

#boscoverysat

#tlpinnova



A satellite with homespun electronics

July 2016

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Achievements

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Current I+D process



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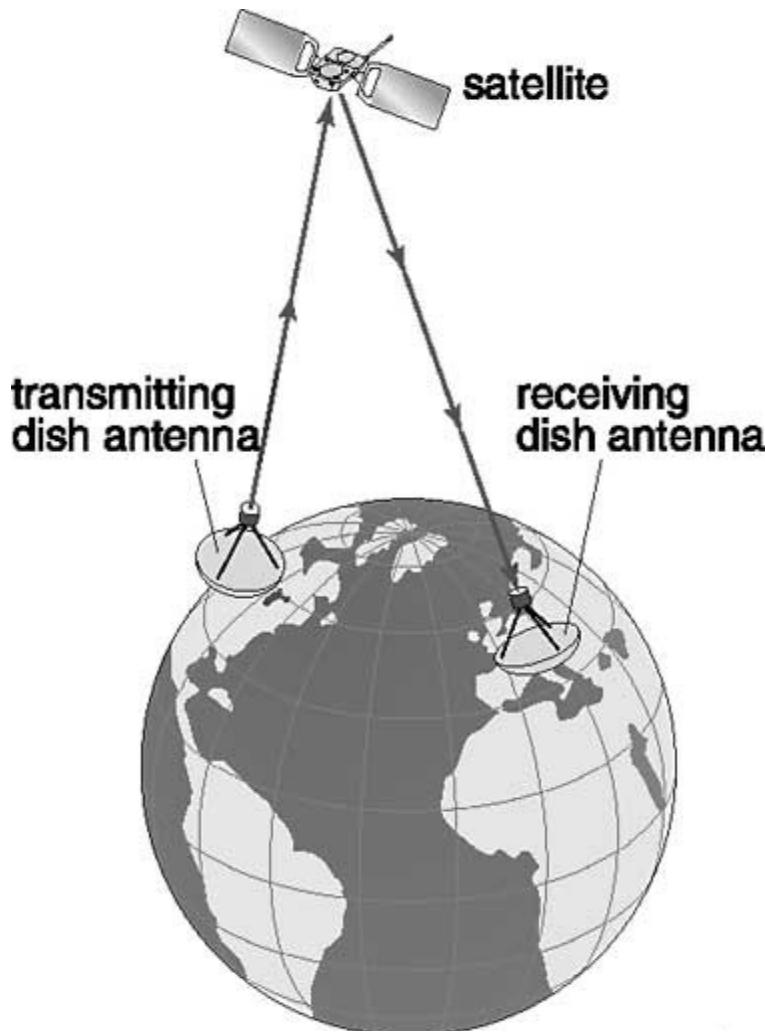
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PROBLEM



Classic Satellite Communications usual problems

High costs
Unaccessible
Private owners
Low bandwidth
Maintenance



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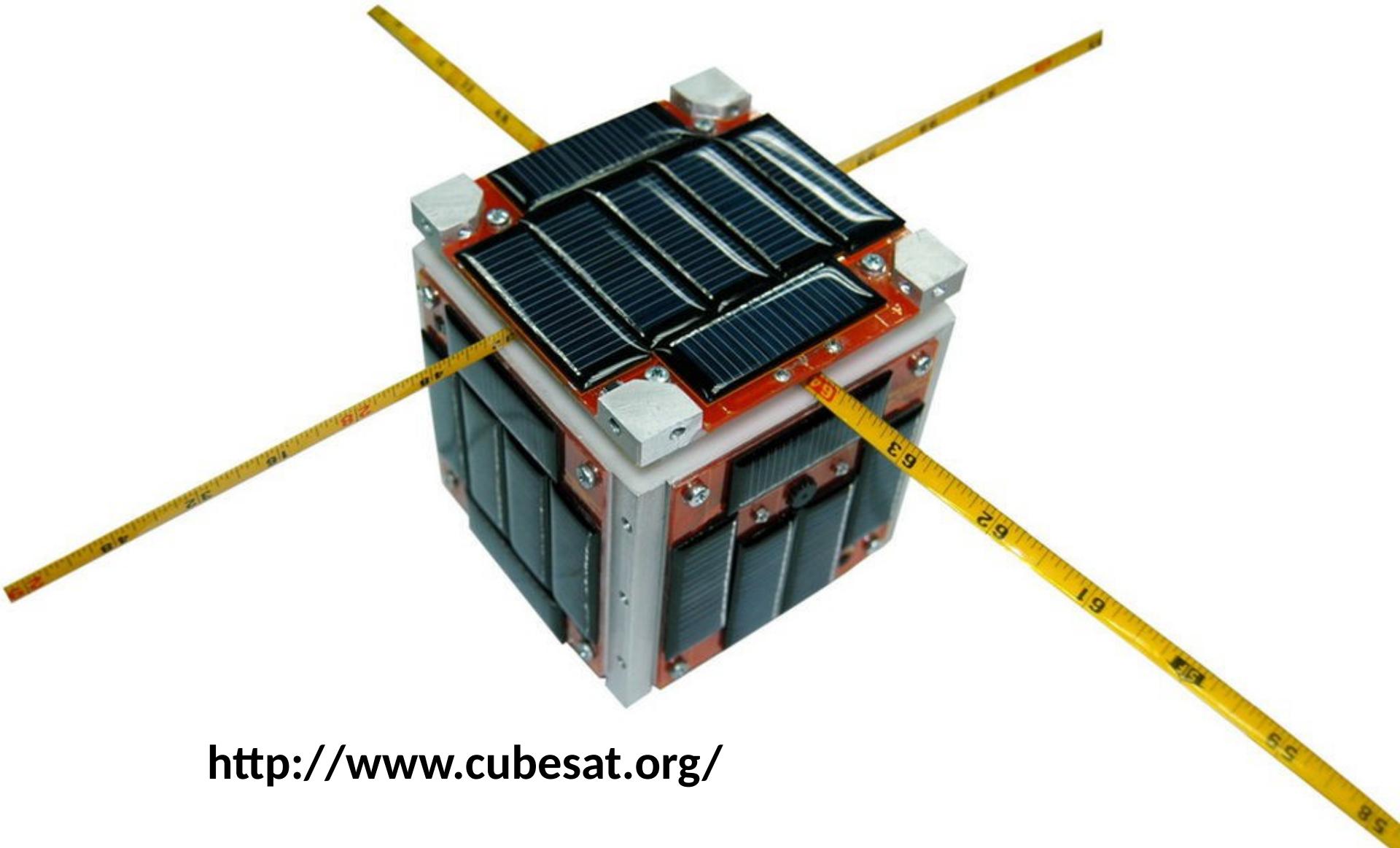
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SOLUTION

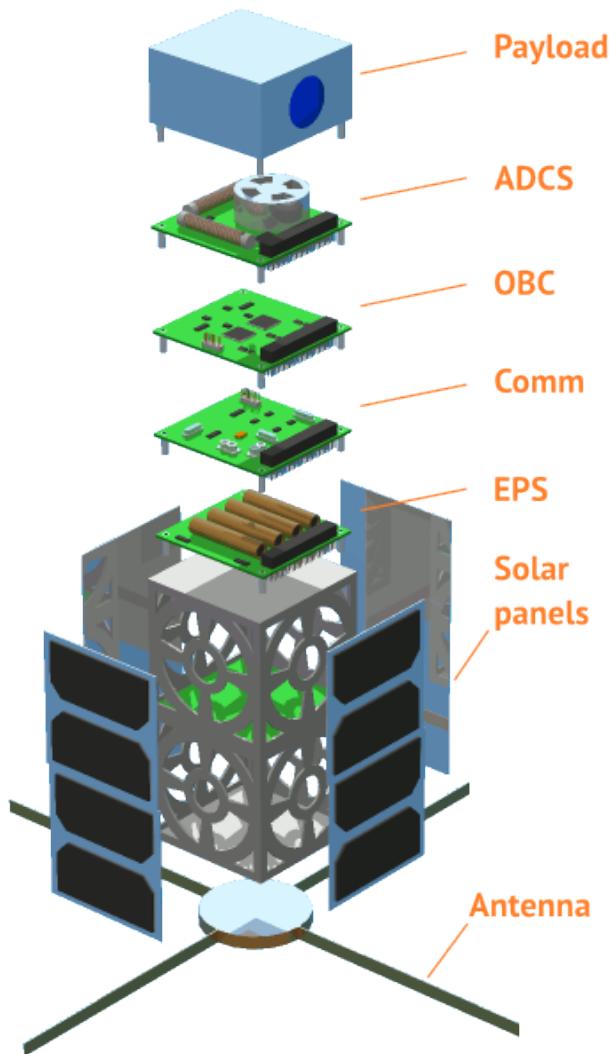


<http://www.cubesat.org/>



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COLEGIO SAN JUAN BOSCO LA CUESTA

SOLUTION



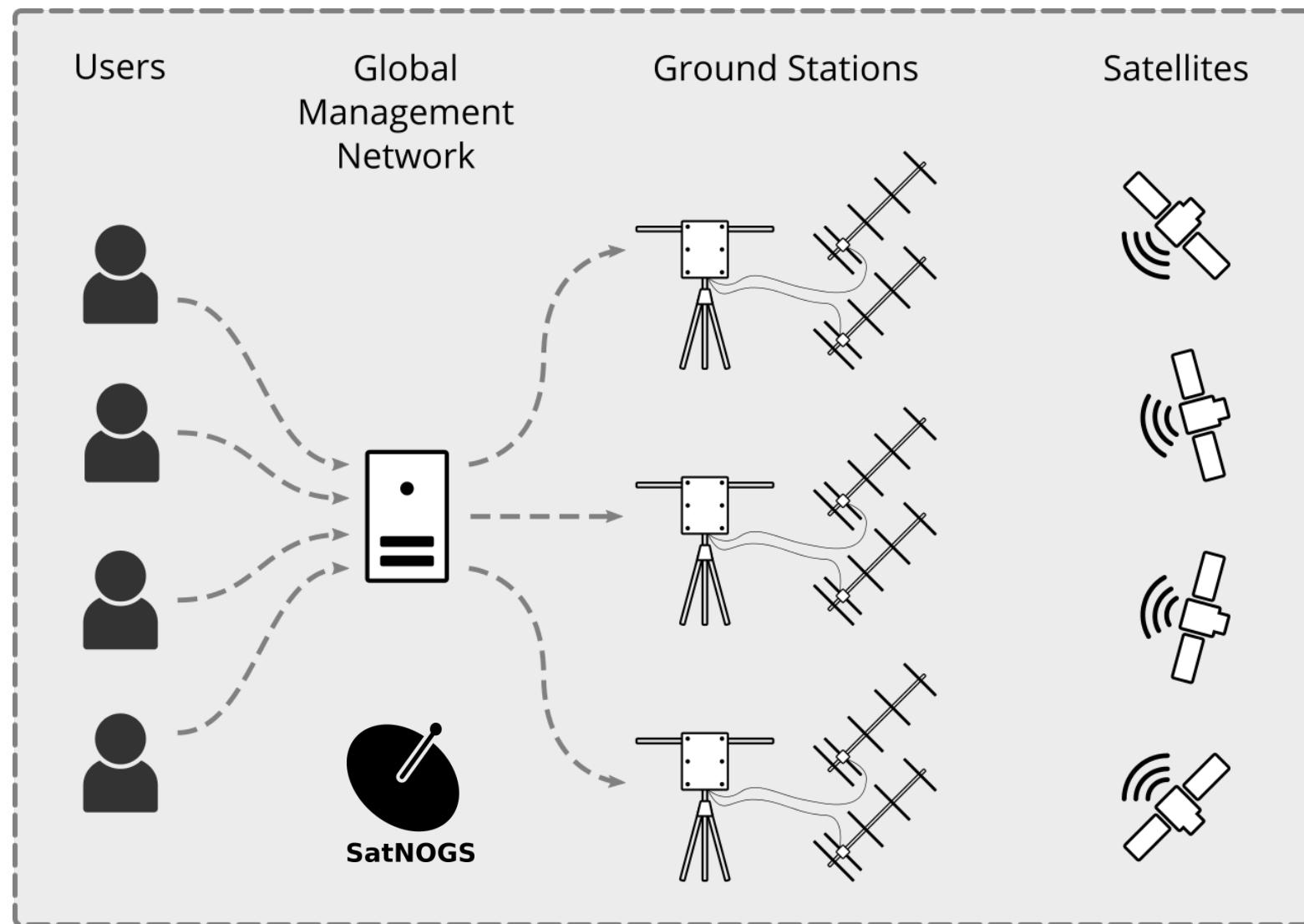
SOLUTION

<https://satnogs.org/>



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SOLUTION



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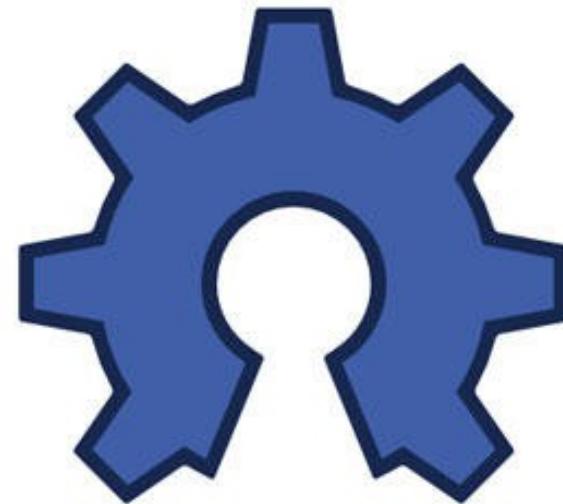
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PROJECT PHILOSOPHY



open source



open hardware



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TEAM



**Eduardo González
Hernández**



Héctor Melián Plasencia



Luis Herrera Medranda



**Ernesto Padrón
Velázquez**



**Goyo Regalado
Pacheco**



Dailos Díaz Lara



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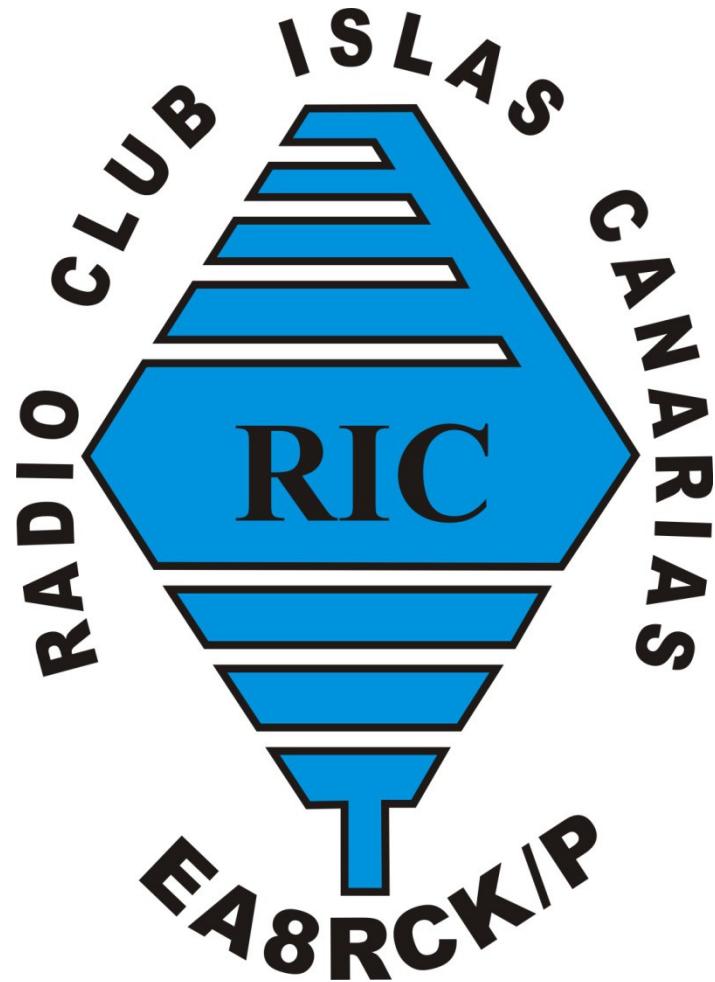
TEAM



