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## EVOLUTION OF THE ROSETTA GROUND SEGMENT FOR THE COMET MISSION PHASE

**Abstract**

The International Rosetta Mission was launched on 2nd March 2004 on its 10 years journey to comet Churyumov-Gerasimenko. Rosetta will reach the comet in 2014, orbit it for about 1.5 years down to distances of a few kilometres and deliver the lander Philae onto its surface. Following the hibernation entry in June 2011, necessary due to the large heliocentric distances reached by the solar-powered spacecraft, which prevent full operation of the on-board electrical systems, Rosetta is flying through the aphelion phase of its orbit (5.29 AU in October 2012) returning to the Sun distance of 4.5 AU in January 2014, when it can be reactivated. This period of about 2.5 years without contact with the spacecraft is being used by the mission controllers at ESOC to prepare the ground segment and the operations teams for the new and challenging operations that will start when the spacecraft will enter its main scientific phase at the comet. The whole mission ground segment was designed and developed more than ten years ago and requires now an upgrade to guarantee its operability and maintainability in the crucial years of comet operations. In this respect several activities were conducted to port operationally validated systems to new operating systems and modern hardware. Furthermore, the ground segment is being upgraded to respond to new functional needs stemming from the unique operations planned for the comet phase, requiring an operation concept with more demanding and frequent planning activities than in the past cruising years. For this reason a new whole set of processes, interfaces, and systems are being developed in order to fulfil the mission requirements. The mission planning concept and tools are based on those already successfully implemented for Mars Express and Venus Express, with the extensions and modifications required by the extremely unpredictable and variable comet environment. The planning process at the comet will be mainly characterised by the need of high flexibility in adapting to the varying conditions and by the capability of conducting late (re-)planning activities. The capability of automatic scheduling of ground stations configuration is also being added to the mission baseline, both for ESA and NASA DSN ground stations. This paper presents the activities carried out during the delta-design phase of the Rosetta ground segment, with emphasis on the mission planning aspects. It also addresses lessons learned from the experience gained in the operational ground segment maintenance for this long duration mission.