IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Advances in Space-based Communication Technologies (7)

Author: Dr. Inkyu Kim
Korea Aerospace Research Institute (KARI), Republic of Korea

Dr. Sangman Moon
Korea Aerospace Research Institute (KARI), Republic of Korea
Prof. Jongmyung Woo
Chungnam National University, Republic of Korea

THE IMPACT OF GROUND NON-DTN SYSTEM ON TRANSMISSION TIME IN KPLO DTN FLIGHT TEST.

Abstract

The Korea Pathfinder Lunar Orbiter (KPLO) was launched in August 2022. Following the launch, KPLO's Delay/Disruption Tolerant Network (DTN) tests were conducted in collaboration with international partners, including the Korea Aerospace Research Institute (KARI) and NASA's Jet Propulsion Laboratory (JPL) DTN team. During that, various DTN tests were verified, including text transfer, file transfer, and real-time video streaming through multiple ground stations on Earth. However, data transfer latency was observed in the ground system. Many studies focus on BP/LTP analysis between nodes, providing statistical models to estimate accurate file transfer times between them. Previous research has analyzed transmission time between two DTN nodes with statistical mode, but practical environments often include non-DTN systems positioned between nodes. The research is needed to study how non-DTN equipment impacts end-to-end transmission time. In this paper, the non-DTN equipment under consideration is the Real-time Operating System (ROS), which converts received Telemetry (TM) packets into bundle data for transfer to ground DTN nodes. Consequently, the latency of non-DTN equipment is a critical factor influencing the overall end-to-end transmission time. By measuring the latency of non-DTN equipment with various file sizes, we aim to optimize this latency, which is influenced by the packet generation process for bundle data. This paper compares the results of BP/LTP transmission time analysis between nodes, based on existing statistical models, with data obtained from the KPLO DTN flight tests. This methodology provides a new approach to more accurately calculate the end-to-end transmission time in space networks.