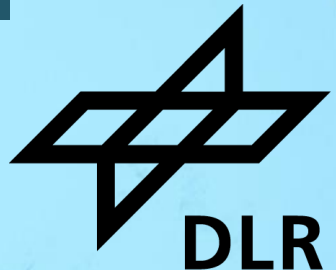


# **Multi-Fidelity-Simulation: Integration von High-Fidelity in GTlab**

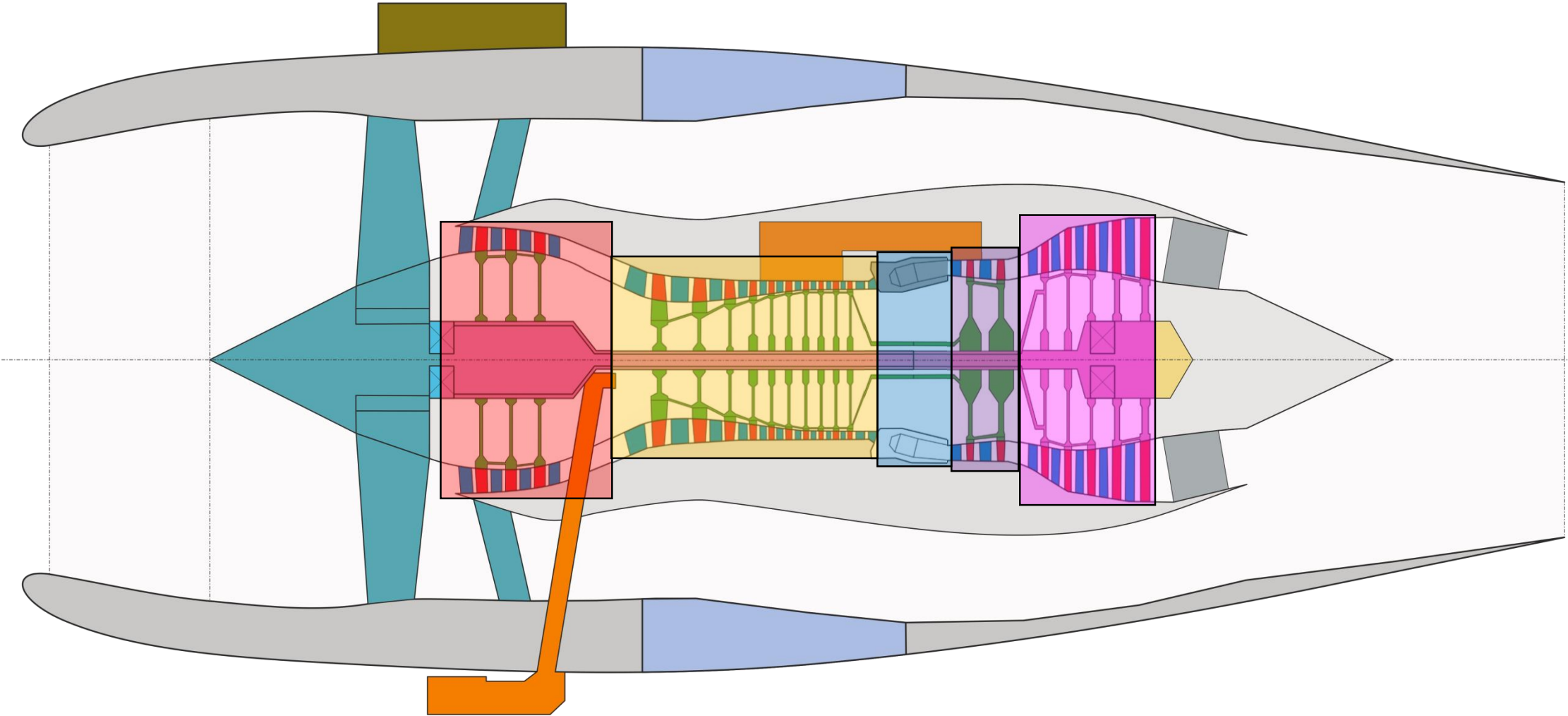
**Matthias Schuff**

**DLR-Institut für Test und Simulation für Gasturbinen**

**GTlab Community Days, 22.11.2024**



# Modellierung komplexer Simulationen



## Segmentierung

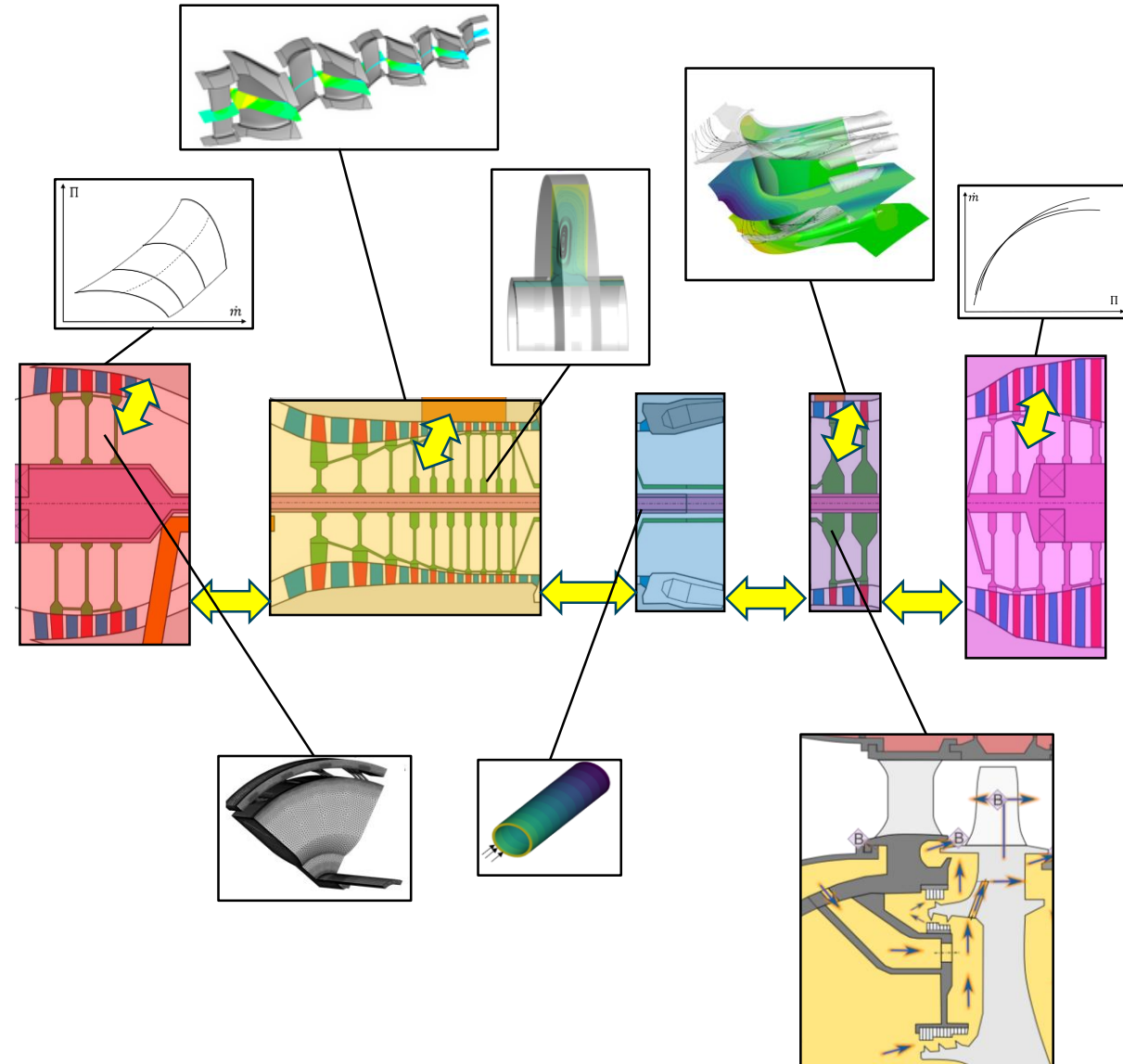
- Multi-...  
Disziplin, Fidelity, Physik, Skalen, Domain,  
...

