Implementation of FEM on HPC –I (Guided examples)

Dr. Damijan Zorko, University of Ljubljana, Faculty of Mechanical Engineering, LECAD

June/2021

Univerza *v Ljubljani*

TU WIEN — TECHNISCHE UNIVERSITÄT WIEN

CINECA — consorzio interuniversitario

VSB TECHNICAL UNIVERSITY OF OSTRAVA | IT4INNOVATIONS NATIONAL SUPERCOMPUTING CENTER

Overview of Ansys Workbench
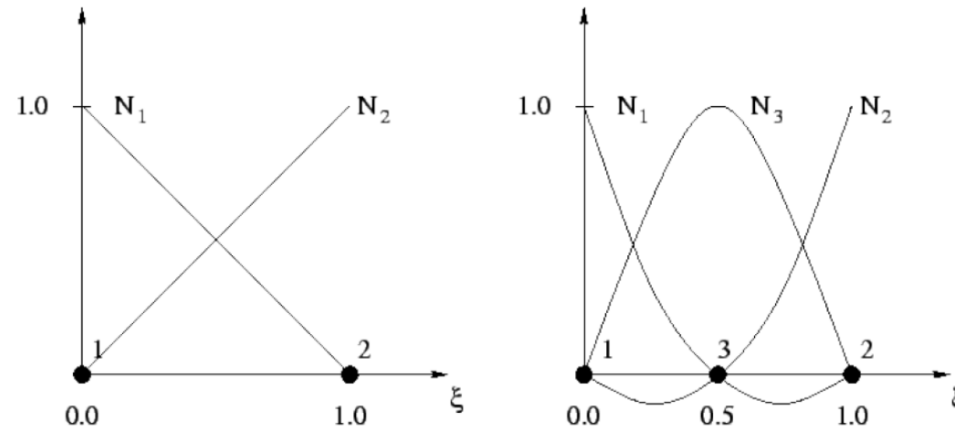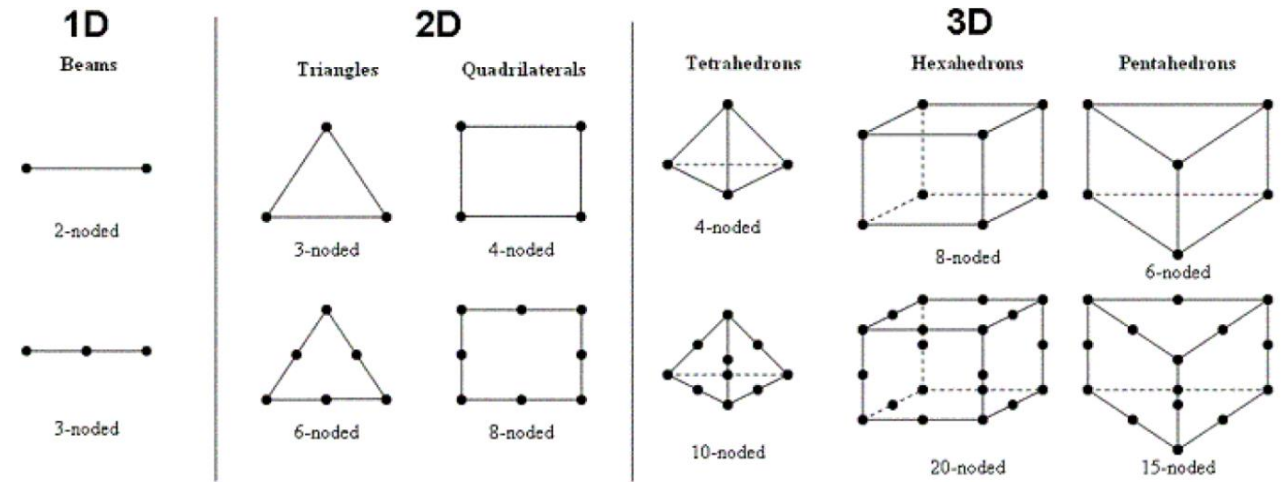
- Analysis types

