

Application Skeleton: Generating Synthetic Applications for Infrastructure Research

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Summary

Application Skeleton is a simple and powerful tool to build simplified synthetic science and engineering applications (for example, modeling and simulation, data analysis) with runtime and I/O close to that of the real applications. It is intended for applied computer scientists who need to use science and engineering applications to verify the effectiveness of new systems designed to efficiently run such applications, so that they can bypass obstacles that they often encounter when accessing and building real science and engineering applications. Using the applications generated by Application Skeleton guarantees that the CS systems' effectiveness on synthetic applications will apply to the real applications.

Application Skeleton can generate bag-of-task, (iterative) map-reduce, and (iterative) multistage workflow applications. These applications are represented as a set of tasks, a set of input files, and a set of dependencies. These applications can be generally considered many-task applications, and once created, can be run on single-core, single-node, multi-core, or multi-node (distributed or parallel) computers, depending on what workflow system is used to run them. The generated applications are compatible with workflow system such as Swift (Zhao et al. 2007, Wilde et al. (2009), Wilde et al. (2011)) and Pegasus (Ewa Deelman et al. 2004, E. Deelman et al. (2005)), as well as the ubiquitous UNIX shell. The application can also be created as a generic JSON object that can be used by other systems such as the AIMES (Turilli et al. 2015) middleware.

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