

SPACE OPERATIONS SYMPOSIUM (B6)
New Operations Concepts (2)

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LATENCY AS A DRIVER FOR GROUND STATION ARCHITECTURE

Abstract

The purpose of this paper is to highlight the ground station architecture and its relation to the desired system latency. Latency is defined as the time from a received request to a delivered response. The ground station latency is a part of the total system latency, where also factors as reception of requests, data processing and data delivery play important roles. This is relevant for Earth observation, but also other services such as SAT-AIS. In this paper, missions are classified in three categories:

- latency missions requiring more than one ground station contact per orbit

- contact per orbit category

- tolerant category that has more flexible contact profile

The low-latency network with more than one access to the satellite per orbit needs a ground station network consisting of several locations, where the each station can be considered to have a geographical coverage. Typical low-latency applications are Earth observation for security or disaster monitoring, as well as SAT-AIS. The driver for this category is response time. The one-access-per-orbit category is a typical Earth observation mission, collecting images during the orbit and in need of emptying the on-board storage during the contact. The design driver is on-board storage space and data throughput. For the latency tolerant missions, such as Earth science, Climate science and technology demonstration, packet based solutions often referred to as delay-tolerant-networks or IP-in-space is discussed. Data is downloaded when any available ground station is available. This option will be in need for new operational concepts, where functionality is changed in both space and ground segment, as well as the division of functionality between the mission control centre (MCC) and the network management centre (NMC). With the better usage of the ground resources, these solutions are enabling a cost effective option for several smaller mission types.