Focus Topic Session

Challenges in Extreme Engineering Algorithms

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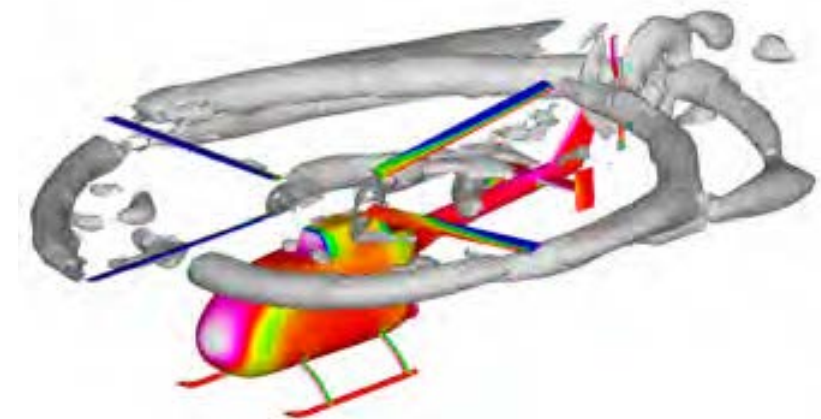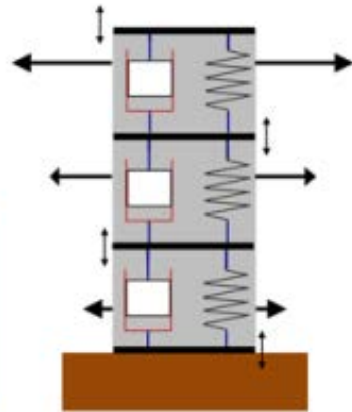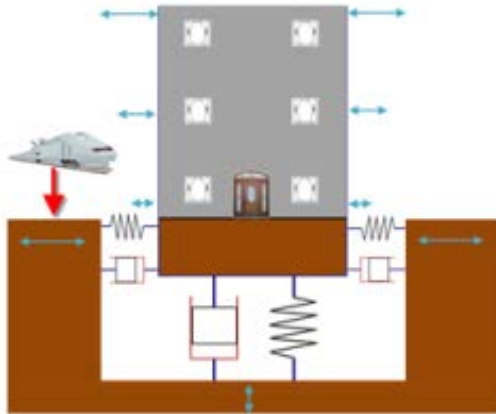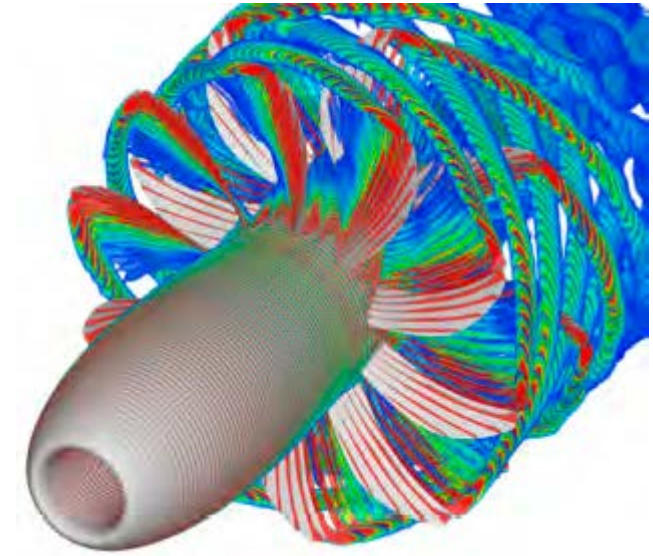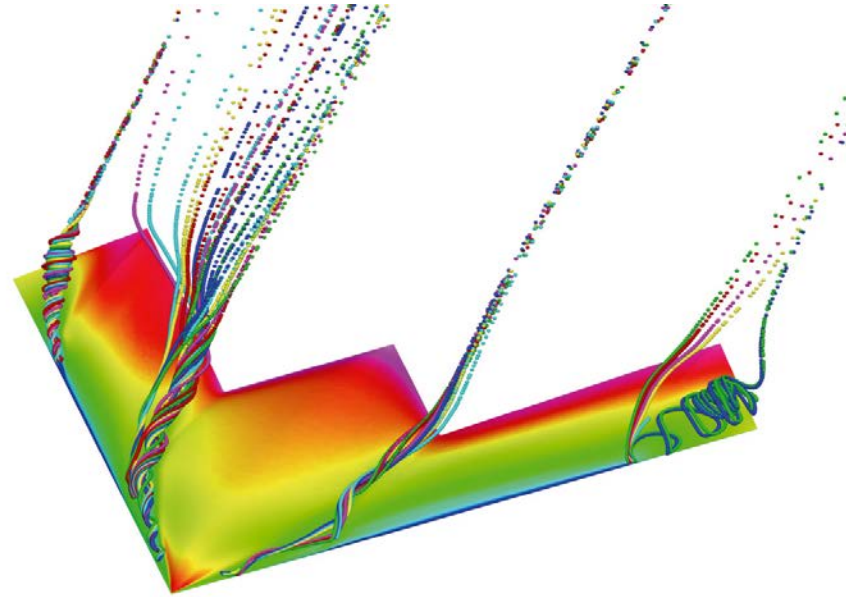Simulation and Software Technology

