

Management of the ALH Consortium

Context

The current collaboration between the different consortia ALADIN, LACE and HIRLAM takes place under the ongoing [Collaboration Agreement between the ALADIN and HIRLAM consortia](#), signed in 2016. The scope of the collaboration is specified under its item 6. At the management level, this Agreement indicates that: *The ALADIN Assembly and the HIRLAM Council shall annually decide during the common ALADIN GA/HIRLAM Council meeting upon the common research/work plan to be carried out.*

The creation of the common work plan was one of the first tasks addressed after the start of the Agreement in 2016.

The ALH community presently collaborates on seven areas: *dynamics, physics, data assimilation, surface modeling, ensemble prediction, meteorological quality and system developments*. The Rolling Work Plan (RWP) is organized according to these seven areas.

As the convergence process is only at its first stage, in today's practice the management of the research activities is handled in an intensive communication process between by 3 Programme Managers (PM's) (ALADIN, LACE and HIRLAM), the 16 ALADIN Local Team Managers (LTML's), the 10 Heads of Research (HoR's) of the HIRLAM Groups, the 12 members of the ALADIN Committee for Scientific and System Issues (CSSI), the 6 members of the RC LACE management group and the 6 members of the HIRLAM management group (HMG). For each of the above-mentioned seven areas interactions need to take place between at least three managers in the current collaboration. Each of them is expected to report to their own hierarchy.

The situation which we aim to ultimately achieve in the joint consortium is one in which a central management group provides coordination of the R&D and technical activities at the ALH level, in communication with both LTM's and HoR's, and in which the need for remaining coordination at the CSC level would be strongly reduced. It will be difficult to realize this already right from the start of the joint consortium. It is envisaged that in the first few years of the joint consortium an intermediate phase is needed in which a number of specific actions are carried out to achieve a greater convergence in the goals and working practices of the three CSC teams, and a greater level of interoperability between the CSC's themselves.

As announced during the joint ALADIN General Assembly/HIRLAM Council in Istanbul, the Convergence Working Group organized a Strategy Meeting on 3-4 February 2020.

In this meeting, the future aims for the coming years were considered, Also, actions were identified by which a greater level of interoperability between CSC's, and a closer and more effective collaboration between the CSC teams, could be achieved.

Based on these outcomes, a draft Strategy document has been written, organized along the lines of the 7 areas. During the CSSI/HMG web meeting on 2-3 April 2020 some of the novelties of the Strategy document have been implemented as specific work packages in the draft RWP2021.

Based on the outcomes of the Strategy Meeting we propose here the composition and Terms of Reference (ToR) for the central management group (MG) of the ALH consortium. General ToR for the MG positions are given in the MoU (Annex VI). In this document we will more specifically refer to the corresponding work packages/tasks of the RWP2021 to make the content of the work of the Area Leaders, and the division of work between them and the CSC leaders, concrete, at least for the first years of the MoU period.

Area Leaders

We recall here that in the MoU two types of Area Leaders have been defined, responsible for:

- i. whenever possible, leading the corresponding area, that is defining a long term scientific and architectural vision for the modernisation of the code, including normative aspects, increased modularity and interoperability and take full responsibility of the delivery or the corresponding developments,
- ii. or otherwise, conducting specific actions in order to progress on CSC interoperability, as decided by the Assembly and for a limited duration.

These two types of area leaders are called area leaders of the first and second kind (AL1K and AL2K), respectively. It should be stressed that these two types of AL only differ by their tasks which are of equal strategic importance, and function at the same level of hierarchy. The duration of the mandate of AL2K depends on their individual ToR, and in practice varies between 2 and 5 years.

Area Leaders are not responsible for the specific implementation of the scientific developments in each CSC, that remains the responsibility of the CSC leaders (see below).

The intention is to gradually evolve to a situation where the main R&D areas are all led by AL1K. One can assume that after the further convergence at the initial phase of the new consortium, the jobs of the Area Leaders of the second kind will become obsolete.

