

Insights for our future: International Assessment of Simulation-Based Engineering and Science

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The use of computer simulation in engineering systems began many decades ago. Only in the last decade or so has it become an essential scientific methodology for research and education in nearly all areas of engineering and in many branches of science. CACHE participants have been active in a recent multiagency-sponsored international assessment of Simulation-Based Engineering and Science (SBE&S), examining activities -- and needs -- from around the world. 57 sites were visited in China, Japan, and Europe by a panel of leaders in the field, and analyses will be presented in a report to be published on the web site www.wtec.org/sbes, along with an earlier study of SBES and preliminary findings.

There are several reasons for this remarkable pervasiveness of computer simulation. First, computer simulation has enabled study and prediction of physical, chemical, and biological events as an extension of their R&D investigations, in many cases even providing a powerful alternative to experiments by probing unobservable phenomena. Second is the steady advance in computational science. Rapid advances in computer, software, and networking technologies have allowed simulation to become a powerful and ubiquitous tool for engineers and scientists. Third, supercomputing at teraflop levels is now readily available at the desktop, either as a dedicated simulation tool or as a shared facility via a high-speed network for collaborative research among researchers at a distance.

New, emerging developments in computing, networking, and data storage promise to further revolutionize how SBE&S will be done in the future, and this study is meant to provide a current and future vision of these developments.