Newsletter n°2

20 January 2010

HAPPY NEW YEAR!

The OUFTI-1 team wishes you all the best for 2010.
This newsletter focuses on a crucial and challenging aspect of the project: telecommunications. After a brief review of OUFTI-1 telecommunication system, work performed and in progress regarding the on-board COM subsystem, as well as on the ground segment and the D-STAR repeater, is presented.

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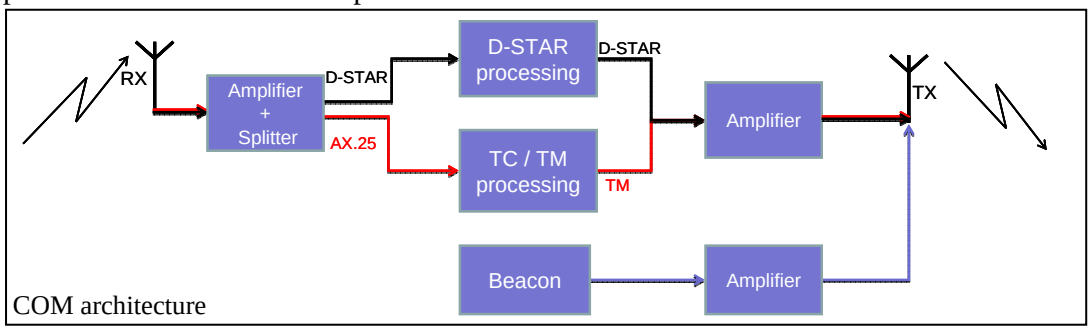
COMMUNICATION SUBSYSTEM (COM)

Three different means of communication are implemented on board OUFTI-1: a beacon, a classical radio link, and a D-STAR link. Each of them has its own purpose and specificities, as described below.

The beacon is a safety signal. It continuously transmits the "Hi Hi OUFTI-1" sentence (which permits to identify our satellite) followed by twelve crucial parameters which indicate the general state of OUFTI-1. The whole message is encoded in Morse-code. This code has numerous advantages: simple, well-known all around the world, and easy to decode even in difficult transmission conditions. Thanks to these characteristics, only little power will be needed to transmit the message, and ham-radio operators all over the world will be able to collect and send us the telemetry.

The classical radio link will be used by the ground station to send telecommands to the satellite ("Rx"), and by the satellite to send telemetry to the ground station ("Tx"). These two functions require a well-known and widespread protocol, so AX.25 (an amateur-radio protocol) was chosen.

The D-STAR transceiver (emitter + receptor) constitutes the payload. D-STAR is an amateur-radio telecommunication protocol. Its key features are to be digital, to permit simultaneous transmission of voice and data, and to permit roaming through the internet. OUFTI-1 will be available for ham-radio operators to test D-STAR in space.



COM architecture

Combining these three different signals on board a single (and so small) satellite is technically challenging! But the team is quite proud to have found a solution. An overall architecture for the COM subsystem has recently been fixed. It involves two micro-controllers for the processing part (one for AX.25, one for D-STAR). The beacon will be independent of these microcontrollers, in order to be more reliable. For the radio-frequency part, one amplifier will be used in reception, followed by a splitter which will separate the signals. Two amplifiers are needed in transmission: one for the low-power beacon, and one for higher power transmission in D-STAR or AX.25. This latter amplifier will be homemade, as no commercial component was found suitable.

More details about D-STAR.

GROUND STATIONS

We are currently working hard to have our two tracking stations finalized as soon as possible. The main one, located at the University of Liège, is waiting for its antennas to be installed on the roof of the Montefiore building. A backup station is also being set up at the Euro Space Center of Redu in collaboration with the amateur radio community.

Meanwhile, the development of the control software, started last year, continues with two students involved. The current software architecture is partially redefined in order to meet new requirements, and to be more easily integrated with other software components, specifically the scheduler. The automatisation of the mission control system is indeed our current priority. We are trying to build the system as flexible, but also user-friendly as possible, these two goals being generally antagonistic. Different solutions are under study, with current preference for scripting languages.

D-STAR REPEATER

The D-STAR repeater, which took several temporary forms at various locations, was completely overhauled. A new tower and antenna were installed on the roof of the PCC building of the ULg. New rack-mounted PCs were installed for the gateway and other uses. The installation now looks quite professional. The above re-design of the repeater was done taking into account its interplay with the tracking system of the satellite.

New tower and antenna

The D-STAR repeater is now fully operational on 2m and 70cm bands. The synchronization of the gateway with the trust server is in process. Next instructions from the trust server support team are awaited with impatience in order to offer again the possibility of roaming through the internet.

Current status of the repeater on OUFTI-1 website

NEXT NEWSLETTER

The next newsletter is planned for 20 March 2010. It should present the first results of the new semester. Most of students will work full-time on OUFTI-1 from February, so things should evolve quickly. In the meantime, news and information can be found on the OUFTI-1 website: www.oufti.ulg.ac.be .

The OUFTI-1 team is pleased to collaborate with numerous partners and thanks them for their support.

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