Odyssey Platform Code Generator

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Company Background:

Lunar Outpost is an industry leader in lunar surface mobility, commercial space robotics, and space resources. From our terrestrial product lines revolutionizing the air quality sector on Earth to the creation of oxygen on Mars, our impact spans the solar system. Lunar Outpost's exploration class rover, the Mobile Autonomous Prospecting Platform (MAPP), will be the first commercial rover on the Moon and the first rover in history to explore the lunar South Pole.

Since our founding in 2017, Lunar Outpost has raised Venture Capital from top-tier investors and continues to attract strong investment partners as we continue to prove the opportunity that advanced mobility, robotics and autonomy provides to the new space economy and here on Earth. In 2021, Lunar Outpost announced that our commercially funded MAPP rover—including payload mass allocations for MIT and Nokia — was scheduled for delivery by an Intuitive Machines lander to the lunar South Pole. Lunar Outpost has since secured two additional contracted lunar surface missions, one of which is fully commercial and the other a NASA funded science exploration rover. In addition to the three missions above, Lunar Outpost has also won a contract with the Australian Space Agency to design and develop a lunar rover for Australia's first mission to the Moon as part of the Trailblazer program. In 2024, Lunar Outpost was awarded a Lunar Terrain Vehicle Services (LTVS) contract by NASA to develop a human-rated Moon rover as part of the Artemis campaign.

With over a dozen active contracts across commercial, defense and civil space, Lunar Outpost is The Next Leap that will enable humanity to become interplanetary.

Description of Work to Be Done:

The Odyssey Platform is a test suite for the Stargate Mission Control Platform (Stargate), Lunar Outpost's primary communication platform for all rover platforms in terrestrial and cislunar operation. This project is for verifying Stargate Message Schema (SGMS) via code generation and messaging with Stargate as part of the Odyssey Platform. The messaging schema for Stargate provides a consistent message format and long-term generation capability for all messages used on rover platforms. Odyssey will be used to generate these messages from the schema files and verify their readiness for flight. This project is focused on designing and implementing a framework to generate message headers from the SGMS custom message descriptor, and test those generated messages for accuracy. This component will form the backbone of message generation and test for the Stargate platform.
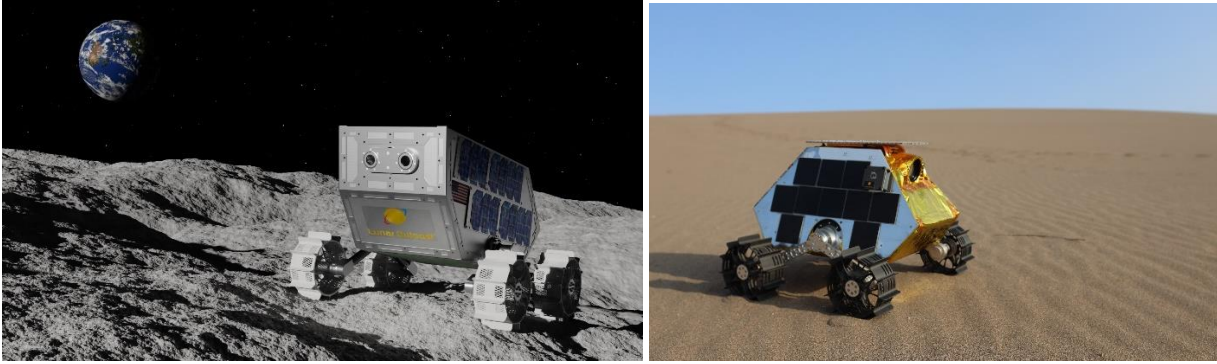
Figure 1: M1 MAPP rover and MAPP being tested at the Great Sand Dunes.

Students will focus their efforts on key functionality for Odyssey:

1. Odyssey will be able to take a message schema file from Stargate and parse it to generate C and C++ headers which match to the described message in the schema
2. The test framework shall be able to take these generated message headers, format messages and send out messages to a test endpoint to verify them

Reach goal:

- As a stretch goal, the generated message fields will be populated with various values within an accepted range for each field before being sent for verification
- The end goal of this project is end-to-end generation of test messages from the SGMS file, and sending and verification of the generated messages from a test device

The students will be involved in every phase of the project 'from design through implementation'. During the design phase the students will interact with Lunar Outpost engineers to see what will provide value for operation. From there, the project overview will be created, and the work divided into tasks. As a final product, the Field Session team will develop a software package which can generate message headers and verify the message integrity

Desired Skills for Students:

- Experience with Python
- Experience with C/C++ development
- Experience with parsing files with a custom structure

We understand not all the students in the group might have the desired technical skills. However, if they can problem solve and have a willingness to learn, they can excel in this project with the help of our talented engineers.

Preferred Team Size: 3-4 students

Given the scope of this project a group of 4 students is preferred but 3 students could also excel given they are willing to problem solve and learn.

Internships at the End of the Course:

We are happy to consider offering internships at the end of the course.

Location Where Work Would Be Performed:

We have offices in Arvada, CO. This office is less than a 15-minute drive from CSM campus and should provide a convenient location for the students to meet. We also provide free beverages and snacks to keep the team fueled throughout the day.