

Workflow-Based Internet Platform for Mass Supercomputing

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Abstract—An experience of designing integrated hardware and software solutions for high-performance computing in solving modern geophysical problems on the basis of full-wave inversion is described. Problems of designing mass high-performance software systems intended for extensive use in industry are discussed.

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1. INTRODUCTION

At present, the development of supercomputer calculations has reached yet another qualitative milestone: the performance of high-performance clusters has cleared the bar of tens petaFLOPS, and the scientific community discusses future exaFLOPS computations [1]. The improvement of the competitiveness of enterprises and economics as a whole is largely determined by extensive mass use of supercomputer technologies [2]. In this situation, the diffusion of supercomputer systems in industry becomes more and more urgent, the more so that, at present, such systems are extensively used only by big corporations and in strategic branches.

As is known, in the 2000s, the cost and complexity of high-performance computing systems have sharply dropped. This was largely due to the creation (in 2008) and further development of the technology of graphic accelerators (GPGPU). At the end of 2017, in the World Top 500 list [3] of most powerful supercomputers (see Table 1), 85 supercomputers were equipped with GPGPU, including the Piz Daint supercomputer occupying the first line in the rating (most powerful supercomputer in Europe), and the number of such systems increases every year.

During the seven years passed since the moment when the GPGPU technology was created, this technology has become so mature that it is now not only employed in unique machines designed for solving scientific and strategic problems but also widely used in applied computations. One of such examples is the high-performance computational system created with the participation of the authors and described below.

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