



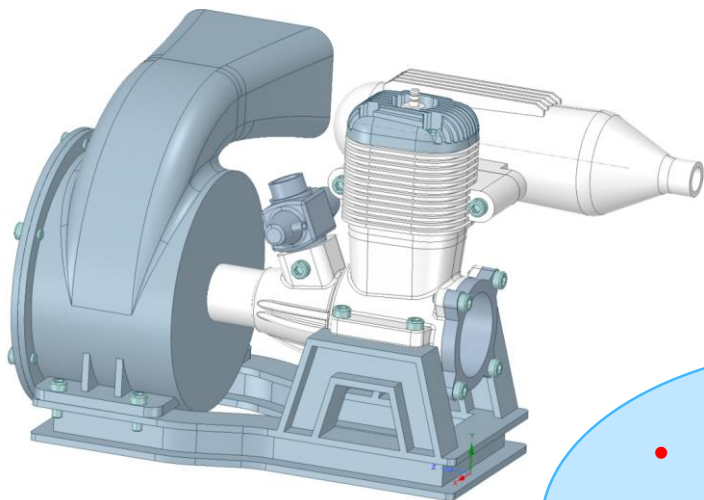
子模型技术培训

刘丙权

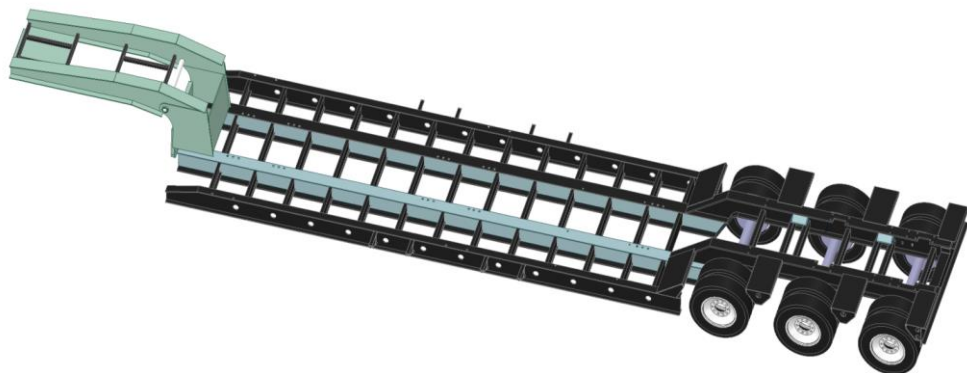
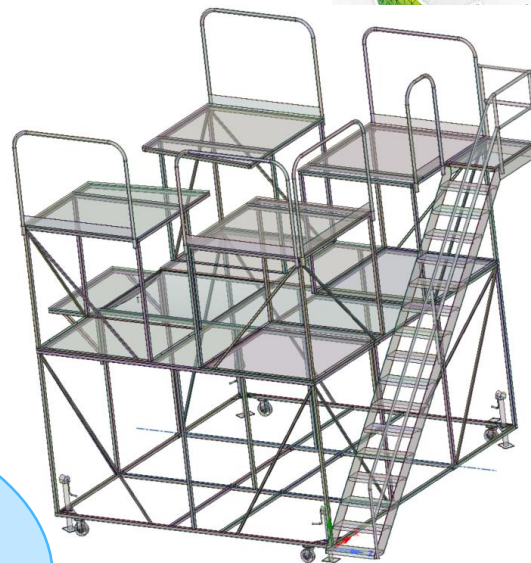
ANSYS CHINA



为什么使用子模型技术

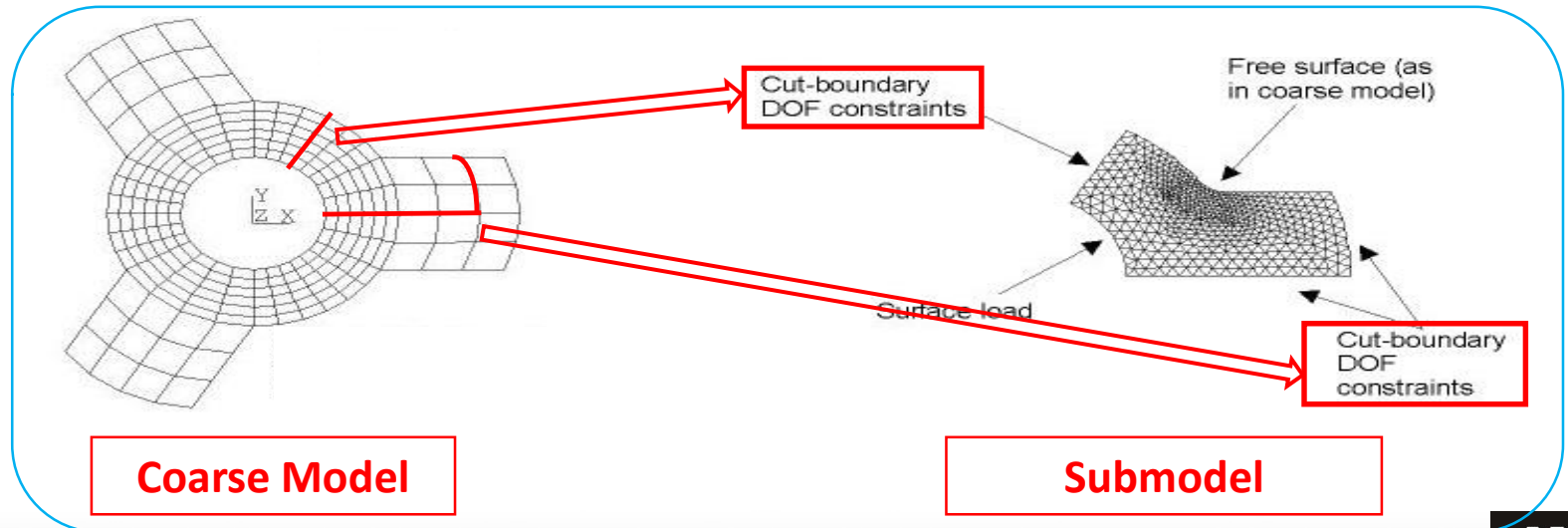
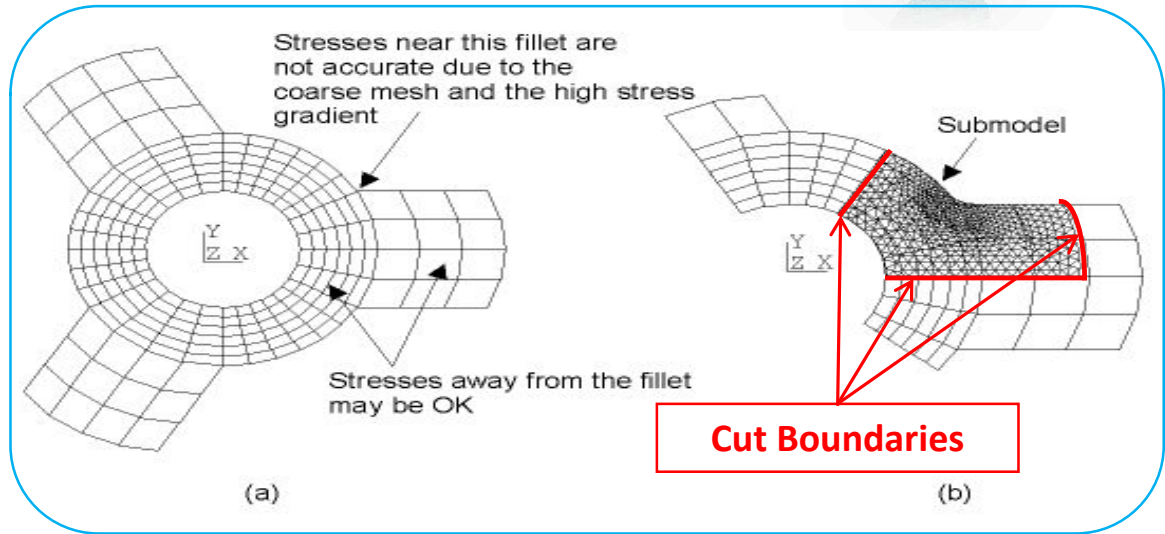


