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HPC Infrastructure

Brussels
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Partners

- Barcelona Supercomputing Center (BSC), Spain
- IT Center for Science Ltd. (CSC), Finland
- High Performance Computing Centre at the University of Edinburgh (EPCC), United Kingdom

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Scope

- Provide HPC infrastructure support for the code optimization effort within JRA2.
- Provide runtime access to supercomputers for feasibility tests for the HPC codes within the code platform.

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Implementation

- Work with codes and code owners to provide program environment
 - Capture requirements of software and libraries for fusion codes
 - Analysis availability on our HPC platforms
 - Provision of required software and suggestion of optimised alternatives
- Work with HPC resource providers to obtain CPU resources for European fusion community
 - National, European, and Fusion HPC facilities
 - Provide “proof of concept” and “world leading” access
 - Provide support to enable users to access
 - Work with code owners and users, help with library, porting, and running issues

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- **Workflow development:** In 2010 we provided support to the efforts of the project on workflows across computational infrastructures (DEISA-EUFORIA-EGEE) to access and run jobs on HPC resources.
- The benefit of this work has been to simplify HPC access to users, by providing both easier access and a larger pool of available resources when trying to obtain time on HPC machines.

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Milestones

- MSA2.1 “Provide a suitable software environment for users” (M8)
- MSA2.2 “Provide support for proof of concept runs” (documented in deliverable DSA2.2, M15)
- MSA2.3 “Obtain additional CPU resources” (M30)

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Deliverables

- DSA2.1 “Provide a suitable software environment for users” (M8)
- DSA2.2 “Run time access provided to supercomputers at CSC, BSC, and UEDIN” (M15)
- DSA2.3 “Status report on the requests and use of production cycles for fusion applications” (M24)
- DSA2.4 “Leading calculations” (M30)
- DSA2.5 “Final report on HPC use and experience” (M36)

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Impacts

- **Programming environment:** We provided access to the programming environment at the computer centers for code owners and developers, in order to ensure that users had the appropriate tools to utilize the HPC resources.
- In conjunction with JRA2 and code owners, we established all the software (libraries, compilers, etc.) that the codes required. Alternatives were suggested if they were known to provide better performance.

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Impacts

- Provided the European research groups dedicated to modeling ITER with broader access to HPC resources.
- Enabled code owners to perform large-scale simulation runs to investigate and produce world-leading fusion science.

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Impacts

- **HPC resources for production:** SA2 has been directly involved in providing 10,500,000 allocation units (AUs) for fusion researchers over the lifetime of the project (outlined in the following table).
- We estimate that this is close to 1 million euros worth of computing resources.

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Call	CPU resources provided
DEISA 2008	2,000,000 DEISA AUs
DEISA 2009	2,000,000 DEISA AUs
EPCC 2009	1,000,000 HECToR AUs
CSC 2009	3,000,000 CPU hours
HPC-FF 2009	500,000 Core hours
EPCC 2010	1,500,000 HECToR AUs
HPC-FF 2010	500,000 Core hours
DEISA 2010	(allocated elsewhere) 1,000,000 DEISA AUs
Total allocated	10,500,000 AUs (mixed)

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Impacts

- SA2 has also provided support to code owners in applying to various calls for HPC resources e.g:
 - 150 million AUs on HECToR in the UK for fusion simulation
- **Publications:** The computing time distributed across various projects has facilitated scientific publications and conference presentations (detailed in the reports).

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Evaluation

- **Progress metrics:** Two questionnaires were carried out: one to assess the experience of the centers providing the computational resources, and the other designed to evaluate the users' experience.
- The results were overwhelmingly positive (reported in DSA2.5).

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Sustainability

- HPC-FF
 - Large scale HPC resource for Fusion
- National and European Facilities
 - Help users with DEISA and PRACE applications
- Medium scale resources much more common
 - Local and national centres commonly have large (couple of thousand cores) resource available
 - This is a change over the course of the project

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End of Presentation

- Thank you!