Steps for Install and run RAPID in less than an hour

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(partly based on documents by Cédric H. David)
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Introduction

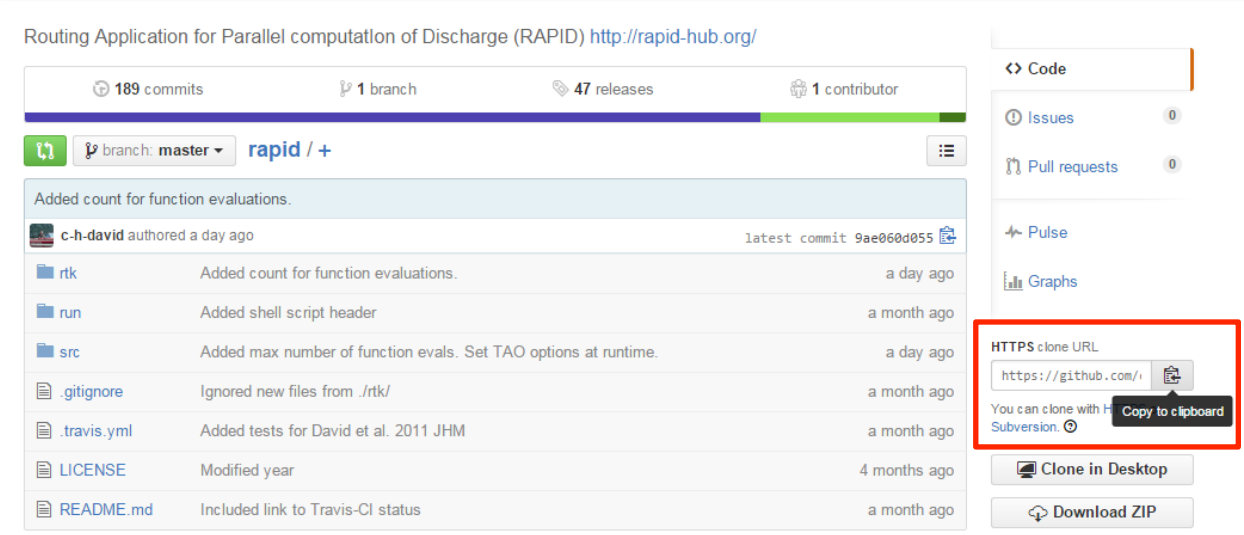
In this short document we explain how to quickly implement a ***regular run*** of RAPID. Everything in this tutorial uses files that are openly available online, except for this particular example simulation files which are hosted on the machine used by participants of the National Flood Interoperability Experiment (NFIE) Summer Institute. However, similar files are available at: http://dx.doi.org/10.5281/zenodo.16565 for a smaller domain.

Download the RAPID source code

Login to the Linux machine and type the following command:

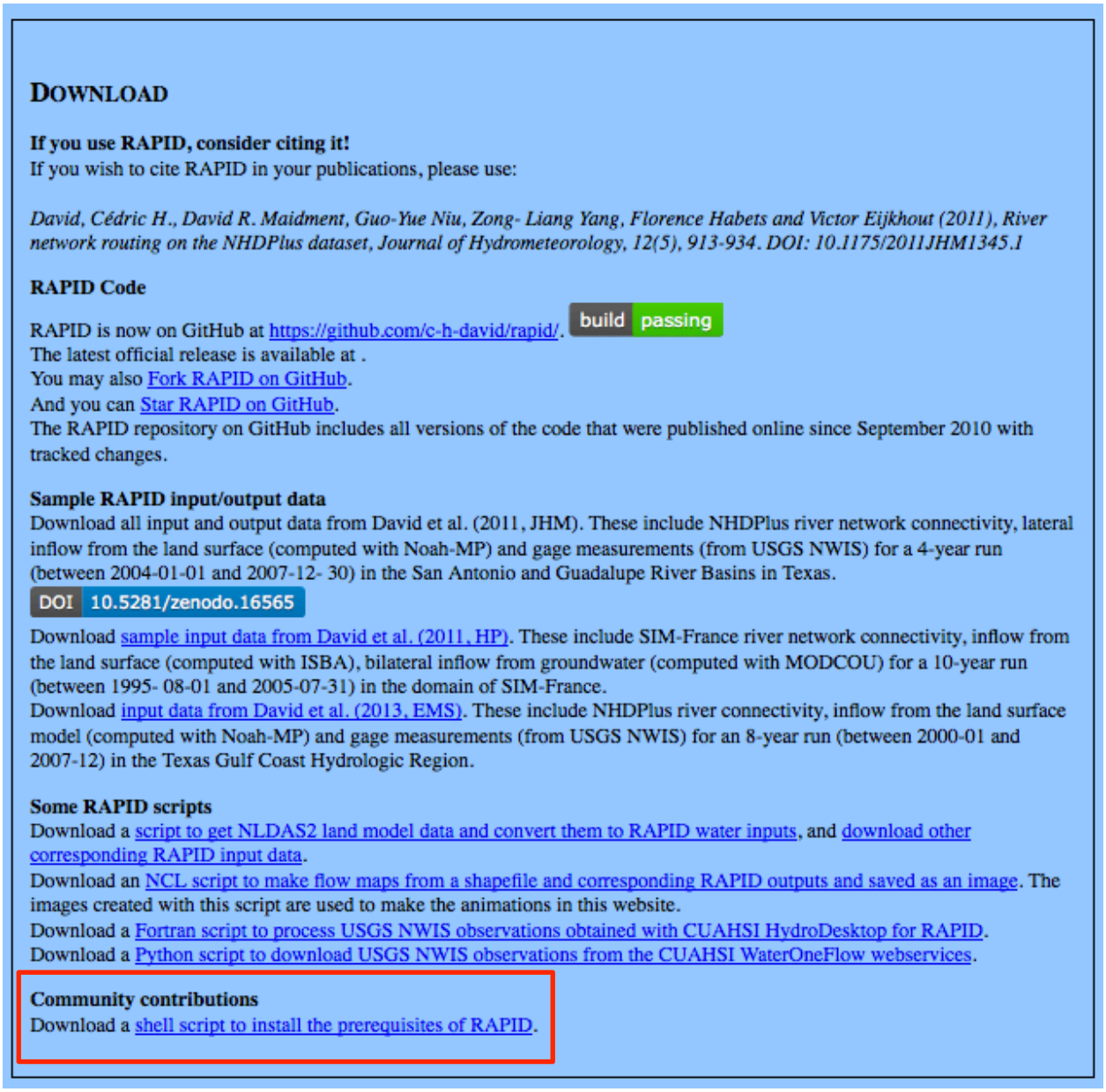
```
git clone https://github.com/c-h-david/rapid.git
```

