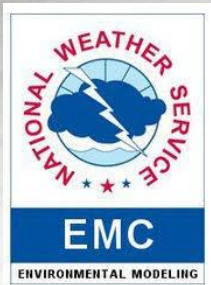# Development of NCEPLIBS umbrella to service the operational modeling and community research

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NOAA NCEP EMC

Outline

- Introduction to build scripts of NCEPLIBS
- What is the umbrella build ?
- Available umbrella build tools for public use
- How to use different Umbrella build based on resources on your machine
- Operation and support
- Summary

Building Scripts for NCEPLIBS

Original Build Script

- It is provided by the initial developer. It has been used for years without problems.

- The script varies among different libraries.

- Relatively, it is difficult to manage and modify.

NCO EE2 Unified Script

- Clean universal makefile.

- Build script define specific setting.

- Configure set up the env and compiler options.

- Strong portability

Cmake Build Script

- Based on cmake v3.6 and up.

- User sonly need to specify the required ENV variables.

- Strong portability.

- For public release.

Problems we have

- Hard to compile
- Set up ENV
- Unknown dependency
- Compiler change
- Multiple tags
- No project specific
- Third party libs
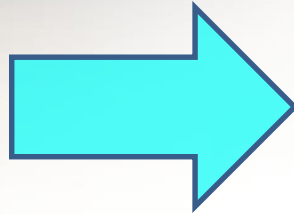
A simple operation solution to address all issues that users may meet with strong portability on various machine environment.

NCEPLIBS

WCOSS CRAY Dell Hera jet Gaea MSU

What is the umbrella build ?

Library code storage
(VLAB/Github)

Automatically adapt to changes/different type of users

Various NCEP librares

Multiple versions

Necessary External Libs

NCEPLIBS-umbrella:
Simple setting can solve trival problems

Multiple compilers

Table setup and selection; Automatically compile; install; including Unix module setup.

Multiple platform

User friendly

Produce release branch for specific task

Changeable compiler Options

Umbrella build systems

1 NCEPLIBS-umbrella

- **Two versions based on VLAB and github repos.**
- **Install new and historical versions.**
- **Include external library for FV3GFS.**

https://github.com/NOAA-EMC/NCEPLIBS-umbrella.git

2 unified-umbrella

- **One short script.**
- **Only take care of nceplibs versions with unified scripts.**
- **Intel and GNU compilers.**

https://github.com/NOAA-EMC/NCEPLIBS-umbrella.git

3 NCEPLIBS

- **Cmake based.**
- **Under UFS release project.**
- **Specific version bounded.**
- **Strong portability.**

https://github.com/NOAA-EMC/NCEPLIBS.git

1 Software and installation structure

NCEPLIBS-FV3GFS

- NCEPLIBS-FV3.sh
- lib/
  - Script/
    - build/
    - unixmodule/
  - sorc/
  - lib/
  - ext_libs/
  - include/
  - modulefiles/
- setlib.conf
- machine-setup.sh

