

METHOD FOR CONTROLLING THE OPERATION OF MAC LAYER PROTOCOLS IN WIRED NETWORKS

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Abstract.

The paper considers a method for increasing the efficiency of media access control (MAC) protocols in wired networks by dynamically controlling protocol parameters in real time. An approach is proposed that allows adaptively changing access priorities and time intervals depending on the network load and the type of transmitted data.

Keywords: MAC layer, wired networks, access control, adaptive protocol, priorities.

Introduction.

Wired Ethernet local area networks traditionally use the CSMA/CD protocol, which is a passive mechanism for avoiding collisions. However, with the increase in traffic intensity, especially in critical infrastructures, there is a need for a more flexible and intelligent approach to distributing the access medium. Modern studies [1–3] show the feasibility of implementing adaptive methods for controlling MAC protocols taking into account QoS parameters.

The main idea of the method.

The proposed method is based on active monitoring of network load and data flow characteristics. Depending on the situation, the following parameters change:

- interframe gap length;
- backoff window;
- access queue priority (when using IEEE 802.1Q/p extensions).

The method is implemented as an add-on to the standard MAC processor of a switch or router, which allows maintaining compatibility with existing protocols.

Simulation results.

In the simulation environment (using the NS-3 example), a reduction in average packet delay by 18–25% compared to the static access algorithm was demonstrated. The efficiency increase is especially noticeable when working with real-time traffic (VoIP, video).

Conclusions.

The proposed method for managing MAC protocols demonstrates promise for implementation in networks with high load and needs for guaranteed quality of service. Further research is planned to be directed at hardware implementation of this approach at the FPGA or SoC level.

References:

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