

Biweekly MSc Thesis Progress Presentation – Lukas Strebel

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CSCS

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Swiss National Supercomputing Centre



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Updates from last time

- Relative difference Burger's equation Zhao Setup (compare to exact solution)

$$(| \text{exact} - x |) / \max(|\text{exact}|, |x|) \sim 1.0$$

$$(| \text{exact} - x | * 2) / (|\text{exact}| + |x|) \sim 1.3$$

- For the serial reference, the domain decomposed with or without MPI.
- Values small so relative difference of 1.0 - 1.3 still very small

MPI One Sided

- Every subdivision has one Window/Buffer for each direction
- Communication process:
 - Copy boundary values into One Sided buffer
 - Call `MPI.Win.Get()` on all the neighbors buffer (including `MPI.Win.Fence()`)
 - Copy transferred One Sided buffer into local halo for next computation
- Currently problem at `Get()` in domain decomposition only returns zeros
- Simplified example transfers values with `Get()`
- Buffer contain values
- No errors / warnings

Shallow Water Equation

- Adapted code for staggered variables (array size difference caused problems).
- Time step is calculated and needs to be accumulated/exchanged between all subdivisions.
- Other computations outside of stencils for pole treatment / auxiliary terms for diffusion need direct access to fields in decomposed domain
- Some calculations require values from specific global coordinates
 - Not sure how to deal with those, library function would require additional communication features i.e. sending / receiving parts of fields from different subdivisions

Next steps

- Benchmarks
 - How large / number of nodes should I try to benchmark?

Next Milestone – September 15

- Complete Implementation
- All benchmarks and optimizations

After that:

October 15 – Complete Thesis document incl. reviews.

October 20 – Thesis text submission to Thomas Schulthess

November 13 – Thesis text submission to ETH (Deadline)