CESM Tutorial

Intro to Lab: Basics of CESM

NSF NCAR CGD Laboratory

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NCAR is sponsored by the National Science Foundation

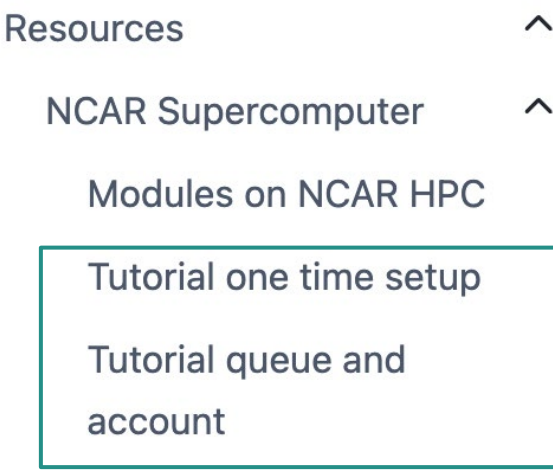
Lab 1 Goals

- Goal 1: Finish Prerequisites
  - https://ncar.github.io/CESM-Tutorial/notebooks/prereqs/prereqs_overview.html
- Goal 2: Checkout CESM and Explore Derecho
  - https://ncar.github.io/CESM-Tutorial/notebooks/basics/basics_overview.html
- Goal 3: Create and Run an experiment
  - https://ncar.github.io/CESM-Tutorial/notebooks/basics/exercises_overview.html

Prerequisites

- **Wireless access**
  - Use the **UCAR Visitor** wireless. It is an open, unencrypted network (require registration for access).
  - Use the **Eduroam** wireless only if you have it already installed on your computer

- **Project account & Reservation Queues**
  - Make sure you follow the instructions in the "One time setup" area of the materials: https://ncar.github.io/CESM-Tutorial/notebooks/resources/tutorial_one_time_setup.html
  - This will set up your account to "charge" time on the supercomputer and the special queue we set up for the week.



Prerequisites

- Find or Download and Install a Unix terminal shell for your laptop
  - https://ncar.github.io/CESM-Tutorial/notebooks/resources/terminals.html
  - Mac: Use Terminal but will likely need XQuartz
  - PC: Terminal from Start Menu or Fast X
  - Talk to helpers if you have any questions or technical issues

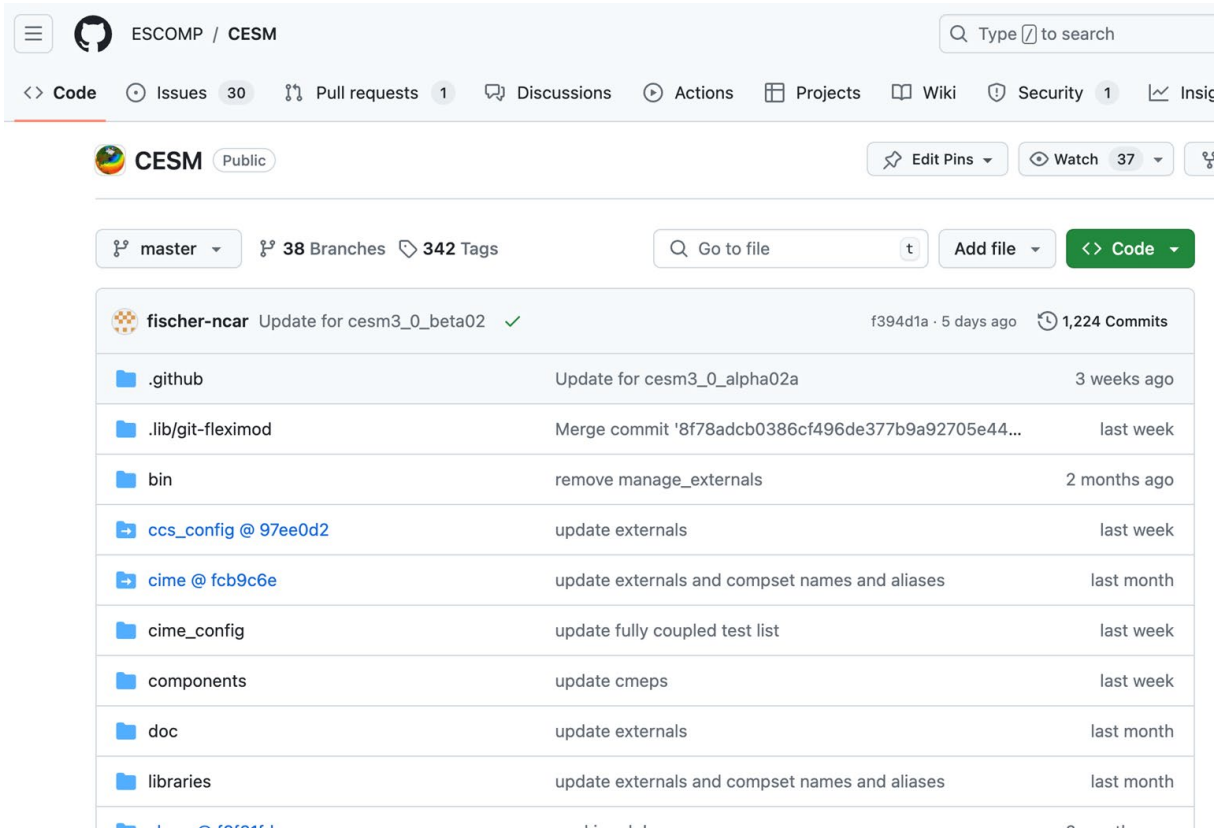
- Log into the Derecho supercomputer
  - “ssh -Y username@derecho.hpc.ucar.edu”
  - Explore the machine areas Rory talked about!

