Theoretical Framework

HOPE project is based on establishing permanent communication between the Earth and Mars regardless of the positions of them and their rotations. In this way, it will allow Martian astronauts to communicate with their loved ones on Earth through a simple smartphone.

The challenge ranges from interplanetary communication to interpersonal communication.
We have developed an application for people to use both on earth and on Mars and a communication proposal between the planets.
It is important because it allows the colonists of Mars to be in contact with people despite the distance.
It works with DSN, the bundle protocol, Wi-Fi and LoRa.
We hope that in the future a faster way of communication can be discovered……..

As a group we have always been passionate about people communication no matter the distance. When we design this project, we have in mind the future colony on Mars, which will need a way to communicate with people on Earth.
For the communication itself, we decide to place three geostationary satellites on Mars to ensure communication no matter planets' rotation, reducing errors and high reliability. It will be necessary to place a fourth satellite on a Lagranging point of the Sun and Earth (L4 or L5) which will retransmit the information.

For inner communication on Mars, communication networks based on WiFi technology (such as ESP8266 12F module) and LoRa (LoRa SX1278 Ra-1 module) will be used, since WiFi is a simple, safe, and reliable technology that is massively used on Earth.We also propose LoRa, since it is a technology that uses relatively little energy compared to others, and also has a range greater than 10 km (6.24 miles).
This is required since during the Martian walks the astronaut can have voice commands activated and from there, communicate with the Earth without any problem , obviously with their respective time delay due to the distance between both planets. In addition, to communicate with very low latency between Mars-Mars.

For missions with a range greater than 10 km (6.25 miles), LoRa repeater stations will be installed powered by a solar panel in conjunction with a battery.

Another way for sending data is through an optical link. This would consist of coding messages in Morse code, and sending them as light pulses through the free space (FSO). Is clearly seen that this technique will have some issues because it needs a free sight line to provide an effective link. To solve this other problem, we propose the use of multiple channels to transmit (a redundant system) and a bug fix code above the link satellites. The bug fix code will take advantage of the multiple light signals to establish a comparison between all the recepted messages, and we will also consider the last probabilistic data provided by different space agencies, about asteroids surrounding the area and space junk. Because of the simplified coding method, it would reduce latency.