# Building a flexible CFD model.
# Overview of surface & volume mesh generation and shape modification through a case study in external aerodynamics.

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## ABSTRACT

The preparation of a mesh for CFD analysis is a complex laborious process that requires large amounts of man hours from experienced users and usually involves the combination of different software that are designed for specific tasks. All this, in combination with the huge model sizes that are currently necessary for realistic and accurate CFD simulations, and are nowadays feasible by the available hardware resources, make the process stiff and error prone. The dependence of the volume mesh to the surface mesh also make error corrections and local model modifications hard to implement without starting back from the early stages of the process.

This paper presents a streamlined and integral process for CFD model build-up, made possible by the latest development of ANSA, based on the experience and feedback from the automotive industry. The process involves CAD data interfacing with industry's most widely used CAD systems, geometry clean up and modification, automatic curvature dependant surface meshing, advanced boundary layer generation and robust volume meshing. Hence, a high mesh-quality model is achieved with minimum effort.

The resulting baseline CFD model, having modular construction, demonstrates the flexibility of performing local or global modifications through Part Replacement or Morphing. In the former case, selected parts are replaced with new ones and are integrated with the main surface and volume mesh. In the latter case, a complete volume mesh model is reshaped by controlled movements or directly to precise target shapes.

This process is an assuring solution for current industries in various engineering sectors where reduction of time-cycle and improved cost efficiency are driving forces.

*keywords: CFD, pre-preprocessing, meshing, morphing*