros Papadeas
215	ISS (ZARYA)	145.800 MHz	FM	2015-09-01 11:37:00	Robert OE6RKE

Scheduling a job



Results are in



network.satnogs.org

- Python/Django based service
- API for client scheduling and auto-provisioning
- Pyephem for calculations and custom scheduling
- Check network-dev.satnogs.org

SatNOGS DB | Home | About | FAQ | Community | Sign Up | Log In

Filter by Name or NORAD Cat ID

65 74 29

39087 - AAUSAT3

40054 - AISAT

CW Beacon

35933 - BEESAT

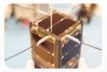
CW Beacon | GMSK 4k8 9k6

39136 - BEESAT-2

CW Beacon

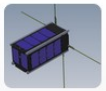
40014 - BUGSAT-1 (TITA)

AX.25 beacon



39153 - CUBEBUG-1 (CAPITAN BETO)

AFSK 1200



39440 - CUBEBUG-2 (LO-74)

27848 - CUBESAT XI-IV (CO-57)

Mode U CW Be... | Mode U AFSK T...

28895 - CUBESAT XI-V (CO-58)

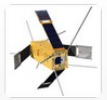
Mode U BEACON | Mode U TLM

27844 - CUTE-1 (CO-55)

Mode U Beacon | Mode U TLM

32785 - CUTE-1.7+APD II (CO-65)

Mode U TLM 1 | Mode U TLM 2
Mode L/U Digip...

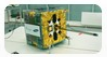


32789 - DELFI-C3 (DO-64)

Mode V BPSK T... | Mode V BPSK T...