Download CESM

- Use git to download and set up your CESM code
  - CESM code is publically available
  - Instructions for downloading and checking out the correct tag are in the exercise:
    - https://ncar.github.io/CESM-Tutorial/notebooks/basics/code/git_download_cesm.html
  - Once you download it, you will use "manage_externals" to pull in code from many other repositories
  - Note: CESM~3 uses a different tool (git-fleximod) instead of manage_externals, but it does very similar things.

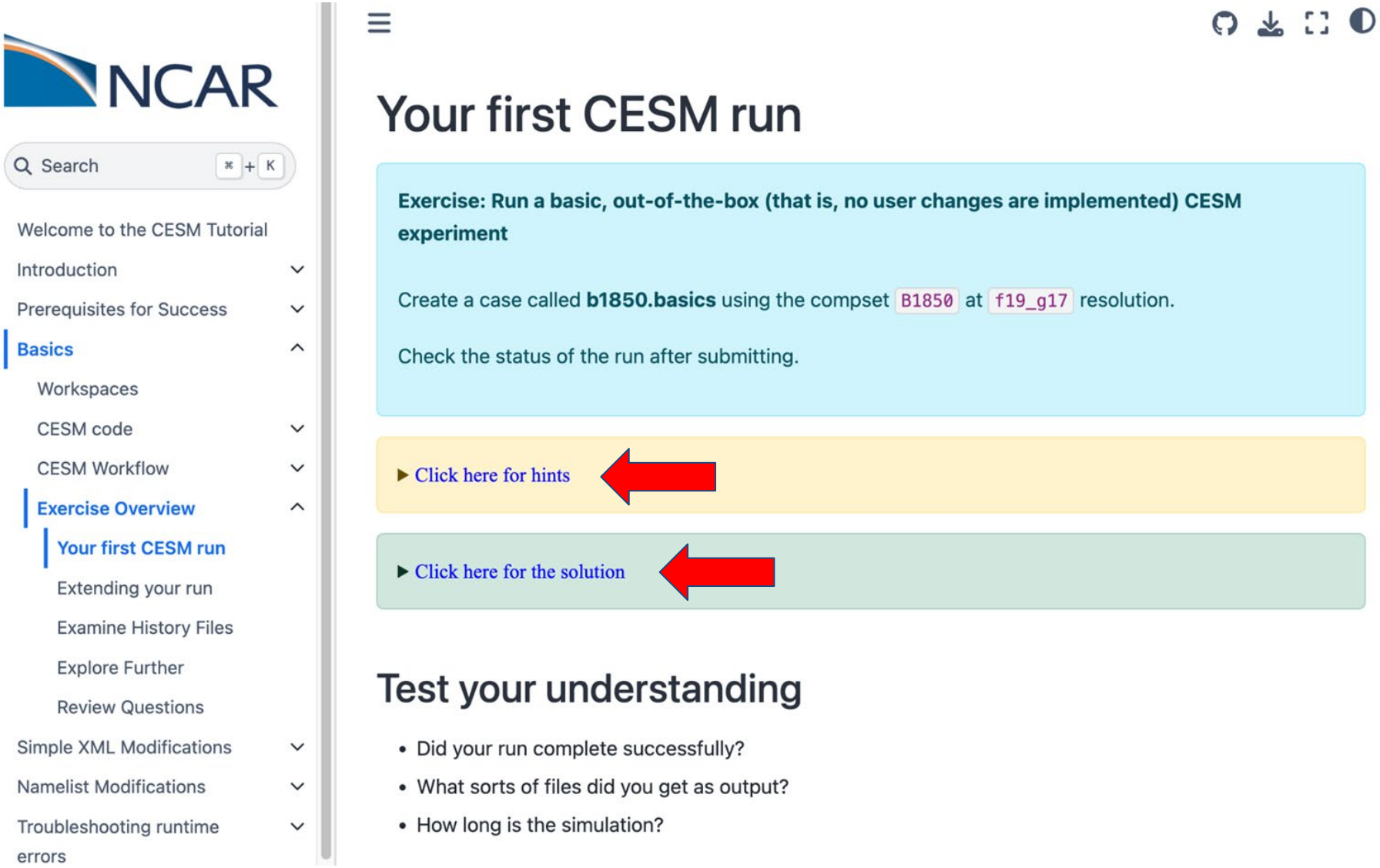
Download CESM

- A good idea to explore the CESM Github pages
- https://github.com/ESCOMP/CESM
- Issues, discussions, and the place to start code modifications.



