ESAT,
The Hands-On Training Satellite

Ignacio Barrios Tascón
info@theiaspace.com
www.theiaspace.com

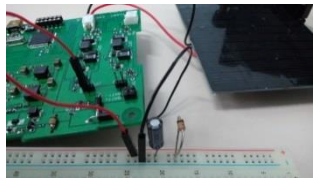
Contents

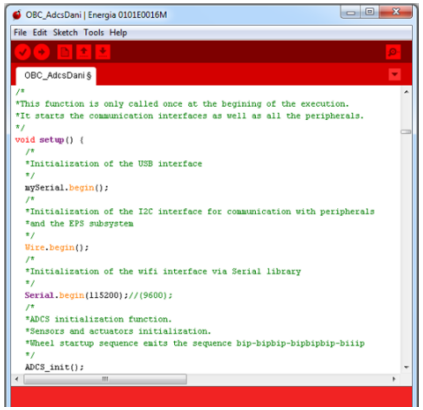
- Theia Space
- ESAT Objectives
- ESAT Subsystems
- ESAT EGSE and MCS
- ESAT Data Management
- Potential ESAT users

Theia Space

ESAT Objectives

- Teach space systems engineering, **from design to operations.**
- Teach how the different subsystems and architectures work and interact with each other.
- Teach how the integration and validation tests are performed.
- Possibility to work with the subsystems **stand-alone or integrated**.
- Easy to use and robust.
- **Community oriented.**
- Easy to build on it:
  - **Open Source SW**
  - Easy programming interface
  - **Bus Interface**





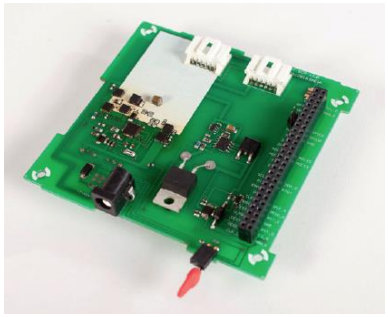
ESAT Subsystems (I)

EPS

- 2 solar panels
- 2 solar panel regulators: MPPT/DET
- Voltage/current telemetry
- 5V, 3.3V DC/DC converters and switches
- Battery management module with overcurrent/overvoltage/undervoltage protection
- Integrated battery charger
- **Fully programmable MCU** (preprogrammed with open source base software)

OBC

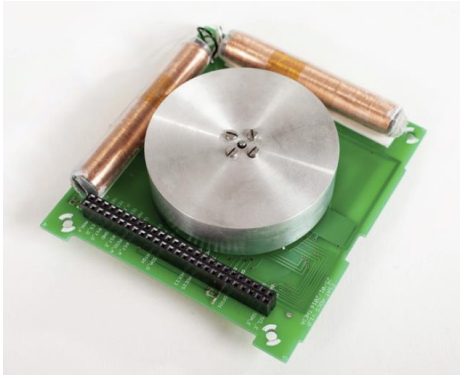
- **Fully programmable MCU** (preprogrammed with open source base software)
- Micro-SD card
- Real Time clock
- Wireless communication via **WiFi module**



ESAT Subsystems (II)

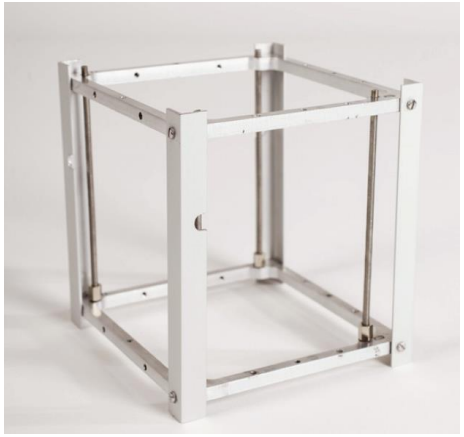
ADCS

- One reaction wheel
- Two magnetorquers
- One IMU with 9 degrees of freedom (3 accelerations, 3 gyros, 3 magnetic axis)
- 4 sun sensors
- Wheel tachometer
- **Customizable control algorithms**



