Specifying Dynamic Routing Protocol in a Form of CPN

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Abstract - **BGP-E6 dynamic routing protocol is developed for autonomous systems and back-bone networks based on innovative E6 protocol stack. Base algorithms specifications are presented in a form of Colored Petri Nets. Simulation of the model proves the protocol's correctness.**

Keywords - **E6 protocol stack, UA-E6 , BGP-E6, CPN, Specification, Distance-vector routing**

I. INTRODUCTION

E6 protocol stack is introduced in [1] . The concept of E6 consists of following key points: implementation of flat network addressing using 6 byte addresses for 2^{16} times increase of the address space in comparison to IP v.4; utilization of headers with format similar to Ethernet for compatibility with majority of existing networks and also for addressing in both local and global networks; usage of standard LLC 1 and 2 Ethernet extension headers for datagram and guaranteed delivery functions. Described features of E6 are intended to increase the efficiency of networks. Set of correct and effective dynamic routing protocols is necessary for E6 protocol stack.

II. BGP-E6 SPECIFICATION

E6 protocol stack is specified in a form of Colored Petri Nets (CPN) in [2]. On the first stage of stack development the existing routing protocols are supposed to be adapted. BGP-E6 is developed as distance-vector protocol for autonomous systems and back-bone networks; it is an adaptation of BGP [3], [4]. The protocol correctness is verified. Base algorithms specifications are presented totally in a form of Colored Hierarchical Petri Nets. The specification of BGP-E6 in a form of CPN consists of components: model of routing table control, input and output messages queues models, and models of router and network – interconnected hierarchically according to the introduced order.

The model of routing table control, Fig. 1, describes the algorithm of addition, extraction and updating of records. It performs the cyclic comparison (transitions "put chk 1 – 5", Fig. 1) of existing records in a table (place "RT2", Fig. 1) with the records received in announces (place "incoming", Fig. 1), and, concerning the metrics, performs an action (arcs marked "rs^^x^^[r]", Fig. 1).

The models of routers built using the described component have been connected into a model of network and a simulation in CPN-Tools software has been performed.

The simulated routing tables have been compared to the routing tables built by well known Bellman-Ford algorithm for the similar network topology, the comparison showed the correctness of the model and protocol. Also the simulations have been performed to verify the reaction of the protocol for the changes of network topology – they prove that the protocol needs finite number of steps to fully discover the network and build correct routing tables for random topology.

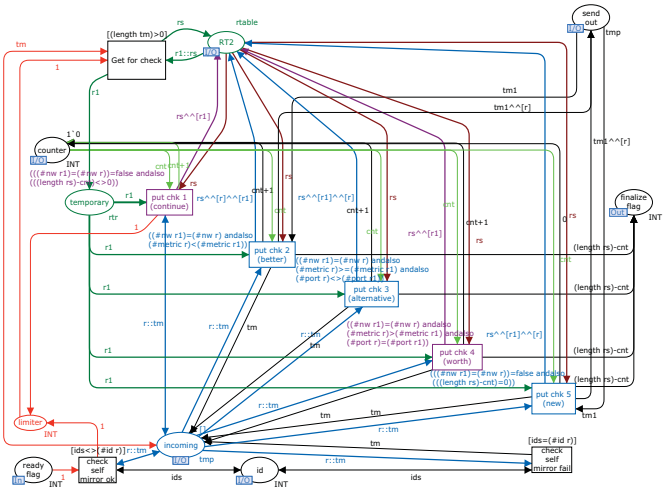

Fig. 2 BGP-E6 routing table control model

III. CONCLUSION

BGP-E6 routing protocol is specified in a form of CPN model. The correctness of protocol is proved. Presented specification of BGP-E6 is used for routing software development. Protocol model is suitable for further E6 research by integrating it with real network models and traffic generators, e.g. models considered in [2].

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