The proposal by the CWG for the ALH management group

We propose 4 Area Leaders of the first kind (AL1K) as described above (i.e. leading the area for the duration of the MoU). These will be complemented with 4 Area Leaders of the second kind (AL2K) to address specific issues, as described above. More specific ToR's for each Area Leader position are provided in the following pages. Some tasks have been identified that remain the responsibility of the CSC Leaders, as described below.

Thus, the total ALH Management Group at the start of the new consortium is proposed to consist of:

- the PM
- 8 Area Leaders (4 AL1K, 4 AL2K) and DAsKIT coordinator under supervision of DA AL2K
- 3 CSC leaders
- 1 Integration Leader
- And as supporting functions, the Scientific Secretary and the Coordinator of Networking Activities (CNA).

The ToR for the PM, Integration Leader, the Scientific Secretary and the CNA are provided in the MoU Annex VI.

With this composition and size, the ALH Management Group represents a significant improvement in terms of effective overall coordination in comparison with the present situation. The proposed Management Group permits the coordination of already quite many activities at the central ALH level, while in particular the contributions of the AL2K will allow us to progress towards a greater interoperability between CSC's and better collaboration across CSC teams. This should allow the need for coordination at the CSC level to reduce significantly during the 2021-2025 period.

As described in the strategy document, the origins of the interoperability issues are historically situated in the physics packages of the different CSCs. In order to ensure that clear and concrete convergence steps will be made, the mandate of the Area Leader for physics will be, in the first years, deliberately limited to a few very specific technical and scientific tasks, while keeping the scientific progress of the physics parameterizations of the CSC's still under the responsibility of the CSC Leaders. In practice he/she will take responsibility for the first strategic physics goal *to work towards a greater level of interoperability (enabling exchange of individual parameterizations across CSCs)*. Additionally he/she will be responsible for the interoperability aspects of the new 3D code solutions needed for the second strategic physics goal, i.e. *to develop the model physics to be fit to represent the hectometric scales*. . This will allow the Physics AL to work in the first two years with a clear deliverable in mind. This limited scope should guarantee that by 2023 a roadmap for further convergence can be delivered. The expectation is that the content of the roadmap will take into account the relative ambition (difficulty) of the interoperability tasks, leveraged by their expected benefit for collaboration and new ambitions across the future Consortium. After scrutiny and approval of this roadmap by the various governance bodies of the Consortium, the Assembly will decide whether the Physics AL position will be extended or redefined, and possibly reopen the position. The Terms of Reference of the Physics AL will be reviewed, in accordance with the decisions in the Governance bodies, by 2023. The Physics AL will then implement it and lead the area in more general terms with joint scientific and technical goals in mind.

1. Area Leader for the Transversal activities on addressing future evolution of software infrastructure (AL2K - Length of mandate: 5 years)

This Area Leader will conduct specific actions the address the uncertainties in the future evolution of the software infrastructures. These efforts are transversal to all CSCs.

- In the short term, he/she will be responsible for planning and executing the SPTR work package. In the short term (2020-2021) this includes:
 - finalizing the work on the LAM configuration for Atlas;
 - deciding on an approach to introduce flexibility in the 1D components, namely physical parameterizations and surface models;
 - train people to build know how on Atlas, the IO server and the chosen software for the flexibility of the 1D components;
 - analyze and document the existing DSL solutions.

- He/she will coordinate and plan contributions of the ALH consortium to the development of the DSL for the LAM version.
- At a longer term he/she will implement these approaches in the other area's dynamics, physics, surface, data assimilation and system.

2. Area Leader of Dynamics (AL1K – Length of mandate: 5 years)

- The Dynamics Area Leader will lead the Dynamics Area during the period of the MoU.
- He/she will be responsible for the redaction and the execution of the DY work package of the RWP.
- He/she will be responsible for the developments of the necessary improvements of the present dynamical core to ensure the models will be able to progress towards the hectometric scales, as specified in work package DY1.
- He/she will be responsible for the developments to ensure the long-term (of the time scale of 10 years) evolution of an Atlas based dynamical core. This includes:
 - the development of a LAM solution based on a finite-volume approach following the FVM developments of ECMWF, as planned in work package DY2;
 - the finalization a gridpoint dynamics solver as a scientific testbed, as a backup solution and as an alternative to the spectral dynamics, as described in work package DY3.

