Meshing of a detailed DrivAer Body with ANSYS Meshing and ANSYS ICEM CFD

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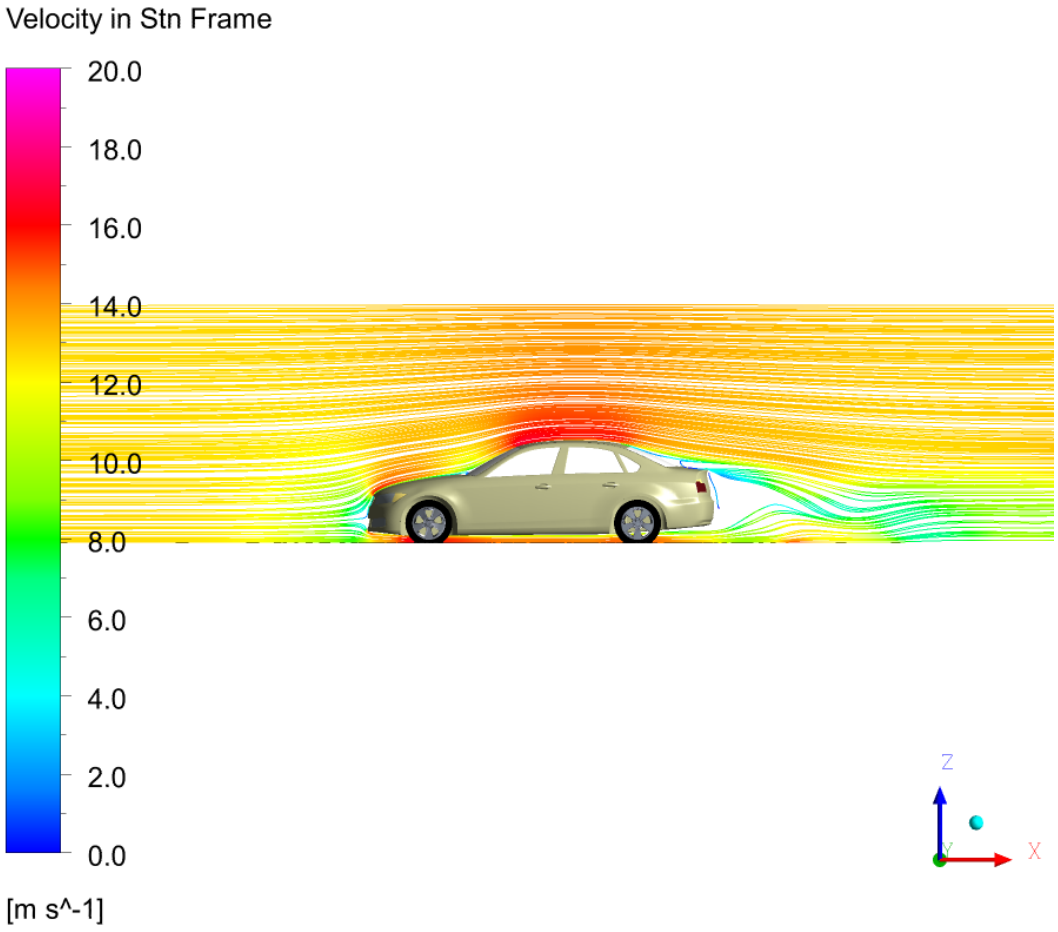
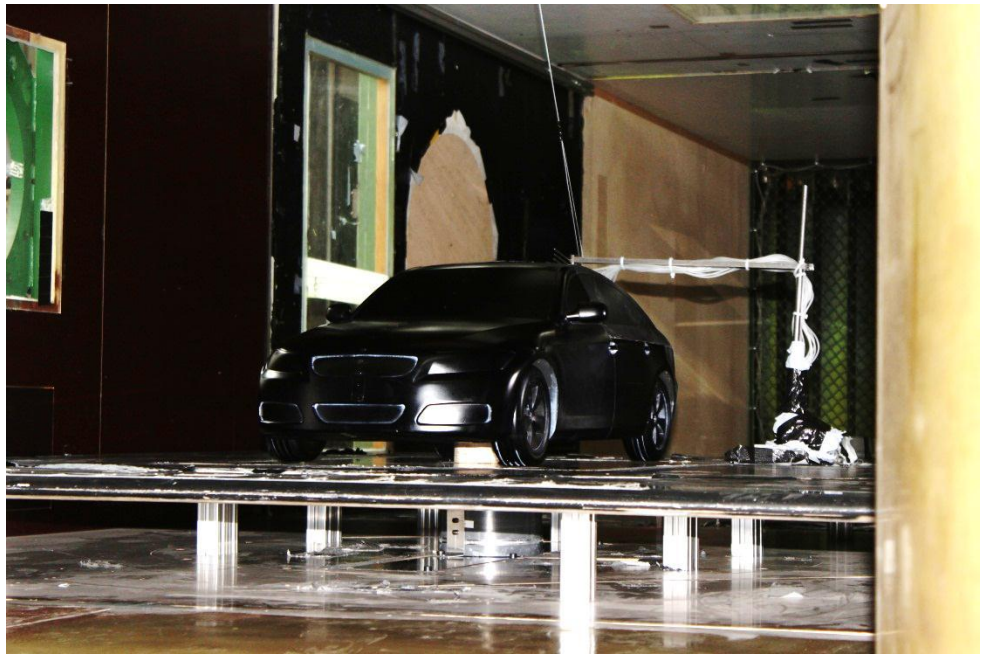