Linder Höhe, Cologne, Germany

Knowledge for Tomorrow

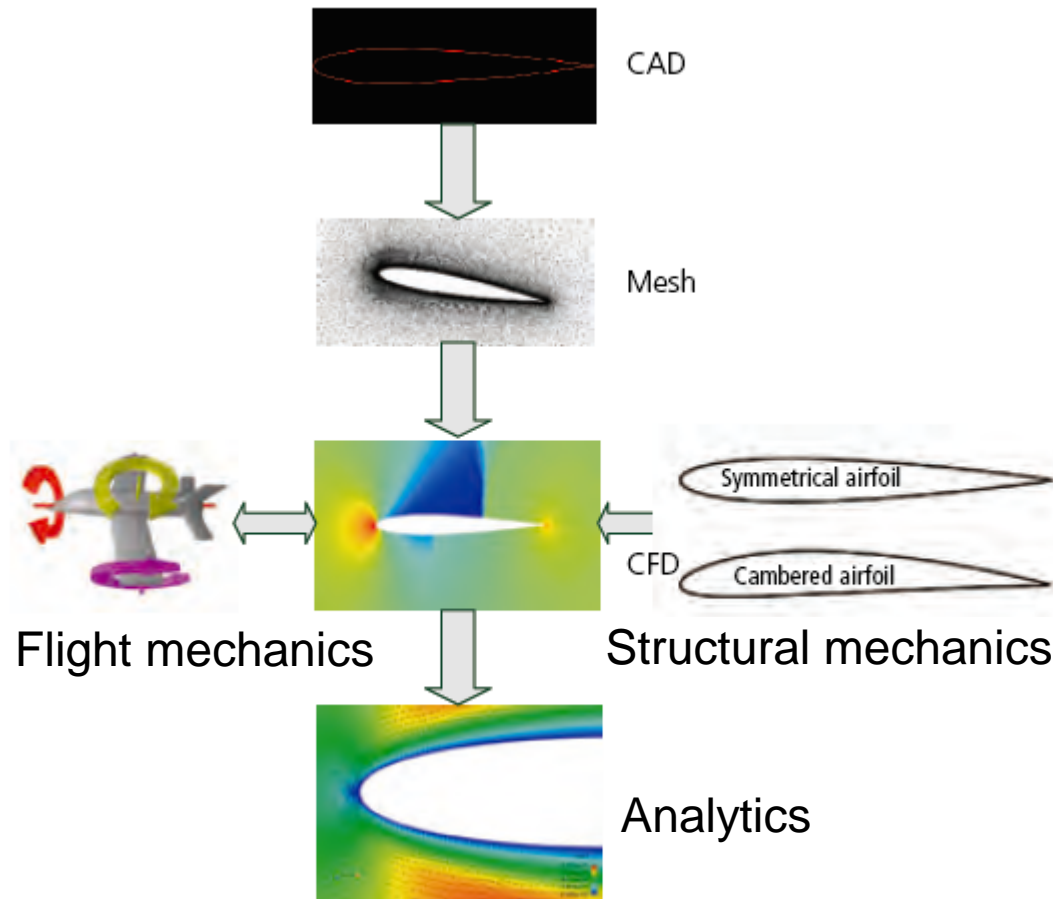# Engineering Simulations on Massively Parallel Hardware

- Aircraft design

- Helicopter Design

- Building Design

Challenges

Algorithms must

- usually solve time-dependent and non-linear problems

- be robust

- be highly accurate

- be scalable

CAD

Mesh

Flight mechanics

Symmetrical airfoil

Cambered airfoil

CFD

Structural mechanics

Analytics

Software frameworks must

- exploit hardware parallelism on several levels

- be tunable for heterogeneous computer systems

- support load balancing

- be easily to maintain

Coupling of several application components

→ Convergence challenges
→ Scalability challenges

→ Load balancing challenges
→ Communication challenges

Presentations

Coupling Rotor Dynamics with a Parallel Airflow Simulation

Johannes Hofmann

Research Engineer, Institute of Flight Systems, German Aerospace Center

Extreme Simulations on ppOpen-HPC

Prof. Dr. Kengo Nakajima

Professor, Supercomputing Research Division, Information Technology Center, University of Tokyo