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MODEL OF DISTRIBUTION AND INFORMATION MANAGEMENT FLOWS IN BUSINESS PROCESSES

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ABSTRACT

Analysis of trends in the development of the corporate communications market shows that in order to improve economic performance, companies strive, when building automated systems, to integrate business processes on the basis of common platforms. The use of such platforms requires an increase in the throughput of the communication system and taking into account the peculiarities of the functioning of such systems in the management of the corporate network. The studies of the effectiveness of the distribution of information flows in business processes in digital marketing presented in the article contain the following key stages. It is shown that none of the information technologies provides routing control based on the forecast of changes in information flows, which reduces the efficiency of automated systems functioning. Therefore, a hierarchical system of dynamic models has been developed that reflects the process of transferring information between various services of automated systems. The models contain information about the history of changes in information traffic and serve as the basis for calculating the predictive characteristics of changes in information flows. A method for increasing the efficiency of distribution of information flows in corporate computer systems of automated systems is proposed, taking into account the restrictions on their throughput and the discrete nature of the distribution of traffic over network channels. For the first time, a method for routing traffic in corporate computer systems is proposed, which minimizes the average time of message delays in the network. The method makes it possible to find routes in computer systems that ensure the minimum transmission time for a given traffic distribution in the network nodes. The model makes it possible to select the optimal information transmission routes in computer systems that ensure the minimum message transmission time for a given distribution of information flows. The use of the developed model of distribution and management of information flows makes it possible to increase the productivity of corporate computer systems at enterprises.

Keywords: Models; methods; information technology; characteristics; corporate networks; management; information flows; business processes

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INTRODUCTION

A characteristic feature of modern corporate computer systems is the joint functioning of a large number of dynamically changing business processes, each of which, for effective functioning at different periods of the enterprise's life cycle, requires a different bandwidth of the communication system of the corporate computer network (CCN). This requires the implementation of an appropriate service-oriented communication network management technology, when its bandwidth is dynamically allocated in accordance with the requirements of business processes. The transmission of information traffic at the enterprise level is carried out in the environment of routers. Consequently, the performance control of the CCN can be implemented at the routing management level. In data transmission networks (DTN) in business processes in some parts of the network, overloads can occur, which leads to the formation of queues [1-2] and a decrease in the efficiency of distribution of information flows in them.

To increase the efficiency of the loading of communication channels in backbone DTN in the implementation of business processes, it is necessary to formalize the task of redistributing data streams in order to optimize their loading and take into account the limitations on their bandwidth.

ANALYSIS OF RECENT RECEARCH AND PUBLICATIONS

Analysis of trends in the development of business processes in digital marketing shows that in order to improve economic performance, companies strive to integrate business processes on the basis of unified ERP platforms when building automated systems. The use of ERP systems requires both an increase in the requirements for the throughput of the communication system, and taking into account the peculiarities of the functioning of such systems in the management of a corporate network [3-4], [5-6].

A characteristic feature of modern ERP-systems is the joint functioning of a large number of dynamically changing business processes, each of which for successful functioning in different periods of the life cycle of an enterprise requires a different bandwidth of the communication system of the corporate computer network (CCN) [7-8]; [9-10]. This requires the implementation of an appropriate service – an oriented communication network (CN) management technology, when its bandwidth is dynamically allocated in accordance with the requirements of business processes. The transmission of information traffic at the enterprise level is carried out in the environment of routers. Consequently, the performance control of the CN can be implemented at the routing control level [11-12], [13-14], [15-16], [17-18]

To make decisions on the choice of new routes, information is needed about changes in the traffic of each of the business processes. The most effective is the technology of choosing the optimal routes based on predictive information about changes in information traffic [19-20]. Routing based on a priori information about changes in information flows can significantly increase the performance of the CN by preventing possible delays and blocking packets located in routers [21-22]; [23-24].

Thus, the development of models and methods of information technology for managing the CN, which ensures an increase in the quality of functioning of automated systems by choosing the optimal routes for traffic transmission based on predictive information about changes in information flows of business processes, is relevant.

FORMULATION OF THE PROBLEM

The statement of the problem is to increase the efficiency of the functioning of business processes by developing a technology for managing corporate computer networks by means of optimal routing of information flows, taking into account predictive information about changes in the traffic of business processes.

