Intellectual Mobile Ad Hoc Networks

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Abstract – **In this article intellectualization of Mobile Ad Hoc Networks resources management is offered. It was proposed decomposition of the primary goal of MANET functioning into easy subgoals, and fragment of the MANET node target structure is presented.**

Keywords – **Mobile Ad Hoc Networks, dynamic topology, intellectual control system.**

I. Introduction

Today, the rapid development of wireless networks is observed in all areas of social activity: LANs, broadband radio access networks, emergency networks, etc. The example of above-mentioned networks is Mobile Ad hoc Networks (MANETs) – 4G high-speed radio networks. MANET is a collection of mobile nodes with wireless communication device, which are able to join into the network without previously deployed infrastructure. Distinctive features of MANET networks are dynamic topology, decentralized control and heterogeneity of network elements.

Space, frequency, code and time – are the four main components that determine the distribution of total radio resource in radio networks. In [1] proposed a new approach to radio resource management, which provides dynamic distribution of frequency spectrum and was called "cognitive radio". This approach is characterized by nodal control system that can collect and measure information about radio medium and dynamically configure transceiver parameters according to the radio medium parameters. However, having regard to the MANET characteristics, besides radio resource management, it would be advisable to intellectualize other important control problems for example the choice of an alternative network that mobile nodes can be connected, the routing, topology, data flow and security control and others [2].

II. Intellectualization Of MANET Resources Management

The main problem in the MANET management is a necessity to select the set of possible management decisions depending on the situation in the network, and quality requirements for the transfer of a certain traffic types. In addition, MANET management requires significant amounts of ordering information, which requires considerable time for its collection and processing, and also making management decisions based on such information.

Therefore, in [2] a model of intellectual control system for MANET node was proposed. The main architectural feature that distinguishes the proposed intellectual control system built on the "cognitive" scheme consist in the presence of a knowledge base which contains information about the targets of the nodal control system, as well as rules of decision on the choice of node "behavior". Intellectualization of routing processes, flow control and topology processes ensure adaptation of the nodes to the MANET conditions, which are characterized by uncertainty of radio medium.

In general, managerial decision making consist in analyzing the current state of radio network, and on its basis determines the value of controlled variables, which implementation allows providing a given quality of service in MANET (C_1 – the primary goal of MANET functioning). However, considering decentralized management and presence of conflict between optimal information awareness of the nodal control system and control impacts timeliness, it was proposed decomposition of the primary goal into easy subgoals (C_{km}). For this purpose the target structure is constructed as a graph, whose nodes are the goals and arcs represent the influence of achievement goals in subgoals (Fig. 1).

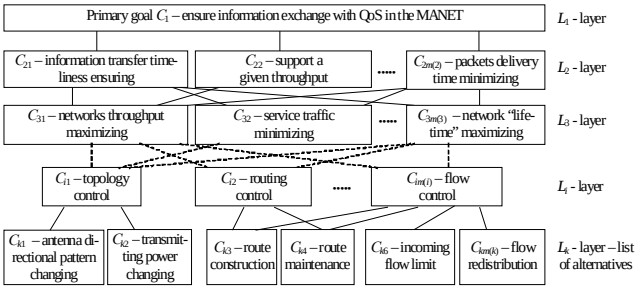

Fig.1 A fragment of the MANET node target structure

Implementation of decisions, adopted by the control system, is based on the requirements for information exchange and is achieved by using combination of methods and algorithms that provide interlayer interaction within the OSI model. For example, if there are several alternative networks, nodal control system can perform optimization of convolution indicators in order to choose the most optimum network for the user by the cost of services and service quality criteria.

III. Conclusion

In this paper intellectualization of MANET resources management is offered. Implementation of the proposed approach will allow reducing user's costs for communications services, automating the decision-making process of nodal control system, and improving the performance of the MANET.

References

[1] I.F. Akyildiz, W.Y. Lee, K.R. Chowdhury, "CRAHNs: Cognitive radio ad hoc networks", *Ad Hoc Networks*, vol. 7, 2009, pp. 810 – 836.

[2] О.Я. Сова, В.А. Романюк, П.В. Жук, "Интеллектуальные самоорганизующиеся радиосети", *Международная Крымская конференция технологии*", Севастополь, 2011, С. 43 – 44.

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