

ESIWACE: Work Packages and Deliverables

WP1

WP1 focuses on the governance of the ESIWACE. It is a networking activity in support to ESIWACE. More specifically WP1 aims at:

Community engagement and governance: WP1 aims at better engaging the climate and weather modelling communities using Earth system models in the ESIWACE and ensure the ESIWACE serves the communities.

WP1 will ensure:

- User representation in the governance of common software and in ESIWACE new developments
- Consistency and exploitation of possible synergies with other relevant activities in which the community is engaged (infrastructure projects, FETs, environment projects...).
- Enhancing community capacity in HPC: WP1 will foster efficient use of HPC through regular exchanges with the communities. It will also organize relations with PRACE and will deal with the PRACE resource allocation dedicated to the ESIWACE.
- Networking with industry and ETP4HPC: WP1 will network with ETP4HPC and relevant hardware and software industry.
- Strengthening strategy and business planning: WP1 will develop:
- An HPC roadmap for HPC and ESM for the climate and weather communities
- Upgrade the business plan, for which a first version is included in this proposal, and prepare for future activities, taking benefit from all the ESIWACE activities

Deliverables

- **D1.1** Agreed portfolio of community tools: D1.1 will report on shared software. It will define general governance rules for shared software and how they are applied for each software, in particular their user group and how it interacts with ESIWACE
- **D1.2** Roadmap to the implementation of 1km ESM ensembles
- **D1.3** Business plan
- **D1.4** First International HPC workshop
- **D1.5** Second International HPC workshop

WP2

Demonstrate how to build and productively operate global cloud resolving models
Improve efficiency and scalability of community models and tools and provide

improved access to scientific and performance upgrades

Provide support and training for community I/O and coupling tools and establish convergence strategies for the future

In the exascale perspective, Investigate scientific and technical options for efficiency upgrades and methodologies to reduce volume of future high-resolution modelling output

Deliverables

- **D2.1** Final workshop report on results and evaluation of demonstrators
- **D2.2** Optimised community model code options tested on selected cases
- **D2.3** Multithreaded or thread safe OASIS version including performance optimizations to adapt to many-core architectures
- **D2.4** Multithreaded XIOS version adapted to many-core architectures, and supporting GRIB2 format
- **D2.5** White paper on a strategy for full convergence of I/O and coupling tools
- **D2.6** Report outlining a strategic approach for efficiency savings based on concurrency and accuracy
- **D2.7** Report from study of data compression assessment of dimensions required for Earth system model output archiving retaining information but reducing volume
- **D2.8** Implementation of IFS global 1 km atmosphere-only demonstrator and performance analysis
- **D2.9** Implementation of ICON global 1km atmosphere-only demonstrator and performance analysis
- **D2.10** Implementation of NEMO global 1km ocean-only demonstrator and performance analysis
- **D2.11** Implementation of EC-Earth 10km global coupled demonstrator and performance analysis
- **D2.12** Implementation of ICON 10km global coupled demonstrator and performance analysis

WP3

Support scientific excellence through provision of effective HPC and big data infrastructures by allowing scientists to more easily design and carry out simulation campaigns that seamlessly exploit the existing multi-model framework, including the inherent value of model diversity.

Considerably improve the ease-of-use of the software, computing and data-handling infrastructure for ESM scientists from the applications through the software stack to the hardware.

Support the uptake of scheduling engines within the community through user-driven development, training and support services. This activity will absorb 40% of the effort in this work package, since it will provide a step change in the community's ability to cope with increasing suite complexity for both climate and weather applications in production and research modes. MetO, who have existing skills in CycL and are supporting its adoption, will lead this task

Reduce the skills gaps at individual centres by sharing best practice through worked examples using use-cases derived from user-driven engagement, the need to prepare extreme scale demonstrators, and governance.

Propose avenues for co-design of system software and architectures between industry and applications

Deliverables

- **D3.1** ESiWACE Application Software Framework: A White Paper. Version 1, Specification of a Standard Recommendation for an ESM End-to-end Workflows and Application Software Environments Framework
- **D3.2** Update of ESiWACE Application Software Framework (D3.1), prepared for the demonstrators
- **D3.3** Software specification for the 3rdE2SCMS, narrowing down D3.1 for the 3rdE2SCMS
- **D3.4** Experiences with ESM Multi-model Ensembles for Educational Purposes: A report from the use of D3.1 for the 3rdE2SCMS
- **D3.5** How to select, configure and install ESM software stacks: Handbook for system administrators Specification of a standard recommendation for an ESM System Software Stack in the form of a white paper
- **D3.6** Update Handbook for system administrators (D3.5)
- **D3.7** Software Stack for ESM- A Specification narrowing down D3.5 for the demonstrators
- **D3.8** Experiences with the ENES System Software Stack: A Report from the use of D3.5 for the demonstrators
- **D3.9** ESiWACE Scheduler development and support activities: a first report of Scheduler development and support activities for Tasks 3.3.2 and T3.3.3.
- **D3.10** ESiWACE Scheduler development and support activities, v2: a second report of Scheduler development and support activities, updating D3.9 and reporting on Tasks 3.3.4

WP4

Making the best use of HPC in Earth simulation requires storing and manipulating vast quantities of data. Often such manipulation involves handling very high volumes of data (by contrast to many commercial applications which sift, or query into, high volumes of data).

Existing storage hardware and software is not well adapted to these use modes, particularly, for binary data. Hence the overall goal of this work package is to address the exploitability of storage systems in weather and climate HPC, first by modelling existing and possible future systems, then by developing improved software and exploitation strategies for both disk and tape systems.

The work is broken into specific tasks:

- Understanding the business of storing and exploiting high volume Earth system data by developing a model which can be used to both understand the cost and performance of a range of storage strategies in weather and climate HPC workflows (and compare those with typical commercial strategies).
- Developing a New disk storage layout for Earth system data to overcome the performance limitations of existing fixed on-disk formats and APIs by providing a novel data-specific layout interface. The new interface will be capable of supporting both interoperability between higher-level file formats and of customisation to local heterogeneous disk storage

environments. It will be deployed in test mode to support the demonstrator activity.

- Developing new tape access strategies and software customised for Earth system data by first modelling and simulating possible strategies, and then developing a new software library which provides both higher bandwidth to tape storage and increased storage redundancy.

Deliverables

- **D4.1** Business model with alternative scenarios
- **D4.2** ESD middleware design
- **D4.3** Final implementation of the ESD middleware
- **D4.4** Final report on alternative tape usage

WP5

The general objective of this Work package is to ensure effective and smooth high-quality implementation of the project and delivery of innovation actions, and impacts. This includes general administrative and management practices that can be expected for programs founded via EU programs, including financial and scientific reporting.

Deliverables

- **D5.1** Design and implementation of the intranet, portal, wiki: The intranet is a tool for the legal, financial and administrative management of the project. It contains contractual documents, consortium documents, templates for the legal, financial administrative management, and copies of reports to the EC. The intranet will be web based
- **D5.2** Project Public website
- **D5.3** Media and Communication Plan
- **D5.4** Data Management Plan (DMP): The DMP will be drafted in compliance with the guidelines given on data management in the Horizon 2020 Online Manual
- **D5.5** Dissemination and Exploitation Plan (EP): Plan identifying types of potential pathways of market-oriented exploitation, converting or transforming knowledge will be identified, together with key factors for a successful innovation management
- **D5.6** Strategy for the Intellectual Property exploitation: Strategy for defining measures for exploitation “after the project” phase, providing evidence of best practices in capturing and assessing