Modern multiservice networks, including Internet networks, are packet networks in which packet streams undergo different traffic shaping mechanisms. One of the most commonly used mechanisms is the mechanisms of thresholdless and threshold traffic compression, also used in Internet and mobile networks. Traffic that undergoes these mechanisms is called in the literature of the subject elastic and adaptive traffic, respectively. Compression mechanisms effect in a decrease in bit rate of new or currently serviced packet streams and, in consequence, have the advantage of servicing a greater number of streams. A decrease in bit rate can be accompanied by a prolongation of service time, occurring in the case of an execution of non-real-time services that use the TCP protocol (elastic traffic). In other cases, e.g. in the case of an execution of real time services using the RTP protocol (Real Time Protocol), service time is not changed even during an abrupt change in the bit rate of a generated packet stream (adaptive traffic).

Analysis of packet networks, and in particular TCP/IP networks, requires appropriate models, including models of queueing systems that take into account a possibility of servicing elastic and adaptive traffic, to be constructed. Heretofore, only models of systems with losses, i.e. models of full-availability systems servicing elastic traffic, have been developed. As yet, no accurate models of systems with losses for adaptive traffic or multiservice queueing models servicing elastic and adaptive traffic have been developed.

The research objective of the project ”Modeling and service quality evaluation of Internet-based services” is to develop multiservice models of systems of packet networks, in particular Internet networks, that would make effective evaluation of the quality of service for services offered in these networks possible. The authors of the project intend to work out simple analytical models of systems with losses as well as queueing systems with elastic and adaptive traffic that will make it possible to evaluate the quality of service of services provided by nodes and links of multiservice networks. In particular, the authors intend to develop models of systems with losses and queueing systems with adaptive traffic and a mixture of adaptive, elastic and non-elastic traffic. These models will then provide a basis for a development of advanced models of links and nodes in the Internet that would take into consideration traffic overflow mechanisms, priorities, limited access to resources and virtualization of links and nodes of a network. The models will allow the quality of service of services provided by individual elements of a network to be evaluated and the compliance of appropriate parameters (blocking probability, average waiting time, acceptable throughput for particular services, etc.) to reference values, e.g. those defined in the QoS and GoS standards set by service providers or network operators, to be determined.