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Coupler Governance model document

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Abstract

In this document, we present a proposal for a community governance model for the OASIS coupler based on previous discussions within IS-ENES, on a recent user survey, and on the author's experience as an OASIS developer. The results of the survey are summarized and a lightweight community governance model, in line with the traditional bottom-up approach followed up to now for the coupler evolution, is proposed. This community governance model is based on:

- a user committee ensuring right level of interaction between the coupler users and developers
- an external advisory board to which the developers regularly report and that provides advice to the developers with a special consideration of strategic needs

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Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants including the Commission Services	
RE	Restricted to a group specified by the partners of the **IS-ENES2** project	
CO	Confidential, only for partners of the **IS-ENES2** project	

CERFACS

CAPACITIES

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Executive Summary

One objective of IS-ENES2 is to establish a community governance model for the coupler software. First discussions on this issue were organized in June 2014 during the IS-ENES2 General Assembly and a "straw man" governance structure based on a user group, a technical advisory group and a stakeholder group was suggested in milestone M4.3. At that point, a survey was proposed to more formally consult the main OASIS user institutions on the need for and the form of an OASIS governance.

In this document, we present a proposal for a governance structure based on the 2014 discussions, on the user survey, and on the author's experience as an OASIS developer. The results of the survey are summarized and lead to the conclusion that a lightweight governance model is best suited to the needs of the community. The community governance model is based on:

- a user committee ensuring a right level of interaction between the coupler users and developers
- an external advisory board to which the developers regularly report and that provides advice to the developers with a special consideration of strategic needs

This light governance structure ensures closer links between the users and the developers than today. The advisory board will consider current and future strategic needs of coupling, for example the ability to support climate models on exascale systems. The advisory board will also aim to reduce the duplication of effort and promote software convergence in the community,.

This proposition will be presented to the IS-ENES partners at the next General Assembly and its implementation should be aided by ESiWACE, the recently funded Centre of Excellence in Simulation of Weather and Climate in Europe.

1. Objectives

At the beginning of the IS-ENES2 project, the short-, mid- and long-term evolution of the OASIS coupler was unclear and it was considered urgent to actively involve its users in the development and governance of the software. Even if this seems today less urgent thanks to the success of OASIS3-MCT, establishing a community governance strategy for the coupler is still needed, at least on the long term, to address the foreseen jump in complexity of the coupling problem on exascale platforms and the associated increase of performance required. Essentially, to exploit exascale systems, Earth System Models (ESMs) will have to increase their parallelism and this needs to be supported by the component coupling infrastructure. First discussions on this issue were organized in June 2014 during the IS-ENES2 General Assembly. A "straw man" governance structure, based on a user group, a technical advisory group and a stakeholder group was suggested in the milestone M4.3 “Draft governance model document for the community coupler” released in September 2014. At that point, a survey was initiated to more formally consult the main OASIS user institutions on the need and form of an OASIS governance. This document presents the results of the survey and the governance structure proposed for the coupler based on these results and on additional experience.

2. Context

The context of the OASIS coupler development, presented in details in the milestone M4.3, is summarized here.

OASIS development started in 1991 when the two main French climate modelling groups, Météo-France and IPSL/CNRS, commissioned CERFACS to develop a modular coupling software. Some form of top-down governance therefore existed at that time at the French national level. OASIS became progressively used by more and more groups and is today the coupling tool of more than 45 climate-modelling groups around the world (Valcke et al., 2012). The great care taken by CERFACS to constantly integrate user community improvements in the OASIS official version allowed the user community to partly influence the coupler functionality, even if CERFACS was, and still is, ultimately responsible for the software.

CERFACS and, since 2007, CNRS (the French Centre National de la Recherche Scientifique), devoting each one person full time to OASIS, ensure the development, maintenance, integration and user support of the coupler. In addition, externally-funded projects bringing temporary but important funding streams for the development of the OASIS3, OASIS4, OASIS3-MCT versions (e.g. PRISM, CICLE, METAFOR, IS-ENES1&2 projects) have provided another means for community engagement in the coupler governance, as the work proposed in the projects is agreed on with the whole project community.