Installed libraries

Option Table

```
step A: select the libraries to compile and install
%vi setlib.conf
==================================================
### setup/select library install:
#-----------------------------------------------
#Y/N        # Library name        #Version   #Group       #Compiler
#-----------------------------------------------
#Indenpendent NCEP libraries
#-----------------------------------------------
INSTALL     | bacio               |v2.0.2      |NCEP
INSTALL     | bufr                |v10.2.5     |NCEP
INSTALL     | bufr                |v11.0.1     |NCEP
INSTALL     | bufr                |v11.2.0     |NCEP
INSTALL     | crtm                |v2.0.6      |
INSTALL     | crtm                |v2.2.3      |
INSTALL     | crtm                |v2.2.5      |
INSTALL     | crtm                |v2.2.6      |
INSTALL     | g2tmpl              |v1.3.0      |NCEP
INSTALL     | g2tmpl              |v1.5.0      |NCEP
INSTALL     | gfsio               |v1.1.0      |NCEP
INSTALL     | ip                  |v2.0.0      |NCEP
INSTALL     | ip                  |v3.0.0      |NCEP
INSTALL     | ip                  |v3.0.1      |NCEP
INSTALL     | landsfcutil         |v2.1.0      |NCEP
INSTALL     | nemsio              |v2.2.3      |NCEP
INSTALL     | sfcio               |v1.0.0      |NCEP
INSTALL     | sigio               |v2.0.1      |NCEP
INSTALL     | sigio               |v2.1.0      |NCEP
INSTALL     | sp                  |v2.0.2      |NCEP
INSTALL     | w3nco               |v2.0.6      |NCEP
INSTALL     | graphics            |v2.0.0      |NCEP
##INSTALL   |                     |v2.0.2      |
#
```

```
#-----------------------------------------------
#External libraries support other libraries
#-----------------------------------------------
INSTALL     | jasper                           |v1.900.1   |           |
INSTALL     | png                              |v1.2.44    |           |
INSTALL     | z                                |v1.2.6     |           |
###INSTALL  |                                  |v1.3.0     |           |           |
#
#-----------------------------------------------
#Denpendent NCEP libraries
INSTALL     | nemsiogfs                        |v2.0.1     |NCEPLIBS   |
INSTALL     | w3emc                            |v2.2.0     |NCEPLIBS   |
INSTALL     | w3emc                            |v2.3.0     |NCEPLIBS   |
INSTALL     | g2c                              |v1.5.0     |NCEPLIBS   |
INSTALL     | g2                               |v3.1.0     |NCEPLIBS   |
##
##
#-----------------------------------------------
##External libraries
##-----------------------------------------------
INSTALL     | xmlparse                         |v2.0.0     |           |           |
INSTALL     | hdf5                             |v1.8.18    |           |           |
INSTALL     | netcdf                           |v3.6.3     |           |           |
INSTALL     | netcdf                           |v4.4.1.1   |           |           |
INSTALL     | netcdf                           |v4.4.4     |           |           |
INSTALL     | esmf                             |v7.1.0r    |           |           |
##INSTALL   |                                  |v1.3.0     |           |           |           |
#
==================================================
```

To run:

% sh NCEPLIBS-umbrella.sh

- Set up compiler.

- Set up environment variables and installation path.

- Set up version number.

- Specific the machine or use general configure.
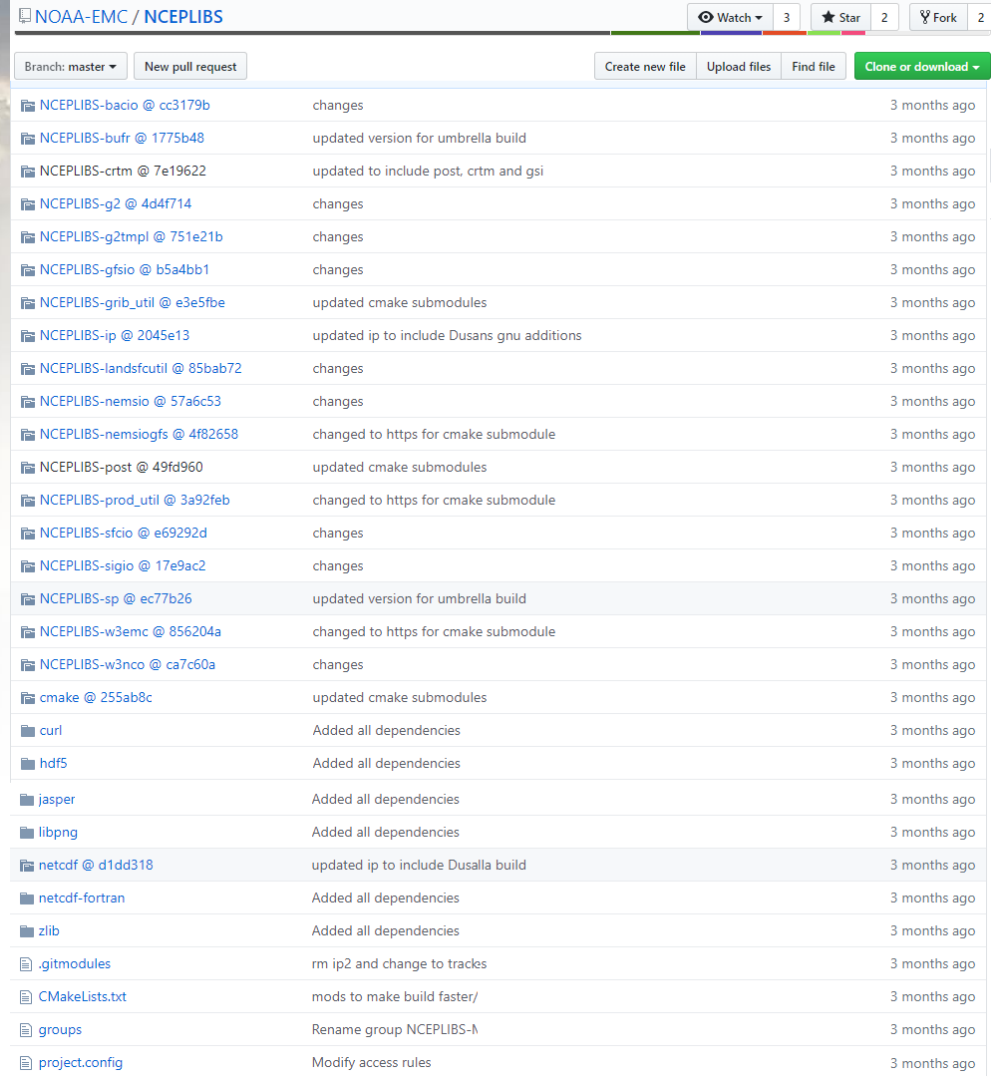
How to run:

Step 1: git clone all NCEPLIBS libraries and checkout the versions.

Step2 : After set up above variables,
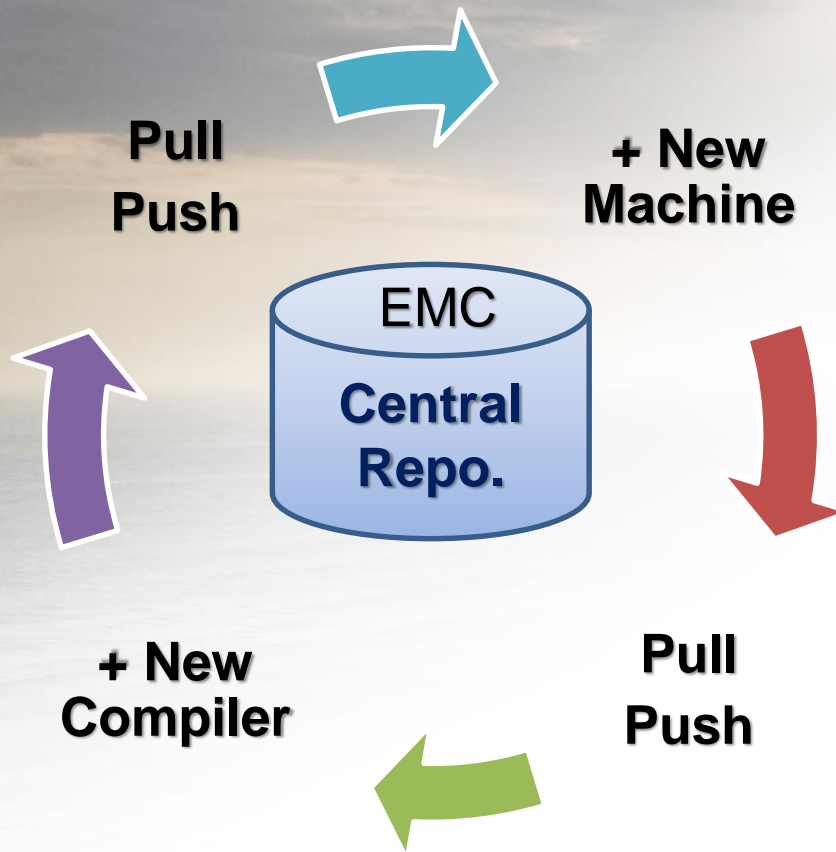
% sh unified_umbrella.sh

3 NCEPLIBS

- **Step 1. configure:**

cmake

-DCMAKE_C_COMPILER=

-DCMAKE_CXX_COMPILER=

-DCMAKE_Fortran_COMPILER=

-DMPI_LIBRARIES=

-DMPI_INCLUDES=

-DNETCDF_LIBRARY=

-DNETCDF_INCLUDE=   .

- **Step 2. Build:**

cmake –build .

Operations and Support

Pull Push

+ New Machine

EMC

Central Repo.

+ New Compiler

Pull Push

- ☐ Manage at NOAA EMC
- ☐ Community application and development involved
- ☐ Rolling development
- ☐ Fast-paced code-review & release on github NOAA_EMC domain

Summary

1. Three umbrella build tools has been developed for users to install NCEPLIBS libraries.

2. All umbrella build tools need to be adjusted, when repository or machine changes.

3. It is a open platform in github to continue this development and pull more contributions from the community research.

Thanks!