It will get the latest version of RAPID from the RAPID website:



RAPID prerequisites

A few libraries should be installed in order to run RAPID. A shell script prepared by Alan Snow and allowing downloading and installing the necessary libraries is available on the RAPID website:



DOWNLOAD

If you use RAPID, consider citing it!
If you wish to cite RAPID in your publications, please use:

David, Cédric H., David R. Maidment, Guo-Yue Niu, Zong- Liang Yang, Florence Habets and Victor Eijkhout (2011), River network routing on the NHDPlus dataset, Journal of Hydrometeorology, 12(5), 913-934. DOI: 10.1175/2011JHM1345.1

RAPID Code

RAPID is now on GitHub at https://github.com/c-h-david/rapid/. build passing
The latest official release is available at .
You may also Fork RAPID on GitHub.
And you can Star RAPID on GitHub.
The RAPID repository on GitHub includes all versions of the code that were published online since September 2010 with tracked changes.

Sample RAPID input/output data
Download all input and output data from David et al. (2011, JHM). These include NHDPlus river network connectivity, lateral inflow from the land surface (computed with Noah-MP) and gage measurements (from USGS NWIS) for a 4-year run (between 2004-01-01 and 2007-12- 30) in the San Antonio and Guadalupe River Basins in Texas.
DOI 10.5281/zenodo.16565
Download sample input data from David et al. (2011, HP). These include SIM-France river network connectivity, inflow from the land surface (computed with ISBA), bilateral inflow from groundwater (computed with MODCOU) for a 10-year run (between 1995- 08-01 and 2005-07-31) in the domain of SIM-France.
Download input data from David et al. (2013, EMS). These include NHDPlus river connectivity, inflow from the land surface model (computed with Noah-MP) and gage measurements (from USGS NWIS) for an 8-year run (between 2000-01 and 2007-12) in the Texas Gulf Coast Hydrologic Region.

Some RAPID scripts
Download a script to get NLDAS2 land model data and convert them to RAPID water inputs, and download other corresponding RAPID input data.
Download an NCL script to make flow maps from a shapefile and corresponding RAPID outputs and saved as an image. The images created with this script are used to make the animations in this website.
Download a Fortran script to process USGS NWIS observations obtained with CUAHSI HydroDesktop for RAPID.
Download a Python script to download USGS NWIS observations from the CUAHSI WaterOneFlow webservices.

Community contributions
Download a shell script to install the prerequisites of RAPID.

We recommend downloading and installing the libraries in the `home` directory; even you will be running RAPID from a `work` directory. To go to your home directory, use:

```
cd ~
```

The shell script can now be downloaded using the following command:

```
wget http://rapid-hub.org/data/rapid_install_prereqs.sh.gz
```

Decompress the file by running:

```
gunzip rapid_install_prereqs.sh.gz
```

Edit (using a text editor like `vi`) the name of the directory in which all libraries will be installed, here we use the name `rapid` for the directory name:

```
#*******************************************************************************
#Update user name here
#*******************************************************************************
#Before running the script make sure you install gfortran and g++:
# $ apt-get install gfortran g++
#Also, make sure you give this file execute privileges.
#And, change the NAME variable to your username.
NAME="rapid"
```

Run the shell script using by the following command:

```
./rapid_install_prereqs.sh
```

Once the libraries and downloaded and installed, **do not rename any of the installation folders**, and **do not move any of the installation folders**. Such would break your install.