A deep evaluation of OASIS4 (Redler et al. 2014) was performed during the IS-ENES1 project (2011-2014) and led to the conclusion that OASIS4 had some fundamental weaknesses, in particular regarding the lack of support of unstructured grids. At this point, CERFACS and CNRS decided to stop its development. At that time, which coincides with the writing of the IS-ENES2 proposal, it was becoming urgent to provide a parallel coupling library to the climate modelling community. CERFACS and CNRS decided to interface MCT (the Model Coupling Toolkit, www.mcs.anl.gov/mct) with OASIS3. Version 1 of OASIS3-MCT was released in July 2012 and a second and a third version were made available in May 2013 and May 2015 respectively (Valcke et al. 2013, Valcke et al. 2015).

Since its first release, more than 450 OASIS3-MCT downloads were registered from groups in Europe but also in Canada, USA, Colombia, India, Japan, China, Saudi Arabia, etc. Among these groups, many have effectively migrated to OASIS3-MCT, in general for relatively high-resolution version of their coupled model, for example all IPSL labs, ETHZ in Switzerland, SMHI in Sweden, MPI-M and the regional climate modelling community COSMO in Germany, the UK Met Office and the BoM in Australia. The latest official releases of the NEMO ocean model and of the atmospheric WRF model now include the OASIS3-MCT API. Regarding user support, three-day training sessions on OASIS3-MCT are offered twice a year, the OASIS web site (http://oasis.enes.org) is continuously maintained, and additional support is provided through the forum and by mail and phone exchanges.

Tests were done with 8000 cores on the Bullx Curie machine at the TGCC near Paris and 16000 cores on the IBM MareNostrum III at BSC in Barcelona. Tests for more than 16000 cores are planned in the framework of the ESiWACE Centre of Excellence. Based on the TGCC and BSC tests, we can conclude that OASIS3-MCT presents good performance and scalability for up to O(10000) cores. We therefore consider it is very likely that OASIS3-MCT will provide an efficient and easy-to-use coupling solution for many climate modelling groups for at least the 5 years to come.

There is however a need to consider strategic developments to meet long term needs. For example, OASIS3-MCT offers fully parallel regridding and distributed exchanges of the coupling fields but OASIS3-MCT does not perform the parallel calculation of the regridding weights and addresses per se. Different tools (like the Earth System Modelling Framework - ESMF) can be used off-line to pre-calculate these weights and addresses in parallel. It will become necessary to integrate this functionality in the coupler when support of adaptive grids will be required. In the longer term, we must therefore consider the development of parallel calculation of the regridding weights and addresses or the integration of an existing library offering this functionality, e.g. ESMF (Hill et al. 2004) or OpenPALM (Duchaine et al. 2013) in the coupler. Another example of strategic evolution is the possible long-term convergence with XIOS, the I/O server developed at IPSL and used in many climate component codes. The main functions of an I/O server and of a coupler (i.e. communication and regridding of data) are very similar and it is likely that these could be integrated into a converged solution. An effective governance structure should consider the long term coupling needs of the community and provide advice on how to address related exascale challenges.

It is agreed within the ENES community that the efforts needed to efficiently address these challenges should be underpinned by a stronger governance structure of the community coupler. It was therefore decided to define the main constituents of an adapted governance structure in IS-ENES2 (this deliverable) and to implement it in the recently funded Centre of of Excellence in Simulation of Weather and Climate in Europe, ESiWACE.

3. Results of user survey

To further define the terms and structure of a possible governance strategy for a community coupling software, a survey with questions about the strategic requirement, the appetite for engagement, the structure of the governance, the need for more software sharing was realized beginning of 2015 among OASIS users.

8 different OASIS user institutions: Met Office (UK), the EC-Earth consortium, MPI-M (DE), Météo-France & IPSL (FR), CMCC & INGV (IT), JAMSTEC (JA), the NEMO consortium, and 2 individual French users provided answers to the survey. These answers are detailed in Appendix 1 and summarized here after.

- ***The strategic requirement.***

  Do you think that sharing common coupling software, like the OASIS coupler used today by a majority of the climate modelling groups in Europe, is a good thing?

The answers were almost unanimous with 9 “yes” with only 1 “maybe”.

Do you think the different groups should keep on sharing their coupling software in the mid and long term?

Again, the answers were almost unanimous with 9 “yes” with only 1 “no” because they have other in-house plans.

