P: Data Infrastructure for ACME

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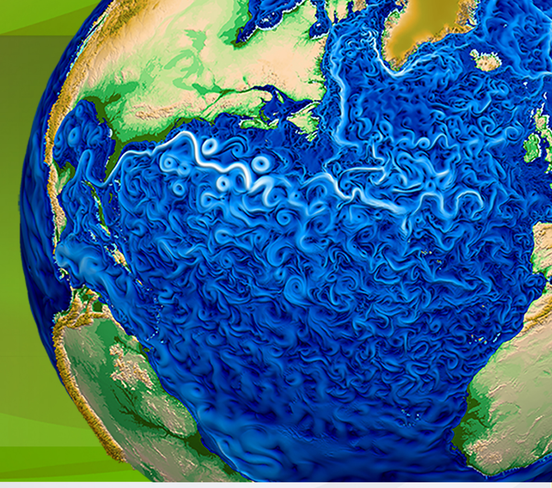


Issue

Data Handling in ACME:

Running ACME in a production manner is very time intensive in terms of taking long periods of time to get the runs completed, but also in the amount of effort to properly manage the data. There are many steps to this process including Archiving to data storage standards, Publishing to ESGF, producing Diagnostics. Also the input data for model and diagnostics needs to be systematically stored.

The difficulty in managing data from a production run comes from several sources. The the large size of the data, the long time period over which the data is generated and periodic sweeps of stored data.

Other system behaviors like failure of individual components require near constant attention.

Distributed nature of the services also cause several issues, adding at a minimum additional data transfer, more accounts with passwords and hardware keys, additional time until the data set is ready. In practice it also adds people to take run the additional processes. This causes a communication issue in that both the fact that an experiment is being run along with the state of each file for each of the steps in the workflow. This record keeping is distributed across people and site providing an information management issue that is difficult to get correct 100% of the time.

There are two main approaches to solving these issues. The first is to build tools that people can use to better manage the data (usability, less training to use correctly, fault tolerant and faster). The second thrust is to have the computer track the status and location of each file we generate and how it was generated.

Data Solutions

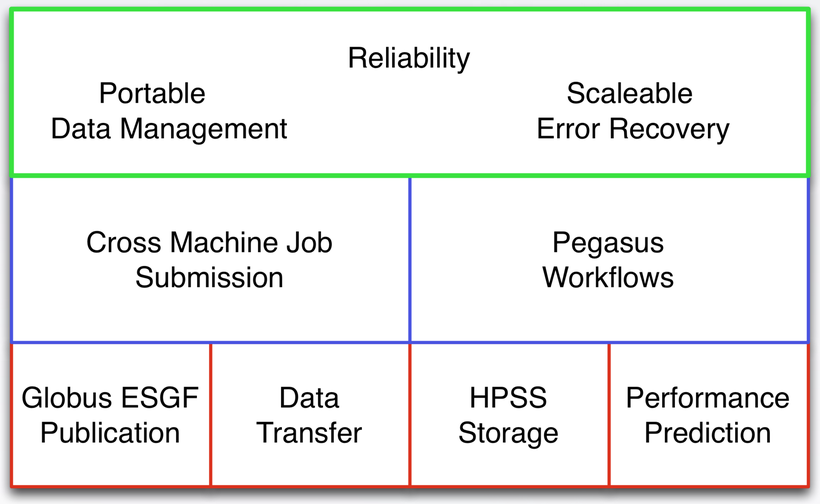
Archiving Tools:

Running ACME in a production manner is very time intensive in terms of taking several months to get the runs completed, but also in the amount of effort to properly manage the data. There are many steps to this process including Archiving to data storage standards, Publishing to ESGF, producing Diagnostics. Also the input data for model and diagnostics needs to be systematically stored.

Data Repositories:

There are two datasets which are used for input. One is the ACME Input data set and is used as direct input to the model. The other is the Observational data set that is used as input for diagnostic comparisons. These systems are hosted in an SVN system in the CADES Open Research Environment at ORNL.

Alexandria Scientific Data Management



Process Solutions

Tying it all together - Process Automation:

In addressing the large scale record keeping issue automation of each of these processes in an integrated manner allows for the automation of the record keeping as well for a small one time cost.The Pegasus workflow management system provide many of the portability, reliability and scalability feature that we need and supports the record tracking capabilities we are implementing with Velo.

There are Pegasus system installed at NERSC, OLCF and CADES. A basic ACME workflow is implemented and has successfully run. This workflow contains model configuration, build and run with diagnostics run happening for every five years of model output. Further work needs to be done in order to add data transfer, archive and publication capabilities. As these functions are added a combination of reliability and functional testing can happen at large scale.

Model Request Time Estimate:

Queue wait time is a major controlling factor in time to solution. One of the contributing factors to queue wait time is how much run time is requested. We have built a utility that takes previous run timing files, a probably of success and how long the model should be run for and produces the run time that should be requested.

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