40719 - DEORBITSAIL

40021 - DUCHIFAT-1



40071 - DX1

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SatNOGS DB

- Crowdsourced transmitter information
- Python/Django based open source app

db.satnogs.org

SatNOGS NETWORK

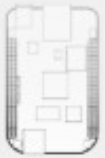
No Network Connectivity

Commercial Software

SatNOGS CLIENT

Gpredict & Gqrx

Raspberry Pi

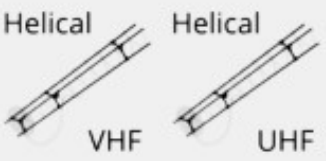


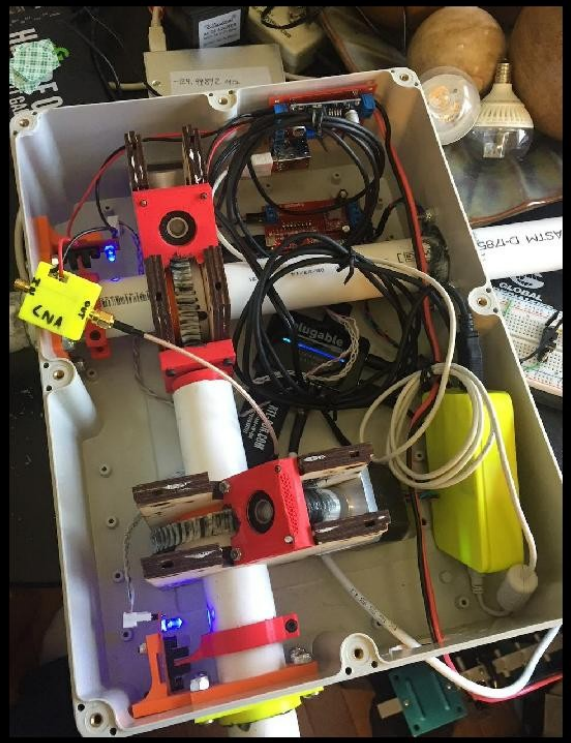
Beaglebone Black

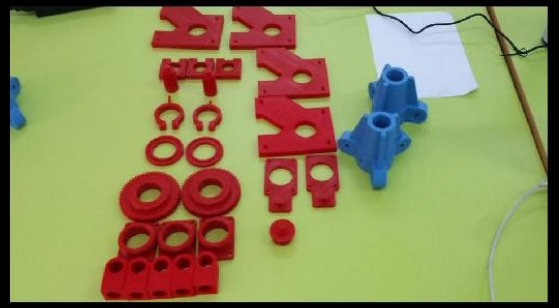
Odroid U3

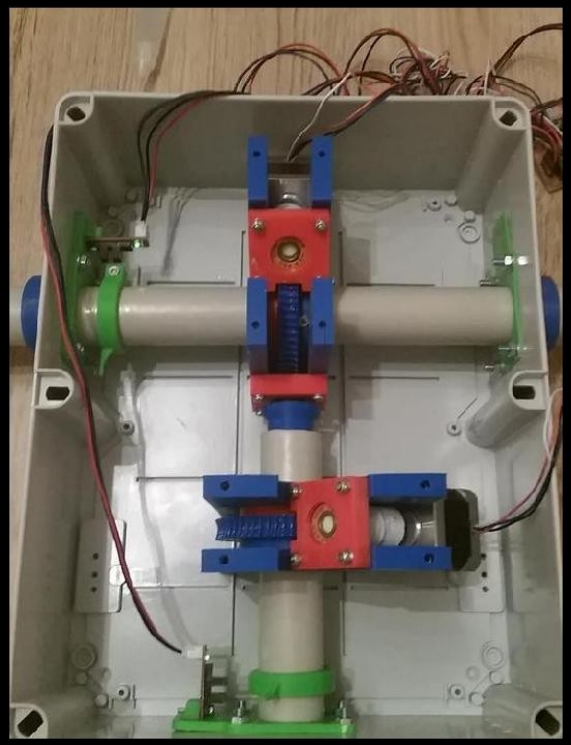
Commerical Rotator

SatNOGS v2 Ground Station




LNA

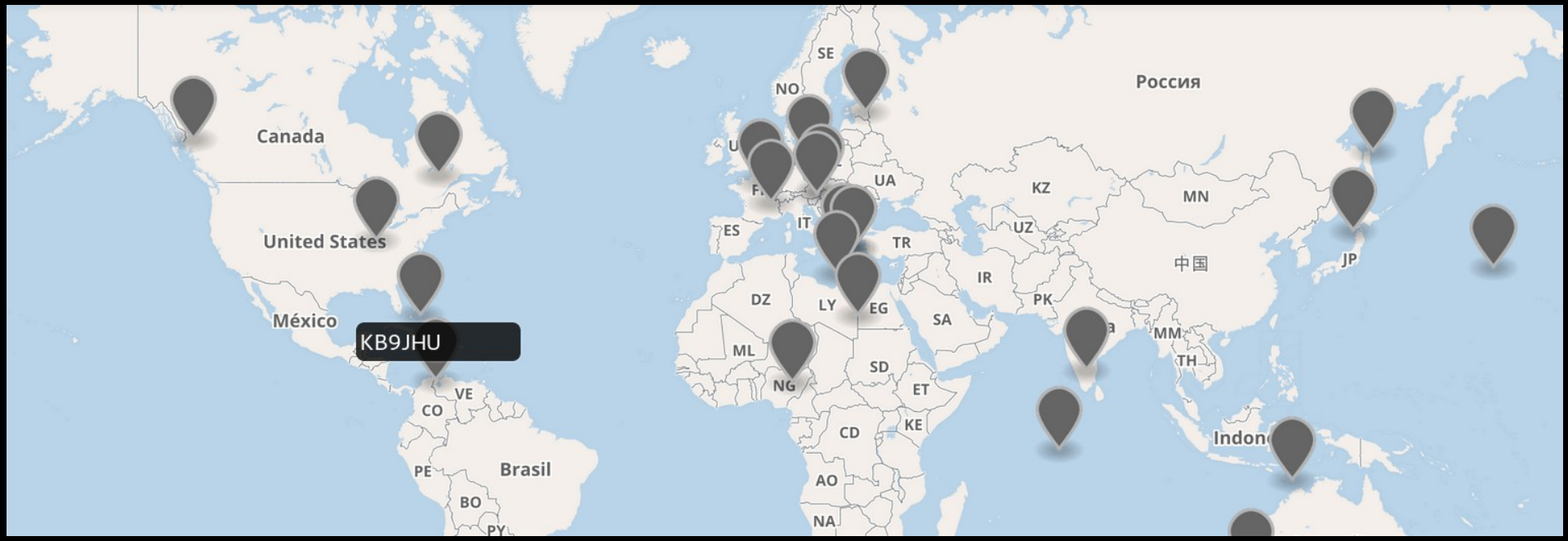




Future Work

- Focus on UX for TX operations
- Move to higher bands (S, Ku, C)
- Achieve continuous tracking

More stations!



Join the network today! Check satnogs.org for details.

Thanks!

- Website: satnogs.org
- Email: info@satnogs.org
- Forum: community.satnogs.org
- Code: github.com/satnogs
- Network: network.satnogs.org
- DB: db.satnogs.org