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Author: Mr. Ozan Kara
Koc University, Türkiye

Mr. Burak Yaglioglu
TUBITAK Uzay, Space Technologies Research Institute, Türkiye
Ms. Melanie Brunner
United States
Mr. Dario Schor
University of Manitoba, Canada
Mr. Roger Birkeland
Norwegian University of Science and Technology, Norway
Mr. Thomas Smith
United States
Mr. Andreas Hornig
University of Stuttgart, Germany

COMMUNICATION ARCHITECTURE AND INTERNATIONAL POLICY RECOMMENDATIONS ENABLING THE DEVELOPMENT OF GLOBAL CUBESAT SPACE NETWORKS

Abstract

Emerging technologies of CubeSat communication and navigation systems enable new approaches such as larger bandwidths, spectrum and security decrement and high speed communications. In order to create a vantage point, young professionals and students from the four corners of the earth had performed a comprehensive study at the 2014 Space Generation Congress in Toronto, Canada under "CubeSat Swarms – Communication Networks and Policy Challenges" working group. While potential possibilities are endless for the structure of Cubesat networks, decisions made amongst the group were based on existing technologies and guidelines. Therefore, the working group discussed (1) short and long term technical challenges (2) policy requirements, (3) radio communication bandwidth limitations, (4) data collection and transmission regulations and (5) the standardization of the CubeSat communication system. Technical challenges for small satellite missions involve limitations of link budgets, the size of the deployable high gain antennas, optical and laser communication and the restriction of the link budget due to the interferences. In addition, policy issues have immaturities for frequency allocation and registration complimenting the short lifespan of CubeSats. The standardization of mission operations enables a space communication network architecture that of which is similar to the internet, incorporated into CubeSat Swarms. The group suggests a CubeSat network system architecture including inter-swarm and intra-swarm constellations, optical and laser communications and delay-tolerant networks (DTN). The proposed CubeSat communication network also consists of inter-swarm constellation communications along with intra-swarm constellations sustained through four different basic data links, a mother-daughter satellite framework, and net-neutrality throughout the network. In the meantime, policy regulation recommendations allow global communication by reducing data downlink time. Governments, as well as service providers, treat all data used online the same regardless of its origins, platform, and users. The standardization of the CubeSat network system was formed by operator expectations for high downlink speeds, equal priority for data transfers, and streamlined registrations. The simplified registration process for CubeSat-Swarms

is more efficient by establishing new baseline legal framework, rules, and standards. This would help all users and operators in this sector, including entrepreneurs, licensing bodies, and end-users. Saving time for everyone while achieving maximum efficiency, utilization of the time and results are the end result of proposed system architecture by the working group.