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ТЕЗИСТЕР

ABSTRACTS

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An approach to the development of distributed applications for oil extraction problems

In this paper, we propose a new approach to the development of distributed applications for oil extraction problems. From the experience of high performance scientific computing application development for oil-gas industry we found that a concerted cooperation of specialists from different fields is important. So we recommend to organize "Relay race of specialists" in high performance scientific computing application development. Cooperation of specialists can best be described with the help of the approach of passing a baton. A specialist in the oil-gas industry defines the subject of research and makes the statement of the problem. A specialist to whom the baton was passed creates a mathematical model of the problem. Then the baton is handled on to a specialist in the field of numerical methods who finds a corresponding explicit or implicit numerical method. The following stage is the work of a high performance scientific computing application designer. In the implementation stage the baton is passed to a high performance computing specialist, who is responsible for a final programming product. To display the scheme of cooperation with passing on the baton, we use the MDA technology, according to which a computation independent model (CIM), platform independent model (PIM) and platform specific model (PSM) of the application are constructed. In this work, an MDA model of development of distributed applications for oil-gas industry is constructed. This model was used for the development of a specific application to calculate the pressure in anisotropic elastic porous medium on the MapReduce Hadoop platform. In the stage of designing an application of a resource-intensive computing problem, we have to determine general input and output parameters, a class of equations, explicit or implicit methods of calculations and instruments for carrying out parallel computations. The four invariable independent parts of the computational problem are presented in the form of four base components which are responsible for various parts of organization of high performance scientific computing [1]. These components are used in the stage of transformation of CIM model into PIM model of MDA technology. In this work, transformation of PIM model to MapReduce PSM model consists in transformation of UML class diagram to the Java classes with addition

of MapReduce specification to PSM. On the basis of MDA technology, we developed PIM and MapReduce PSM models and transformed the MapReduce PSM model to Java code automatically. The experiments are designed to gain data on working implementation of iterative MapReduce solution. The results allow to conclude that the application works well and with the increase in the volume of the data being processed the performance of Hadoop implementation increases.

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Computer mathematical and biochemical modeling and simulation of the life processes in human kidneys

Motivation and aim. Motivation and aim. The purpose of research is computer simulation of biochemical processes in the human kidney with his daily activities based on mathematical and biochemical methods to describe these processes and diverse library of templates changes in the conditions of their course based on various scenarios of the changing environment and the different nature of their actions. *Methods and Algorithms.* Kidneys – the main organ of the urinary system – play the role of complex biological filters. They are removed from the blood and then excrete water, urea, excess salts, maintain blood ion balance is outputted foreign substances, including drugs, residual reaction products, thereby to maintain the constancy of blood, interstitial fluid, regulated by the total body fluids and the ratio of the amount of these salts in the sodium, potassium, and other substances. The main biochemical and physical processes are filtration processes in a weak electromagnetic field, reabsorption processes, diffusion, chemical processes of splitting of molecules of salts, separation of protein molecules, processes of absorption of substances the body needs. The general direction of our research is the use of modern methods of WPF technology for visualization of complex biochemical processes occurring in the kidney nephron, in terms of identifying the mechanisms of self-regulation processes thin buds in a random environment with the assistance of well-known methods of mathematical physics and bioinformatics. Since these nephrons in the kidney about a million units, it would be interesting to understand how the human body fails to regulate the activities of each of them independently. This contributes under heavy load on the human body to regulate the degree of processing of the blood into the urine. For this purpose, I use of automatic control methods of multiply multidimensional systems. *Results.* Building representative strictly structured database characteristics functioning human kidney with deep classification distinguishes the characteristics of its life. Building an