- 网格与计算精度
- 大型复杂模型
- 项目周期问题



什么是子模型技术

- 基于粗糙模型，针对关键部位进行精细分析的技术
 - 切割边界的定义
- 将粗糙模型的位移结果映射到子模型切割边界
 - 切割边界的选取



ANSYS子模型仿真流程

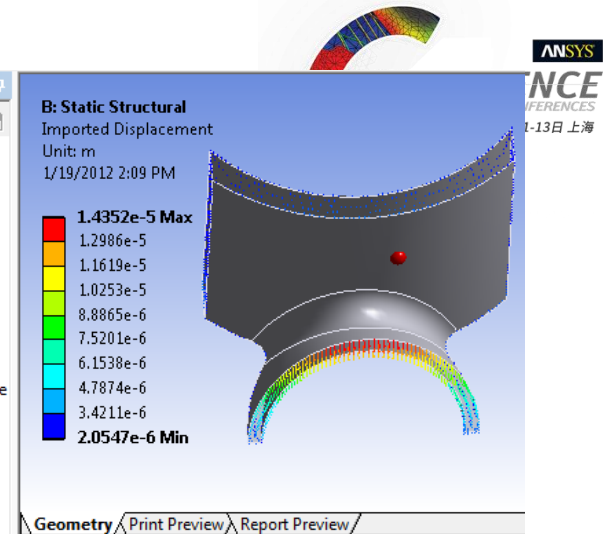
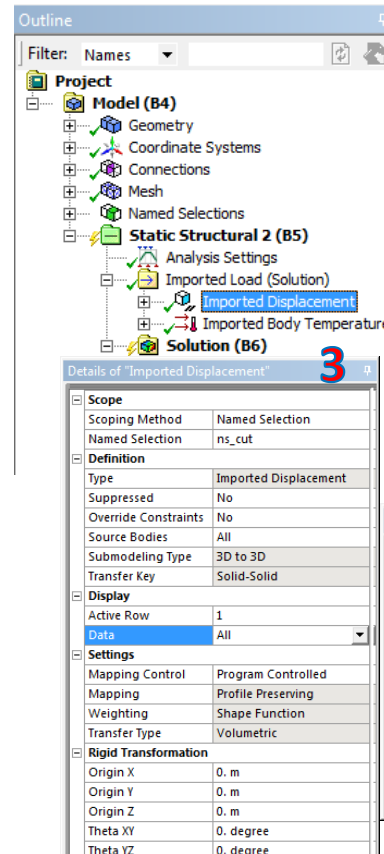
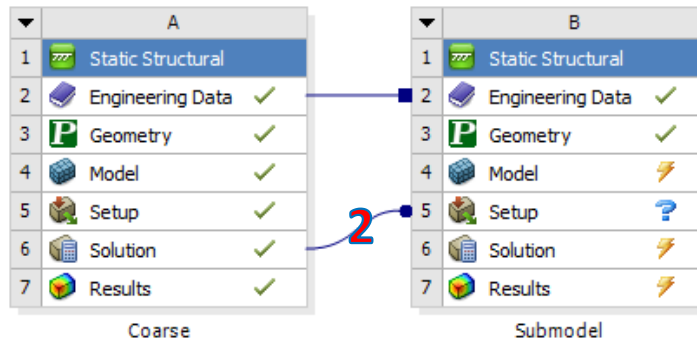
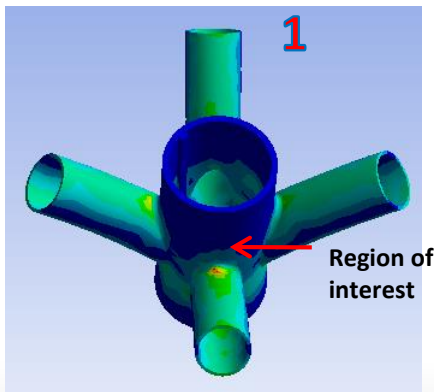
Workflow