DrivAer Body

DrivAer Body

- The shapes of simple car models differ very much of the actual car geometries, so optimizations are often done on real car geometries.
- This geometries are only available to a small number of people.
- To close the gap between the strongly simplified models an the highly complex production cars, the generic DrivAer model was introduced.



DrivAer Body

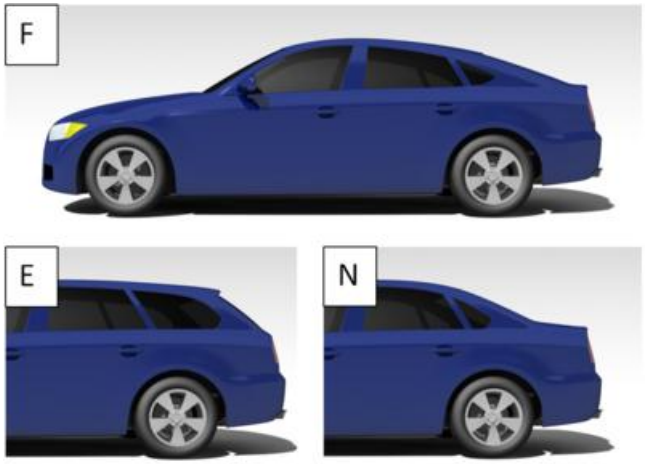
- The DrivAer Model is provided by the Technical University of Munich.

- Several kinds of the model are available:
  - Fastback
  - Notchback
  - Estateback

