PP CEL-ACCEL

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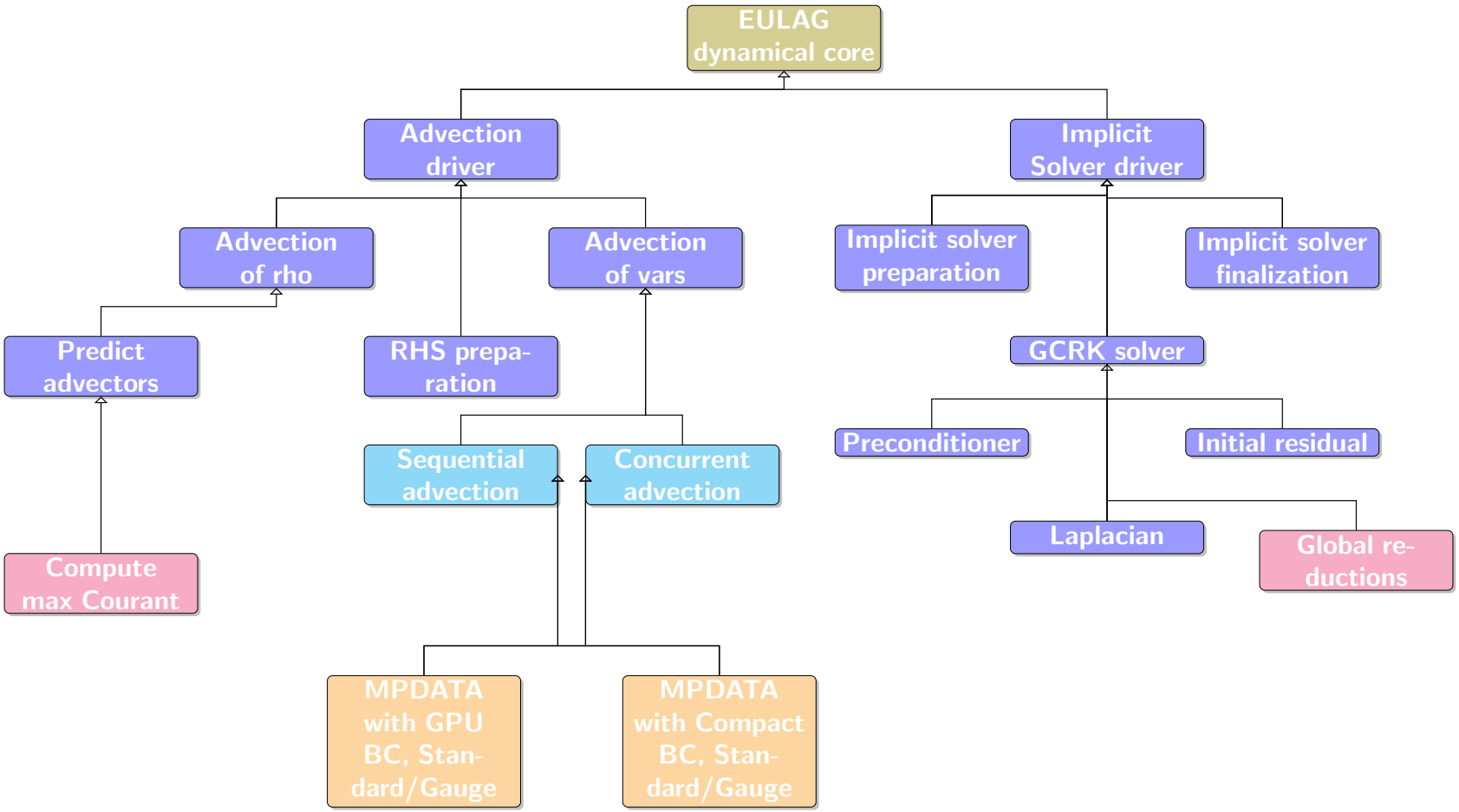
CEL-ACCEL goals

- To prepare EULAG Fortran codebase for implementation into GridTools DONE
- To implement EULAG components using GridTools and test them against their Fortran counterparts using serialization tools provided IN PROGRESS
- To implement EULAG GridTools components inside COSMO, based on the reference RK implementation IN PROGRESS
- To test COSMO-EULAG GridTools on GPU-based machine IN PROGRESS

CEL-ACCEL activities

- Last year, EULAG codebase ported to Gridtools (development version) and successfully tested on CPU, porting alone took 4 months.
- Huge CMake software stack as a side effect, look at beetroot-project on Git, took 1.5 FTE
- Major Fortran rewrite as a side effect to facilitate implementation and improve performance to make fair comparison.
- Software stack allows for testing agreement of Fortran and Gridtools code basically line by line if needed.
- Currently moving to Gridtools 1.0 and testing on GPU
- No performance results yet on GridTools side

Hierarchical structure of stencils in EULAG dynamical core



Legend: olive - dynamics timestep, boxes - programming units, red - global MPI operations, cyan - Task parallelism, orange - two optional realizations of boundary conditions.

Issues

- To be able to develop dynamical cores in stencil paradigm, much shorter compilation time and memory footprint is needed. Access to low level code or far more experience is needed to produce high-quality numerics.
- GridTools paradigm relatively accessible for the model developer, but ...
- GridTools alone is only a part of the story, the whole software stack imposes significant burden and forces the developers to work in tandem of domain scientist and computational scientist/programmer.
- Missing features of GridTools still an open question (e.g. global reduction for GPU in the iterative solver.

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