CLM5.0 Tutorial: Running CLM

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NCAR is sponsored by the National Science Foundation

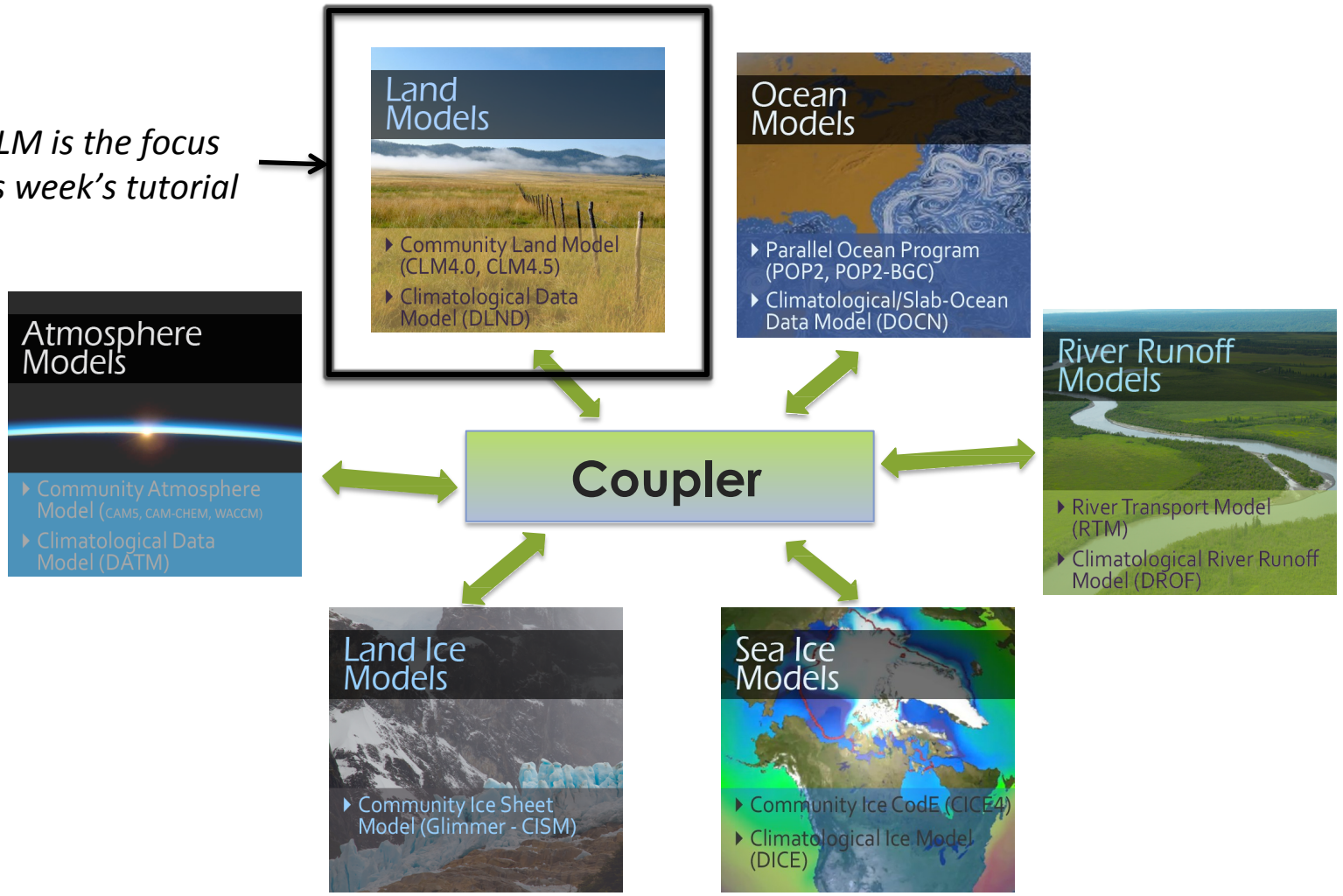
Outline

- **CESM at a glance**
  1) The CESM framework
  2) Finding information about CLM & CESM
  3) Overview of CLM (and CESM) directory structure
- **Basic workflow**
  1) Create a new case
  2) Invoke case_setup
  3) Build the executable
  4) Run and output data
- **Changing configuration options**
  1) Component Sets
  2) ENV files (env_[command])
  3) Namelist files (user_nl_[model])
- **Getting help**
- **Appendix**

The CESM Framework

The Community Earth System Model (CESM) is a set of models that can be run independently or together to simulate the Earth global climate.

The CLM is the focus of this week's tutorial



The CESM Framework

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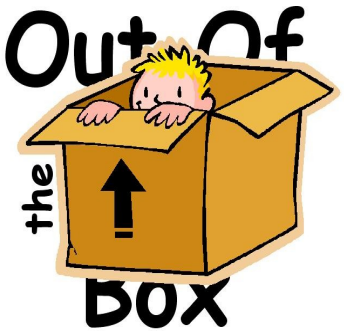
The CLM (and the CESM) can be run through a set of scripts provided with the model.

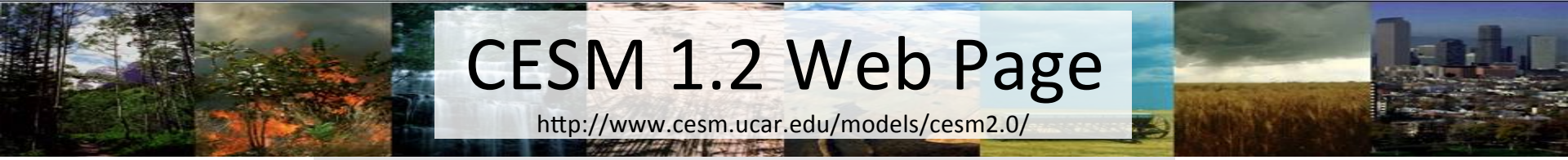
The first part of this practical session is a quick start to the CLM workflow (out-of-the-box)



out of the box = works immediately after installation without any modification

CESM 1.2 Web Page

http://www.cesm.ucar.edu/models/cesm2.0/



CESM Models

Home » CESM Models » CESM2.0 Series Public Release

**** DRAFT ** CESM2.0 SERIES PUBLIC RELEASE**

Release Notes

ABOUT THIS RELEASE SERIES

CESM2.0 SERIES RELEASE NOTES

SCIENTIFIC VALIDATION

Scientific validation

Scientific validation consists of a multi-decadal model run of the given component set at the target resolution, followed by scientific review of the model output diagnostics. All scientifically supported component sets are also accompanied by diagnostic and model output data.

What version of the model should I use?
For a scientifically supported target component set and resolution, please refer to the Scientifically Validated Configurations for that target configuration.

DIAGNOSTIC PACKAGES AND NAMING CONVENTIONS

Post processing Tools

- Post Processing Utilities
- Model File Naming Conventions
- Experiment Case Naming Conventions

MODEL DOCUMENTATION

CESM2.0

Model Documentation

- User's Guide
- Machines
- Resolutions
- Component Sets
- Model Component Namelists
- $CASEROOT xml files

Component Models

- Atmosphere Models
- Land Models
- Sea Ice Models
- Ocean Models
- Land Ice Models
- River Models
- Coupler

EXTERNAL LIBRARY DOCUMENTATION

- Parallel I/O Library (PIO)
- Model Coupling Toolkit (MCT)
- Earth System Modeling Framework (ESMF)

MODEL INPUT DATA

Model Input Data

The input data necessary to run all supported component sets is made available from a public Subversion input data repository. Note that the inputdata repository has much more data in it than you need to run CESM2.0 ---- DO NOT attempt to svn checkout the whole input data repository. The CESM2.0 User's Guide explains how to obtain the subset of input data required for your needs.

PERFORMANCE AND LOAD BALANCING DATA

Timing & Load Balance

The development and testing of CESM2.0 required several iterations in the CESM1.Y series. The following timing tables for each model revision are available:

- CESM1.3 Timing Table
- CESM1.5 Timing Table
- CESM2.0 Timing Table

CESM PROJECT

The Community Earth System Model (CESM) is a fully-coupled, global climate model that provides state-of-the-art computer simulations of the Earth's past, present, and future climate states.

CESM is sponsored by the National Science Foundation (NSF) and the U.S. Department of Energy (DOE). Administration of the CESM is maintained by the Climate and Global Dynamics Laboratory (CGD) at the National Center for Atmospheric Research (NCAR).

Background and Sponsors

MODEL SOURCE CODE

Copyright and Terms of Use

All CESM source code is subject to the following Copyright Notice and Disclaimer.

Acquiring the Release Code

The source code for CESM releases is distributed through a public Subversion code repository. This code can be checked out using Subversion client software, such as the command tool svn, or simply view the latest version with a web browser.

A short registration is required to access the repository. After registering, you will receive an email containing a user name and password that is necessary to gain access to the repository.

Acquistion of the code is more fully described in the most recent version of the CESM1.2 User's Guide.

How to acquire the code

REPORTING A PROBLEM

Reporting problems Getting Help

If you have any problems, please first read the User's Guide including the sections on FAQs and Use Cases. Please also refer to the CESM Bulletin Board, which is in place to facilitate communication within the CESM community. Finally, please also refer to the Release Notes entries that are provided with every release and release update. If questions or problems still exist, then please send an email to cesm-help@cgd.ucar.edu. Support questions will be answered as resources are available.

CESM SUPPORT POLICY

CLM Web Page

http://www.cesm.ucar.edu/models/cesm1.2/clm

Model Documentation

Model Diagnostics

Post-processing Tools

CESM Models

Home » CESM Models » CESM1.2 Public Release » CESM1.2: CLM Documentation

CESM1.2: CLM DOCUMENTATION

INTRODUCTION

The Community Land Model versions 4.0 and 4.5 in CESM1.2.0 are the latest in a series of land models developed through the CESM project. More information on the CLM project and access to previous CLM model versions and documentation can be found via the CLM Web Page.

DOCUMENTATION

- User's Guide for CLM4.5 and CLM4.0 in CESM1.2.0 [html] (Last update: Jul/20/2013)
- Technical Description for CLM4.5 (Last update: Aug/ 1/2013)
- Technical Description for CLM4.0, CLM4.0 Urban Model, CLM4.0 Crop and Irrigation Model
- Explanation of supported configurations in CLM4.5 and CLM4 in CESM1.2
- What's new in CLM in CESM1.2 (CLM4.5 release) Science, CESM1.2 (CLM4.5 release) Software, CESM1.1.1, CESM1.1.0, CESM1.0.5, CESM1.0.4, CESM1.0.3, CESM1.0.2, CESM1.0.1, CESM1.0, CCSM4.0 (CLM4.0 release).
- Known bugs in CLM in CESM1.2.0, CESM1.1.0, CESM1.0.4, CESM1.0.3, CESM1.0.2, CESM1.0.1, CESM1.0.
- Known limitations in CLM in CESM1.2.0, CESM1.1.0.

MODEL OUTPUT AND OFFLINE FORCING DATA AND DIAGNOSTIC PLOTS

- CLM4.0 and CLM4.5 offline control simulations: Diagnostic plots
- CLM4.0 and CLM4.5 offline control simulations (links need to be updated and data posted to ESG)): Model output data
- CLM4.0 and CLM4.5 offline control simulations (links need to be updated and data posted to ESG): Model forcing data
- CLM4.0 and CLM4.5 offline historical and RCP simulations: CCSM4 coupler history forcing data

CLM POST-PROCESSING AND ANALYSIS UTILITIES

- CLM Diagnostic Package: Introduction, Code (via svn repository, registration required), and User's Guide
- Multivariate visual analytics tool: EDEN (Exploratory Data analysis ENvironment)
  Helps reveal associations among variables for guided analysis (beta version, comments to Chad Steed)

MODEL DESIGN AND DEVELOPMENT

- Request Form for Developer Access (active close collaborators only)
- CLM Developers' Guidelines
- CLM4/CESM1.2.0 Code Reference Guide

REFERENCES

- Bibliography of papers utilizing and/or developing CLM (Last update: Jan/29/2016)

CLM4.5

- Oleson, K.W., D.M. Lawrence, G.B. Bonan, B. Drewniak, M. Huang, C.D. Koven, S. Levis, F. Li, W.J. Riley, Z.M. Subin, S.C. Swenson, P.E. Thornton, A. Bozbiyik, R. Fisher, E. Kluzek, J.-F. Lamarque, P.J. Lawrence, L.R. Leung, W. Lipscomb, S. Muszala, D.M. Ricciuto, W. Sacks, Y. Sun, J. Tang, Z.-L. Yang, 2013: Technical Description of version 4.5 of the Community Land Model (CLM). Ncar Technical Note NCAR/TN-503+STR, National Center for Atmospheric Research, Boulder, CO, 422 pp, DOI: 10.5065/D6RR1W7M.