3. Area Leader of Physics (AL2K – Length of mandate 2 years, to be redefined after the first tasks are complete)

- The Physics Area Leader will execute a number of specific actions on topics that are transversal to the three CSCs:
 - coordinate the creation of an inventory of the blocking points for convergence between the CSCs and analyze and define a road map for convergence by 2023 (PH9),
 - coordinate the actions to increase the interoperability at the level of the exchange of parameterizations schemes between the different CSCs,
 - analyze and coordinate the development of the code restructuring needed for the implementation of 3D physics.
- The leadership of the physics of the CSCs will remain in the hands of the CSC Leaders, as described in work packages PH1, PH2, PH3 and PH5 in the RWP.
- The PM will in principle be responsible for all transversal issues between the three CSCs (specifically, PH6-PH10 and HR1 in the RWP). He/she may appoint additional experts to address specific transversal issues, in particular concerning the redaction and execution of the related work packages in the RWP.

4. Area Leader in Data Assimilation (AL2K – Length of mandate: 5 years)

- The Data Assimilation Area Leader will execute a number of specific actions on topics that are transversal to the three CSCs.
- He/she will be responsible for developing a long term solution for data assimilation and for the redaction and the execution of the work packages that are transversal to all CSCs. This includes:
 - the implementation of OOPS and its corresponding interoperability aspects (DA6);
 - the development of data assimilation algorithmic solutions based on an ensemble variational approach (DA2.3 and DA2.4);
 - the optimization of data assimilation for nowcasting (DA5);
 - an assessment of the possibility for a common preprocessing approach based on a tool like SAPP (DA7.1-7.4);
 - the definition of the testing environment for the data assimilation components in concertation with the System Area Leader and Integration Leader;
 - consider the consequences of growing data volumes and of new quality control mechanisms for an increasing variety of observations, in close collaboration with the CSC leaders;
 - guaranteeing the liaison with EUMETNET and EUMETSAT, in concertation with the CSC leaders;

DAsKIT coordinator, under supervision of DA AL2K

The aim of the DasKIT program is to develop and maintain a basic data assimilation kit that allows newcomers or starting members to organize their local data stream and to help them to easily set up a basic data assimilation cycle.

The DasKIT coordinator will execute a number of specific actions, as described in work package DA8 and will assist the DA Area Leader and the PM, to

- coordinate the DasKIT program;
- organize meetings, trainings, enquiries and progress reports;
- be responsible for the planning and the execution of the tasks in work package DA8 of the RWP for the DAsKIT program.

5. Area Leader on Surface (AL1K – Length of mandate: 5 years)

- The Surface Area Leader will lead the Surface Area during the period of the MoU.
- He/she will be responsible for the redaction and the execution of the SU work package of the RWP.
- He/she will define a long term scientific and architectural vision for the modernisation of the Surface code.
- Specifically, he/she will
 - for the surface model (SU3, SU4),
 - coordinate, in concertation with the ALARO CSC Leader, the switch to SURFEX
 - explore and develop more advanced options (with emphasis on soil, snow, urban) are possible
 - streamline the code for phasing and coupling with other parts of the NWP system
 - for the physiography (SU5):
 - continue to update physiographic databases as the model resolution is increasing
 - assess the forecast impact of the new databases and perform the required tuning of surface modules
 - for Surface Data Assimilation (SU1, SU2):
 - work on the assimilation of satellite and crowd-sourced surface data,
 - work on the interoperability and modernization of the code for the spatialization and the adaptation to the OOPS framework
 - progressively move to a coupled surface-atmosphere data assimilation system.