To achieve this goal, it is necessary to solve the following tasks:

– to carry out a system analysis of information technologies for managing CN of automated systems (AS) in order to determine their ability to dynamically route flows to reduce the delivery time of messages in business processes;

– to develop a method for calculating the predictive characteristics of changes in the traffic of business processes.

PRESENTATION OF THE BASIC RESEARCH MATERIAL

Consider the parameterization of information flows in the implementation of business processes, and their reflection in information flows [23].

To formalize the processes in the enterprise, the following concepts can be introduced: business tasks, business processes and business units [24-25].

A business task is the smallest logical unit of activity for an enterprise (buy material x, send invoice to customer y, etc.).

A business process combines several business tasks into a single sequence aimed at solving a specific functional goal, for example, to produce products z, for this it is necessary to calculate the rate of expenditure of consumables, calculate the required amount of labor and time, ship consumables, assemble or welding, etc. [26].

Several business processes, logically and functionally interconnected, are combined into a business unit (production, warehouse management, financial management, controlling department, etc.).

The business unit, in contrast to the business process, has a large scope of functions and is responsible for coordinating processes within the overall framework of the enterprise.

Business processes are subdivided into business tasks. Business processes can be both internal and external. Internal business process refers to the interaction within the enterprise between departments or strategic units. An external business process means interaction with external factors (suppliers, consumers, enterprises, government agencies, etc.) [27-28].

We define a network as an arbitrarily directed graph with n vertices and l arcs and represent it using the incidence matrix A and the contour matrix B defined in [29]. For our task, we will assume that the arc corresponds to only one direction of data transmission, so that the usual sections of the DTN are represented by two oppositely directed arcs, between the same two vertices, and the direction of the arc coincides with the direction of movement of the information flow. Further, in this model, the vertex does not necessarily represent only one switching node, but more macroscopically it can correspond to some small section of the network, while the arc in this case corresponds to a set of backbone data transmission systems between servers.

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If q_j is the intensity of information transfer on arc j, then we have

$$q_j \geq 0, \qquad (1)$$

due to the assumption that the arcs are unidirectional.

As a criterion for the efficiency of the distribution of information flows over the network, we use the total time of information transmission over the network and, in addition, we take the following assumptions:

1) we will take into account only the net transfer time along the arcs, neglecting the delays arising at the vertices;

2) we neglect gradual or random changes in the time of the information flow and assume that the transmission time is determined only by the traffic intensities along each arc, and not by any network effect;

3) the relationship between the transmission time (individual) and the intensity of the information flow along the arc is represented by a convex increasing function of the intensity (assuming that the speeds exceed the values corresponding to the peak load intensities, we have here an unambiguous function).

If $\tau_j\ (q_j)$ represents the transmission time along the arc j as a function of the transmission intensity g_j, then the total transmission time F is determined by the formula.

$$F = \sum_{j=1}^{l} g_j \tau_j (q_j). \qquad (2)$$

Let us introduce the following restriction on the information flow.

In general, the information flow can be represented by the rates of information transfer between the points of origin and destination (*OD*). Let us assume that the points of origin and destination of packets are some suitable nodes and we will denote by OH_{ik} (always non-negative) the information flow from vertex i to vertex j. First, consider the case where there is only one destination, and then extend the results to the case of many such destinations.

Single destination case.

Let's consider an imaginary case when information flows move to single point k.

If g_j is the intensity of the flow starting at the top i (possibly with a negative sign) and the destination point is the top k, then it is determined by means of the relations:

$$g_i = OH_{ik} (i \neq k),$$
$$g_k = -\sum_{i \neq k} OH_{ik}\ , \qquad (3)$$

where g_h negative value means the flow arriving at k.

Then we get the relationship between the intensity g_j and generating intensities q_i.