1. Create and Analyze Coarse Model

2. Create Submodel and link systems in Project Schematic

3. Do Cut-Boundary/Body load Interpolation using appropriate Imported Load(s)

4. Analyze Submodel



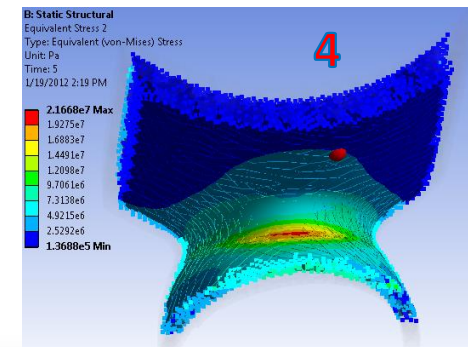
Data View

Imported Displacement

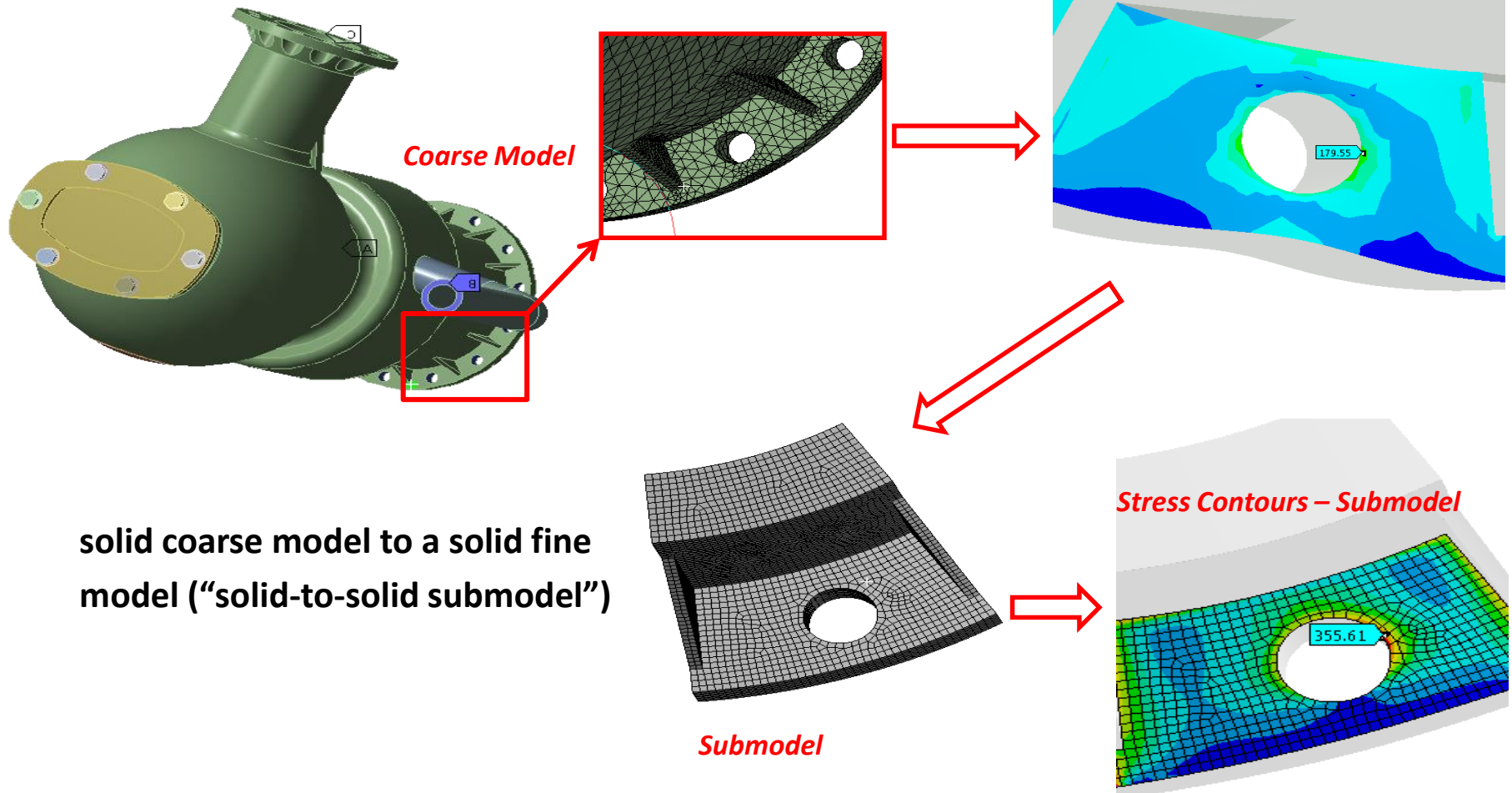
	Source Time (s)	Analysis Time (s)
1	0.7	0.7
2	2.1	2.1
3	3	3
4	4.2	4.2
5	5	5

