METHODS OF DATA TRANSMISSION CONTROL IN COMPUTER NETWORKS

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Dynamic processes in modern multi-service networks directly affect the stability of virtual connections and the overall speed of packet processing. The intensive growth of traffic volumes caused by the introduction of cloud services and IoT technologies leads to uneven loading of communication channels. As a result, congestion occurs, which causes degradation of QoS parameters: increased jitter, unpredictable delays and mass loss of packets in the buffers of switching equipment. Therefore, the development of adaptive control systems capable of dynamically responding to changes in the network environment remains a priority scientific problem [1].

Traditional reactive methods based on loss detection (for example, classical TCP algorithms) in modern high-speed networks often turn out to be ineffective. They initiate a reduction in the transmission speed only after the queue overflows, which leads to cyclic fluctuations in bandwidth.

This limits the application of standard models in systems with strict real-time requirements.

The purpose of the report is to substantiate flow control methods based on predictive analysis of the state of network nodes and taking into account the properties of self-similarity of traffic.

The report analyzes the results of measuring traffic intensity in individual network segments. It is established that local fluctuations are significantly affected by the buffer memory capacity of intermediate routers, types of application protocols, and current topology.

Unlike classical schemes, the proposed approach involves the use of connection state monitoring procedures, which allows detecting signs of overload at early stages. Special attention is paid to active queue management (AQM) algorithms that interact with feedback mechanisms at the transport level.

The use of predictive models based on the intelligent analysis apparatus allows for flexible adjustment of the transmission window, minimizing the probability of packet rejection [2].

This approach ensures stable functioning of virtual connections even under non-stationary load conditions, which is confirmed by the results of the simulation.

References

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