  - Detailed underbody
  - Smooth underbody

  - With/Without mirrors

  - Detailed wheels
  - Smooth wheels

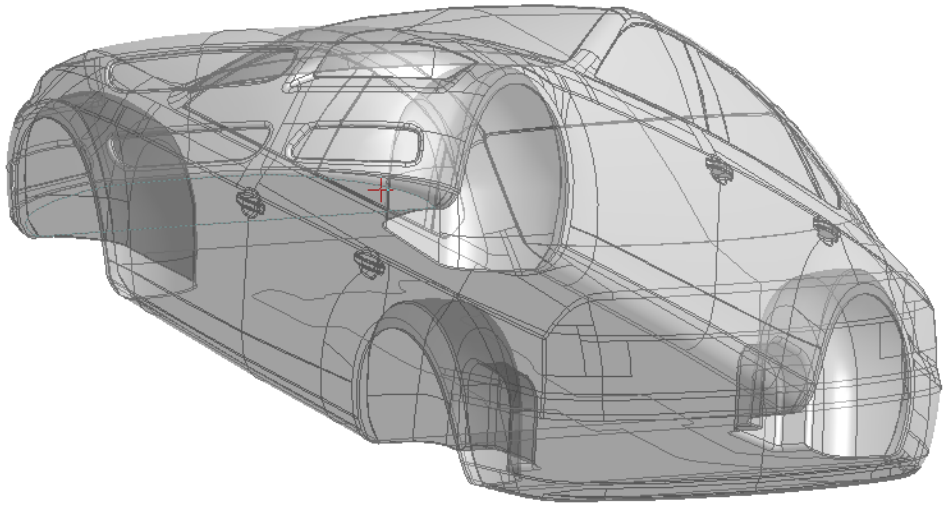


Geometry preparation

ANSYS DesignModeler

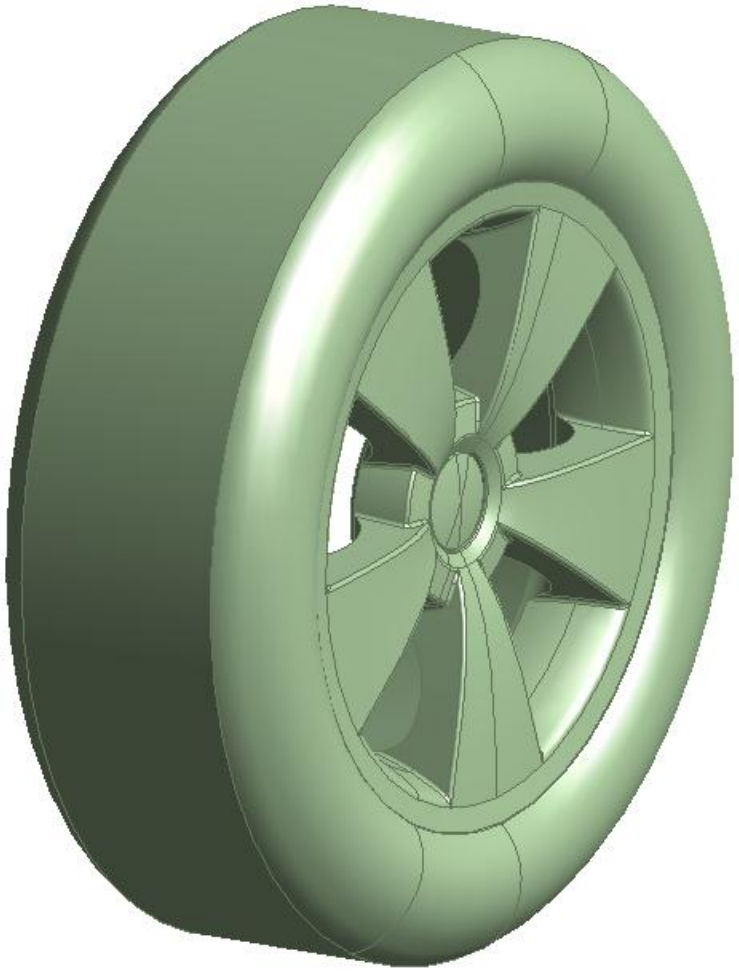
Geometry preparation

- After geometry import, only a surface model is available. This has to be corrected for *ANSYS Meshing* import.
- If a closed surface model is available, the body operation sew can fill it and turn the model to a solid body.
- The repair functions can help to detect defects of the geometry.



