# Volkswagen: Sensitivity-based morphing and optimization with ANSA

## Challenge

- Efficient translation of element- or node-based CFD adjoint sensitivities into a new, smooth shape for geometries of industrial complexity.

## Approach

- The sensitivities as computed by an adjoint CFD solver are mapped from the model surface to adequate morphing control points and drive the subsequent morphing of the model.

## Results

- The sensitivity-based shape morphing method developed in cooperation with BETA CAE Systems closes an important gap towards an automatic adjoint-based shape optimization process.
- One-shot optimization of entire vehicle aerodynamics at a cost of 4-6 flow solutions is now possible as demonstrated by the application to the external aerodynamics of the Volkswagen L1.
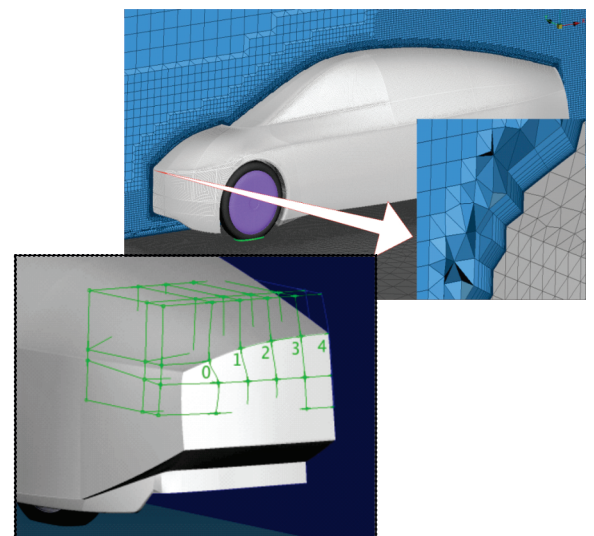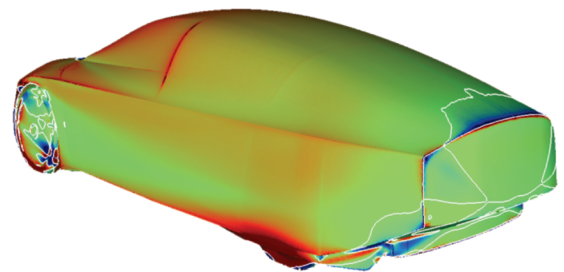


*"The extension of ANSA's morphing capabilities towards sensitivity-based morphing opens up the way for an efficient adjoint-based shape optimization."*

*Dr. C. Othmer, Volkswagen AG, Group Research*