For example, for the network in *fig. 2* we have

$$q_1 - q_2 - q_3 + q_4 = g_i\ . \qquad (4)$$

In a more general case, if (a_{ij}) is the incidence matrix A, then, as is obvious from the definition of matrix A, equation (4) is transformed to the form:

$$a_{i1}q_1 + a_{i2}q_2 + a_{i3}q_3 + \dots + = g_j.$$

In other words, if:

$$q = \begin{pmatrix} q_1 \\ q_2 \\ \vdots \\ q_l \end{pmatrix},\ \ q = \begin{pmatrix} g_1 \\ g_2 \\ \vdots \\ g_n \end{pmatrix},$$

then we have:

$$Aq = g. \qquad (5)$$

Since the rank of A is equal to $n - 1$, then exactly $n - 1$ of the n equations from the system of equations (5) are independent. Therefore, in order to avoid complications in notation, let us assume that the bottom row q_n, as well as the element g_n from g, have already been removed in equation (5)

The case of multiple destinations.

In the case where there are multiple destinations, it is necessary to use equation (5) for the traffic flow moving towards each of them.

If $N \leq n$ is the number of destination points and OH_{ij} is the demand from the i-th point of departure to the k-th destination, then the intensity of information transmission that is generated at the vertex i due to the presence of the destination k is:

$$g_i^k = \begin{cases} OH_{ik},\ i \neq k \\ -\sum_{\nu \neq k} OH_{\nu k},\ i = k \end{cases} \qquad (6)$$

Let q_j^k be a part of the information flow along the arc j, which has a vertex k as a destination (Fig. 1.)

$$q^k = \begin{pmatrix} q_1^k \\ q_2^k \\ \vdots \\ q_l^k \end{pmatrix},\ g^k = \begin{pmatrix} g_1^k \\ g_2^k \\ \vdots \\ g_n^k \end{pmatrix}, \qquad (7)$$

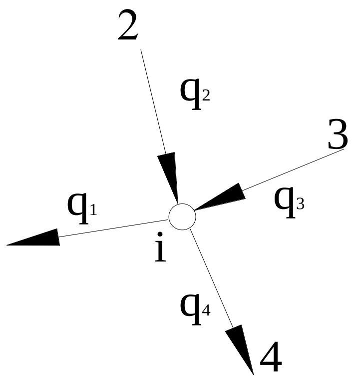

Fig. 1. **Information flow at the top**
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For the case with one destination, we have

$$Aq^k = g^k (k = \overline{1, N}). \quad (8)$$

If we denote by g_j the intensity of the information flow along the arc y_j, then

$$q_j = \sum_{k=1}^{N} g_j^k \quad (9)$$

Consequently, the problem of distribution of information flows over the network is reduced to the problem of minimizing expression (2) under constraints (8), (9), $q_j \geq 0$ for all j, k and $q_j \leq C_j$ where C_j is the capacity of the arc j.

We implement the optimal distribution of information flows using linear programming.

The relationship between the transmission time and the intensity of the information flow along the arc can be generally represented by a function similar to that shown in Fig. 2. As such a function, we can use the sum of the transmission time and the formation of queues at the switching nodes. Consider an optimization method based on the approximation of the objective function [29].

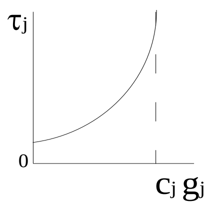

Fig. 2 **Dependence of the message transmission time on the intensity of the information flow**
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As a simple case, we take the information transmission time constant, as shown in Fig. 3, i.e.

$$\tau_j(q_j) = \tau_j^0, \quad (10)$$

for $0 \leq q_i \leq C_j$.This assumption means that the average information transfer rate is constant regardless of the intensity of the information flow.

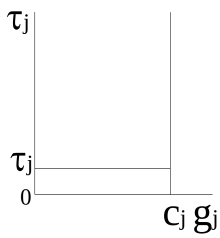

Fig. 3. **Approximation of the information flow transit time**
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Objective function F shown in Fig. 3, was obtained using equations (9) and (10) as a linear function of g_{kj}:

$$F = \sum_{j=1}^{l} \tau_0 q_j = \sum_{j=1}^{l} \sum_{k=1}^{N} \tau_j^0 = q_j^k. \quad (11)$$

Constraints are specified by relations (8) and (9) in the form:

$$\begin{cases} q_j^k \geq 0, (j = \overline{1, l}; k = \overline{1, N}); \\ \sum_{k=1}^{N} q_j^k \leq C, (j = \overline{1, l}) \\ Aq^k = g^k, (k = \overline{1, N}) \end{cases} . \quad (12)$$

Now we obtain the optimal one, i.e., corresponding to the minimum of F, q_k, using the linear programming technique.