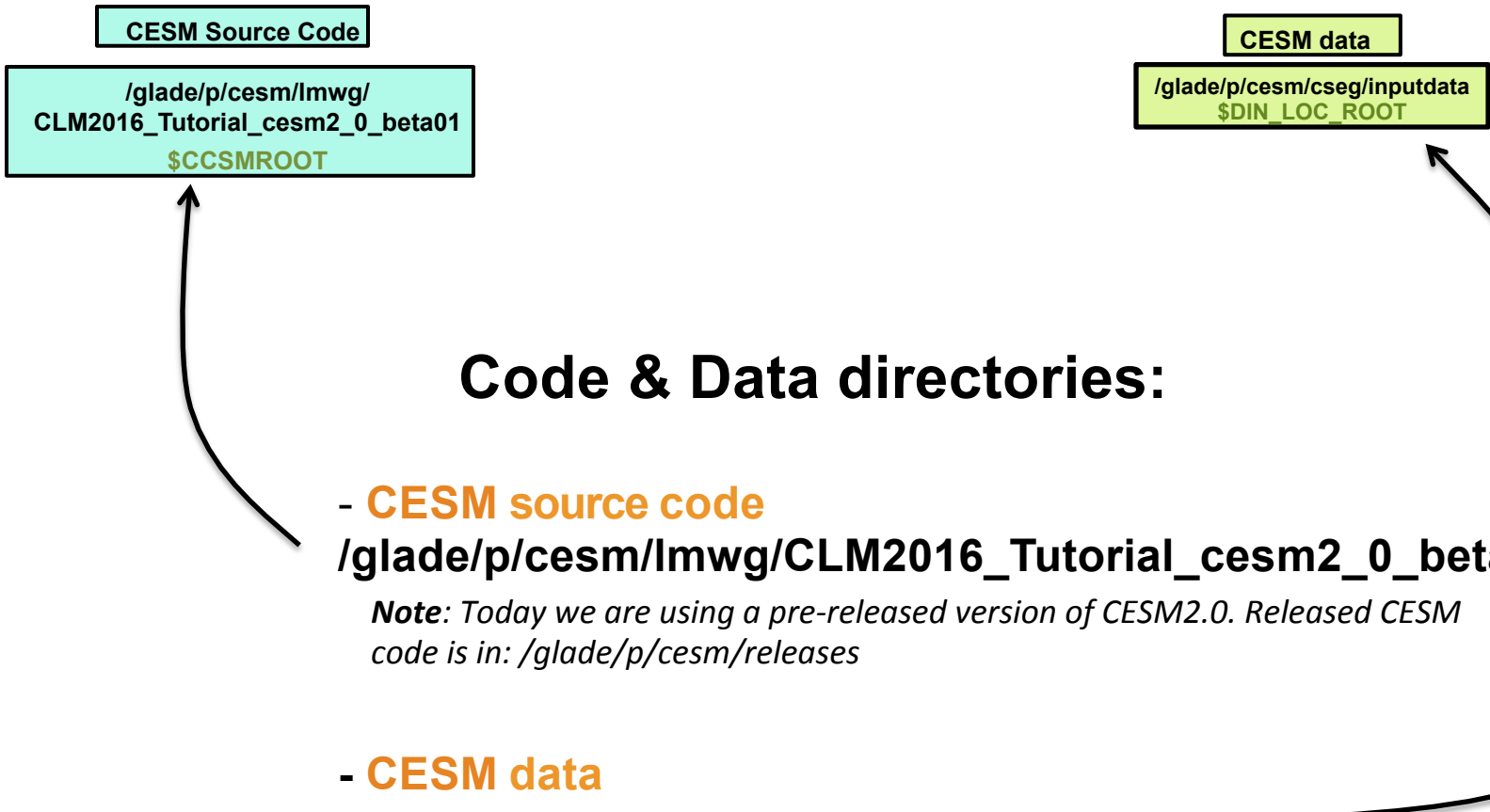
CRUNCEP Forcing (standard for CLM4.5, but can also be used for CLM4.0

- Piao et. al. 2012: The carbon budget of terrestrial ecosystems in East Asia over the last two decades. Biogeosciences, 9, 3571-3586, doi:10.5194/bg-9-3571-2012. (CRUNCEP forcing)

CLM4.0

- Lawrence, D.M., K.W. Oleson, M.G. Flanner, P.E. Thornton, S.C. Swenson, P.J. Lawrence, X. Zeng, Z.-L. Yang, S. Levis, K. Sakaguchi, G.B. Bonan, and A.G. Slater, 2011: Parameterization improvements and functional and structural advances in version 4 of the Community Land Model. *J. Adv. Model. Earth Sys.*, 3, DOI: 10.1029/2011MS000045.
- Oleson, K.W., D.M. Lawrence, G.B. Bonan, M.G. Flanner, E. Kluzek, P.J. Lawrence, S. Levis, S.C. Swenson, P.E. Thornton, A. Dai, M. Decker, R. Dickinson, J. Feddema, C.L. Heald, F. Hoffman, J.-F. Lamarque, N. Mahowald, G.-Y. Niu, T. Qian, J. Randerson, S. Running, K. Sakaguchi, A. Slater, R. Stockli, A. Wang, Z.-L. Yang, Xi. Zeng, and Xu. Zeng, 2010: Technical Description of version 4.0 of the Community Land Model (CLM). NCAR Technical Note NCAR/TN-478+STR, National Center for Atmospheric Research, Boulder, CO, 257 pp.

CESM Directory Structure



Code & Data directories:

- **CESM source code**
  /glade/p/cesm/lmwg/CLM2016_Tutorial_cesm2_0_beta01

  ***Note**: Today we are using a pre-released version of CESM2.0. Released CESM code is in: /glade/p/cesm/releases*

- **CESM data**
  /glade/p/cesm/cseg/inputdata

CESM Directory Structure

CESM Source Code

/glade/p/cesm/lmwg/CLM2016_Tutorial_cesm2_0_beta01

$CCSMROOT

- **components**
  - aquap (aquaplanet)
  - cam (atmosphere)
  - cice (sea ice)
  - cism (land ice)
  - clm (land)
  - mosart (river routing)
  - pop (ocean)
  - rtm (river routing)
  - ww3 (ocean waves)
- **cime**
  - scripts
    - create_newcase

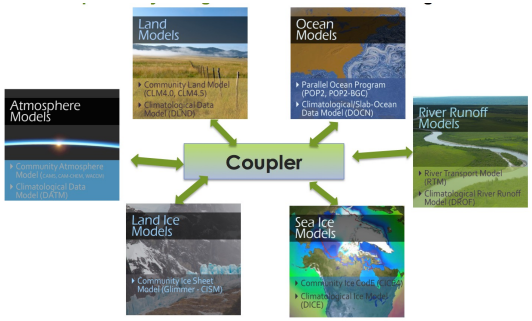
CESM data

/glade/p/cesm/cseg/inputdata

$DIN_LOC_ROOT

Source code has 2 subdirectories:

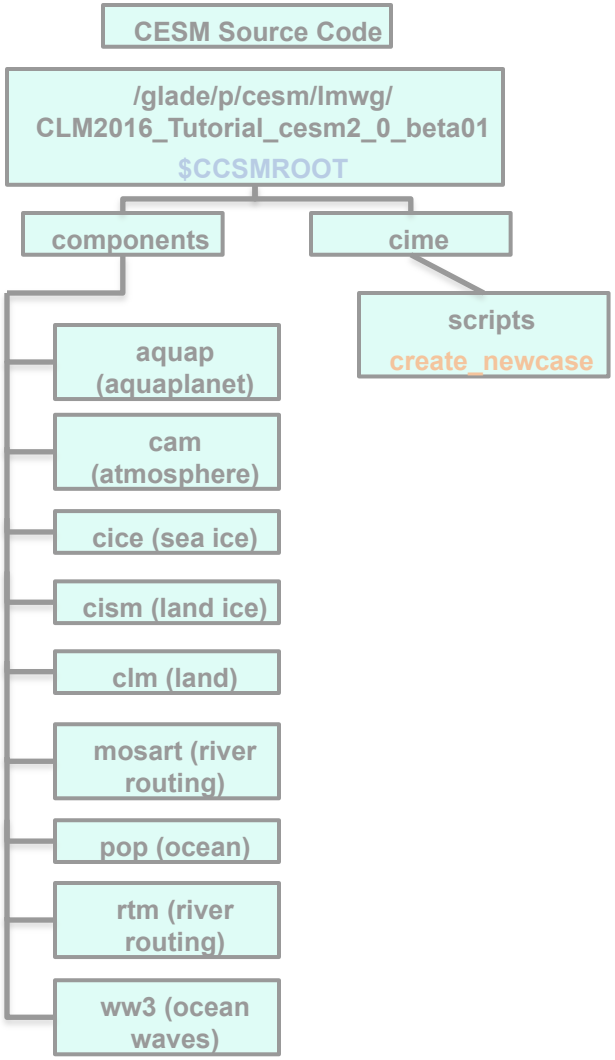
- **components:** contains the code for every model component

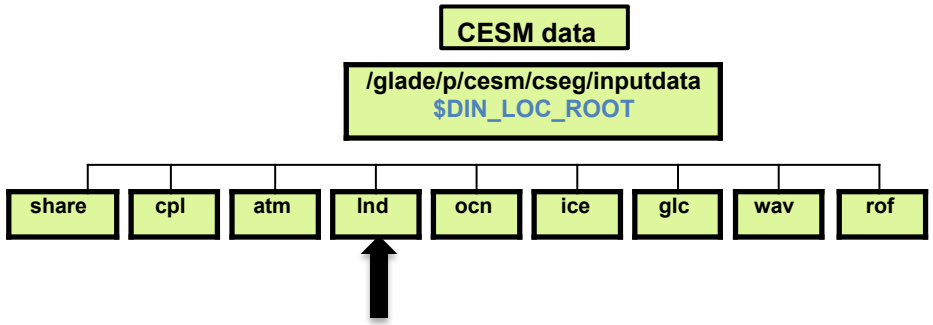


- **cime:** contains the scripts you need to run CESM

Note: the subdirectories of "components" will change based on whether you are using a CESM code base or a CLM code base. Shown here is the structure for the CESM model base. For CLM, you will only find "clm", "mosart" or "rtm", and "cism" subdirectories. You can use either code base to run CLM-only simulations, which are defined by the component set you choose. More information on component sets is presented later.

CESM Directory Structure





"Inputdata" directory, $DIN_LOC_ROOT, contains all input data required to run the model

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  1) Component Sets
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- **Getting help**

- **Appendix**

Work Flow: Super Quick Start

CESM can be run in 4 steps:

(1) create a new case

This step sets up a new simulation. It is the most complicated of these four steps because it involves making choices to set up the model configuration

(2) invoke case.setup

This step configures the model so that it can compile

(3) build the executable

This step compiles the model

(4) submit your run to the batch queue

This step submits the model simulation to the supercomputer queue

Here, you will learn to use these four steps to set up and run a simulation. After completing this section, you will learn how to make basic modifications to the model configuration.

First: Logging in to Yellowstone

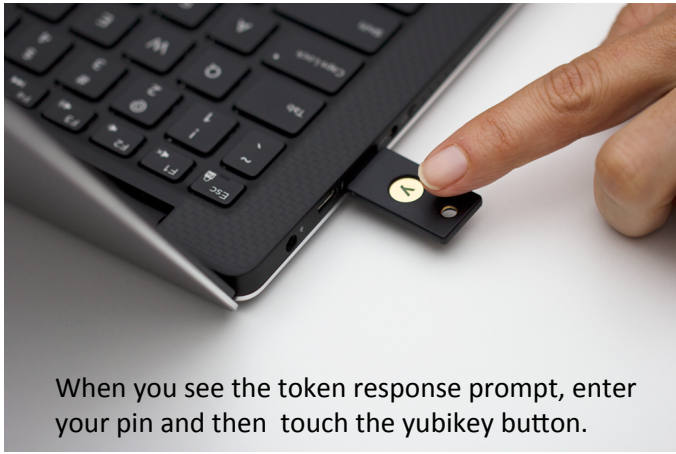
1. **Open a secure shell window**:
   Terminal, Cygwin, PuTTY, Mobaxterm

2. **Log on using your yubikey:**
   ssh –Y <username>@yellowstone.ucar.edu

   Your screen displays a response:
   Token_response:

3. **Enter your PIN number (do not hit enter), then touch the yubikey button.**
   This will insert a new one-time password and a return

Note: the yubikey is activated by the warmth of your finger, not the pressure of pushing the button



When you see the token response prompt, enter your pin and then touch the yubikey button.

Exercise 1: Create & run an out-of-the-box simulation

Work Flow: Super Quick Start

Exercise 1: Create & run an out-of-the-box simulation

(1) create a new case

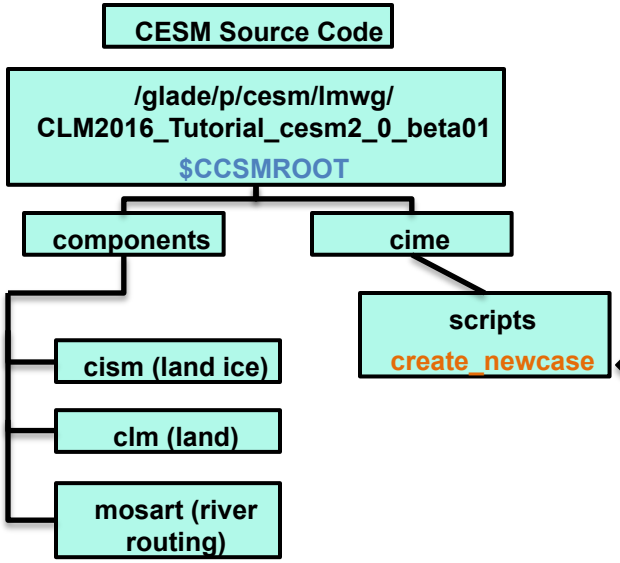
(2) invoke case.setup

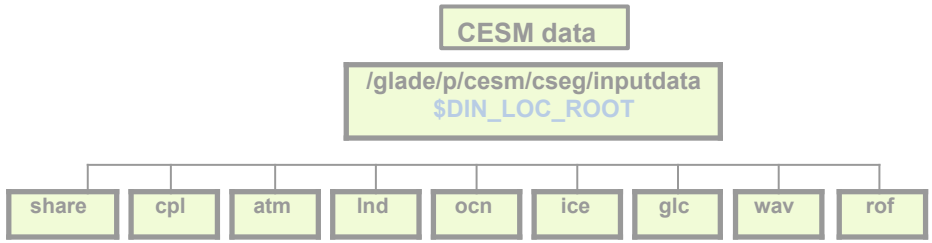
(3) build the executable

(4) submit your run to the batch queue

We will progress step by step, starting with step 1

CLM Directory Structure





the script you need to set up a new simulation (or create a new case)

Note: This week, we are using a CLM code base, which has fewer subdirectories than the CESM code base.

Follow the steps on the next slide to set up a simulation

Work Flow: Super Quick Start

Exercise 1: Create & run an out-of-the-box simulation

To Do:

cd into scripts directory from the source code directory:

cd /glade/p/cesm/lmwg/CLM2016_Tutorial_cesm2_0_beta01/cime/scripts

(1) create a new case

Type this command line:

./create_newcase -case ~/I1850CLM50_001 -res f19_g16 -compset IM1850CRUCLM50BGC

Stop here

---

(2) invoke case.setup

(3) build the executable

(4) submit your run to the batch queue

Next, let's dig into the details of this command to understand the parts

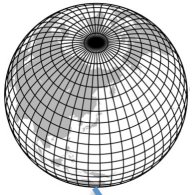
Create a new case

In the scripts directory, create_newcase is the tool that generates a new case.

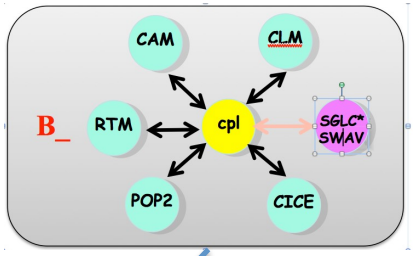
create_newcase requires 3 arguments

What is the casename ?

Which resolution?



Which model configuration ? Which set of components ?



./create_newcase –case ~/I1850CLM50_001 –res f19_g16 –compset IM1850CRUCLM50BGC

YourCaseName

2-degree

I = CLM only, 1850

***Note**: A previously required 4th argument, "-mach", is no longer needed when using a supported machine. CIME now figures out what machine you are running on. If you are running on an unsupported machine, this argument is required.*

create_newcase arguments

3 arguments required by create_newcase:

create_newcase -case ~/I1850CLM50_001 -res f19_g16 -compset IM1850CRUCLM50BGC

create_newcase arguments

3 arguments required by create_newcase:

```
create_newcase -case ~/I1850CLM50_001 -res f19_g16 -compset IM1850CRUCLM50BGC
```

case is the location and name of the case being created

~/I1850CLM50_001

"~" = home directory, or /glade/u/home/{username}

I1850CLM50_001 = case directory name

Recommendation: Use meaningful names, including model version, type of simulation, and any additional details to help you remember the configuration of this simulation

Note: Steps 2-4 take place in the case directory that you create here in step 1. More on that coming up.

create_newcase arguments

3 arguments required by create_newcase:

```
create_newcase -case ~/I1850CLM50_001 -res f19_g16 -compset IM1850CRUCLM50BGC
```

res specifies the model resolutions (or grid): f19_g16 (atm/lnd_ocn/ice)

Grid naming convention

Each model resolution can be specified by its alias, short name and long name.

