**Toward Common Components for Open Workflow Systems**

**Achievement:** Published on the role of common components in future workflow systems at OpenSuCo 2017.

**Significance and Impact:** This work enhances our ability to talk constructively about and plan for the next generation of workflow management systems.

**Research Details:**
- Document problems of current workflow management systems
- Identify specific path forward
- Provides an overview of the current state of the art

**Sponsor/Facility:** Work was performed ORNL / sponsored by DOE EERE.

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**Overview:**
The role of scalable high-performance workflows and flexible workflow management systems that can support multiple simulations will continue to increase in importance. For example, with the end of Dennard scaling, there is a need to substitute a single long running simulation with multiple repeats of shorter simulations, or concurrent replicas. Further, many scientific problems involve ensembles of simulations in order to solve a higher-level problem or produce statistically meaningful results. However most supercomputing software development and performance enhancements have focused on optimizing single- simulation performance. On the other hand, there is a strong inconsistency in the definition and practice of workflows and workflow management systems. This inconsistency often centers around the difference between several different types of workflows, including modeling and simulation, grid, uncertainty quantification, and purely conceptual workflows. This work explores this phenomenon by examining the different types of workflows and workflow management systems, reviewing the perspective of a large supercomputing facility, examining the common features and problems of workflow management systems, and finally presenting a proposed solution based on the concept of common building blocks. The implications of the continuing proliferation of workflow management systems and the lack of interoperability between these systems are discussed from a practical perspective. In doing so, we have begun an investigation of the design and implementation of open workflow systems for supercomputers based upon common components.