- ***The appetite for engagement.*** *Do you think community governance should be established for the OASIS coupler on the short term and for its evolution or the use of alternative software in the mid and long term?*

  A weak majority agrees with that statement with 6 “yes”, 1 “maybe”, but 3 answered “no” because they consider that interacting at the working level is more efficient than top-level governance.

- ***The structure.*** *If so, what type of governance should be established? Should it include a OASIS user group, providing feedbacks and advices from the users to the developers?*

  A strong majority agrees that a strong user group is important with 9 “yes”; 1 did not provide any answer.

  Should it include higher-level more strategic groups providing directions for the technical development, quality control, resources and funding of the software, as described above?

  Here the answers are more diverse with only 5 “yes” (with some of them insisting that this is important for longer term exascale computing developments).

- ***Funding model.***

  If so, what should be the funding model of community coupling software? Should one group develop the coupling software with the different partners contributing money to this group?

  Only 3 groups answered “possibly” to this statement.

  Should the different partners contribute efforts to the software development, this resulting in a geographically distributed software development?

  This statement did not get a strong agreement with 5 “no” and only 3 “maybe”.

  Should sustainable funding be sought from some form of research infrastructure?

  This is the form of funding that is largely preferred with 7 “yes” (with 3 of them explicitly stating that this should be coordinated by ENES), even if 2 explicitly wrote that long-term funding is not needed.

- ***Need for more software sharing before possible governance.*** *Alternatively, do you think that sharing more software, naturally leading to distributing the software development effort over more groups, is a mandatory condition before trying to establish some community software governance for the coupler?*

  The majority consider that this is not needed with 7 “no” even if 3 of them think this would help; other did not provide any direct answer.

4. A proposition for a community governance structure

The following elements come out from our analysis of the user survey and CERFACS experience of more than 15 years managing the OASIS software and interacting with its users:

- Almost all groups consider that they benefit from sharing common coupling software.

- A vast majority consider they should keep on sharing this software and in principle they consider that the sharing could and should be extended to other parts of the infrastructure (IO, post-processing, monitoring).
- A stronger user group and stronger user-developer communication is important and these aspects should certainly be included in the governance.
- But in practice, the vast majority of the groups are not ready to take any active steps to be more involved in the development and management of the coupler or other software.
- In general, the groups are not in favour of any concrete top-down action that would enforce the sharing, partly because are not ready to commit themselves, partly because they are not convinced that such a top-down approach would be effective.
- They prefer to rely on the current bottom-up approach, which has proven to work, where the different groups develop different tools and the "good" ones, that deserve to become community tools, naturally emerge given that enough networking is ensured. All groups can expect to benefit from this approach given reciprocal arrangements between the groups.
- The groups do not directly face the question of whether or not this approach will remain effective to address the exascale challenges.
- The funding model based on "one group develop the coupling software with the different partners contributing money to this group" did not get a lot of positive feedbacks. In general, it is felt that contributing money to one centralized group of developers is too risky.
- The funding model based on "different partners contribute efforts to the software development, this resulting in a geographically distributed software development" is not favoured either as it is considered difficult to ensure effective multi-site developments. In fact, if OASIS3-MCT provides a successful example of distributed development, OASIS4 has proved to be less successful.
- In general, the community prefers to rely on some form of externally funded research infrastructure, ideally coordinated via ENES, to ensure the networking and additional funding for the tools identified as community tools. Whether or not this is a realistic view on the long term needs to be considered.

Given these elements, we consider that a lightweight governance structure is better able to meet the community needs and expectations, as follows:

- A user committee charged to collect the needs and requirements of end users to directly inform the developers. Each major group using OASIS should have a representative who would be responsible for collecting the needs and feedbacks from this group, but means to get inputs from the whole community will need to be implemented.
- No formal governance at the technical level; keeping a small number of developers strongly interacting and in charge of the evolution of the coupler and related technical choices, as is the case today, should be continued. The user committee would be encouraged to provide feedback on any technical issues that they are aware of. Should external funding be provided, the developers would have, as today, decision making power over these resources, of course within the governance of the external funding programme which should be coordinated, as far as possible, with the coupler governance.

- An external advisory board to which the developers would regularly report, presenting the work realized and the plan for future developments; this board should evaluate if the plans are coherent with the users' needs.