Example of equivalent alias, short name and long name:

- **alias: f19_g16 (atm/lnd_ocn/ice)**
- **short name: 1.9x2.5_gx1v6**
- **long name = a%1.9x2.5_l%1.9x2.5_oi%gx1v6_r%r05_m%gx1v6_g%null_w%null**

atm — lnd — ocn/ice — river — lnd mask — lnd-ice — wave

create_newcase arguments

3 arguments required by create_newcase:

```
create_newcase -case ~/I1850CLM50_001 -res f19_g16 -compset IM1850CRUCLM50BGC
```

compset specifies the "component set"

Component set specifies component models (e.g. active vs data), forcing scenarios (e.g. 1850 vs 2000) and physics options (e.g. CLM4.5 vs CLM5.0) for those models. All CLM-only compsets start with "I".

Compset naming convention

Each model compset can be specified by its alias, short name and long name.

Example of equivalent alias, short name and long name:

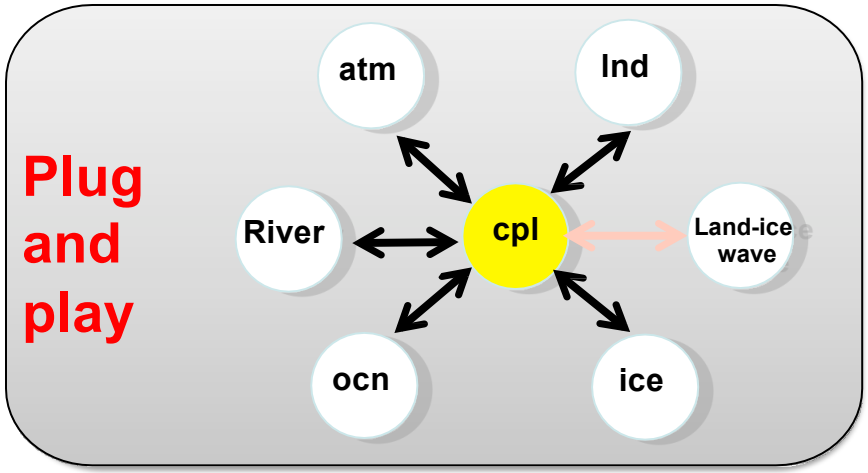
- **alias: IM1850CRUCLM50BGC**
- **long name = 1850_DATM%CRU_CLM50%BGC_SICE_SOCN_MOSART_SGLC_SWAV**

time atm lnd ice ocn river lnd-ice wave

More on CESM component sets

Plug and play of components with different component models

Color code: active data stub



Key Definitions:

Active: Simulation is using the code from the model during the run

Data: Simulation is reading in data from a file for this component

Stub: Component is not being used

More on CESM component sets

Plug and play of components with different component models

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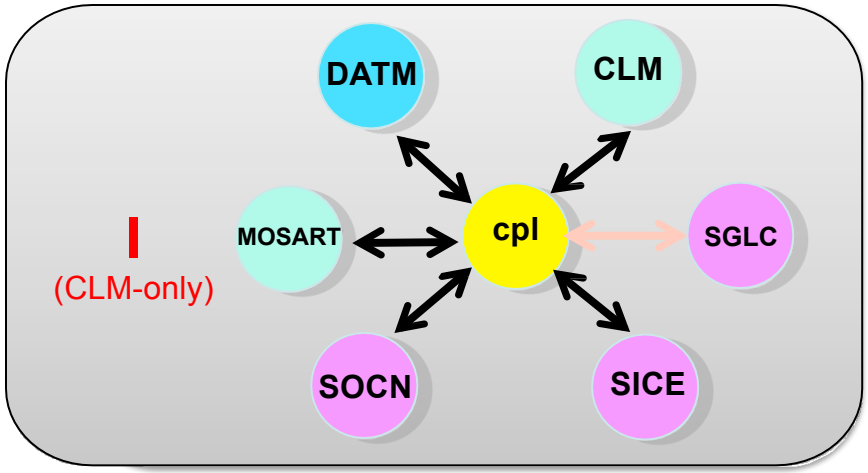

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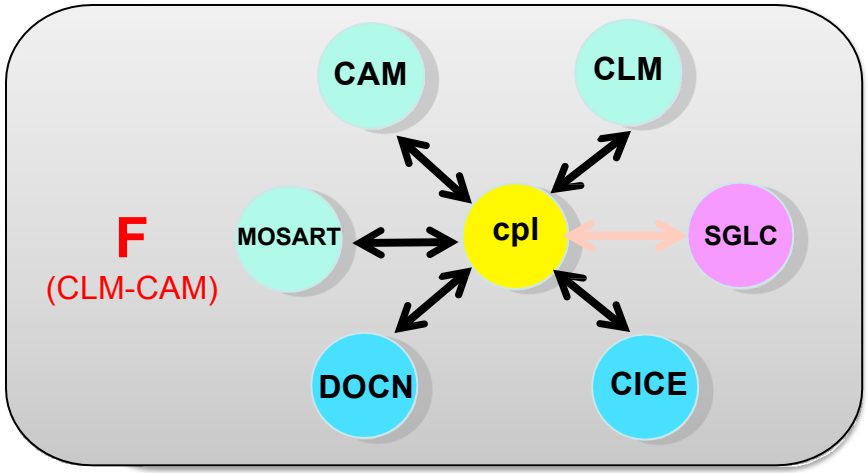

Key Definitions:

Active: Simulation is using the code from the model during the run

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create_newcase:
More Information & Help

In the **scripts** directory (in the Source Code), where you run the command "create_newcase", you can search for compsets, resolutions (e.g. model grid), etc.:

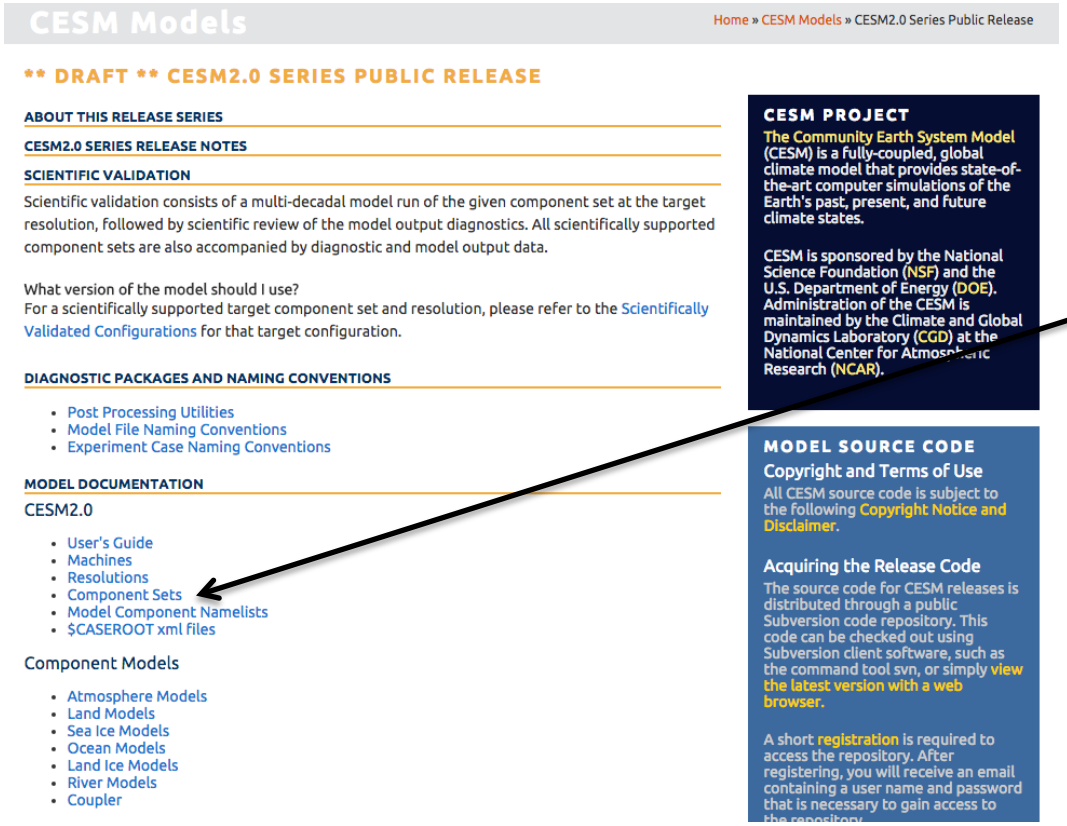
./manage_case -query <*type*>
Where "***type***" can be: compsets -setby <*name*>; component -name <*name*>; grids; machines
And "***name***" is the name of a particular model component, like clm, cam, datm, etc.

For example:
./manage_case -query compsets -setby clm
Will list all the "I" compsets available

For additional help and options: ./manage_case -help

Note: In the released version of CLM5.0, the syntax will change to "./manage_case --query-<type>" (e.g., ./manage_case --query-grids). See ./manage_case --help for all options.

create_newcase:
More Information & Help



A list of valid values is also available on the CESM website:

http://www.cesm.ucar.edu/models/cesm2.0/

Work Flow: Super Quick Start

Exercise 1: Create & run an out-of-the-box simulation

cd into scripts directory from the source code directory:

cd /glade/p/cesm/lmwg/CLM2016_Tutorial_cesm2_0_beta01/cime/scripts

(1) create a new case

./create_newcase -case ~/I1850CLM50_001 -res f19_g16 -compset IM1850CRUCLM50BGC

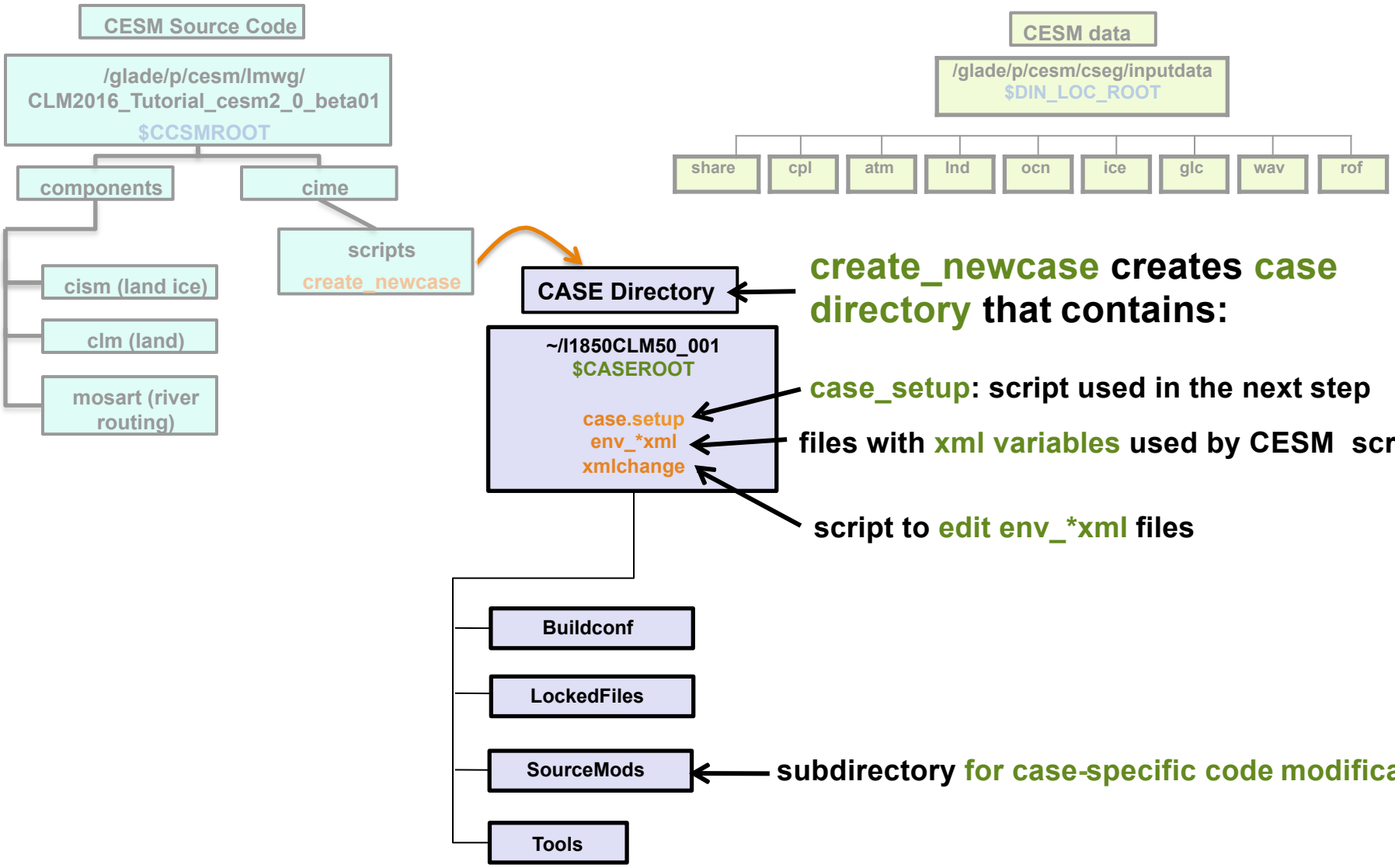
This command line creates a case directory with the case name you specified. Let's explore that directory structure.

(2) invoke case.setup

(3) build the executable

(4) submit your run to the batch queue

CLM Directory Structure



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Using this command line, we just set up a new simulation and created the case directory.

(2) invoke case.setup

(3) build the executable

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Work Flow: Super Quick Start

Exercise 1: Create & run an out-of-the-box simulation

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./create_newcase -case ~/I1850CLM50_001 -res f19_g16 -compset IM1850CRUCLM50BGC

(2) invoke case.setup

Now we'll configure the case you just set up.

