

# FSI❄ce for Fluid-Structure Interactions on Cartesian Grids

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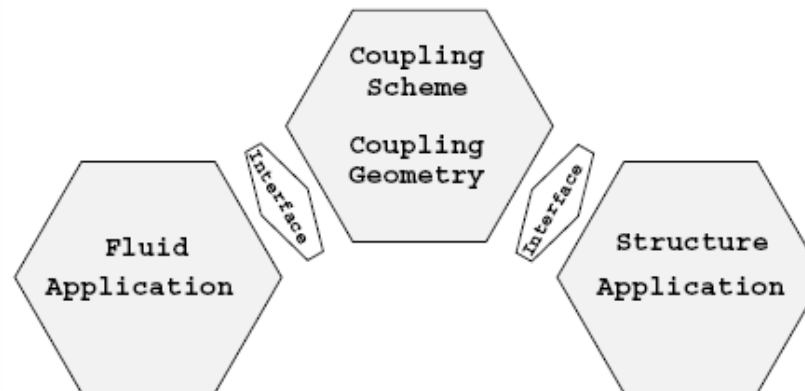


# Outline

- Design of FSI\*ce
- Usage of FSI\*ce
- Outlook

# Design of FSI<sup>❄</sup>ce

- “plug-in” mechanism for the CFD/CSD programs
- coupling scheme (explicit/implicit) outside CFD/CSD simulation programs
- client-server approach
- developed together with group Prof. Rank

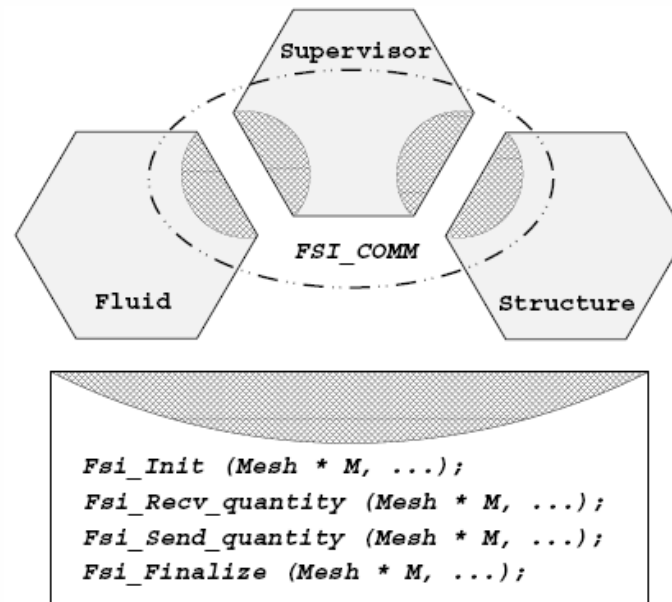
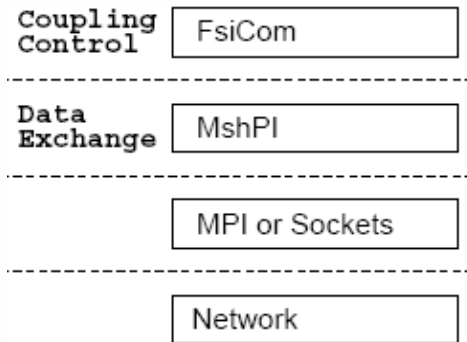


# Design of FSI\*ce – coupling geometry

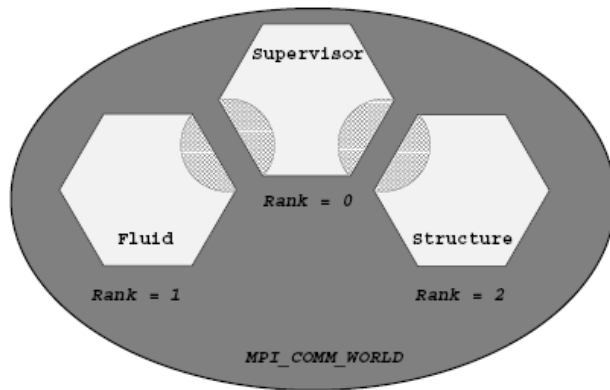
independent representation of the coupling geometry

- Vertex-edge-face representation (vef-graph)
- Data structure *FSI\_Mesh*
  - coordinates
  - data associated with vertices or faces (e.g. forces)
  - access methods

