

CLOUD BASED MULTIPHYSICS COMPUTATIONAL SIMULATION APPLICATIONS

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ABSTRACT

The use of computational simulation earlier in the product development and design process has continued to grow, because it can reduce the time and expense of traditional prototype testing and evaluation methods. With the increasing complexity of today's technology, virtual prototyping provides valuable insight and allows exploration of innovative solutions that cannot be obtained through traditional development approaches. This results in improved products and technology and increases the likelihood of on time launch.

To allow the benefits of computational simulations to be more widely applied, their use needs to be broadened beyond the existing expert user base. Computational simulation applications represent one way in which the benefits of computational simulation can be made available for use by an increasing number of engineers and scientists. These predictive physics-based computational simulation applications can help resolve workflow bottlenecks in large companies, increase the rate of product and process development, and provide custom design capabilities to small and medium-sized enterprises where it is often impractical to have dedicated simulation expertise.

Computational simulation applications enable personnel with limited or no expertise in computational analysis to experience the benefits of simulation. By capturing expert knowledge in the form of a predictive physics-based computational analysis linked with simplified interfaces, computational simulation can be made accessible to most individuals.

As increasingly accurate simulations of real world behaviour are required to more accurately predict the behaviour of today's technology, multiphysics simulation is more often required and has moved towards fully coupled solution methodologies that are representative of real world technology. To demonstrate how multiphysics simulation based virtual prototyping can be made available for more general use we will discuss the development and deployment of multiphysics based computational simulation

applications. Examples of applications that address problems ranging from dissipation of thermal energy in electronic circuits to metal processing for advanced aero-engine materials will be discussed. Due to the complexity of the analyses, High Performance Computer based hardware is required to perform the simulations. To enable access to the computational simulation applications by a broad group of users, cloud based approaches to access the required hardware and software remotely on a confidential basis have been developed. This allows the user to set up and control complex analyses through simplified interfaces that provide automated set up and submission of analyses. Analyses are automatically distributed across multiple nodes to minimize solution time and on completion the user is automatically provided with predefined results available in a standardized report format.