(3) build the executable

(4) submit your run to the batch queue

Work Flow: Super Quick Start

Exercise 1: Create & run an out-of-the-box simulation

cd into scripts directory from the source code directory:

cd /glade/p/cesm/lmwg/CLM2016_Tutorial_cesm2_0_beta01/cime/scripts

(1) create a new case

./create_newcase -case ~/I1850CLM50_001 -res f19_g16 -compset IM1850CRUCLM50BGC

Start here

(2) invoke case.setup

cd into case directory:

cd ~/I1850CLM50_001

Type this command line:

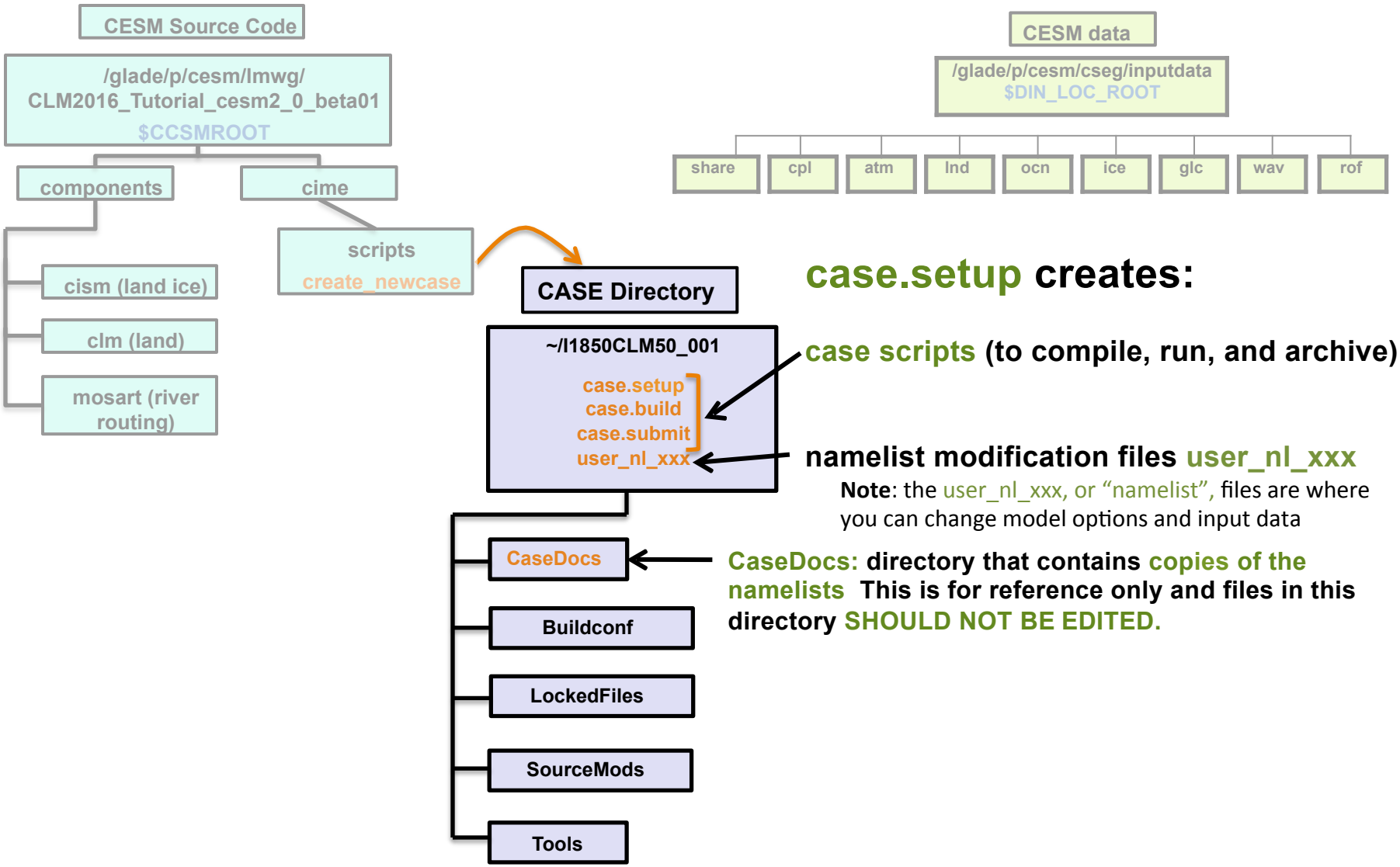
./case.setup

Stop here

(3) build the executable

(4) submit your run to the batch queue

CLM Directory Structure



case.setup creates:

case scripts (to compile, run, and archive)

namelist modification files user_nl_xxx

Note: the user_nl_xxx, or "namelist", files are where you can change model options and input data

CaseDocs: directory that contains copies of the namelists This is for reference only and files in this directory SHOULD NOT BE EDITED.

Work Flow: Super Quick Start

Exercise 1: Create & run an out-of-the-box simulation

cd into scripts directory from the source code directory:

cd /glade/p/cesm/lmwg/CLM2016_Tutorial_cesm2_0_beta01/cime/scripts

(1) create a new case

./create_newcase -case ~/I1850CLM50_001 -res f19_g16 -compset IM1850CRUCLM50BGC

(2) invoke case.setup

cd into case directory:

cd ~/I1850CLM50_001

./case.setup

Using this command line, we just configured the model and created the files to modify options & input data.

(3) build the executable

(4) submit your run to the batch queue

Work Flow: Super Quick Start

Exercise 1: Create & run an out-of-the-box simulation

cd into scripts directory from the source code directory:

cd /glade/p/cesm/lmwg/CLM2016_Tutorial_cesm2_0_beta01/cime/scripts

(1) create a new case

./create_newcase -case ~/I1850CLM50_001 -res f19_g16 -compset IM1850CRUCLM50BGC

(2) invoke case.setup

cd into case directory:

cd ~/I1850CLM50_001

./case.setup

(3) build the executable

Next, we will compile the model code

(4) submit your run to the batch queue

Work Flow: Super Quick Start

Exercise 1: Create & run an out-of-the-box simulation

cd into scripts directory from the source code directory:

cd /glade/p/cesm/lmwg/CLM2016_Tutorial_cesm2_0_beta01/cime/scripts

(1) create a new case

./create_newcase -case ~/I1850CLM50_001 -res f19_g16 -compset IM1850CRUCLM50BGC

(2) invoke case.setup

cd into case directory:

cd ~/I1850CLM50_001

./case.setup

Start here

(3) build the executable

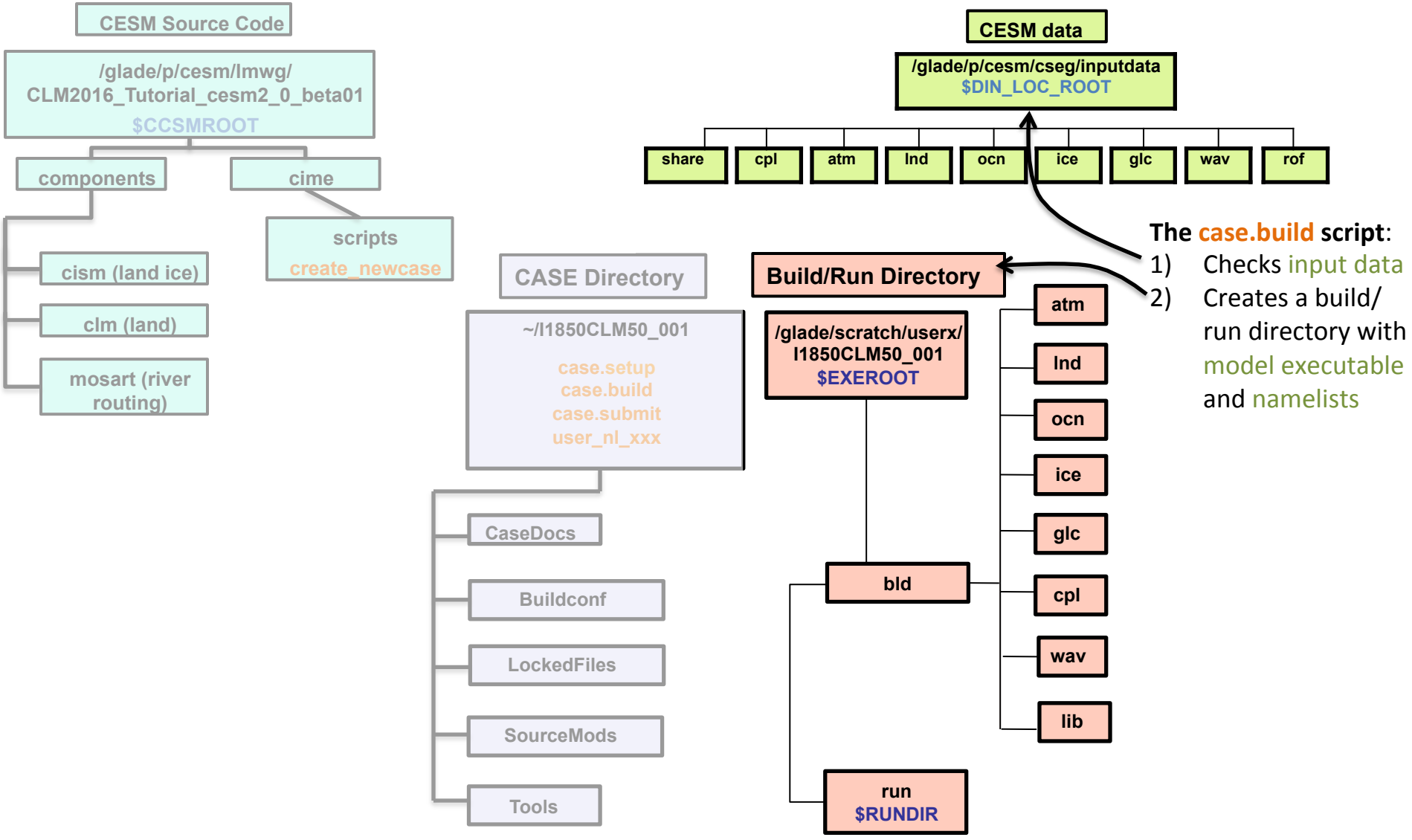
Type this command line:

./case.build

Stop here

(4) submit your run to the batch queue

CLM Directory Structure



Note: If an input data is missing, build aborts and provides a list of missing files.

Work Flow: Super Quick Start

Exercise 1: Create & run an out-of-the-box simulation

cd into scripts directory from the source code directory:

cd /glade/p/cesm/lmwg/CLM2016_Tutorial_cesm2_0_beta01/cime/scripts

(1) create a new case

./create_newcase -case ~/I1850CLM50_001 -res f19_g16 -compset IM1850CRUCLM50BGC

(2) invoke case.setup

cd into case directory:

cd ~/I1850CLM50_001

./case.setup

(3) build the executable

Type this command line:

./case.build

Using this command line, we just compiled the model and created a run directory with model executables.

(4) submit your run to the batch queue

Work Flow: Super Quick Start

Exercise 1: Create & run an out-of-the-box simulation

cd into scripts directory from the source code directory:

cd /glade/p/cesm/lmwg/CLM2016_Tutorial_cesm2_0_beta01/cime/scripts

(1) create a new case

./create_newcase -case ~/I1850CLM50_001 -res f19_g16 -compset IM1850CRUCLM50BGC

(2) invoke case.setup

cd into case directory:

cd ~/I1850CLM50_001

./case.setup

(3) build the executable

Type this command line:

./case.build

(4) submit your run to the batch queue

We're on the last step! We will submit the simulation to the supercomputer queue

Work Flow: Super Quick Start

Exercise 1: Create & run an out-of-the-box simulation

cd into scripts directory from the source code directory:

cd /glade/p/cesm/lmwg/CLM2016_Tutorial_cesm2_0_beta01/cime/scripts

(1) create a new case

./create_newcase -case ~/I1850CLM50_001 -res f19_g16 -compset IM1850CRUCLM50BGC

(2) invoke case.setup

cd into case directory:

cd ~/I1850CLM50_001

./case.setup

(3) build the executable

Type this command line:

./case.build

Start here

(4) submit your run to the batch queue

Type this command line:

./case.submit

Submit and Check Job Status

When you submit a job, you will see confirmation that it successfully submitted:

```
Check case OK
submit_jobs case.run
job is case.run
Submit job case.run
Submitting job script bsub   -q regular -W 12:00 -P P93300641 < case.run
[dll@yslogin3 ~/I1850CLM50_001]$
```

Your job was submitted to the regular queue ("q"). Wallclock time ("W") and project number ("P") are also specified

Checking jobs:

a. Type *bjobs* or

b. Type *bjobs –uall* to see everyone's jobs

```
[dll@yslogin5~/I1850CLM50_001]$ bjobs
JOBID   USER    STAT  QUEUE      FROM_HOST   EXEC_HOST   JOB_NAME     SUBMIT_TIME
192822  dll     PEND  regular    yslogin3-ib                *M50_001.run  Sep 6 08:34
```

Job ID

Your job is waiting in the queue

```
[dll@yslogin5 ~/I1850CLM50_001]$ bjobs
JOBID   USER    STAT  QUEUE      FROM_HOST   EXEC_HOST   JOB_NAME     SUBMIT_TIME
192822  dll     RUN   regular    yslogin5-ib 15*ys0724-i *0_001.run Sep  6 09:57
                                             15*ys0751-ib
                                             15*ys0813-ib
                                             15*ys1570-ib
                                             15*ys1571-ib
                                             15*ys1814-ib
                                             15*ys2740-ib
                                             15*ys2968-ib
                                             15*ys2969-ib
                                             15*ys2971-ib
```

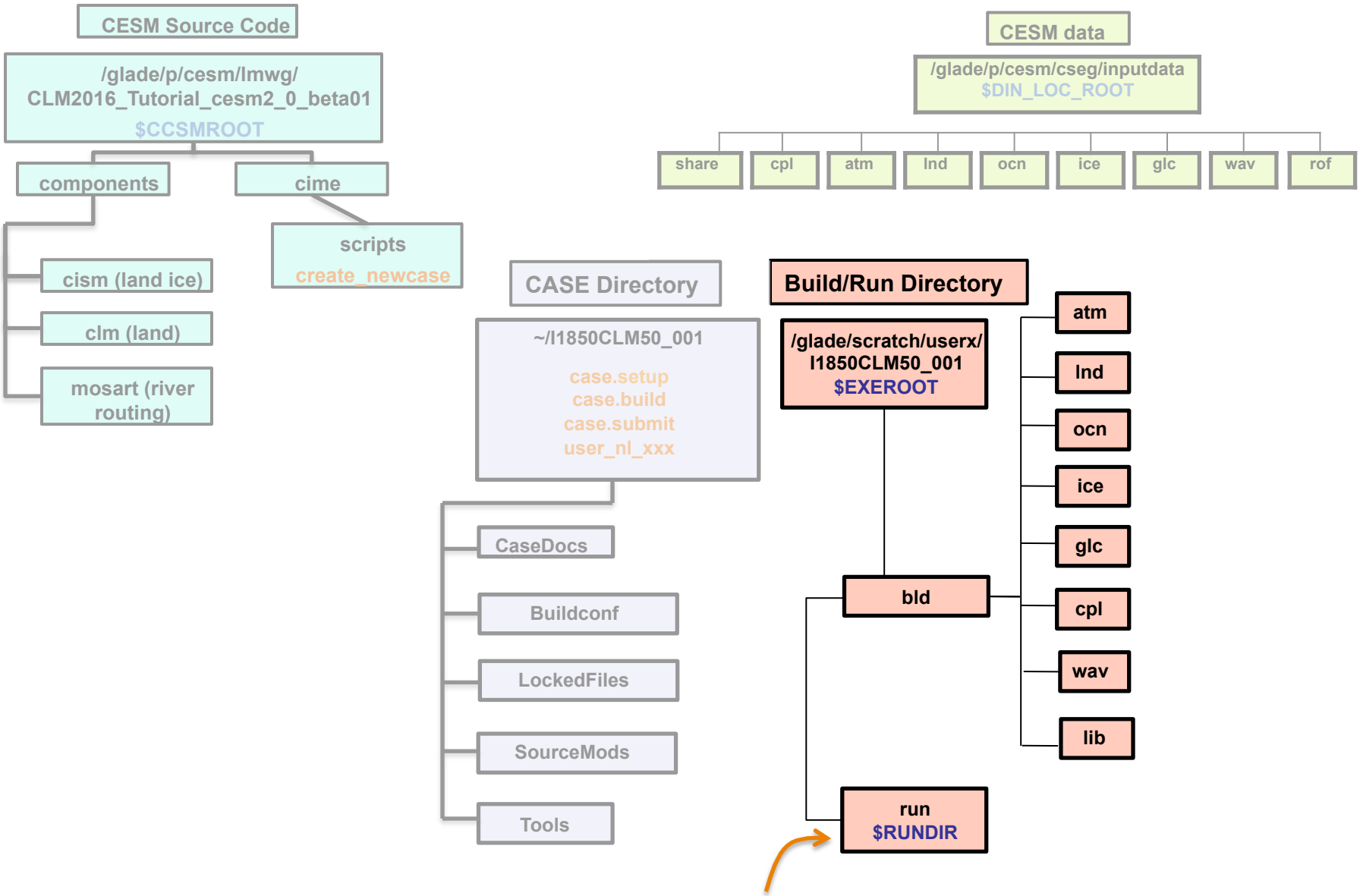
Your job is running

Killing jobs:

a. Find your Job ID after typing *bjobs*

b. Type *bkill <Job ID>*

CLM Directory Structure



When *running*, the model scripts write files into your run directory.