  Each major group using OASIS should have a representative on this board.

  The advisory board would not have any decision-making power on the developers regarding technical decisions or use of externally-funded resources but would give advice to the developers on how to ensure convergence with the community needs and expectations.

  Staying in line with the traditional bottom-up approach, the advisory board should also help recognize and favour geographically distributed interactions at the working level if/when they happen. In other words, the board should not "push things" but make sure that "things that work are pulled".

  Another essential aspect is that the existence of an advisory board would give a place where to regularly discuss the long-term evolution of the coupler, in the exascale perspective. In this respect, the role of the advisory board would be to ensure that expertise is shared between the groups and that efforts spent in the different groups converge toward the development of common exascale software. The board should regularly analyse at a more strategic level the effort invested in the coupling infrastructure and this analysis could lead to an organised community investment, possibly through ENES.

In practice, the user committee and the advisory board could be composed of the same people. The frequency of formal interaction between the different stakeholders (user committee with developers, developers with advisory board, advisory board with developers) should be of the order of once a year. In between, informal communication would continue to be encouraged as now.

5. Conclusions

One objective of IS-ENES2 is to establish a community governance model for the coupler software. We fulfil here this objective, making a proposition for a governance model based on first discussions organized during the 2014 IS-ENES2 General Assembly, on our experience as OASIS developer for more than 15 years and on the results of a survey realized beginning of 2015 among OASIS users. After a historical overview of the OASIS development in section 2, this document presents the results of the user survey in section 3.

The community governance model is then detailed in section 4. This model is based on:

- a user committee ensuring a better interaction between the coupler users and developers
- an external advisory board to which the developers regularly report and that provide advices to the developers

This light governance structure can be considered as a natural evolution of the bottom-up approach followed up to now for the coupler evolution while ensuring closer links between the people using the software and the people developing it.

This proposition of a governance structure for the community coupler will be presented to the IS-ENES partners at the next General Assembly and its implementation should be realised through the recently funded Centre of of Excellence in Simulation of Weather and Climate in Europe, ESiWACE. More generally, it will be discussed if such a governance should also be put in place for the other software shared in the community, such as the IO server XIOS or the Cylc meta-scheduler.

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7. Appendix
Governance for the community coupler
User survey results - April 2015

8 OASIS user institutions (Met Office –UK, the EC-Earth consortium, MPI-M –DE, Météo-France & IPSL –FR, CMCC & INGV – IT, JAMSTEC –JA, the NEMO consortium) and 2 individual users answered the user survey realized beginning of 2015. In this survey, questions about the strategic requirement, the appetite for engagement, the structure of the governance, need for more software sharing before possible governance were asked. The questions and the answers provided by the different institutions are detailed in this appendix (the replies of the individual users are not reported as they were in French).

- **The strategic requirement**. Do you think that sharing common coupling software, like the OASIS coupler used today by a majority of the climate modelling groups in Europe, is a good thing? Do you think the different groups should keep on sharing their coupling software in the mid and long term?

  Met Office

  Sharing coupling software is a good thing because:

  • Using common interfaces to coupling provides more flexibility in the community, especially if components models are compatible with the shared interface. For example, people using the Unified Model atmosphere use a variety of ocean and other models in coupled mode.

  • Using common software reduces the overall effort on technical code making the climate community more efficient. Use of common software in multiple centres also leads to greater robustness and portability, which is beneficial to all concerned. Note that there is great benefit in supporting multiple sciences to support key activities such as MIPs (comparing the output of multiple models is the state of the art in climate and in weather) but no direct benefit of having multiple software solutions other than competition driving improvements.

  However, this statement is only true if the software can provide the functionality and performance that the community needs. Hence there is a need for on going investment.

  Clearly, this implies we should aim to share coupling software, reduce divergence in the mid and long term.

  EC-Earth consortium

  The EC-Earth model is composed of a number of software components, sub-models of the physical domains and model infrastructure software components (MISCs). OASIS is currently the single choice for coupling sub-models in EC-Earth and, as such, an integral part of EC-Earth's MISCs.

  Acknowledging the complexity of the coupler component, the EC-Earth consortium has made a deliberate decision to rely on the availability of OASIS as a functional and efficient coupler. The expectation is that the EC-Earth model benefits from higher software quality than what could be delivered by internal development and that it allows the consortium to better focus on it's core competences.

