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OPEN SPACE BOX: COMMUNICATION TO SUPPORT BIG DATA IN ORBIT

Abstract

Big Data is the reality created by the fusion of computers and progressively improving sensor technology. The data created by the use of sensors, scanners and in general, which is needed for a mission or operations, is growing dramatically, on an annual basis.

The idea of denormalization applies to all sorts of data now. Open Space Box presents a novel model of communications to support future data transmission needs. This Big Data processing technique facilitates the analysis, storage and processing for needs that we presently have and potential future needs. Open Space Box provides direct NoSQL to NoSQL data transmission, allowing a single virtual database to span multiple orbital and terrestrial locations.

The autonomic nature and pervasive (shared between all spacecraft) data context enables a single factual view. Thus, from a user's or application developer's perspective it doesn't matter (except, of course, for the local hardware, sensing capabilities and other resources available) whether the application runs within a single space craft or across a few in similar orbited. Moreover, excepting sensing requirement fulfillment, it does not matter, what the trajectories of these spacecraft are. It is a known fact a Nano Satellite or CubeSat has rather limited lifespan. In addition to scheduled mission conclusion point, an unknown peril, such as a collision with space debris or some other object might terminate the mission of this small space craft or damage or destroy the equipment used to capture, process and transmit data.

Communication to and from a small spacecraft can be at an extremely slow Baud rate, means both sending and receiving any communication will take some time to egress and ingest, the ETL (Extract, Transform Load) tools designed to transmit and receive data needs to have a base protocol, which is flexible. The Open Space Box (OSB) model provides this base for smaller spacecraft to provide users data in a fashion that is pervasive within satellites as well as the ground stations. It also autonomically distinguishes between data streams and disseminates relevant information to the related end users. Request and Response messages are sent in batch mode and communications are done using Map Reduce.