



Steps to build and run the UFS Medium-Range Weather App v1.1.0

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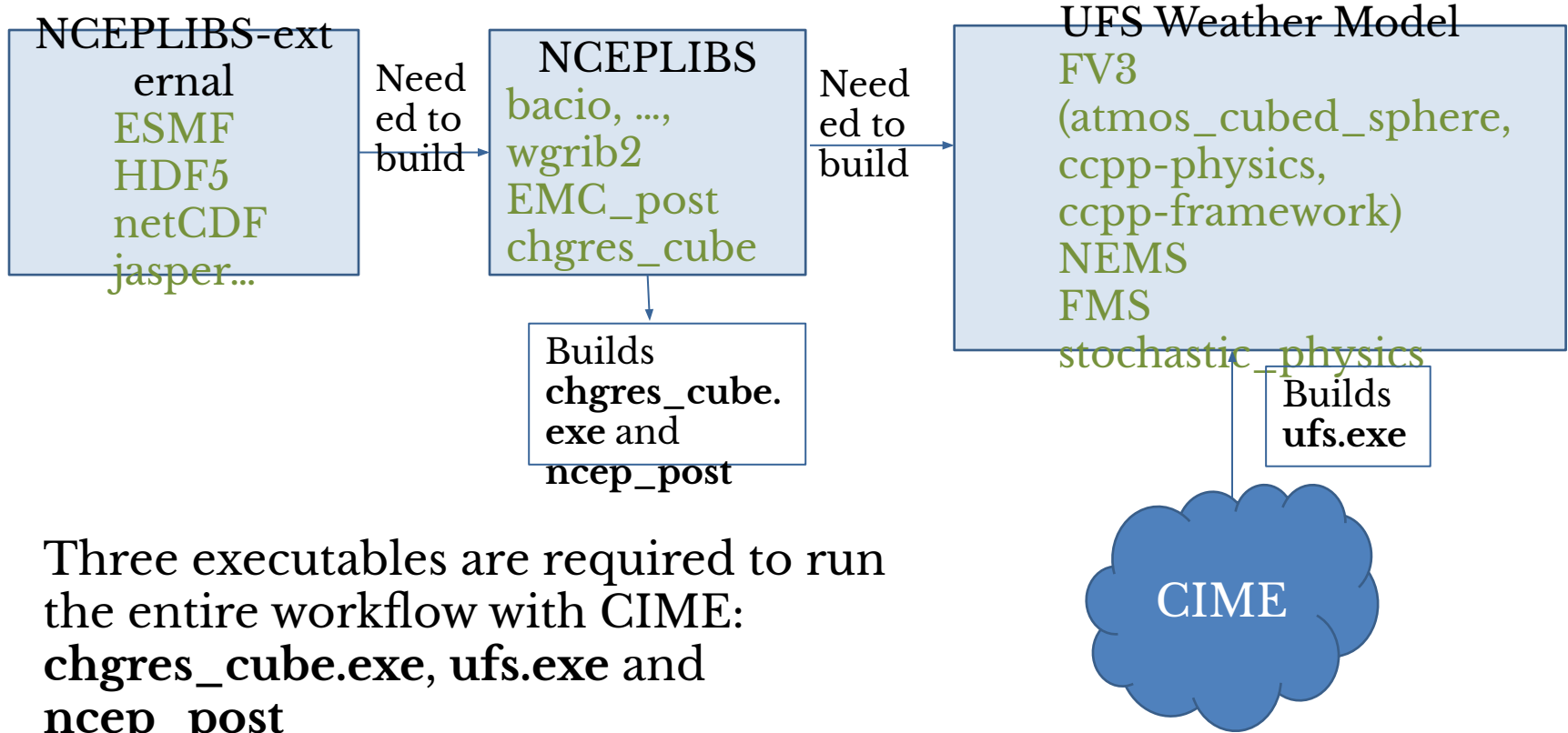


Overview of UFS MRW App

- The UFS MRW App is comprised of many components, some with their own subcomponents:
 - **NCEPLIBS-external** – a collection of third party libraries required to build NCEPLIBS
 - **NCEPLIBS** –NCEP library source code and utilities required for chgres_cube, the UFS Weather Model, and UPP
 - **UFS Weather Model** - prognostic model that can be used for short- and medium-range research and operational forecasts
 - **CIME** (Common Infrastructure for Modeling the Earth) - contains support scripts (configure, build, run, test), essential utility libraries, and other tools that are needed to build the UFS Weather model

 All of these components are necessary to build and run the MRW App and have dependencies on each other.