In the following, you'll need the absolute path of your where you installed all libraries. To do that, use pwd. In our example:

```
login4.stampede(4)$ pwd
/home1/03295/tg825940
```

Set environmental variables

RAPID will know where the libraries are installed based on a few environment variables (i.e. shortcuts). Based on the full path mentioned above (adapt your installation based on your own full path) specify the variables using:

```
export TACC_NETCDF_LIB='/home1/03295/tg825940/rapid/installz/netcdf-
3.6.3-install/lib'
export TACC_NETCDF_INC='/home1/03295/tg825940/rapid/installz/netcdf-
3.6.3-install/include'
export PETSC_DIR='/home1/03295/tg825940/rapid/installz/petsc-3.3-p7'
export PETSC_ARCH='linux-gcc-cxx'
export TAO_DIR='/home1/03295/tg825940/rapid/installz/tao-2.1-p2'
export PATH=$PATH:/$PETSC_DIR/PETSC_ARCH/bin
export PATH=$PATH:/home1/03295/tg825940/rapid/installz/netcdf-3.6.3-
install/bin
```

More information can be found in one of the documents on the RAPID website: "Compile and run RAPID on the Microsoft Azure Cloud"; (http://rapid-hub.org/docs/RAPID_Azure.pdf). The screenshot from the section of the document that we used is shown below:

Set environmental variables

Environment variables are used in Linux to set some user preferences. Such is usually done in a file called .bashrc that is located in the user's home directory /home/username. Here we will specify where the libraries were installed, and make sure Linux knows where the MPI executables for parallel computing (installed with PETSc) are located. Edit the .bashrc file by adding:

```
export TACC_NETCDF_LIB='/home/username/installz/netcdf-3.6.3-
install/lib'
export TACC_NETCDF_INC='/home/username/installz/netcdf-3.6.3-
install/include'
export PETSC_DIR='/home/username/installz/petsc-3.3-p7'
export PETSC_ARCH='linux-gcc-cxx-O3'
#export PETSC_ARCH='linux-gcc-cxx'
#export PETSC_ARCH='linux-gcc-cxx-debug'
export TAO_DIR='/home/username/installz/tao-2.1-p2'
export PATH=$PATH:/$PETSC_DIR/$PETSC_ARCH/bin
export PATH=$PATH:/home/username/installz/netcdf-3.6.3-install/bin
```

You can edit the .bashrc file using a text editor such as "vi". Reload the .bashrc file by either logging out and logging back in or by typing `source ~/.bashrc` on the terminal. This insures that every time the computer starts, those environment variables are set. Optionally, you can set the environment variables by just typing those commands on a terminal window and continue the rapid install steps on the same window without closing it.

Compile RAPID

Once the environment variables are set, we can compile RAPID, to do this, use the following command in the source directory (`src`):

```
make rapid
```

You should be able to see the `rapid` executable in the `src` directory:

```
login2.stampede(3)$ ls
LICENSE  README.md  rtk  run  src
login2.stampede(4)$ cd src
login2.stampede(5)$ ls
makefile                    rapid_get_Qdam.F90        rapid_phiroutine.F90
rapid                       rapid_hsh_mat.F90         rapid_read_namelist.F90
rapid_arrays.F90            rapid_init.F90            rapid_read_Qfor_file.F90
rapid_close_Qfor_file.F90   rapid_main.F90            rapid_read_Qhum_file.F90
rapid_close_Qhum_file.F90   rapid_net_mat_brk.F90     rapid_read_Qobs_file.F90
rapid_close_Qobs_file.F90   rapid_net_mat.F90         rapid_read_Vlat_file.F90
rapid_close_Qout_file.F90   rapid_obs_mat.F90         rapid_routing.F90
rapid_close_Vlat_file.F90   rapid_open_Qfor_file.F90  rapid_routing_param.F90
rapid_create_obj.F90        rapid_open_Qhum_file.F90  rapid_set_Qext0.F90
rapid_create_Qout_file.F90  rapid_open_Qobs_file.F90  rapid_var.F90
rapid_destro_obj.F90        rapid_open_Qout_file.F90  rapid_write_Qout_file.F90
rapid_final.F90             rapid_open_Vlat_file.F90
login2.stampede(6)$ pwd
/work/03295/tg825940/aat669/rapid/src
```

Run RAPID

(This particular section uses files that are not currently openly available online.)

The input files are located at:

```
/work/03295/tg825940/aat669/rapid/input/Reg12/
```

The namelist is located at:

```
/work/03295/tg825940/aat669/rapid/run/rapid_namelist_Reg12
```

Copy these files in your own RAPID folder.

RAPID is run in the `run` directory.

Use the following line to link to the default namelist name to the namelist of the project:

```
ln -s ../../rapid_project/rapid_unified/rapid_namelist_Reg12
rapid_namelist
```

The last step is to Run RAPID. Type the following short command:

```
./rapid
```

You are done! Take a coffee break before digging to the results.