6. Area Leader on EPS (AL1K - length of mandate: 5 years)

- The EPS Area Leader will take the scientific leadership of the EPS Area during the period of the MoU. He/she will define a long-term vision to progress to provide seamless, well-calibrated high-resolution ensemble prediction systems from the nowcasting range to 2-3 days ahead.
- Specific attention will be paid to the following aspects:
 - the development of user oriented approaches (E7) that facilitate the use of ensemble output;
 - the development of more physically based EPS perturbations in concertation with the Physics Area Leader (PH10) and the Surface Area Leader;
 - acting in concertation with the System Area Leader concerning the development of the EPS collaboration and working environment.
- He/she will be responsible for the redaction of the EPS work packages in the RWP, and coordinate with the CSC leaders on the execution of these packages.
- The CSC leaders will be responsible for the implementation of the scientific developments in their respective CSC's.

7. Area Leader on Meteorological Quality Assurance (AL1K – Length of mandate: 5 years)

- The Meteorological Quality Assurance Area Leader will lead the Meteorological Quality Assurance Area during the period of the MoU.
- He/she will be responsible for the redaction and the execution of the MQA work package and of the RWP. He/she will
 - coordinate an iterative consultation process to collect requirements and assess what needs to be done to make HARP more attractive as a common tool; (MQA1)
 - coordinate the developments of common methods/metrics with focus on methods for spatial-temporal verification and high impact weather; (MQA2)
 - carry out verification of physical processes to aid model development, including the necessary observations and their quality. (MQA3)
- He/she will strengthen the synergy with DA team on observation format and quality control.
- He/she will strive to enhance the user-developer interaction: both R2O (didactic) and O2R (model weaknesses, cases).

8. Area Leader for System (AL2K – Length of mandate 5 years)

- He/she will be responsible for the redaction and the execution of the SY1 and SY4 work package and of the RWP.
- The System Area Leader will be responsible for the following specific tasks:
 - The development of a more distributed, efficient and continuous process for the integration and validation of new developments for the T-codes, in concertation with the Integration Leader. Ensure that this process abides to evolving ECMWF and MF integration constraints.
 - Develop the testing environment for DA, in concertation with the DA Area Leader (who is responsible for the definition of the tests) and the Integration Leader (who needs to approve the functionality of the tests).
- In the first two years of the MoU period, he/she will:
 - Collect information from Members to map their current scripting systems, their functionalities and their dependencies on IT elements that may constitute barriers to convergence on the scripting system. (SY4)
 - Assess Vortex potential as a basis for a future common system. (SY4)
 - Collect views on, and then define, a more common collaboration and development environment for EPS, in concertation with the EPS Area Leader. This can then be developed during the remainder of the MoU period.

CSC Leaders

The CSC Leaders will be responsible for :

- the physics developments specific to the CSC in PH1, PH2, PH3;
- planning and execution of the developments to prepare the CSCs for hectometric resolutions as described in work package HR1;
- the day-to-day execution of the improvement of the model forecast performance (work packages PH4 - PH10 of the RWP). All transversal strategic issues related to work packages PH4-PH10 and HR1 will be the responsibility of the PM;
- the development and maintenance of applied data assimilation setups for the CSCs using efficient, accurate and maintainable algorithms (DA1);
- the definition of the data assimilation algorithm of the CSC (DA2.1, DA2.2, DA2.5, DA2.6 and DA2.7);
- the continuous effort on high-resolution observations (DA3, DA4). The novelty is the massive number of data from various sources (satellite, radar, aircraft, crowd-sourced data, ...) and their quality control, exploring machine-learning. Consider the consequences of growing data volumes, in close collaboration with the DA leader;
- the implementation of the data handling for the data assimilation of the CSC (DA7.5);
- the definition of CSC related EPS systems and performance assessment for extreme weather, NWC range, sub-km resolutions (E1, E2, E3, E4);
- the meteorological quality of their CSC.

In addition :

- The HIRLAM CSC Leader will be responsible for the SY2 work package and for the short-term improvements in the HARMONIE scripting setups in SY3.
- The ALARO CSC Leader will be responsible for the implementation of SURFEX in ALARO (SU3.3, SU3.9).