- Project schematic

- Ansys Mechanical
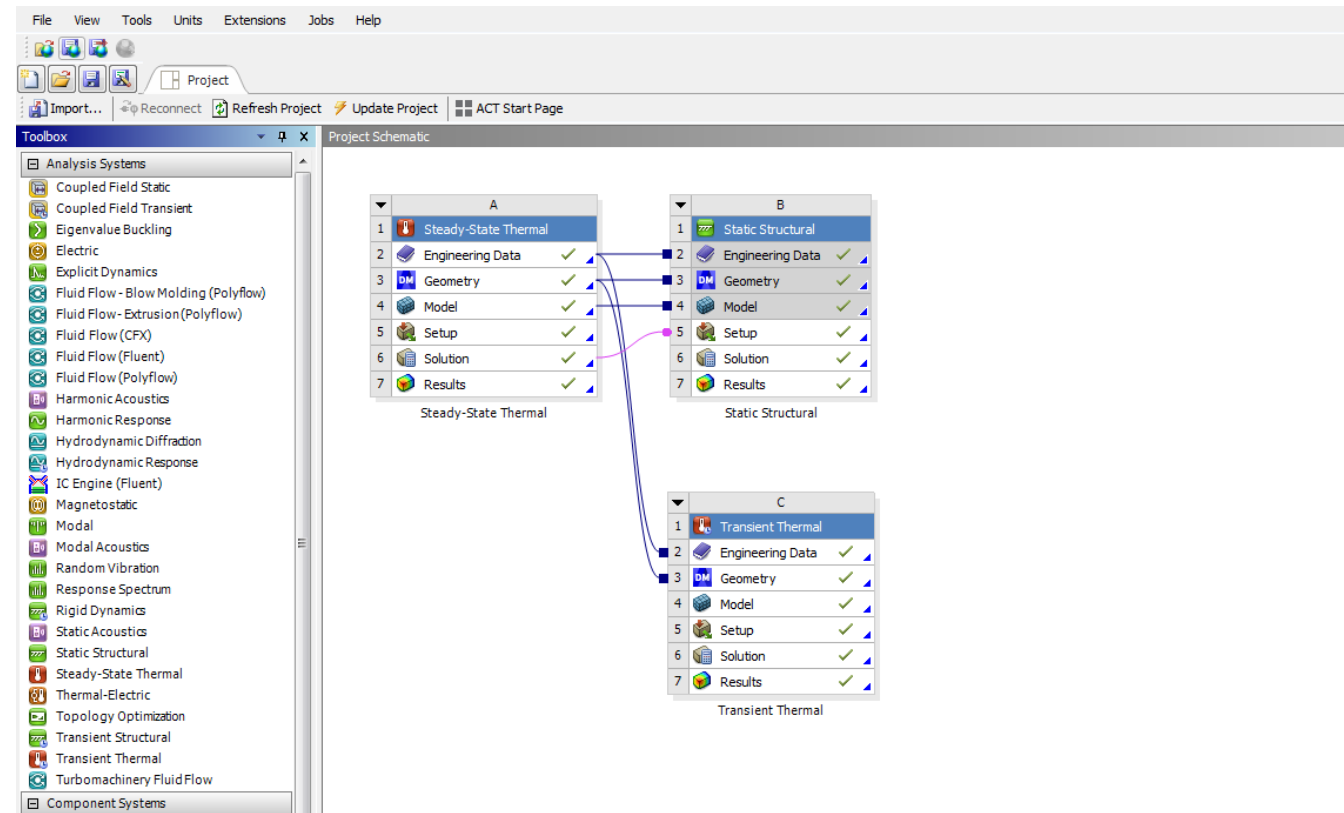
Overview of element types

- Beams
- Shells
- Solids

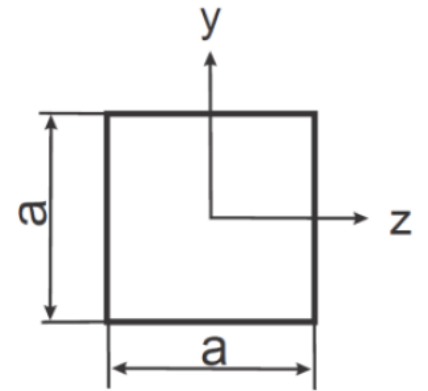SCtrain | SUPERCOMPUTING KNOWLEDGE PARTNERSHIP

Example I (Cantilever beam)

- a = 10 mm
- L = 1000 mm
- F = 20kN
- E = 200 Gpa
- N = 0.3
- $\sigma = ?, \Delta L = ?$
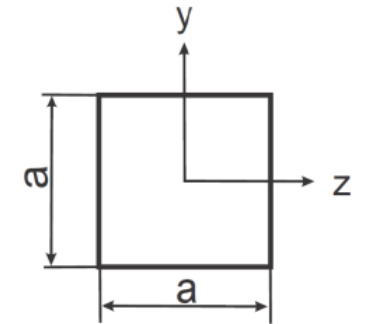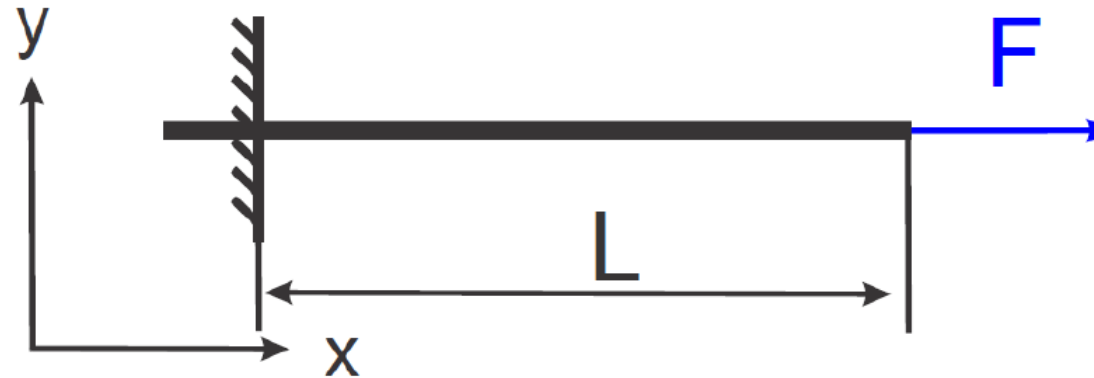
Exact analytical solution $\quad \sigma = \dfrac{F}{A} = 200 \ \text{MPa} \qquad \Delta L = \dfrac{\sigma \cdot L}{\varepsilon} = 1 \ \text{mm}$