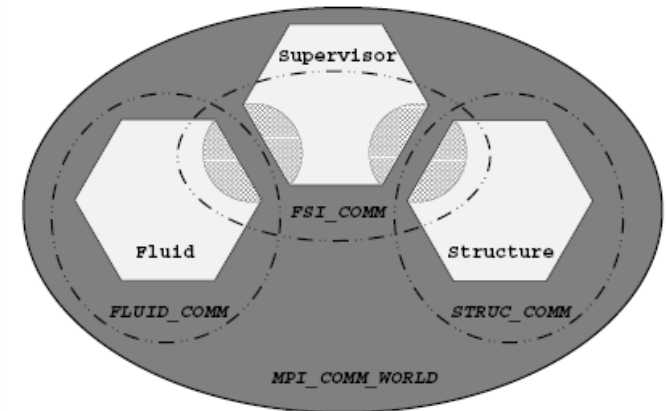
# Design of FSI<sup>❄</sup>ce – communication



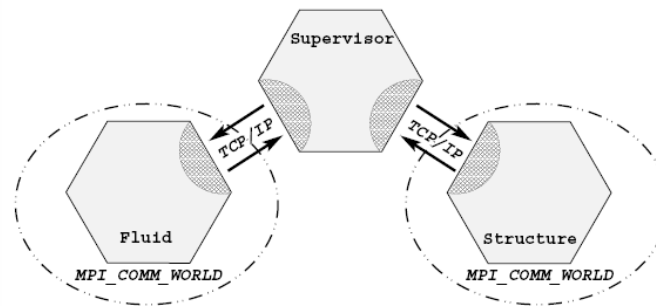
# Design of FSI<sup>ce</sup> – communication



Server programs are serial



MPI Communicators



Communication with Sockets / distributed application

# Outline

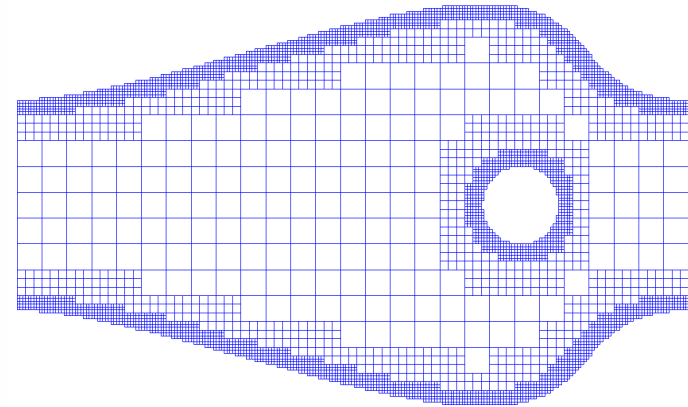
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# Usage of FSI<sup>❄</sup>ce

## CFD: Cartesian grids (no restriction!)

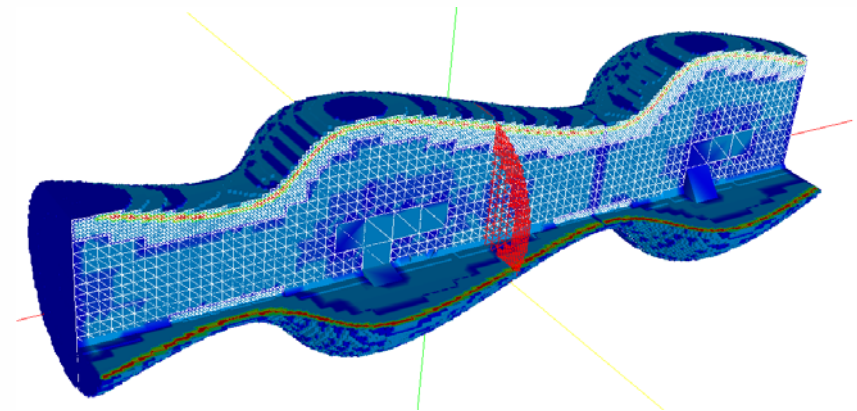
- **F3F**

- 3D
- FV
- regular Cartesian grids



- **Peano**

- 2D, 3D
- FEM
- adaptive/regular Cartesian grids
- SFC (cache-optimisation)
- grid hierarchy (multigrid)
- SE aspects -> maintainability!



