Hams, Hackers, and Makers

Open Source Ground Stations for Fun, Education, and Inspiration

Daniel J. White, Ph.D.  ADØCQ
Electrical and Computer Engineering
dan.white@valpo.edu
valpo.edu/college-of-engineering

© 2016 Valparaiso University. Published by The Aerospace Corporation with permission.
Hams

Radio Comms

... in space

... have a long history

- Homebrew
- Experimental
- Sharing
Hackers

Computing

... have a long history

- Tools
- Curious
- Open source
Makers

3D printing
laser cutters

... have a long history

- DIY culture
- Experimental
- Collaborative
These groups are more similar than different.
By our powers combined, ...
Hackerspace.gr → SatNOGS.org
Satellite Networked Open Ground Stations

2014 People's Choice Finalist

VIRTUAL GROUND STATION APP – GLOBAL CROWDSOURCING OF CUBESATS
2014 Challenge
2014 Hackaday Prize ($200k)

SatNOGS

satnogs.org

librespacefoundation.org

LIBRE SPACE FOUNDATION

Let's claim space, the libre way!
Problem

CubeSat-class downlinks
LEO ground coverage
GS coordination
Data collection
Approach

DIY antenna pointing
RTL-SDR type receiver
Raspberry Pi computing
Network coordination
Goals

Autonomous RX
Low cost → more stations

Independent GS owners, coordinated observation

Fully open-source
+ data publically available
Modular options:

- Commercial Software
- Beaglebone Black
- Commercial Rotator
- Odroid U3
- SatNOGS v2 Ground Station
- Yagi
- Yagi
- UHF
- VHF
- Helical
- VHF
- UHF
- Helical
- Yagi
- UHF
Users schedule an Observation of a Satellite/TX Network creates Jobs for each visible GS, who upload recordings.
db.satnogs.org

Crowd-sourced database of satellite information
→ machine-readable API ←
ThumbSat.com

Same GS needs:
- Low-cost, wide deployment
- STEM-focused
Benefits:

- LEO downlink volume
- Engage + train next generation
How can S/C operators work with distributed G/S networks?

Questions?