



Objective 2: Models, Tools and HPC

WP8/JRA1:

Models and Tools development

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Partners:

Met Office (33PM), CNRS-IPSL (31PM), CERFACS (28PM),
BSC (20PM), CMCC (14PM), UKRI (6PM),
UREAD-NCAS (2PM), MF-CNRM (1PM)



WP Objectives

■ Main Objectives

promote and further develop community models and tools in order to produce more accurate and reliable simulations of the Earth climate system, pursuing and extending IS-ENES1&2 strategy

■ Specific Objectives

- Improving NEMO computational performance
- Developing the unified European platform for sea ice modelling
- Developing community software tools (OASIS3-MCT, XIOS, Cylc/Rose)



WP Tasks

1. Improving Nemo computational performance

CMCC (11 PM), BSC (20 PM), Met Office (5 PM) - *I. Epicoco, M. Acosta*

- Use state-of-the-art performance tools for **scalability analysis** at routine level.
- **Limitation** of **communication overhead**: balance between number of messages and packet size, optimal distribution of model subdomains, ...
- **Emulator** to understand the **floating-point precision** required by each process
- Evaluate **XIOS performance** in NEMO in **HR configurations** (e.g. 1/12°, 1/16°)
- **D8.5 (mo 44): Update of the NEMO code**

2. Extending NEMO to include a unified European platform for sea ice modelling

Met Office (4 PM), CNRS-IPSL (4 PM), CMCC (1 PM), MF-CNRM (1 PM), UREAD-NCAS (2 PM) – *E. Blockley - M. Vancoppenolle*

- in-depth **technical testing** and **documentation**
- Improvement of the **code modularity** for flexibility and ease of use
- **D8.1 (Task 2, mo 24): NEMO sea ice model code**



WP Tasks

3. OASIS3-MCT development

CERFACS (23 PM), UKRI (6 PM) – *S. Valcke, R. Ford*

- Parallel and **higher-accuracy library** for the **interpolation weights**
- Further development of the **load balance analysis tool, LUCIA**
- **Diagnostics** and **pre- and post-processing** transformations.
- Development of **Python bindings**
- **D8.2 (mo 36): OASIS3-MCT_5.0 release**

4. XIOS development

CNRS-IPSL (27 PM), CERFACS (3 PM) – *Y.Meurdesoif, MP Moine*

- Additional **spatial transformations** and **time interpolation**
- **Restartability**
- Automated **suite of unit tests** for continuous integration (Jenkins tools)
- Further testing and validation of **multithreading** (prototype in ESIWACE)
- Implement **coupling functionalities**
- **dr2xml extension** to CMIP7 and other projects (CORDEX, Copernicus)
- **D8.3 (mo 40): XIOS new release**



WP Tasks

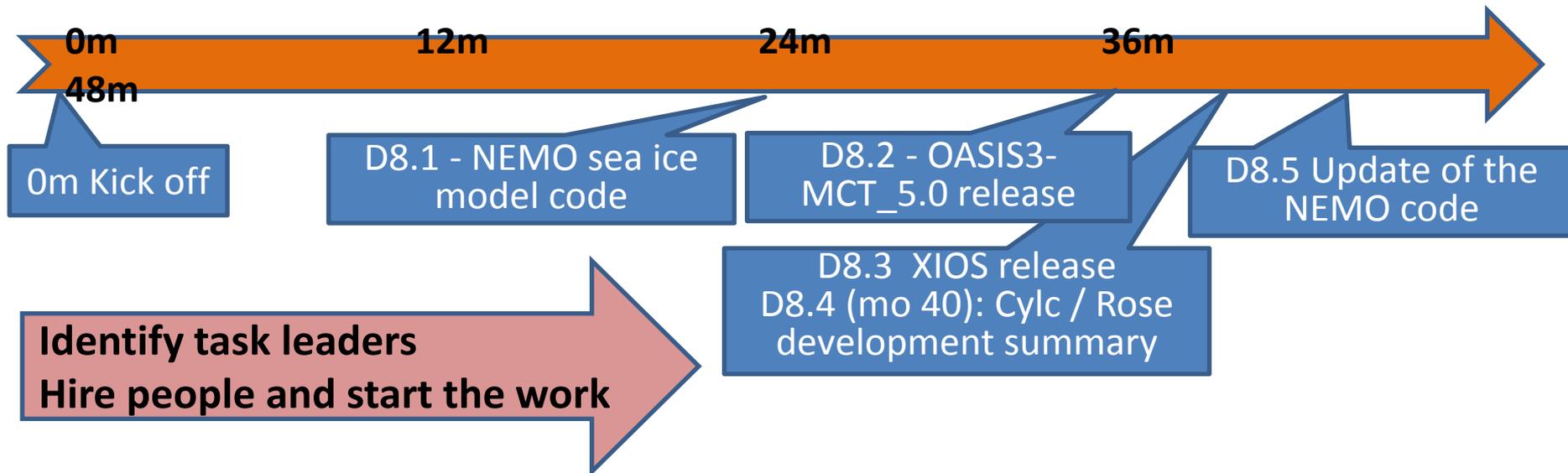
5. Cylc development

Met Office (24 PM) - *D. Matthews*

- **performance** and **scalability improvements** to address the demands of increasingly complex workflows
- new requirements from **emerging applications** (e.g. Machine Learning, Data Analytics workflows), **new platforms** and **schedulers**, **new data storage** architecture (e.g. Object Storage)
- **new GUI technologies** to replace the deprecated GTK+ 2 based GUIs
- Migration from **Python 2 to 3**
- **D8.4 (mo 40): Cylc / Rose development summary**



WP First actions and issues to be addressed



- Integration of NEMO & sea-ice with community activities
- How far can we go regarding the coupling with XIOS (cf OASIS3-MCT – XIOS convergence?)
- Tools development: difficulty to hire skilled people on contract soft money



Models, Tools and HPC Breakout Group

1. **Integration of NEMO (ocean & sea-ice) developments (WP4 T1-T2, WP8 T1-T2)**
 - **Coordination with other community activities (NEMO System Team)**
 - sea-ice model HPC development
 - Validation strategy
 - Interfacing of sea-ice in NEMO (embedded or via OASIS)
2. **Complex coupled system HPC performance evaluation (WP4 T3)**
 - Definition, coordination with CPMIP
 - Coordination with ESM developers, which models? **How to manage risk of poor coverage?**
 - Collection of metrics from CMIP6 experiments
 - Interaction with OASIS3-MCT/LUCIA developers