Multi-step import

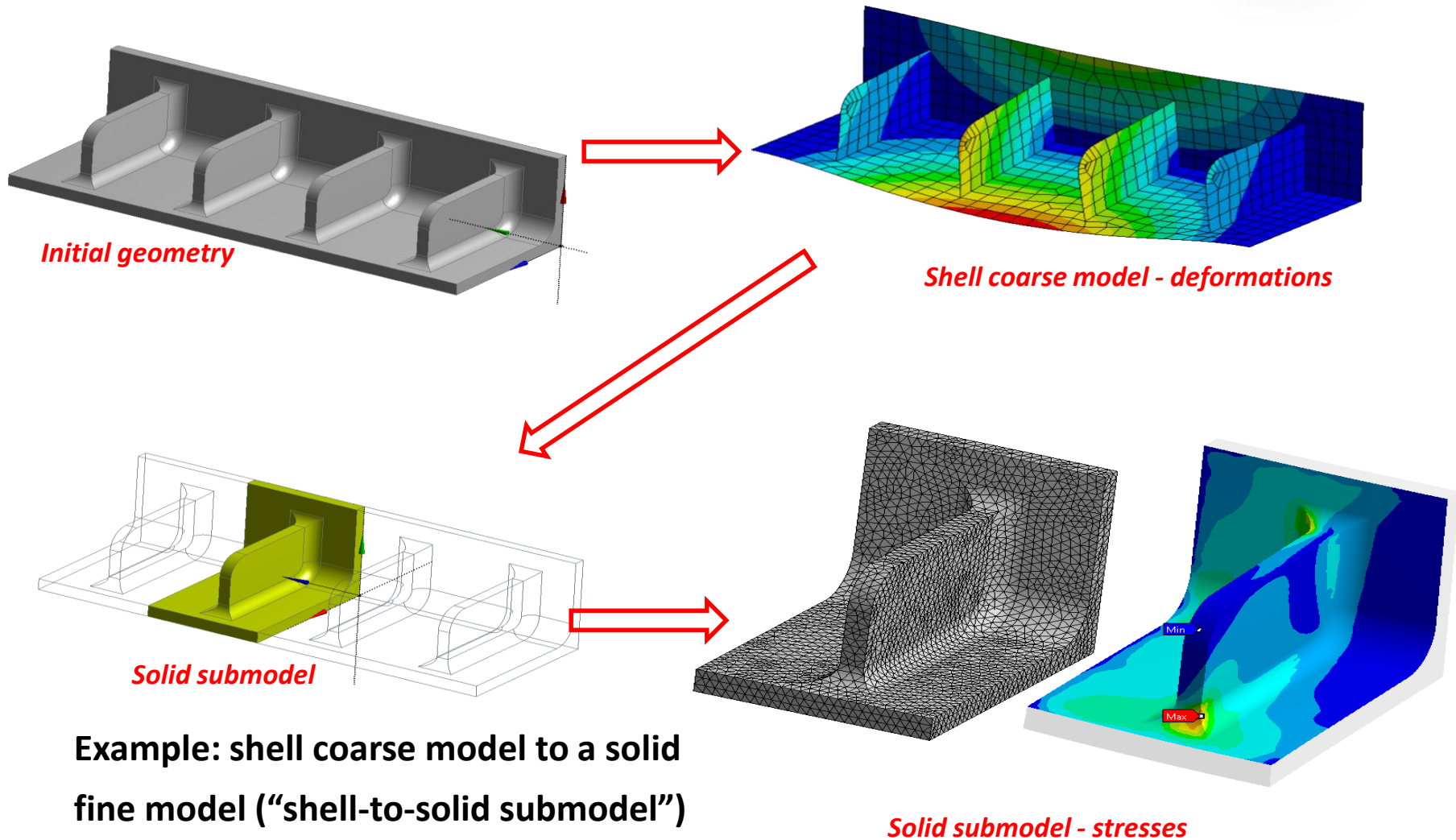
Messages Graph Data View



ANSYS子模型技术Solid-Solid



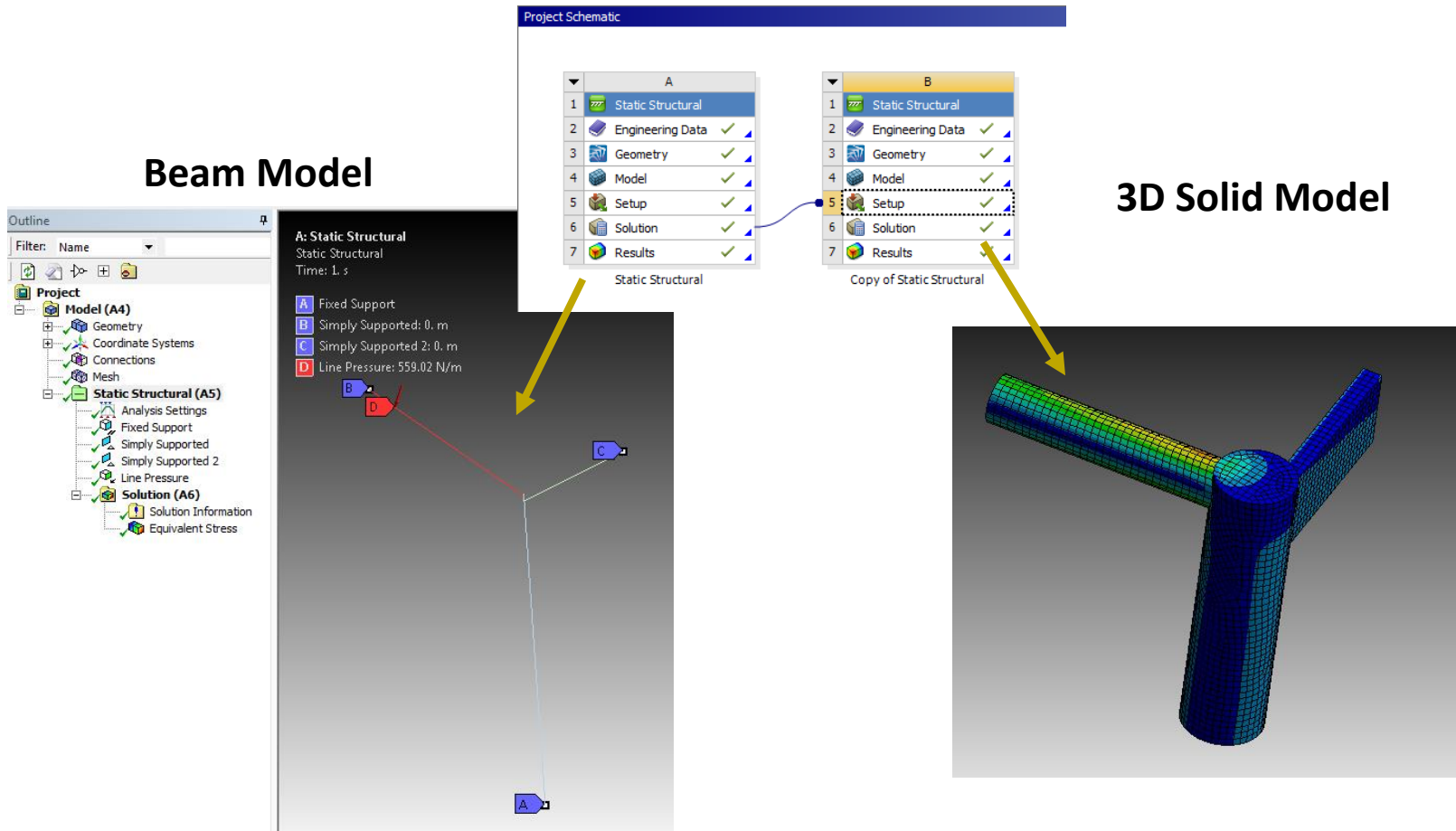
ANSYS子模型技术Shell-Solid



Example: shell coarse model to a solid fine model (“shell-to-solid submodel”)