STR

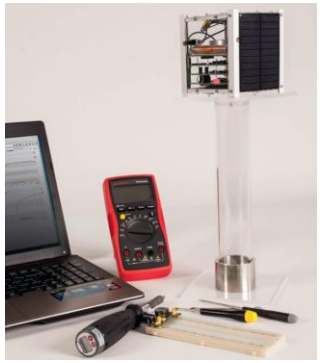
- 2 Aluminium frames
- 4 Aluminium rails
- 4 methacrylate side panels
- 2 Solar panels
- Spacers between the electronic boards



ESAT EGSE and MCS

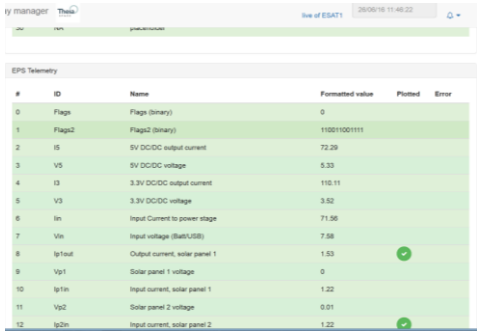
EGSE

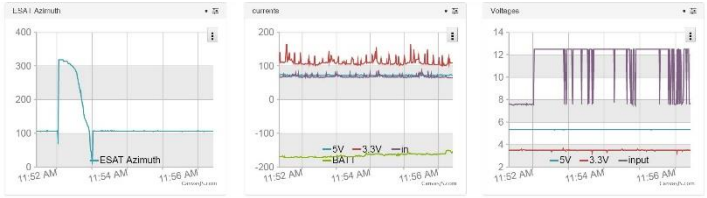
- Magnets to provide a useful magnetic field
- Turning table
- Sun simulator



MCS

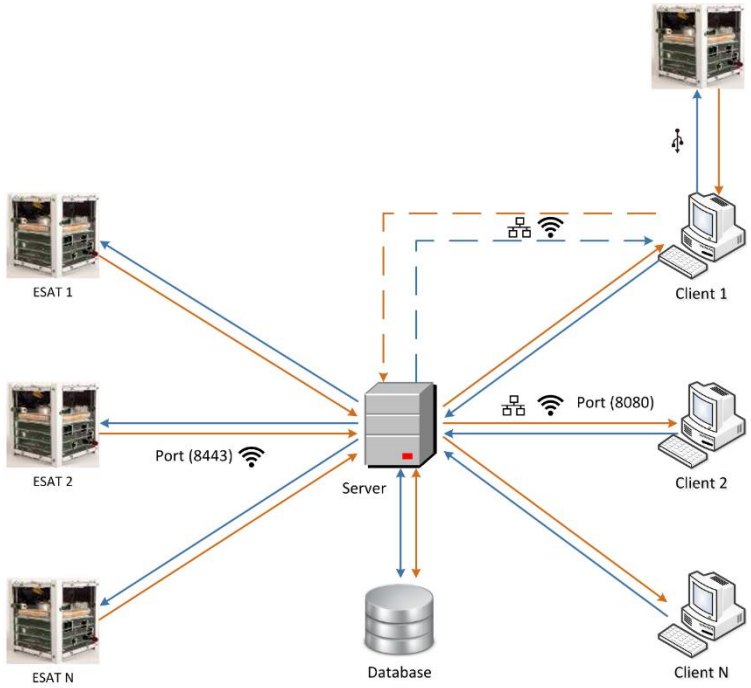
- Telemetry visualization:
  - Raw
  - Plots
  - Subsystems displays
  - Replay
- Allow to send TC with sanity checks
- TM/TC reports (csv format) for postprocessing.





ESAT Data Management

- A central server handles the TM sent by all the satellites and broadcasts it to the corresponding connected users (clients).
- The server forwards commands from the users to the corresponding satellites.
- The client interface helps the user interpreting the TM and sending TCs.
- **Open-source code.**



Potential Users

- STEM education
- Universities
  - Space Vehicles Design courses.
  - New space programs.
  - New students/teachers in the team.
  - Long projects where students do not get to see all the phases.
  - Low funding cases.
- Space Companies
  - Staff training.
  - Different kinds of courses.
- Student competitions
- Reach out activities
- Fast prototyping

Thank you!

Come visit our booth!

Ignacio Barrios Tascón

info@theiaspace.com

www.theiaspace.com