



How to install the integrated code: TASK

A. Fukuyama

Professor Emeritus, Kyoto University

1. Preparation for macOS
2. Preparation for Ubuntu
3. Install PETSc
4. Introduction to git
5. Install task and related libraries
6. Introduction to the task code

Preparation for macOS (1)

- **Install Xcode**

- Xcode: development environment on macOS
- Use App Store
- Category: Development
- Choose and install Xcode

- **Install Command_Line_Tools**

- Command_Line_Tools: various Unix commands for development
- Input command on terminal
- `xcode-select --install`

- **Install XQartz**

- Download and install XQartz from <https://www.xquartz.org>

- **Install java**

- Download and install java from https://www.java.com/en/download/mac_download.jsp

Preparation for macOS (2)

- **Install Macports**

- Download the latest macports binary from <https://www.macports.org>
- Select tab: Installing MacPorts
- Quickstart: download and install MacPorts installer for appropriate macOS version
- MacPorts is mostly installed at /opt/local
- Update to the latest Macports
 - `sudo port selfupdate`
 - `sudo port upgrade outdated`

- **Install compiler and related modules**

- gfortran: `sudo port install gcc11`
- mpich: `sudo port install mpich`
- others: `sudo port install gmake cmake imake`

Preparation for Ubuntu

1. Install required modules

```
sudo apt-get install gfortran-11
```

```
sudo apt-get install gcc-11
```

```
sudo apt-get install g++-11
```

```
sudo apt-get install git
```

```
sudo apt-get install xorg-dev
```

```
sudo apt-get install valgrind
```

```
sudo apt-get install cmake
```

```
sudo apt-get install python
```

```
sudo apt-get install mpich
```

Install PETSc (1)

- **PETSc**: Parallel matrix solver library
 - blas,lapack: matrix solver tolls
 - scalapack, metis, parmetis, blacs, superlu: parallel solver tools
 - MUMPS: Direct matrix solver for real and complex
 - PETSc: Iterative matrix solver for real or complex
- **Make PETSc directory and change its owner**
 - `sudo mkdir /opt/PETSc`
 - `sudo chown /opt/petsc $USERNAME`
 - `cd /opt/PETSc`
- **Download latest PETSc library package by git**
 - **First download of PETSc source**
 - `git clone -b release https://gitlab.com/petsc/petsc.git petsc`
 - **In order to update PETSc source**
 - `git pull`

Install PETSc (2)

- **Provide environment variables for PETSC in ~/.profile or .zprofile**
 - `export PETSC_DIR=/opt/PETSc/petsc`
 - `export PETSC_ARCH=default`
- **Configure script in python**
 - **Copy** `default.py` **to** `/opt/PETSc/petsc`
 - **Provide exec attribute to** `default.py`
 - `chmod 755 default.py`
 - **Execute configuration script** (It may take half an hour.)
 - `./default.py`
 - **Additional libraries are created in** `default/externalpackages`
- **Make and check PETSc library**
 - `make` (It may take half an hour.)
 - `make check`

How to use git (1)

- **git**: version and remote repository control facility
- **Repositories**
 - **local**: in your machine
 - **remotes**: in remote servers
 - **remotes/origin**: in default server: bpsi.nucleng.kyoto-u.ac.jp
- **Branches**
 - **There are several branches for code development**
 - **master**: default, stable version, often rather old
 - **develop**: latest version, where I am working
 - **others**: branches for working specific modules
 - **cd task**
 - **git branch** : list branch names, local only
 - **git branch -a** : list branch names, local and remote

How to use git (2)

- **To use develop branch**
 - **Create local branch develop and associate it with remote develop**
 - `git checkout -t -b develop origin/develop`
 - `git branch`
- **Change working branch**
 - `git checkout master`
 - `git checkout develop`
- **Update working branch:** download from remote repository
 - `git pull`
 - Your modification is kept, if committed.
 - If uncommitted modification remains, no overwrite.
 - use `git stash` to keep away your modification.
 - If there are conflicts with your committed modification, the conflicts are indicated in the file. Correct them and `git pull` again.

How to use git (3)

- **To check your modification**
 - `git status`
- **To commit your modification with message:** only local depository is updated. message is required.
 - `git commit -a -m'message'`
- **To list all modification**
 - `git log`
- **To show difference from committed repository**
 - `git diff [filename]`
- **For more detail, visit**
 - <https://git-scm.com/documentation>

Install TASK (1)

- **Check availability of git:** just command input “git”
- **Set your identity:** To record who changed the code?
 - `git config --global user.name “[your-full-name]”`
 - `git config --global user.email [your-mail-address]`
 - For example,
 - `git config --global user.name “Atsushi Fukuyama”`
 - `git config --global user.email fukuyama@nucleng.kyoto-u.ac.jp`
 - Data is saved in `$HOME/.gitconfig`
- **Create a working directory:** any directory name is OK
 - `mkdir git`
 - `cd git`

Install TASK (2)

