

Publication

Trusted high-performance computing in the classroom

ConferencePaper (Artikel, die in Tagungsbänden erschienen sind)**ID** 2995817**Author(s)** Burkhart, Helmar; Guerrera, Danilo; Maffia, Antonio**Author(s) at UniBasel** [Burkhart, Helmar](#) ; [Guerrera, Danilo](#) ; [Maffia, Antonio](#) ;**Year** 2014**Title** Trusted high-performance computing in the classroom**Book title (Conference Proceedings)** EduHPC 2014 : proceedings of the Workshop on Education for High-Performance Computing, Nov 16, 2014**Place of Conference** New Orleans**Year of Conference** 2014**Publisher** IEEE**Place of Publication** Piscataway, NJ**Pages** 27-33

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A well-designed high-performance computing (HPC) course not only presents theoretical parallelism concepts but also includes practical work on parallel systems. Today's machine models are diverse and as a consequence multiple programming models exist. The challenge for HPC course lecturers is to decide what to include and what to exclude, respectively. We have experience in teaching HPC in a multi-paradigm style. The practical course parts include message-passing programming using MPI, directive-based shared memory programming using OpenMP, partitioned global address space based programming using Chapel, and domain-specific programming using a high-level framework. If these models are taught in an isolated mode, students would have problems in assessing the strengths and weaknesses of the approaches presented. We propose a project-based approach which introduces a specific problem to be solved (in our case a stencil computation) and asks for solutions using the programming approaches introduced. Our course has been successfully taught several times but a major problem has always been checking the individual student solutions, especially to decide which performance results reported one can trust. In order to overcome these deficiencies, we have built a pedagogical tool which enhances the trust in students' work. In the paper we present the infrastructure and tools that make student experiments easily reproducible by lecturers. We introduce a taxonomy for general benchmark experiments, describe the distributed architecture of our development and analysis environment, and, as a case study, discuss performance experiments when solving a stencil problem in multiple programming models.

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