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On algorithms of task placement in computing clusters taking into account task and system topologies

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Currently, problems related to task placement in clusters play an important role as they significantly reduce the execution time of parallel applications. To efficiently allocate tasks, the scheduler must consider both the topology of the cluster and that of the input task.

In this work, we study various cluster topologies and consider several task placement algorithms. In particular, we propose naive task placement algorithms that do not consider any topology and are based on either random placement or node enumeration. We also consider algorithms that only consider the topology of the cluster and algorithms that consider both the topology of the cluster and that of the task.

To compare these algorithms, we developed an application that implements these algorithms and simulates clusters with 2D and 3D torus topologies, as well as fat tree and thin tree topologies. Through the developed application, we conducted a series of experiments that studied the performance of abstract applications in different situations.

As a result of the study, it was established that the task placement algorithm that considers both the topology of the cluster and that of the task significantly outperforms other task placement algorithms.

Summary

Primary authors: ZHDANOV, Dmitriy (Saint Petersburg State University); KORKHOV, Vladimir (St. Petersburg State University)

Presenter: ZHDANOV, Dmitriy (Saint Petersburg State University)

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