EuroNGI

Internet Links for/with Spacecraft

Klaus Schilling, Marco Schmidt

Abstract

The application perspectives of using internet protocols (IP) in space attracted significant development efforts in projects like CANDOS and OMNI [1], or investigations from CISCO [2]. These missions contributed significant steps of using standardised internet components in the space environment. These developments benefit from the elaborately tested and already available solutions from terrestrial networks, but nevertheless raise additional challenging requirements specific to space applications due to signal propagation delays and increased noise levels.
The University of Wuerzburg contributed the dedicated satellite UWE-1 for this research purpose in the framework of the cubesat program [3]. UWE-1, the University Wuerzburg´s Experimental satellite was launched on the 27th of October 2005. One of his main objectives was the execution of communication experiments in space regarding different adaptions of protocol parameters [4]. This mission has proved in orbit, that the experiments with internet protocols on a pico satellite can provide interesting results at very limited costs.
This opened now interesting perspectives to further develop the UWE platform to realise more complex scenarios of IP in space. That development is very important for the next generation of pico satellites, where a swarm consisting of several pico satellites is to be realised. This way, payloads can benefit from the related distributed sensor networks in space for fault tolerant, robust remote observations. In this way, virtual instruments can take advantage from satellite motions and long baselines resulting in a high resolution after data processing. In this case, usage of standard internet algorithms is very helpful to guarantee a stable, robust and flexible connection between satellites and the groundstation.

References

[1] Keith Hogie, Ed Criscuolo, Ron Parise. Using standard Internet Protocols and applications in space. Computer Networks 47(5)

[2] Lloyd Wood, Will Ivancic, Dave Hodgson, Eric Miller. Using internet nodes and routers onboard satellites. In International Journal of Satellite Communications and Networking, September 2005.

[3] Barza,R., Y. Aoki, K. Schilling. CubeSat UWE-1 – technology tests and in orbit results, 57th International Astronautical Congress, October 2006, Valencia (Spain)

[4] Marco Schmidt, Florian Zeiger, Prof. Dr. Klaus Schilling. Design and Implementation of In Orbit Experiments for the Pico Satellite UWE-1, 57th International Astronautical Congress, October 2006, Valencia (Spain)