

SPACE DEBRIS SYMPOSIUM (A6)
Space Surveillance and Space Situational Awareness (5)

Author: Dr. Holger Krag
European Space Agency (ESA), Germany

SERVICES, DESIGN DRIVERS AND SOLUTION CONCEPTS FOR A EUROPEAN LEO SPACE
SURVEILLANCE SYSTEM

Abstract

Europe is preparing for the development of an autonomous system for space situational awareness. One important segment of this new system will be dedicated to Surveillance and Tracking of space objects in Earth orbits. First concept and capability analysis studies have led to a draft system proposal. This foresees, in a first deployment step, a groundbased system consisting of radar sensors and a network of optical telescopes. These sensors will be designed to have the capability of building up and maintaining a catalogue of space objects. Based on these capabilities a number of related services will be provided including collision avoidance and the prediction of uncontrolled reentry events. For the time being, the user requirements defining the different services and the accuracy and timeliness which the different services need to comply with, are in a consolidation process. Parameters like the lower diameter limit above which catalogue coverage is to be achieved, the degree of catalogue coverage in various orbital regions and the accuracy of the orbit data maintained in the catalogue are important design drivers for the number, location and performance of the various sensors. Further, the required minimum time for the detection of a maneuver, a newly launched object or a fragmentation event, significantly determines the required surveillance performance. In the requirement consolidation process the performance to be specified has to be based on a careful analysis which takes into account accuracy constraints of the services to be provided, the technical feasibility, complexity and costs. User requirements can thus not be defined without understanding the consequences they would pose on the system design. This paper will outline the design definition process for Surveillance and Tracking segment. It will present the core user requirements and the definition of the services that are derived from these. The desired performance parameters will be explained together with their rationale and justification. This will be followed by an identification of the resulting major design drivers. The influence of these drivers on the system design will be analysed, including limiting diameter, catalogue coverage, orbit maintenance accuracy, minimum time to detect events like maneuvers or breakups. The underlying simulation and verification concept will be explained. Finally, a first compilation of settled performance parameters for the surveillance and tracking segment will be presented and discussed.