The assumption of a constant transmission time is unrealistic. We will use the approximation of the transmission time using the step function shown in Fig. 4.

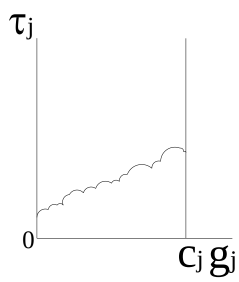

Fig. 4. **Approximation of the information transfer time by a step function**
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The problem, as before, is solved by the linear programming method, but in this case one will have to deal with huge matrices, since each variable q_{kj} is replaced with a number of new variables equal to the number of steps of the objective function. In addition, the number of restrictions increases.

We optimize the distribution of information flows using quadratic programming.

The task of quadratic programming is to minimize the function

$$F = \frac{1}{2} x^{\tau} P_x - x^{\tau} d \qquad (13)$$

under the constraints

$$\mathrm{Ax} = \mathrm{b}, \qquad (14)$$

and

$$\mathrm{x} \geq 0. \qquad (15)$$

Considering the general situation, it is possible to solve quadratic programming problems.

To maximize $F = f(x_1, x_2, ..., x_n)$ under the constraints:

$$g_i(x_1, x_2, ..., x_n) = 0, \ (i = \overline{0, m_1} \quad m_1 < n)$$
$$h_i(x_1, x_2, ..., x_n) > 0, (i = \overline{0, m_2}), \qquad (16)$$

m_2– arbitrarily solve simultaneously n equations

$$\frac{\partial f}{\partial x_k} + \sum_{i=1}^{m_1} \lambda_1 \frac{\partial g_i}{\partial x_k} + \sum_{i=1}^{m_2} \lambda_1 \frac{\partial h_i}{\partial x_k} = 0, \qquad (17)$$

and (m_1 + m_2) equations and inequalities (16) under the constraints

$$\begin{cases} \mu_i \geq 0 \\ \sum_{i=1}^{m_2} \mu_i h_i = 0 \end{cases} \qquad (18)$$

Equation (18) means that $h_1 > 0$, then $\mu_i = 0$, if $h_i = 0$, then $\mu_i \geq 0$. The formulated method for solving the original problem is called the method of Lagrange multipliers with constraints in the form of inequalities [29-30].

The geometric idea of the method is quite simple and is based only on elementary concepts of partial differentiation and scalar multiplication of vectors. At the point $x = (x_1, x_2, ..., x_n)$ of the conditional maximum of the function f, a sufficiently small displacement δx in any direction, if it does not violate the constraints, changes f by a non-positive value.

Determine which offsets $\delta x = \delta x_1, (\delta x_2, ..., \delta x_n)$ are valid.

Since the new point $x + \delta x$ must still satisfy the constraints δg_1, the changes for each constraint g_1 must be small compared to δx_k.

Therefore, we can write:

$$\delta g_i = \sum_{k=1}^{n} \left(\frac{\partial g_i}{\partial x_k} \right) \delta x_k = 0, \ i = \overline{1, m_1}, \ m.e. \ \delta g_i = (\nabla g_i, \delta x) = 0$$

where ∇g_i is a function gradient g_i, and $(\Delta g_i \, \delta x)$ is a scalar product.

Similarly, to satisfy the constraints $h_i(x + \delta x) > 0$ for those i for which $h_i(x) = 0$, must be satisfied $\delta x_1 \geq 0$ (up to small values compared to changes δx_k).

This condition can be rewritten as

$$(Z(h_i \nabla h_i, \delta x)) \geq 0, \ i = \overline{1, m_2},$$

where

$$Z(h) = \begin{cases} 0, \ npu \ \ h > 0 \\ 1, \ npu \ \ h = 0 \end{cases}$$

Thus, we have established that $\delta f = (\nabla f, \delta x) \leq 0$, when at the same time $(\delta g_i, \delta x) = 0, \ i = \overline{0, m_1}$, and $(Z(h \nabla h_i, \delta f)) \geq 0, \ i = 1, m.$

We transform the latter fact geometrically, and take into account the fact that $(A, B) = 0$ means the orthogonality of vectors A and B, and $(A, B) < 0$, when A and B form an obtuse angle.