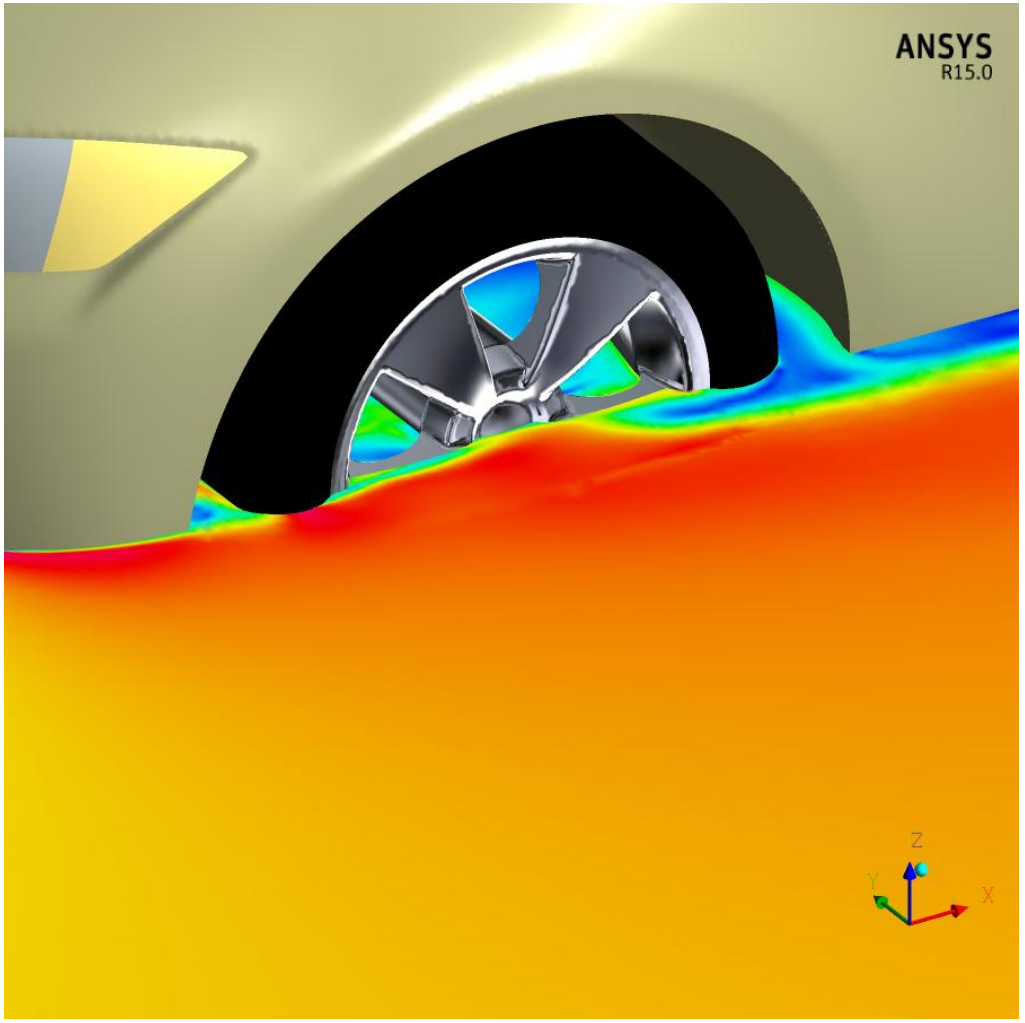
Geometry preparation

- Sometimes its easier for modifing a geometry to go back to a surface model.
- Delete the faces you do not need, close the model again and sew it.
- The wheel and the rim is just prepared once. The finished model is copied.



Geometry preparation

- The fluid volume has to be extracted. Therefor it‘s impossible, that all bodies are solid bodies.
- A body of influence is created to allow local refinement.
- The rims are separated to allow a rotational definition in the fluid solver.