Example II (Pure bending)

- a = 100 mm
- L = 1000 mm
- F = 25kNm
- E = 200 Gpa
- N = 0.3
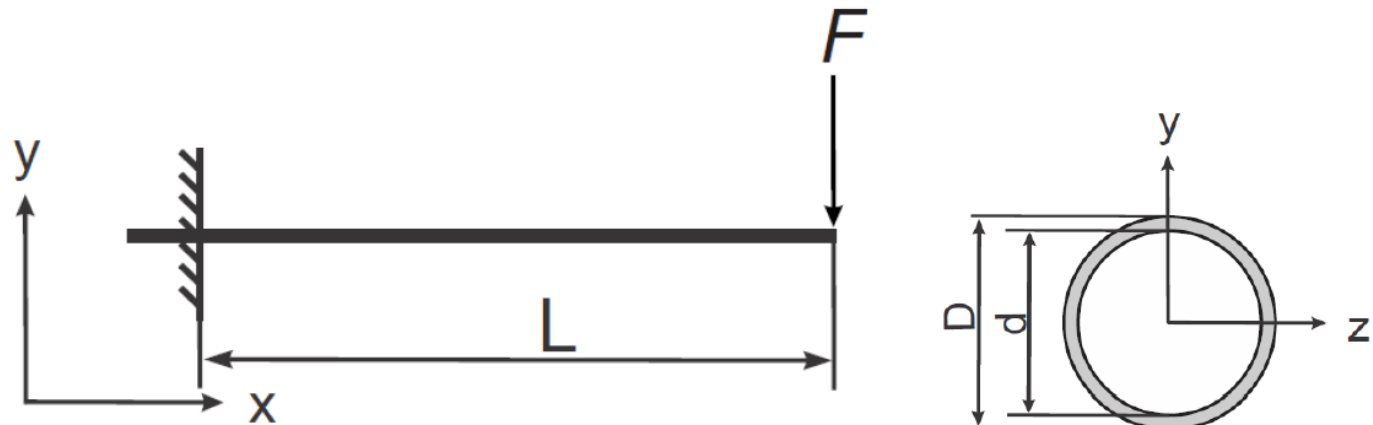- $\sigma = ?$, y (L/2) = ?

Exact analytical solution:
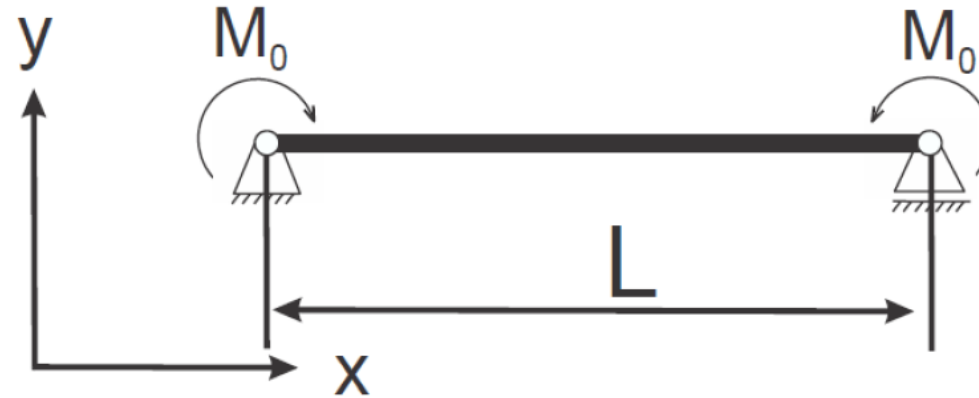
$$\sigma_X = \frac{M}{W} = 150 \text{ MPa}$$

$$y\left(\frac{L}{2}\right) = \frac{1}{8}\frac{M_0 \cdot L^2}{EI} = 1{,}875 \text{ mm}$$

Example III (Individual exercise)

- D = 50 mm

- d = 46 mm

- L = 2000 mm

- F = 250 N

- E = 200 Gpa

- N = 0.3

- σ = ?, y (L) = ?

Thank you for your attention!

http://sctrain.eu/