



**INTERNSHIP OFFER**  
**5 – 6 months (1st semester 2024)**

 Toulouse  
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## **Implementation of a GNSS application for a Cubesat platform**

### Description

**GNSS** (Global Navigation Satellite System) is an essential module of any spacecraft operating in low Earth's orbit. By recovering the GNSS messages, the satellite can keep a **clock synchronization** needed for the autonomous timestamp-tasks. The flight software (FSW) executes an application to control and recover this information from the GNSS module.

Our laboratory at ISAE-SUPAERO has started the development of a state-of-the-art Hybrid CUBESat (**HyCUBE**) platform to support our education programs and researchers with the support of the **CNES**. This Hardware-in-the-Loop system is composed of an open-source ground station (**YAMCS**), the hardware platform running a CNES flight software (**LVCUGEN**) and an open-source space environment simulator (**Basilisk**).

### Internship results expected

The goal of the internship is to program an Input/Output System (IOS) application that communicates using UART with the GNSS module in baremetal, then integrate and test it in the current FSW. Once functionality has been verified you will be tasked to create a Basilisk model of the GNSS module and tested it in the HyCUBE platform. The following design steps are expected:

- 1° Understand the concepts of **Time-Space Partitioning**, Hypervisors, the elements of an IOS partition application as well as a global understanding of the **LVCUGEN framework**.
- 2° Implement a **IOS-GNSS** application in C and integrate it in HyCUBE's FSW.
- 3° Test the application in the development platform (**Zybo Z720**) using a GNSS COTS module.
- 4° Create a **Basilisk Python/C++** model of the GNSS and tested it in the HyCUBE platform.
- 5° Implement the **On-Board Time Management** packet service (PUS 9).

### Skills and prerequisites

Preparation of a diploma in Engineering (computer science / electronics),  
Bac +4/+5.

- General engineering
- **Strong knowledge of C/C++ programming language**
- **Basic knowledge of Python or other OOP languages**
- Basic knowledge of communication protocols (UART,I2C,...) would be a plus
- A good knowledge in space application would be a plus
- Autonomy and proactivity

### Language skills

- English mandatory
- French and/or Spanish accepted

### How to apply?

Send resume to [marc.justicia-mayoral@isae.fr](mailto:marc.justicia-mayoral@isae.fr).

