Component Framework for Loosely Coupled High Performance Integrated Plasma Simulations[1] W.R. ELWASIF, D.E. BERNHOLDT, A.G. SHET, D.B. BATCHELOR, ORNL, S. FOLEY, IU — We present the design and implementation of a component-based simulation framework for the execution of coupled time-dependent plasma modeling codes. The Integrated Plasma Simulator (IPS) provides a flexible lightweight component model that streamlines the integration of stand alone codes into coupled simulations. Standalone codes are adapted to the IPS component interface specification using a thin wrapping layer implemented in the Python programming language. The framework provides services for inter-component method invocation, configuration, task, and data management, asynchronous event management, simulation monitoring, and checkpoint/restart capabilities. Services are invoked, as needed, by the computational components to coordinate the execution of different aspects of coupled simulations on Massive parallel Processing (MPP) machines. A common plasma state layer serves as the foundation for inter-component, file-based data exchange. The IPS design principles, implementation details, and execution model will be presented, along with an overview of several use cases.

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