C3F: Collaborative Container-based Model Coupling Framework

Objective

The goal is to develop a cyberinfrastructure solution to dynamically couple hydrological, agricultural, and economic models. This will facilitate uncertainty quantification and characterization of projected adaptation in a coupled system.

Approach

We developed a flexible Collaborative Container-based model Coupling Framework (C3F) by leveraging advanced technologies and cyberinfrastructure such as high-performance computing (HPC), containers, Open OnDemand (OOD), and DOI-issuing platforms. Using this framework WBM and SIMPLE-G researchers can independently package their models and data processing code into Singularity containers and collaboratively explore, create, and execute the coupled modeling workflows.

Impact

The tools developed in C3F are portable and can be applied to other cyberinfrastructure platforms. It lays the foundation for a broader exploration of the use cases for cross-disciplinary research with multiple models, while enhancing model reproducibility and multi-model framework modularity.

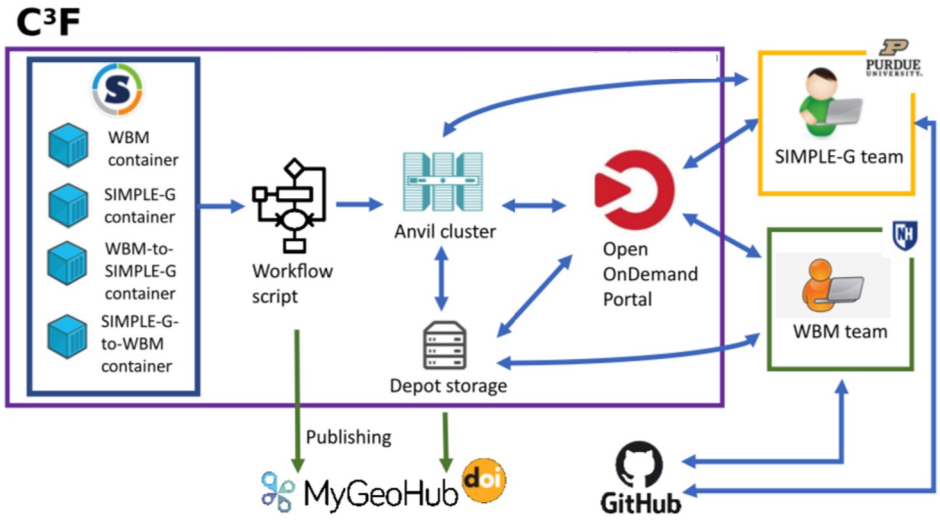

Figure: An example of C3F framework for coupling a hydrological model (WBM) and a geospatial agricultural economic model (SIMPLE-G). Hydrologic models can simulate groundwater levels, and groundwater-surface water interactions. Economic models can simulate human decisions around land and water use in response to changes in water resources. Adaptation can only be evaluated if both the resource (water) and the decisions are captured by a single modeling system.

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