



Introduction: Goals and structure of this meeting

2nd E-TASC General Meeting | Garching | Feb 9-13, 2026

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nature reviews physics

<https://doi.org/10.1038/s42254-025-00837-1>

F. Jenko, Nature Reviews Physics 7, 365 (2025)

Perspective

<https://rdcu.be/ex2Eb>

 Check for updates

Accelerating fusion research via supercomputing

Frank Jenko  

Abstract

The pursuit of fusion energy is gaining momentum, driven by factors including advances in high-performance computing. As the need for sustainable energy solutions grows ever more urgent, supercomputing emerges as a key enabler, accelerating fusion power toward practical realization. Supercomputers empower researchers to simulate complex plasma dynamics with remarkable precision, aiding in the prediction and optimization of plasma confinement and stability – both essential for sustaining burning plasmas. They also have a critical role in assessing the resilience of materials exposed to the

Sections

Introduction

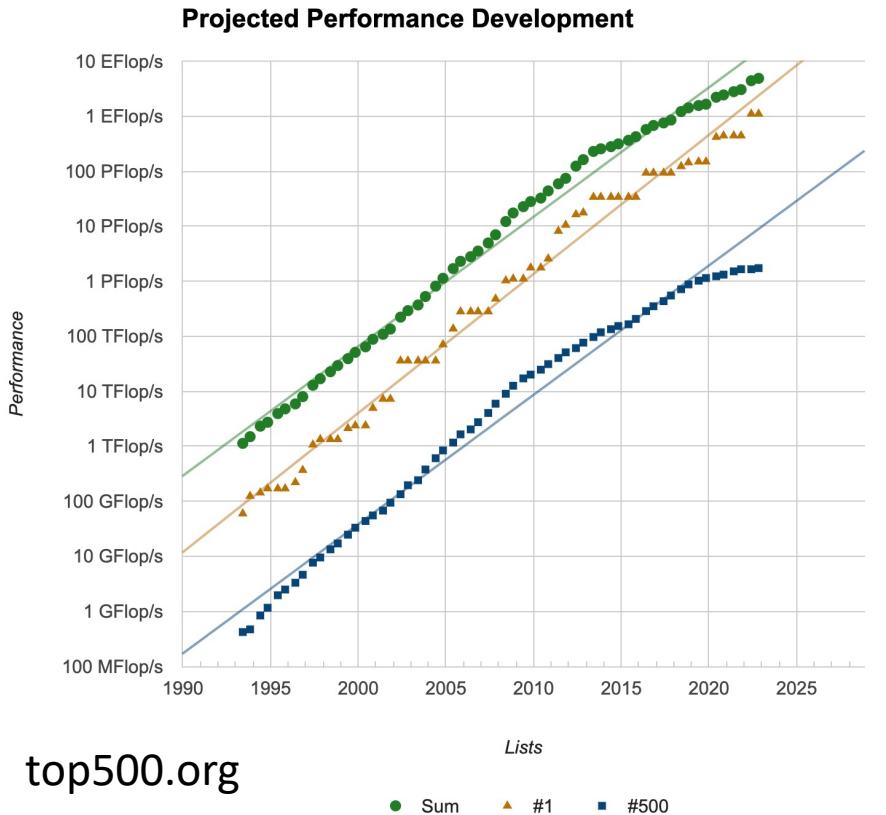
Developments and challenges in fusion research