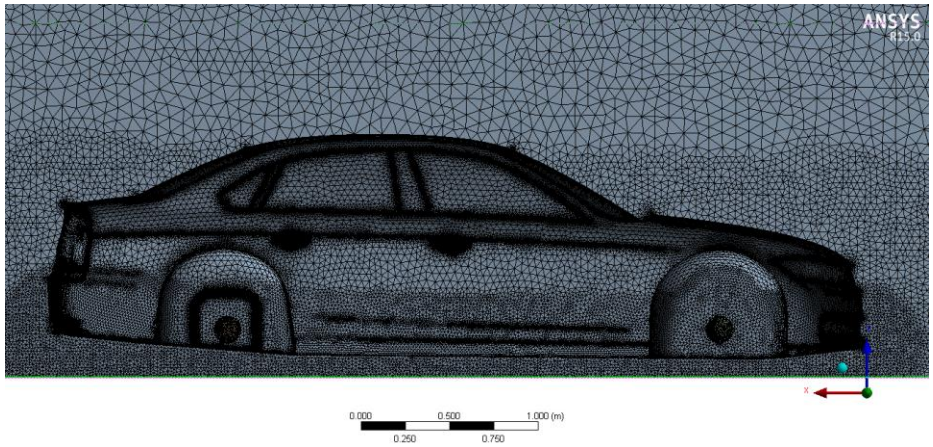


Mesh generation

ANSYS Meshing

Mesh generation in ANSYS Meshing

- The patch independent mesher is used for complex geometries with many small faces.
- The patch dependent mesher is used to mesh the rims, bottom-up the existing mesh.
- Body of influence to refine the mesh close to the car.
- Inflations are created in a later step.



Pre mesh modification

ANSYS ICEM CFD

Pre mesh modification with ANSYS ICEM CFD

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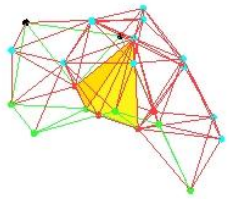
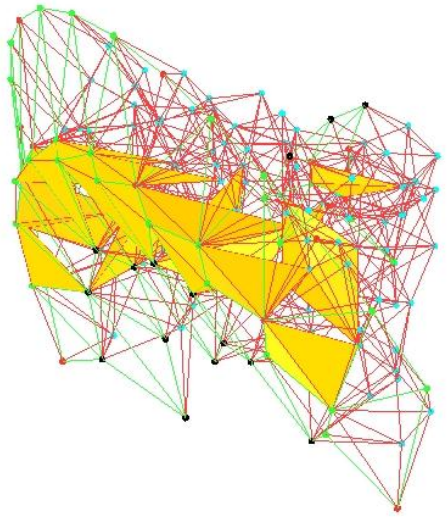
- The mesh quality can be increased before creating the prism layer.
- Some nodes, projected to points or curves can be reprojected to surface to increase their degree of freedom.
- Moving some nodes manually can help to fix bad elements.
- Working with subsets will guarantee a better overview.