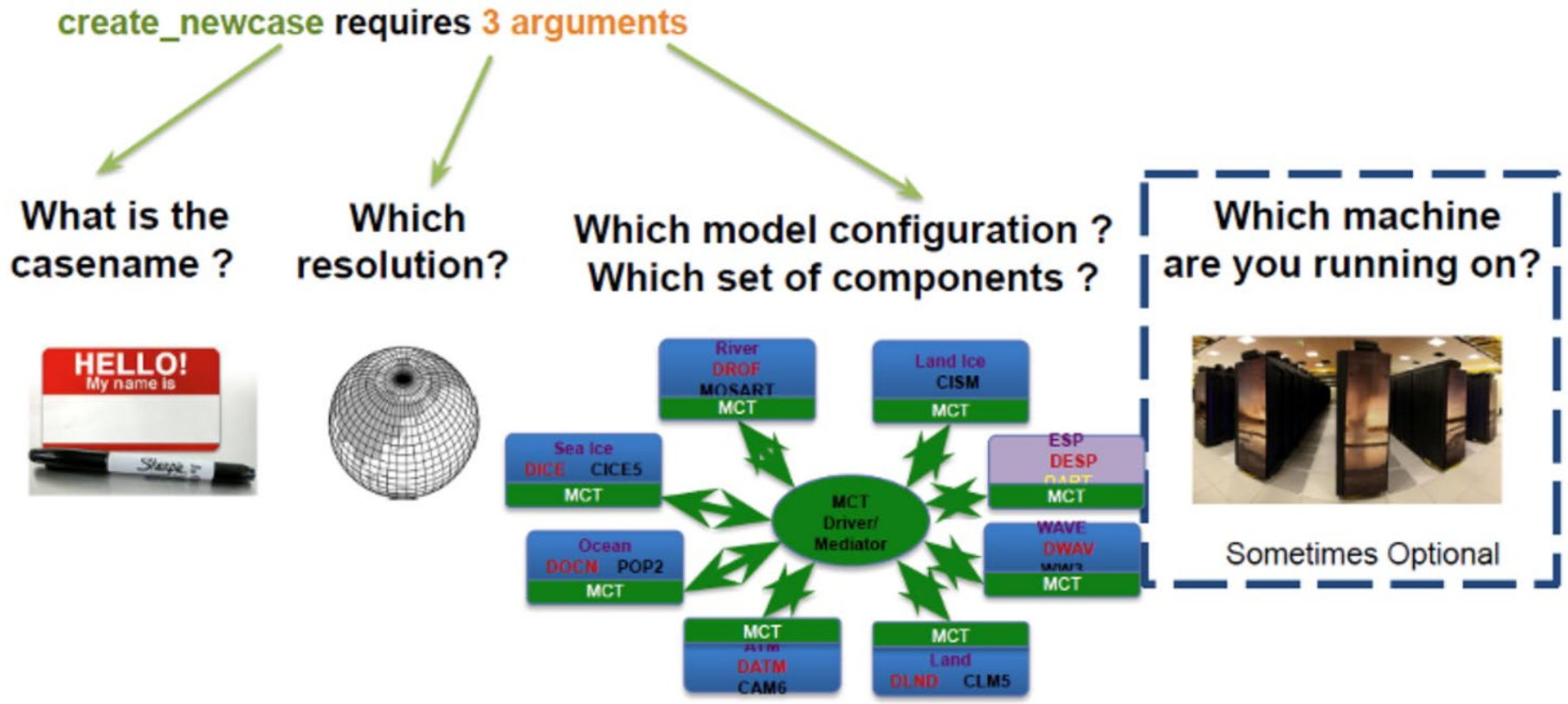
CESM Tutorial Exercise Layout

https://ncar.github.io/CESM-Tutorial/notebooks/basics/exercises/first_B1850.html



Create an Experiment

- CESM experiments are organized into “cases” and each case contains all of the parameters needed to describe a specific run.
- Use “create_newcase” in “my_cesm_code/cime/scripts” to define a new case or experiment



Create an Experiment

- Your first CESM experiment (or “Case”) will be a **B1850** case with a **2 degree finite volume global grid** (f19_g17). This is an **“All Active”** experiment, so you will have active atmosphere, ocean, land, sea ice, river and wave components.
