How to perform a CNRM-CM6 simulation on Beaufix ?

(in the context of CMIP6)

Marie-Pierre Moine, Stéphane Sénési, mai 2018

Special thanks to the Toulouse-Paris CMIP6 technical team

@CNRM: Stéphane Sénési, David Saint-Martin, Aurore Voldoire, , Laurent Franchistéguy, Pierre Nabat, Martine Michou, Bertrand Decharme, Roland Séférian, Jeanne Colin, Romain Roherig,...
@IPSL: Yann Meurdesoif, Arnaud Caubel, Guillaume Levavasseur, Sébastien Denvil
@Cerfacs: Sophie Valcke, Laurent Bessières, Marie-Pierre Moine

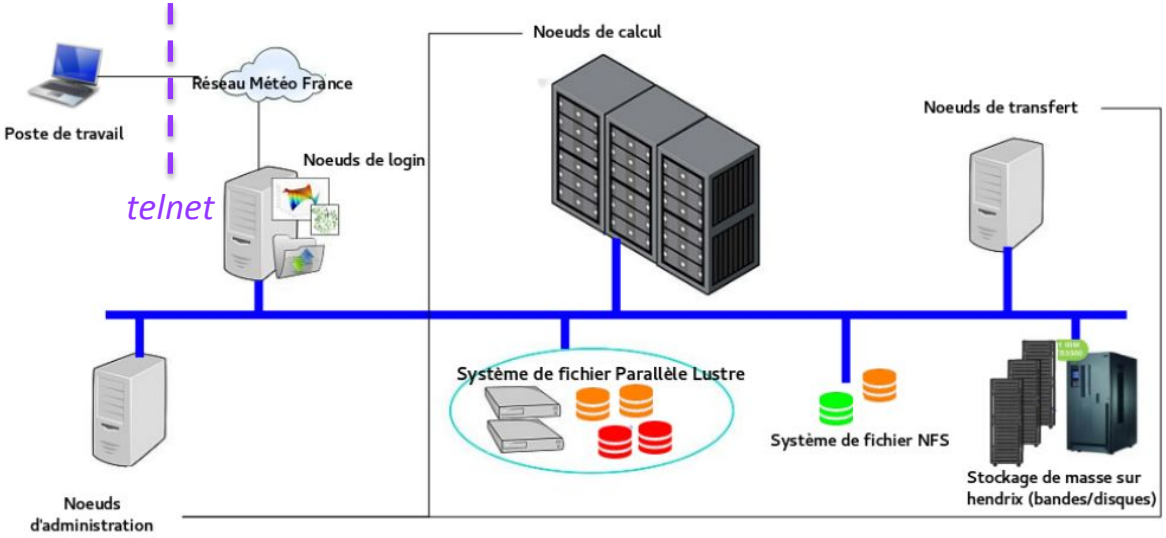
Who is beaufix ?

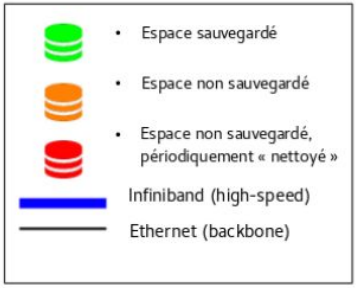
Meteo France super-computer :

- # of nodes: 1836
- # of cores/node: 40
- peak power: 2885 TFlops

FireWall (Garde-Barrière)