We see that the vector ∇f forms a non-acute angle with any vector, which is orthogonal to all ∇g_i and forms a non-obtuse angle with all $z(h_i) \nabla h_i$. This means that ∇f is the sum of a linear combination of ∇g_i and a linear combination of $Z(h_i) \nabla h_i$ with non-positive coefficients. Equation (17) is an algebraic way of expressing this fact, which, however, requires the use of linear programming techniques for a complete proof.

The rules given above apply to equations (13) – (15), in obvious notation we will have:

$$\begin{cases} a = \frac{1}{2} \sum_{i=1}^{n} \sum_{j=1}^{n} p_{i,j} x_i x_j - \sum_{j=1}^{n} d_j x_j \\ g_i = \sum_{i=1}^{m_1} a_{ij} x_j - b_j ; 1 \leq i \leq m \\ h_i = x_i ; 1 \leq i \leq n \end{cases}.$$

Equation (17) is transformed to the form:

$$\sum_{j=1}^{n} x_j p_{kj} - d_k + \sum_{i=1}^{m_1} \lambda_i a_{ik} + \mu_k = 0 \qquad (19)$$

where we took $p_{ij} = p_{ji}$..

Equation (18) is transformed to the form.

$$\sum_{i=1}^{n} \mu_i x_i = 0, \;\; \mu_i \geq 0 \qquad (20)$$

Thus, solving equations (14), (19) and (20), we find the optimal solution. Equation (20) is nonlinear (since both λ_i and x_i are unknown), it simply means that from each pair $\mu_i x_i$ only one unknown can be positive. Therefore, when equations (14) and (19) are solved using linear programming methods, equation (20) can be satisfied by sequentially rejecting those of the trial solutions in which nonzero x_i and λ_i appear simultaneously.

Let us now formulate the problem of distribution of information flows in business processes as a quadratic programming problem. Let us approximate the transmission time along each arc using the linear function shown in Fig. 5:

$$\tau_j = \alpha_j q_j + \beta_j, \qquad (21)$$

$$0 \leq q_j \leq C_j, \qquad (22)$$

where b_j is the transmission time at zero information transmission intensity, equal to the arc length j divided by the maximum allowed speed.

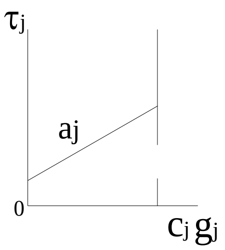

Fig. 5. **Linear approximation**
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The objective function is quadratic:

$$F = -\sum_{j=1}^{i} q_j \tau_j = -\sum_{j=1}^{i} \left\{ \sum_{k=1}^{i} q_j^k \left(\alpha_j \sum_{k=1}^{N} q_j^k + \beta_j \right) \right\}, \qquad (23)$$

change the sign in order to solve the maximization problem.We denote by q_j^{N+1} the so-called residual [30], then condition (22) is transformed to the form:

$$q_i + q_j^{N+1} = \sum_{k=1}^{N+1} q_j^k = C_j \, (j = \overline{1,l}); \qquad (24)$$
$$q_j^{N+1} \geq 0.$$

Combining equations (8) and (24), we obtain:

$$\begin{bmatrix} A & & & & & & & & & 0 \\ & A & & & & & & & & \\ & & \cdot & & & & & & & \\ & & & \cdot & & 0 & & & & 0 \\ & & & & \cdot & & & & & \cdot \\ & & & & & \cdot & & & & \cdot \\ & & & & 0 & & \cdot & & & \cdot \\ & & & & & & & \cdot & & \cdot \\ & & & & & & & & A & \cdot \\ E & E & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & E & E \end{bmatrix} \begin{bmatrix} q^1 \\ q^2 \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ q^N \\ q^{N+1} \end{bmatrix} = \begin{bmatrix} g^1 \\ g^2 \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ g^N \\ g^{N+1} \end{bmatrix} \qquad (25)$$

where E is the l-dimensional identity matrix and $g^{N+1} = (C_1, C_2, \ldots, C_l)\,\tau$.

