

# NCAR Technology Development Division Systems Benchmarking

## Overview

Tracking changes in technology is part of the Technology Development Division (TDD) at NCAR. This tracking includes performance evaluation of system components as they are released, and often times before public disclosure. There are three major system components that we test in TDD: Processing rate of individual nodes with one to several sockets, scalability of system interconnects from thousands to tens of thousands of cores, and I/O subsystems. Detailed here are the benchmarks we use for node level benchmarks and scalability. There is a page for each individual benchmark which includes a short description of the program, how to compile, setup and run the benchmark, and finally how to gather the performance results.

There are several pieces of [support software](#) required to build each of these models.

### ICESS Node Evaluation

The High-Order Method Modeling Environment ([HOMME](#)), is a framework for developing scalable and efficient General Atmospheric Circulation Models (GACMs) to support climate science. This version of the program is integrated into CCSM and is run as part of CAM. We benchmark HOMME using a 20 day 3-degree simulation.

The Parallel Ocean Program ([POP](#)) is Los Alamos National Laboratory's ocean component of the Community Climate System Model (CCSM). We benchmark POP using a 20-day 3-degree simulation.

Geophysical High-Order Suite for Turbulence ([HD3D](#)), a numerical solver for the compressible Navier-Stokes equations in 3 dimensions with periodic boundary conditions. We benchmark the HD solver with cube size  $n=512$ .

The Weather Research and Forecasting ([WRF](#)) model, is a mesoscale numerical weather prediction system. The em\_real standard benchmark case is a test simulation of 12 hours at xxx km resolution.

### Updated Node Evaluation

The High-Order Method Modeling Environment ([HOMME](#)), is a framework for developing scalable and efficient General Atmospheric Circulation Models (GACMs) to support climate science. This version of the program is integrated into CCSM and is run as part of CAM. We benchmark HOMME using a 20 day 3-degree simulation.

The Parallel Ocean Program ([POP](#)) is Los Alamos National Laboratory's ocean component of the Community Climate System Model (CCSM). We benchmark POP using a 20-day 3-degree simulation.

Geophysical High-Order Suite for Turbulence ([GHOST](#)), a numerical solver for the compressible Navier-Stokes equations in 3 dimensions with periodic boundary conditions. We benchmark the HD solver with cube size  $n=512$ .

The Weather Research and Forecasting ([WRF](#)) model, is a mesoscale numerical weather prediction system. The em\_real standard benchmark case is a test simulation of 12 hours at xxx km resolution.

### System Interconnect

When pushing the boundaries of computational science the use of tens to hundreds of thousands of processors are required. This benchmark is designed to measure the ability of an interconnect to scale to a large number of processors.

This is a stand alone version of [HOMME](#) which has scaled to more than 32,000 processors using advanced partitioning techniques.

[POPPerf](#) is a version of POP built for scaling benchmarks.

### Example Report

#### [Report](#)

Contact for more information:

bmayer at the ucar.edu domain