

Implementation of FEM on HPC – I (Guided examples)

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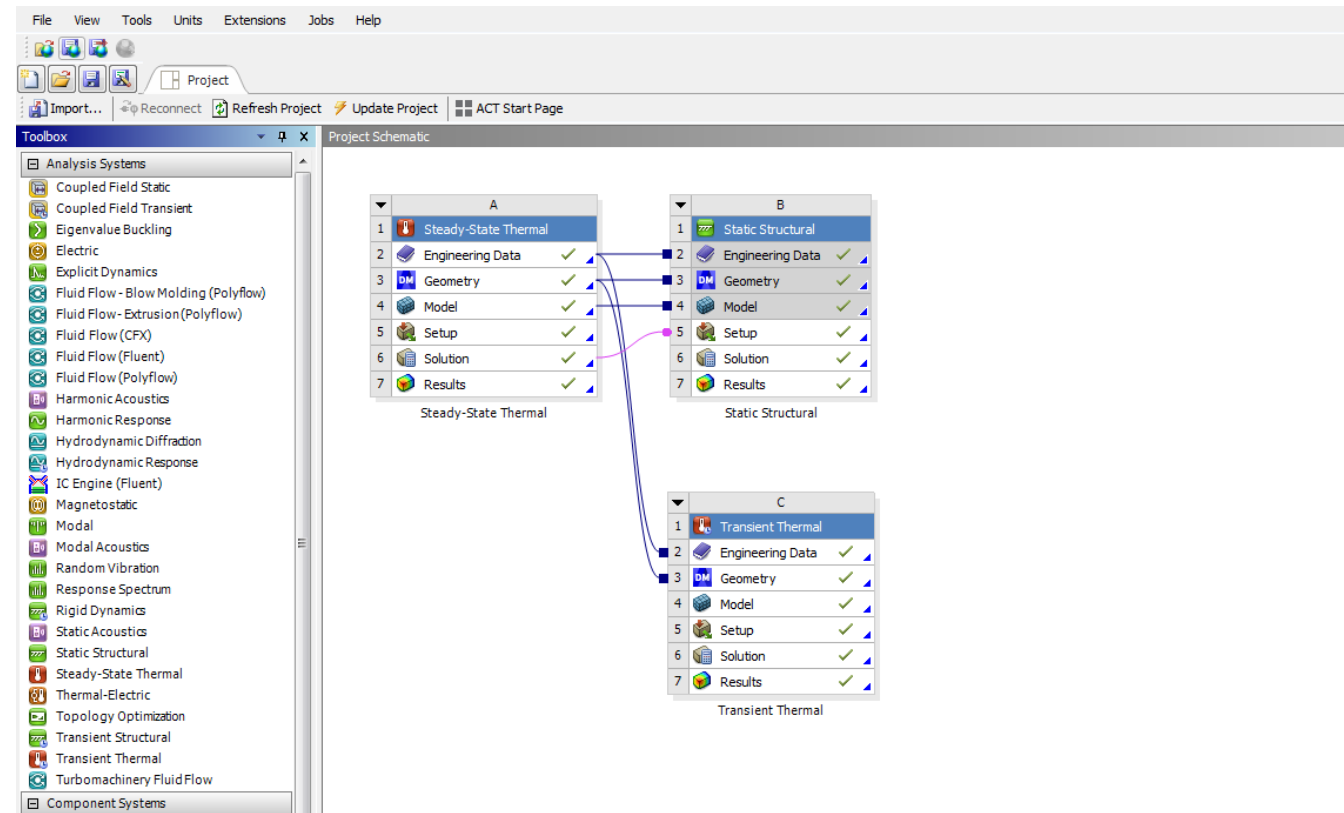
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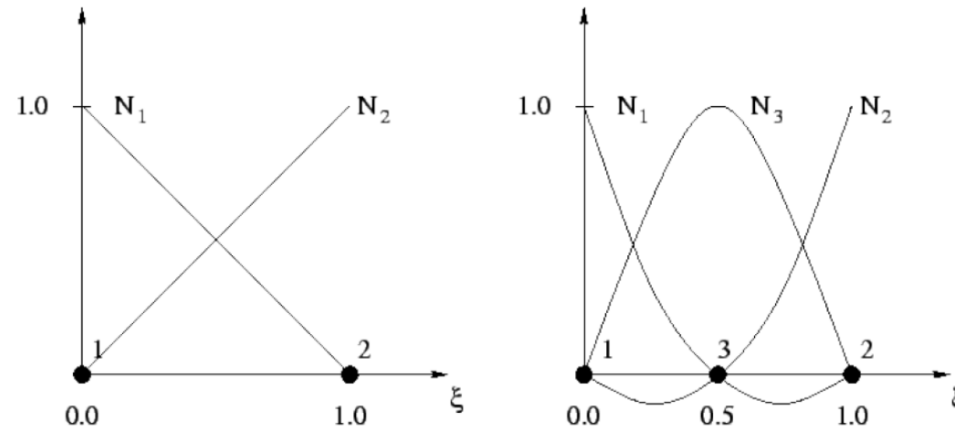
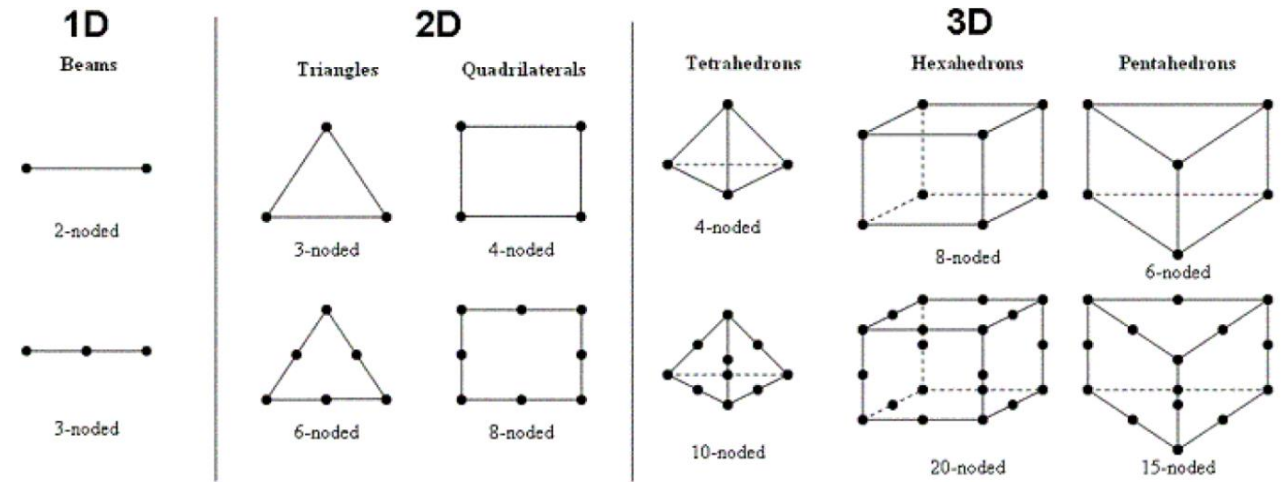
Overview of Ansys Workbench