Overview of UFS MRW App



Build/run Overview

- Documentation for the UFS Medium-Range Weather (MRW) App can be found at:
<https://ufs-mrweather-app.readthedocs.io/en/ufs-v1.1.0/index.html>
- These slides follow the build and run steps in the Workflow Quick Start section:
<https://ufs-mrweather-app.readthedocs.io/en/ufs-v1.1.0/quickstart.html>
and are done on a pre-configured machine (Cheyenne)
- The steps to build and run the CIME workflow covered here are:
 1. Clone the code
 2. Set up the environment
 3. Create a case
 4. Set up the case run script

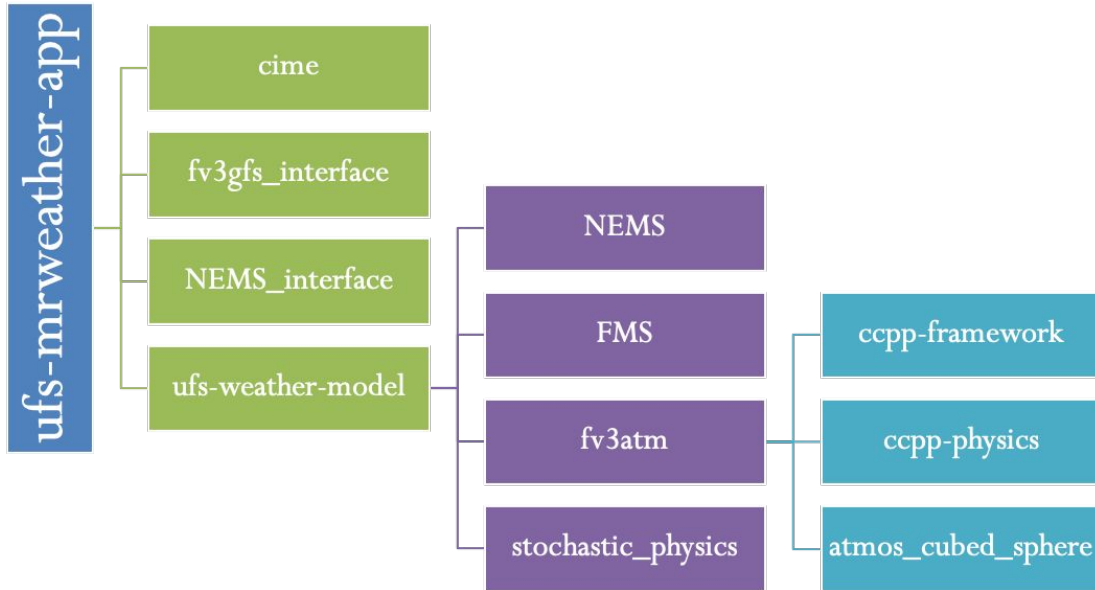
Step 1: Clone the code

```
git clone https://github.com/ufs-community/ufs-mrweather-app.git -b \
release/public-v1 my_ufs_sandbox
cd my_ufs_sandbox
./manage_externals/checkout_externals
```

This will clone the **release/public-v1** branch of the **ufs-mrweather-app** repository and check out all of the externals and sub-modules:

```
Processing externals description file : Externals.cfg
Checking status of externals: model, fv3gfs_interface, cime, emc_post,
nems_interface,
Checking out externals: model, fv3gfs_interface, emc_post, cime,
nems_interface,
```

Code hierarchy



Step 2: Set up the environment

Prior to building the model, the environment for CIME needs to be set up. This requires five environment variables:

Variable	Description
UFS_INPUT	Path to location of input data. A directory named ufs_inputdata should be located under this directory. This can be in a shared location so multiple users can use the data.
UFS_SCRATCH	Writable directory where output for each case will go.
UFS_DRIVER	Default is nems , do not change.
CIME_MODEL	Default is ufs , do not change.
PROJECT	Account code on machine

