Cloud Computing for Earth System Models

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Overview: In our research, we work with coupled models to represent the air, ocean and river domains for coastal urban applications at high resolution. We propose to use open source containerized code for earth system prediction and document the performance and benefits of cloud/edge computing in the realm of geophysical fluid dynamics. For the model coupling we will utilize gRPC, a CNCF project.

Background: Some progress has been made in containerizing earth system tools. The open source community atmospheric weather model, Weather Research & Forecasting (WRF), has recently been containerized by National Center for Atmospheric Research (NCAR) (Hacker et al., 2017) *. We have already satisfactorily tested that container on Google cloud and we are looking to work at a larger scale.

Approach: We will begin with containerized WRF and expand to work with or implement a sea (model) container for ROMS (Regional Ocean Modeling System) and a river (model) container for WRF-Hydro. All of these codes are open source community models with no proprietary or sensitive data. To couple the model systems we will aim to employ gRPC, an open source project hosted by CNCF. As a research entity we are comfortable with varying load availability.

Outcomes: We will write a blog post documenting our novel experiment with CIL resources for high resolution coupled air/sea/hydrology modeling. We also envision producing several peer-reviewed papers from this effort in which we will credit the CIL resources.

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* https://ral.ucar.edu/projects/ncar-docker-wrf
*Docker-WRF project home page: www.ral.ucar .edu/projects/ncar-docker-wrf *GitHub repository Docker files and scripts to build images:
https://github.com/NCAR/container-wrf