- Analysis types
- Project schematic
- Ansys Mechanical



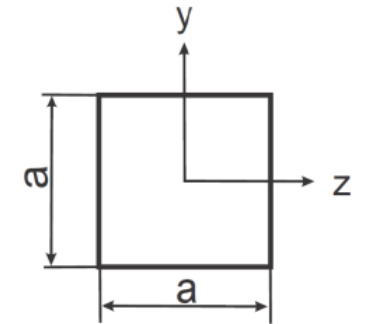
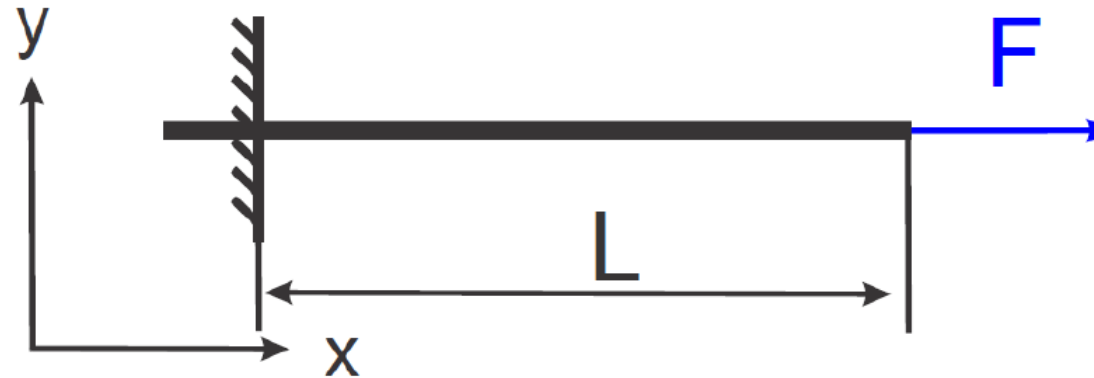
Overview of element types

- Beams
- Shells
- Solids



Example I (Cantilever beam)