- The default configuration runs all of these models together, coupled, for **5 days with preindustrial (year 1850) conditions.**
- You will change the details of the run (start-up options, run length, restart options, namelist configuration changes, etc) using the XML files in your new case directory.
- The model will build and run in scratch space, and your output will be archived to your archive directory.

CESM Case, Build and Run directories

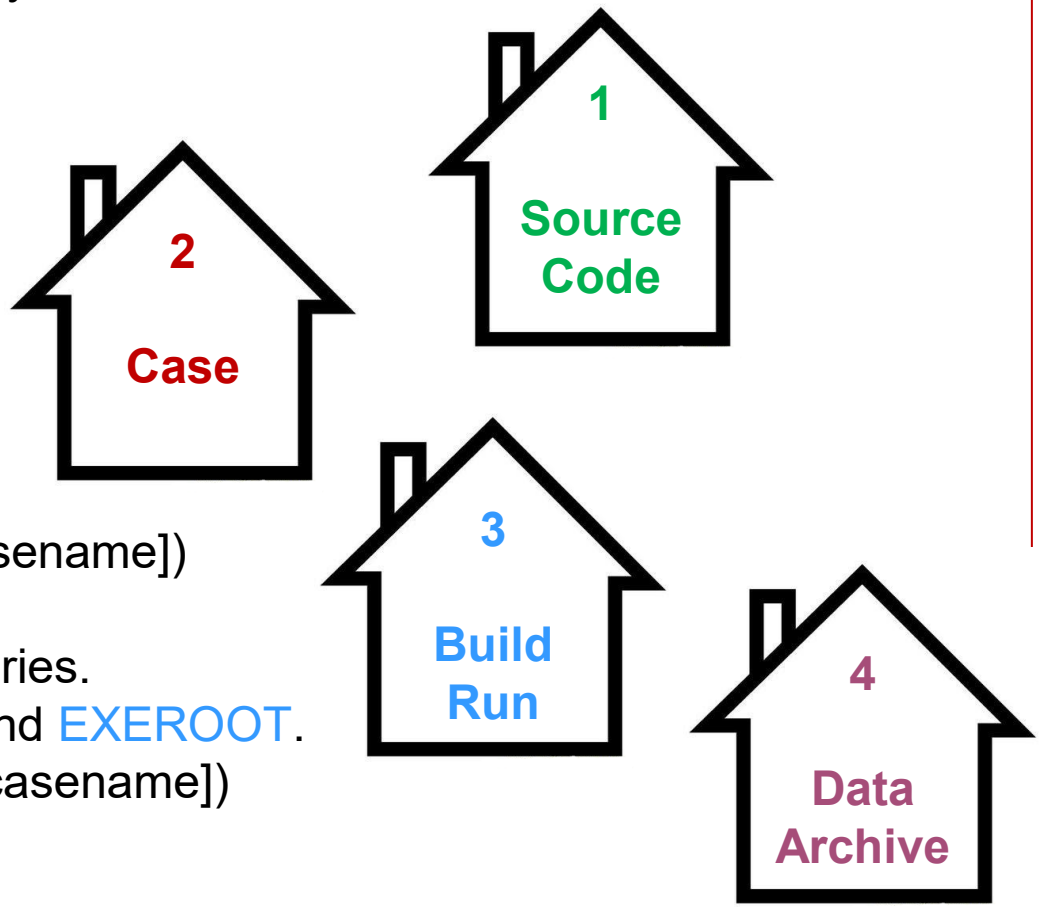
You will need to be aware of 4 paths in your project, These are stored in your case directory in XML variables

