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INTEGRATION AND VALIDATION OF NEO SYSTEMS WITHIN THE ESA SSA PREPARATORY PROGRAMME

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ABSTRACT

The implementation of the future European Space Situational Awareness (SSA) operational capability is being prepared through the SSA Preparatory Programme, which includes the delivery of a series of precursor services in the area of NEOs.

The Programme is implemented in successive periods. Period 1 (P1) started back in 2009 with the analysis and evaluation of existing NEO assets and the design of the SSA NEO segment. As a result, the initial NEO system was integrated based on three main European assets: 1) the NEO Dynamic Site (NEODyS) system of the University of Pisa/SpaceDyS to compute high-precision orbits and perform impact monitoring, 2) the priority list developed by INAF/Rome to monitor NEOs in need of observations, and 3) the physical properties database of the EARN (European Asteroid Research Node). A virtual environment was decided to host the NEO systems, consisting of a set of VMware ESXi servers and an associated redundant storage unit. They are located in the SSA-NEO Coordination Centre (NEOCC) at ESRIIN and are accessible via a web portal at <http://neo.ssa.esa.int>.

From a Data Systems (DS) perspective, the 2012-2016 Period 2 (P2) has mainly addressed the migration of the enhanced NEODyS system to the NEOCC. The enhanced system takes into account non-gravitational perturbing forces for orbital evolution as well as the new DE431 JPL ephemerides data and a new observation error model for orbit determination and impact risk assessment. Other P2 DS activities have focussed on enhancing the NEO services through the provision of tools for experienced users (observation planning tool, impact location displayer, and orbit and Flybys' visualisers) and the general public (visualisation tools for object positions in a format to be utilized by the media and general educational tools). Major challenges have been the hardware procurement and integration in the NEO segment architecture, and the software integration and validation at system level.

Next 2017-2020 Period 3 main DS activities are related to observational support, information provision, mitigation, and development support. Specific goals for this period are the set-up of an impact effects database, software development for Telescope data processing, and completion of the NEODyS migration.

In this paper, we describe the progressive integration along with the test and validation process performed for the overall NEO systems. We also present the main challenges from the DS point of view to be faced in the transition from P2 to P3.