  Software re-use – in general and for scientific software in particular – is considered best practise. Moreover, given the size of the climate model community and the small part of that community focusing on technical aspects, it seems natural to join forces. This is particularly beneficial for MISC development as their shared use does not compromise the diversity of ESMs in scientific aspects.

  From the EC-Earth perspective, a shared use of the OASIS coupler is beneficial, because it could improve inter-operability of components as well as it helps to ensure quality and persistence of OASIS development.

  MPI-M

The sharing of coupling software has been very useful in the past and is likely to be useful in future. At MPI-M the coupler is mainly seen as a black box, which does its job silently in the back. In the past, the ease of use and integration into existing physical model components plus the lack of any alternatives and the relative stability has served as the main motivation to use OASIS. Since all of this runs smoothly in the background, users at the MPI-M do not see a direct benefit from sharing common coupling software. That does not mean they outrule the existence of any indirect effects, that is the common effort which made the software stable such that it can work silently in the back. The users still see a need for support of OASIS in the future.

A common coupling software in principle eases the exchange of model components, however exchanging model components is not of primary importance for the MPI-M.

At MPI-M, any particular challenges, which would make coupling software special in the world of exascale, are not seen. Problems that have to be addressed, e.g. the handling of a manifold of messages in such extreme cases, are not confined to coupling alone but shall be dealt with in a broader context. A trend is observed to run ensemble members at somewhat coarser resolution rather than performing single model experiments at the highest possible resolution.

Météo-France

Yes + Yes (consensus)

IPSL

From a user point of view, sharing a common coupling software is a good thing in the short/mid/long term for following reasons:

- share experiment with different users (common problems, common solutions, tricks,...)
- share (more) easily models using same coupling software (for example : Oasis coupling interface is implemented in NEMO reference code)
- have a user community to discuss efficiently with computing centres on technical aspects such as non standard use mode such as MPMD mode,...

CMCC & INGV

Yes, sharing common coupling software is definitely a positive thing, which can help both modelling groups and software developers.

JAMSTEC (Japan)

Coupling software is nowadays an important component of the climate modelling, providing valuable enhancement in models accuracy. Sharing such software is a good thing for the sustainability of forecast systems around the world.

NEMO consortium

We believe sharing a common coupling software is a very good thing for the main following reasons. First, for NEMO it makes things much easier for all its coupled configurations: once an ocean atmosphere NEMO coupled configuration has been built, using OASIS, it is much easier for the others: only the slight adjustments related to the specifics of new atmospheric model have to be built. Indeed, NEMO is widely used as an ocean model in a number of ESMs (Earth System Models) for climate studies. The OASIS interface is implemented in the NEMO reference code and so available to all the NEMO community, allowing easy implementation of new couplings. From the users point of view, the fact that OASIS is known and used widely in the community clearly facilitates NEMO use.

Moreover, OASIS has recently become (OASIS-MCT) very interesting to envisage coupling between NEMO components (ocean dynamics and sea-ice for example) to increase modularity and HPC performance. More generally, the coupling expertise is shared and increased within and by the whole OASIS user community.

Considering these elements, it is clearly useful for NEMO to keep an OASIS alive in the mid and long term. Otherwise, the loss would be considerable considering the investments done to reach the state of the art today, and also for the future since a complete new coupling interface would have to be built and validated again.

- **The appetite for engagement.** Do you think community governance should be established for the OASIS coupler on the short term and for its evolution or the use of alternative software in the mid and long term?

  Met Office (UK)

  Yes, we do think we should try to establish community governance for OASIS and successors. This would be necessary to ensure that the coupling software meets the user needs and hence encourages convergence of coupling software.

  EC-Earth consortium

  The availability of OASIS has, to a certain extend, led to the arguable assumption that the coupler development (likewise other MISCs) can be taken for granted. The motivation behind the EC-Earth consortium is related to Earth system questions rather than technical aspects. It is difficult to get the consortium engaged in additional overarching technical development activities. Therefore it is unlikely that the EC-Earth consortium can participate in core development of OASIS. Still, the EC- Earth consortium is internally pursuing a distributed development approach and realizes the value of close interaction between component development. A limited deeper integration of ESM development with coupler interface development is worthwhile to explore.