CLM Directory Structure

CESM Source Code

/glade/p/cesm/lmwg/
CLM2016_Tutorial_cesm2_0_beta01
$CCSMROOT

- components
  - cism (land ice)
  - clm (land)
  - mosart (river routing)
- cime
  - scripts
    create_newcase

CESM data

/glade/p/cesm/cseg/inputdata
$DIN_LOC_ROOT

- share
- cpl
- atm
- lnd
- ocn
- ice
- glc
- wav
- rof

CASE Directory

~/I1850CLM50_001

case.setup
case.build
case.submit
user_nl_xxx

- CaseDocs
- Buildconf
- LockedFiles
- SourceMods
- Tools

Build/Run Directory

/glade/scratch/userx/
I1850CLM50_001
$EXEROOT

- bld
- run
  $RUNDIR
- atm
- lnd
- ocn
- ice
- glc
- cpl
- wav
- lib

Short Term Archive

/glade/scratch/userx/
archive/I1850CLM50_001
$DOUT_S_ROOT

- atm
- lnd
  - logs
  - hist
- ocn
- ice
- glc
- cpl
- rof
- dart
- wav
- rest

When *complete*, a short-term archive directory is created, and history and log files are moved here. Files necessary to continue the run are left in $RUNDIR

Up Next: Making changes to CLM configuration options

Outline

- **CESM at a glance**
  1) The CESM framework
  2) Finding information about CLM & CESM
  3) Overview of CLM (and CESM) directory structure
- **Basic workflow**
  1) Create a new case
  2) Invoke case_setup
  3) Build the executable
  4) Run and output data
- **Changing configuration options**
  1) Component Sets
  2) ENV files (env_[command])
  3) Namelist files (user_nl_[model])
- **Getting help**
- **Appendix**

Review: The 4 commands to run CLM

cd into scripts directory from the source code directory:

cd /glade/p/cesm/lmwg/CLM2016_Tutorial_cesm2_0_beta01/cime/scripts

(1) create a new case

./create_newcase -case ~/I1850CLM50_001 -res f19_g16 -compset IM1850CRUCLM50BGC

(2) invoke case.setup

cd into case directory:

cd ~/I1850CLM50_001

./case.setup

(3) build the executable

Type this command line:

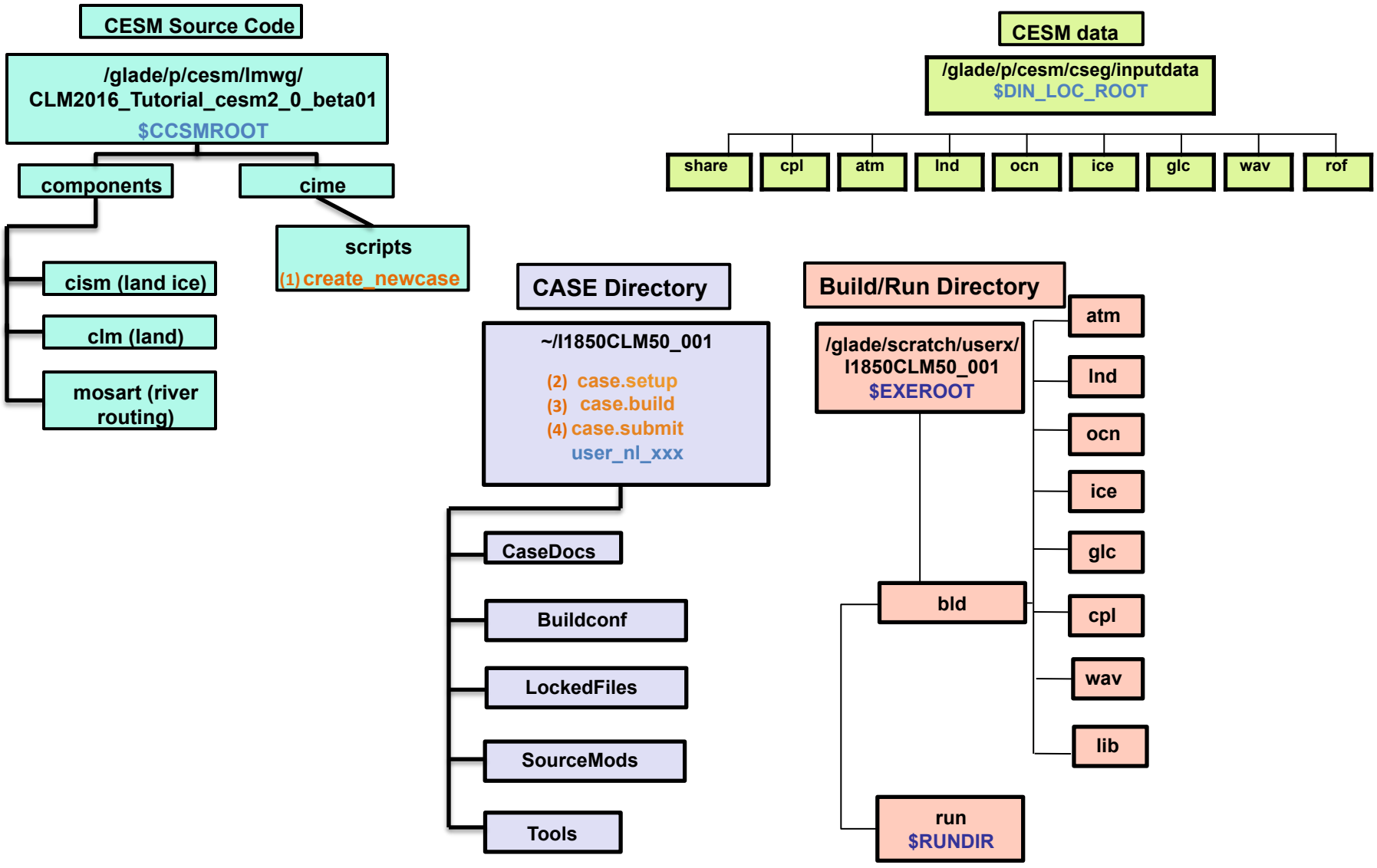
./case.build

(4) submit your run to the batch queue

Type this command line:

./case.submit

Review: CLM Directories & Commands



Review: Queues and Jobs

On Yellowstone

Checking jobs:

a. Type *bjobs* or
b. Type *bjobs –uall* to see everyone's jobs, or

Killing jobs:

a. Find your JOBID after typing *bjobs*
b. Type *bkill <JOBID>*

Finding model output

Directory:

Change this to your user name

/glade/scratch/{userXX}/archive/I850CLM50_001/lnd/hist

Finding model output

Directory:

Change this to your user name

/glade/scratch/{userXX}/archive/I850CLM50_001/lnd/hist

Files (use "*ls*" to list them):

I1850CLM50_001.h0.0001-12.nc

Case Name

Output Type
(history)

Time

File Type
(netCDF)

3 Types of Basic Modifications

1. Component Sets

2. ENV files (env_[command])

3. Namelist files (user_nl_[model])

3 Types of Basic Modifications

1. Component Sets

   Set up a simulation for 2000

2. ENV files (env_[command])

3. Namelist files (user_nl_[model])

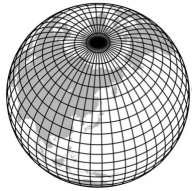
Create a new case

create_newcase requires 3 arguments

What is the casename ?

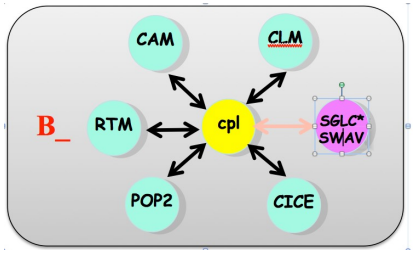
You used: I1850CLM50_001

Which resolution?



f19_g16
(2-degree)

Which model configuration ? Which set of components ?



IM1850CRUCLM50BGC
(I = CLM only, 1850)

The command line:

```
./create_newcase –case ~/I1850CLM50_001 –res f19_g16 –compset IM1850CRUCLM50BGC
```

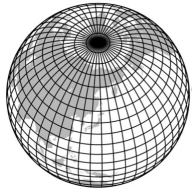
Create a new case

create_newcase requires 3 arguments

What is the casename ?

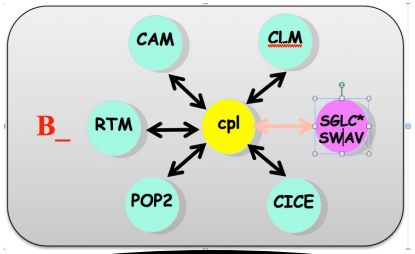
I1850CLM50_001

Which resolution?



f19_g16
(2-degree)

Which model configuration ? Which set of components ?



IM1850CRUCLM50BGC
(I = CLM only, 1850)

Now we'll change the compset

./create_newcase –case ~/I1850CLM50_001 –res f19_g16 –compset IM1850CRUCLM50BGC

Changing Simulation Components

Compset, or component set:

predefined options for running the model

Use compset to change the type of simulation

Changing compsets lets you run different experiments

Some component options:

- Year (1850, 2000, transient, etc.)
- Data atmosphere (GSWP3, CRUNCEP, CPLHIST3HrWx)
- Model options (SP [satellite phenology], BGC [biogeochemistry])
- RCP scenarios

Changing compsets lets you run different experiments

Some component options:

- Year (1850, 2000, transient, etc.)
- Data atmosphere (GSWP3, CRUNCEP, CPLHIST3HrWx)
- Model options (SP [satellite phenology], BGC [biogeochemistry])
- RCP scenarios

Examples of simulations using different compsets:

- Stabilize (“spin up”) a biogeochemsitry (includes N & C cycles) simulation for 1850
- Run a transient historical simulation from 1850-2000 based on the 1850 spin up
- Run a transient future simulation from 2000 through 2100 using RCP8.5
- Run a “time slice” simulation for 2000

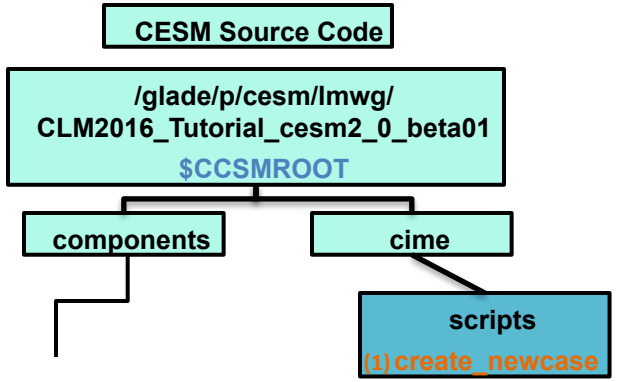
Where to find a list of compsets:

http://www.cesm.ucar.edu/models/cesm1.2/cesm/doc/modelnl/compsets.html

Website lists ALL compsets for released CESM. CLM only = "I" compsets

In CESM scripts directory, can run:

./manage_case -query compsets -setby clm



Tip: Add " | more" at the end of the command line, then use the spacebar to scroll through the options

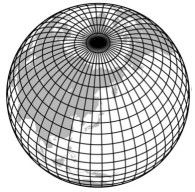
Exercise 2: Create & build simulation for 2000

create_newcase requires 3 arguments

What is the casename ?

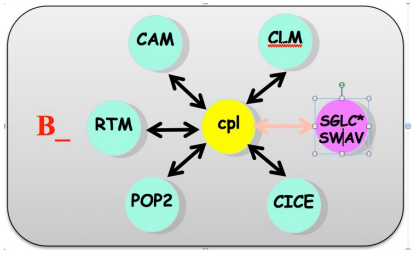
I2000CLM50_001

Which resolution?



f19_g16
(2-degree)

Which model configuration ? Which set of components ?



IMCRUCLM50BGC
(I = CLM only, 2000)

./create_newcase –case ~/I2000CLM50_001 –res f19_g16 –compset IMCRUCLM50BGC

Exercise 2: Create & build simulation for 2000

cd into scripts directory from the source code directory:

cd /glade/p/cesm/lmwg/CLM2016_Tutorial_cesm2_0_beta01/cime/scripts

(1) create a new case

./create_newcase -case ~/I2000CLM50_001 -res f19_g16 -compset IMCRUCLM50BGC

(2) invoke case.setup

cd into case directory:

cd ~/I2000CLM50_001

./case.setup

(3) build the executable

Type this command line:

./case.build

Stop Here

---

(4) submit your run to the batch queue

Type this command line:

./case.submit

3 Types of Basic Modifications

1. Component Sets

2. ENV files (env_[command].xml)

   Changing the length of the run

3. Namelist files (user_nl_[model])

Exercise 3: Change the length of simulated time

cd into scripts directory from the source code directory:

cd /glade/p/cesm/lmwg/CLM2016_Tutorial_cesm2_0_beta01/cime/scripts

(1) create a new case

./create_newcase -case ~/I2000CLM50_001 -res f19_g16 -compset IMCRUCLM50BGC

(2) invoke case.setup

cd into case directory:

cd ~/I2000CLM50_001

./case.setup

(3) build the executable

Type this command line:

./case.build

← **Change the run length BEFORE submitting**

(4) submit your run to the batch queue

Type this command line:

./case.submit

How To: Change the length of simulated time

Two methods of changing the run length. Method 1 uses the "xmlchange" script and is the preferred method

Use when modifying "xml" files (e.g. env_run.xml)

1. Benefit: Won't let you mess up the syntax!
2. For help, type *./xmlchange -help*
3. Use "*./xmlquery list*" to list all variables and their values in all the .xml files

Example: editing env_run.xml via the xmlchange tool

./xmlchange {variable to be changed}={value to change to}

* We won't use xml commands right now, but you will during the next section.