Equation (25) corresponds to constraints (16) at $g_i = 0$. Let us solve equation (17) as follows. The first term $\frac{\partial f}{\partial x_k}$, i.e. in this case $\frac{\partial F}{\partial q^k} (k = \overline{1,N})$ is calculated from equation (23)

$$\frac{\partial F}{\partial q^k} = -2\alpha \sum_{v=1}^{k} q_j^v - \beta_j$$

where: $\tau_j = \alpha_j q_j \, \beta_j$, $0 < q < C_i \, C_j$, is the number over the arc;β_j is the number over the erc, $\alpha_j = 4\beta_j / C_j$ is the information flow generation.The second term $\sum \lambda_i \partial g_i / \partial x_i$ for differentiating relation (25) with respect to $q_i^k (k = \overline{1,N})$ has the form,

$$\sum_{i=1}^{n} \lambda_i^k a_{ij} + \lambda_j^{N+1},$$

and for differentiation with respect to $q_j N + 1$ is equal to. The third term is equal to $\mu_i^k (k = \overline{1,N} + 1)$ because the conditions $h_i(x_1, x_2, \ldots, x_n) \geq 0$, are met $q_i^k \geq 0$ therefore

$$-2\alpha_j \sum_{v=1}^{N} q_j^v - \beta + \sum_{i=1}^{n-1} q_i^k a_{ij} + \lambda_j^{N+1} + \mu_j^{N+1} = 0, \qquad (26)$$

$$(j = \overline{1,l}, k = \overline{1,N}); \lambda_j^{N+1} + \mu_j^{N+1} = 0. \qquad (27)$$

Substituting equation (27) into (26), we obtain

$$2\alpha_j \sum_{j=1}^{N} q_i^v - \beta_j + \sum_{i=1i}^{n-1} \lambda_i^k a_{ij} + \mu_j^k - \mu_j^{N+1}. \qquad (28)$$

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If we represent the set λ^k by a vector λ^k and denote by a_j the jth column of the matrix A, then equation (28) will take the form:

$$-2\alpha_j \sum_{j=1}^{N} q_i^{\nu} - \beta_j + \lambda^k a_i^{\tau} + \mu_j^k - \mu_j^{N+1} = 0 . \qquad (29)$$

Assuming $M = -2diag(\alpha_1, \alpha_2, ..., \alpha_e)$ and multiplying it by the contour matrix B on the left, e obtain, taking into account equation (29), the relation

$$BM\left(\sum_{\nu=1}^{N} q^{\nu}\right) - B\beta + B\mu^k - B\mu^{N+1} = 0 , \qquad (30)$$

into which the vector λ^k is no longer included. If we combine equations (30) with respect to k and put $D = BM$, then

$$\begin{bmatrix} D & D & \dots & D \\ D & D & \dots & D \\ . & . & & . \\ . & . & & . \\ . & . & & . \\ . & . & & . \\ . & . & & . \\ . & . & & . \\ . & . & & . \\ D & D & \dots & D \end{bmatrix} \begin{bmatrix} q^1 \\ q^2 \\ . \\ . \\ . \\ . \\ . \\ . \\ . \\ q^N \end{bmatrix} \begin{bmatrix} B & & & & & -B \\ & B & & & & -B \\ & & . & & & . \\ & & & . \quad 0 & & . \\ & & & . & & . \\ & & & & . & . \\ & 0 & & & . & . \\ & & & & . & . \\ & & & & . & . \\ & & & & B & -B \end{bmatrix} \begin{bmatrix} u^1 \\ u^2 \\ . \\ . \\ . \\ . \\ . \\ . \\ . \\ u^{N+1} \end{bmatrix} = \begin{bmatrix} B\beta \\ B\beta \\ . \\ . \\ . \\ . \\ . \\ . \\ g. \\ B\beta \end{bmatrix} . \qquad (31)$$

.

On the other hand, in accordance with Eq. (18), we have:

$$\sum_{j=1}^{l} \sum_{k=1}^{N} \mu_j^k q_j^k = 0, \quad \mu_j^k \geq 0; \quad q_j^k \geq 0 \qquad (32)$$

.

Thus, the optimal (q_j^k) are found by solving equations (25) and (31) under condition (32). This can be done, as already indicated, using a linear programming technique, and nonzero μ_j^k and q_j^k for any j and k are never used at the same time.

As an example, Fig. 6 shows a numerical solution for a corporate information network used in an electronic business process.

