Contribution ID: **208** Type: **Sectional reports**

Algorithms for the calculation of nonlinear processes on hybrid architecture clusters

Thursday, 13 September 2018 13:45 (15 minutes)

The problem of porting programs from one hardware platform to another has not ceased to be less relevant and simpler with time. The need to transfer programs to platforms with different architectures can have different roots. One of them is to increase the efficiency of executing programs for mass calculations on multiprocessor systems and clusters.
The purpose of our work is to identify the key features of algorithms in porting codes for calculating of essentially nonlinear processes to a modern cluster of hybrid architecture that includes both CPUs (Intel Xeon) and GPU (NVIDIA TESLA) processors. In order to increase cluster productivity by the well-known Amdahl law, it is necessary to achieve heterogeneoty of computational nodes.
As a test problem for studying the process of porting a code to a cluster of hybrid architecture, the KPI equation of Kadomtsev-Petviashvili was chosen, written in integro-differential form [1].
As a result of the work, the procedure for porting a simulation code for a two-dimensional nonstationary model problem to a hybrid system is proposed. The features of such a transition are revealed.
References
[1] A.V. Bogdanov, V.V. Mareev. Numerical Simulation KPI Equation. Proceedings of the 15th International Ship Stability Workshop, 13-15 June 2016, Stockholm, Sweden. pp. 115-117.

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Session Classification: 8. High performance computing, CPU architectures, GPU, FPGA

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