ANALYSIS OF QUALITY OF SERVICE INDICATORS OF USEFUL AND SERVICE TRAFFIC IN MULTISERVICE COMMUNICATION NETWORKS

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At present, a feature modern multiservice communication networks is the need to provide a certain level quality of service for heterogeneous processed traffic, a significant proportion which is multimedia streams. The main tasks in multiservice communication networks include optimizing the distribution of a limited number information and network resources between users. Various types useful and service traffic transmitted over a packet-switched communication network require dynamic allocation resources to users [1, 2]. Resource management modules deal with the tasks resource planning, assigning access priorities depending on the type of traffic with specified requirements for quality of service (QoS, Quality of Service).

At present, along with a systematic increase in data transfer rates in communication networks, the share real traffic, which is extremely sensitive to the parameters of a multiservice transport network, is increasing. Therefore, the task of ensuring the quality of service QoS is becoming more relevant and important. The definition of the QoS term from Cisco: "QoS - QoS refers to the ability of a network to provide better service to selected network traffic over various underlying technologies". It should be noted that the necessary multimedia services are described by many parameters, we note the most important among them [1, 2]:

- bandwidth, describes the nominal bandwidth of the medium for transmitting a message over communication channels, determines the width of the channel. Measured in bit/s or bps;
- delay in the transmission of useful and service packets;
- fluctuation - a variation of the delay in the transmission of packets;
- the probability of packet loss and determines the number of packets dropped by the network during transmission and error probability when receiving traffic flows.

In a communication network, the main functions QoS are to provide the necessary service parameters and are defined in relation to traffic as [2]:

- classification, marking, congestion control;
- congestion avoidance and regulation.

Functionally, classification and labeling are most often provided at the input ports of the equipment, and control and overload prevention at the output. Packet classification is a mechanism for assigning a packet to a particular class of traffic. Due to incorrectly configured QoS parameters, congestion occurs on the transport network, which to a large extent affects the quality of services provided.

Overloads appear when the output buffer drives of the network equipment transmitting traffic are full. The main mechanisms for the occurrence of congestion (or, equivalently, congestions) is traffic aggregation, when the rate of incoming

traffic exceeds the rate outgoing traffic $V_{in.} \geq V_{out.}$, i.e. and inconsistency speeds on interfaces $V_{\text{int}.}$. The increase in the number applications and the nature of the load in modern communication networks has led to the fact that ensuring the quality of service QoS has become one of the most important tasks when using MPLS technologies. It is known that MPLS [1, 2] makes it possible to effectively provide the required level of quality of service in the conditions of processing heterogeneous traffic, which is typical for modern networks. In addition, this technology has flexible and efficient mechanisms for managing traffic and network resources, which is relevant for multi-service communication networks with packet switching.

The systems for handling this traffic are better described by the G/G/1 or G/G/n models. The paper considers two options for multimedia traffic:

– multimedia traffic registered under wireless transmission conditions,

– IPTV traffic registered at the access level of the telecom operator's network.

For multimedia traffic of a communication network distributions time intervals between packets and packet lengths can be represented by the following expression:

$$W(x,\ \mu,\ \sigma) = 1/\pi\sigma \cdot [1 + (x - \mu)^2 \cdot \sigma^{-2}]\ , \qquad (1)$$

where $\sigma -$ continuous scale parameter; $\mu -$ continuous shift parameter.

Expressions (1) are the laws distribution random time intervals between packets and packet lengths, as well as the distribution function approximation by the Cauchy distribution.

For the distribution packet lengths, it is easy to see that, as in the case multimedia traffic packets of a multiservice network, we have two pronounced peaks and can be represented by a mixture distribution of the form:

$$w(x,\ \mu,\sigma) = P_1 \cdot \delta(x - x_1) + P_2 \cdot \delta(x - x_2)\ ,\ \ P_1 + P_2 = 1 \qquad (2)$$

where $\delta(x - x_1) -$ delta function at the point x_1 experiencing the first peak; $\delta(x - x_2) -$ delta function at the point x_2 second peak.

Taking into account the normalization condition $P_1 + P_2 = 1$ expression (2) will be written as:

$$w(x,\ \mu,\sigma) = 0.08 \cdot \delta(x - x_1) + 0.92 \cdot \delta(x - x_2) \qquad (3)$$

Thus, this approach makes it possible to evaluate the performance multiservice networks, respectively, built on the basis of the NGN and FN concepts, and the main parameters quality of service useful and service traffic in the system in the case processing Poisson flows [2].

References

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