

# ANALYTICAL MODEL OF COMPUTATIONAL GEOGRAPHICALLY DISTRIBUTED NETWORKS WITH SATELLITE COMMUNICATION CHANNELS

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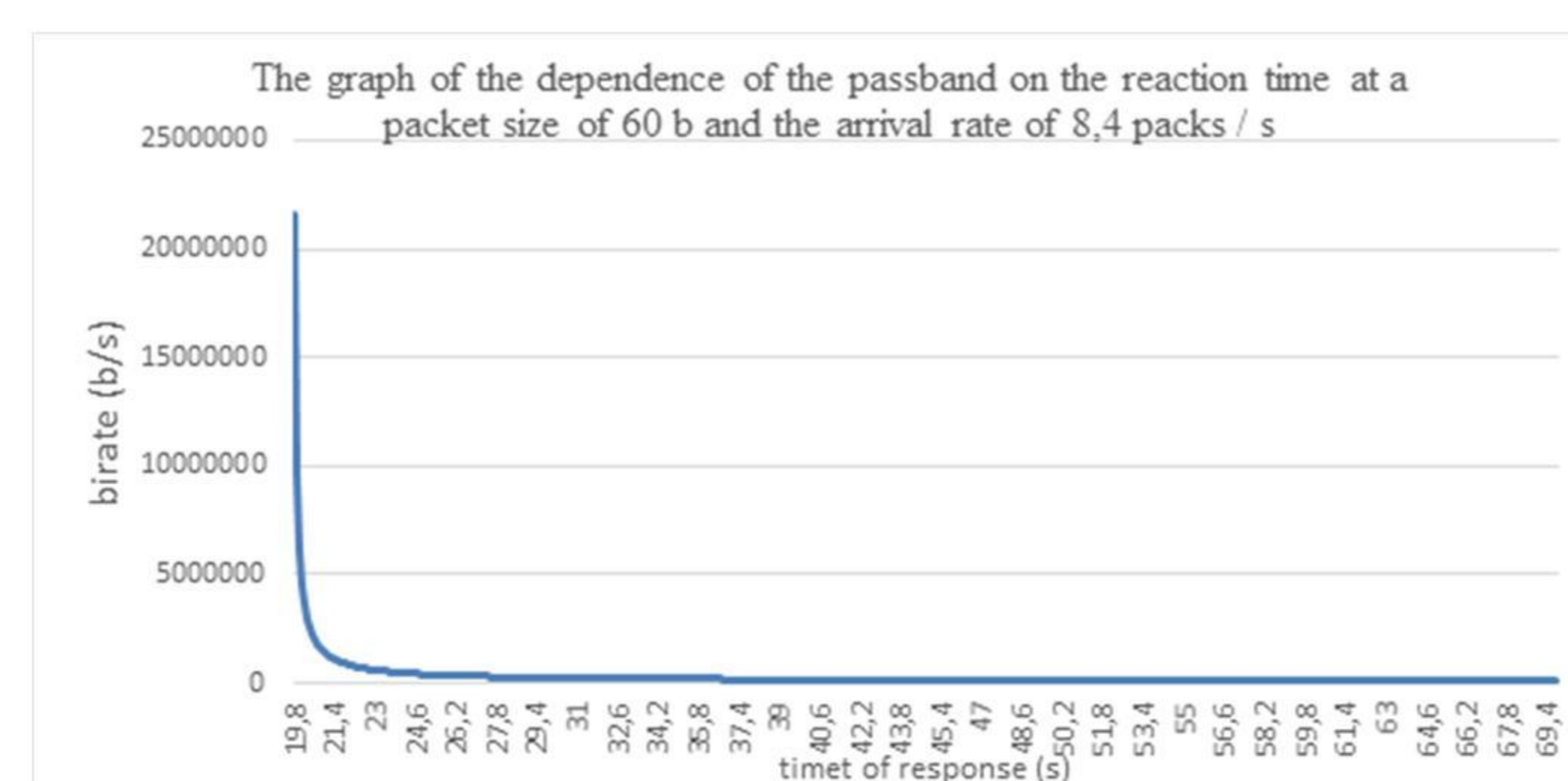
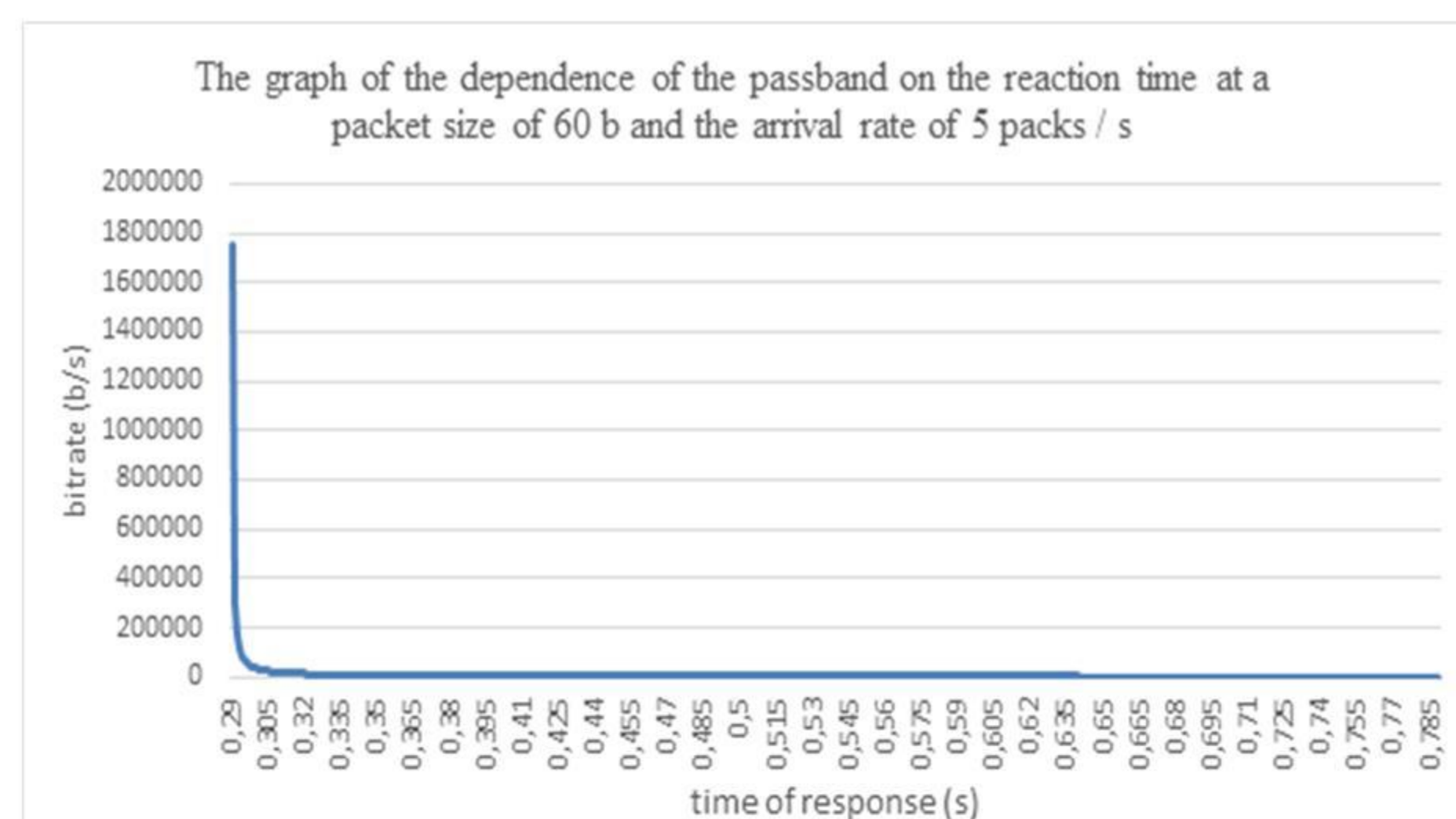
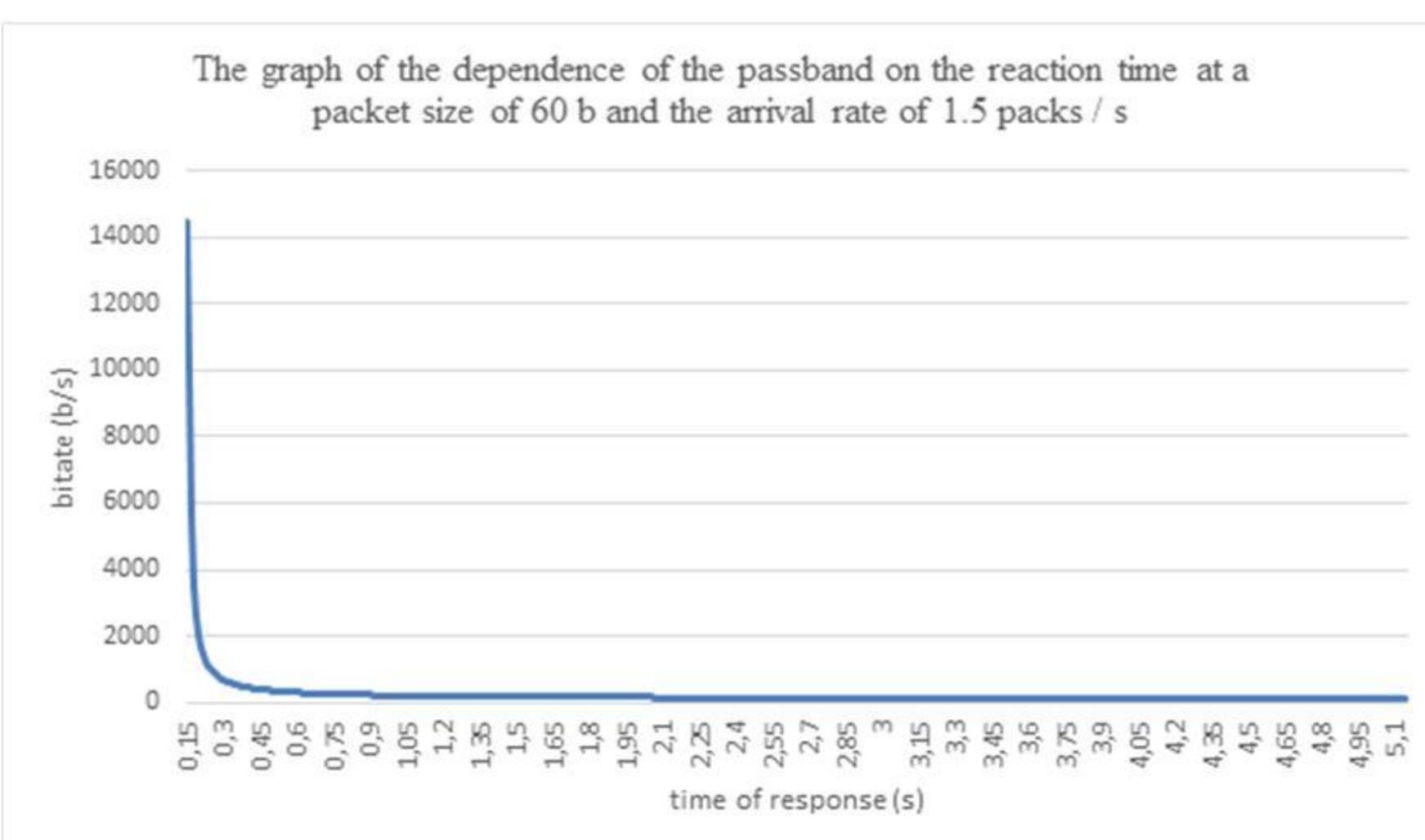
