Architecting CFD for the Industrial Scale

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The widespread use of CFD in industrial design and practice we see today has been made possible by the co-evolution of both robust algorithms and models as well as efficient ways of implementing them.

Early efforts were usually academic, proof of concept Fortran based codes, modified by successive generations of graduate students for the specific problem of interest. National laboratories and research organizations such as NASA also developed more general purpose codes for internal use but in most cases these still required modifications by the end user. Starting in late 80's commercial companies started offering general purpose software that increasingly handled more complex and realistic geometries and enabled simulation of coupled, multiphysics problems by non-experts.

In this keynote we will review the development of CFD code architectures that have enabled this. The architectures had to evolve as the hardware landscape changed from mainframes to commodity personal computers, GPUs and the Internet. The FOAM project introduced other innovations, exploiting developments of modern programming languages and practices to enable easy implementations of new models in an open architecture.