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LA CUESTA



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COLEGIO SAN JUAN BOSCO LA CUESTA



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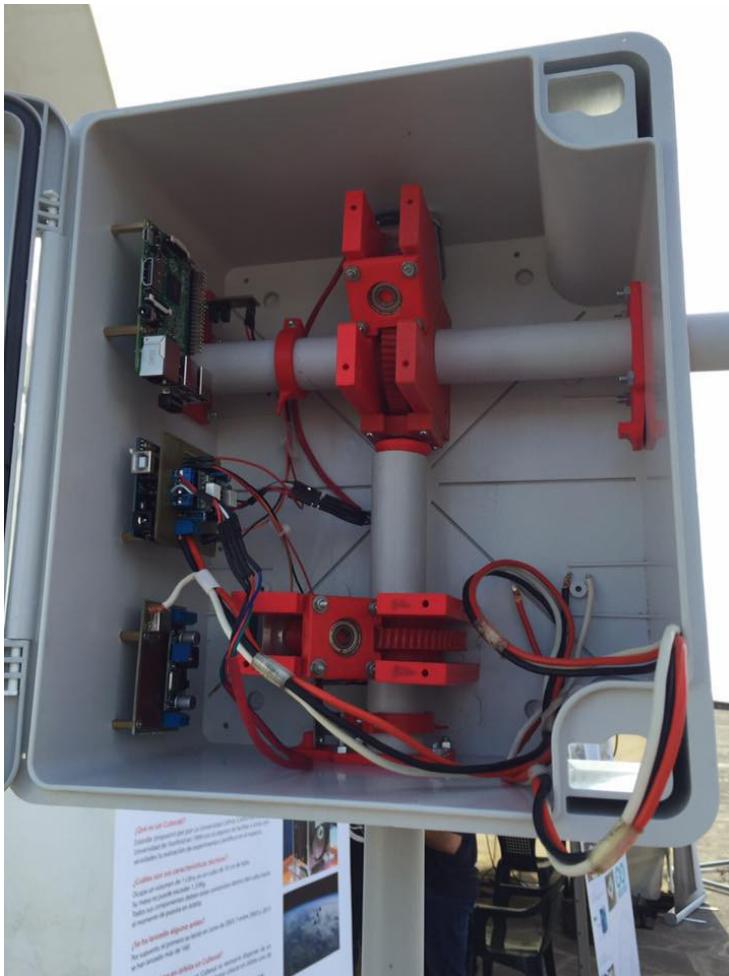
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ACHIEVEMENTS

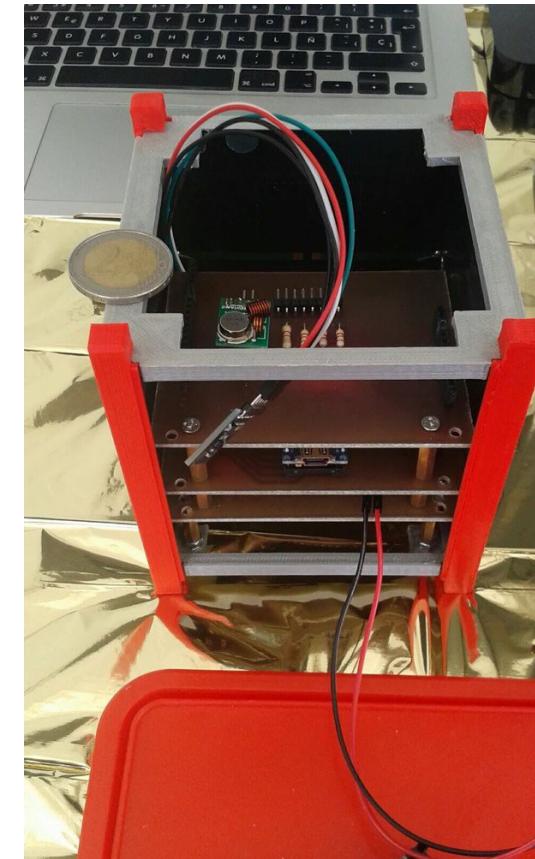
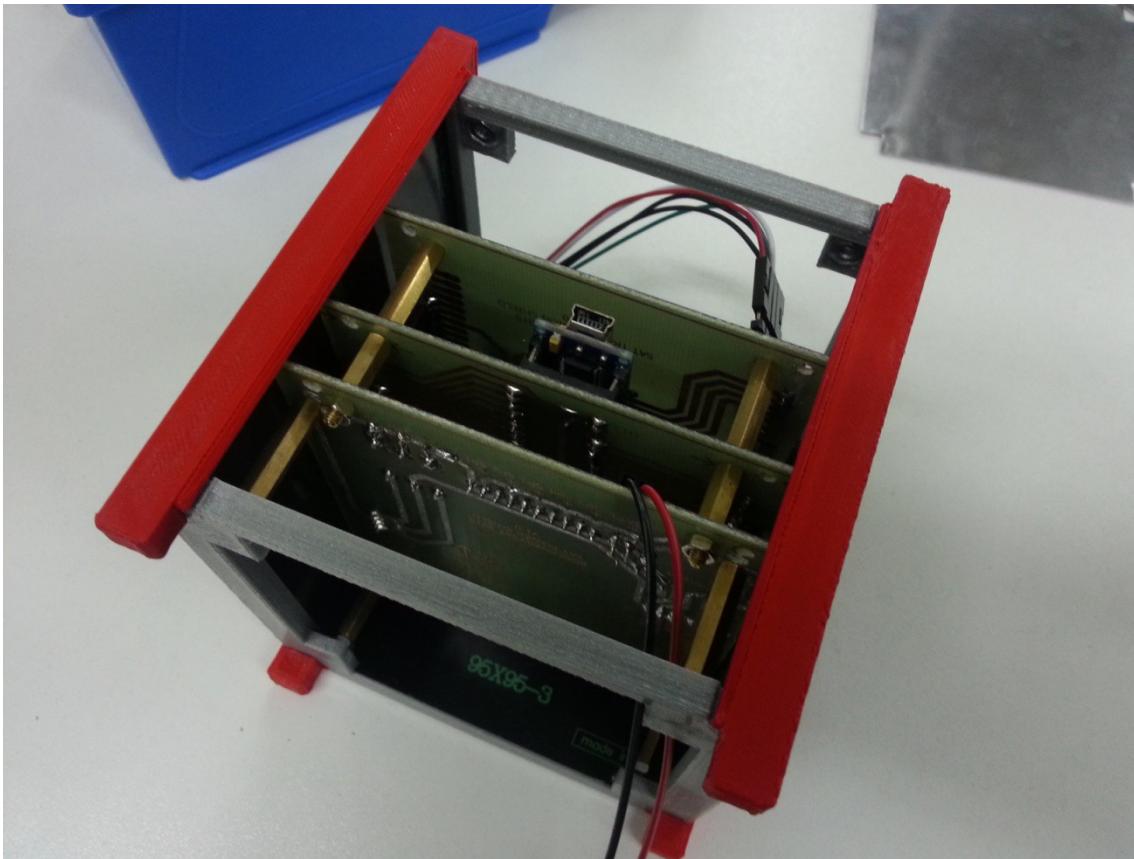
RADIO STATION (SATELLITE TRACKER)



