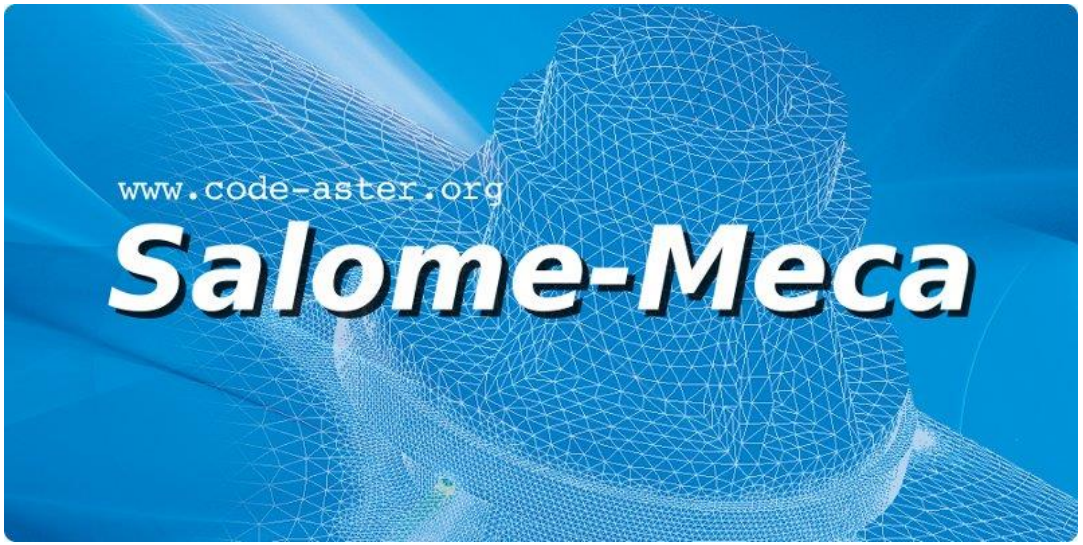
# Development in code_aster
# Creating a new macro-command




**Code_Aster, Salome-Meca course material**

# What is a macro-command ?

Looks like a standard Code_Aster command.

```
acce2 = CALC_FONCTION(FFT=_F(FONCTION=acce, SYME='OUI'))
```

Has its own syntax description.

Usually calls some other commands.

May be very closed to usual command files

Written in Python but more or less « pythonized ».

Returns 0, 1 or N Code_Aster results.

Example of official macro-commands:

- ASSEMBLAGE: mainly a sequence of commands
- CALC_MODES: high level switcher between some more basic commands
- CALC_TABLE: works on Python objects converted from Jeveux objects
- CALC_EUROPLEXUS: calls an external program and build a Code_Aster object

# Arguments of the macro-command

[d5.01.02]

## Arguments passing:

```
def calc_function_ops(self, NOM_PARA, NOM_RESU, **args):
   """description"""
```

*self is the macro-command objects.*

*All **existing** keywords at the first level can be passed as arguments. You must check existence of those under blocks! Unnamed arguments are available with args[keyword].*

## Use the keywords value:

- High-level simple keyword: just use it as a usual variable

  `NOM_PARA` contains a string, for example: `'INST'`

  Simple keywords are list if *max='**'* even if there is only one item.

- Python Keyword arguments (syntax ***args*)

  `args['INFO']` contains an integer: 1 or 2

- Loop on factor keyword occurrences (`COMB` can/should be repeated):

```
for mcf in args['COMB']:
    func = mcf['FONCTION']
    # mcf['FONCTION'] is a fonction_sdaster
```

  Factor keywords always contains a list even if *max=1*.

  Simple keywords under each occurrence of `COMB` are available with `mcf[`*`keyword`*`]`

# Under the hood of the macro-command

## Always starts with

```
self.set_icmd(1)
```

*Used by the supervisor for the numbering of commands: just copy/paste and forget it!*

## Import of Code_Aster commands:

```
from Cata.cata import LIRE_MAILLAGE, _F
```

## Import of utilities:

```
from Utilitai.Utmess import UTMESS
UTMESS('A', 'MESSAGE_NN', valk=…, vali=…, valr=…)
```

## Internal Code_Aster objects:

The results of Code_Aster commands must not conflict with the user commands file.

```
__mesh = LIRE_MAILLAGE()
```

*Beginning with 2 underscores, the result is temporary and will be automatically deleted at the end of the macro-command. It will be named '.99999xx'.*

```
_mesh = LIRE_MAILLAGE()
```

*Beginning with one underscore, the result is hidden to the user, not deleted at the end, should be referenced by another object (model -> mesh for example). It will be named '_99999xx'.*

Use two underscores as often you can (but only for commands results for readibility)!

# Result(s) of the macro-command

Back to `sd_prod` method for more than one results:

- Returns the type of the main result
- Types the other results in its body (keywords declared with `typ=CO`)

Example:

```
def more_complex_sdprod(self, MODELE, **kwargs):
    self.type_sdprod(MODELE, modele_sdaster)
    return maillage_sdaster
```

Usage:

```
resmesh = MYCMD(MODELE=CO('resmodel'), …)
```

Link between the result and the local variable

For the main result:

```
self.DeclareOut('mesh', self.sd)
mesh = LIRE_MAILLAGE(…)
```

Other results:

```
self.DeclareOut('model', MODELE)
model = AFFE_MODELE(…)
```

Only that when the macro returns one result.