Prism layer generation

ANSYS ICEM CFD

Prism layer generation with ANSYS ICEM CFD

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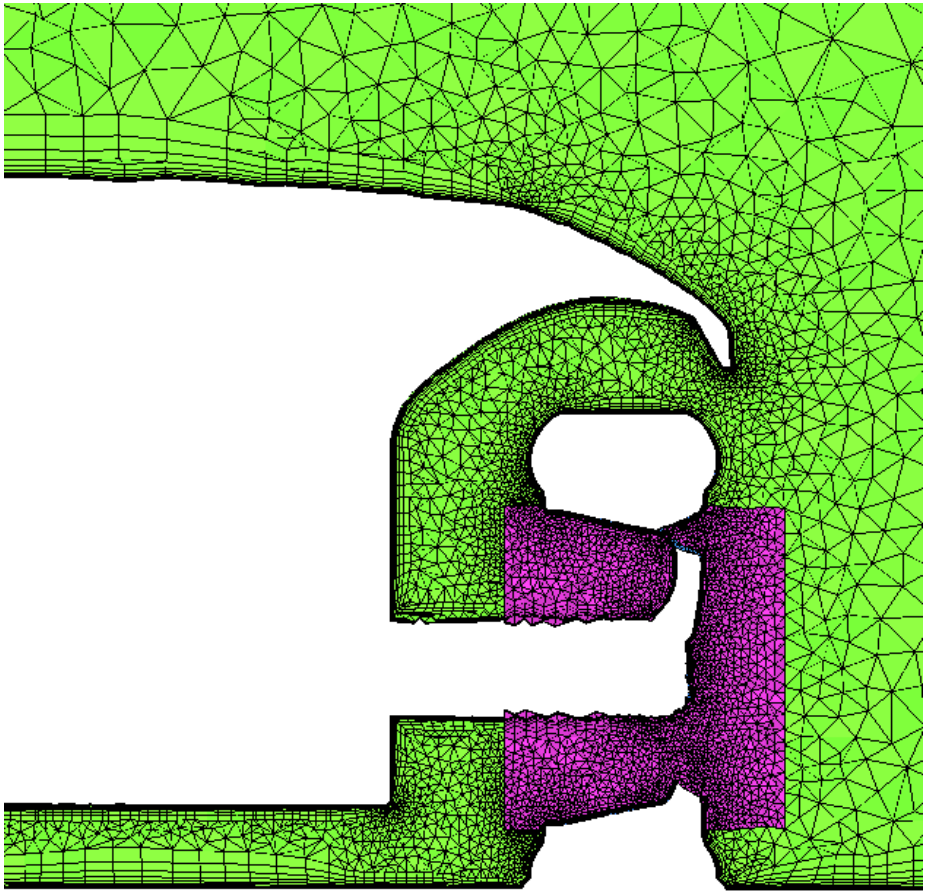
- Only one prism layer is extruded.
- This prism layer can be split into several layers.
- No pyramids are generated.
- Auto reduction avoid collisions.