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ACHIEVEMENTS

SATELLITE



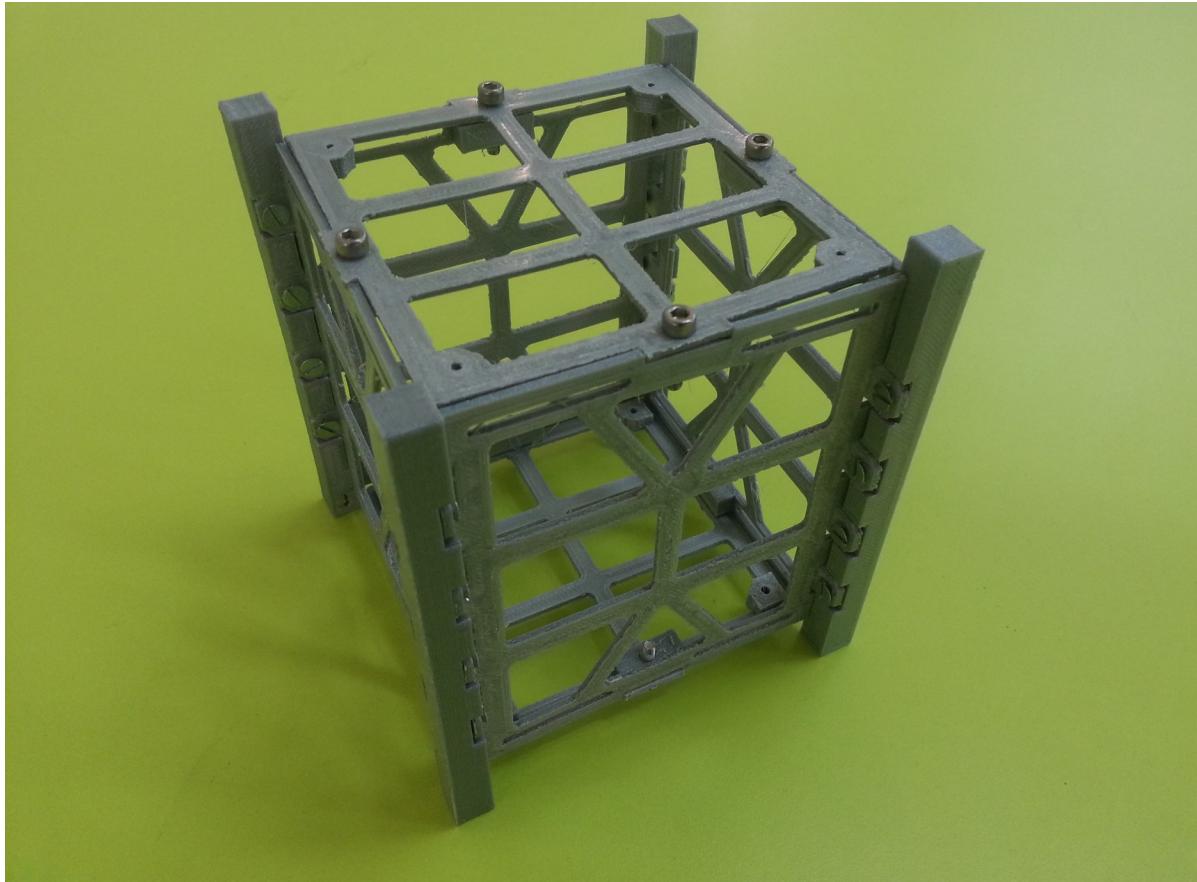
MARK I - ALPHA 1



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SATELLITE



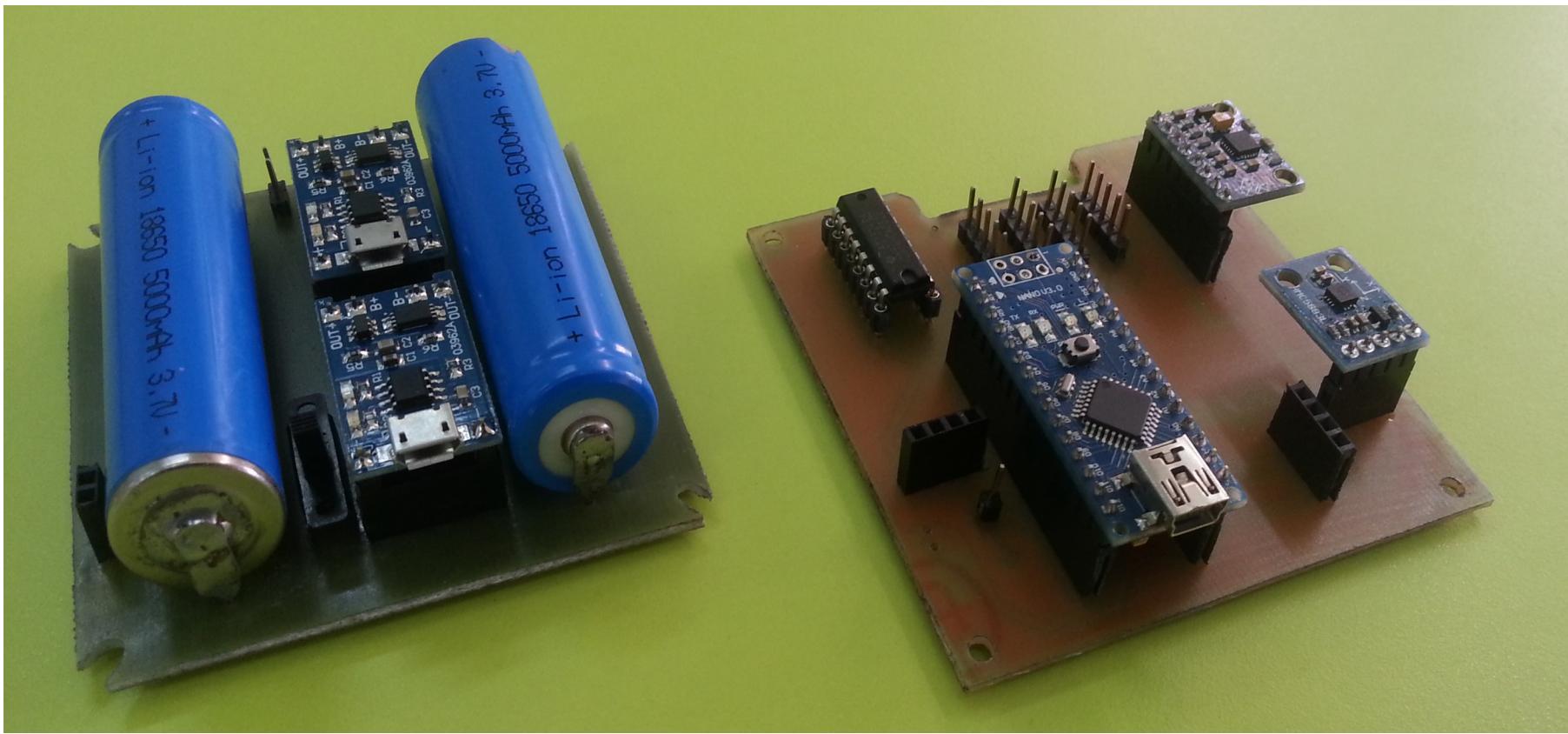
MARK I - ALPHA 2



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SATELLITE



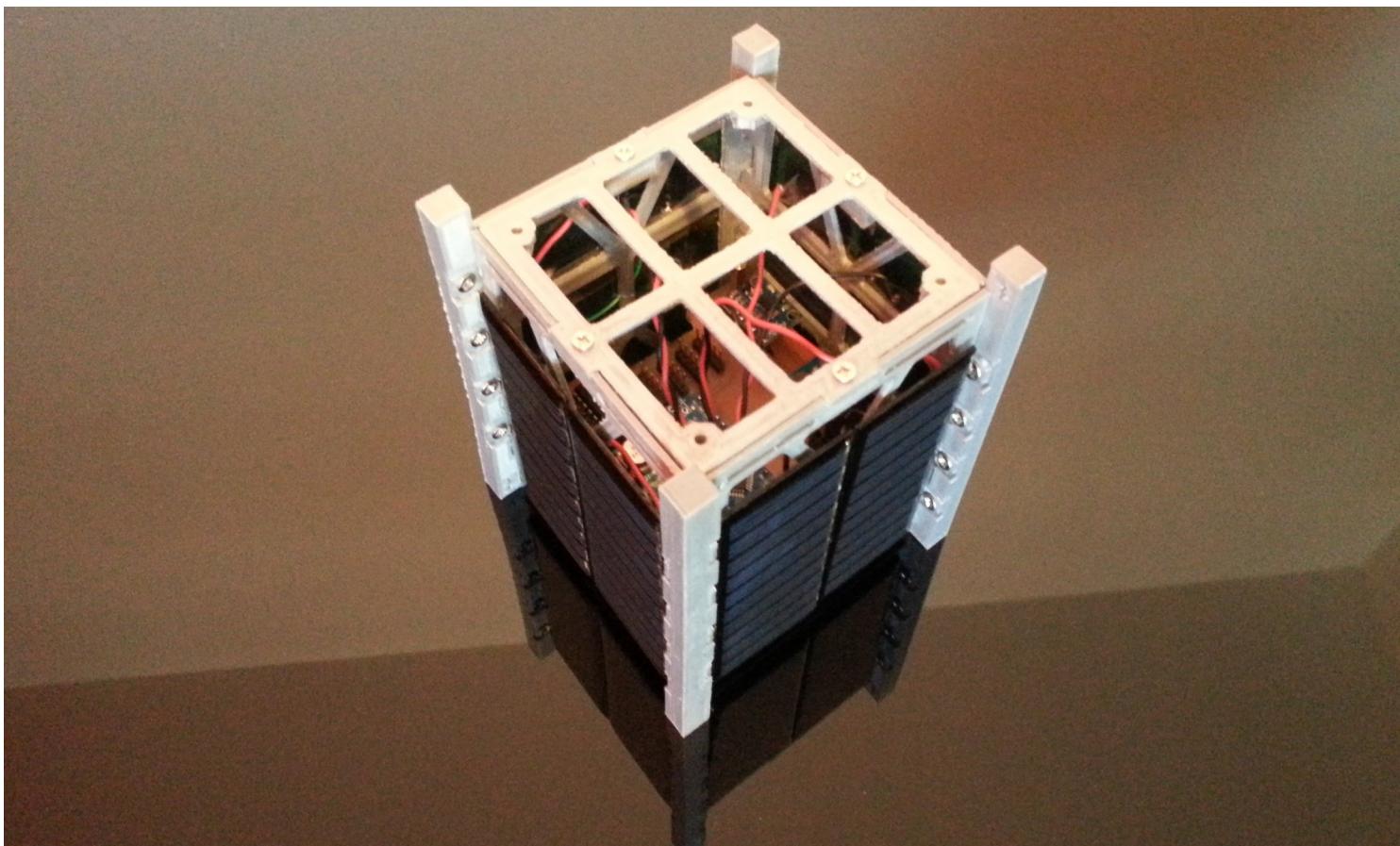
MARK I - ALPHA 2



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ACHIEVEMENTS

SATELLITE



MARK I - ALPHA 2



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ACHIEVEMENTS

DOCUMENTATION (GitHub Repository)

Screenshot of a GitHub profile page for the organization "Boscovery SAT".

Profile Information:

- Avatar: Logo for "BOSCOVERY SAT SALESIANOS LA CUESTA" featuring a cube labeled "MARK I" inside a circular path.
- Name: Boscovery SAT
- Username: boscoverysat
- Location: Tenerife, España
- Email: boscoverysat@gmail.com
- Joined: 27 Aug 2015
- Contributions: 2
- Starred: 0
- Following: 0

Repository Section:

- Popular repositories:**
 - [bsat.sat.transmision_400mhz](#): Análisis, pruebas y documentación del sistema de transmisión en 400MHz empleado en el proyecto. (0 stars)
 - [bsat.doc.documentacion_de_...](#): Este repositorio contendrá los documentos de referencia que iremos empleando a lo largo del proyecto. (0 stars)
 - [bsat.doc.git_y_github](#): En este repositorio se recogerá toda la documentación relativa a la instalación, configuración, operaciones y dem... (0 stars)
 - [bsat.doc.presentaciones](#): Repositorio donde se recogerán las presentaciones preparadas para el proyecto. (0 stars)
 - [bsat.gst.control_de_rotor](#): Este repositorio contiene el código fuente y la electrónica de control para el rotor de antena. (0 stars)
- Contributions:** A timeline showing activity from Dec to Nov. A green bar is visible for September.



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COMMUNICATION



Gmail



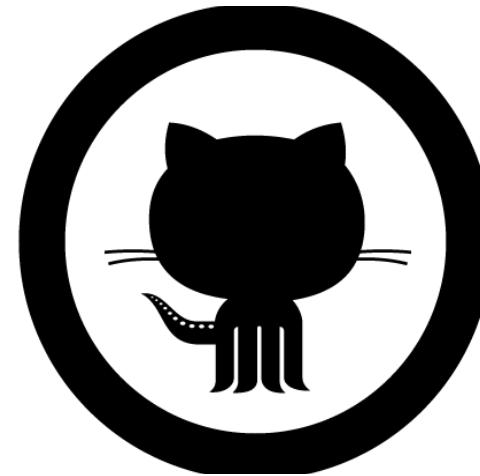
Whatsapp



TEAMWORK



Google Drive



GitHub



MANAGEMENT



Google Calendar



Trello



TOOLS

DEVELOPMENT (SW & HW)

Editors and IDEs



Prog. Languages



Version Control



Operative Systems



Satellite & Tracker



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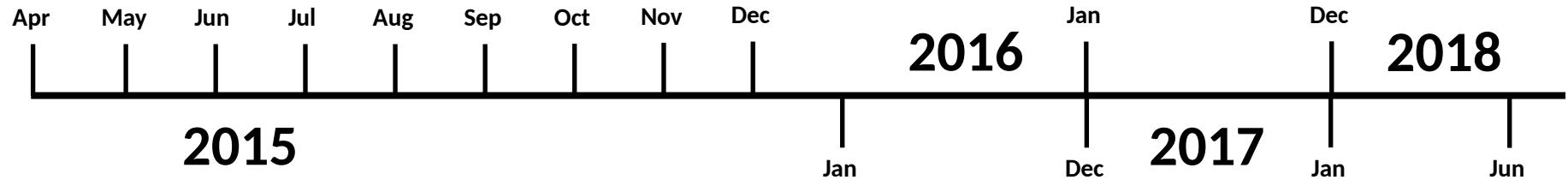
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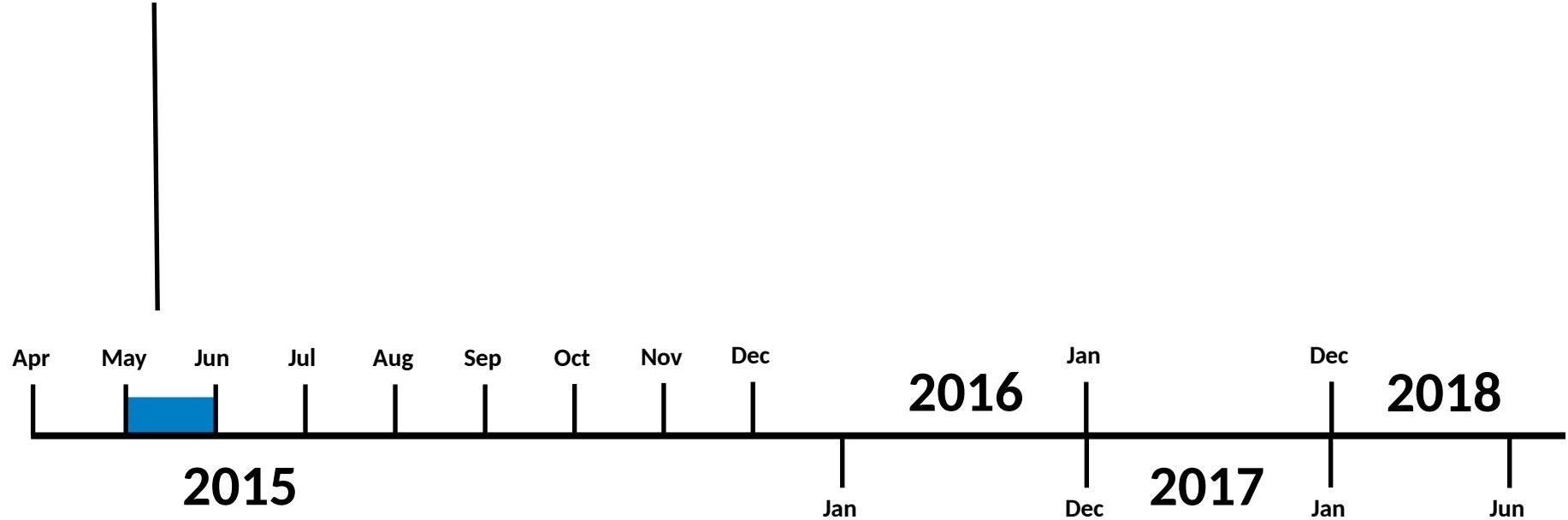


ROADMAP

It is a long time project



ROADMAP

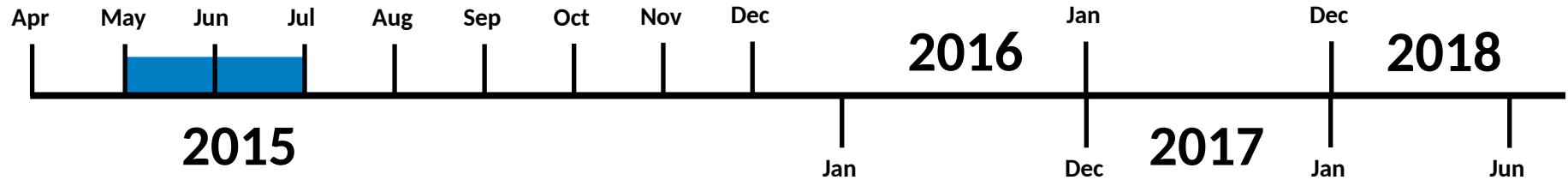


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COLEGIO SAN JUAN BOSCO LA CUESTA

ROADMAP



**San Juan Bosco
La Cuesta School
Projects Week 2015
Satellite Tracker**



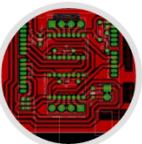
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ROADMAP