Step 3: Create a case

- A case is an instance of a MRW model simulation. It is determined by:
 - component set
 - model grid
 - machine
 - compiler
 - any other additional customizations
- Invoke `create_newcase` as follows from the `cime/scripts` directory using the following format:

```
./create_newcase --case CASENAME --compset COMPSET --res GRID
```

Variable Name	Description
CASENAME	Name of your case
COMPSET	Name of CCPP suite you are using: GFSv15p2 or GFSv16beta
GRID	Model resolution: C96 , C192 , C384 , or C768
WORKFLOW	ufs-mrweather which includes pre- and post-processing steps ufs-mrweather_wo_post includes only the

Step 3 (cont): Create a case on Cheyenne

- Use the GFSv15p2 CCPP physics suite, C96 grid and the UFS weather model with pre- and post-processing steps

```
./create_newcase --case $UFS_SCRATCH/ufs-mrweather-app-workflow.c96  
--compset GFSv15p2 --res C96 --workflow ufs-mrweather
```

- This will create a new directory:

Creating Case directory /glade/scratch/\$USER/ufs-mrweather-app-workflow.c96

- Go into this directory to complete the next step:

```
cd /glade/scratch/$USER/ufs-mrweather-app-workflow.c96
```

Step 4: Run the case setup script

- This step creates the scripts needed to build and run the model.

```
./case.setup
```

- Note the new **bld** and **run** directories under your case directory:

```
/glade/scratch/$USER/ufs-mrweather-app-workflow.c96/bld  
/glade/scratch/$USER/ufs-mrweather-app-workflow.c96/run
```

- The **bld** directory contains the executables `ufs.exe`, `ncep_post` and `chgres_cube.exe`
 - Note that `chgres_cube.exe` and `ncep_post` are links to the `NCEPLIBS-ufs-v1.1.0` directory, since they are build with the `NCEPLIBS`

Step 5: Build the model executable

- This step builds **ufs.exe** in about 8 minutes, and constructs the input namelists:

```
./case.build
```

```
Building case in directory /glade/scratch/$USER/ufs-mrweather-app-workflow.c96
...
Building atm with output to
/glade/scratch/$USER/ufs-mrweather-app-workflow.c96/bld/atm.bldlog.200930-094156
ufsatm built in 484.297560 seconds
Building ufs from
/glade/p/ral/jntp/$USER/my_ufs_sandbox/cime/./src/model/NEMS/cime/cime_config/buildexe
with output to
/glade/scratch/$USER/ufs-mrweather-app-workflow.c96/bld/ufs.bldlog.200930-094156
Time spent not building: 6.931199 sec
Time spent building: 485.038825 sec
MODEL BUILD HAS FINISHED SUCCESSFULLY
```

Step 6: Run the case

- Modify the runtime settings in `env_run.xml` for a low-resolution, 24 hour forecast:
 - Reduce run length
 - Reduce wallclock time
 - Turn off short term archiving

```
./xmlchange STOP_OPTION=nhours,STOP_N=24  
./xmlchange JOB_WALLCLOCK_TIME=00:30:00  
./xmlchange DOUT_S=FALSE
```

- Useful diagnostic commands
 - `./xmlquery -listall`
 - `./preview_namelists`

```
./case/submit  
./preview_run
```

- Run the case:

Running the case

- After running `./case.submit`, you will see:

```
Submits 3 jobs for chgres, the model run and post:
```

```
Submitted job id is 4433245.chadmin1.ib0.cheyenne.ucar.edu
```

```
Submitted job case.chgres with id
```

```
4433243.chadmin1.ib0.cheyenne.ucar.edu
```

```
Submitted job case.run with id 4433244.chadmin1.ib0.cheyenne.ucar.edu
```

```
Submitted job case.gfs_post with id
```

```
4433245.chadmin1.ib0.cheyenne.ucar.edu
```

Running the case

- How to tell if your jobs completed:

```
cd /glade/scratch/$USER/ufs-mrweather-app-workflow.c96/run
```

Job name	File Name	Look for
chgres	chgres_cube.yymmdd-hhmmss.log	DONE.
run	ufs.log.<jobid>.yymmdd-hhmmss	PROGRAM nems HAS ENDED.
gfs_post	oi.hhhh	PROGRAM UNIFIED_POST HAS ENDED.

That's it!

- 17 commands to clone the code, setup the CIME environment, build the model, and run the pre-processor, model and post-processor
- Questions?