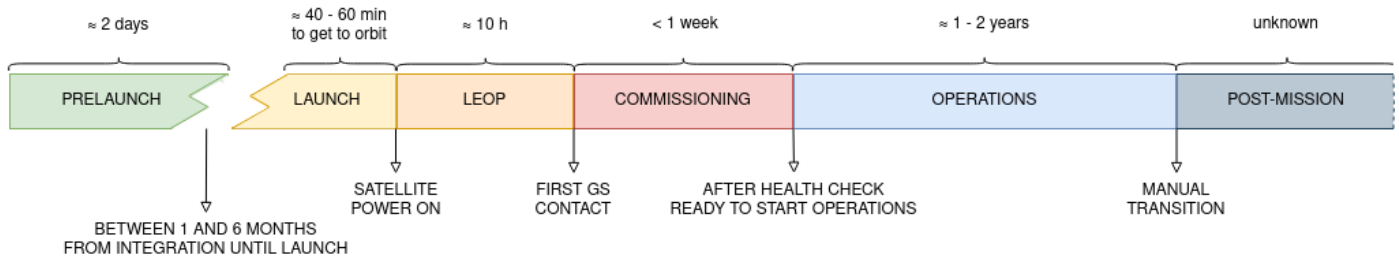


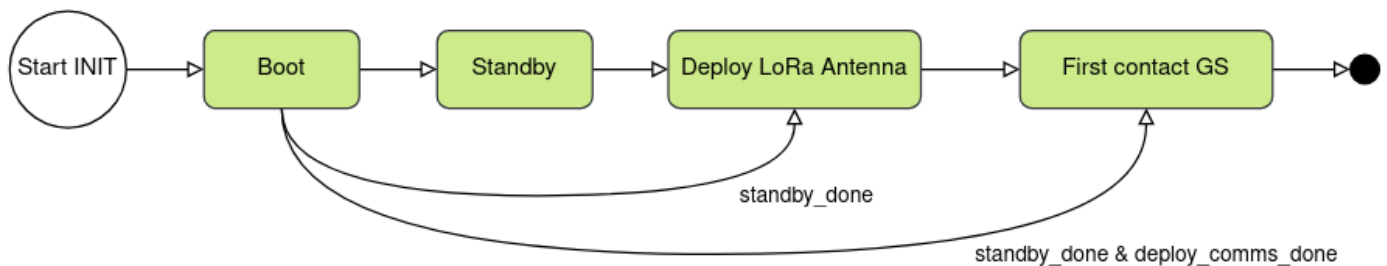
Mission Timelines

Mission phases are divided into Prelaunch, LEOP, In-orbit Commissioning, Operations, and Post-mission. The mission phases and the expected duration of each of them can be observed in the following picture.



1. Activation sequence

The activation sequence encompasses the first two flight mission phases, which correspond to the LEOP and In-Orbit Commissioning phases. The LEOP phase is entirely performed automatically and is executed solely by the Init mode.



After the satellite is released into space by the deployer, the kill switches are depressed, and the satellite is powered on, causing it to enter the Init state. According to the requirements, the satellite remains in standby for 45 minutes before commencing operations. Once this time period is completed, the deployment of the COMMS antenna begins. After the deployment process is finished, the satellite starts sending periodic beacons and awaits the reception of a telecommand from the ground segment to exit the Init state and start operations.

Two different flags can be activated to skip certain steps. The *standby_done* flag is activated once the standby period is complete, while the *deploy_comms_done* flag is activated through a telecommand sent by the ground segment, confirming that the deployment has been successfully completed and that communications are feasible. Both flags must be deactivated during the activation sequences; however, in the event of a system reboot, they can be used to facilitate a faster recovery of the system.

When the first contact with the ground segment is achieved, the operators can check the state of the satellite through the HK information provided by the beacons. Those parameters, such as the battery level, the satellite temperatures, and the stabilization of the satellite, among other parameters, are checked. If everything is as expected, the operator will send a "PING" telecommand to the satellite, triggering it to exit the Init mode and transition to the Nominal Mode.

In the Nominal Mode, two actions from the operator's side are essential to guarantee the proper functionality of the satellite. These are the upload of the current timestamp to ensure the correct synchronization of the satellite with the ground segment and the upload of the TLE information to allow the satellite to correctly perform AOCS tasks and achieve proper pointing.

At the same time, the task in charge of the payload gets activated. This allows for the deployment of the payload antenna and the scheduling of some test experiments to perform calibrations and upload the proper configurations of the payload for its correct functioning. Once everything is ready, it will be possible to transition to the Operations phase, which will consist of scheduling new experiments at the desired times to start the collection of data at the desired locations.