Post mesh modification

ANSYS ICEM CFD

Post mesh modification with ANSYS ICEM CFD

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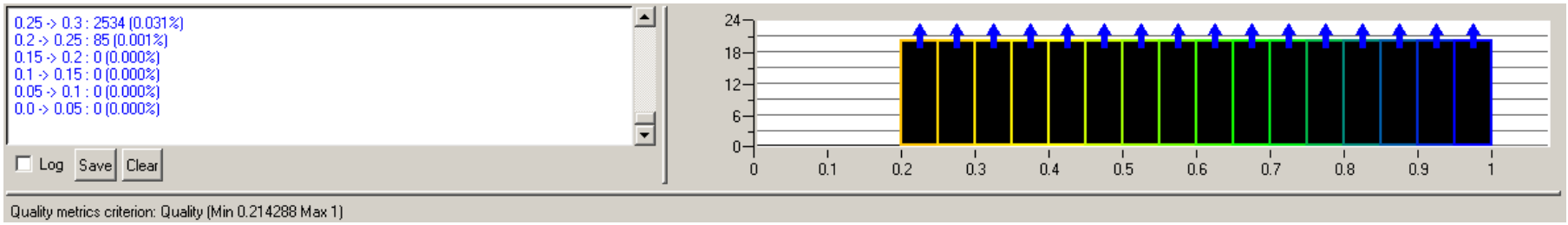
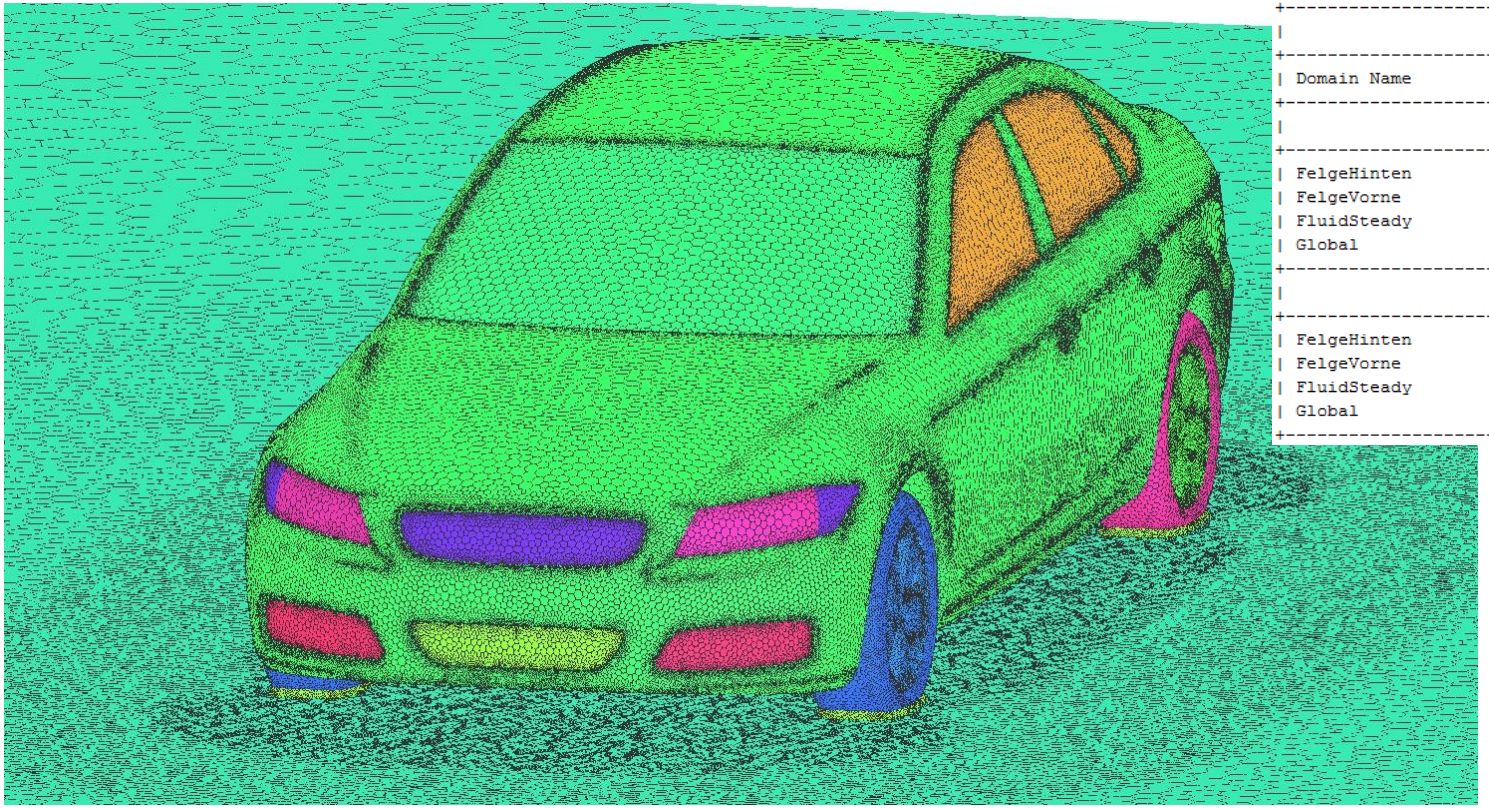
- After the generation of the prism layer, the mesh has to be smoothed again.
- The layer it self should not be smoothed with high quality to avoid to high jump factors in the layers.
- A minimum Quality of 0.21 could be achieved.