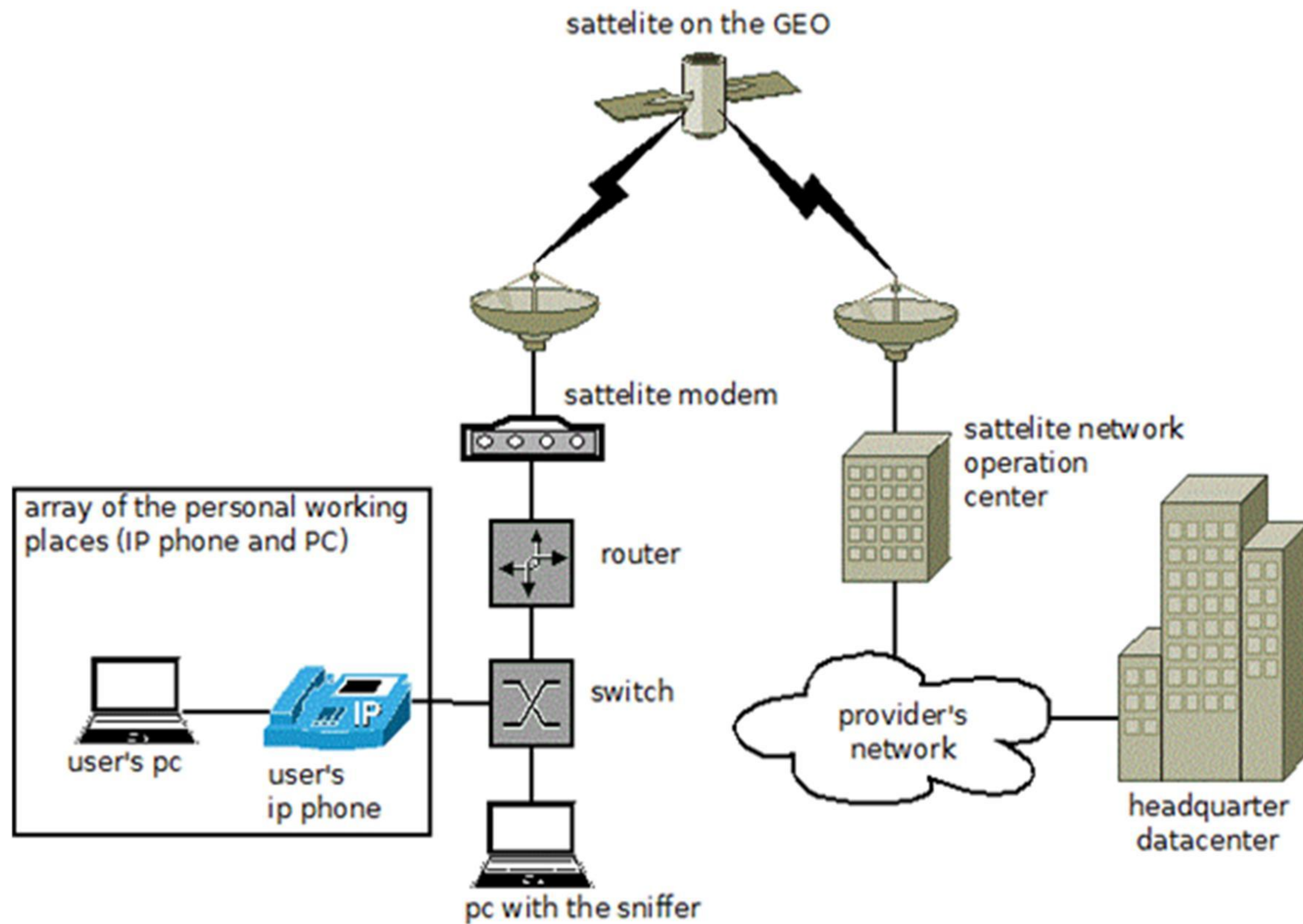
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**STATUSE OF ISSUE:** The Unified National Electrical Network (UNEG) facilities are distributed throughout the country. To ensure the required data exchange with the necessary speed, it is necessary to intensively create and develop the Unified Digital Communications System of the Electric Power Industry (ECDCA). This measure will provide operational and administrative personnel with access to the data necessary for making management decisions, which includes satellite communication channels

