



Transversal activities on addressing future evolution of software infrastructure

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Background and motivation

- Non-traditional hardware platforms may offer great computing power at relatively low energy usage.
- Other consortia and institutes have made significant efforts to take advantage of that:
 - MeteoSwiss rewrote the COSMO dynamical core in CUDA
 - UKMO investigating Domain-Specific Language tools to offer flexibility wrt dynamics
 - ECMWF investigating several paths in their Scalability Programme
- ACCORD is a bit lagging behind ...

Background and motivation

- In a community as diverse as ours, we can't expect everyone to master every possible emerging technology.
- At the same time, we don't know how technologies will evolve ...
- So **flexibility** of the code is crucial ...
- ... all the more for a model used operationally in 26 countries!

Background and motivation

- Regarding urgency:
 - LUMI HPC being installed in Finland, delivering 550 Pflop/s, but largely powered by (AMD) GPU's.
 - ECMWF aims to have IFS ready for heterogeneous architectures by the next HPC procurement (2024).

Separation of concerns

- We should aim for a “**separation of concerns**”, i.e. make scientific developments independent of the low-level hardware-specific implementation
- Several approaches can be considered to achieve this:
 - Libraries such as *Atlas*, abstracting the memory layout of the data
 - Several LAM features have been implemented (grids, biperiodic meshes, geographic projections) and tested on toy applications, but the integration with the NWP code will require more work.
 - *Domain-Specific Language* toolchains translating high-level computational patterns in optimized low-level code
 - Source-code translator tools such as CLAW, adding accelerator-ready parallelized horizontal loops to 1D column code (Single Column Abstraction)

SPTR Work Package: first steps

- The first stage will consist in investigating the different possibilities, and making a decision
- This will also depend on the work being done at ECMWF
- ... but keep in mind our specific situation:
 - 26 operational settings
 - Different partners with different needs
 - 3 CSC's

Thank you!