  Engagement of the EC-Earth consortium in OASIS governance could be well motivated if

  • there was a clear strategic advantage, such as

  ◦ savings in the development of component models' technical and physical interfaces,

  ◦ impact on the course of OASIS development;

  • it ensures continuity of OASIS development;

  • if it supports funding-raising for development activities at particular institutions.

  MPI-M

  Users at the MPI-M do not see any urgent need for a community governance of the OASIS coupler. Users do not see any benefit or find it difficult to judge if any added value results from being involved in a user group or even in an advisory board. It is clear, that this means MPI-M would have to accept what is offered as shared software. For the next generation model system at MPI-M different coupling technologies will be used.

  MPI-M will stay engaged in the organisation of community exchange on coupling methods and technologies, which might be considered as part of a “governance for coupling strategies“.

  Météo-France

  Yes (the user's group is much appreciated).

  IPSL (France)

  Obviously the coupling software solution on the short term is Oasis-MCT. The role of community governance should be to ensure the user community to have a coupling software in mid and long term, that means community governance will be responsible for choosing and maintain a software solution (Oasis, ???) that will be adapted to user requirements and needs.

  CMCC & INGV (Italy)

  I think that a community governance would be a useful tool in order to keep development focused. It would be a indispensable tool if the OASIS coupler development process evolve toward a community based approach.

  JAMSTEC

  A community governance might be of importance to optimize the different aspects of the OASIS coupler scheme (development, optimization, upgrading...).

  NEMO consortium

  For NEMO, considering the answers above, a clear governance should be established for the OASIS coupler and its future (including eventually possible evolutions of the software).

Since OASIS is a free software used in a wide community, this governance has to take into account the various needs of the community, meaning some form of community governance or community involvement which needs to be defined.

- **The structure.** If so, what type of governance should be established? Should it include an OASIS user group, providing feedbacks and advices from the users to the developers? Should it include higher-level more strategic groups providing directions for the technical development, quality control, resources and funding of the software, as described above?

Met Office (UK)

It is hard to be prescriptive on the structure as it depends in part on other things such as the funding and resource arrangement. For example, if ENES was to able to coordinate governance of a number of shared software systems then a higher level structure across all these is likely to be beneficial. The funding and resource arrangements need to be established in order to work out the best structures, but in general we should try to streamline structures as far as possible. All the governance activities listed are important and should be clearly articulated in the Terms of Reference. It is important that any members of groups have clearly defined communities they represent and that they communicate effectively with that community. If this works well, it may be possible for technical governance group to represent the needs of end users, for example.

It is also important to ensure that there is clear single management that can ensure that day-to-day decisions can be made within agreed parameters rather than every detail needing broader discussion.

EC-Earth consortium

The value of a common coupler component for European ESMs is seen in its availability and quality, which is what any governance approach should encourage. Moreover, a sustainable community development can only be driven by needs. This means that a governance structure should be as much bottom-up as possible and only as much top-down as needed.

A good user-developer communication would help to drive the OASIS development by the needs of its users. A dedicated user group is therefore seen as a strong basis for governance.

It appears useful to have a stakeholder and/or a technical advisory group to help placing OASIS development in the focus of funding agencies and to define strategic goals that may be beyond the horizon of current usage scenarios.

MPI-M

If a governance structure is going to be established a suitable ratio has to be found between the number of people doing active software development and the number of people getting involved in the various bodies, being it an advisory board, an OASIS user group or other strategic groups1. MPI-M users prefer the exchange on the working level for direct response and agility of the system. More panels tend to decrease the weight of the voice of the users. They lower the chance of constructive co-development. Response times for solutions to existing problems will be higher. A sophisticated management structure bears the risk that OASIS will develop into a generic solution to address a manifold of problems possibly even beyond coupling which will make the software harder to maintain in the long term and less attractive to use. A lightweight governance may be a way to go.

Météo-France

These two groups may be sufficient.

IPSL

A team of coupling software developers exist by default, i.e. people who develop, fix bugs,... in coupling software (present Oasis team). Besides, a committee to speak about fundings/resources and a user/technical group to discuss technical aspects and user needs would be good and enough : it is not needed to have one technical group and one user group because users and people in charge of technical advices are often the same people.

