The Cluster Ground Segment and Operations – maintaining the high quality of services at lower cost –

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The Cluster ground segment mostly consists of that which was built in the early 1990s for the original Cluster mission which was destroyed in 1996.The four Cluster spacecraft were rebuilt and launched in Summer 2000. The Cluster mission has been in its routine operational phase since February 2001. After a data extension phase, which added the upgraded Maspalomas terminal as a second Cluster dedicated ground station to the original VILSPA-1 station the mission is in its second extension phase and preparing to fly up to end 2009.

The operational concept of Cluster is presented with emphasis on services to the user community such as: response time, monitoring of quality of operational service such as publishing the science data return ratio and anomalies in the space and ground segment.

With a considerable re-design and upgrade of the ground segment the annual mission costs for the additional 4 mission years could be reduced by 25% while maintaining the prime requirements of the mission. The re-design and upgrade is subject of the paper presented. It is shown how a combination of greatly differing measures can lead to this considerable reduction in cost: Moving the ground station support from VILSPA-1 to Perth takes advantage of the orbit evolution and allows reducing significantly the staffing of Spacecraft controllers. By making use of redundancies and margins in the space segment, sharing of the Perth station with the XMM project is possible. To share the station between two projects is facilitated by the migration from the old telemetry processors (TMPs) to the new generation Telemetry and Telecommand System (TMTCS). The TMTCS also allows a more cost efficient tailoring of ground station support time, because the station is not blocked by Cluster during the data transfer time to ESOC. The migration of the old VAX based control system to more powerful ALPHAs reduces the number of machines considerably and the maintenance costs.

Last but not least, the technical evolution of the Internet during the last 10 years paves the way for reducing the communication costs of the decentralised planning process and the distribution of the science data without producing and mailing 80000 CD-ROMs per year to a widespread user community.