How To: Change the length of simulated time

Method 2 edits the scripts directly and involves two steps:

1) Modify env_run.xml to set desired simulated length (STOP_N and STOP_OPTION)

2) Modify env_batch.xml to tell computer how much computer time is needed to complete the simulation (JOB_WALLCLOCK_TIME)

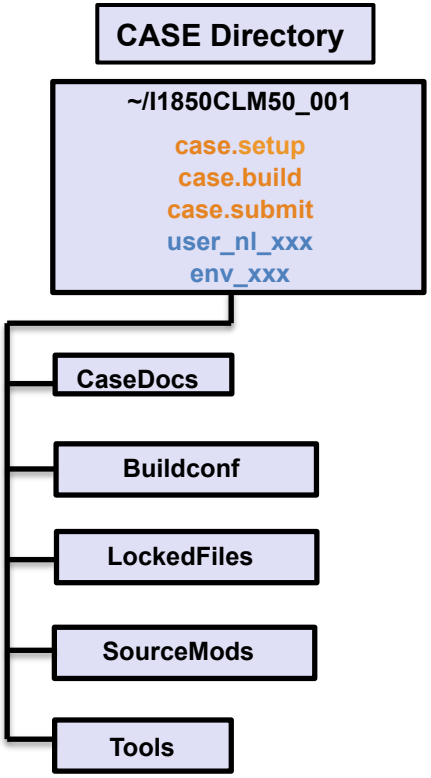
When modifying files, use an editor of your choice

Examples:

Emacs
nedit
vi

Exercise 3: Change the length of simulated time

1)Modify env_run.xml to set desired simulated length



In a text editor*, open env_run.xml

* If you don't have a preferred editor, emacs is user friendly.
Type "emacs env_run.xml" (or "emacs anyfilename")

env_run.xml script

This is the beginning of the env_run.xml script:

```
<?xml version="1.0"?>

<config_definition>

<header>

    These variables MAY BE CHANGED ANYTIME during a run.
    Additional machine speific variables that can be changed
    during a run are contained in the env_mach_specific file
    Note1: users SHOULD NOT modify BUILD_COMPETE in env_build.xml
    this is done automatically by the scripts.
    </header>

<groups>
   <group>external_tools</group>
   <group>run_begin_stop_restart</group>
   <group>run_budgets</group>
   <group>run_cesm</group>
   <group>run_co2</group>
   <group>run_component_cism</group>
   <group>run_component_clm</group>
   <group>run_component_cpl</group>
   <group>run_component_datm</group>
   <group>run_component_rtm</group>
   <group>run_coupling</group>
   <group>run_data_archive</group>
   <group>run_desc</group>
   <group>run_din</group>
   <group>run_domain</group>
   <group>run_dout</group>
   <group>run_drv_history</group>
   <group>run_flags</group>
   <group>run_glc</group>
   <group>run_machine</group>
   <group>run_mpi</group>
   <group>run_pio</group>
</groups>


  <entry id="DATA_ASSIMILATION"  value="FALSE">
    <type>logical</type>
    <valid_values>TRUE,FALSE</valid_values>
    <group>external_tools</group>
    <desc>Run the external tool pointed to by DATA_ASSIMILATION_SCRIPT after the model run completes</desc>
  </entry>

  <entry id="DATA_ASSIMILATION_CYCLES"  value="1">
    <type>integer</type>
    <group>external_tools</group>
    <desc>Number of model run - data assimilation steps to complete</desc>
  </entry>
                                                                                1,1           Top
```

env_run.xml script

Runtime variables can be changed in env_run.xml *at any point* and control the mechanics of the run (length, resubmits, and archiving).

Common variables to change include:

1. STOP_OPTION → sets the run time interval type, i.e. nmonths, ndays, nyears

2. STOP_N→ sets the number of intervals to run the model during the specified wallclock* time.

* Wallclock time is set in the env_batch.xml file and is a measure of the actual time.

3. RESUBMIT→ sets the number of times to resubmit the run

Scroll through the script to find these variables

Exercise 3 (Part 1): Run simulation for 5 years

TO DO:

In the env_run.xml script in your I2000CLM50_001 case, change:

1. **STOP_OPTION** → change to "nyears"

2. **STOP_N**→ change to "5"

3. **RESUBMIT**→ sets the number of times to resubmit the run

   We won't use "resubmit" right now. Here is an example for how to run 5 years using the resubmit option:

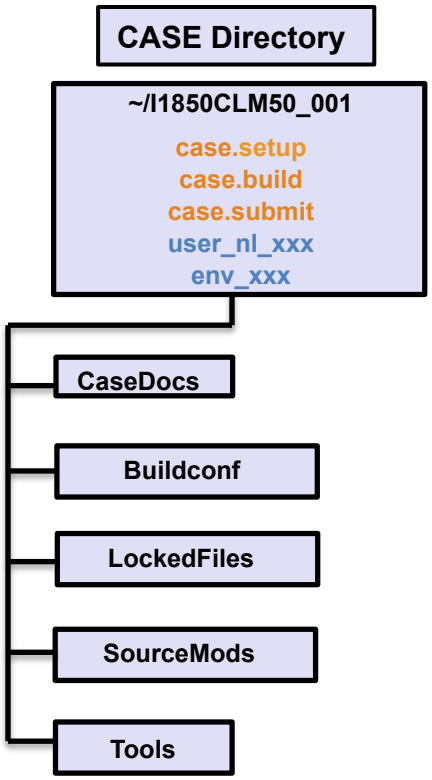
   STOP_N = 1

   RESUBMIT = 4

   *** This will run 5 different simulations for 1 year each ****

env_batch.xml script

Exercise 3 (Part 2): Modify env_batch.xml to tell computer how much computer time is needed to complete the simulation (Wall Clock Time)



Using a text editor, open env_batch.xml

env_batch.xml script

```
<?xml version="1.0"?>

<config_definition>

<header>

      These variables may be changed anytime during a run, they
      control arguments to the batch submit command.
    </header>

<groups>
   <group>job_submission</group>
</groups>

  <job name="run">
      <entry id="JOB_QUEUE"  value="regular">
        <type>character</type>
        <group>job_submission</group>
        <desc>The machine queue in which to submit the job.  Default determined in config_machines.xml can be overwritten by testing</desc>
      </entry>

      <entry id="JOB_WALLCLOCK_TIME"  value="4:00">
        <type>character</type>
        <group>job_submission</group>
        <desc>The machine wallclock setting.  Default determined in config_machines.xml can be overwritten by testing</desc>
      </entry>

      <entry id="PROJECT"  value="P93300641">
        <type>char</type>
        <group>job_submission</group>
        <desc>project for project-sensitive build and run paths, and job scripts</desc>
      </entry>

      <entry id="PROJECT_REQUIRED"  value="TRUE">
        <type>logical</type>
        <valid_values>TRUE,FALSE</valid_values>
        <group>job_submission</group>
        <desc>whether the PROJECT value is required on this machine</desc>
      </entry>
  </job>
  <job name="test">
      <entry id="JOB_QUEUE"  value="">
        <type>character</type>
        <group>job_submission</group>
        <desc>The machine queue in which to submit the job.  Default determined in config_machines.xml can be overwritten by testing</desc>
      </entry>
```

Common Variables to change:

Make sure that changes are in the job "run", at the top of the script. You can also make changes to the short-term and long-term archive submission scripts here.

1) queue type (also: economy, premium, etc.)

2) wallclock time requested*

3) project number

**Note: Maximum allowable wall clock time on Yellowstone is 12 hours.*

Submissions requesting less time typically have shorter wait times in the queue.

Exercise 3 (Part): Change wall clock time

TO DO:
In the env_batch.xml script in your I2000CLM50_001 case, change:

change **JOB_WALLCLOCK_TIME** to “2:00”

Exercise 3: Change the length of simulated time

cd into scripts directory from the source code directory:

cd /glade/p/cesm/lmwg/CLM2016_Tutorial_cesm2_0_beta01/cime/scripts

(1) create a new case

./create_newcase -case ~/I2000CLM50_001 -res f19_g16 -compset IMCRUCLM50BGC

(2) invoke case.setup

cd into case directory:

cd ~/I2000CLM50_001

./case.setup

(3) build the executable

Type this command line:

./case.build

After modifying env_run.xml and env_batch.xml, Start Here

(4) submit your run to the batch queue

Type this command line:

./case.submit

3 Types of Basic Modifications

1. Component Sets

2. ENV files (env_[command])

3. Namelist files (user_nl_[model])

   * Going back to I1850CLM50_001 case, changing data record frequency

Exercise 4: Changing data record frequency

cd into scripts directory from the source code directory:

cd /glade/p/cesm/lmwg/CLM2016_Tutorial_cesm2_0_beta01/cime/scripts

(1) create a new case

./create_newcase -case ~/I1850CLM50_001 -res f19_g16 -compset IM1850CRUCLM50BGC

(2) invoke case.setup

cd into case directory:

cd ~/I1850CLM50_001

./case.setup

(3) build the executable

Type this command line:

./case.build

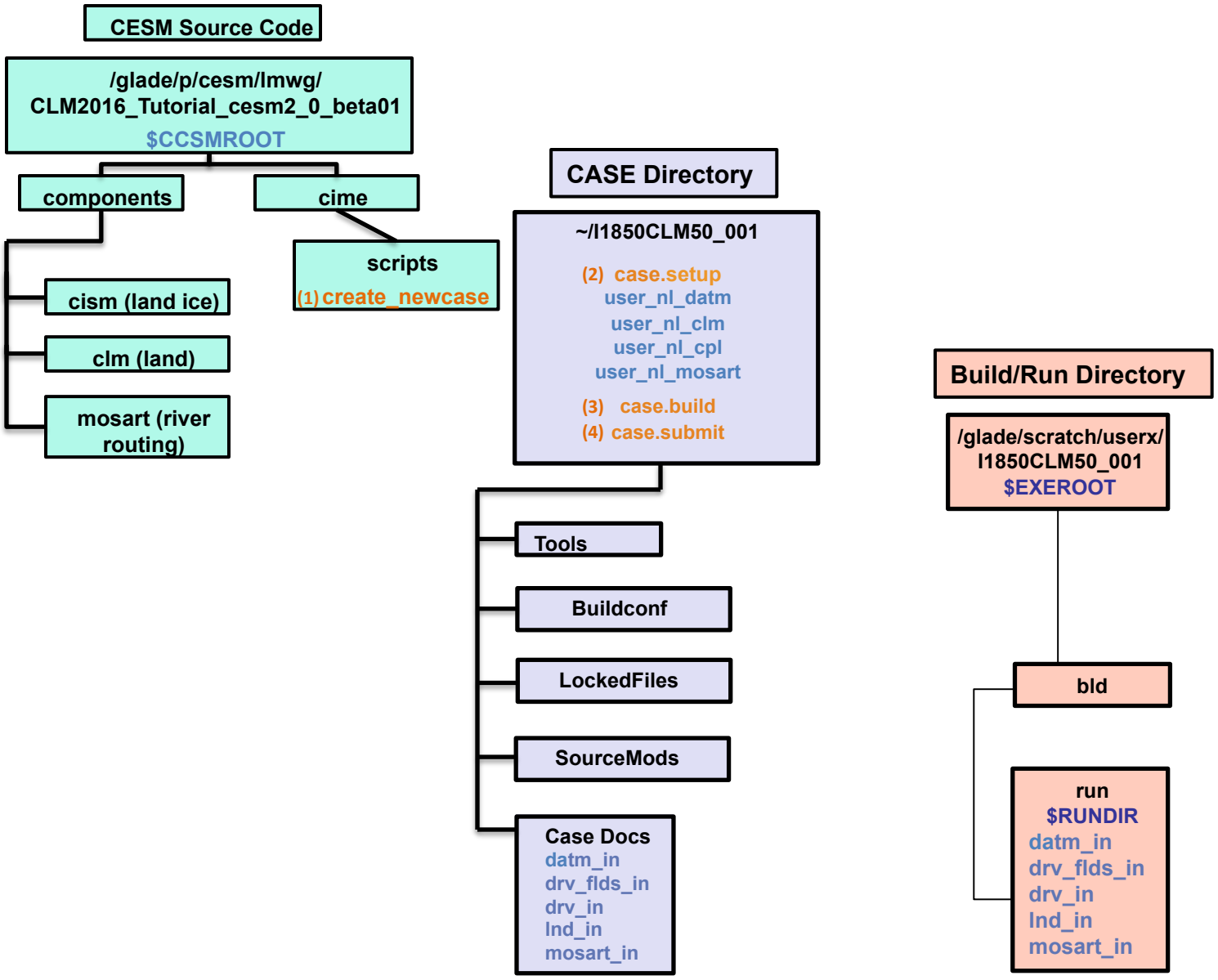
← **This is when you modify the namelists.**