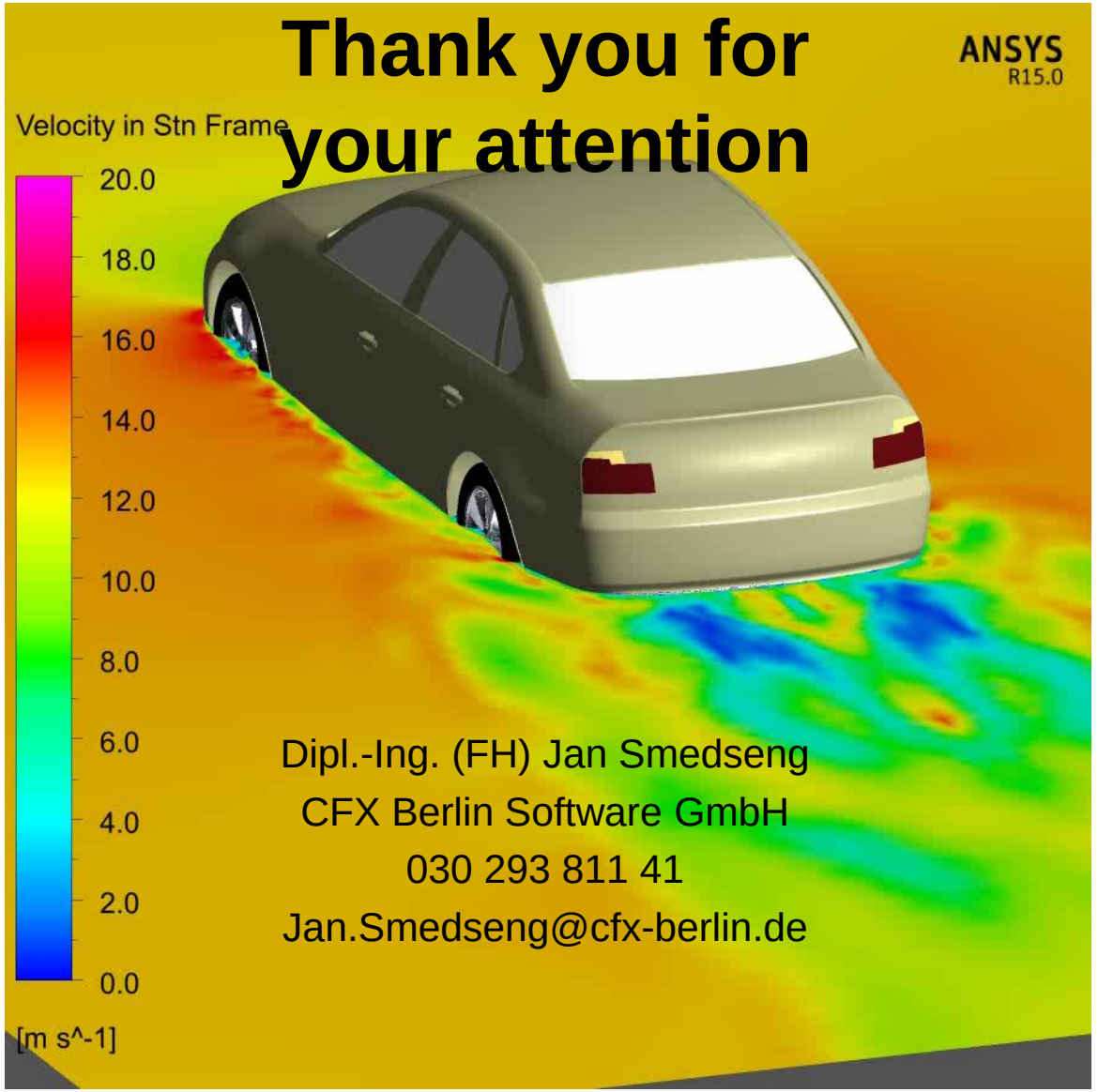


Finalise



Mesh Statistics									
Domain Name	Orthog. Angle			Exp. Factor			Aspect Ratio		
	Minimum [deg]			Maximum			Maximum		
FelgeHinten	28.5 ok			16 ok			203 OK		
FelgeVorne	28.9 ok			18 ok			243 OK		
FluidSteady	33.1 ok			35 !			265 OK		
Global	28.5 ok			35 !			265 OK		
	%!	%ok	%OK	%!	%ok	%OK	%!	%ok	%OK
FelgeHinten	0	1	99	<1	4	96	0	0	100
FelgeVorne	0	1	99	<1	4	96	0	0	100
FluidSteady	0	1	99	<1	11	89	0	0	100
Global	0	1	99	<1	9	91	0	0	100

Thank you for your attention



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