

Jordan University of Science and Technology

Distributed simulation of DEVS and Cell-DEVS models in CD++ using Web-Services

Authors: G. Wainer, R. Madhoun, Khaldoon Al-Zoubi

Abstract: Discrete event system specification (DEVS) is a modeling and simulation formalism that has been widely used to study the dynamics of discrete event systems. Cell-DEVS is a DEVS-based formalism that defines spatial models as a cell space assembled of a group of DEVS models connected together. CD++ is a modeling and simulation toolkit capable of executing DEVS and Cell-DEVS models that has proven to be useful for executing complex models. We present the design and implementation of a distributed simulation engine, known as D-CD++, which exposes CD++ simulation utilities as machine-consumable services. In addition, we present the design and implementation of the Web-Service components which enable D-CD++ to expose the simulation functionalities to remote users. Enabling CD++ with Web-Services technology provides a solid framework for interoperating different DEVS implementations in order to achieve a standard DEVS Modeling Language and simulation protocols. This paves the road towards DEVS standardization, while providing a mashup approach, which can lead to higher degree of reuse and reduced time to set up and run experiments, and making sharing among remote users more effective. To prove this fact, we integrate it within larger services (such as a 3D visualization engine), showing the mechanism to incorporate to other environments (including geographical information systems, web-based applications and other modeling and simulation tools) through using standard Web-Service tools. Performance of D-CD++, major bottlenecks and communication overheads are analyzed.