# Multiphysics Simulation Applications

J. S. Crompton[1]

[1]AltaSim Technologies, Columbus, OH, USA

## Abstract

Increasing demand for new technology, products and processes to provide improved performance, achieve proof of concept quicker, offer higher quality and meet demands for on-time and on-budget delivery have put increasing pressure on scientist and engineers to predict performance before prototypes are built and can be tested. To address these demands, more focus has been placed on the use of predictive physics based computational models to provide information in the absence of physical prototypes and enable rapid iteration of designs. This increased use of computational modelling is no longer restricted to large multi-national corporations but is being rapidly adopted by small and medium sized enterprises who are seeking to innovate and differentiate themselves from their competition. In addition, large companies are seeking to cascade routine use of computational modelling onto engineers with limited or no familiarity with computational analysis.

With finite resources available to perform computational analysis one method to expand the routine use is to package expert knowledge into easy to use computational analysis files that have simplified interfaces to set up analyses of predefined problems. This allows design and process engineers to run a series of analyses easily and use the results to aid decisions on developments without having to make direct use of computational analysis domain experts. This approach has recently become a viable option through the release of capability to allow the development and distribution of packaged Simulation Applications (SimApps).

To address critical areas AltaSim has developed a series of SimApps using COMSOL Multiphysics® that solve multiphysics based problems and allow the non-expert user to investigate the solutions to a range of complex multiphysics based technologies. The SimApps have been integrated with intelligent decision-making algorithms that automatically distribute problem solving across distributed memory systems. In this way, the complexity of both performing the multiphysics based analysis and the intricacy of running analyses on large scale computing resources have been overcome thus allowing routine use by personnel with no expertise in computational analysis and high-performance computing resources.