**MATERIALS AND METHODS:** The main method by which the analytical model of a computer network was compiled is the contour method, applied to a distributed network, considered as a queuing system. To increase the degree of adequacy of the model obtained, experimental studies were carried out using the Wireshark traffic analysis software.

**RESULTS:** A model is obtained for calculating the performance parameters of the computer network, depending on the number and type of traffic. The parameters of the necessary bandwidth are analytically determined to solve the required tasks, peak load conditions are determined.



The robust evaluating model of network operation in this article is represented as point-to-point connection between two nodes (left and right part of the scheme relatively to the satellite on the GEO). It's taken that the parts of the network segments after satellite channels operate in dialog-mode. This assumption makes allows to consider described system of satellite communication channel, which provides a duplex mode of packet transmission in the form of two independent SMOs, which according to the Kendal classification correspond to the model  $M / M / 1 / \infty$ . The above constraint is introduced to simplify the exposition and can be extended to other models.

The relations obtained in this article and the experimental data obtained by measuring a really functioning network with a satellite communication channel made it possible to construct graphs on which it is possible to estimate the dependencies of such parameters as the bit rate and the response time of the computing system on the packet lengths, load and location of the satellite station.

The obtained model can be used for calculating the characteristics of a technological computer network in various operating modes, forming control commands for allocating a frequency resource between nodes of a computer network with satellite communication channels.

## 4. CONCLUSIONS AND RECOMMENDATIONS

1. The obtained dependence (4) of the information bandwidth  $P$  from the specified or varied parameters  $C, R, P, D$  and the required  $t$  transmission time of the data block can be used by the customer and the SCS provider when creating the technical task
2. Restriction (5) will eliminate the situation of incorrect setting of the required  $t$  transmission time of the data block. In such cases, it is necessary to change the values of the parameters  $R, P, D$
3. The obtained dependence (4) can be applied (after completion) for complex configurations and modes of operation of SCS
4. The obtained dependence (4) allows to formulate strictly the task of monitoring the functioning SCS, and also to develop a monitoring methodology that will ensure the current control and operative management of SCS resources.
5. Based on the set parameters of the required reaction time and the structure of the transmitted traffic, it is possible to formulate QoS policies.