- **Download TASK and necessary libraries** for download only
 - `git clone https://bpsl.nucleng.kyoto-u.ac.jp/pub/git/gsaf.git`
 - `git clone https://bpsl.nucleng.kyoto-u.ac.jp/pub/git/bpsd.git`
 - `git clone https://bpsl.nucleng.kyoto-u.ac.jp/pub/git/task.git`
- **Download TASK and necessary libraries** for download and upload
 - `git clone ssh://username@bpsl.nucleng.kyoto-u.ac.jp/pub/git/gsaf.git`
 - `git clone ssh://username@bpsl.nucleng.kyoto-u.ac.jp/pub/git/bpsd.git`
 - `git clone ssh://username@bpsl.nucleng.kyoto-u.ac.jp/pub/git/task.git`
 - `username@` can be omitted if the usernames at remote and local are same.
- **Three directories are created**
 - **gsaf**: graphic library
 - **bpsd**: data interface library
 - **task**: main TASK directory

Install TASK (3)

- **Install graphic library GSAF**

- `cd git/gsaf/src`
- Copy Makefile.arch appropriate for your environment
 - for macOS: `cp ../arch/macos-gfortran/Makefile.arch .`
 - for Ubuntu: `cp ../arch/ubuntu-gfortran64-static/Makefile.arch .`
- **Edit Makefile.arch**: adjust BINPATH and LIBPATH to available ones
 - BINPATH: graphic commands are located, should be included in \$PATH in ~/.profile or ./zprofile
 - LIBPATH: graphic libraries are located, should be included in library path for compiling applications using the graphic libs.
- `make`
- `make install`
 - if BINPATH is protected, use “`sudo make install`”

Install TASK (4)

- **Check the availability of GSAF library**
 - `cd test`
 - `make`
 - Applications using GSAF library must be started from X11 window such as xterm, not from Terminal on macOS.
 - `./bsctest`
 - `5` : Choose the size of window
 - `c` : Continue the run
 - `m`
 - New graphic window opens and marks and lines are drawn.
 - To go back to the original window, enter CR.
 - If focus does not change, click the original window and check XQartz preferences.
 - `e` : Close the graphic window
 - `cd ../../..`

Install TASK (5)

- **Setup make.header file**
 - `cd task`
 - `cp make.header.org make.header`
 - **Edit make.header** to remove comments for target OS and compiler
- **Compile data exchange library BPSD**
 - `cd ../bpsd`
 - `make`
 - `cd ../task`
- **Compile TASK:** eq for example
 - `cd eq`
 - `make`
 - `./eq`

Install TASK (6)

- **Type of parallel matrix solver configuration**
 - `.nompi`: only single- processing solver without MPI environment
 - `.mpi`: only single-processing solver with MPI environment
 - `.petsc`: various parallel iterative solvers in with MPI
 - `.petsc+mumps`: various parallel iterative and direct solvers with MPI
- **Setup matrix solver library**
 - `cd mtxp`
 - `cp make.mtxp.XXX make.mtxp`
 - `make`
- **Compile modules:**
 - **Edit the beginning of Makefile:** Select matrix solver
 - **Real** matrix equation (fp,ti): any mtxp library
 - **Complex** matrix equation (wm,wf2d,wf3d): band matrix or MUMPS

How to use GSAF

- **At the beginning of the program**
 - **Set graphic resolution** (0: metafile output only, no graphics)
 - **commands**
 - **c**: continue
 - **f**: set metafile name and start saving
- **At the end of one page drawing**
 - **commands**
 - **c** or **CR**: change focus to original window and continue
 - **f**: set metafile name and start saving
 - **s**: start saving and save this page
 - **y**: save this page and continue
 - **n**: continue without saving
 - **d**: dump this page as a bitmap file “gsdumpn”
 - **b**: switch on/off bell sound
 - **q**: quit program after confirmation

Graphic Utilities

- **Utility program**

- **gsview**: View metafile
- **gsprint**: Print metafile on a postscript printer
- **gstoeeps**: Convert metafile to eps files of each page
- **gstops**: Convert metafile to a postscript file of all pages
- **gstotgif**: Convert metafile to a tgif file for graphic editor tgif
- **gstotsvg**: Convert metafile to a svg file for web browser

- **Options**

- **-a**: output all pages, otherwise interactive mode
- **-s ps**: output from page ps
- **-e pe**: output until page pe
- **-p np**: output contiguous *np* pages on a sheet
- **-b**: output without title
- **-r**: rotate page
- **-z**: gray output

Typical File Name of TASK

- **XXcomm.f90**: Definition of global variables, allocation of arrays
- **XXmain.f90**: Main program for standalone use, read XXparm file
- **XXmenu.f90**: Command input
- **XXinit.f90**: Default values
- **XXparm.f90**: Read input parameters
- **XXview.f90**: Show input parameters
- **XXprep.f90**: Initialization of run, initial profile
- **XXexec.f90**: Execution of run
- **XXgout.f90**: Graphic output
- **XXfout.f90**: Text file output
- **XXsave.f90**: Binary file output
- **XXload.f90**: Binary file input

Typical input command

- When input line includes **=**, interpreted as a namelist input (e.g., **rr=6.5**)
- When the first character is not an alphabet, interpreted as line input
- **r**: Initialize profiles and execute
- **c**: Continue run
- **p**: Namelist input of input parameters
- **v**: Display of input parameters
- **s**: Save results into a file
- **l**: Load results from a file
- **q**: End of the program
- **Order of input parameter setting**
 - Setting at the subroutine **XX_init** in **XXinit.f90**
 - Read a namelist file **XXparm** at the beginning of the program
 - Setting by the input line