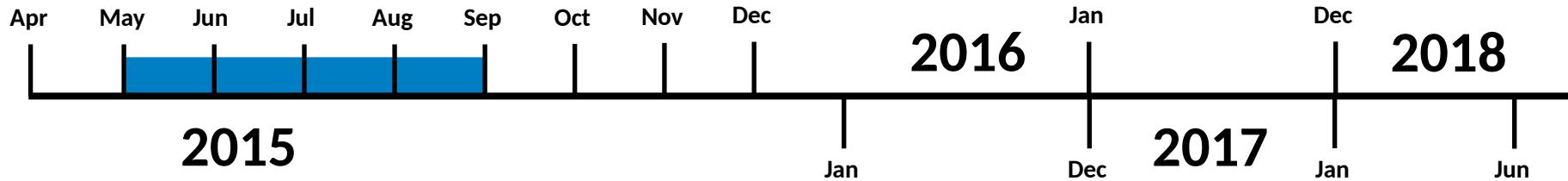
San Juan Bosco La Cuesta School

Projects Week 2015
Satellite Tracker



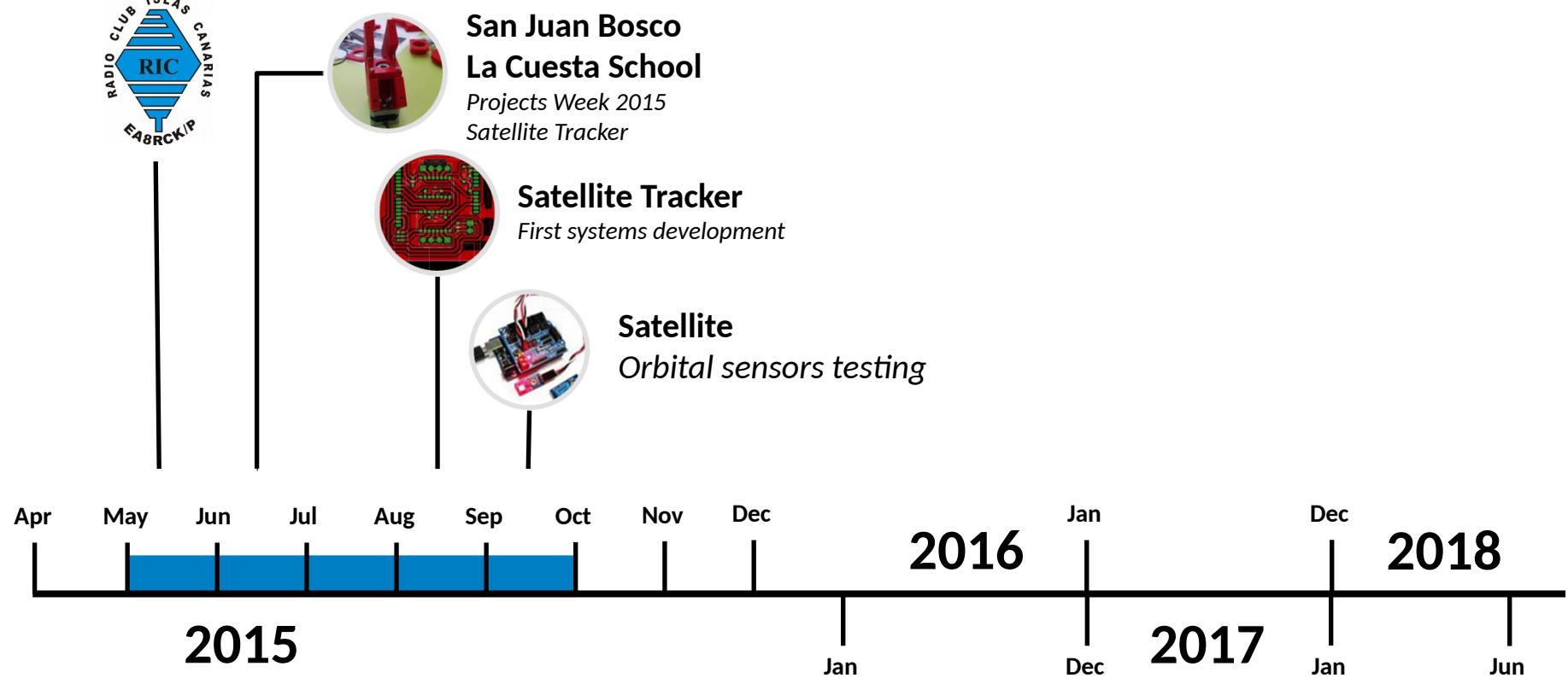
Satellite Tracker

First systems development



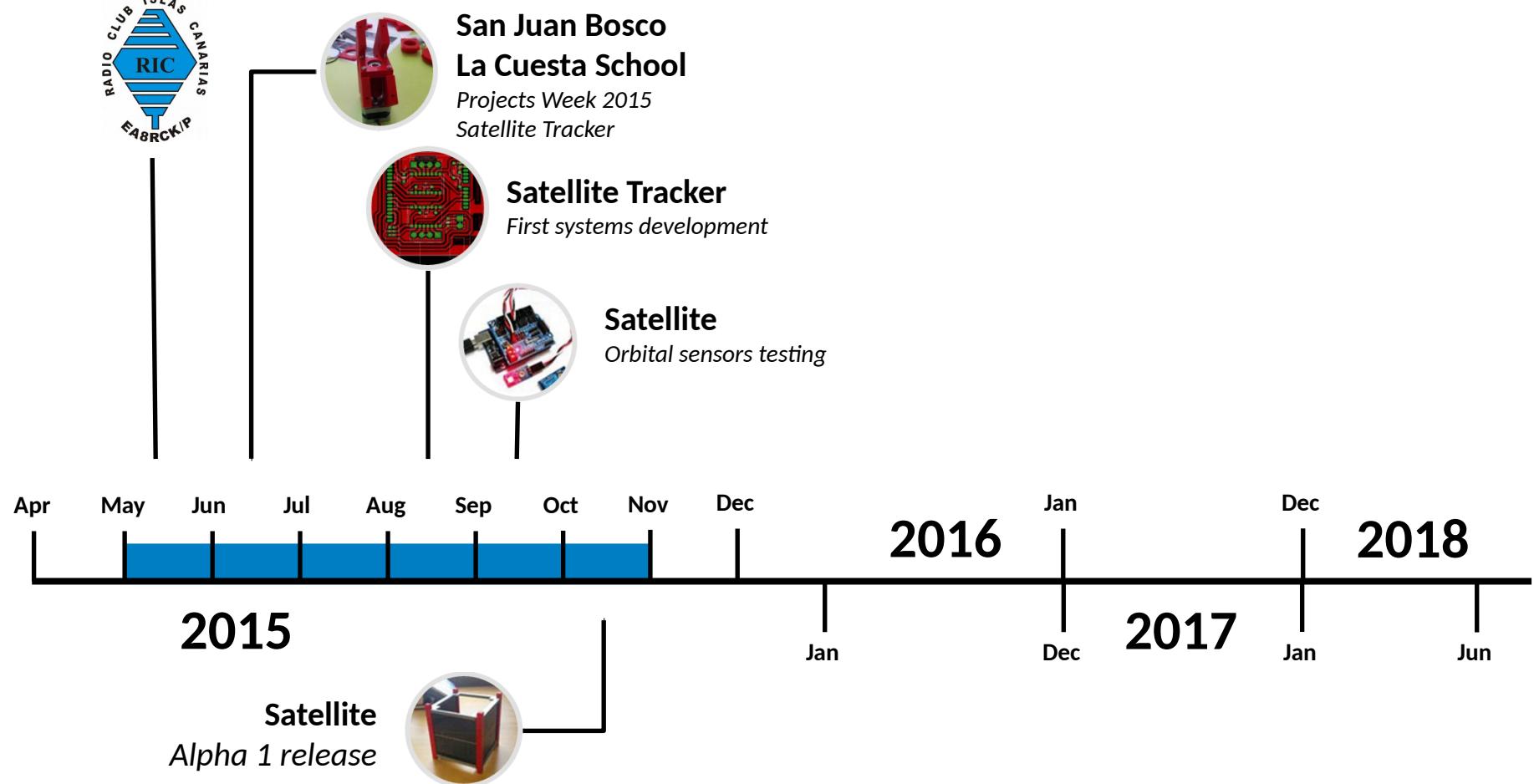
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ROADMAP

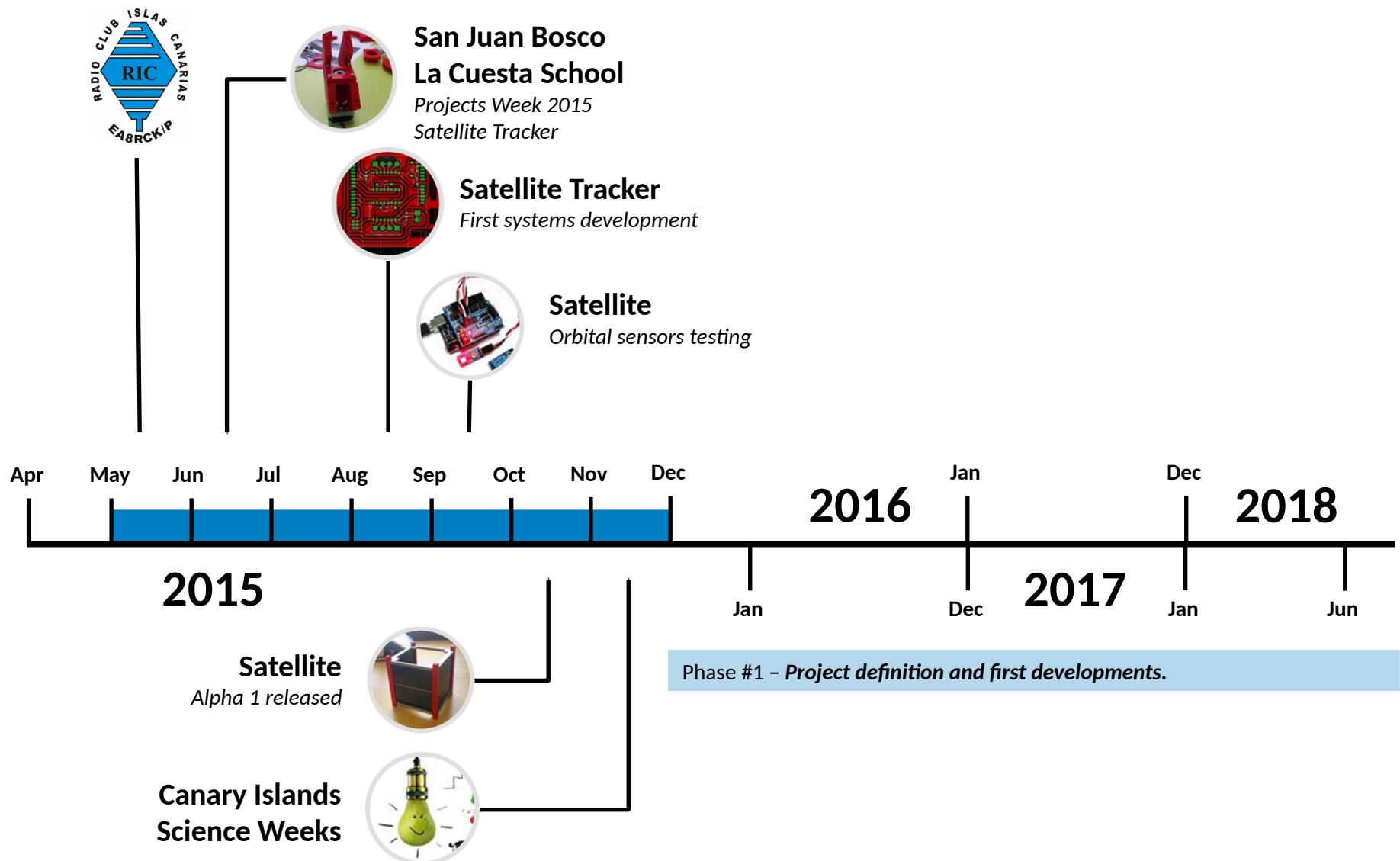


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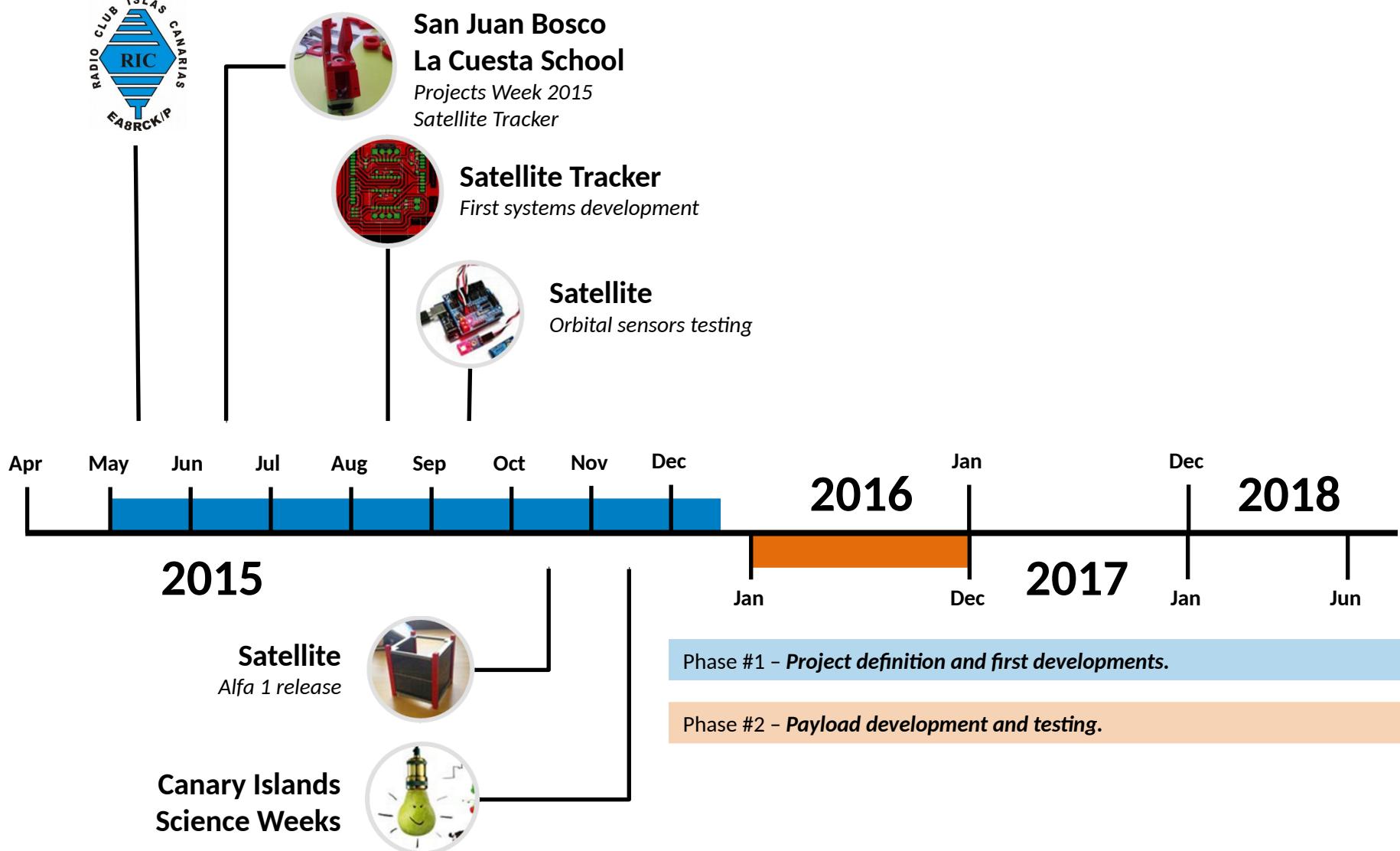
ROADMAP



ROADMAP



ROADMAP



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ROADMAP

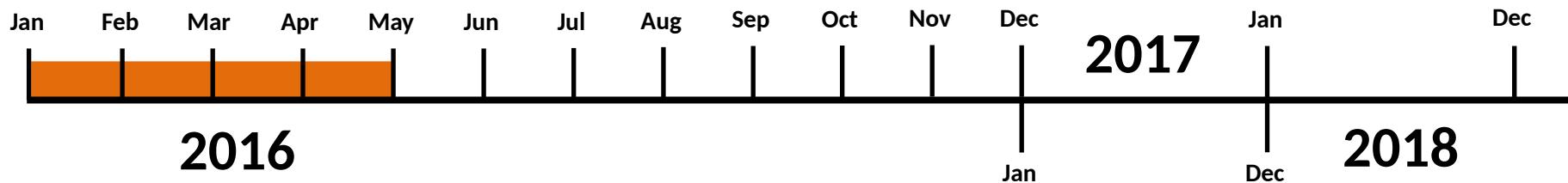
2016



ROADMAP



Research &
Documentation



Phase #1 – Project definition and first developments.