@cerfacs

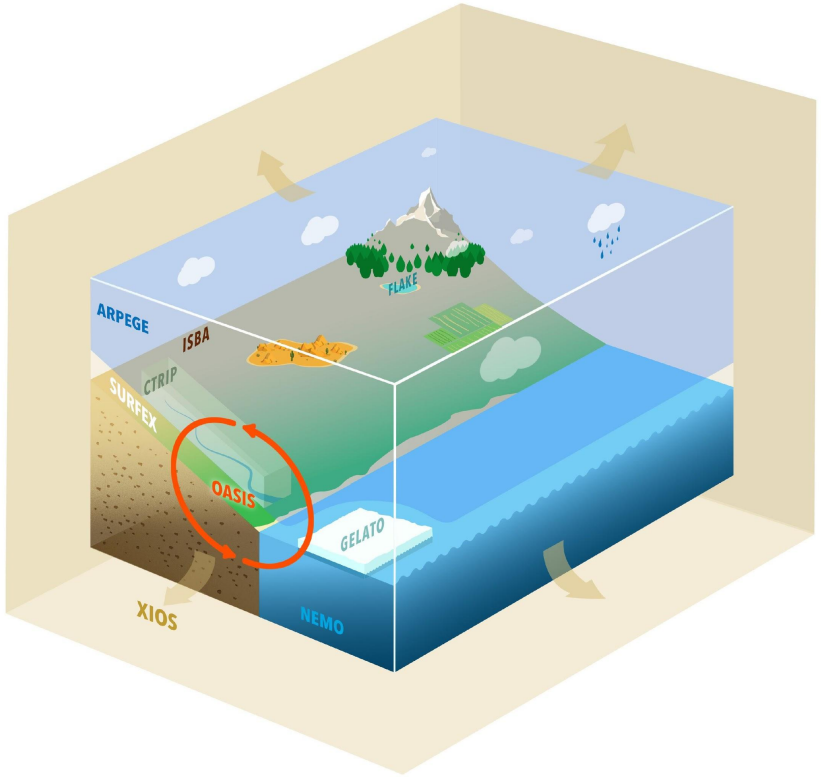




Hisgh-speed interconnect network :
Réseau Infiniband, utilisé pour le transfert de données entre les noeuds de calcul et les nœuds d'IO.

Backbone network :
Il connecte les nœuds d'administration et de login au monde extérieur en utilisant Ethernet.

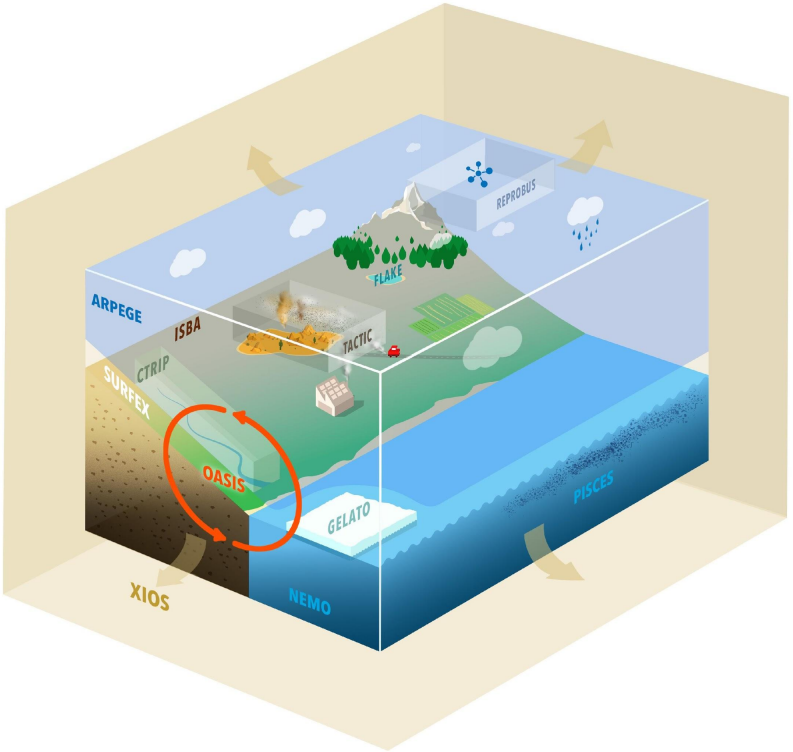
CNRM-CM/ESM for CMIP6



CNRM-CM

CNRM-CM6-1

CNRM-CM6-1-HR



CNRM-ESM

CNRM-ESM2-1

CNRM-ESM2-1-HR

CNRM-CM6 model components

			LR (standard)	HR
Atmosphere:	ARPEGE 6.3.1	1 exe	T127 L91	T359 L91
Continental Surfaces:	SURFEX		*~250 km*	*~50 km*
Ocean:	NEMO 3.6_stable	1 exe	eORCA1 L75	eORCA025 L75
Sealce:	GELATO		*~100 km*	*~25 km*
River routing:	TRIP	1 exe	T359	T359
			~50 km	*~50 km*
Coupler:	OASIS3-MCT	library		
IO server:	XIOS 1442	1 exe (xios server), clients (xios linked)		