(4) submit your run to the batch queue

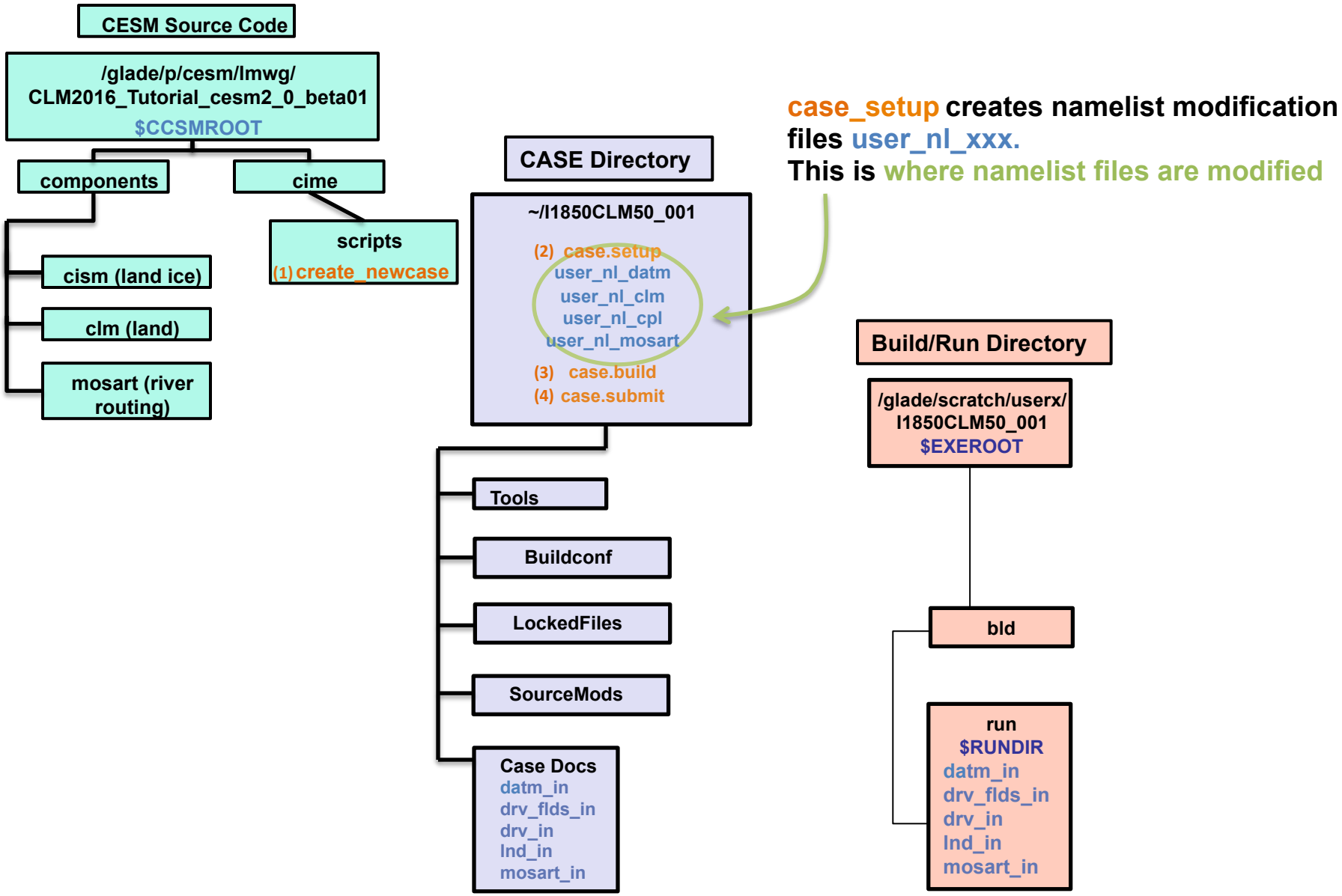
Type this command line:

./case.submit

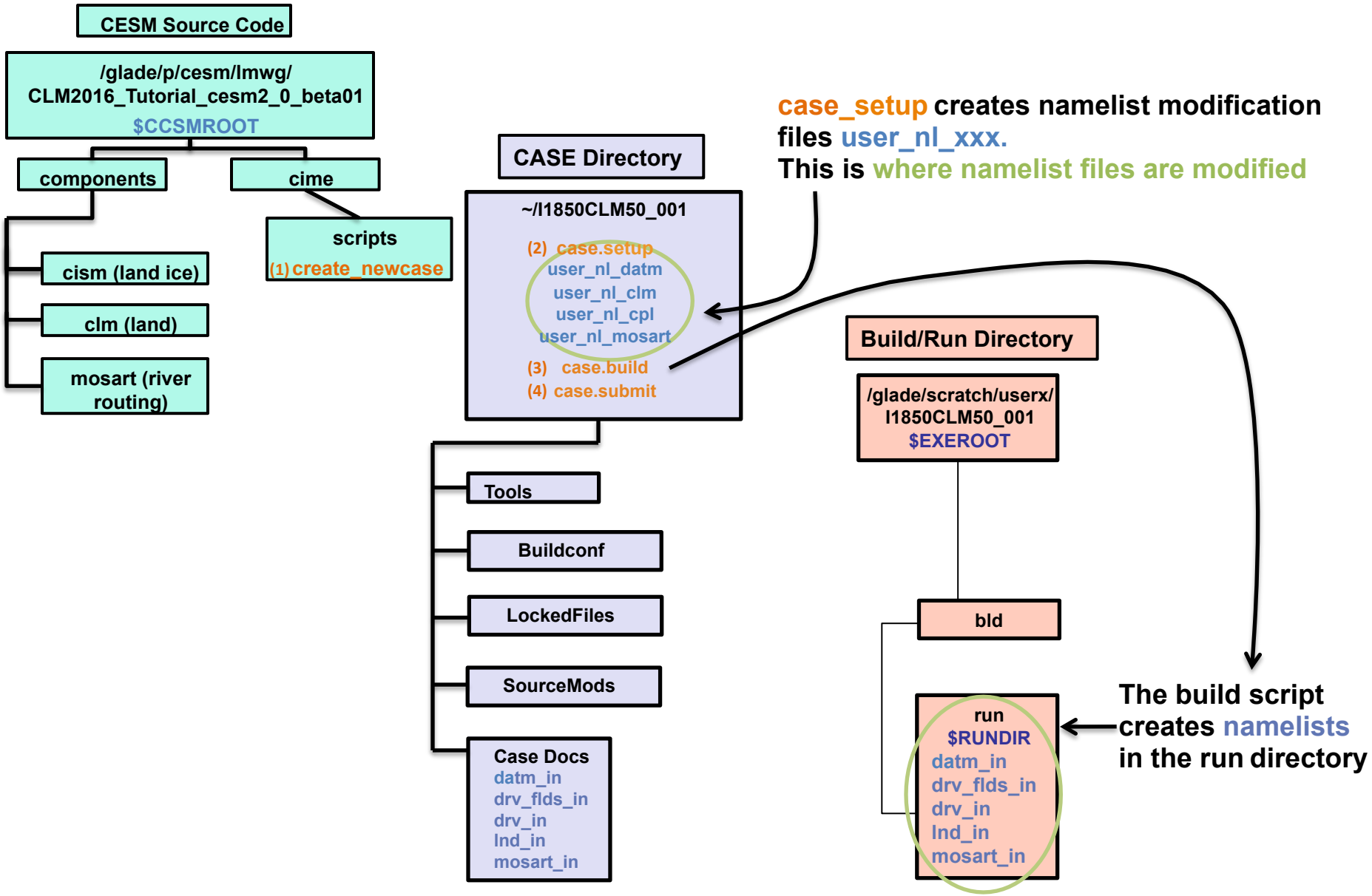
Review: CLM Directories & Commands



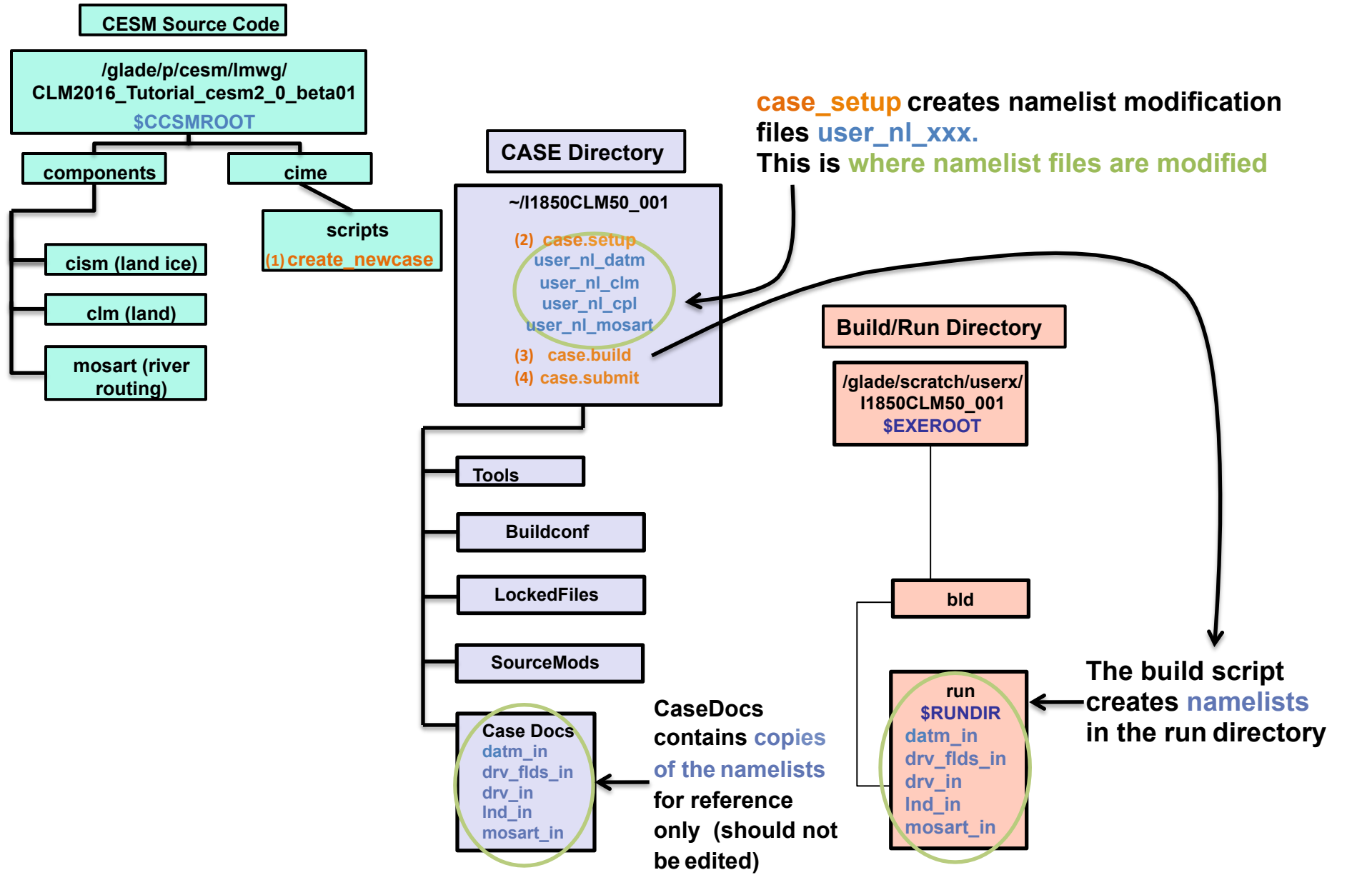
Review: CLM Directories & Commands



Review: CLM Directories & Commands



Review: CLM Directories & Commands



Exercise 4: Changing data record frequency

- Not all changes can be made in env_run.xml.
- **user_nl_<model>** files appear in the case directory after ./case.setup is invoked:

user_nl_datm ⟷ atmosphere (atm_in)

user_nl_clm ⟷ land (lnd_in)

user_nl_cpl ⟷ coupler (driver; drv_in)

user_nl_mosart ⟷ river transport (mosart_in)

Modifying Name lists

- Compsets set up namelists
- user_nl_clm modifies lnd_in name list file

  Important: Don't modify the namelist file directly. Make changes in user_nl_clm.

Modifying Name lists

- Compsets set up namelists
- user_nl_clm modifies lnd_in name list file

  Important: Don't modify the namelist file directly. Make changes in user_nl_clm.

- Website for CLM namelist variables:

http://www.cesm.ucar.edu/models/cesm1.1/cesm/doc/modelnl/nl_clm.html

** Some namelist variables can also be changed in env_run.xml file

Looking at Namelist Files

Note: These files tell the input datasets and model options that your simulation is set up to use. Do not change these files directly. If changes are necessary, modify the user_nl_xxx files.

Option 1

- cd into your case directory, then CaseDocs
  - (~/I1850CLM50_001/CaseDocs)
- Open lnd_in with text editor

Option 2

- cd into your run directory
  - (glade/scratch/I1850CLM50_001/run)
- Open lnd_in with text editor

Open the lnd_in file using one of these options

Beginning of the lnd_in file

dll — dll@yslogin5:~/I1850CLM50_001 — ssh -Y dll@yellowstone.ucar.edu — 155×52

```
&clm_inparm
 albice = 0.60,0.40
 co2_ppmv = 284.7
 co2_type = 'constant'
 create_crop_landunit = .false.
 dtime = 1800
 fatmlndfrc = '/glade/p/cesmdata/cseg/inputdata/share/domains/domain.lnd.fv1.9x2.5_gx1v6.090206.nc'
 finidat = ' '
 fsnowaging = '/glade/p/cesmdata/cseg/inputdata/lnd/clm2/snicardata/snicar_drdt_bst_fit_60_c070416.nc'
 fsnowoptics = '/glade/p/cesmdata/cseg/inputdata/lnd/clm2/snicardata/snicar_optics_5bnd_c090915.nc'
 fsurdat = '/glade/p/cesmdata/cseg/inputdata/lnd/clm2/surfdata_map/surfdata_1.9x2.5_16pfts_simyr1850_c160127.nc'
 glc_do_dynglacier = .false.
 h2osno_max = 10000.0
 hist_mfilt = 1
 hist_nhtfrq = 0
 limit_irrigation = .true.
 maxpatch_glcmec = 0
 maxpatch_pft = 17
 nlevsno = 12
 nsegspc = 35
 paramfile = '/glade/p/cesmdata/cseg/inputdata/lnd/clm2/paramdata/clm5_params.c160713.nc'
 repartition_rain_snow = .true.
 soil_layerstruct = '20SL_8.5m'
 spinup_state = 0
 use_bedrock = .true.
 use_century_decomp = .true.
 use_cn = .true.
 use_crop = .false.
 use_dynroot = .false.
 use_ed = .false.
 use_fertilizer = .false.
 use_flexiblecn = .true.
 use_fun = .true.
 use_grainproduct = .false.
 use_hydrstress = .true.
 use_lch4 = .true.
 use_luna = .true.
 use_nguardrail = .true.
 use_nitrif_denitrif = .true.
 use_vertsoilc = .true.
/
&ndepdyn_nml
 ndepmapalgo = 'bilinear'
 stream_fldfilename_ndep = '/glade/p/cesmdata/cseg/inputdata/lnd/clm2/ndepdata/fndep_clm_hist_simyr1849-2006_1.9x2.5_c100428.nc'
 stream_year_first_ndep = 1850
 stream_year_last_ndep = 1850
/
&popd_streams
 popdensmapalgo = 'bilinear'
 stream_fldfilename_popdens = '/glade/p/cesmdata/cseg/inputdata/lnd/clm2/firedata/clmforc.Li_2012_hdm_0.5x0.5_AVHRR_simyr1850-2010_c130401.nc'
 stream_year_first_popdens = 1850
                                                                                1,1           Top
```

Beginning of the lnd_in file

dll — dll@yslogin5:~/I1850CLM50_001 — ssh -Y dll@yellowstone.ucar.edu — 155×52

```
&clm_inparm
 albice = 0.60,0.40
 co2_ppmv = 284.7
 co2_type = 'constant'
 create_crop_landunit = .false.
 dtime = 1800
 fatmlndfrc = '/glade/p/cesmdata/cseg/inputdata/share/domains/domain.lnd.fv1.9x2.5_gx1v6.090206.nc'
 finidat = ' '
 fsnowaging = '/glade/p/cesmdata/cseg/inputdata/lnd/clm2/snicardata/snicar_drdt_bst_fit_60_c070416.nc'
 fsnowoptics = '/glade/p/cesmdata/cseg/inputdata/lnd/clm2/snicardata/snicar_optics_5bnd_c090915.nc'
 fsurdat = '/glade/p/cesmdata/cseg/inputdata/lnd/clm2/surfdata_map/surfdata_1.9x2.5_16pfts_simyr1850_c160127.nc'
 glc_do_dynglacier = .false.
 h2osno_max = 10000.0
 hist_mfilt = 1
 hist_nhtfrq = 0
 limit_irrigation = .true.
 maxpatch_glcmec = 0
 maxpatch_pft = 17
 nlevsno = 12
 nsegspc = 35
 paramfile = '/glade/p/cesmdata/cseg/inputdata/lnd/clm2/paramdata/clm5_params.c160713.nc'
 repartition_rain_snow = .true.
 soil_layerstruct = '20SL_8.5m'
 spinup_state = 0
 use_bedrock = .true.
 use_century_decomp = .true.
 use_cn = .true.
 use_crop = .false.
 use_dynroot = .false.
 use_ed = .false.
 use_fertilizer = .false.
 use_flexiblecn = .true.
 use_fun = .true.
 use_grainproduct = .false.
 use_hydrstress = .true.
 use_lch4 = .true.
 use_luna = .true.
 use_nguardrail = .true.
 use_nitrif_denitrif = .true.
 use_vertsoilc = .true.
/
&ndepdyn_nml
 ndepmapalgo = 'bilinear'
 stream_fldfilename_ndep = '/glade/p/cesmdata/cseg/inputdata/lnd/clm2/ndepdata/fndep_clm_hist_simyr1849-2006_1.9x2.5_c100428.nc'
 stream_year_first_ndep = 1850
 stream_year_last_ndep = 1850
/
&popd_streams
 popdensmapalgo = 'bilinear'
 stream_fldfilename_popdens = '/glade/p/cesmdata/cseg/inputdata/lnd/clm2/firedata/clmforc.Li_2012_hdm_0.5x0.5_AVHRR_simyr1850-2010_c130401.nc'
 stream_year_first_popdens = 1850
                                                                                1,1           Top
```

$[CO_2]$

File with initial conditions

File with surface dataset

Different compsets will change the status of some of these things.