Supercomputers in fusion research

Current research directions

The emergence of digital twins

Outlook

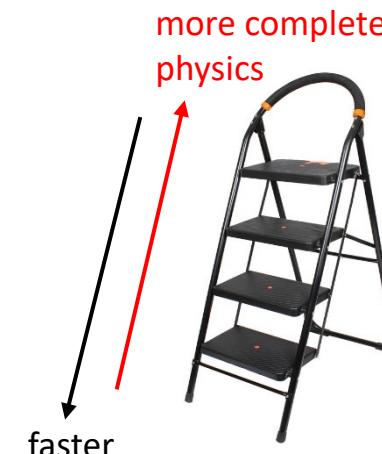
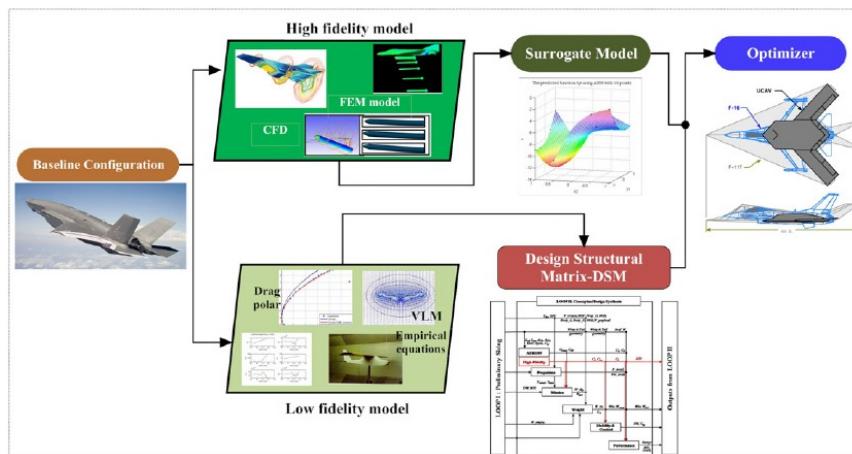
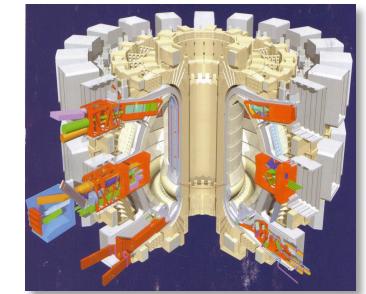
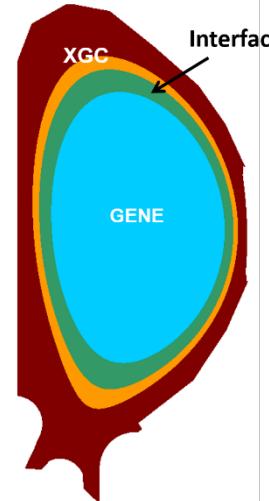
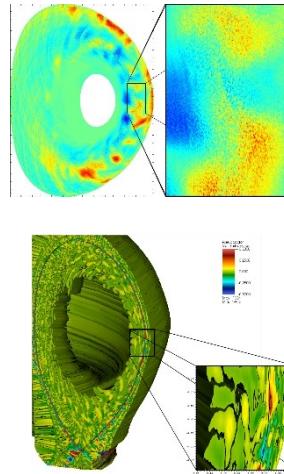
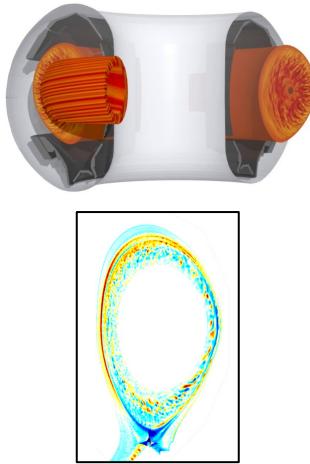
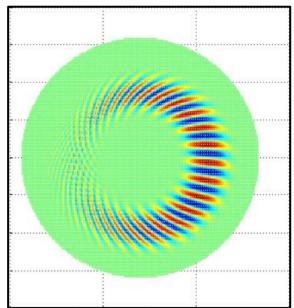


