

Parallelizing flood models with MPI: approaches and experiences¹

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Abstract. Parallelizing large sequential programs is known as a challenging problem. This paper focuses on problems encountered during parallelization process of different flood models and on the approaches used for solving them. The approaches are focused on reducing development time, which can help programmers make a parallel version of existing sequential programs within a short time.

1 Introduction

Over the past few years, floods have caused widespread damages throughout the world. Most of the continents were heavily threatened. Therefore, modeling and simulation of floods in order to forecast and to make necessary prevention is very important. As Linux clusters are widely used as low-cost high performance platforms, it is important to make the parallel versions of the flood models running on Linux clusters. That limits the possibility of using OpenMP or parallel compilers for parallelization. Therefore, programmers have to rely on MPI or other message-passing libraries for developing the parallel version of the flood models.

This paper focuses on the problems encountered during parallelizing flood models using MPI and solutions for them. In Section 2, the flood models are introduced. The problems encountered during parallelization and their solutions are discussed in Section 3. Section 4 gives the results of the parallelization and Section 5 concludes the paper.

2 Numerical flood models

At the beginning of ANFAS project [4], many surface-water flow models were studied in order to find a suitable high-performance model for pilot sites at Vah river in Slovakia and Loire river in France. The result of the study showed that many

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