We use the function shown in Fig. 5, and assume that $\tau_j(C_j) = 5\tau_j(0)$, so we get

$$\alpha_j = 4\beta_j / C_j .$$

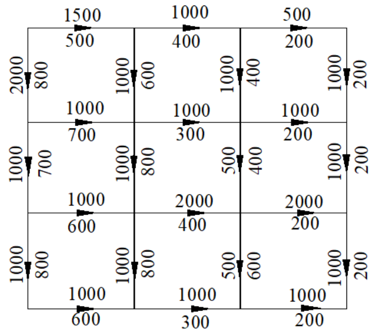

Fig. 6. **An example of the bandwidth of an information network**
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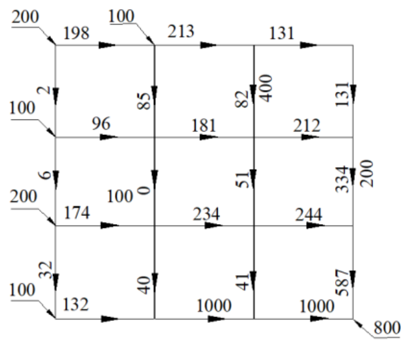

Fig. 7. **An example of numerical calculations of the optimal network load**
***Source:* compiled by the authors**

The numbers above and below each communication line of the corporate information network in Fig. 6 represent, respectively, the throughput C_j of information traffic and the minimum values of the delay time β_j of information flows of business processes, obtained by the linear programming method based on the proposed model.

The calculation of the throughput of the information network is performed in dimensionless units. The results of calculating the optimal network load are shown in Fig. 7. In the external designations, information demand is presented along the perimeter of the network load, along the lines – the estimated value of the proposed flow.

CONCLUSIONS

A systematic analysis of the structural and functional organization of automated systems, as well as information technologies for managing routing in the CS is carried out. To make decisions on the choice of new routes, information is needed about changes in the traffic of each of the business processes.

The presented model of a system for managing information flows of business processes, which is aimed at their efficient distribution and consumption in corporate networks.

A method for routing traffic in the CS is proposed, which minimizes the average time of message delays in the network. The method allows you to find routes in the CS that provide the minimum message transmission time for a given traffic distribution in the network nodes.

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МОДЕЛЬ РОЗПОДІЛУ ТА УПРАВЛІННЯ ІНФОРМАЦІЙНИМИ ПОТОКАМИ В БІЗНЕС-ПРОЦЕСАХ

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АНОТАЦІЯ

Аналіз тенденцій розвитку ринку корпоративних коммунікацій показує, що для покращення економічних показників компанії прагнуть при побудові автоматизованих систем до інтеграції бізнес-процесів на основі єдиних платформ.

Застосування таких платформ вимагає підвищення пропускної спроможності коммуникаційної системи і обліку особливостей функціонування подібних систем в управлінні корпоративною мережею. Наведені в статті дослідження эффективності розподілу інформаційних потоків в бізнес-процесах містять наступні ключові етапи. Аналіз літературних джерел показав, що в існуючих інформаційних технологіях не забезпечено управління маршрутизацією на основані прогнозу про зміни інформаційних потоков, які знижують ефективність функціонування автоматизованих систем. Тому разроблена система динаміичних моделей, які відображають процес передачі інформації між різними службами автоматизованих систем. Модель містить інформацію про передісторію зміни інформаційного трафіку та служить основою для розрахунку прогнозних характеристик зміни інформаційних потоків. Запропонований метод підвищення ефективності розподілу інформаційних потоків у корпоративних компютерных системах автоматизованих систем, який враховує обмеження на їх пропускну здатність і дискретний характер розподілу трафіка по каналам мережі. Запропонований метод маршрутизації трафіка в корпоративних компютерных системах, забезпечує мінімізацію середнього часу затримки повідомлень в мережі. Метод дозволяє знаходити маршрути в компютерних системах, які забезпечують мінімальний час передачі повідомлень для заданого розподілу трафіка у вузлах мережі. Модель дозволяє проводити вибір оптимальних маршрутів передачі інформації в компютерних системах, які забезпечують мінімальний час передач повідомлень для даного розподілу інформаційних потоків. Використання розробленої моделі дозволяє підвищити продуктивність корпоративних компютерных систем на підприємствах.

Ключові слова: моделі; методи; інформаційні технології; характеристики; корпоративні мережі; управління; інформаційні потоки; бізнес-процеси

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