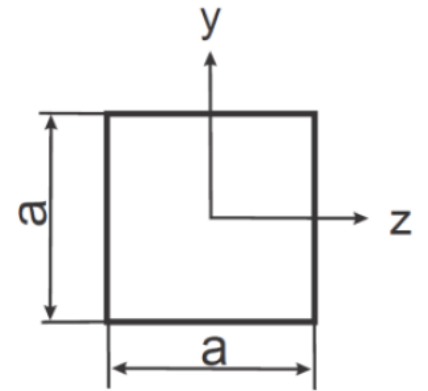
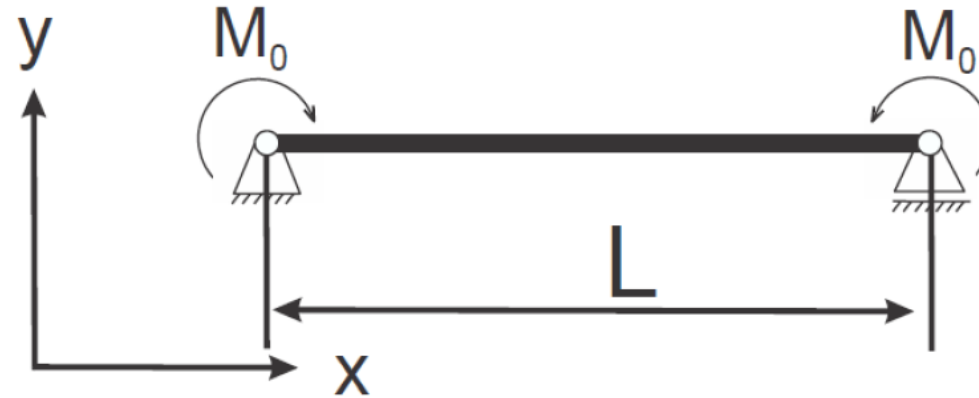
- $a = 10 \text{ mm}$
- $L = 1000 \text{ mm}$
- $F = 20 \text{ kN}$
- $E = 200 \text{ GPa}$
- $\nu = 0.3$
- $\sigma = ?$, $\Delta L = ?$



Exact analytical solution $\sigma = \frac{F}{A} = 200 \text{ MPa}$ $\Delta L = \frac{\sigma \cdot L}{E} = 1 \text{ mm}$

Example II (Pure bending)

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



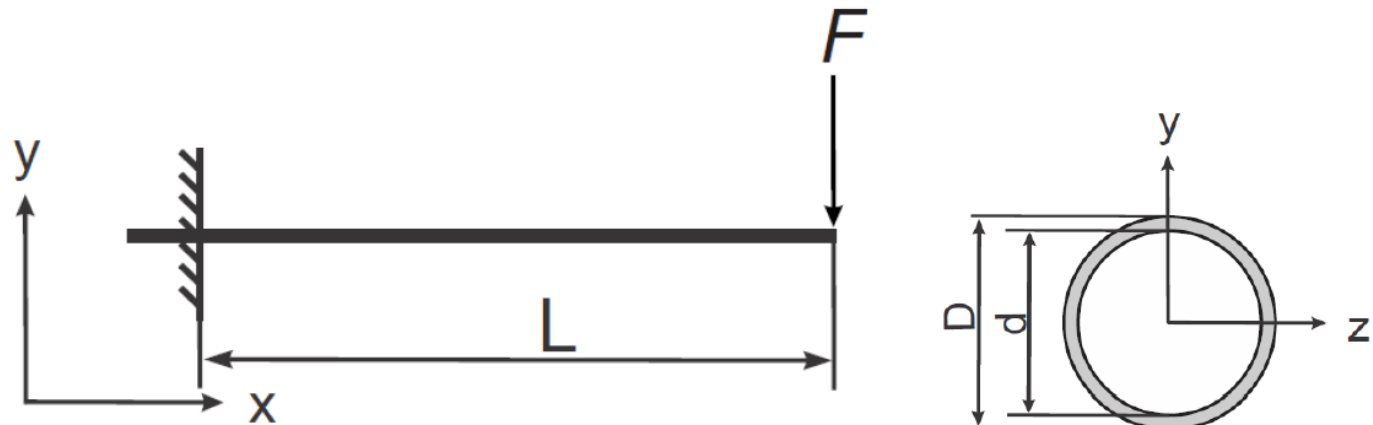
$$\sigma_x = \frac{M}{W} = 150 \text{ MPa}$$

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

Exact analytical solution:

Example III (Individual exercise)

- $D = 50 \text{ mm}$
- $d = 46 \text{ mm}$
- $L = 2000 \text{ mm}$
- $F = 250 \text{ N}$
- $E = 200 \text{ Gpa}$
- $N = 0.3$
- $\sigma = ?$, $y(L) = ?$



Thank you for your attention!

<http://sctrain.eu/>

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