Phase #2 – Payload development and testing.



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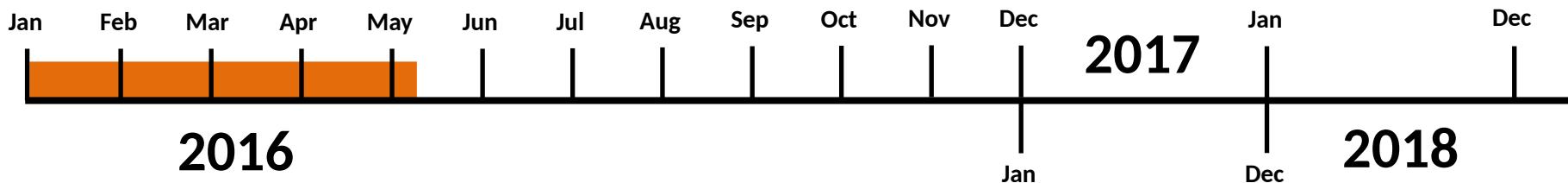
ROADMAP



**Research &
Documentation**

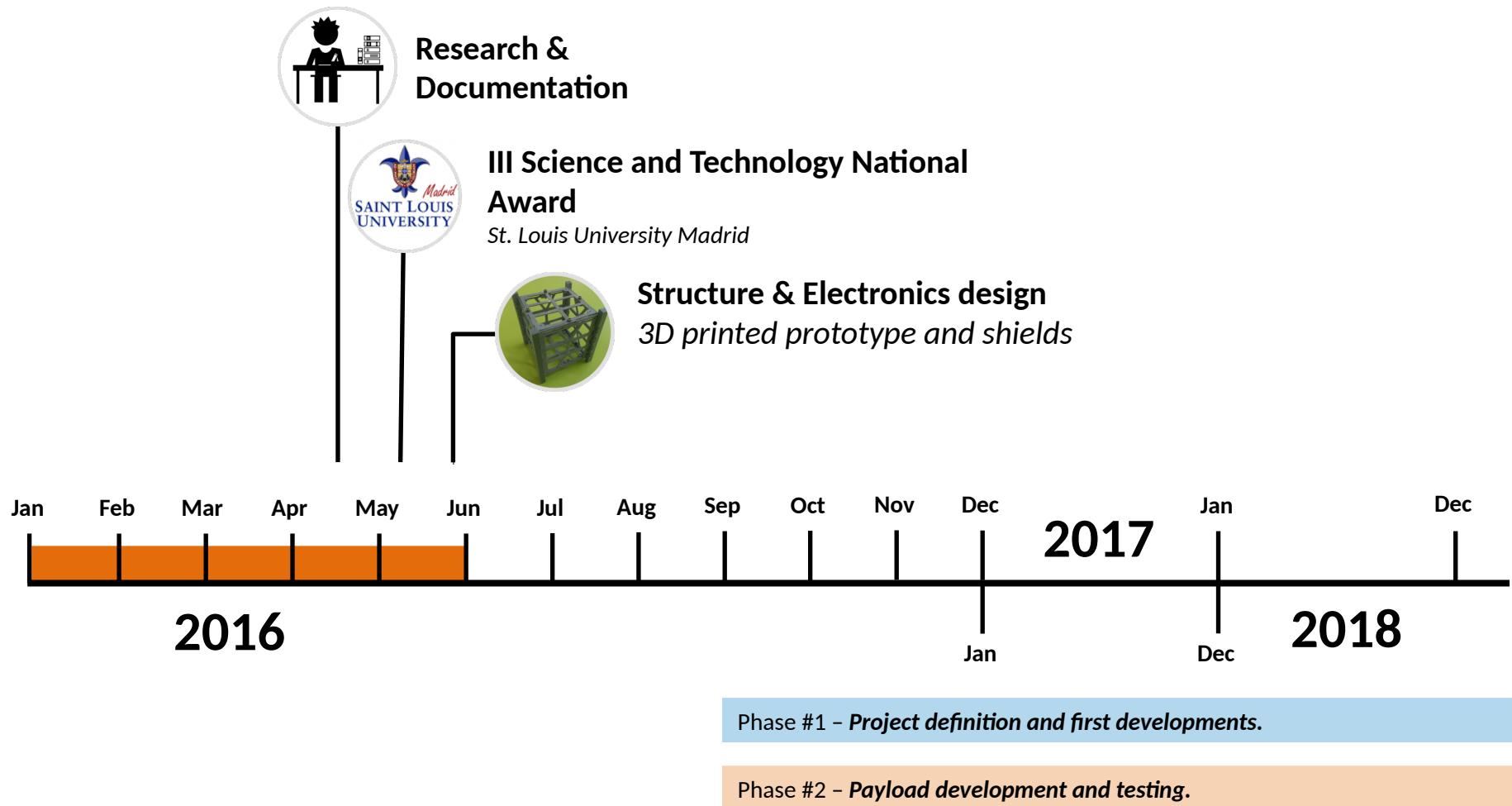


**III Science and Technology National
Award**
St. Louis University Madrid



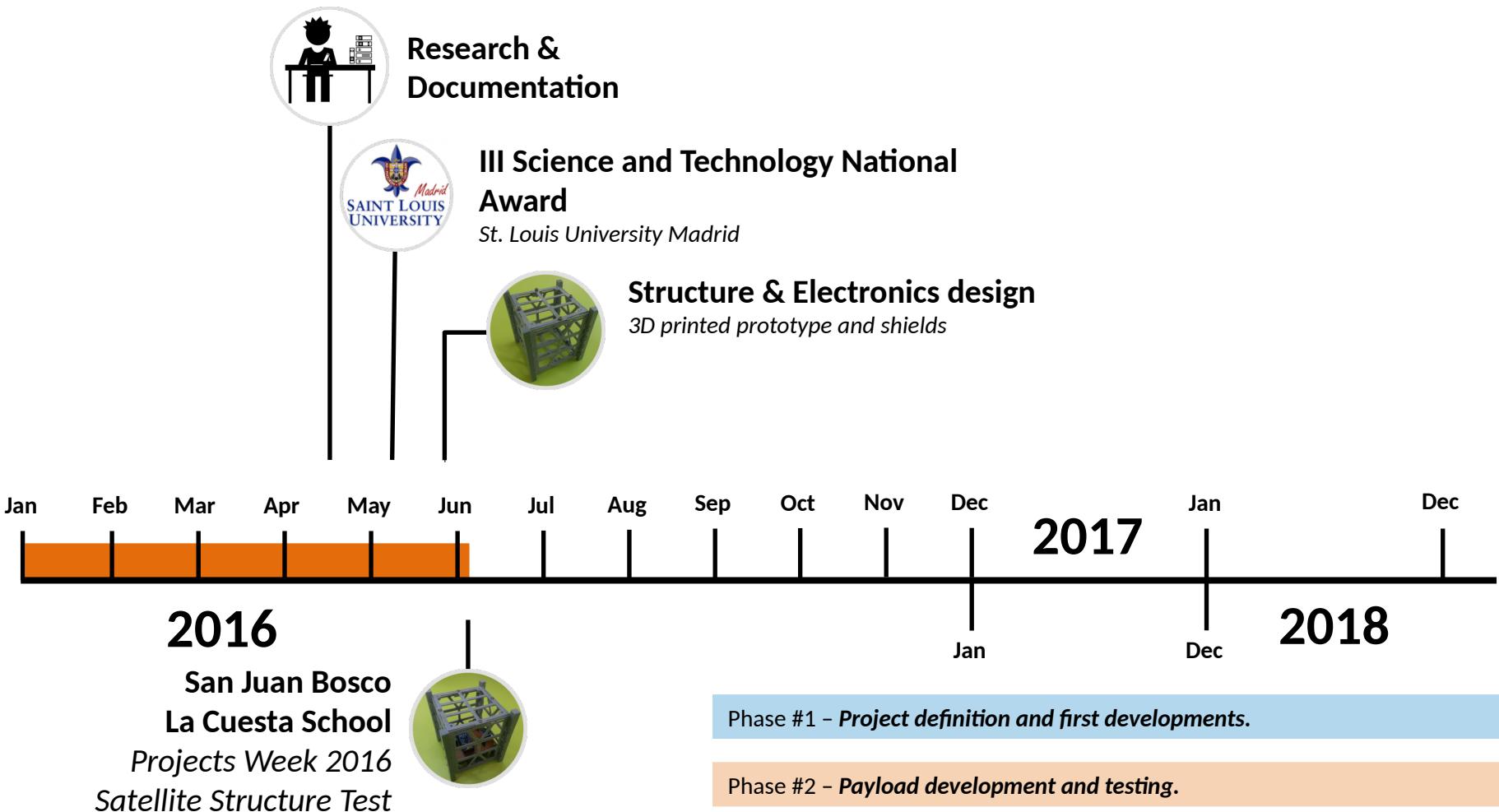
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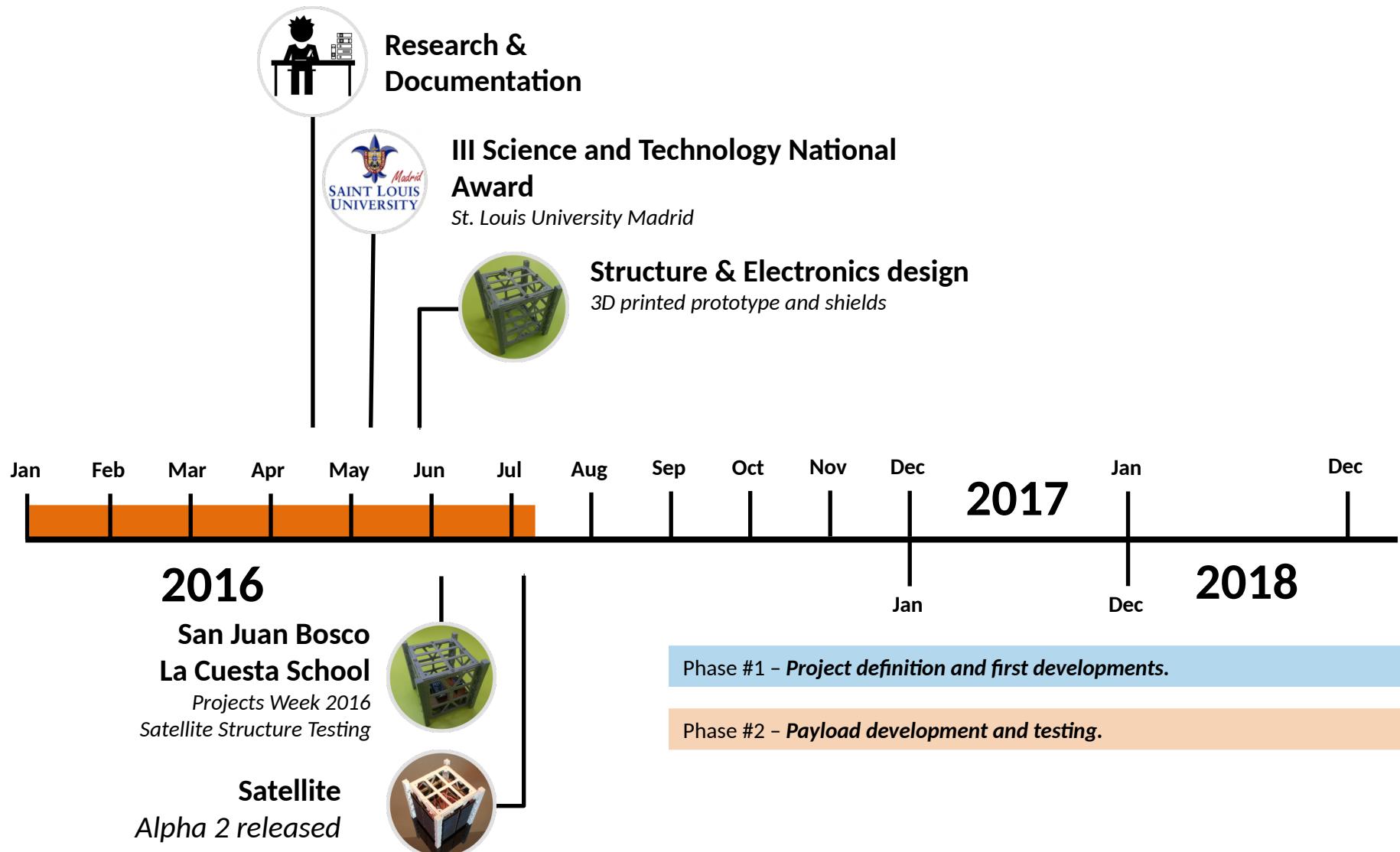