## Kopplung

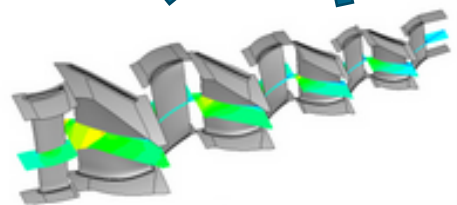
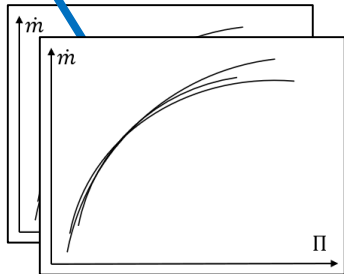
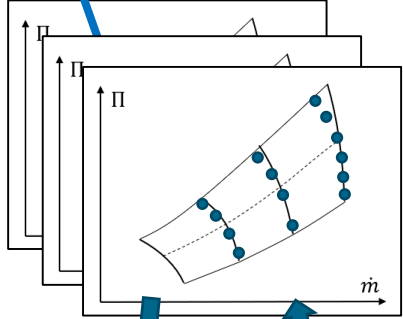
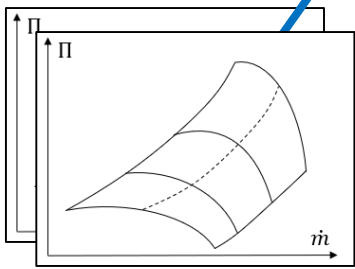
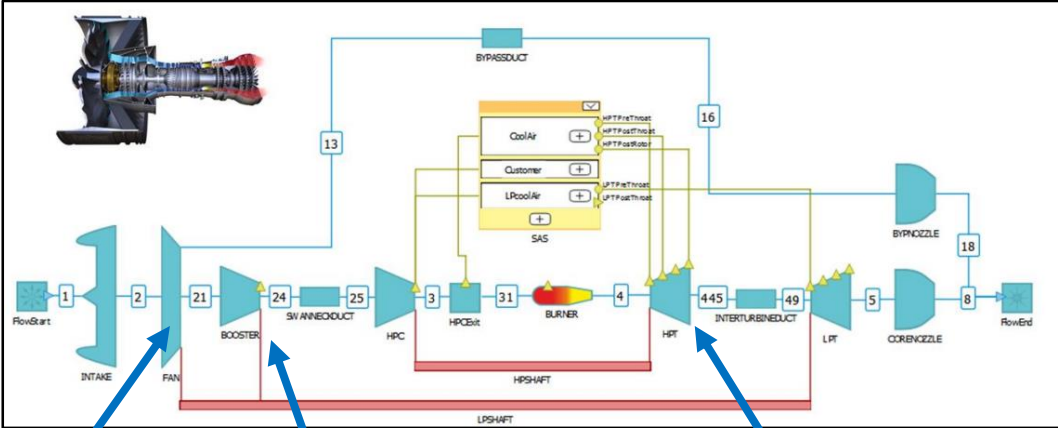
- ...**von Segmenten**, z.B. aero-thermale Ausdehnung/Schließung von Spalten
- ...**über Detailstufen**, z.B. Kalibrierung eines Ersatzmodells mit High-Fidelity

## Verteilte Simulationen

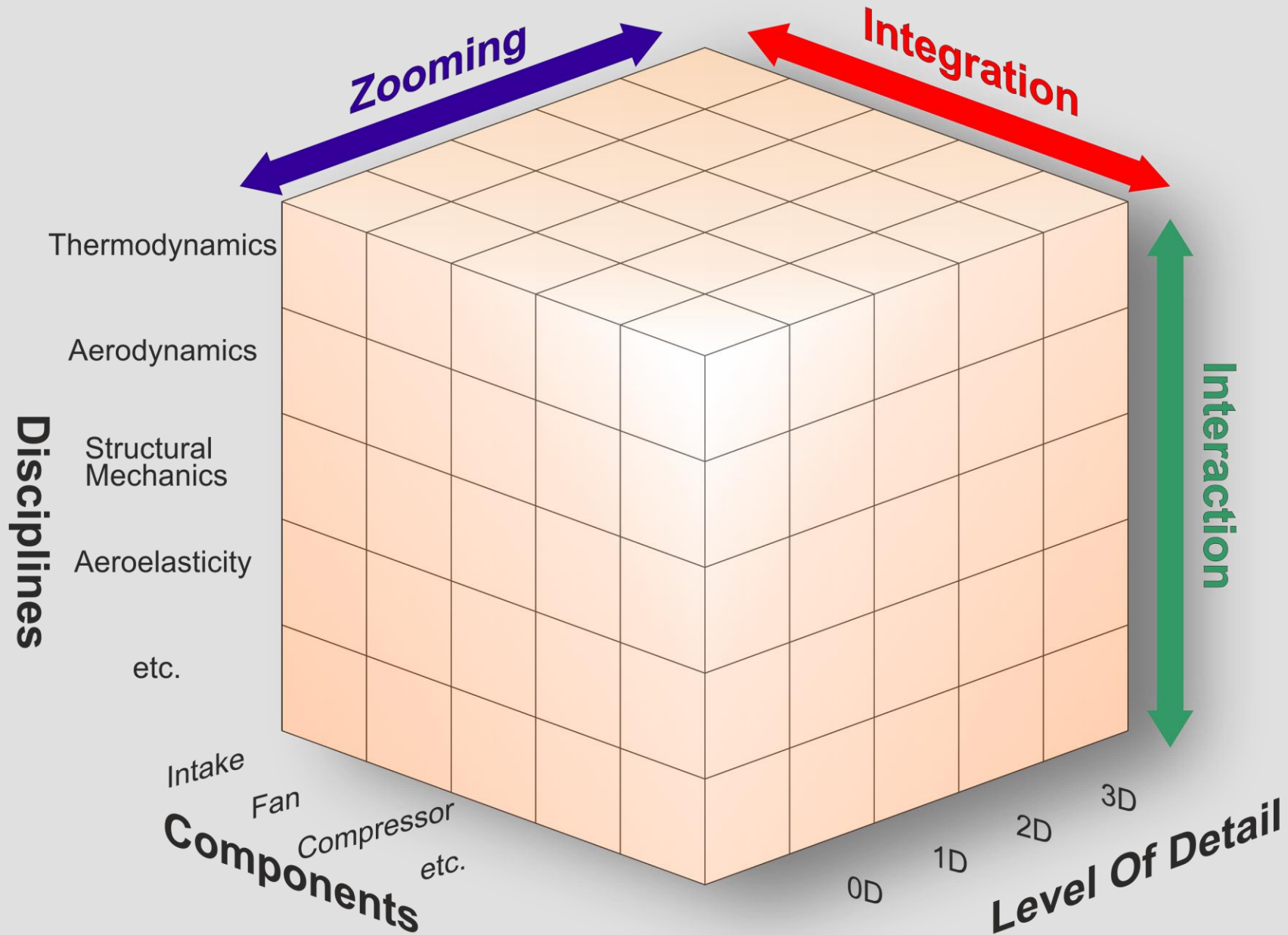
- Austausch verschiedener Löser (nicht nur FSI!)
- HPC-Infrastruktur



