

ESTIMATING THE THROUGHPUT CAPACITY OF A VPN TUNNEL IN A HETEROGENEOUS COMPUTER NETWORK

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The paper analyzes the factors that affect the throughput of virtual tunnels built in a heterogeneous computer network using VPN technology. The Hoare mathematical apparatus is used as the evaluation mechanism.

The success of modern Internet business directly depends on the infrastructure that implements it. The main factor that underlies the fault tolerance of such infrastructures is the use of resource redundancy schemes. That is, by creating schemes with a high level of redundancy, it is possible to achieve imperceptible for users mode of switching of serving services to use redundancy schemes.

Promising in our time is the model of using cloud technologies, and the scheme to increase redundancy is the duplication of cloud infrastructure on the basis of other service vendors. Thus, the scientific and applied problem of creating reliable communication channels with a high level of security in data replication between cloud sites and estimating the capacity of such channels is relevant.

As the most popular solution in this paper we consider a solution using VPN (Virtual Private Network) technology. VPN is a secure virtual network that allows secure transmission of data over unprotected computer networks, such as the Internet.

The target function, which can be used as a mathematical form of writing the work problem has the form:

$$T_{VPN} \rightarrow \min, \begin{cases} \sum_{n=1}^N K_s \rightarrow \min \\ T_{\xi} \rightarrow \min \\ \vartheta_e \rightarrow \max \\ \vartheta_r \rightarrow \min \end{cases},$$

where T_{VPN} is the data transfer time in the VPN tunnel;

K_s - network delay s-segments of a heterogeneous computer network;

T_{ξ} - VPN tunnel rearrangement time in case of "service failure" error;

e, r - elastic and inelastic data types transmitted between nodes through the tunnel.

Let's take an example. Figure 1 shows a scheme with six intermediate networks marked by semicircles. Each of them is characterized by its own bandwidth, which depends on the factors given in the mathematical model. The time it takes to transmit data between nodes is calculated as the sum of times: t_1 , t_2 , t_3 , t_4 , t_5 and t_6 . It is also important to point out that delays at the border nodes may have an insignificant effect. To estimate the capacity of such a network, it is advisable to use the mathematical apparatus discussed above.

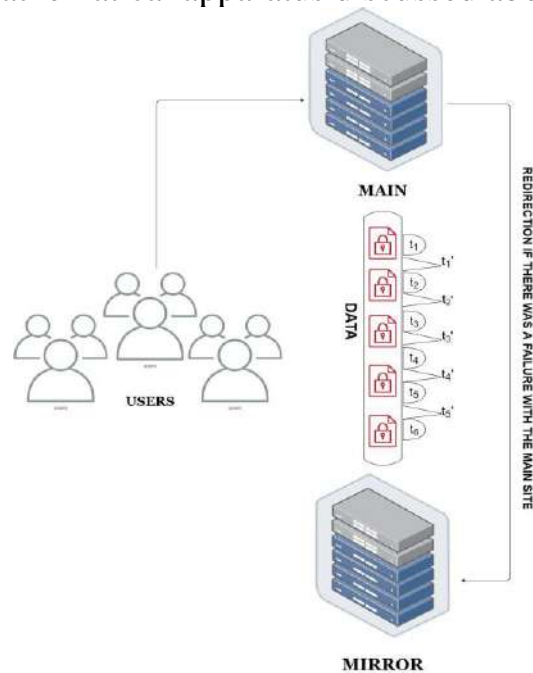


Figure 1 – Example of a heterogeneous network in which virtual tunnels between reference nodes are used

Thus, this paper presents a method for estimating the throughput capacity of a VPN tunnel in a heterogeneous computer network.

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