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A METHOD OF RESEARCH OF SELECTED PROCESSES IN SATELLITE NETWORKS ROUTING DATA PACKETS ON THE BASE OF TWO ACCURACY LEVEL SIMULATION MODELS

Abstract

In this work we consider data packets routing satellite networks built on constellations with orbits of different altitude. Initial stages of designing of such networks require methods and models suitable for quick analysis of many variants of their organization.

While designing satellite networks, research of routing and changing of the load at nodes is of interest. Here, either the analysis of influence of these processes on the functioning of the whole network is needed or only analysis of functioning of certain elements of the network or selected processes can be sufficient. For a symmetrical network and no strong imbalances between the load coming into and out of the network, for a number of problems it is enough to investigate only certain "typical" processes in it (by "typical" we shall understand one of the many similar). The outcomes of investigating of a typical process or element can be applied to all other processes or elements of the same kind. Among such processes there are data flows between terminal users of the network or processes of functioning of a node. In this work, a method is proposed for analysis of network processes based on joining models of different accuracy in one model.

In particular, a method of analysis of satellite network based on joining two models with two levels of accuracy is presented. The background model represents a simplified model of the whole network and implements a simplified approach to modeling the current topology and changes of the load at the nodes. The second model is more accurate. It is used for analysis of selected processes and is superimposed over the background model. In this model, network processes are modelled with the accuracy of the length of the packets. Several modifications of such models have been developed for satellite networks based on constellations deployed at different altitudes: for analysis of processes at a node or several subsequent nodes; for investigating routing via a virtual channel; for datagram routing. In these models the selected processes are modelled with the accuracy up to the lasting of packets and their current location in transmission through the network. The delay of a packet at a node is determined by the background network. The presented method can be useful at the early stages of designing of satellite systems and for methodical or algorithmic working out of functioning of particular nodes or processes in the network.