Підсекція 2

STUDY OF THE RELIABILITY COMMUNICATION NETWORKS IN CRITICAL INFORMATION INFRASTRUCTURES

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This paper examines the task of studying the reliability indicators of servers multiservice networks NGN/IMS (Next Generation Network/Internet Protocol Multimedia Subsystem) to ensure security and reliable communication in critical information infrastructures in order to obtain analytical expressions of reliability indicators of IMS session monitoring and management systems [1].

Monitoring and management systems for critical objects such as IMS multimedia communications are subject to requirements for the reliable operation of multiservice network servers [2, 3].

Taking into account the above, we will consider the functioning of the server management system in the conditions failures in the IMS core. At the initial stage operation, the server management system is in a fully functional initial state [4].

After the first failure, the control system, let's say, goes into a state in which it searches for a fault in the IMS servers. If a malfunction is detected in the IMS system and the protection is triggered with a probability

$$1-q_1 = p_1 \ .$$

In this case, we assume that in the absence of a second failure during the period of its recovery, the faulty communication channel is excluded from operation without loss of functionality.

Let us assume that after recovery from the consequences of a failure, the server transitions to its original state. In the absence of protection, it is likely

$$q_1 = 1 - p_1$$

The latter means that even the first failure is considered dangerous for multiservice NGN/IMS networks in critical information infrastructures.

Taking into account the above, a structure of graph circuits has been proposed that describes transition states based on absorbing homogeneous Markov chains with continuous time [3].

Here is a graph of state transitions that reflect changes associated with failures and restoration of the server hardware and software systems, and the transitions are determined by the intensity failures λ_i and restorations μ_i, $i = \overline{1,n}$.

We assume that the system input has a failure intensity flow λ_i with duration T_0 and recovery speed μ_i with duration T_b recovery and accept it as the simplest failure flow [3]. We believe that all these random variables are independent of each other and have the same distribution:

$$F(t,\lambda_i) = P\{\eta < t\} \ , \quad G(t,\mu_i) = P\{\xi < t\} \ . \qquad (1)$$

Based on reliability theory for an object with a finite recovery time and on the basis of (1), we can determine the probabilistic characteristics of the IMS multimedia communication subsystem [3]:

● The mathematical expectation T_0 – is the mean time between failures, which is an indicator of the failure-free operation of restored objects of critical information infrastructures and is equal to:

$$T_0 = E[\eta, \lambda_i] = 1/\lambda_i \quad , \quad i = \overline{1,n} \tag{2}$$

● The mathematical expectation T_b – of the average recovery time, as an object with a finite recovery time of the IMS core, is an indicator of maintainability and is equal to:

$$T_b = E[\xi, \mu_i] = 1/\mu_i \quad , \quad i = \overline{1,n} \tag{3}$$

Expressions (1), (2) and (3) are the probabilistic characteristics processes of homogeneous Markov chains with continuous time, allowing to evaluate the components of the reliability of monitoring and control systems for IMS platforms.

These are necessary to ensure maintenance critical information infrastructures, including non-stationary availability $K_H(\lambda, t, \mu)$.

It is worth noting that the latest indicators of the system are new components reliability in international documents such as the provision maintenance and repair.

It is known [2-4] that the IMS platform is designed to manage sessions while ensuring information security and reliable communications in critical information infrastructures that form the basis of the information and communication technology environment.

In addition, the IMS platform serves for session management when providing any multimedia services to users of fixed and wireless networks.

Since the critical information infrastructure as a whole now includes multi-service telecommunication networks based on the NGN and FN (Future Network) architectural concepts.

References

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