Degoras Project: A libre software and hardware for satellite laser ranging stations

Vera-Herrera, J. Relinque, J. Marín, M. Larrán, M. Sánchez-Piedra, M. Catalán
Royal Institute and Observatory of Spanish Navy, San Fernando, Spain

Degoras Project (Debris and Geodetic Ranging System Project; DP) is a modern libre software and hardware system, currently in development, for the control of SLR stations. The aim of this project is to have a system that can be integrated into any station without much effort. This way, stations with obsolete systems with high coupling could take a step forward. The software includes a core that acts as a service or daemon (DP Core)and different user-friendly GUI applications that interacts with this core. These applications cover all the functionalities, such as space objects and files management, predictions generation, tracking and control subsystem, data analysis, as well as other secondary functionalities. The different GUI applications can be accessed from the main application (DP Station Control). The software can be integrated into different stations by using a dynamic system of plugins and interfaces. The hardware consists of a FPGA-based Range Gate Generator (DPRGG), responsible for maintaining real-time control of the station. This equipment, among other functionalities, maintains the real-time clock and generates the operating frequency of the laser devices as well as the gating signals for the photon sensors and lasers. The FPGA has its own embedded control software, so the RGG can operate independently without producing coupling in other systems. Other computers can also command it through a TCP/IP interface. The software is written in C++17 and Python 3, using the Qt5 framework. On the other hand the hardware is developed in VHDL using an Intel Cyclone V SX SoC FPGA and C++14 for its internal control software. The modular design of Degoras Project allows adding new features easily in an optimal way within a collaborative development environment.