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Author: Mr. Anthony Faure-Gignoux

ISAE-Supaero University of Toulouse, France, anthony.fauregignoux@gmail.com

Mr. Jeremy Aubert

ISAE-Supaero University of Toulouse, France, jeremy.aubert@student.isae-superaero.fr

Mr. Florian Fillol

ISAE - Institut Supérieur de l'Aéronautique et de l'Espace, France, fillol.florian@gmail.com

Mrs. Tania Gres

Space Generation Advisory Council (SGAC), Italy, tania.gres@gmail.com

Mr. Adrien Lafontan

ISAE - Institut Supérieur de l'Aéronautique et de l'Espace, France, adrien.lafontan@student.isae-superaero.fr

Mr. Clement Loneux

ISAE-Supaero University of Toulouse, France, clement.loneux@2020.icam.fr

Mr. Timothée Simon

ISAE-Supaero University of Toulouse, France, timothee.simon.2021@utt.fr

Mr. Pierre Vignaud

ISAE-Supaero University of Toulouse, France, pierre.vignaud@outlook.fr

Mr. Benoit Vinière

ISAE - Institut Supérieur de l'Aéronautique et de l'Espace, France, benoit.viniere@gmail.com

Mrs. Alexia Duchene

ISAE - Institut Supérieur de l'Aéronautique et de l'Espace, France, alexia.duchene@student.isae-superaero.fr

OBELIX: THE HUMAN AND ROBOTIC PARTNERSHIPS THROUGH THE CLOUD COMPUTING

Abstract

The roadmap for future human exploration sees the Moon as the best place to develop technologies and innovations for future long term missions towards it or farther away on Mars. In this context, humans and quasi-autonomous robots are going to evolve together on the Moon surface. Thus, this cohabitation and collaboration require reliable and safe systems to ensure the astronauts and infrastructures integrity. The more centralized the monitoring, the quicker the system is able to adapt itself in order to avoid an incident propagation. In this respect, the OBELIX team, composed of ISAE-SUPAERO students within the frame of "Move on the Moon" contest proposed by CNES, has performed a study about this kind of collaboration using cloud computing.

Cloud computing is a centralized computation of different subsystems. The first advantage of this technology is that the central system monitors all the subsystems as a whole. This high-level integration allows a powerful adaptation in case of unit failure, by redirecting some operational subsystems to compensate and recover the failed unit. This kind of computation also allows the implementation of much powerful algorithms like artificial intelligence algorithms, giving a better autonomy to the system and the capacity to face numerous kinds of situations.

In our study, we have implemented a cloud computing system on a fleet of rovers. This system allows a quasi-autonomy on the rovers thanks to the centralized computer without adding mass on them. It permits the rovers to know the position of each other in case assistance is needed, to quickly redefine a roadmap, to face most of the unexpected situations, and even to optimize the surface coverage to be more efficient with scientific operations. A constant health monitoring of the astronauts is also provided to ensure their integrity and be able to abort a mission and rescue them as quickly as possible in case of emergency.