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BLOCKCHAIN ENABLED SPACE TRAFFIC AWARENESS (BESTA)

Abstract

Today, satellite launches, on-orbit operations, and deorbiting by space faring countries is manual-intensive and safe. However, projected increases in both number of space faring nations, and volume of space traffic, will strain these processes and operations, and require increased stakeholder coordination and automation. Stakeholder coordination requires situational awareness of the current orbit and position of satellites, launch paths through the atmosphere, and deorbit paths at end of life. Today, situational awareness of orbits is expressed in the USSTRATCOM space catalog, where objects are screened and potentially updated at least daily.

Maturation of current launch, orbit, and deorbit lifecycle processes and operations into Space Traffic Management (STM) requires not only USSTRATCOM orbital data in the current space catalog, but also orbital data from commercial launch and payload companies, academic and lab observations, and all space faring nations. Today, this data is provided in siloed services with independent access rules. Beyond orbital data, launch paths through the atmosphere, and deorbit paths must be included.

STM situational awareness must be useful for space operations in a tactical timeline, versus a post-mortem autopsy, and must remain current and relevant during expected and unexpected circumstances. STM situational awareness also must be extensible to include new data types and sources, with access for all stakeholders to access data once written. This expanded definition of situational awareness tracks assets from ground to space and back is challenged by the need for data collection and sharing among a diverse and increasing number of stakeholders. The classic approach is to create a new repository, owned and operated by a single stakeholder. Yet, as number of data types and stakeholders increase, so does distrust of the single owner and operator.

BESTA (Blockchain Enabled Space Traffic Awareness) is proposed as both an extension to the current catalog, and as an alternative to the single owner / operator model. Blockchain technology is uniquely suited to enable reading and writing among all STM stakeholders, by providing trust that data is cryptographically linked to the originator, and that data cannot be counterfeited, changed, or destroyed. Blockchain provides the opportunity to streamline stakeholder relationships, shortening timelines for capturing data, and provides a secure foundation for increased automation. BESTA is an extension of current MITRE permissioned blockchain research and prototypes, including capturing orbital element sets from space sensors. BESTA is based on open source technology, and proposed as an internationally governed effort, usable by all stakeholders.