- Path to your CESM code.
  This is referred to as SRCROOT and contains CIMEROOT.
(/glade/u/home/[username]/code)

- Path to your case directories.
  This is your CASEROOT.
(/glade/u/home/[username]/cases/[casename])

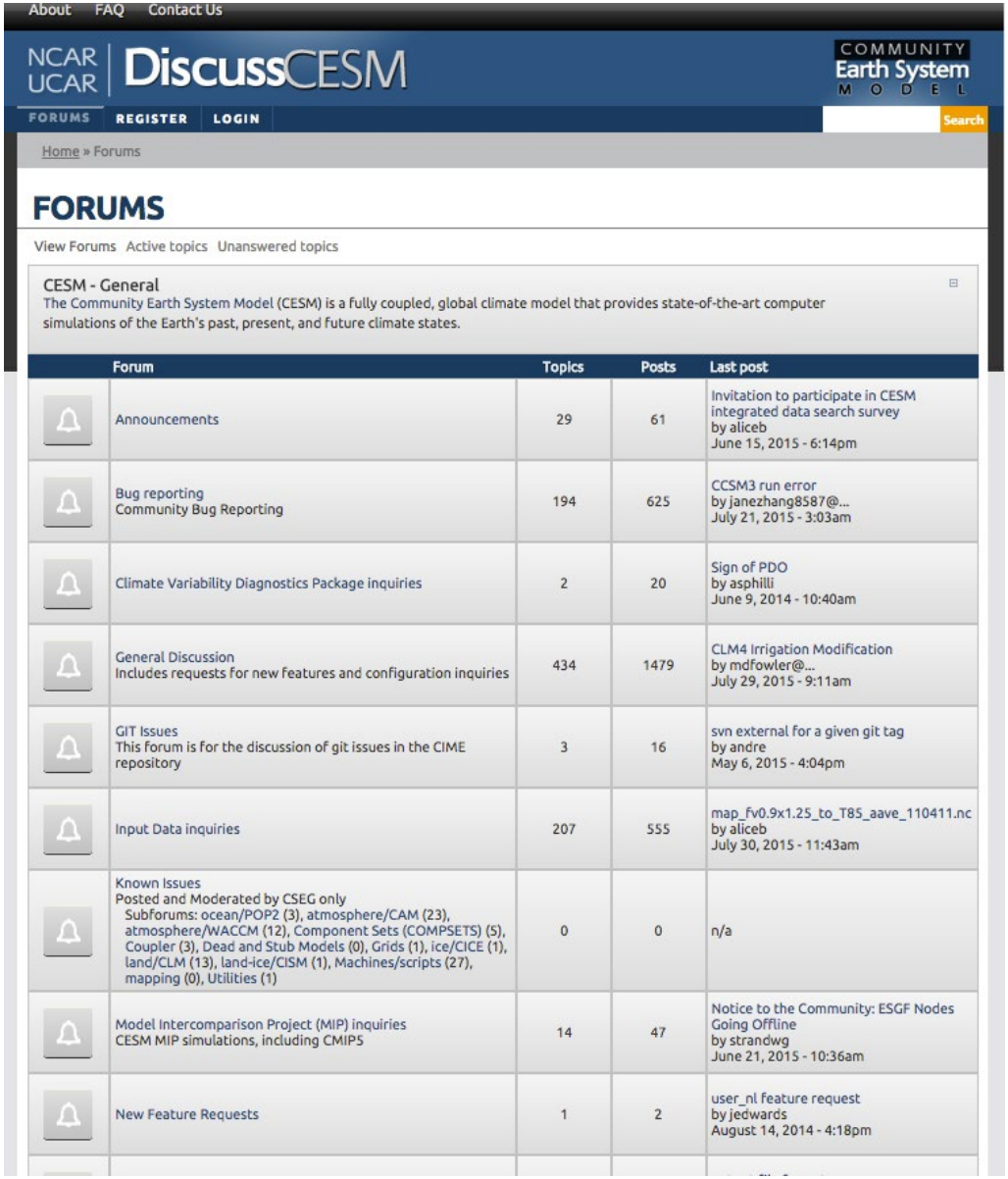
- Path to your build and run directories.
  Referred to later as OBJROOT and EXEROOT.
(/glade/derecho/scratch/[username]/[casename])