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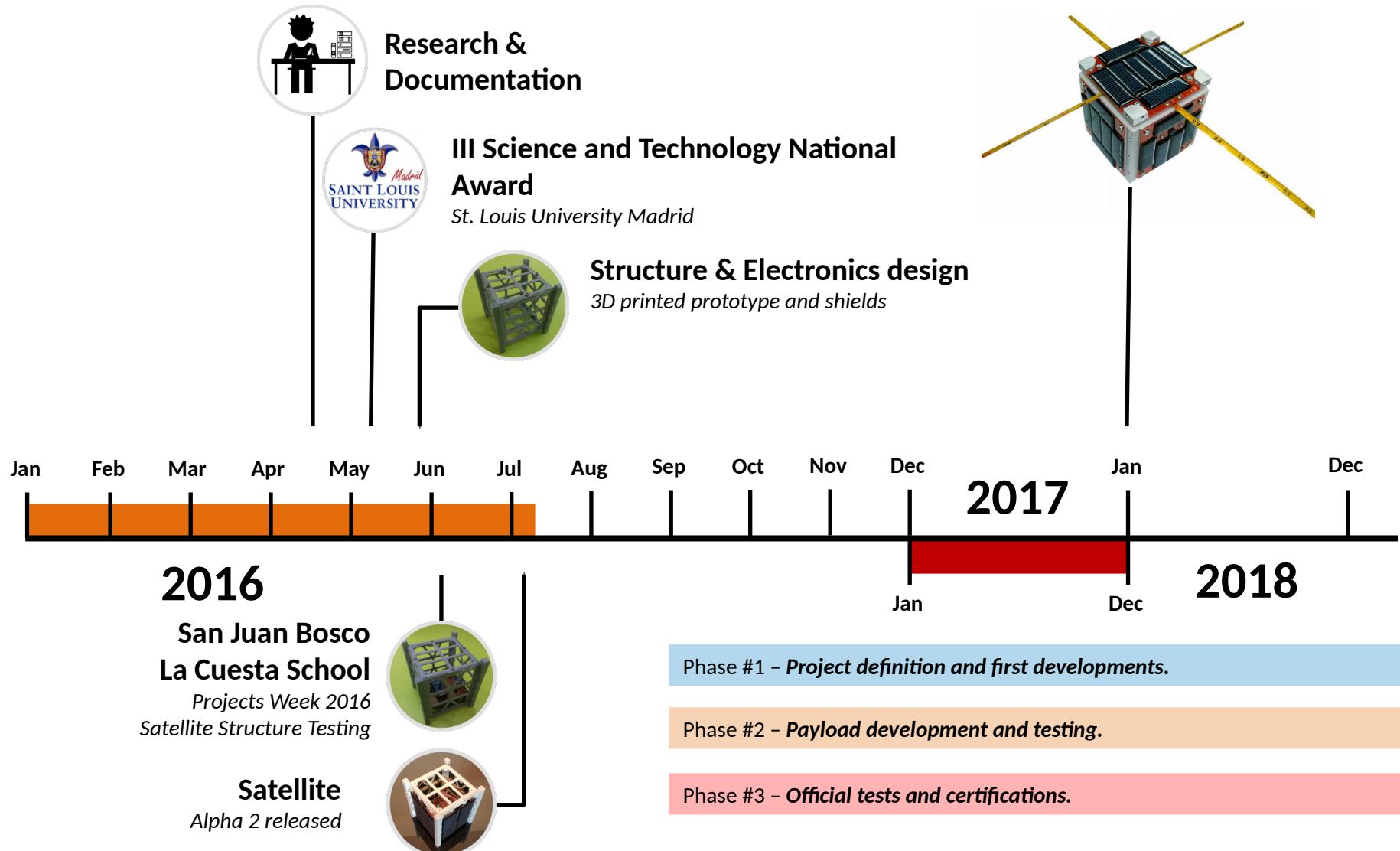
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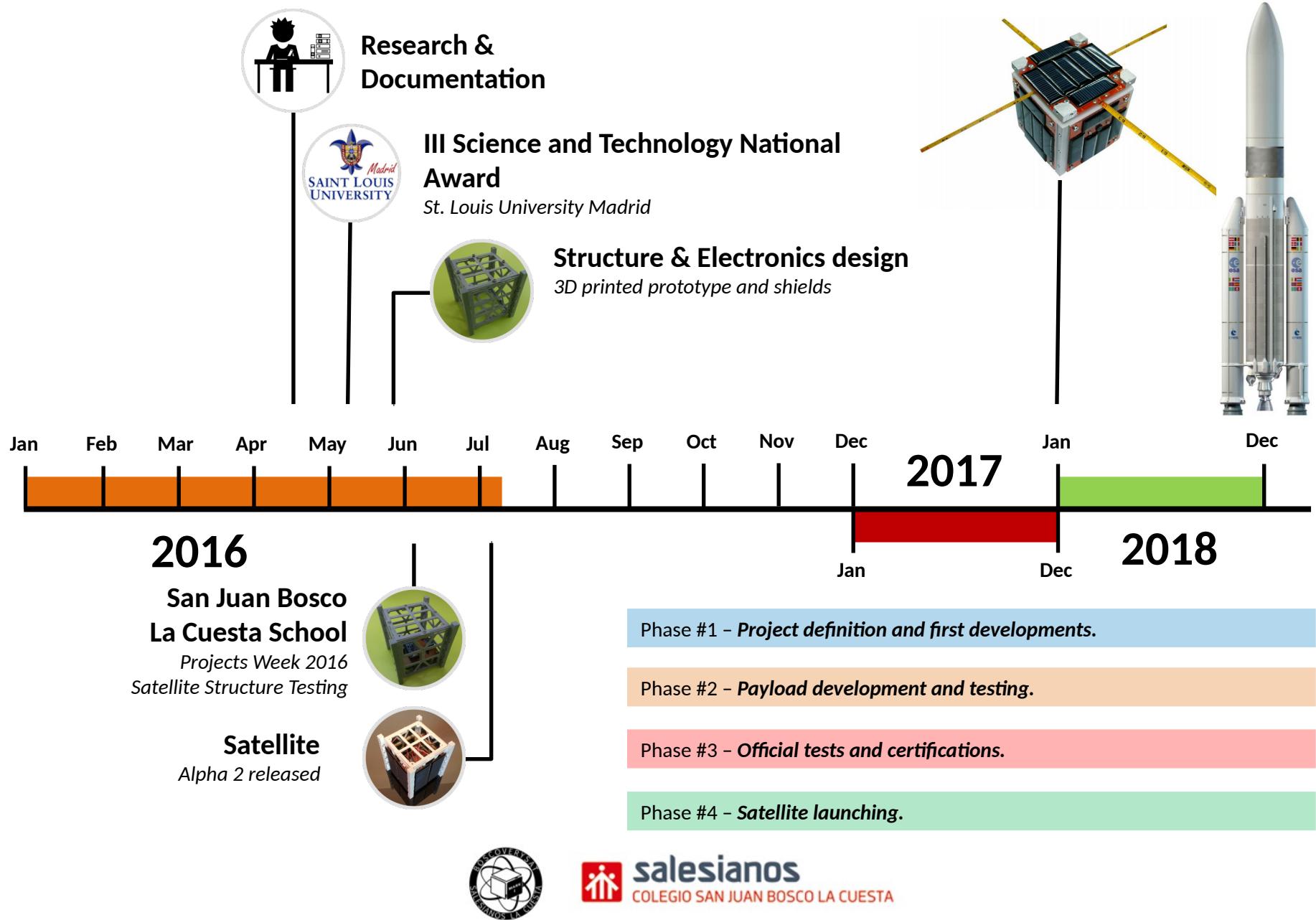
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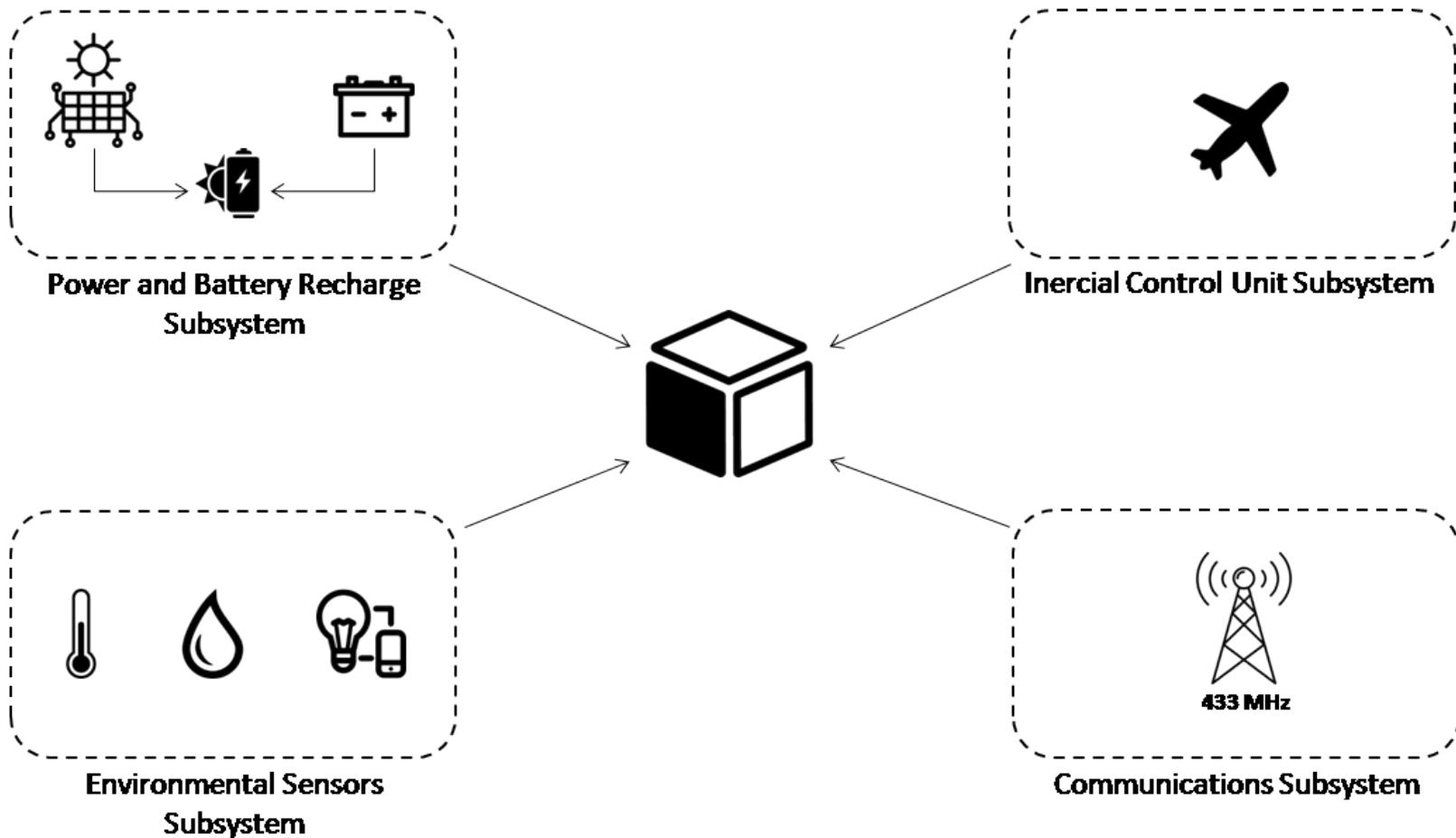
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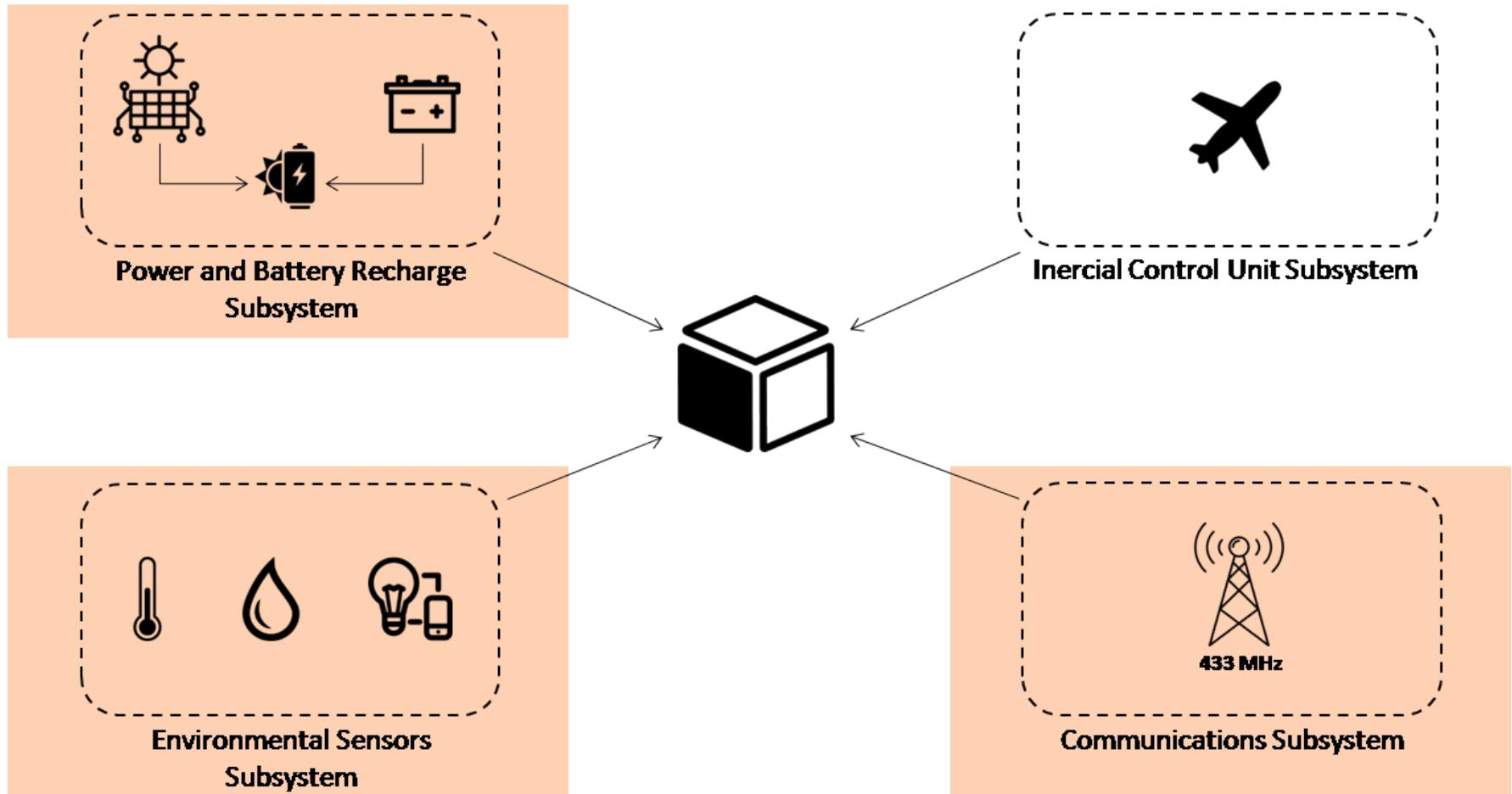
Current I+D process