# Multi-Fidelity: Zooming



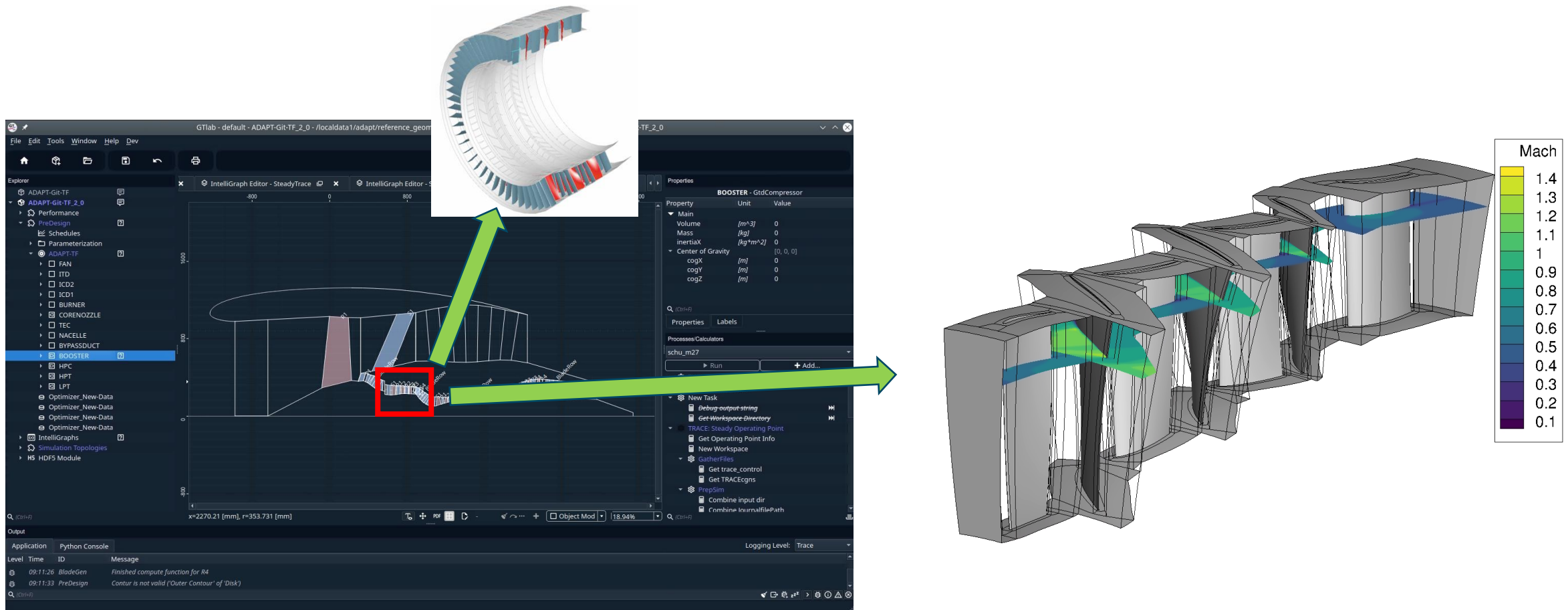




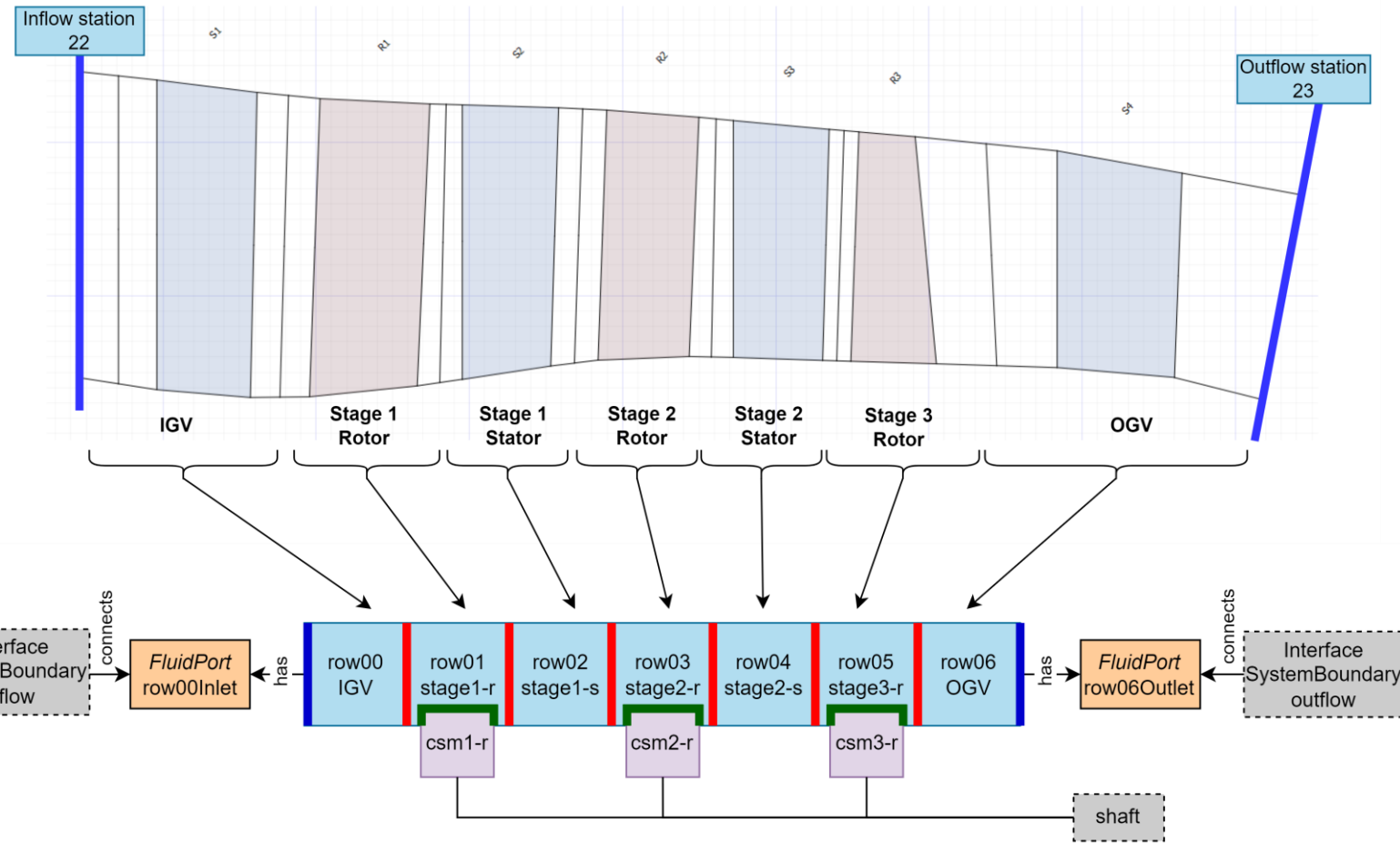
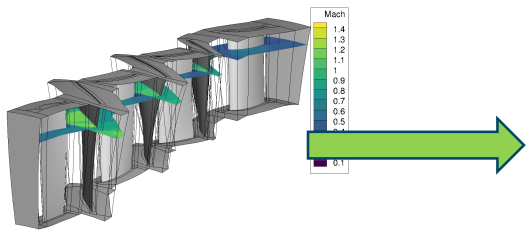
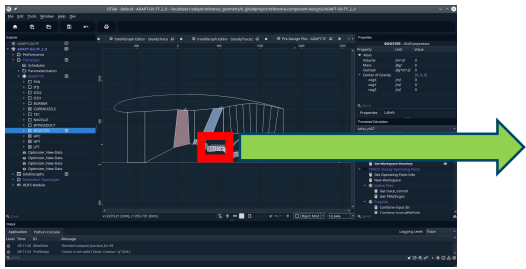
## Übersicht

- **Datenmodellierung High-Fidelity**
- **Simulationstopologie**
- **HPC-Anwendung**

