Paper ID: 103002
student

IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Extra-Terrestrial and Interplanetary Communications, and Regulations (5)

Author: Ms. Nasira Espejo
Universidad Nacional Mayor de San Marcos, Peru

Mr. ponciano cardenas
INICTEL-UNI, Peru

DESIGN OF A SCALABLE COMMUNICATIONS INFRASTRUCTURE FOR THE FIRST LUNAR CITY

Abstract

The advancement of telecommunications has revolutionized global connectivity, and its expansion into the space environment will be key to the operational autonomy of future missions and the commercialization of services in space. In this context, the Moon, with regions suitable for permanent settlements, stands out as a strategic point for this sustainable expansion. Therefore, it is essential to develop a network infrastructure that facilitates communication among habitats, vehicles, and scientific stations, driving innovations applicable to extreme environments. This research proposes the design of a lunar communications network based on a distributed and scalable infrastructure, using interconnected devices through high-capacity links and protocols optimized for extreme conditions. Its implementation incorporates software-defined networking (SDN) and dynamic traffic segmentation, enabling efficient management adaptable to the needs of different missions and operational requirements. Additionally, intelligent mechanisms are integrated to optimize resource management and ensure autonomous operation. To strengthen the system's security and stability, next-generation firewalls and cybersecurity protocols are incorporated. The design is validated through simulations in virtual environments in order to analyze different operational scenarios and optimize its configuration. In conclusion, this strategic infrastructure for communications on the lunar surface represents a significant advancement that will help reduce the environmental burden on Earth and strengthen communication systems. Likewise, it will guarantee the secure storage of critical data and promote the development of advanced technologies to address global challenges.