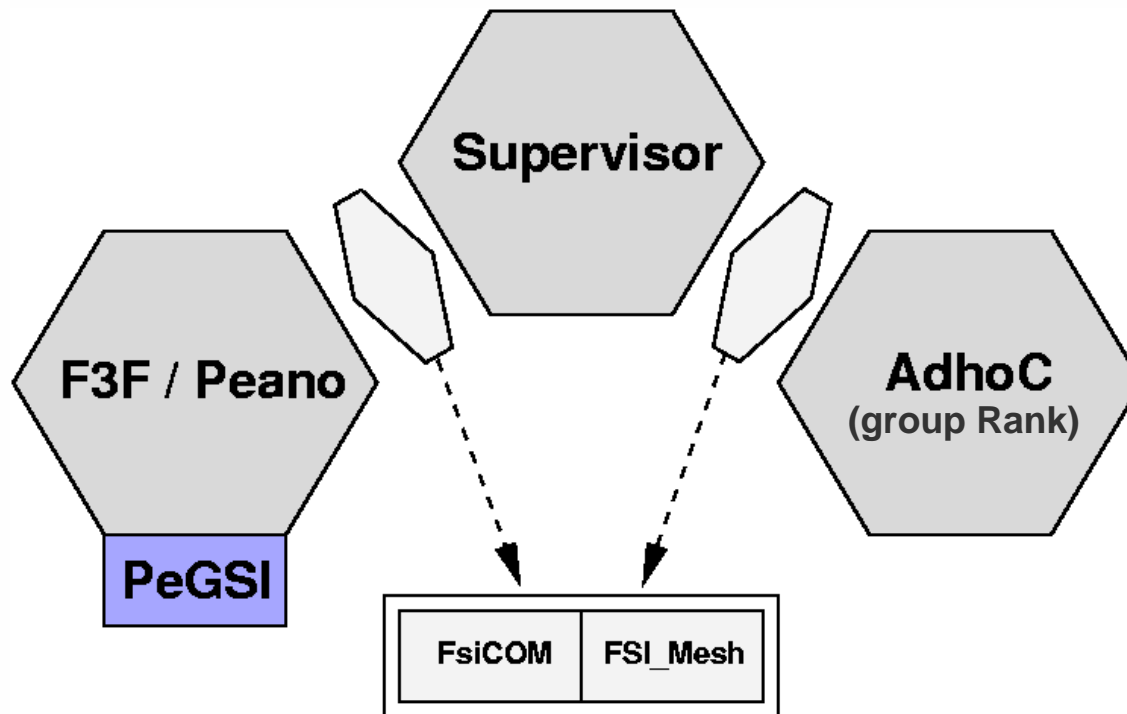


## Usage of FSI❄ce

### **PeGSI** (add-on)

- Recent BGCE student project
- 2D, 3D
- data format reader
- spacetree for coupling surface
  - dynamic creation / modification
  - key data structure for geometry queries
  - fast geometry access
- modular interpolation scheme

# Usage of FSI❄ce

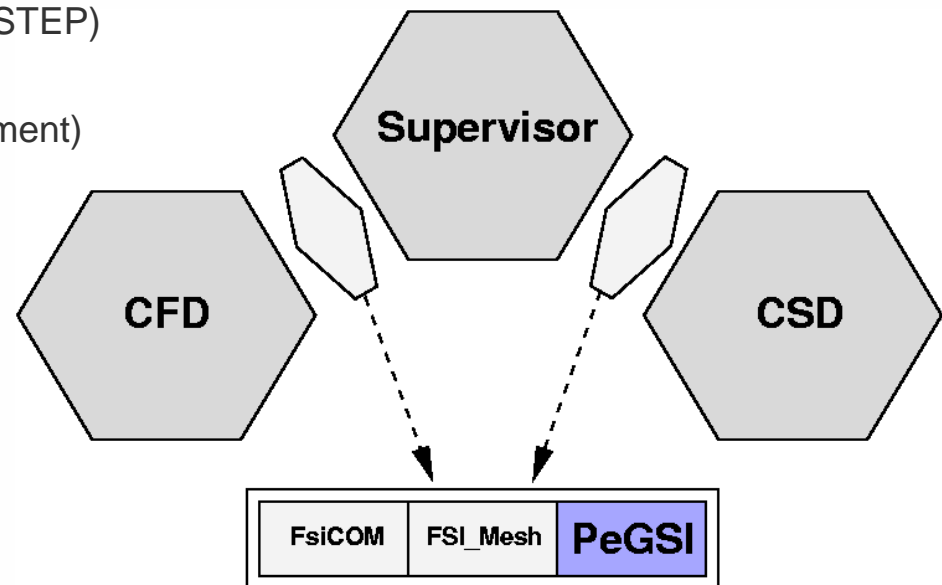


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# Outlook

- integration of PeGSI :
  - triang. data format reader (IGES,STEP)
  - central definition of interpolation
  - fast geometry access (grid movement)
  - collision detection



- preparation for usage in Grid infrastructures

Thanks for your attention!

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