WG6 – Recommendation Document

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In the COSMO Science Plan 2015-2020, the first paragraph of WG6 section started with these words:

“The need of more and more accurate weather forecasts requires a particular attention towards the small-scale features of the atmosphere that, at the moment, are not resolved directly but only parametrised with physical approximations.
A way to achieve this goal is to increase the resolution (horizontal and vertical) of our limited area models. This permits the reduction of the errors due to wrong or inadequate parametrisations because the physical processes would be directly described. The drawback of a resolution increase is the increase of calculation time which is not desired for operational duties.
Another way to improve the weather forecasts is to take into account the uncertainties of the model (parametrisation errors, boundary conditions, initial conditions, assimilated data, etc.) by using ensemble techniques which again require massive use of computer resources.
Therefore, whatever action will be taken, the attention has to be moved to software engineering aspects.”

These concepts are still valid and modern, therefore the aim is to go towards this direction, taking on board the lessons learnt in the latest years. In this document we consider all the different souls that coexist in WG6: IT aspects, documentation implementation, user support and web application/services.

The main actions planned in the future can be summarized here. They can be subdivided into

- **Continuous Actions**
- **Short- to Mid-Term Actions**
- **Mid- to Long-Term Actions**
- **(and Long- to Very-Long Term Actions).**

Continuous Actions

- Maintaining a high level of software portability in terms of both function and performance.

- Staying up-to-date with the documentation production and distribution, fundamental for sharing the knowledge. Documentation consists of model documentations, release notes, etc., up to protocols of meetings.

- Keeping a high level of user support, including organization of trainings for using the software.

- Consolidation and increase of cooperation with the other COSMO and ICON Groups, with Academia and with other Consortia, because collaboration is one of the keys to scientific success.

- Participation in European Projects, such as the Horizon program, because it increases the visibility of the Consortium and brings funds available for the increase of manpower (PhD students for instance).

- Maintaining and further developing web services for exchange of information within the Consortium and for the outside world.

- Organization of regular training courses for ICON researchers on new architectures and programming languages/paradigms and on the COSMO software itself.

Short- to Mid-Term Actions

- Consolidation of the results obtained with the present PPs (IMPACT, CEL-ACCEL, C2I).

- Evaluation and testing of the most recent hardware and software architectures.

- Usage of modern code administration tools.

- Optimization of the Test Suites, from both computational and scientific points of view.

- Modification of the COSMO-LEPS system to be integrated into the new ICON framework (ICON-LEPS).

- Implementation of a new web server, with more user-oriented web services, taking into account the newest web architectures.

Mid- to Long-Term Actions

- Staying aligned with the developments of the computer science, which deal with big data and Artificial Intelligence: https://www.washington.edu/news/2020/12/15/a-i-model-shows-promise-to-generate-faster-more-accurate-weather-forecasts

Long- to Very-Long Term Actions

- Transfer of COSMO software on quantum computers: https://www.psi.ch/en/media/our-research/eth-zurich-and-psi-found-quantum-computing-hub