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Dynamic Multipath QoS-Routing Modeling using Tensor Approach

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Nowadays development of telecommunication networks (TCN) is characterized by introduction the increasing number infocommunication services and associated technological means of improving the Quality of Service (QoS) of end-users. An important place in the list of such methods is given to QoS-routing over multiple parameters (average delay, jitter, packet loss probability and performance of TCN as a whole). However, existing technological and routing solutions based mostly on insufficient mathematical models and methods (graph models, method of finding the shortest path), that do not take into account the characteristics of packet flows making it difficult to control and prevent communication links overload.

In this research was obtained the new dynamic presentation of tensor model for multipath routing with QoS guarantees over multiple parameters. The model is based on the flow-based conservation law. The expressions for different queuing systems modeling state of the network router interface [1] used for representing the average packet delay as time-varying function. Conditions of ensuring QoS for the set of parameters as packet transmission rate and average delay obtained in the same way as in [2]. The novelty of the model is that the network metric is a function of time, i.e. it takes into account that the average queue length and the average delay take their limit values not instantly, but after some time (convergence). As was shown by simulation, this time is within the range of few to tens of seconds. Thus, using the proposed model allows more adequate describing the routing process in terms of packet transmission rate and average delay. Proposed model can be used in calculation of important network parameters (average packet delay, network utilization), and can be the basis for a new QoS-routing protocols in modern multiservice networks.

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