**Exascale computing:
 $> 10^{18}$ floating point operations per second**

From highly idealized models towards digital twins



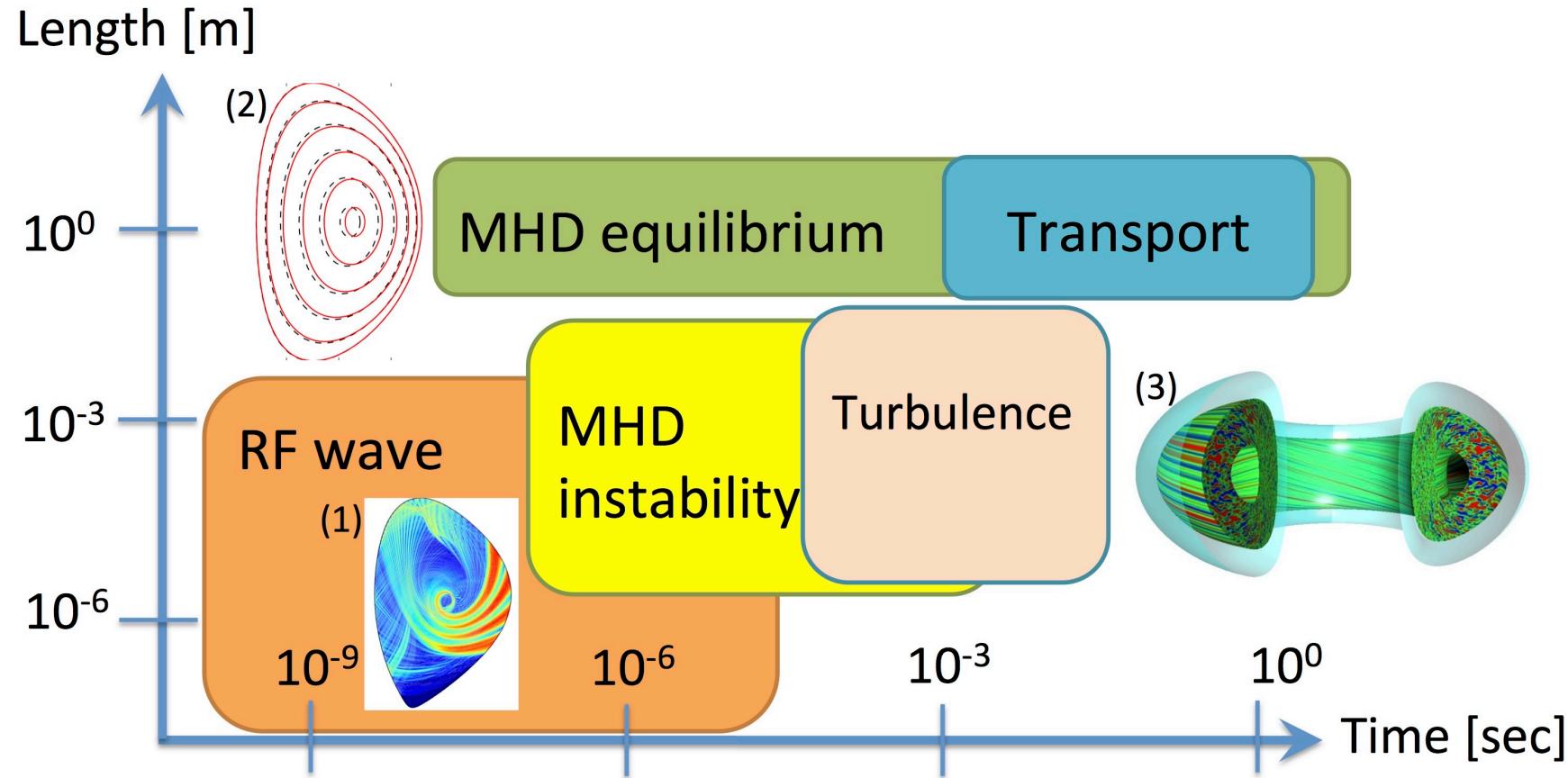
Increasing fidelity & modeling capability with increasing computing power



Multi-fidelity approach:

- HiFi models for reliable extrapolation/prediction
- LoFi models (ideally based on HiFi models) for optimization, real-time control etc.

