Multicriteria Approach for Choice Routes

Bezruk Valery, Varich Vyacheslav

Abstract - **There are practical features of multi-criteria approach for solving the problem of optimal routing in a multiservice network in this article. For solve this problem in the theory of decision-making using the multi-criteria approach - a selection of some properties of objects (features), them evaluation and decision by results of the comparisons. Network model is chosen.**

Keywords – **Pareto optimal route, multicriteria, weight method.**

I. INTRODUCTION

In the modern multiservice network increas volumes of diverse information. It is transfered by modern multiservice network with a guaranteed quality. This case determines the need to search more advanced approaches for planning and traffic management in the multiservice communication networks. It is necessary to use the multicriteria optimization methods for solving the routing problem in such communication networks.

II. PROBLEM STATEMENT

A set of feasible solutions (routes) on the finite network graph is given $G = (V, E)$, where $V = \{v\}$ – set of nodes, $E = \{e\}$ – set of network lines. Each route x defined by a subset of nodes and links. Optimal decisions is the model $\{X, F\}$ x^* In routing, where $X = \{x\}$ – set of feasible solutions (routes) on the network graph $G = (V, E)$; $F(x)$ – objective function of choice of routes; x^* – optimal solution of the routing problem. In the multi-criteria approach for choosing the best routes relies to perform decomposition of the function $F(x)$ by set (vector) partial choice functions. In this case there is vector objective function on the set X:

$$F(x) = (W_1(x), \mathbf{K}, W_j(x), \mathbf{K}, W_m(x)), \qquad (1)$$

these components determine the values of quality routes indicators [1].

III. FEATURES OF CHOICE PARETO-OPTIMAL ROUTES

Particulars of choice Pareto-optimal routes consider taking into account a set of quality indicators [2]. We propose to solve the problem of finding Pareto-optimal routes using weight method [3].

It is extreme values of the objective route function as a weighted sum of partial choice functions for all possible values of the weighting coefficients λ_j:

$$\underset{\text{var } x \;\; X}{\text{extr}} \; F(x) = \sum_{j=1}^{m} \lambda_j W_j(x) \qquad (2)$$

The coefficients λ_j describe the relative value of quality routes indicators, and $\sum_{j=1}^{m} \lambda_j = 1$.

Pareto-optimal routes have some characteristic features. Particularly, Pareto-optimal alternative routes correspond by Pareto coordinated optimum partial objective functions $W_1(x), \mathbf{K}, W_j(x), \mathbf{K}, W_m(x)$. Pareto-optimal alternatives of routes are equivalent to the criterion of Pareto and it can be use for organize multipath routing in the multi-service communication networks. Fig. 1 shows subset of the Pareto-optimal routes. It is shown in the space of two indicators of quality and selected by triangular badges.

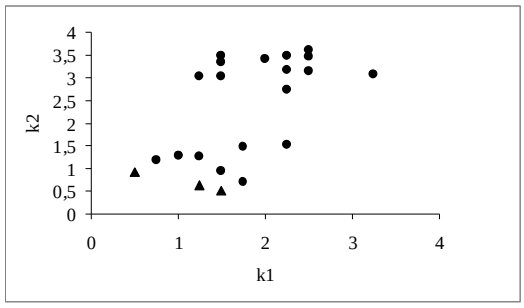

Fig.1 Set of variants routes in the network

IV. CONCLUSIONS

We considered the practical features of multi-criteria approach to the solving problem of routing in multiservice network. The optimal solution is a subset of the Pareto-optimal alternative routes. This subset can be use for organize multipath routing by using MPLS.

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