# Exercise

```
cd $HOME/dev/codeaster/src
hg pull -r a8b1cf codeaster_push
hg update -C a8b1cf
```

Create a macro-command, called CONV_MAIL_MED, that:

- reads a mesh file in the ASTER format (.mail),
- writes this mesh onto a MED file using a given logical unit number,
- reads this MED file in order to return a *maillage_sdaster* object.

- Inputs:
  - `UNITE_IN`: Logical number of a mesh file, compulsory.
  - `FORMAT_IN`: Format of this mesh file, 'ASTER' by default, no other value for the moment
  - `UNITE_OUT`: Logical number of the MED file, same default as in IMPR_RESU

    *This number is an input, the file is an output.*
  - `INFO`: Verbosity flag that will be passed to subcommands. Optional, 1 or 2, default is 1.
- Output
  - The mesh (maillage_sdaster object).
- Improvements
  - Accept more formats in `FORMAT_IN`: `'GIBI'`, `'GMSH'`.

# Use case

```
DEBUT()

master = CONV_MAIL_MED(UNITE_IN=20,
                       INFO=2)

mgmsh = CONV_MAIL_MED(UNITE_IN=21,
                      FORMAT_IN='GMSH',
                      UNITE_OUT=81,
                      INFO=2)

mgibi = CONV_MAIL_MED(UNITE_IN=22,
                      FORMAT_IN='GIBI',
                      UNITE_OUT=82,
                      INFO=2)

FIN()
```

A testcase must really check the command using `TEST_xxx` operators.

# Skeleton of conv_mail_med.py

```
CONV_MAIL_MED = MACRO(
    nom="CONV_MAIL_MED",
    op=OPS('Macro.conv_mail_med_ops.conv_mail_med'),
    sd_prod= … ,
    fr=tr("Conversion d'un maillage vers le format Med"),

    reentrant= … ,

    UNITE_IN= … ,
    FORMAT_IN= … ,
    UNITE_OUT= … ,

    INFO= … ,
)
```

# Skeleton of conv_mail_med_ops.py

```
from code_aster.Cata.Syntax import _F
from code_aster.Cata.Commands import PRE_GIBI, PRE_GMSH, LIRE_MAILLAGE,
   IMPR_RESU
from Utilitai.Utmess import UTMESS


def conv_mail_med(self, UNITE_IN, FORMAT_IN, UNITE_OUT, **kwargs):
    """Convert a mesh to the Med format"""
    self.set_icmd(1)

    # print the message MESH_1
    UTMESS( … )
    # declare the output
    …
    # convert the mesh file if FORMAT_IN != 'ASTER'
    …
    # read the input mesh file
    …
    # write the med file
    …
```

# Content of Messages/mesh.py

```
cata_msg = {
    1 : _(u"""
Conversion du maillage au format %(k1)s, sur l'unité logique %(i1)d,
au format MED dans le fichier d'unité logique %(i2)d.
"""),
}
```

Expects two integers and one string.

The message identifier is built from the filename (uppercases) and the message number:

Message #1 in mesh.py => MESH_1

# Debugging a macro-command

+ Trace subcommands calls with:
`DEBUT(IMPR_MACRO='OUI')`

## Prepare of the execution directory with

```
waf test -n tpdvp04a -exectool=env
```

Open the output, and copy/paste the instructions:

```
cd /tmp/user-hostname-interactif.11144
```

*[There may be several environment files]*

```
. $HOME/dev/codeaster/install/std/share/aster/profile.sh
```

To start execution in the Python debugger you could type :

```
cp fort.1.1 fort.1
…/install/std/bin/aster /usr/lib/python2.7/pdb.py
…/install/std/lib/aster/Execution/E_SUPERV.py -commandes fort.1  -num_job 11144 -mode
interactif -rep_outils /opt/aster/outils -rep_mat …/install/std/share/aster/materiau -
rep_dex …/install/std/share/aster/datg -tpmax 60.0 -memjeveux 126.5
(Pdb) break /home/mc/dev/codeaster/install/std/lib/aster/Macro/conv_mail_med_ops.py:29
Breakpoint 1 at /home/mc/dev/codeaster/install/std/lib/aster/Macro/conv_mail_med_ops.py:29
(Pdb) continue
…
(Pdb) print UNITE_IN
20
(Pdb) next
…
(Pdb) list
…
```

# Coding tips

- Use small functions
- Take benefit of the Object-Oriented Programming

  Example of CALC_FONCTION:

  - Each factor keyword calculates a function using different algorithms but the reading of inputs and the build of the output function are common.
  - Each factor keyword is a different subclass of an abstract one.
  - Adding a new calculation is easy.
- Document all functions, classes… you will save this time later!
- The source code must respect the PEP8 conventions

# End of presentation

Is something missing or unclear in this document?

Or feeling happy to have read such a clear tutorial?

Please, we welcome any feedbacks about Code_Aster training materials.

Do not hesitate to share with us your comments on the Code_Aster forum dedicated thread.