CMCC & INGV

Yes, it should definitely include the OASIS user group. Feedbacks from users are fundamental. Yes, [it should include higher-level more strategic group], this would help shaping the next generation OASIS.

JAMSTEC

It should in fact include a user group, to provide feedbacks from the end-users to the developers.

NEMO consortium

The governance needs to be able to take in account the community needs, to set up the manpower of experts needed, and to evaluate regularly the work done. Since in terms of organisation, I believe "small is beautiful", a team of OASIS developers, a Users group for advices, and a Steering Committee as executive could be sufficient.

- **Funding model.** If so, what should be the funding model of community coupling software? Should one group develop the coupling software with the different partners contributing money to this group? Should the different partners contribute efforts to the software development, this resulting in a geographically distributed software development? Should sustainable funding be sought from some form of research infrastructure?

Met Office

Securing a stable long-term funding model is the top priority for successful governance.

Opportunities to bring new funding are the ideal situation as we are all challenged by funding constraints. Sustainable research infrastructure funding would be welcome if this is achievable, but it is likely to be hard to deliver as it is likely to be made up of coordinated national funding opportunities.

Direct funding of effort, shared between a consortium of beneficiaries may well need to be explored and the Met Office would be happy to discuss this. In this case, the Met Office would seek to engage alongside Unified Model partners. The larger the consortium the more affordable this would be.

We also need to consider these options in the context of wider software sharing (e.g. Cylc). It may be possible for a consortium to develop reciprocal arrangements but it is likely that even here the benefit will not be balanced by the level of input. Here, a body like ENES could help put this into a wider context but would need to take a stronger leadership role in this regard than has been possible hitherto. If successful, the Centre of Excellence bid can provide the opportunity for this stronger engagement.

One group or multi-group development and support (including partner development) can work or fail depending on how well aligned the contributing groups are at a strategic and technical level, and how engaged local developers are with the community need versus the local interest. There are clearly challenges with a multi-group approach, such as the lack of control of participants as there can be different agendas based on management chains and interests. For small teams, which is likely to be the case for OASIS, a single group approach (in terms of funded effort) can be easier to control but there are examples of multi-group successful developments with small groups such as the development of Cylc and OASIS MCT. There are also examples of single site developments that are not successful, sometimes because the team cannot agree on the direction. Here, it can be easier for management to fix the problem as there is more direct control of staff. It is particularly difficult to ensure effective multi-site development if the primary motivation for involvement is seeking new financial opportunities rather than a common view of the requirement, its priority and the technical direction.

EC-Earth consortium

A well-defined governance approach could support fund-raising for OASIS development activities. This would allow institutions to contribute efforts in the context of a possible European climate modelling infrastructure, and in particular projects. Realistically, a substantial funding of a core development by one group will be necessary. Possible shared development tasks with focus on the interfaces would need support by a European infrastructure and by projects as well.

MPI-M

Currently, users at the MPI-M do not see any need for direct collaboration nor do they see a strong requirement for significant development efforts. Simply speaking, OASIS does work for the MPI-M and will likely do so in the coming years, or not be used in future modelling systems. For us, the need for significant funding support is not obvious at this stage. In case further substantial development is required, the organisation of software development under the ENES body rather than a particular institution may help to increase the visibility for those contributing to the effort and make it more attractive to participate. Changes of the scientific, technological or other strategic boundary conditions might change this opinion.

Météo-France

A team in charge is preferable

Yes [sustainable funding be sought from some form of research infrastructure], But what is the adequate level of human resources devoted to developing the coupling software ? Isn't the quoted number of 4 persons overestimated (cf. document), since it is explained that synergies with Palm and XIOS should be sought ?

IPSL

From a development point of view: geographically distributed software development (in terms of coding, bugs fix,...) is not a good solution. It is more efficient to have people who are in charge of technical development at the same place and so, one group developing the coupling software seems to be a good solution. However the support part of the coupling software (link to the users, hotline, forum ,...) could be done by a group which is located at a different place as the developper group.

From a funding point of view, CNRS is already implied in the funding of present Oasis development and support and will appreciate more commitment from other institutions.