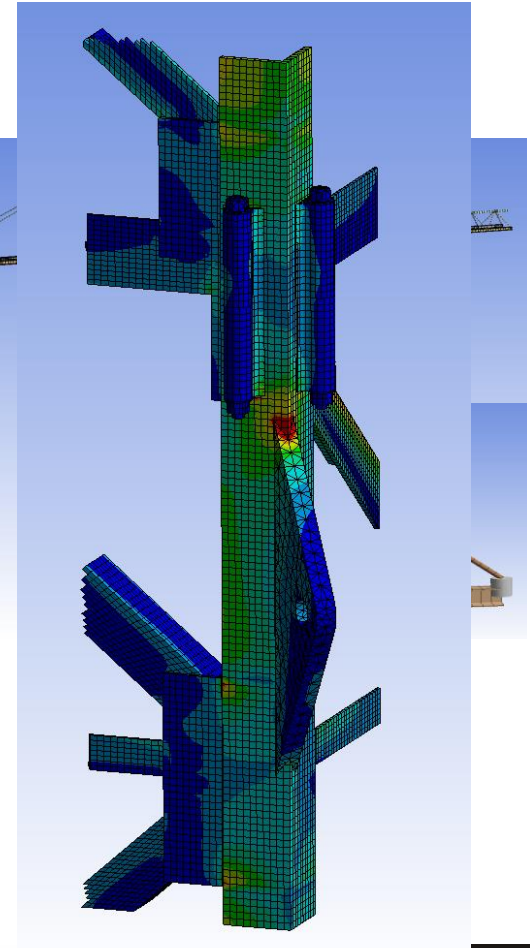
ANSYS子模型技术Beam-Solid

Submodeling between beams and solids

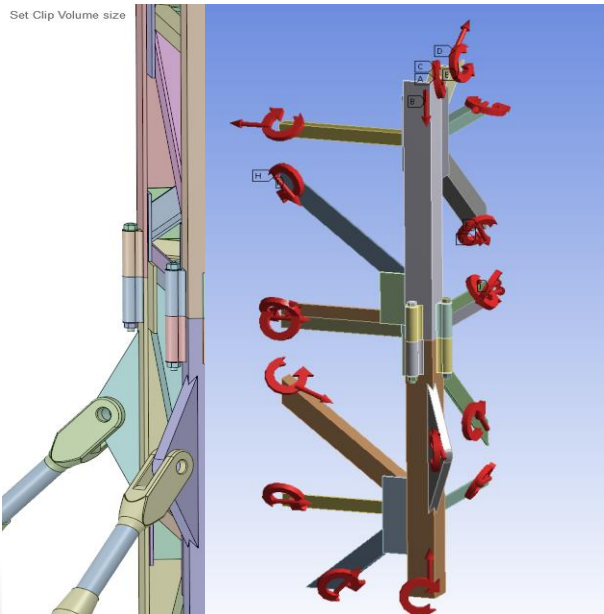


子模型技术-吊车案例

- Structural and thermal submodeling capabilities are available
- Feature Includes:
 - 2D , 3D, and 2D to 3D submodeling
 - Solid to Solid and Shell to Shell/Solid submodeling
 - Ability to view and perform Rigid Body Transformations of source mesh
 - Multiple weighting options for boundary conditions transfer
 - Multi-step support
 - Validation