# Integration von Ergebnissen aus CFD in GTlab



# Von der Geometrie zum Rechnernetz





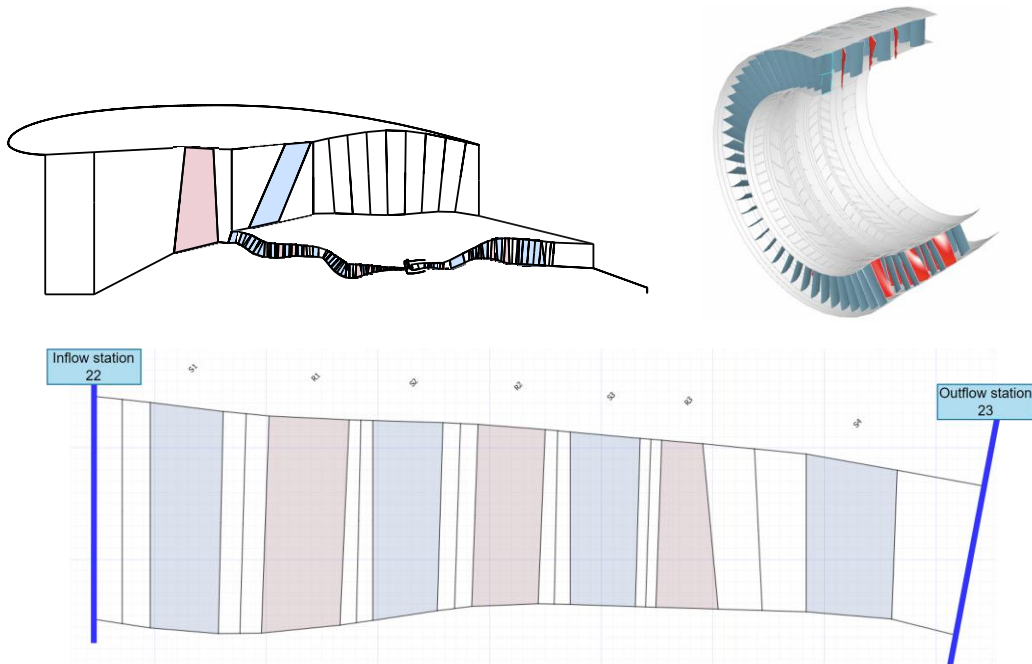


# SIMULATIONSTOPOLOGIE

# Erweiterung des Datenmodells

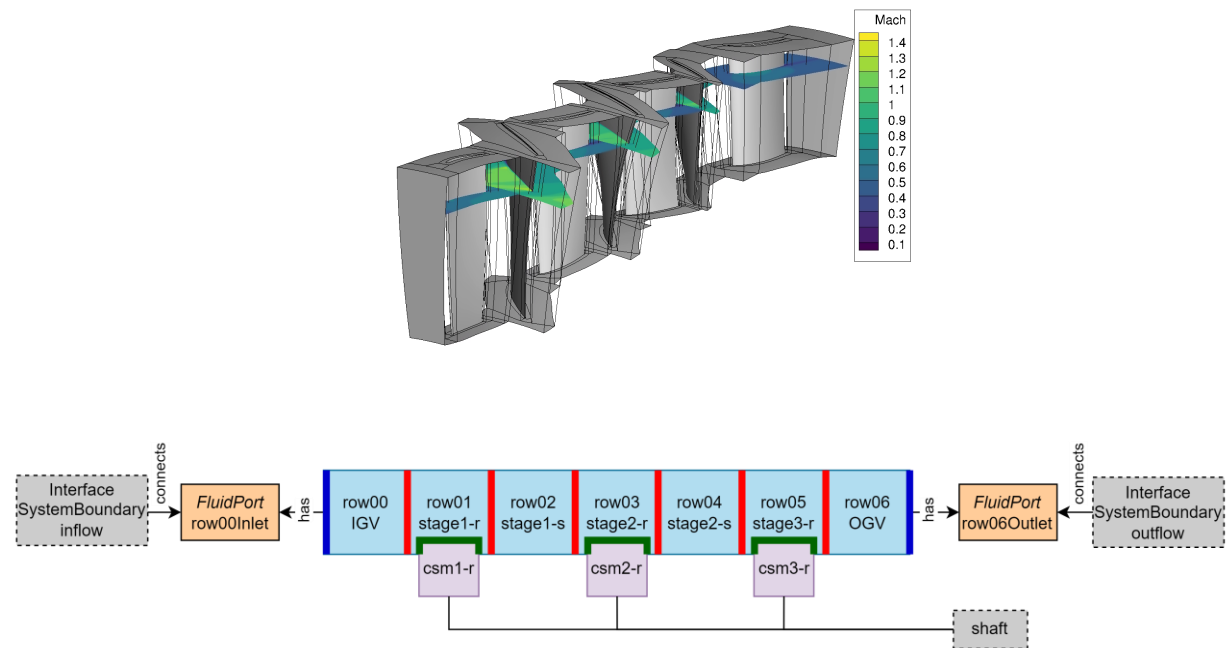
## Geometrie

- Parametrische Modellierung
- CAD

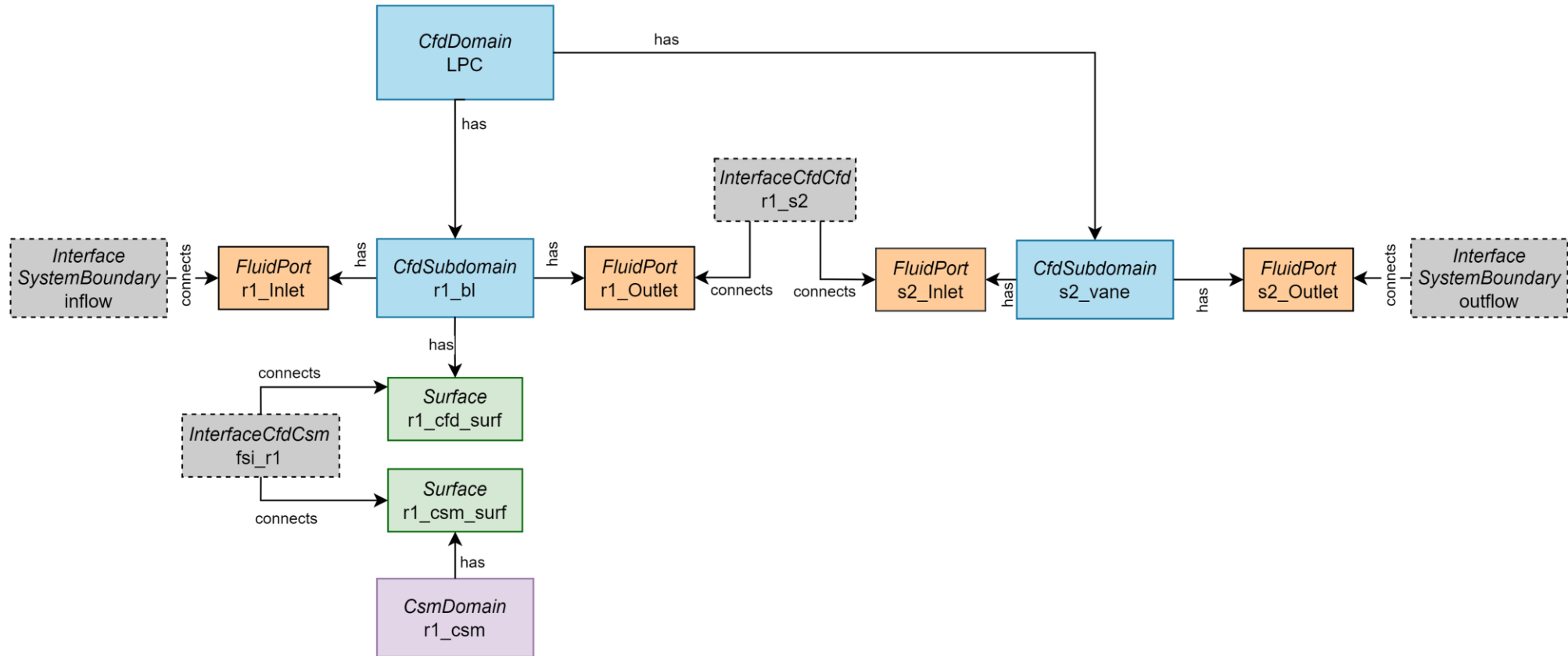
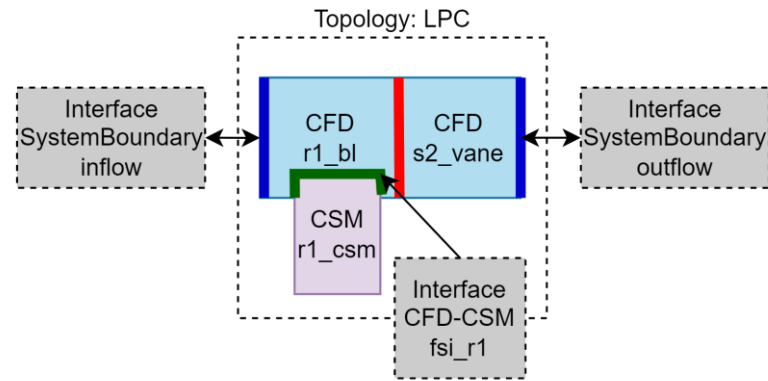


