14th E-TASC Scientific Board meeting (ACH review), CIEMAT, Spain, 18-20 June 2024

ACH review
Feedback from CIEMAT-BSC ACH

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Outline

Summary of CIEMAT-BSC ACH

Our feedback on

- overall organization
- communications with other ACHs and TSVVs
- communications with PMO
- required expertise
- human resources situation
- training opportunities

Further discussion point/suggestion for improvement

Final remarks

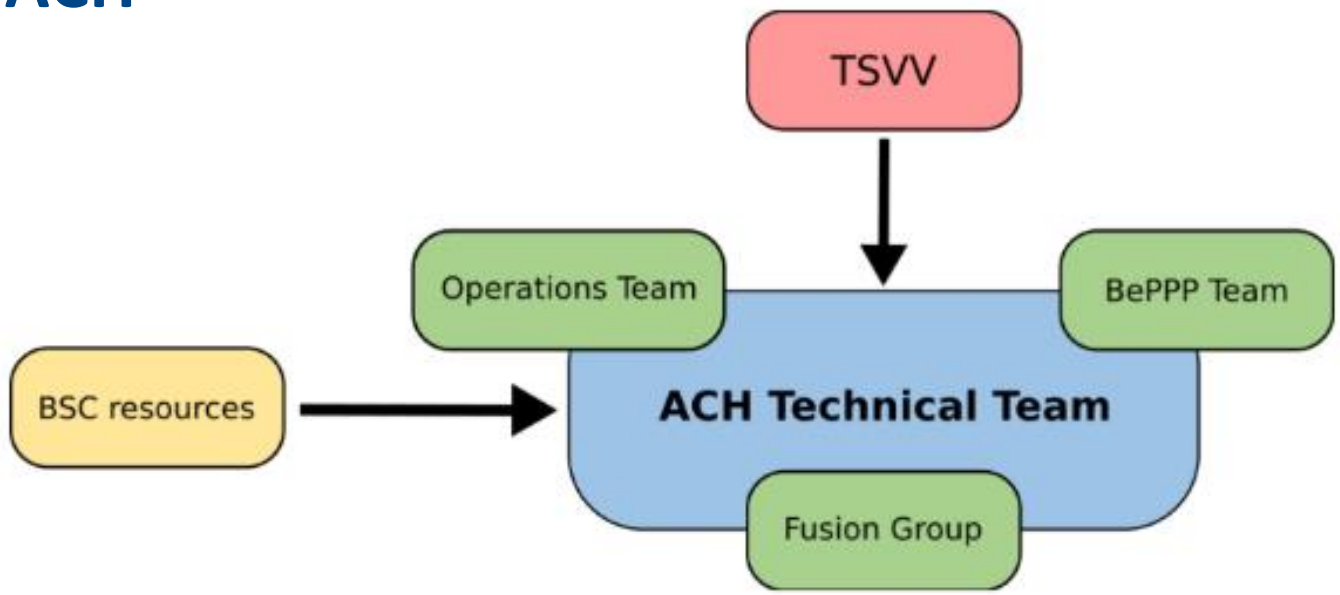
Brief summary of CIEMAT-BSC ACH

- BSC, affiliated to EUROfusion via CIEMAT, hosts one of ACHs **in HPC** [Saez PPCF 2024].

- Involves **three groups** at BSC:
  - 7 people in Fusion Group
  - 2 people in Operations
  - 2 people in Best Practices for Performance and Programmability (BePPP)

- **Total effort**: 328 pm ≈ **27 ppy in 2021-2025**

- From 2024 on, at **full size** of ~100 pm/year ≈ **8 ppy/year**.



Service to EUROfusion community

- lead Ticket meetings and participate in Operations committee of CINECA.
- participate in Marconi-Fusion Allocation Committee

BSC ACH codes and tasks (2021-2024)

Up to now, **11 codes supported**, i.e. ERO2, SPICE2, KNOSOS, BIT1, STELLA, JOREK, GENE-X, SOLPS-ITER, SPEC, XTOR-K, BOUT++

Code characteristics:

- Mainly plasma physics codes
- Mostly CPU-only
- Written in C, C++ and Fortran
- MPI and/or OpenMP
- Under active development by TSVVs

Tasks mainly on:

- performance optimization
- GPU-enabling
- scalable algorithms
- code parallelization

Comment on achievements:

- Different degrees of success, as suggested by feedback provided.
- In some cases, trade-offs had to be sought and the solution that was reachable did not fully meet the original task objectives.

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Feedback on organization

Overall, the system works relatively smoothly in our case.

Establishing a plan in the initial meeting (KoM) with code developers allows us to structure the work plan and achieve feasible targets.

Subsequent meetings with developers to discuss results enable adjustments to the work plan to accommodate new targets for solving issues discovered by our work.