- Path to your Archived data.
  Saved as your DOUT_S_ROOT.
(/glade/derecho/scratch/[username]/archive/[casename])



More Information/Getting Help

CESM Bulletin Board: http://bb.cgd.ucar.edu/



- **Register** as a forums user by entering your valid information in the registration form
- **Subscribe** to forums of interest - especially the “Announcements” and “Known Problems” – this is one way that we communicate updates to you!
- **Join** the CESM participants email list at: http://mailman.cgd.ucar.edu/mailman/listinfo/ccsm-participants
- **Create** a github account and opt-in to ”watch” CESM related repositories

More Information/Getting Help

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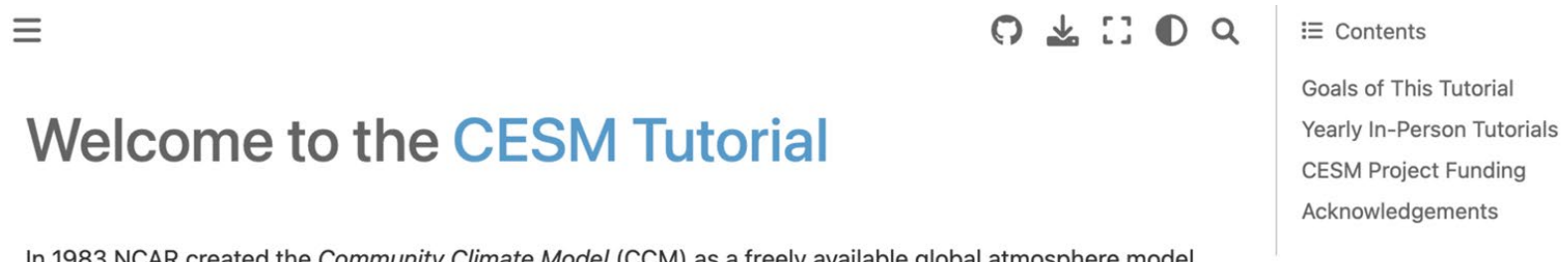

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CESM Project Funding
Acknowledgements

Welcome to the CESM Tutorial

In 1983 NCAR created the *Community Climate Model* (CCM) as a freely available global atmosphere model for use by the climate research community. The scope of CCM development continued to expand and in 1994 NCAR scientists released the *Climate System Model* (CSM), a global model that included component models for the atmosphere, land surface, ocean, and sea-ice, communicating through a central coupler component. To recognize the broad community of users and sponsors contributing to this effort, the CSM was renamed the *Community Climate System Model* (CCSM). The CCSM model evolved to include ice sheet and biogeochemical modeling and was renamed the *Community Earth System Model* (CESM) in 2013.

This repository includes materials designed to be an introduction to running the CESM. The materials were developed to support the CESM tutorial and serve as reference documentation for all CESM users.

Goals of This Tutorial

Through this online tutorial you will learn how to run the CESM model, modify the model experiments, and use the model output. These tutorial materials are designed for the CESM version 2 (CESM2)

Yearly In-Person Tutorials

The CESM tutorial was started in 2010 and is typically offered as an in-person summer workshop. If you are interested in attending the tutorial, please see the CESM webpage for the most up to date information about when the tutorial will next be offered in Boulder, Colorado and the timeline for applying.

Thank You!

The UCAR Mission is:
To advance understanding of weather, climate, atmospheric composition and processes;
To provide facility support to the wider community; and,
To apply the results to benefit society.

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