1154-65-1798 **Carol S. Woodward*** (woodward6@llnl.gov), **David J. Gardner**, **John Loffeld** and **Daniel R. Reynolds**. *Multirate Time Integration Methods and Their Deployment in the SUNDIALS Library.*

The advent of exascale systems will allow for simulating more complex models than ever before. As a result, scientific simulations, such as in climate, combustion, power grid, and hydrological sciences, will include more physics, resulting in a growing number of changing time scales. Starting with Gear (1984) and continuing with Savcenco et al. (2007), Guenther et al. (2016), and others, multirate methods were developed to provide robustness and speed up on multirate applications. These methods lower computational cost as they use small time steps only for fast evolving components and larger steps elsewhere. While multirate methods have been in use in some applications, little work has been done to develop methods that are efficient, have high stability, and have high order of accuracy. In addition, no multirate methods appeared in any general-purpose time integration software package until the last year. The SUNDIALS library, a combined development library by Lawrence Livermore National Laboratory and Southern Methodist University, has multiple types of multirate time integrators deployed. This presentation will overview multirate methods, discuss known strengths and weaknesses, discuss their addition to SUNDIALS, and show results to date of applying them in applications. (Received September 16, 2019)