CMake use

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What is CMake

Officiel website: http://www.cmake.org

CMake is a cross-platform, open-source build system. It is a family of tools designed to build, test and package software

→ The use of CMake can be described as adding a configuration step in the compilation process (like a *./configure* in Linux. This step aims at automatically detect parameters use during the compilation.

The different kinds of parameter detected can refer to:

- the operating system
- the compiler used
- the dependency to other programs, libraries...

CMake allows an out of source tree build

Use: process

1. Build directory creation

   ```
   > mkdir build
   > cd build
   ```

2. Configuration

   ```
   > cmake path_to_sources
   ```

3. Compilation

   ```
   > make
   ```

4. Test (optional)

   ```
   > make test
   ```

5. Installation (not mandatory)

   ```
   > make install
   ```

Example: LMGC90v2_dev

Application to the LMGC90v2_dev repository:

```
> mkdir build
> cd build
> cmake ../LMGC90v2_dev
-- The Fortran compiler identification is Intel
-- Check for working Fortran compiler: /opt/intel/Compiler/11.1...
-- Check for working Fortran compiler: /opt/intel/Compiler/11.1...
   .
   .
   .
> make -j4
```

Example: Details

The configuration step creates, among others, a *CMakeCache.txt* file. In this file, all configuration variables are saved (compiler, source file location...)

$\rightarrow$ after a configuration, the source file tree or the build file tree can NOT be moved

This configuration step is needed only once. If any source file is modified only a compilation is needed through the command: *make*.

make -jx allows the use of x processors instead of only one during the compilation

There is a graphical user interface of CMake: *cmake-gui*

Adding options

Aim of the options:

- to help cmake with choosing/finding a dependency, a compiler...
- to parameter the desired compilation

To add an option : $-Doption = value$

Options can be added during:

- the first configuration

  ```
  > cmake source_path -Doption=value
  ```

- after the first configuration

  ```
  > cmake . -Doption=new_value -Doption2=other_value
  ```

Editing and modifying the *CMakeCache.txt* file is not recommended even it may work sometimes.

Example: LMGC90v2_dev

Application to the LMGC90v2_dev repository:

```
> cd build
> cmake . -DOPT=check
> make -j4
```

Options defined by cmake:

- CMAKE_Fortran_COMPILER: choice of Fortran compiler
- CMAKE_Fortran_FLAGS: adding options when compiling fortran files
- CMAKE_VERBOSE_MAKEFILE: displaying more information during compilation

Options defined for LMGC90v2_dev :

- MATLIB_VERSION: (STRING *off*, *default*. By default *default*) use of the MatLib
- BUILD_CHIPY: (BOOL default ON) build of the lmgc90 python module (*chipy*)
- BUILD_PRE: (BOOL default ON) build of *prepro_grains* and *prepro_mesh2D* of the preprocessor
- OPT: (STRING : *opt*, *debug* or *check*. Default is *opt*) to modify the optimization level of *gfortran* and *ifort* compilers
- BUILD_C_LIB: (BOOL default OFF) build of a C shared library (API of the wrap)
- BUILD_Fortran_LIB: (BOOL default OFF) build of a Fortran shared library (API of the Core)

- BUILD_STANDALONE: (BOOL default OFF). Executable without python interface.
- WITH_OPENMP: (BOOL default OFF). Add openmp parallelization flags to compilation.
- WITH_MPI: (BOOL default ON if *Doxygen* is found) generation of the python
- MUMPS_VERSION: (STRING *none*, *sequential*, *parallel*). Default is *none*. Allow to use the MUMPs library.
- WITH_SICONOS_NUMERICS: (BOOL default OFF). Link with Siconos numerics solver library.
- WITH_DOCSTRING : (BOOL default ON if *Doxygen* is found) generation of the python documentation(*docstring*) of the *chipy* module to modify the optimization level of *gfortran* and *ifort* compilers

In case of OpenMP compilation, ensure to set the environment variables :

```
> export OMP_NUM_THREADS=4
> export OMP_SCHEDULE=STATIC
```