## Simulation

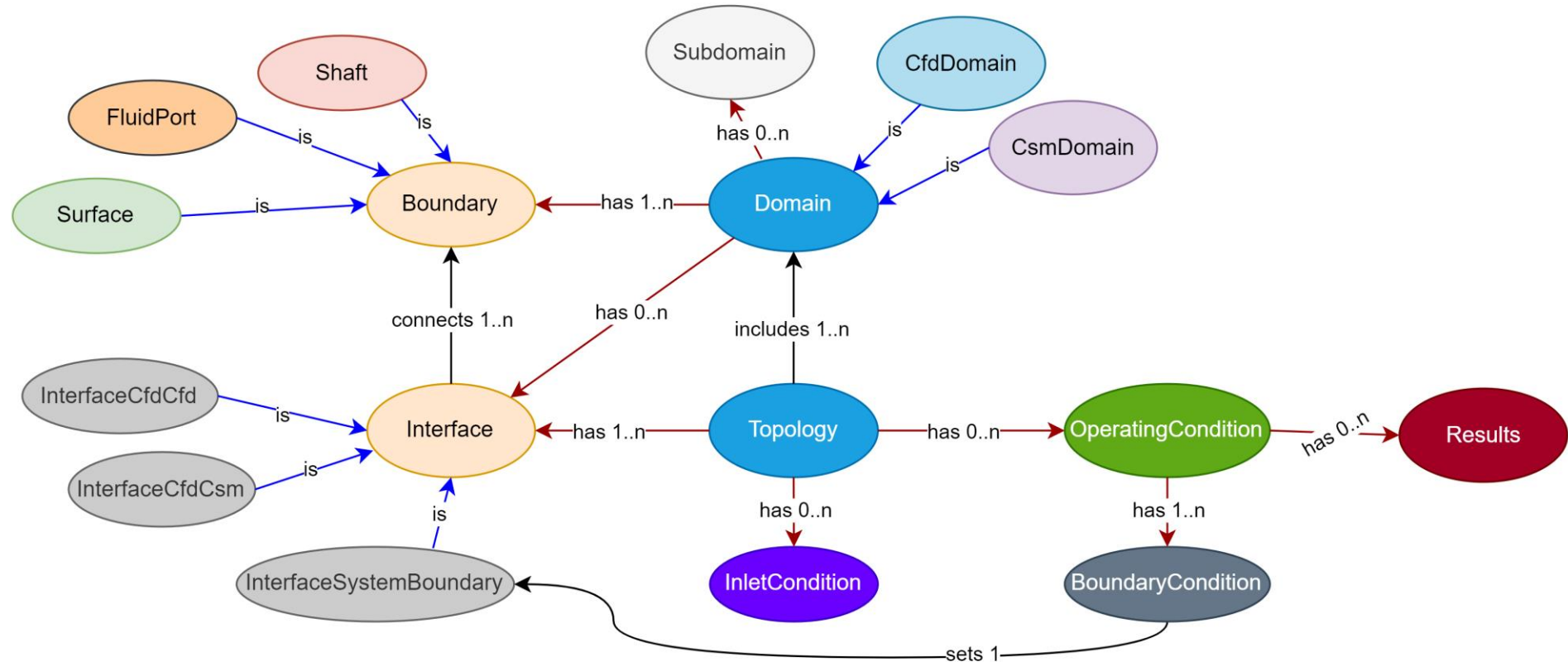
- Diskretisierung der Volumina
- Verknüpfung der Rechennetze



# Wissensgraph



# Datenmodellierung: Ontologie „Simulationstopologie“

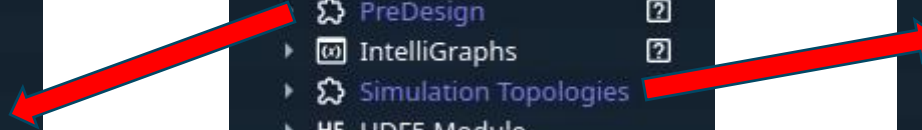
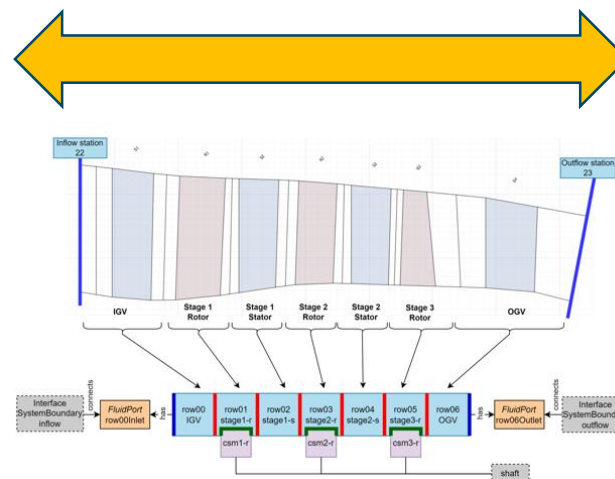
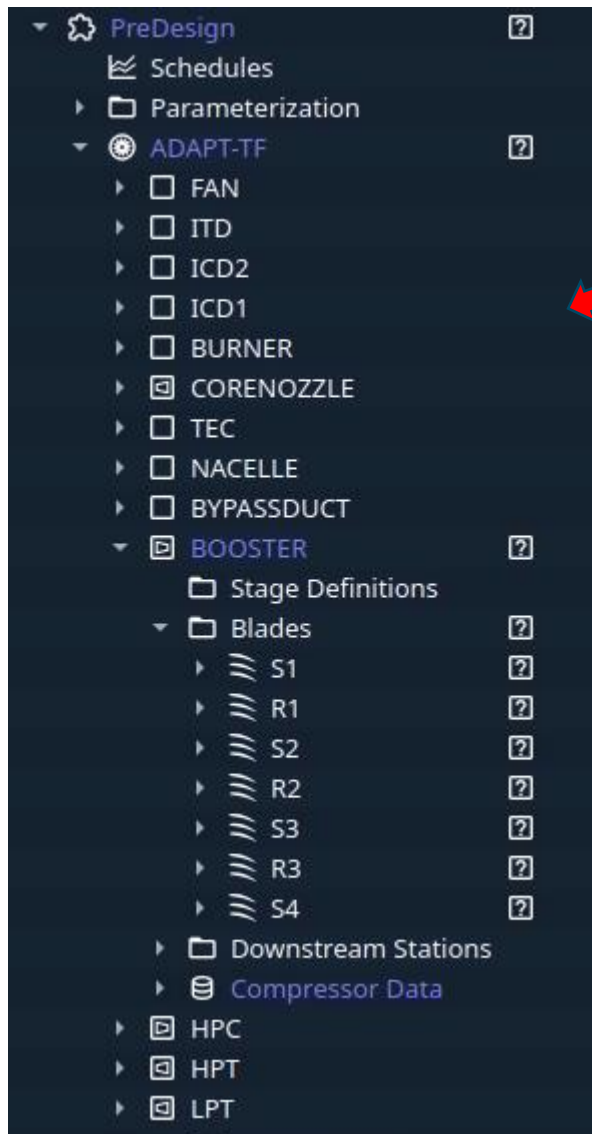


Details?