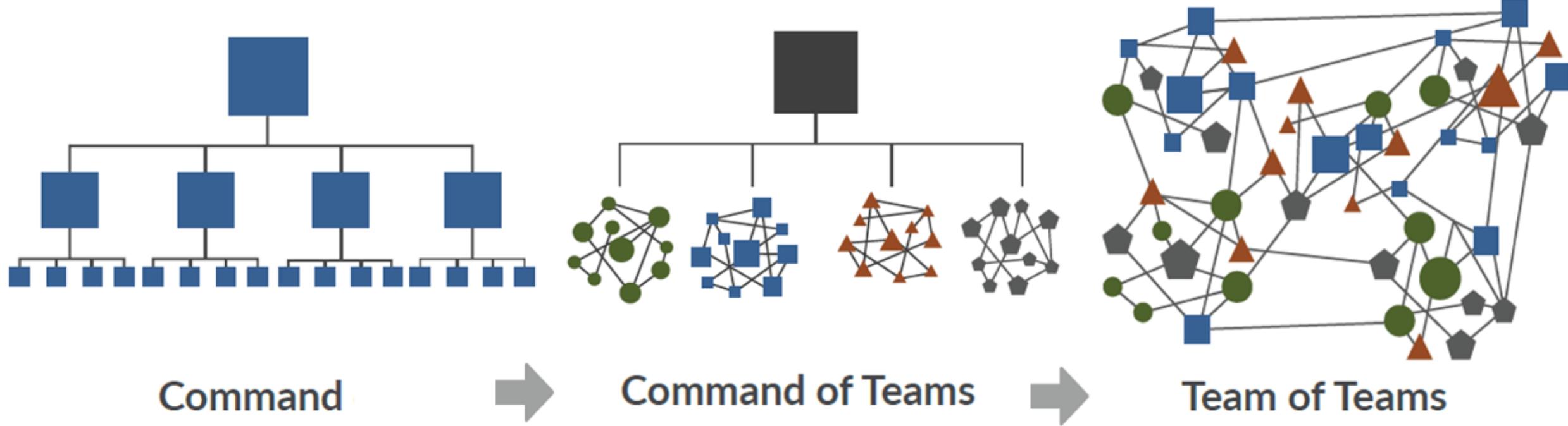
Digital twins: Multi-scale, multi-physics challenges



Many nonlinear interactions; we cannot use a simple “superposition principle”



From Command to Team of Teams





2024 E-TASC General Meeting

Date: November 11–15, 2024

Location: Max Planck Institute for Plasma Physics (IPP), Garching, Germany

Materials: <https://indico.euro-fusion.org/event/3034/>

This document has been written by the E-TASC Scientific Board and is based on the slides presented by Frank Jenko (E-TASC SB Chair) on the last day of the 2024 E-TASC General Meeting.

SUMMARY

The 2024 E-TASC General Meeting brought together nearly 80 researchers to review the progress, address challenges, and outline future directions for the EUROfusion Theory and Advanced Simulation Coordination (E-TASC) initiative. The event featured a mix of plenary and breakout sessions, promoting in-depth discussions across projects and enhancing collaboration between the various Theory, Simulation, Verification, and Validation (TSVV) projects and Advanced Computing Hubs (ACHs).

Goals and structure of this meeting



Monday afternoon

- E-TASC activities in 2026/27: DSO & WPTM
- Theory and modeling in the UK & USA

Tuesday morning

- Poster session (TSVV, ACH, DTE, DATA, ENR projects)

Tuesday afternoon

- DTE / ACH / TSVV discussions (breakouts & plenary)

Wednesday morning

- Community demand for theory & modeling:
Plasma Science Department, ITER & beyond

Wednesday afternoon

- Perspectives: Fusion startups & other companies

Wednesday evening

- Conference dinner

Thursday morning

- E-TASC software & data standards
- Creation and use of databases

Thursday afternoon

- Hands-on parallel sessions

Friday morning

- Goals for 2026/27 & preparation for FP10
- Summary & conclusions

This meeting is designed to be highly interactive, with plenty of time intentionally reserved for discussions

Please no food or drinks inside the lecture hall – Restrooms are located just around the corner