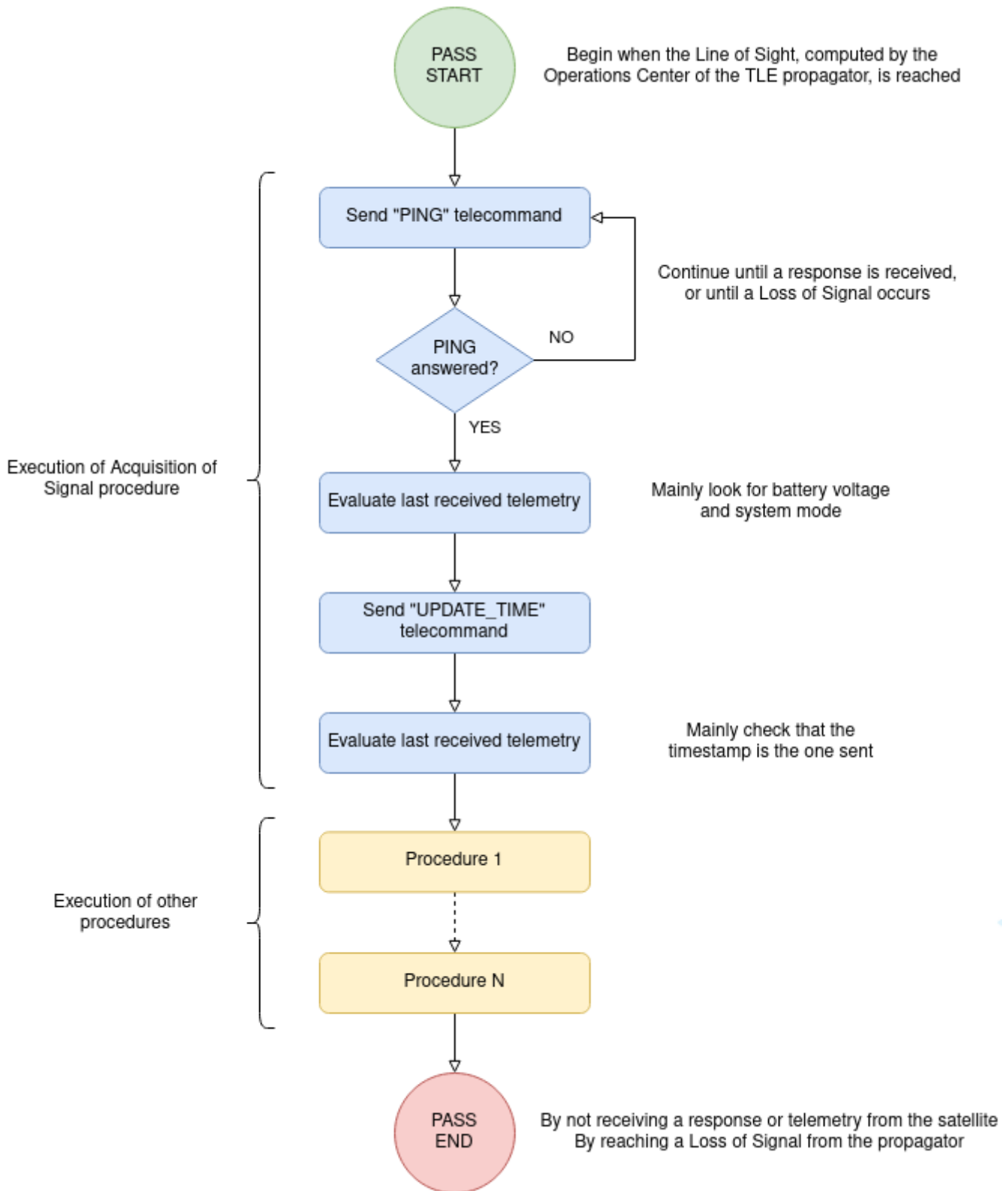
However, in the case of low battery, the satellite will transit to the Nominal mode upon exiting the Init mode and, immediately, transit to the Contingency mode or another mode of lower power consumption. In this case, the upload of the timestamp and the TLE is also needed, as it will allow the satellite to correctly position itself with respect to the Sun to optimize the charging of the batteries.

Once the battery level is adequate, the operator will send a telecommand to transition the satellite to Nominal mode and perform the deployment of the payload and the calibrations as mentioned before.

2. Nominal pass timeline

In nominal conditions, each pass is structured around the execution of different procedures from the procedures list. Each procedure should be executable within one pass, achieving granularity for the system. However, in specific cases, it may extend further if needed. Each pass will begin with the Line of Sight predicted by the TLE orbital propagation.

At the same time, each pass must start with the Acquisition of Signal procedure, which ensures valid communication between the ground segment and the space segment. The operator will then execute the procedure or procedures assigned to that pass. This is briefly depicted in the following figure.



3. Mission critical periods

Under non-nominal mission conditions, the OBSW is designed to operate in a safer mode and to recover from failures. This includes scenarios such as low battery capacity, software errors, and failed attempts to deploy antennas.

In the event of low battery capacity, the satellite automatically transitions to a low-power operational state. During this transition, the microcontroller reduces the CPU frequency to decrease energy consumption. Concurrently, high-energy tasks, such as nadir pointing and payload experiments, are halted. The satellite will then orient itself aligning its solar panels toward the sun to maximize battery charging. It will remain in this state until new instructions are received from ground operators.

Additionally, in the case of software errors or incorrect parameter readings, the OBSW is equipped to handle these issues and recover automatically. If the errors are significant, the satellite will switch to a safer mode and notify operators through information incorporated

Revision #1

Created 15 November 2024 18:20:21 by artur.cot

Updated 15 November 2024 18:20:42 by artur.cot