CURRENT I+D PROCESS



CURRENT I+D PROCESS





boscoverysat@gmail.com



@boscoverysat



boscoverysat



boscoverysat.github.com



BoscoverySAT



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#boscoverysat

#tlpinnova



A satellite with homespun electronics

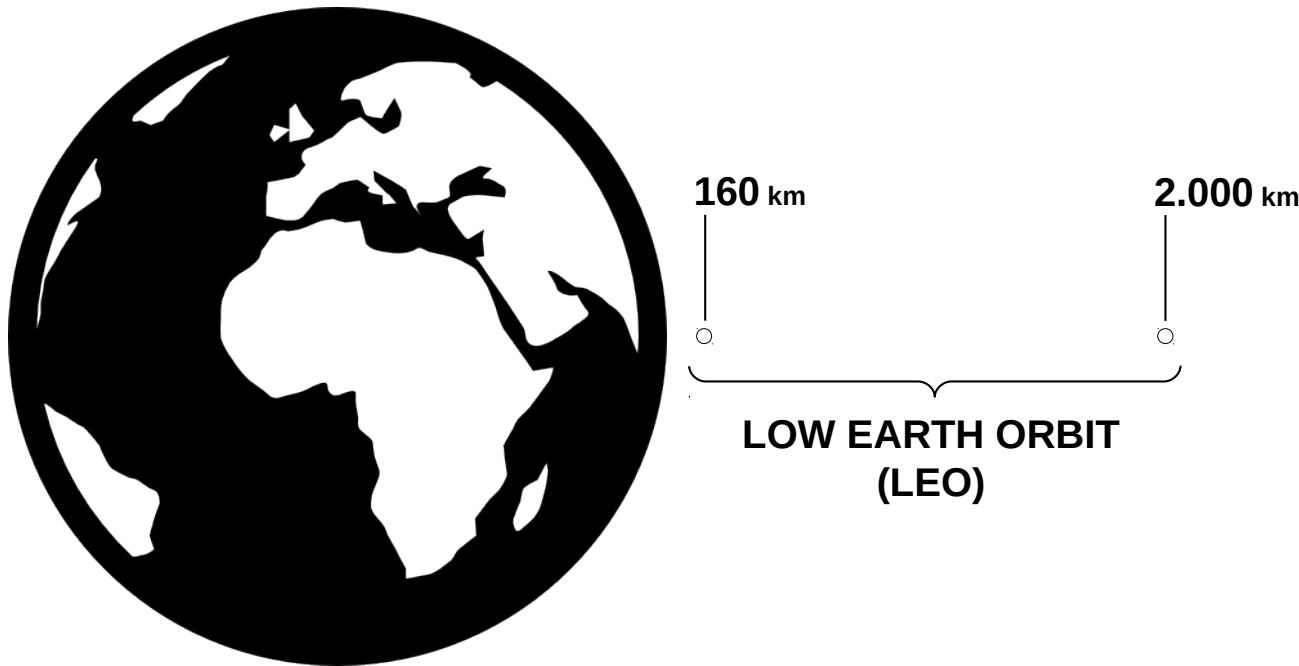
July 2016

Satellites' Orbits and Positioning



SATELLITES' ORBITS AND POSITIONING

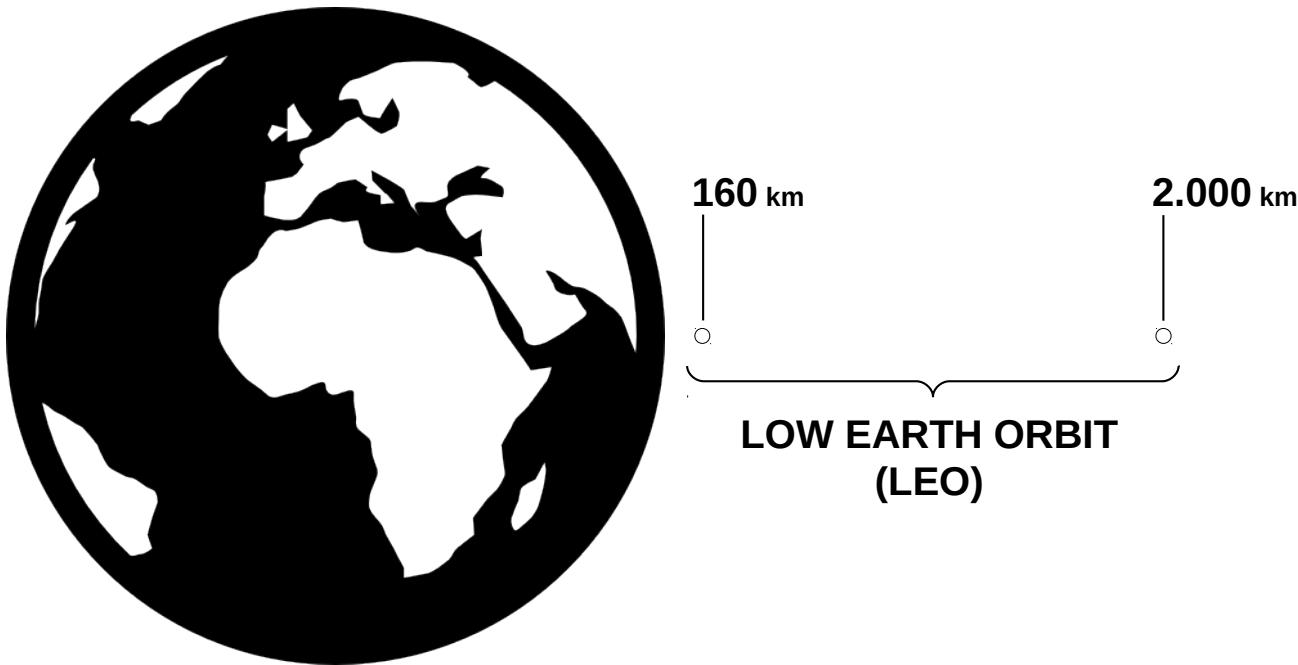
Based on HEIGHTS



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COLEGIO SAN JUAN BOSCO LA CUESTA

SATELLITES' ORBITS AND POSITIONING

Based on HEIGHTS



LOW EARTH ORBIT DATA:

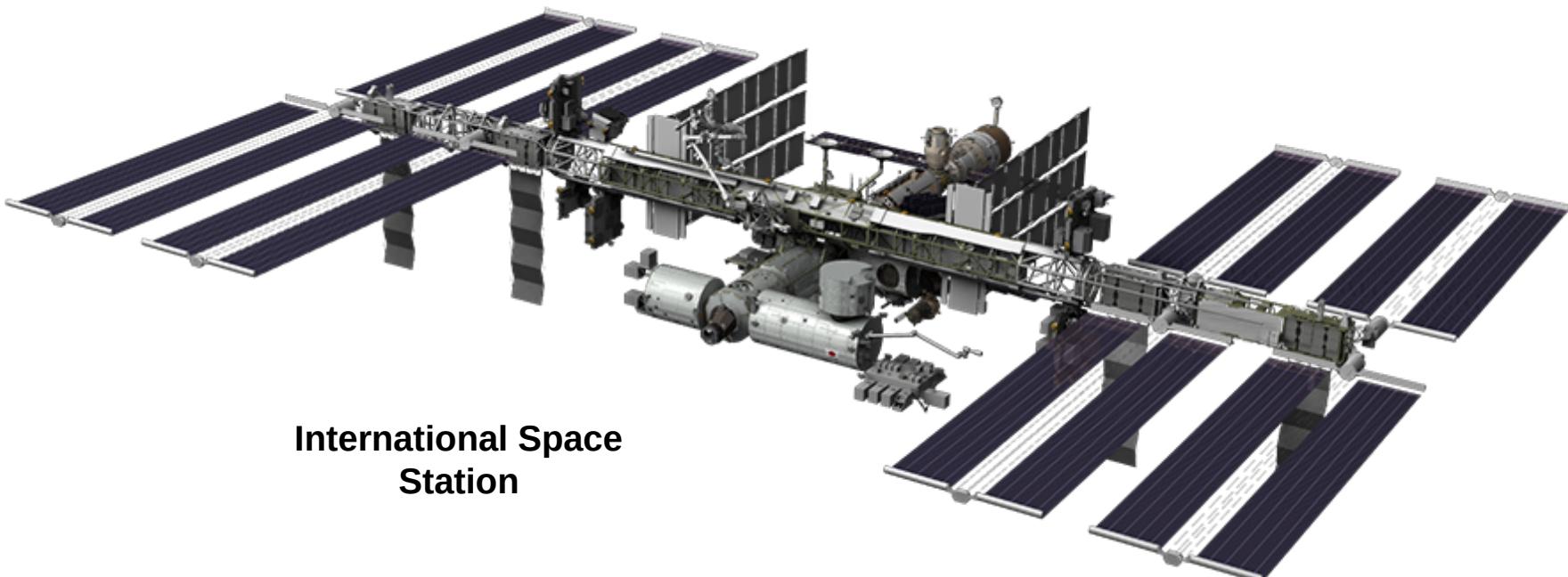
- | | |
|---------------------|----------------------|
| Average speed: | 7,8km/s (28.080km/h) |
| Average orbit time: | 99 minutes |
| Usual deployments: | Scientific missions |



SATELLITES' ORBITS AND POSITIONING

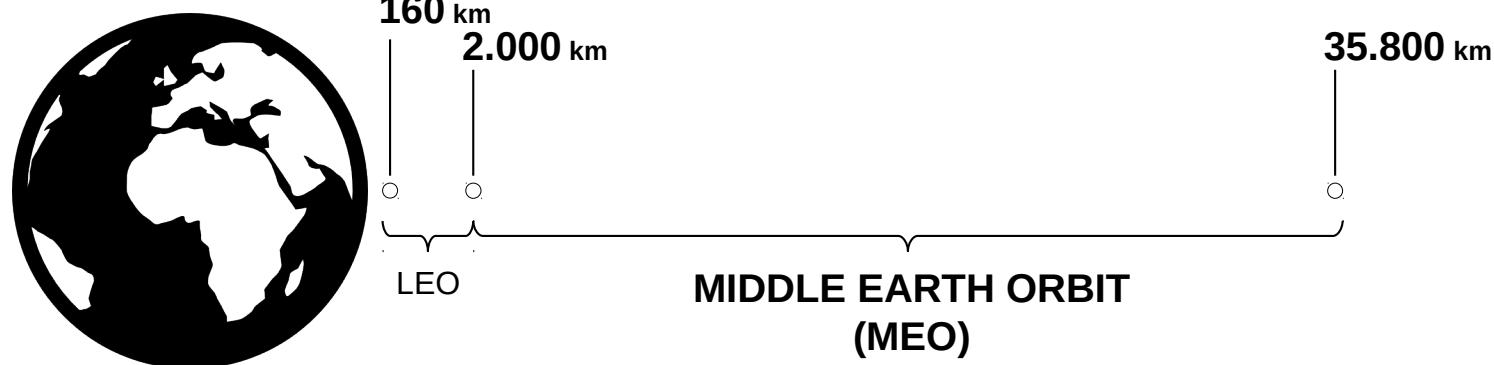
Based on HEIGHTs

Missions deployed at LEO orbit



SATELLITES' ORBITS AND POSITIONING

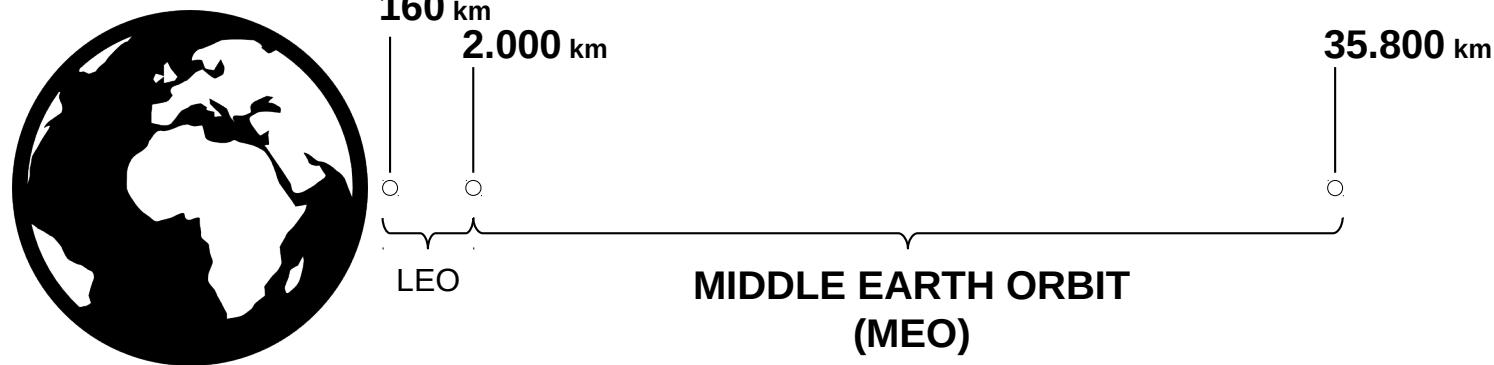
Based on HEIGHTS



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SATELLITES' ORBITS AND POSITIONING

Based on HEIGHTS



MIDDLE EARTH ORBIT DATA:

- | | |
|---------------------|--|
| Average speed: | 3,9km/s (14.040km/h) |
| Average orbit time: | 12 - 24 hours |
| Usual deployments: | GPS (20.200km) and special use for regions tracking |