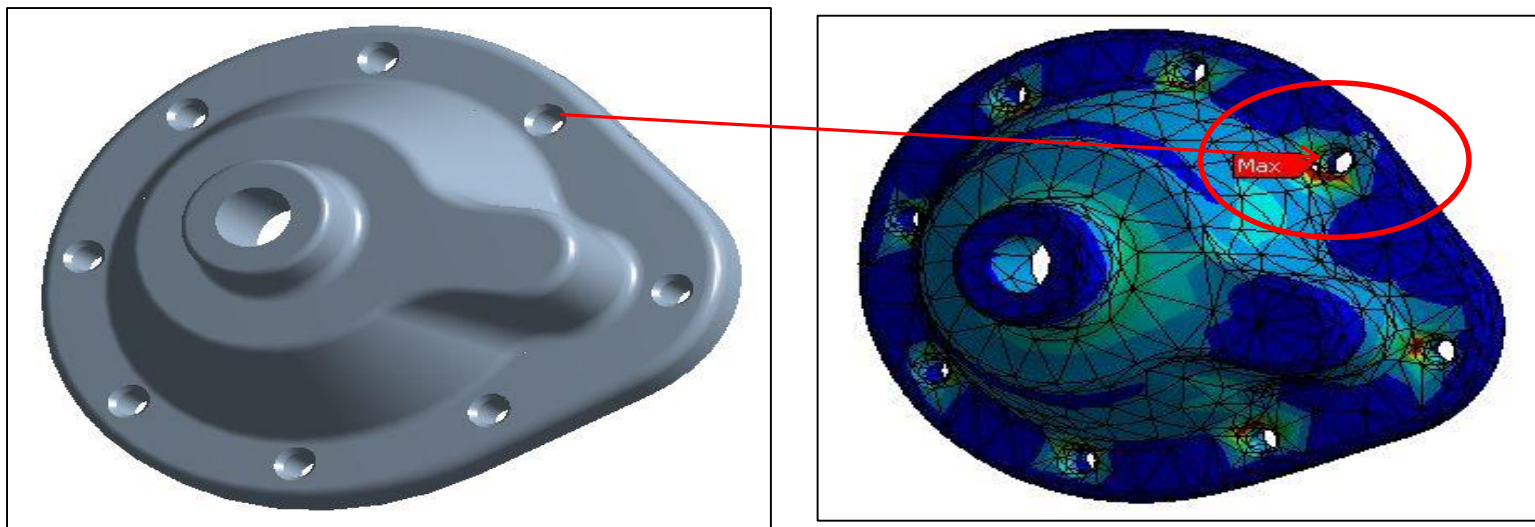


Set Clip Volume size



案例流程

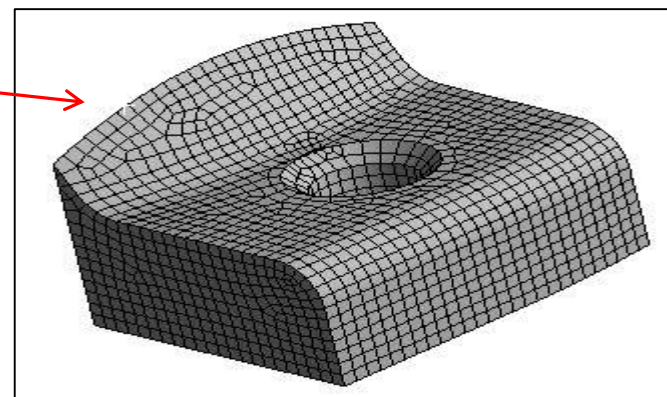
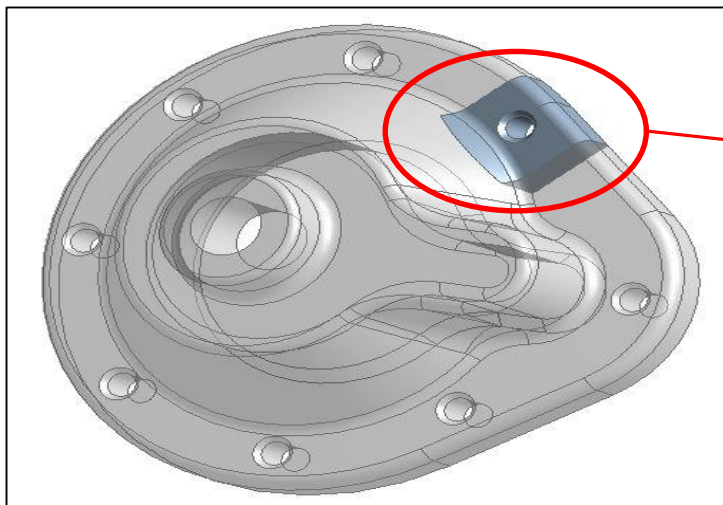
- 整体模型采用粗糙网格求解
- 高应力和应力集中位置
- 基于分析结果，确定子模型位置，获得更加准确的结果



案例流程

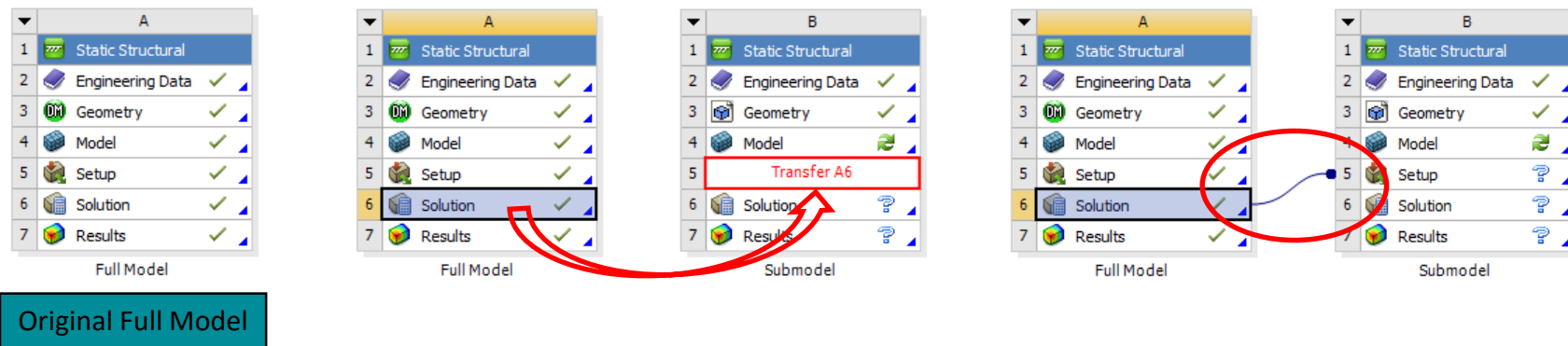
采用ANSYS SpaceClaim切割出子模型

子模型划分更加精细的网格



案例流程

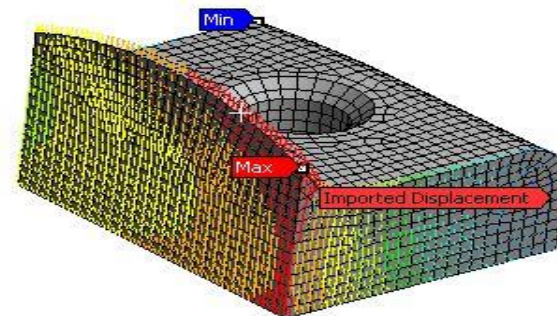
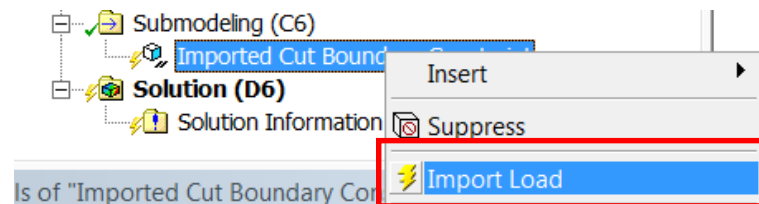
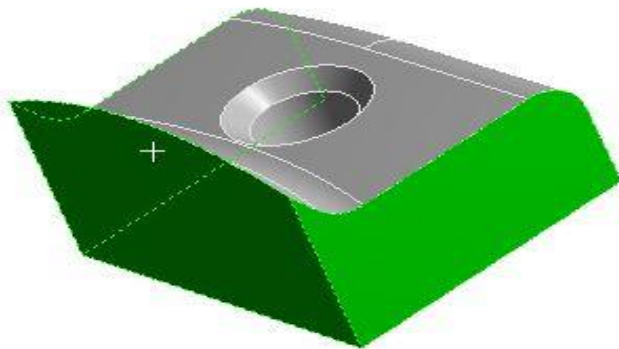
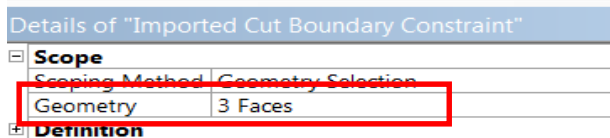
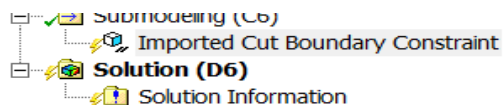
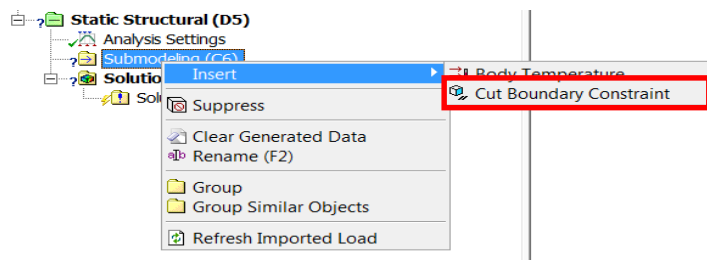
The submodel schematic is set up as shown here:



子模型几何不能拉线共享，应为一个新的几何结构

案例流程

- 完成子模型边界映射

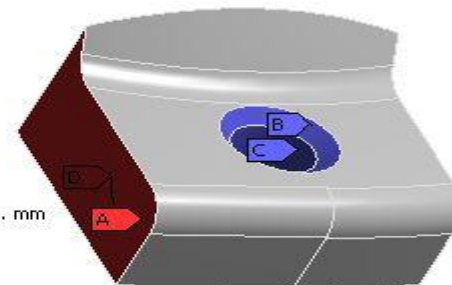


B: Static Structural

Static Structural

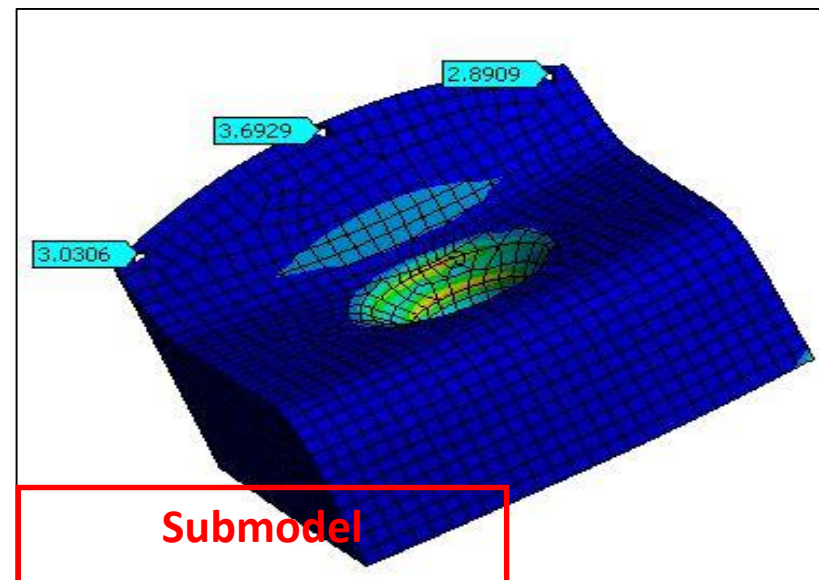
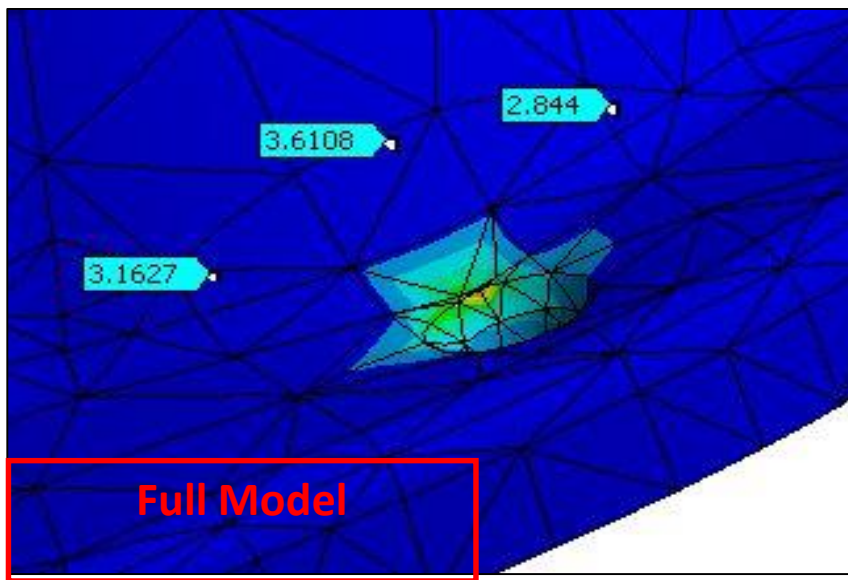
Time: 1. s

- A Imported Displacement
- B Frictionless Support
- C Frictionless Support 2
- D Compression Only Support: 0. mm



案例流程

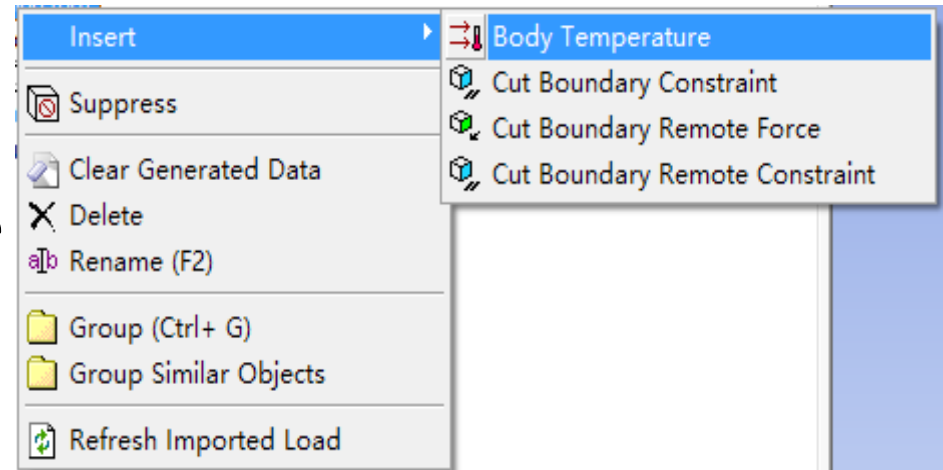
- 检查结果，对比全模型与子模型分析结果
- 通过探针Probe可以查看切割边界上的结果对比是否相近。如果不是通常意味着切割边界应该原理高应力区



