EPA

Environmental Fluid Dynamics Code (EFDC) HYD Conversion Utility

VERSION 1.0
USER GUIDE

Office of Research and Development
Center for Environmental Measurement and Modeling

Contents

1.0   Development Environment Setup

1.1   Required Software and Libraries

Software/Library	Version	Source
MSYS2	20230318	Included(msys2-x86_64-20230318.exe)
NetCDF-C	4.7.4	Included(netcdf-c-4.7.4)
NetCDF-Fortran	4.5.3	Included(netcdf-fortran-4.5.3)
MinGW toolchain	(includes 12.2.0 gnu compilers)	MSYS package
Make	4.4.1	MSYS package
curl	8.0.1	MSYS package
m4	1.4.19	MSYS package
Szip (and supporting libraries)	2.1.1-2	MSYS package
HDF5 (and supporting libraries)	1.14.0	MSYS package

1.2   Setup Instructions

The following steps will install the msys2 development environment and supporting libraries needed to compile the EFDC Utility.

Note the following points before starting:

- Admin privileges are not required for any steps in the installation.
- All commands shown below include the terminal prompt $ to denote separate commands. You should not type $ when running the commands below.
- Steps 1, 3, 4, and 5 require an internet connection.

Procedure

1. Download all required files from the EPA EMVL SharePoint site, using link sent by email.
2. Install MSYS/MinGW:

- Use the included installer msys2-x86_64-20230318.exe
- Specify a user directory (such as C:\Users\username\dir) to avoid the need for admin privileges.
- Use the "Run MSYS2 64bit now" option from the installer or run msys2.exe from the MSYS installation directory.

3. Update all currently installed msys packages:

- Inside the MSYS terminal (msys2.exe) run the command:

   $ pacman -Syuu

- Respond "y" to all prompts (including closure of terminal after completion)
- Reopen msys2.exe and run the command (for the second time):

   $ pacman -Syuu

Note: Steps 4 & 5 can be combined into a single command:

```
$ pacman -S mingw-w64-i686-toolchain msys/make mingw32/mingw-w64-
i686-curl msys/m4 mingw32/mingw-w64-i686-szip mingw32/mingw-w64-
i686-hdf5
```

4. Install the developer toolchain by running the command (when asked to Enter a selection, press <Enter> to select all):

```
$ pacman -S mingw-w64-i686-toolchain
```

5. Install other required libraries using the following commands:

```
$ pacman -S msys/make
$ pacman -S mingw32/mingw-w64-i686-curl
$ pacman -S msys/m4
$ pacman -S mingw32/mingw-w64-i686-szip
$ pacman -S mingw32/mingw-w64-i686-hdf5
```

6. Run mingw32.exe (located in the MSYS installation directory)

Note: Steps 7 & 8 can be run using the "netcdf_setup" script located in the EFDC_util_Install directory:

```
$ ./netcdf_setup
```

7. Compile NetCDF-C library (using included source):

- Change directory to the location of the netcdf-c source files (EFDC_util_Install/netcdf-c-4.7.4). If source files are located at C:/Users/username/Desktop/EFDC_util_Install/netcdf-c-4.7.4 then use the following command:

```
$ cd /c/Users/username/Desktop/EFDC_util_Install/netcdf-c-4.7.4
```

- Run the following commands to compile and install NetCDF-C:

```
$ ./configure --prefix=/mingw32 --disable-utilities --disable-
netcdf-4 --disable-dap
$ make clean
$ make && make install
```

8. Compile NetCDF-Fortran (using included source)

- Change directory to the location of netcdf-fortran source files (EFDC_util_Install/netcdf-fortran-4.5.3).

- Set required environmental variables using the following commands:

```
$ export CPPFLAGS=-I/mingw32/include
$ export LDFLAGS=-L/mingw32/lib
$ export LIBS="-lnetcdf -lhdf5_hl -lhdf5 -lcurl"
```

- Run the following commands to compile and install NETCDF-Fortran:

```
$ ./configure --prefix=/mingw32
$ make clean
$ make && make install
```

2.0 Compiling the Timestamp Library and EFDC Utility

The following sub-sections (Compilation of Timestamp Library and Compilation of EFDC Utility) can be run automatically using the "makeit" script (located in the `EFDC_util` directory) by running the following command:

`$ ./makeit`

2.1 Compiling the Timestamp Library

The following steps will compile the TimeDll.dll library needed for using UNIX timestamps.

1. Change directory to the location of the timedll source files (`EFDC_util_Install/EFDC_util/timedll`)
2. Run the following commands to compile timeDLL

   `$ make clean`
   `$ make`

3. Export the lib file from the DLL

   `$ dlltool -dllname TimeDll.dll --input-def TimeDll.def --output-lib TimeDll.lib`

4. Copy the DLL and lib to the EFDC util directory

   `$ cp TimeDll.dll ../`
   `$ cp TimeDll.lib ../`

2.2 Compiling the EFDC Utility

1. Change directory to the location of the EFDC utility source files (EFDC_util_Install/EFDC_util)
2. Run the following commands to compile the EFDC utility

   `$ make clean`
   `$ make`

3.0 Running the EFDC Utility

1. Setup input files:
   - Copy all required input files to the EFDC_util/input directory.
   - Required input files are:

CELL.INP	Contains grid masks
control.dat	Contains information on array size (IM,JM,KM)
dxdy.inp	Contains cell length and width information
gridext.inp	Contains latitude and longitude information
GVCLAYER.INP	Contains number of layers at each cell
lxly.inp	Contains cell area information
*.hyd	EFDC hydrodynamic file (this does not need to be in the input directory)

2. Run the EFDC utility (EFDCutil.exe).
   - Run the EFDC utility executable using mingw32.exe, Windows Command Prompt, or by double clicking on the executable.
   - The executable will output the "input" path and "output" path to the terminal. User will be prompted for permission to overwrite the files in the "output" path.
3. Enter name and path for EFDC hydrodynamic file
   - User will be prompted for the path/name of the *.hyd file
   - User can enter absolute or relative paths
   - Be sure to use "\" for path separator

   Ex) For relative path use:

   `.\input\test.hyd`

   Ex) For absolute path use:

   `C:\Users\username\Desktop\EFDC_util_install\EFDC_util\input\test.hyd`

4. Hyd File information will be displayed and user will be prompted for multiple of timestep to output data
   - Example output: Size of timestep in secs: 600
   - This means hyd data is available in 10-minute timesteps
   - If user inputs 1, then data will be output at every available timestep (10-minute intervals)
   - If user inputs 2, then data will be output every other timestep (20-minute intervals)
5. Output step (in seconds) will be confirmed. User should press <Enter> to continue. All output files (NetCDF and text formats) will be written to the output directory (displayed in terminal during step 2).