IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Interactive Presentations - IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (IP)

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LEO CONSTELLATION GROUND STRATEGY & MANAGEMENT

Abstract

The big issue with today's LEO systems? The answer is simple ground infrastructure and smart resource management. Any LEO constellation needs a large number of ground terminals at many locations around the world to manage such a global system. Each specific location with a minimum of two terminals, major sites will have a minimum of three.

Questions: What is the best infrastructure design? How to manage?

Infrastructure: To interface so many terminals and keep it simple then distributed processing is a good basis to begin. Using common "smart" terminal packages with a configurable "black-box" interface is the general way forward. Reliable and simple to manage, setup, test and reconfigure, all remotely. Each Antenna system is then seen as fully independent as a managed node. All identical.

Management: The term now used for such a system is Orchestration or sometimes referred to as a System Resource Manager. This is the core to managing a LEO constellation and is crucial to the running of such a system. Coordinating orbit and satellite availability and capacity. In itself is complex. The design goals of a LEO Orchestrator are:

- Incorporating mobility of the LEO satellite
- Leveraging periodicity in LEO mobility
- Leveraging inter-satellite links
- Compensating for error in mobility prediction of LEO satellites
- Compensating application initialization overhead in the terrestrial orchestration

This leads to a set of unique LEO orchestration challenges such as:

- Mobility of the LEO Satellite
- Inaccurate position prediction

These are further amplified due to the tight coupling between orchestrator the underlying infrastructure which holds true for any other non-stationary satellite infrastructure. This session will aim to look at an approach to infrastructure design and a way to manage. In doing so, will allow the hidden issues that surround the operation of any LEO Constellation to be raised. With a view to looking at what else can be done that will help manage, for example, spectrum issues and efficiency, inter-satellite and inter-constellation radio frequency interference.