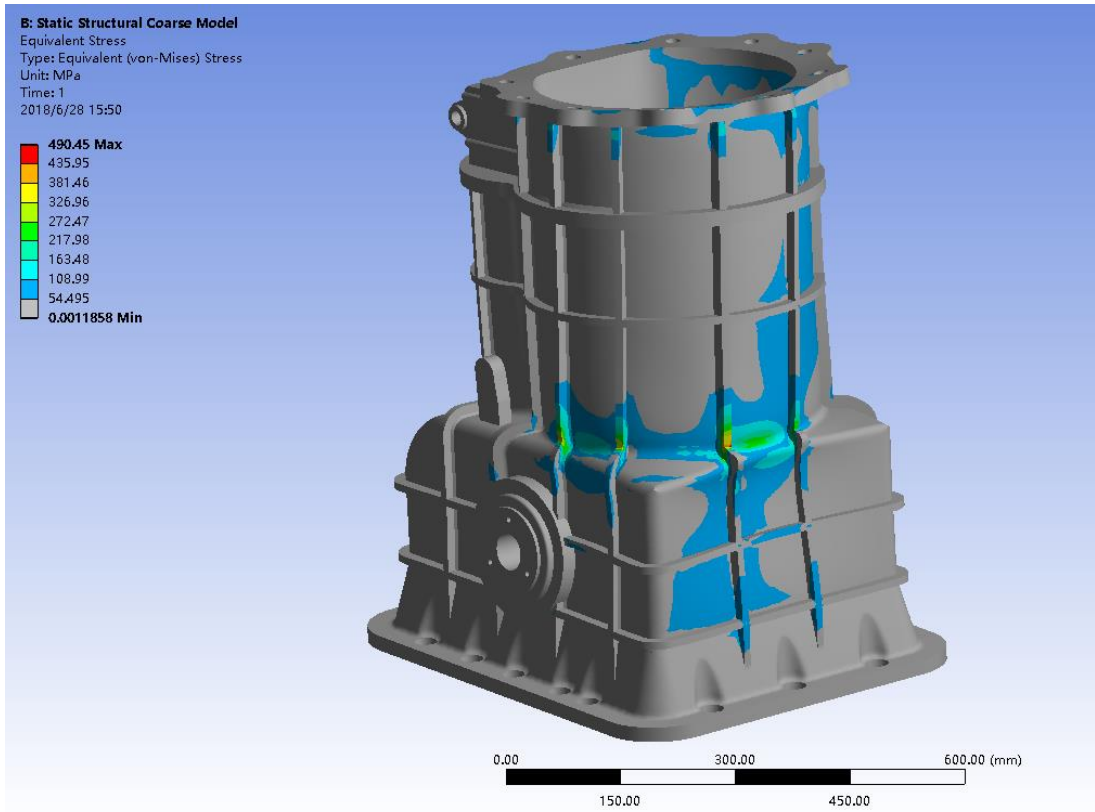
结构子模型支持的边界



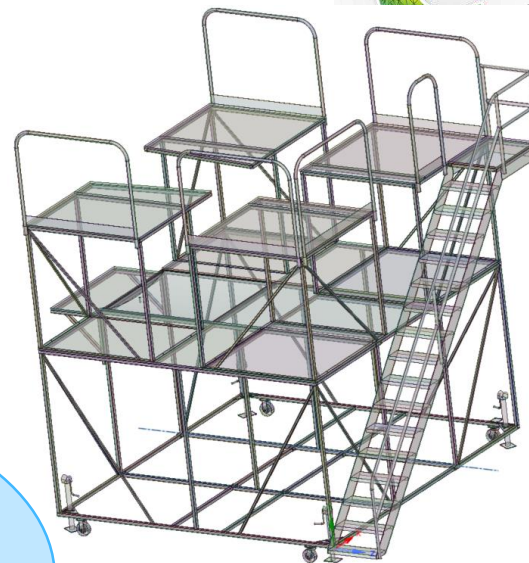
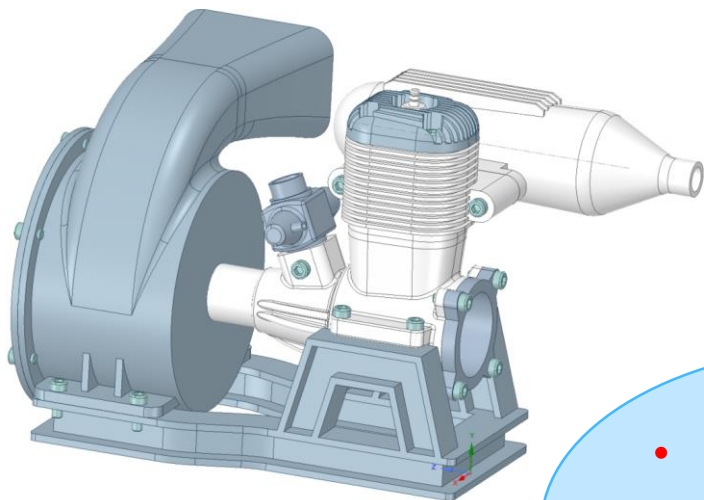
- Body Temperature
- Cut Boundary Constraint
 - 支持shell-solid和solid-solid
- Cut Boundary Remote Force
 - 仅支持beam to shell or solid
 - 映射力和力矩
- Cut Boundary Remote Constraint
 - 仅支持Beam to shell or solid
 - 映射远端位移和扭转力



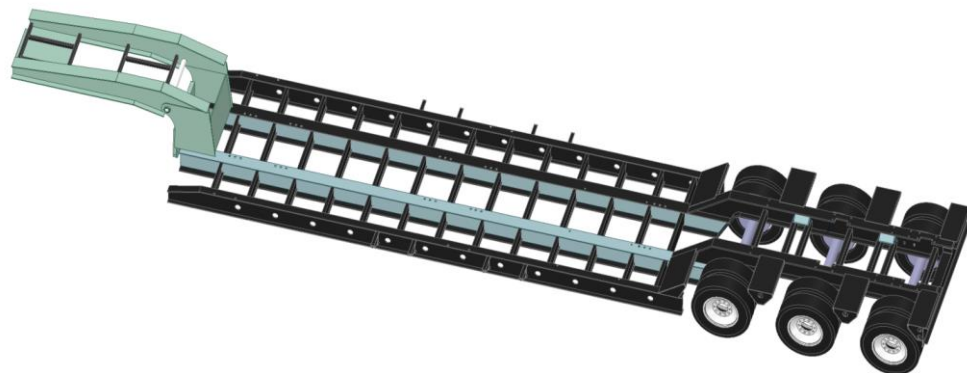
操作练习



总结



- 网格与计算精度
- 大型复杂模型
- 项目周期问题



感谢聆听！

