



OPRACOWANIE METODYKI ROZWOJU SPRZĘTOWYCH TECHNIK RÓWNOWAŻENIA OBCIĄŻENIA SIECI INFORMACYJNYCH ROZPROSZONYCH

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SUMMARY

- The analysis of aspects of load balancing on hardware resources of distributed information systems is carried out. A mathematical apparatus for optimizing the load distribution of the network of a distributed information system based on the corresponding mathematical model is built.
- The method of constructing the graph of tasks of the information system based on the schedule of requests, and also parallelization of planning tasks and the multilevel scheme of distribution hardware and software resources is improved.

FORMULATION OF THE PROBLEM

The effectiveness of the development and modification of distributed information systems (DIS) largely depends on solving systemic and architectural problems, such as the choice of algorithms for load balancing on hardware resources and the introduction of methods for parallel processing of incoming requests.

The development of load balancing methods should be preceded by the development of an appropriate mathematical model, which at the basic level can be represented as a set of elements such as query generator (query generator, QG) and control center (CC).

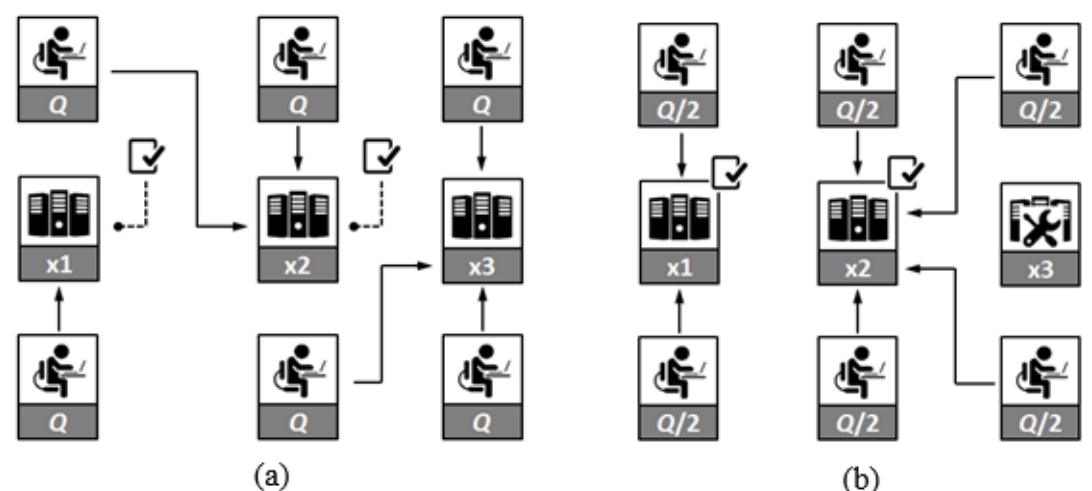
MATHIMATICAL MODEL

When balancing the load on DIS hardware resources, the load distribution is determined both between the network clusters and within each cluster. The load level is determined by the load factor k_{CP} of the central processors (CP) of DIS servers, which in the construction of the mathematical apparatus can be represented as a function of the number of cycles per session and the total number of requests server n_Q , as well as the following server architecture:

- set of CP clock values as a one-dimensional matrix of values for individual servers $f_{CP}: \{f_{CP}^1, f_{CP}^2, \dots, f_{CP}^i, \dots, f_{CP}^I\}$, where I — is the total number of servers, or a one-dimensional matrix of averaged values for server clusters $\bar{f}_{CP}: \{\bar{f}_{CP}^1, \bar{f}_{CP}^2, \dots, \bar{f}_{CP}^j, \dots, \bar{f}_{CP}^J\}$, where J — is the total number of clusters;
- CP multicore coefficients as a one-dimensional matrix of values for individual servers $k_{MK}: \{k_{MK}^1, k_{MK}^2, \dots, k_{MK}^i, \dots, k_{MK}^I\}$ or a one-dimensional averaging matrix for server clusters $\bar{k}_{MK}: \{\bar{k}_{MK}^1, \bar{k}_{MK}^2, \dots, \bar{k}_{MK}^j, \dots, \bar{k}_{MK}^J\}$;
- operating system load factor by κ_Q requests;
- load factor associated with additional processes on the server κ_+ .

Dynamic load balancing in real time should determine the proportion of distribution of requests between servers, for which this study proposes to introduce the concept of relative server rating (relative rating, RR) as a function of k_{CP} and n_Q and the average RR value for the DIS cluster:

$$R_i = \frac{n_Q^i}{k_{CP}^i \cdot \sum_{i=1}^I (n_Q^i)}, R_j = \frac{n_Q^j}{\bar{k}_{CP}^j \cdot \sum_{j=1}^J (n_Q^j)}$$



Scheme of organization of DIS work with load balancing in normal (a) and emergency (b) mode of operation.

CONCLUSSION

The analysis of key aspects of load balancing on hardware resources of the infrastructure of distributed information systems is carried out. The peculiarities of the operation of these systems arising from the introduction of modern information technologies, such as the development of multicore processors, process parallelization and system clustering, are considered.

A mathematical apparatus for optimizing the load distribution of the network of a distributed information system based on the corresponding mathematical model is constructed.

The method of construction of the graph of tasks of the information system based on the schedule of inquiries, and also parallelization of planning of tasks and the multilevel scheme of distribution of hardware and software resources is considered and improved.