Feedback on communications with other ACHs and TSVVs

There would be scope for more interaction and knowledge sharing between ACHs.

Since 2023, the HPC ACHs have set up an Annual Meeting, which is an improvement. This year, it will be an in-person meeting in November at BSC.

Suggestion for further improvement: Create a forum where ACH members and code developers to discuss their experiences and challenges to share this knowledge effectively (linked also with training, c.f. page 11).

Feedback on management aspects

We appreciate the relatively low management overhead.

However, there would be scope for improvement in communications with PMO; we have encountered problems with our messages not been replied to, nor been acted on. This has caused additional work to us to correct the situation and/or mitigate consequences later.

Also, ACHs could be consulted more on the issues that (could) have implications to our work.

Feedback on required expertise

Task selection is based on available manpower and skills. One task discarded (BLUEMIRA) after the KoM as it did not align with our HPC competencies.

Some delays due to staff departures/special leaves. New person needs time to become familiar with the code and/or task. This can cause delay which can be significant.

Difficulties to find replacements in a short time with required competencies and willingness to accept employment terms.

Suggestion for possible improvements: Add more flexibility to be able to fill a vacancy temporarily if a team member leaves and/or has a longer leave, minimizing disruption of top priority work until replacement is found. Possible solutions to consider:

- ACH team member(s) with some unassigned PMs
- Agreed prioritization between tasks to manage unexpected workload increases
- Other tasks/ideas, see new discussion point later on (page 13).

Feedback on human resources situation

Attracting human resources with necessary experience and expertise has been possible. However, it resulted more challenging than anticipated.

Key difficulties: availability of candidates to start the work, salary conditions, and obtaining necessary documentation to work in Spain.

Many applications come from Latin America and Asia. For those candidates, bureaucratic procedures delay onboarding by several months.

We would have benefited from more applications from Europe, but we received very few. This suggests that our offer struggles to compete with private sector for the small pool of candidates with required profile.

Suggestion for improvement: explore ways to “share” candidates between ACHs

Feedback on training opportunities

Most webinars and workshops for training in our areas are at basic level. Finding courses about porting real applications to GPUs beyond simple examples remains a challenge.

Best training options have been PUMPS (pumps.bsc.es), different Hackathons and some webinars by EUROfusion.

Hackathons are on high demand and getting accepted is getting competitive. Recently, our two proposals for participation with TSVV code developers at CINECA Hackathons were rejected.

Suggestion for improvements:

- Offer more advanced and specialized courses and Hackathons that address complex, real-world applications in fusion domain.
- Create a forum where ACH members and code developers to discuss their experiences and challenges to share this knowledge effectively (see also p. 7).

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Further discussion point/suggestion for improvement

- BSC Fusion group develops **multi-physics modelling software for fusion engineering problems using BSC's in-house HPC framework Alya**. Within EUROfusion:
  - **ERG** for coupled neutronics and thermo hydrodynamics modelling (2024-2025).
  - **EEG proposal** (2025-2026) submitted for multi-physics modelling of high temperature superconductors (HTS).
- We believe Alya has **unique HPC capabilities** that could be of interest for wider EUROfusion theory and modelling programme.
- We would be interested **to explore further opportunities to develop Alya fusion applications of common interest with EUROfusion**.
- Within E-TASC, Alya tasks could provide **one way to improve flexibility to changes in manpower resources within our ACH** (c.f. page 9). It could provide a buffer to handle issues arising staff departures as external customer tasks could be given priority over Alya tasks.

Final remarks

E-TASC is a key component in the overall EUROfusion programme.

ACHs play an important role in preparing the EUROfusion standard software.

Overall, ACH organization has worked well. Also, we appreciate the relatively low management overhead.

We look forward to continuing our ACH work beyond 2025.

We would be interested in discussing possibilities to expand our ACH activities with Alya HPC software development tasks for fusion applications of EUROfusion interest.

Invitation to the 5th Fusion HPC Workshop

Fusion HPC Workshop

November 21-22, 2024

Confirmed keynote speakers:

- **Moreto, BSC**, Spain. *Towards European High Performance Computing Accelerators based on the RISC-V Open ISA*.
- **Romero, TAE Technologies**, USA *Integrating inference and real-time plasma control to advance aneutronic fusion*.
- **Kwon, Korea Institute of Fusion Energy**, Republic of Korea. *Digital Twin Technology to Accelerate Fusion R&D*.
- **Lasa, University of Tennessee**, USA. *Development of multi-scale computational frameworks to solve fusion materials science challenges*
- **Candy, General Atomics**, USA. *Porting and Performance of Spectral Gyrokinetics on NVIDIA, AMD and Intel GPU architectures.*

Where: **Online**

Registration: **free and open for all**.

Abstract submissions by September 15, 2024.

More details on **hpcfusion.bsc.es**

Thank you for your attention

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