



How to install the integrated code: TASK

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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 - `sudo port upgrade outdated`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
```

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)

- **Use the latest develop branch and setup files, make.header and make.mtxp**
 - `cd task`
 - `git checkout -t -b develop origin/develop`
 - `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`

Install TASK (6)

- **Choice of parallel matrix solver configuration**
 - Single processing without MPI: `make.mtxp.nompi`
 - Single processing with MPI: `make.mtxp.mpi`
 - Multi processing with parallel real matrix solver: `make.mtxp.petsc`
 - Multi processing with parallel real and complex solver: `make.mtxp.petsc+mumps`
- **Module using parallel matrix solver**
 - **Real**: fp, ti, pic, t2
 - **Complex**: wmx, wf2d, wf2dt, wf2dx, wq
- **Setup matrix solver library**
 - `cd mtxp`
 - `cp make.mtxp.XXX make.mtxp`
 - `make`
 - `cd ..`

Install TASK (7)

- **Compile modules:**
 - `cd lib`
 - `make`
 - `cd ..`
- **Compile TASK:** eq for example
 - `cd eq`
 - `make`
 - `./eq`
 - `5`
 - `c`
 - `r`
 - `g`
 - `s, CR, CR, ...`
 - `x`
 - `q`

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

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`