IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Advance Higher Throughput Communications for GEO and LEO satellites (3)

Author: Mr. WEI WANG
Institute of Telecommunication Satellite, China Academy of Space Technology (CAST), China

Ms. Lili Yuan
Institute of Telecommunication Satellite, China Academy of Space Technology (CAST), China

RESEARCH ON MODELING AND SIMULATION OF SPACE-EARTH INTEGRATED COMMUNICATION SYSTEM-OF-SYSTEMS

Abstract

The main purpose of System-of-systems simulation modeling is to measure the contribution of equipment to the overall effectiveness of the System-of-systems. Space-Earth Integrated Communication System-of-systems exhibits significant characters of large scale, large number,various types of communication units and complex environment.In order to meet the industrial development of Space-Earth Integrated Communication, it is urgent to carry out research on System-of-systems Modeling, Simulation,and index evaluation. It brings great challenges such as simulation confidence requirement, extraordinary contradiction between simulation precision and efficiency, and high requirements of generalization level on simulation model. In this work, the simulation methods, simulation models, simulation technologies and simulation applications are intensively studied for the System-of-systems combat for Space-Earth Integrated Communication.This paper proposes the model construction ideas, thoroughly investigates the three dimensions of model construction in System-of-systems: Elements,correlations, and operation environments in System-of-systems,and forms a set of modeling framework of System-of-systems simulation model. This model can provide a foundation for the simulation and deduction of Satellite Communication System-of-system. And a multi-level Simulation model architecture is proposed base on inter-hierarchy modeling methodology, which broke through the key technologies of universal code framework design, optimization of satellite communication full link simulation efficiency, decoupled optimization of simulation flow for satellite resource allocation under different systems. The simulation indexes and results presents the characteristic of high-dimension,high-redundancy, and high-relationship, and a resonable reduction of indexes and efficient neural network model for effectiveness evaluation are introduced.With the comparison between simulated data and measured data, the validity of the model is verified which provides a solid support for the communication System-of-systems simulation.The research results provide an integrated solution of System-of-systems simulation platform, and an application of Space-Earth Integrated Communication System-of-systems Modeling and Simulation is presented and verifies the research results.The modeling idea and inter-hierarchy simulation methods embodied in this dissertation can also be extended to other satellite System-of-systems application.