SATELLITES' ORBITS AND POSITIONING

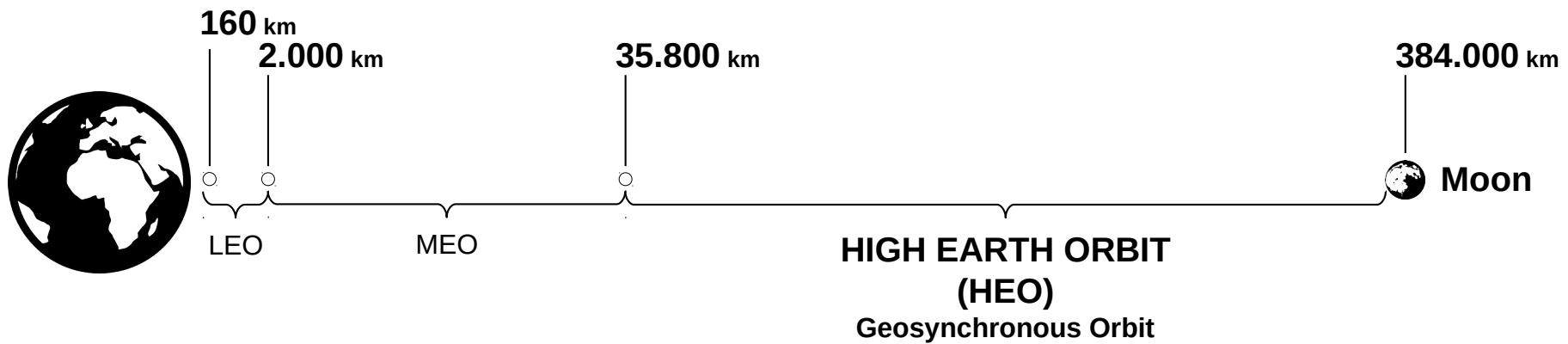
Based on HEIGHTS

Missions deployed at MEO orbit



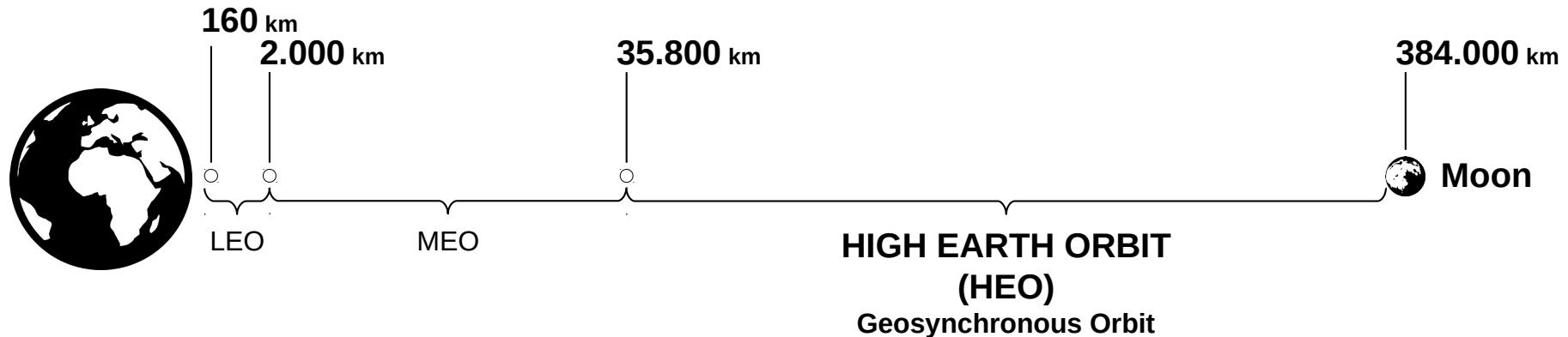
SATELLITES' ORBITS AND POSITIONING

Based on HEIGHTS



SATELLITES' ORBITS AND POSITIONING

Based on HEIGHTS



MIDDLE EARTH ORBIT DATA:

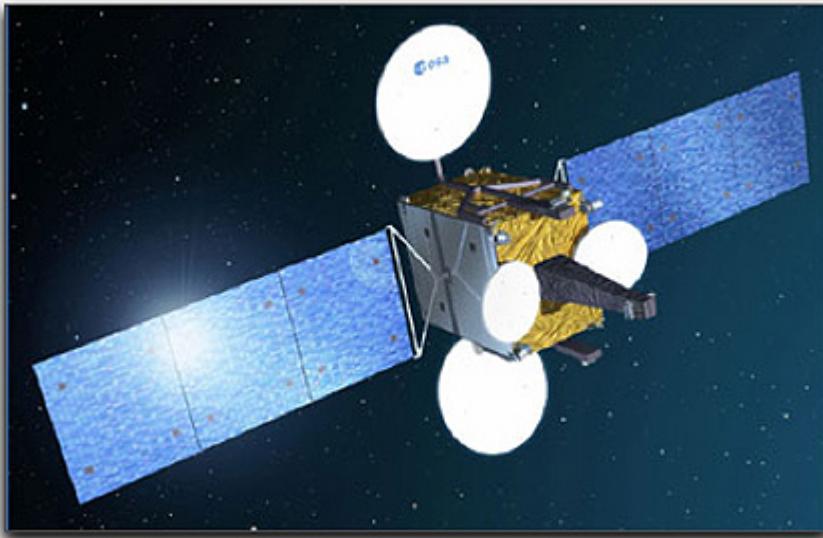
- Average speed: **3,08km/s (11.088km/h) = Earth's rotation speed**
Average orbit time: **Years (geostationary orbit)**
Usual deployments: **Communications and weather satellites**



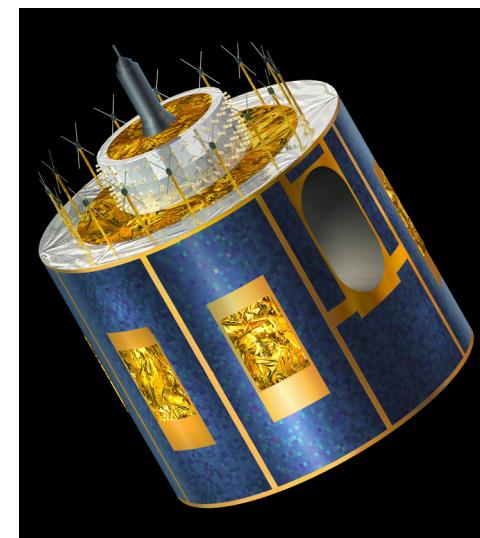
SATELLITES' ORBITS AND POSITIONING

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Missions deployed at HEO orbit



Hispasat AG1



Meteosat



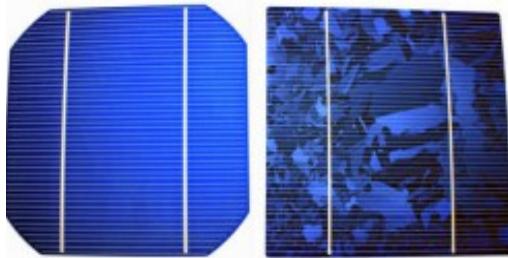
Power and Battery Recharge Subsystem



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POWER AND BATTERY RECHARGE SUBSYSTEM

Facts



9,5 – 11 VDC/Side

50 – 60mA/Side



2 x 18650 Batt type

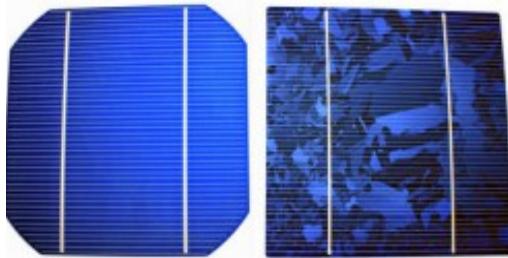
3,7V @ 5000mAh



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POWER AND BATTERY RECHARGE SUBSYSTEM

Facts

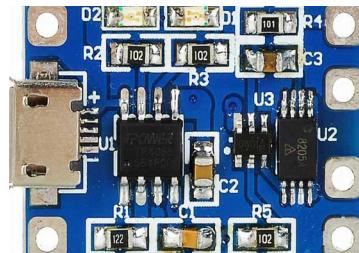


9,5 – 11 VDC/Side
50 – 60mA/Side



2 x 18650 Batt type
3,7V @ 5000mAh

Fails



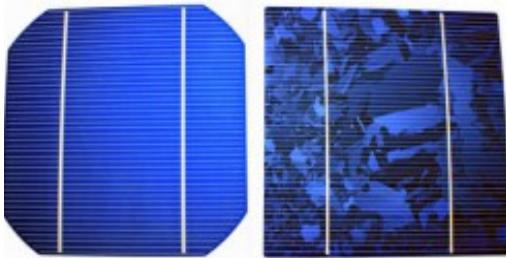
2 x TP4056
4,1V @ 1A
Battery Charger



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POWER AND BATTERY RECHARGE SUBSYSTEM

Facts

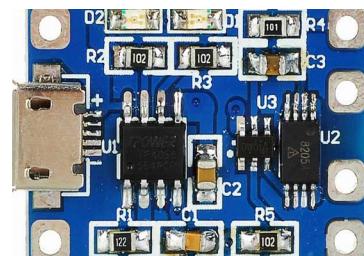


9,5 – 11 VDC/Side
50 – 60mA/Side



2 x 18650 Batt type
3,7V @ 5000mAh

Fails



2 x TP4056
4,1V @ 1A
Battery Charger

Researching



MAX1873REEE
Up to 4 Li+ Batts
-40°C to +85°C



Environmental Sensors Subsystem



ENVIRONMENTAL SENSORS SUBSYSTEM

Facts



HTU21D
Temperature

Battery, Cockpit, Side 1 – 6,
Control Unit



BH1750L
Light Intensity

Side 1 – 6



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ENVIRONMENTAL SENSORS SUBSYSTEM

Facts



HTU21D
Temperature

Battery, Cockpit, Side 1 – 6,
Control Unit

Issues

Multiple I2C devices with the same address.



BH1750L
Light Intensity

Side 1 – 6



ENVIRONMENTAL SENSORS SUBSYSTEM

Facts



HTU21D
Temperature

Battery, Cockpit, Side 1 – 6,
Control Unit



BH1750L
Light Intensity

Side 1 – 6

Issues

Multiple I2C devices with the same address.

Researching

Multiplexing SDA wire.



Dual CMOS 4-channel analog multiplexer, demultiplexer.



Communications Subsystem



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COMMUNICATIONS SUBSYSTEM

Facts



Telemetry &
Configuration

UHF 430 – 440 MHz



Radio
Communication

VHF 144 – 148 MHz



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COMMUNICATIONS SUBSYSTEM

Facts



Telemetry &
Configuration

UHF 430 – 440 MHz



Radio
Communication

VHF 144 – 148 MHz

Issues

Buffer overflow on packages transmission for telemetry and configuration.



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COMMUNICATIONS SUBSYSTEM

Facts



Telemetry &
Configuration

UHF 430 – 440 MHz



Radio
Communication

VHF 144 – 148 MHz

Issues

Buffer overflow on packages transmission for telemetry and configuration.

Researching

Error control by parity bits.

Antenna deployment system.



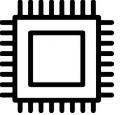
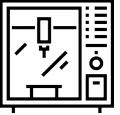
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Budget



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TOTAL RESOURCES INVESTED UP TODAY

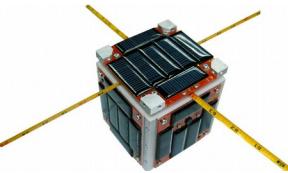
	Electronics	190,00 €
	3D Printing	75,00 €
	Mechanical components	25,00 €
	Other materials	30,00 €

TOTAL AMOUNT 220,00 €

 Total spent time (aprox.) 1.490 h



DEPLOYMENT BUDGET

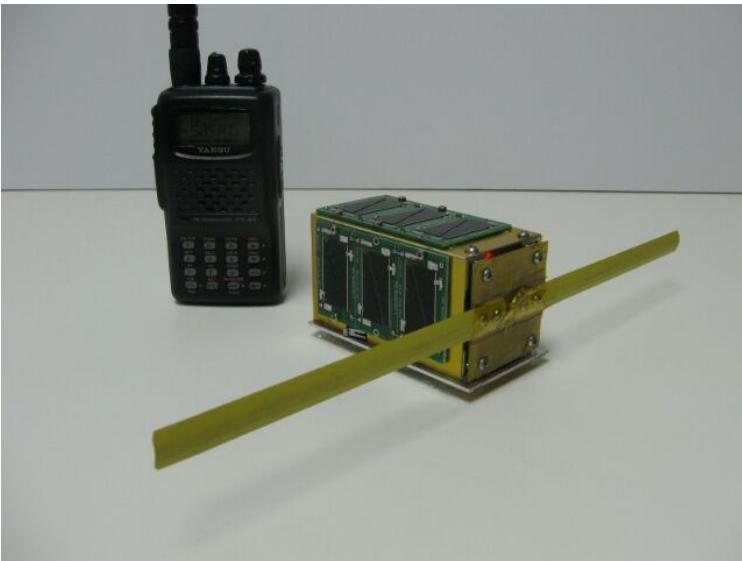
	500,00 €
	10.000,00 €
	60.000,00 €
Unexpected expenses	2.500,00 €
TOTAL AMOUNT	73.000,00 €



REAL DEPLOYED PROJECTS BASED ON CUBESAT



REAL DEPLOYED PROJECTS BASED ON CUBESAT



You are crazy!

Maybe...

But we are not alone.



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REAL DEPLOYED PROJECTS BASED ON CUBESAT

50\$ Sat



Built by three amateur radio operators.



7 months in orbit.



Dniepper russian rocket.



www.50dollarsat.info



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REAL DEPLOYED PROJECTS BASED ON CUBESAT

PicoDragon



Built by VNSC

(Vietnam National Satellite Center)



In orbit during 4 months.



ISS



<https://vnsc.org.vn/en/projects/profile-of-the-picodragon-satellite/>



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REAL DEPLOYED PROJECTS BASED ON CUBESAT

PhoneSat Series



Built by NASA.



Actually in orbit.



It's payload is an android phone.



Falcon 9.



phonesat.org

#boscoverysat

#tlpinnova



A satellite with homespun electronics

July 2016