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### **The Beacon Project: Challenges, Solutions, and Lessons Learned<sup>1</sup>**

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With physical limitations imposing increasingly significant performance limitations on future generations of computing hardware, computer architects are turning to increased parallelism and specialized hardware to accelerate key applications and workloads. As a result, emerging high-performance computing (HPC) systems are much more heterogeneous than their predecessors, leading to both operational challenges and application challenges that must be overcome to effectively utilize the associated architectures. With support from the National Science Foundation, the Application Acceleration Center of Excellence (AACE) at the University of Tennessee is currently exploring the impact of the Intel<sup>®</sup> Xeon Phi<sup>™</sup> coprocessor on computational science and engineering through the Beacon Project, an ongoing research project that encompasses the deployment and operation of an energy-efficient supercomputer and the coordination of an associated research program allowing project teams across the country to explore the applicability of the associated architecture to a variety of scientific codes and libraries. This talk presents an overview of encountered challenges along with associated solutions, highlights some of the current results of the application project teams, and summarizes many of the lessons learned through the Beacon Project to date.

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