Example Modification: user_nl_clm

Changing the frequency of model output

hist_mfilt: Number of samples within a file

- Default is 1
- Setting value to 12 would put 12 records into a single file

Example Modification: user_nl_clm

Changing the frequency of model output

hist_mfilt: Number of samples within a file

Default is 1

Setting value to 12 would put 12 records into a single file

hist_nhtfrq: Frequency that data are recorded and written to a file

Default: 0 means that output is recorded every month (monthly averages)

Positive Values: Number of model timesteps (half-hourly) for output record

ex: 48 means output is recorded every day (daily averages)

Negative Values: Absolute value in hours for output record

ex: –1 means output is recorded hourly; –24 means output is recorded daily

* Both hist_mfilt & hist_nhtfrq must be integers

Example Modification: user_nl_clm

Changing the frequency of model output

Daily output with a years worth of daily records in a file:

hist_mfilt = 365

hist_nhtfrq = -24

Monthly output with each month written to a separate file (default, as in I2000CLM50_001 case):

hist_mfilt = 1

hist_nhtfrq = 0

For this tutorial, we changed the default data record setting to daily in the I1850CLM50 compset.

Example 4: Modify user_nl_clm to get monthly output, 1 file per month in I1850CLM50_001

For this tutorial, we changed the default data record setting to daily in the I1850CLM50 compset.

Example 4: Modify user_nl_clm to get monthly output, 1 file per month in I1850CLM50_001

In user_nl_clm, add:

hist_mfilt = 1

hist_nhtfrq = 0

Then, run I1850CLM50_001 for 5 years. To do this:

1. Change user_nl_clm to record monthly output
2. Change STOP_OPTION and STOP_N variables in env_run.xml
3. Change wall clock time in env_batch.xml
4. Rerun the simulation: case.submit

Use what you learned from the previous examples to make these changes

Exercise 4: Changing data record frequency

cd into scripts directory from the source code directory:

cd /glade/p/cesm/lmwg/CLM2016_Tutorial_cesm2_0_beta01/cime/scripts

(1) create a new case

./create_newcase -case ~/I1850CLM50_001 -res f19_g16 -compset IM1850CRUCLM50BGC

(2) invoke case.setup

cd into case directory:

cd ~/I1850CLM50_001

./case.setup

(3) build the executable

Type this command line:

./case.build

After modifying the namelists,
Start Here

(4) submit your run to the batch queue

Type this command line:

./case.submit

***Note**: The case.submit script will automatically update and check the namelists. If you want to update and check your namelists before submitting, you can also run the "preview_namelists" script.*

Now YOU know how to run the CLM!

Use these 3 basic modifications to run a variety of simulations.

1. Component Sets
2. ENV files (env_[command])
3. Namelist files (user_nl_[model])

Documenting Your Changes: README files

In your case directory, you will find automatically generated documentation files.

README.case file: detailed information on your compset and resolution, including whether your configuration has science support.

Best Practice: In the *README.case file*, we highly recommend YOU document any changes you make to the default scripts. It is YOUR paper trail and opportunity to list modifications.

Exercises: Test Your Knowledge

1) Set up a 2-degree CLM5.0-BGC simulation for 2000 and run for 1 month with daily history files.

2) Set up a 2-degree CLM5.0-BGC historical simulation and run for 5 years with monthly history files

3) Set up a 1-degree CLM5.0-BGC 1850 simulation and run for 1 year with monthly history files

For additional information on running & configuring CLM, see CLM User's Guide

CLM User's Guide:

http://www.cesm.ucar.edu/models/cesm1.2/clm/models/lnd/clm/doc/UsersGuide/book1.html

Note: The CLM5.0 User's Guide is currently a work in progress. Look for the new version with the CESM2.0 release

For help with other parts of the CESM:
http://www.cesm.ucar.edu/models/cesm2.0/

MODEL DOCUMENTATION

CESM2.0

- User's Guide
- Machines
- Resolutions
- Component Sets
- Model Component Namelists
- $CASEROOT xml files

Component Models

- Atmosphere Models
- Land Models
- Sea Ice Models
- Ocean Models
- Land Ice Models
- River Models
- Coupler

EXTERNAL LIBRARY DOCUMENTATION

- Parallel I/O Library (PIO)
- Model Coupling Toolkit (MCT)
- Earth System Modeling Framework (ESMF)

MODEL INPUT DATA

The input data necessary to run all supported component sets is made available from a public Subversion input data repository. Note that the inputdata repository has much more data in it than you need to run CESM2.0 ---- DO NOT attempt to svn checkout the whole input data repository. The CESM2.0 User's Guide explains how to obtain the subset of input data required for your needs.

Getting Help

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

NCAR UCAR | DiscussCESM

COMMUNITY Earth System MODEL

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CESM - General

The Community Earth System Model (CESM) is a fully coupled, global climate model that provides state-of-the-art computer simulations of the Earth's past, present, and future climate states.

Forum	Topics	Posts	Last post
Announcements	16	41	CESM1.2.0 Release Announcement by aliceb June 12, 2013 - 11:52am
Bug reporting	110	306	output date error - monthly history files shifted 1 month by eaton 11 hours 50 min ago
Input Data Inquiries	108	260	CICE input data for B20TR? by marvel1@... 11 hours 3 min ago
Output Data Inquiries	85	202	start time by hannay May 22, 2013 - 2:02pm
Tools A place for questions about the ESMF mapping tools and the cprnc tool as well as any topics related to grid generation.	3	10	runoff_to_ocn by cyoo@... May 23, 2013 - 8:22am
Software Development Includes issues for building/running on supported machines and porting to unsupported machines	174	515	Error in porting CESM by jedwards June 14, 2013 - 10:00am
General Discussion Includes requests for new features and configuration inquiries	193	458	More general MOC computation in POP by afrigola@... June 10, 2013 - 11:48am
Subversion Issues Forum for issues related to the new version control system	9	20	CCSM4/CESM1_0 download problem by sirajkhan78@... March 4, 2011 - 5:06pm
Tutorials For discussion regarding the web based modeling tutorials	5	13	Basic B_1850 Compilation by sstrey2@... June 4, 2013 - 9:10am

Appendix

- **Registration**
- **Download the source code**
- **Hardware/software requirements**

(A) Registration

- **Go to CESM2.0 home page: http://www.cesm.ucar.edu/models/cesm2.0/**

CESM Models

Home » CESM Models » CESM2.0 Series Public Release

**** DRAFT ** CESM2.0 SERIES PUBLIC RELEASE**

ABOUT THIS RELEASE SERIES

CESM2.0 SERIES RELEASE NOTES

SCIENTIFIC VALIDATION

Scientific validation consists of a multi-decadal model run of the given component set at the target resolution, followed by scientific review of the model output diagnostics. All scientifically supported component sets are also accompanied by diagnostic and model output data.

What version of the model should I use?
For a scientifically supported target component set and resolution, please refer to the Scientifically Validated Configurations for that target configuration.

DIAGNOSTIC PACKAGES AND NAMING CONVENTIONS

- Post Processing Utilities
- Model File Naming Conventions
- Experiment Case Naming Conventions

MODEL DOCUMENTATION

CESM2.0

- User's Guide
- Machines
- Resolutions
- Component Sets
- Model Component Namelists
- $CASEROOT xml files

Component Models

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MODEL INPUT DATA

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PERFORMANCE AND LOAD BALANCING DATA

The development and testing of CESM2.0 required several iterations in the CESM1.Y series. The following timing tables for each model revision are available:

- CESM1.3 Timing Table
- CESM1.5 Timing Table
- CESM2.0 Timing Table

CESM PROJECT

The Community Earth System Model (CESM) is a fully-coupled, global climate model that provides state-of-the-art computer simulations of the Earth's past, present, and future climate states.

CESM is sponsored by the National Science Foundation (NSF) and the U.S. Department of Energy (DOE). Administration of the CESM is maintained by the Climate and Global Dynamics Laboratory (CGD) at the National Center for Atmospheric Research (NCAR).

MODEL SOURCE CODE

Copyright and Terms of Use

All CESM source code is subject to the following Copyright Notice and Disclaimer.

Acquiring the Release Code

The source code for CESM releases is distributed through a public Subversion code repository. This code can be checked out using Subversion client software, such as the command tool svn, or simply view the latest version with a web browser.

A short registration is required to access the repository. After registering, you will receive an email containing a user name and password that is necessary to gain access to the repository.

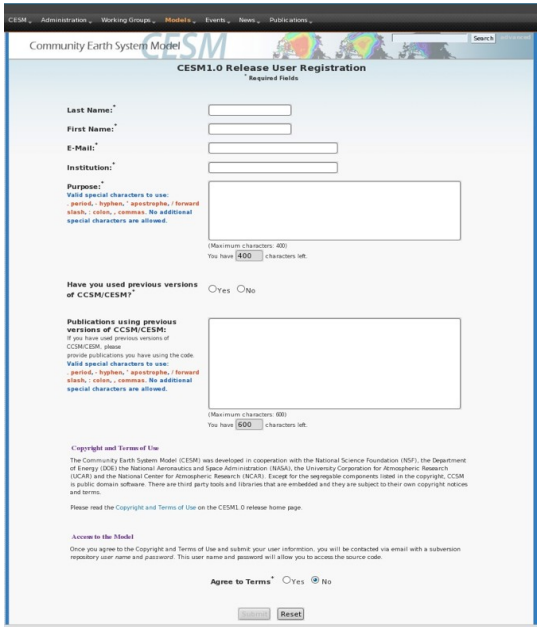
Acquisition of the code is more fully described in the most recent version of the CESM1.2 User's Guide.

REPORTING A PROBLEM

If you have any problems, please first read the User's Guide including the sections on FAQs and Use Cases. Please also refer to the CESM Bulletin Board, which is in place to facilitate communication within the CESM community. Finally, please also refer to the Release Notes entries that are provided with every release and release update. If questions or problems still exist, then please send an email to cesm-help@cgd.ucar.edu. Support questions will be answered as resources are available.

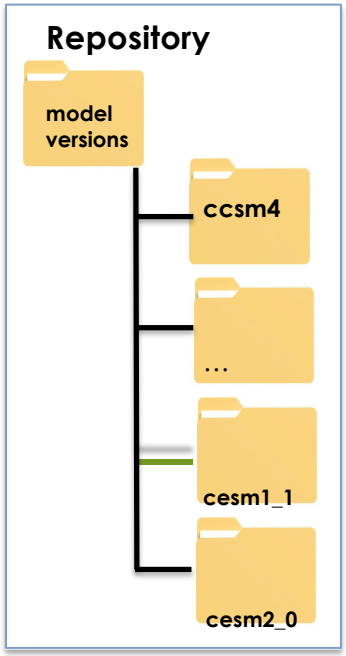
CESM SUPPORT POLICY

Right hand column has a link to the registration page, click on it



Register -- you will be emailed a username and password

(B) Download the Source Code



•**Code and input datasets are in a subversion repository (*)**
https://svn-ccsm-release.cgd.ucar.edu/model_versions

• **List the versions available on the CESM repository**
svn list https://svn-ccsm-release.cgd.ucar.edu/model_versions

• **Check out a working copy from the repository (“Download code”)**
svn co https://svn-ccsm-release.cgd.ucar.edu/model_versions/cesm2_0

Note: only available upon CESM2.0 release, estimated December 2016

(*) You can get subversion at http://subversion.apache.org/

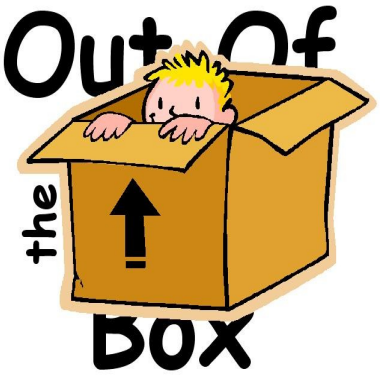
open source

(C) Hardware/Software Requirements

- **Supported platforms**

CESM currently runs "out of the box" today on the following machines

- **yellowstone – NCAR IBM**
- **titan – ORNL Cray XK6**
- **hopper – NERSC Cray XE6**
- **edison – NERSC Cray Cascade**
- **bluewaters – ORNL Cray XE6**
- **intrepid – ANL IBM Bluegene/P**
- **mira – ANL IBM Bluegene/Q**
- **janus – Univ Colorado HPC cluster**
- **pleiades – NASA SGI ICE cluster**
- **and a few others**



out of the box = works immediately after installation without any modification

- **Running CESM on other platforms**

Require porting + software

- **Subversion client (version 1.4.2 or greater)**
- **Fortran and C compilers (recommend pgi, intel, or ibm xlf compilers)**
- **NetCDF library (recommend netcdf4.1.3 or later)**
- **MPI (MPI1 is adequate, Open MPI or MPICH seem to work on Linux clusters)**