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Paper 34	
Title:	Advanced Technologies to Enable Simulation of Life-Cycle Sustainment of Weapon Systems Sustainment
Author keywords:	System Engineering Quantum Computing Large-scale simulations Modular code
Abstract:	The authors have witnessed and been part of the development of the burgeoning complexities of weapons systems. They have focused some of their research on the need to analyze the life-cycle sustainment of these systems. This sustainment analysis has similarly grown in complexity and sophistication. To be optimally useful, the results and insights from these analyses need to be accessible long before the systems are fielded and before sustainment parameters can be established and sustainment data collected from live implementations. This strongly supports the need to employ both constructive and virtual simulations to provide predeployment “experience” with systems. These simulations must be programmed to include the various input and output parameters of the system-engineered sustainment model. The size of modern weapons systems and the wide geographical dispersion of such systems calls for significant computational capabilities; this need is exacerbated by the current focus on simulating operations in large urban areas, fully populated by red, blue and civilian populations, all suitably programmed to act in a demographically appropriate way. Because a major factor of sustainment is maintenance and that maintenance is dramatically impacted by environmental factors, the modeling of these factors, along with verifiable functions representing their impact on hardware and personnel, must be modeled as well. There is a long history of using high performance computing to enable and enhance large-scale simulations and some of the authors have been part of that development process since 1995. Further, new advances in computing now offer to create a new computational paradigm for high performance computing, e.g. the innovations at the University of Southern California, Quantum Computing Center. As Systems Engineering has co-evolved with these computational advances, it has made good use of Markov Analyses, and one of the authors is currently developing a model that relies on this sub-discipline of analysis to better characterize the sustainment of weapons systems. Serendipitously, this line of inquiry is well situated to make excellent use of the quantum annealer at USC, as Markov processes are the foundation of the annealer’s operations, This paper will briefly describe the need for and the current state of the art of sustainment analyses, lay out the need for improved and expanded simulation techniques, and discuss the path to facilitating the implementation these across the entire spectrum of the simulation community. Alternative approaches, interoperability challenges, and future developments will be suggested, outlined and documented.
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Targeted Track	Acquisition Lifecycle and Technology Transfer Track

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