→ Paper auf AIAA SciTech im Januar 2025

M. Schuff et al: “Data Management in a Collaborative Design Architecture, Part C: Simulation Topology”

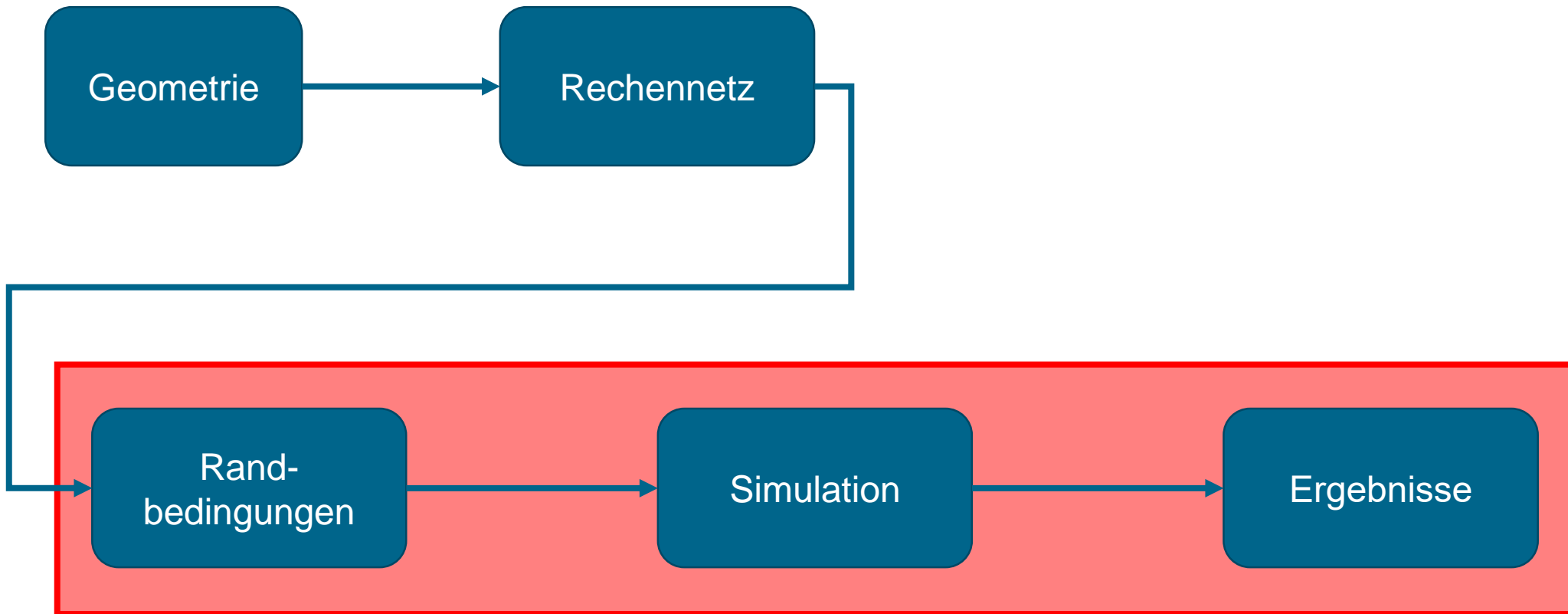
# Simulationstopologie in GTLab





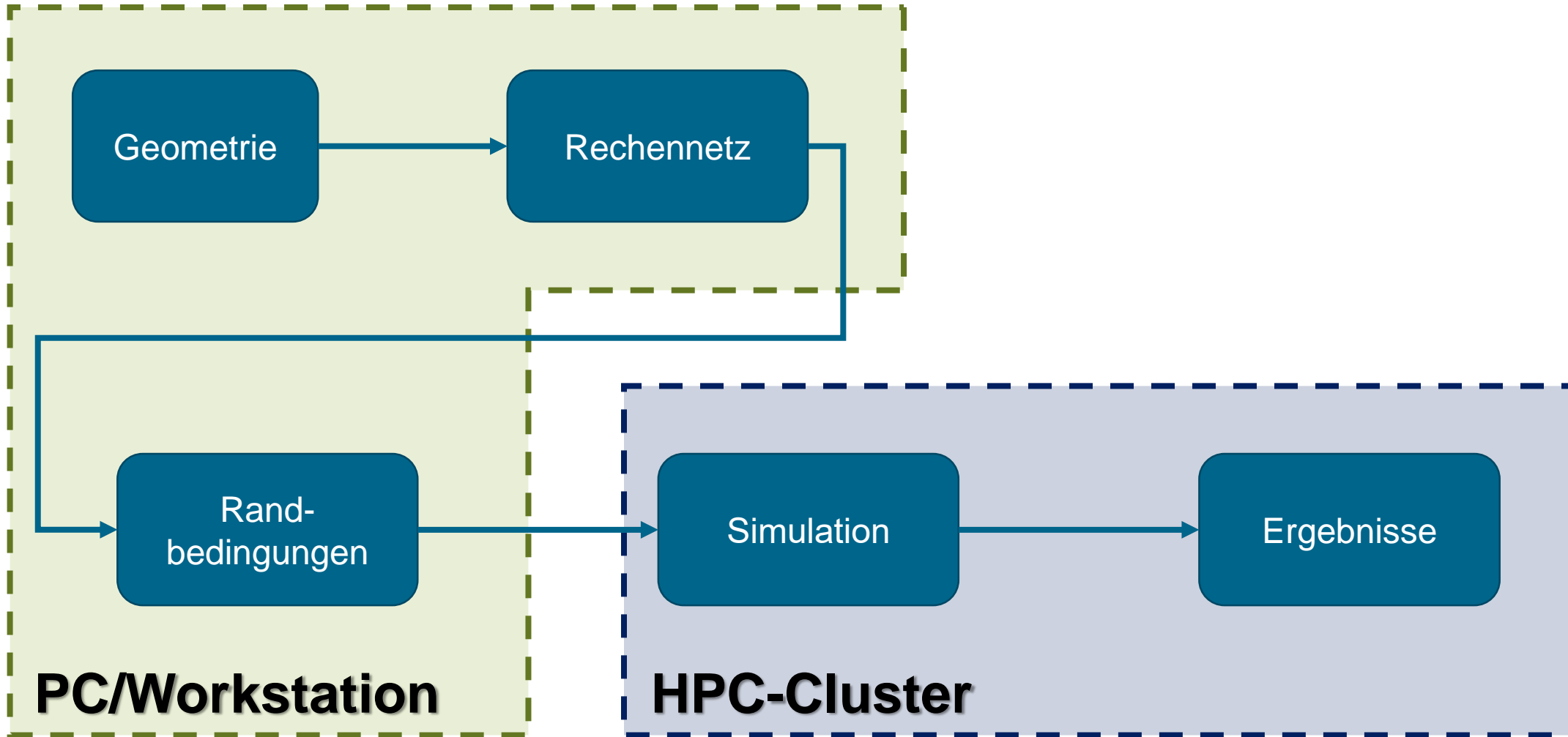
# HPC-ANWENDUNG

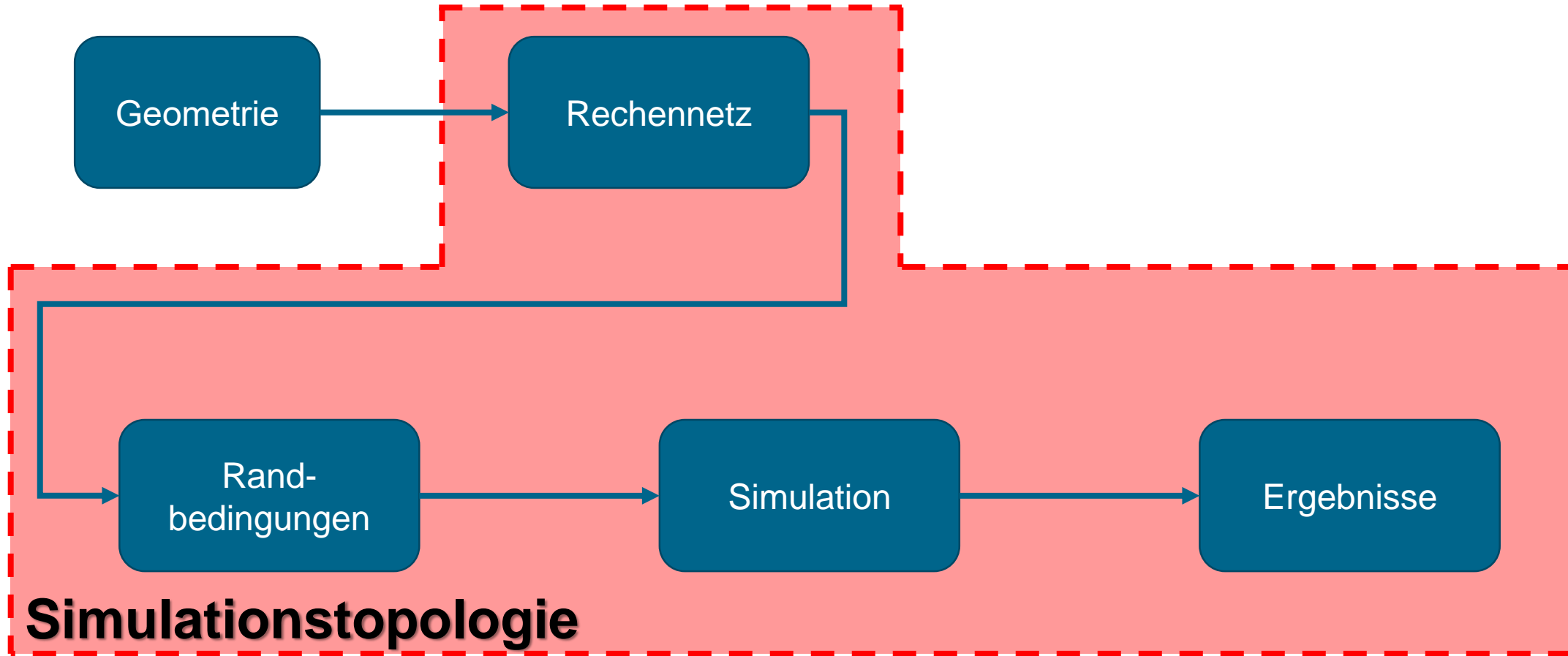
# High-Fidelity-Welt



·n<sub>Sim</sub>

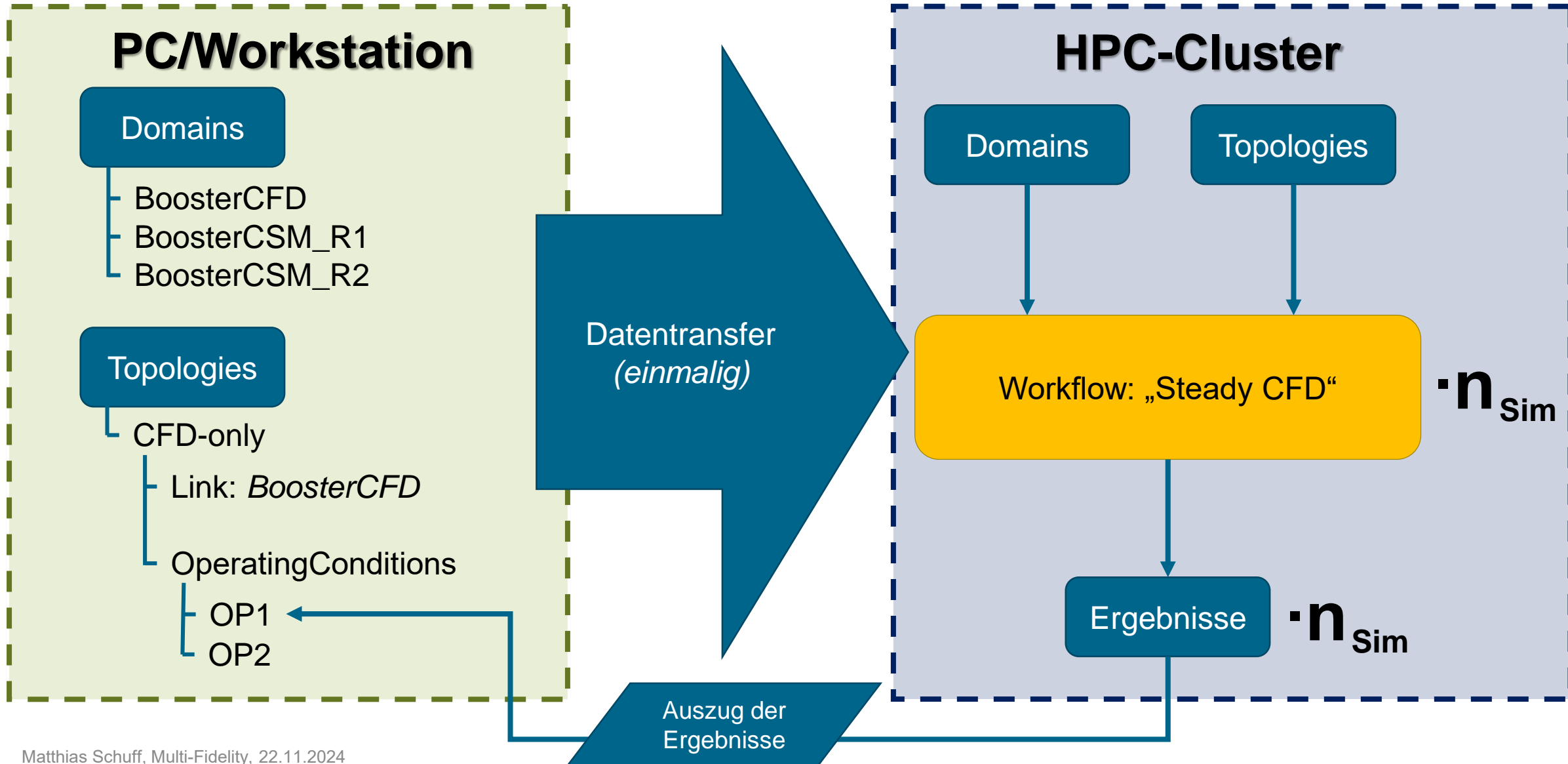
# High-Fidelity-Welt





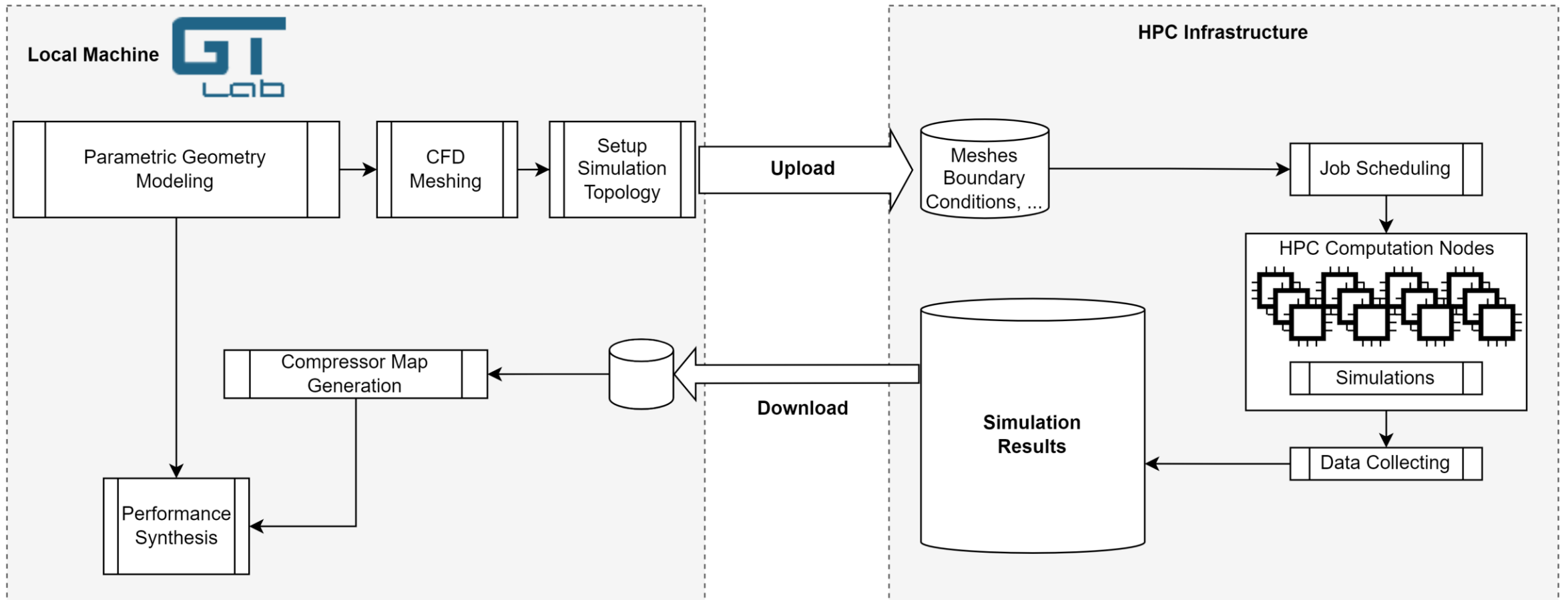
