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Methods for complex simulators development for complex technical objects control

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The training of teams and crews for the control and operation of complex technical objects implies the training of a big number of people at once, who must jointly solve the assigned tasks. Unlike a simple training system, such simulators are built on the basis of a distributed computing environment, consisting of the workplaces of the training crew members and the control server. In the case of organizing simulators for individual subsystems operating under normal operating conditions, there are no problems with the design of the computing environment. Experience shows that in this case, simplified mathematical models are sufficient for training purposes, and the standard bandwidth of network channels copes with the amount of data transmitted between the server and workstations. The situation changes in the case of organizing complex simulators. In this case, multifunctional modeling of technological processes takes place. Both an increase in jobs and synchronization of the work of various subsystems are required. At the same time, the demand for this type of complex simulators becomes real. Especially important is the coordinated work of various subsystems and their teams in case of extreme situations. Such situations require the full commitment of the entire crew. Traditional schemes for organizing training simulators are no longer effective. The reasons lie both in the complication of the mathematical models used and their heterogeneity, and in the increase for data transmitted between the nodes, which ensures the operation of a big number of mathematical models.
A possible method for solving the problem that has arisen is to complicate the distributed computing environment on which the full-featured simulator is based: more powerful computing nodes, replacement of the network infrastructure, etc. However, such an extensive development path must be recognized as economically unprofitable both due to a significant increase in the price of the computing infrastructure and inefficient use of individual nodes due to downtime in normal operation modes. The paper proposes to use the concept of a virtual private supercomputer for flexible connection of individual subsystems of a complex simulator. Virtualization of computing resources, memory, network, storage allows you to collect together only those resources that are required at the moment. In this case, idle resources are effectively utilized, and as a result, a virtual SMP system is organized to solve a specific problem.

Summary

Author: Prof. DEGTYAREV, Alexander (St.Petersburg State University)

Co-authors: Mr SMIRNOV, Victor (Engineering company «NEOTECH MARINE»); Dr DOLGOV, Vladimir (Engineering company «NEOTECH MARINE»); Prof. PYLNEV, Yury (Engineering company «NEOTECH MARINE»)

Presenter: Prof. DEGTYAREV, Alexander (St.Petersburg State University)

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