CMCC & INGV

I think that geographically distributed software development (development community approach) has proved to be only partially successful in many research areas, including ocean (NEMO consortium) and climate modelling. For example, in the NEMO consortium we are facing problems related to the fact that requested efforts are in some cases/periods (for example close to the new version release) very demanding. Some sort

of funding, even if not particularly big, should certainly help.

JAMSTEC

This is a sensitive point, as some national institution don't allow the use of internal budget to support external/abroad group. The alternative of a research structure supporting the development

The existence of a geographically distributed software might help to accelerate improvements in the code. But this implies the existence of a structure to centralize and to spread such improvements.

NEMO consortium

Since 2008, date of signature of NEMO Consortium Agreement, NEMO has been developed by a team composed of experts of the partners of the Consortium. This implies constraints (geographically distributed team, videoconferences every 3 weeks...), but has the major advantage to keep the expertise in the institutions of the Consortium partners, which is indeed crucial, since the validation process of our software is tightly related to science. For the NEMO Consortium, this model works and has a major advantage on sustainability of expertise.

More recently, the national funding tendencies in our countries is starting to somewhat undermine this model. It would be useful to find some additional funding, hopefully at European level, to complement the ones of the institutions. But the situation for now is a bit awkward: as understood by the NEMO Consortium, there is currently no easy way in European projects to ask for the (small) amount of funding for sustainable software development, whereas Europe funds an important number of projects for a much more important amount of money relying on this software.

A form of research infrastructure allowing the funding of sustainable software development (and not services, nor climate services...) would be very useful for NEMO, and also probably for OASIS and a few other software developments in the community.

- **Need for more software sharing before possible governance.** Alternatively, do you think that sharing more software, naturally leading to distributing the software development effort over more groups, is a mandatory condition before trying to establish some community software governance for the coupler?

  Met Office

  It is very difficult to imagine that a governance structure can be put in place without some strong degree of commonality and a degree of trust by the partners. This will often be based on sharing software and is most likely to occur when an institution recognises the need to have a step change in functionality and sees a solution that can provide that. OASIS has a broad enough base of use to conform to this paradigm. It is also possible for a community to jointly recognise the need for something new that can only be delivered by combining resources, as was the case with the METAFOR project but this will carry more risk as it is likely to prove more difficult to establish a common vision within such a project in the absences of any existing concrete solution, especially when initial engagement is focussed on a funding opportunity rather than the details of the technical vision and especially when this is to be delivered by a distributed community. Luckily, OASIS has moved beyond this step but care would need to be taken in planning for future developments, especially when there is a radical change in design (as was possibly the case in OASIS 2).

  EC-Earth consortium

  Sharing of additional software other than the OASIS coupler can be useful when targeting MISCs. Physical components are partly shared as well, however, maintaining a diversity of Earth System Models though requires limits to common physical components. The EC-Earth consortium favours a quick approach ensuring the OASIS development, while the governance of a wider common technical infrastructure should be left to upcoming European initiatives.

  MPI-M

  There is general consensus at the MPI-M that sharing at the working level is crucial. This applies to software, algorithmic work and knowledge. At this stage it is more important than to establish community software governance at first place. We see a large demand for sharing ideas about new concepts about the physical coupling. We acknowledge the challenge when we start coupling massively parallel Earth system model components. Nevertheless, we think that technical problems resulting from the enhanced communication are far easier to solve than those problems arising from running coupled models over long integration times or switching to new coupling algorithms, e.g. the implicit coupling between model components or the understanding of the dynamic interdependency between coupled components.

  Météo-France

  No. It should be more appropriate that the software be developed within a well-defined pool of engineers, so that the software can precisely answer to the needs.

  IPSL

  Sharing more software is not a mandatory condition to establish some community software governance. However, sharing more software could lead to make one of them emerge naturally and make the choice of the mid/long term coupling software solution be easier.

  CMCC & INGV

  I think that governance should be established before any change toward a distributed development in order to avoid chaos, provided that a strong link with the users base (feedbacks from users, as stated above) is set up and operated on a regular basis.

  JAMSTEC

  The licence of the software should be then clarified.

  NEMO consortium

As it is today, OASIS has a full address book of projects and users representing a major part of the European community in our field. Sharing more software should not be a mandatory condition. Moreover, the wider the platform, the more complicated it is to organise the development work. For NEMO, the sustainable future of an OASIS is crucial and should be organised as soon as possible.