## Simulationstopologie

# Vorbereitung und Ausführung der Simulation





# Workflow: GTlab nach HPC – und zurück





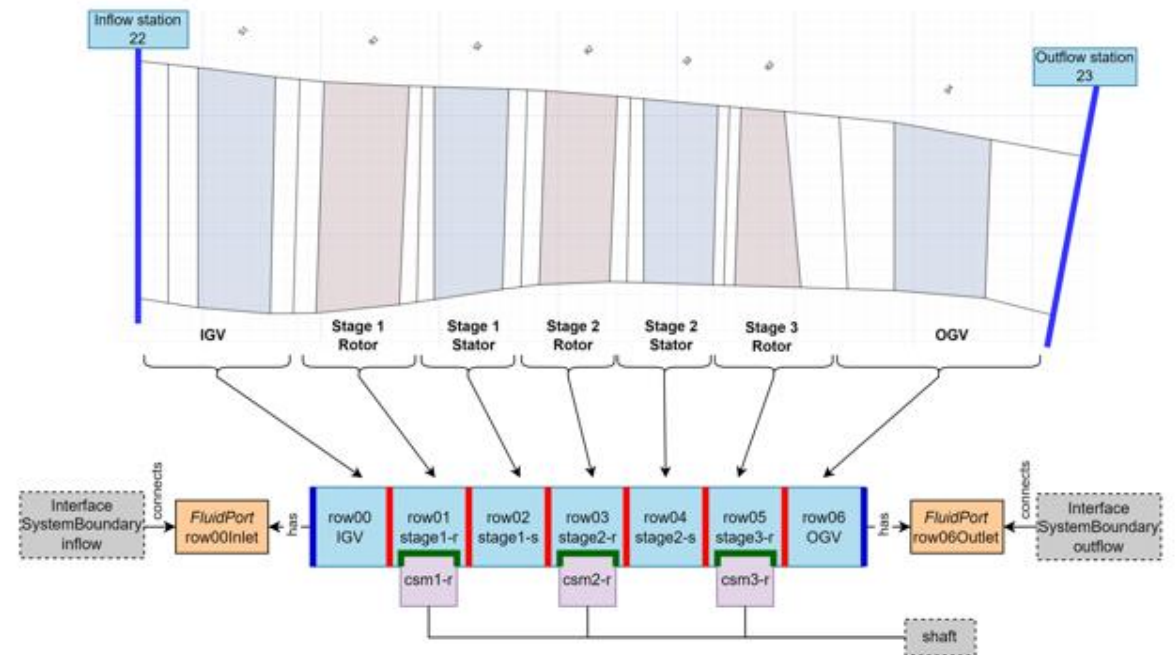
# Conclusion

## Simulationstopologie

- Erweiterung des Triebwerk-Datenmodells
- Aktuell in Erprobung
- Erweiterung auf Strukturmechanik angelaufen

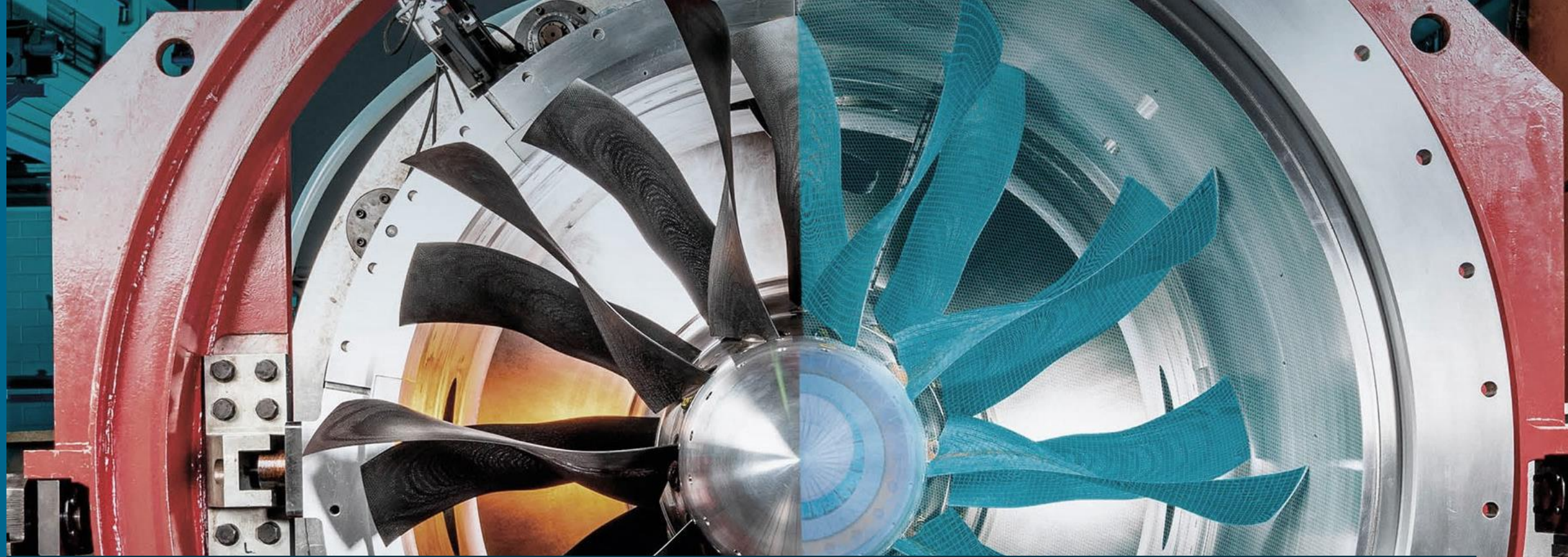
## Multi-Fidelity

- Anwendungsfälle definiert
  - 1. Anwendung: Komponenten-Zooming
- Methodik konzipiert
- Implementierung in GTlab in Arbeit



→ AIAA SciTech 2025, 3-teilige Paperserie  
“Data Management in a Collaborative Design  
Architecture”





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Research Group *Virtual Engine Platform*

# Impressum



Thema: GTlab Community Days: Multi-Fidelity-Simulation

Datum: 22.11.2024

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Institut: DLR-SG

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