Improvement of the Task Scheduler Model Taking Into Account the Heterogeneity of the Entities

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Abstract. *In the modern world, the need and requirements for the efficiency of using net-work computing resources that perform key functions of automating data pro-cessing and storage are significantly increasing. These factors require improvements to existing task schedulers to handle them.The purpose of the work presented in this article is to study existing models of task scheduling and improve models of task scheduling, taking into account the heterogeneity of entities, which will reduce time costs and increase the efficiency of using existing resources of computer systems.In this paper, the methods of GERT-network modeling are used to study the scheme of the scheduler of data dissemination tasks in real time by mathematical formalization of the scheduling process of data dissemination tasks.As a result, a model was developed for the planning of data dissemination tasks, which made it possible to reduce time costs and increase the efficiency of using existing resources of computer systems.*

Keywords: *math modeling, entity processing, task scheduler, GERT-network.*

I. INTRODUCTION

The widespread use of computer systems in most branches of government and public activity significantly increases the need and requirements for the efficiency of using network computing resources that perform the key functions of automating data processing and storage. At the same time, the growing number and level of tasks solved in the network generates an ever-growing load on servers and clusters. Such tasks are mostly associated with e-commerce, financial calculations, social networks, services for the acquisition and distribution of multimedia data (photo, video, audio). Today, cloud service providers rely primarily on large, consolidated data centers to deliver their services. In this regard, systems of parallel and distributed data processing have become widespread: computing clusters, "Grid" systems and cloud systems.

II. REFERENCES ANALYSIS

Analysis of distributed data processing systems, as well as algorithms for their functioning, showed significant limitations that reduce the efficiency of processes. These limitations are caused by the heterogeneity of processing objects (entities), the ambiguity of the input and, possibly, the output data about

them. These factors impose additional restrictions on the model for describing processing objects (entities) and require improvements to existing task schedulers for processing them. In this regard, it is relevant to improve the task scheduler model taking into account the heterogeneity of entities.

III. MAIN PART

A generalized scheme of a task scheduler using the above disciplines can be represented as a scheme in fig. 1.
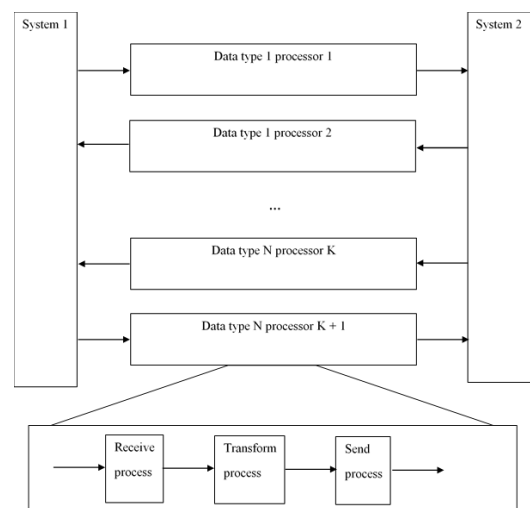

Figure 1. Generalized scheme of the real-time data dissemination task scheduler

Let us study the presented scheme by mathematical formalization of the planning process for data dissemination problems. For this we use the methods of GERT-network modeling. The main advantages of GERT-network modeling methods, as well as examples of mathematical formalization of practical processes and systems, are presented in [1-2].

In fig. 2. GERT-network of the process of scheduling distribution tasks for a separate nth set of data types is presented.

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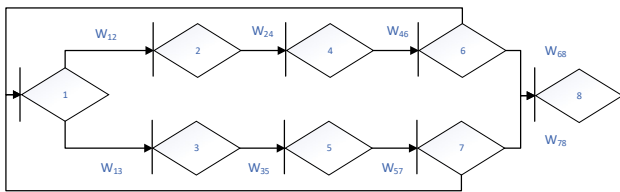
Figure 2. GERT-network of the process of scheduling distribution tasks for a separate nth set of data types

Based on the presented analysis results, it can be concluded that there is a need to improve task scheduling models in distributed data processing systems. This is primarily due to the objectively existing condition of heterogeneity of input data and entities. It is advisable to conduct this improvement by implementing in the scheme on pic. 3 additional block for preliminary analysis and adaptation of heterogeneous entities, which will also perform the functions of adapting the entity processing pro-cedures used in it to the internal capabilities of computer resources. This should make it possible to reduce the time spent on performing data processing applications.

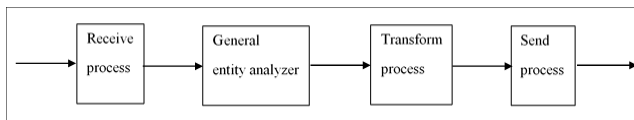To solve this problem, we transform the task scheduler scheme in fig. 3

Figure 3. Data type processor' schema with new block of 'General entity analyzer'

Based on the proposed concept of using additional procedures for preliminary analysis and adaptation of heterogeneous entities, the GERT-model is transformed into a network structure in fig. 4.
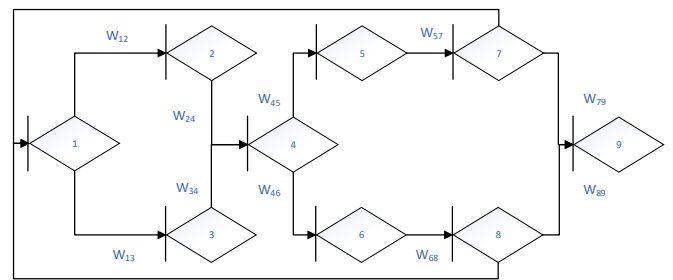

Figure 4. Improved GERT-network of the process of scheduling distribution tasks for a separate nth set of data types

IV. CONCLUSIONS

Thus, a model of the planning process for data dissemination tasks has been developed. A distinctive feature of this model is taking into account the heterogeneity of entities by including an additional unit for their analysis and adaptation to the existing capabilities of processor and other resources. This will reduce time costs and in-crease the efficiency of using existing resources of computer systems.

Further developments and research can be aimed at finding an analytical expression for calculating time costs, as well as at creating models and methods for analyzing and adapting entities to the existing capabilities and resources of computer systems.

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