Remarkable technical improvements since CMIP5/CNRM-CM5

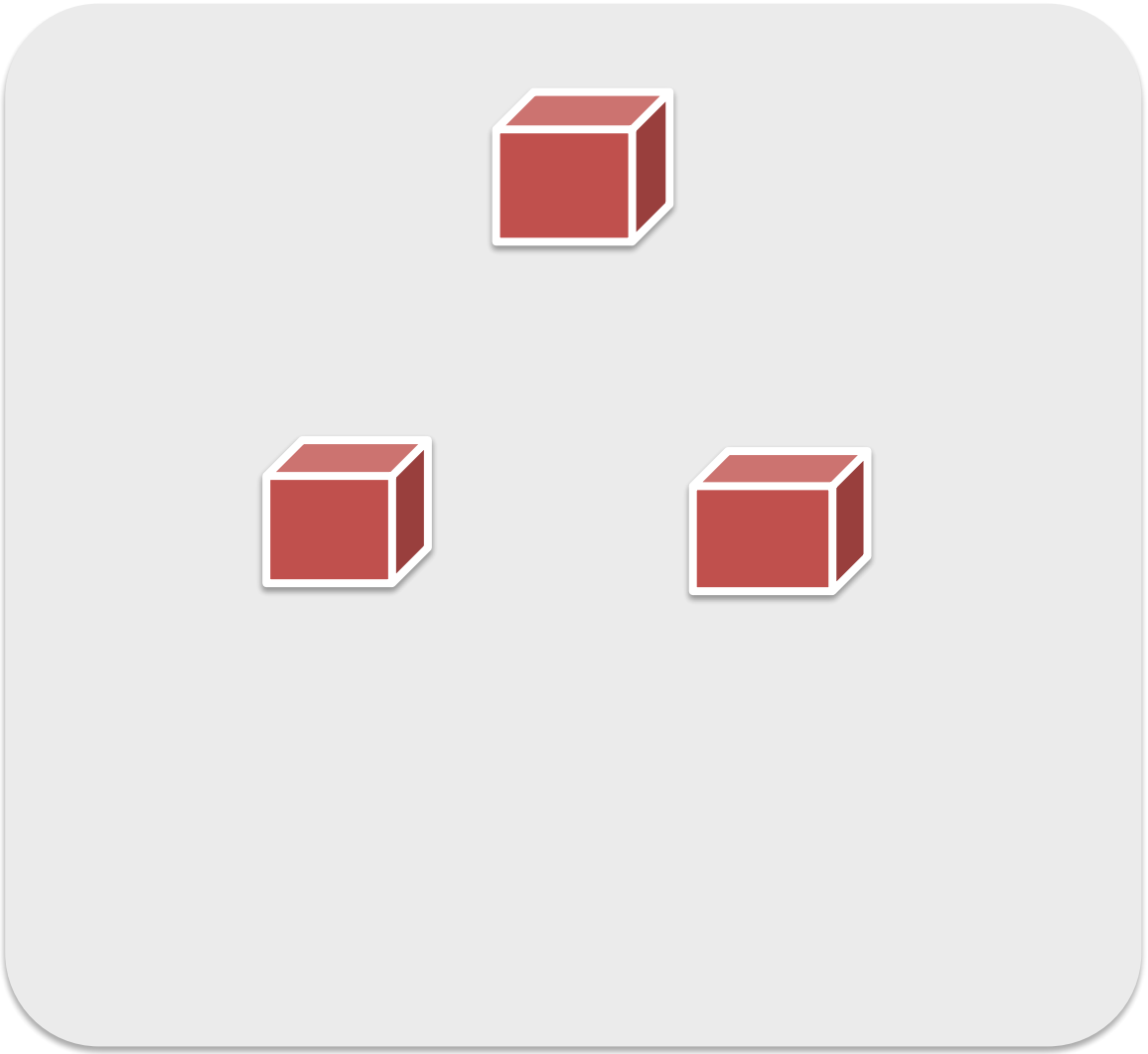
CMIP6 is not CMIP5 !

- Complexification compared to CMIP5:
  - Pharaonic amount of output requested
  - variability across CMIP6 experiments

Major evolutions in the workflow:

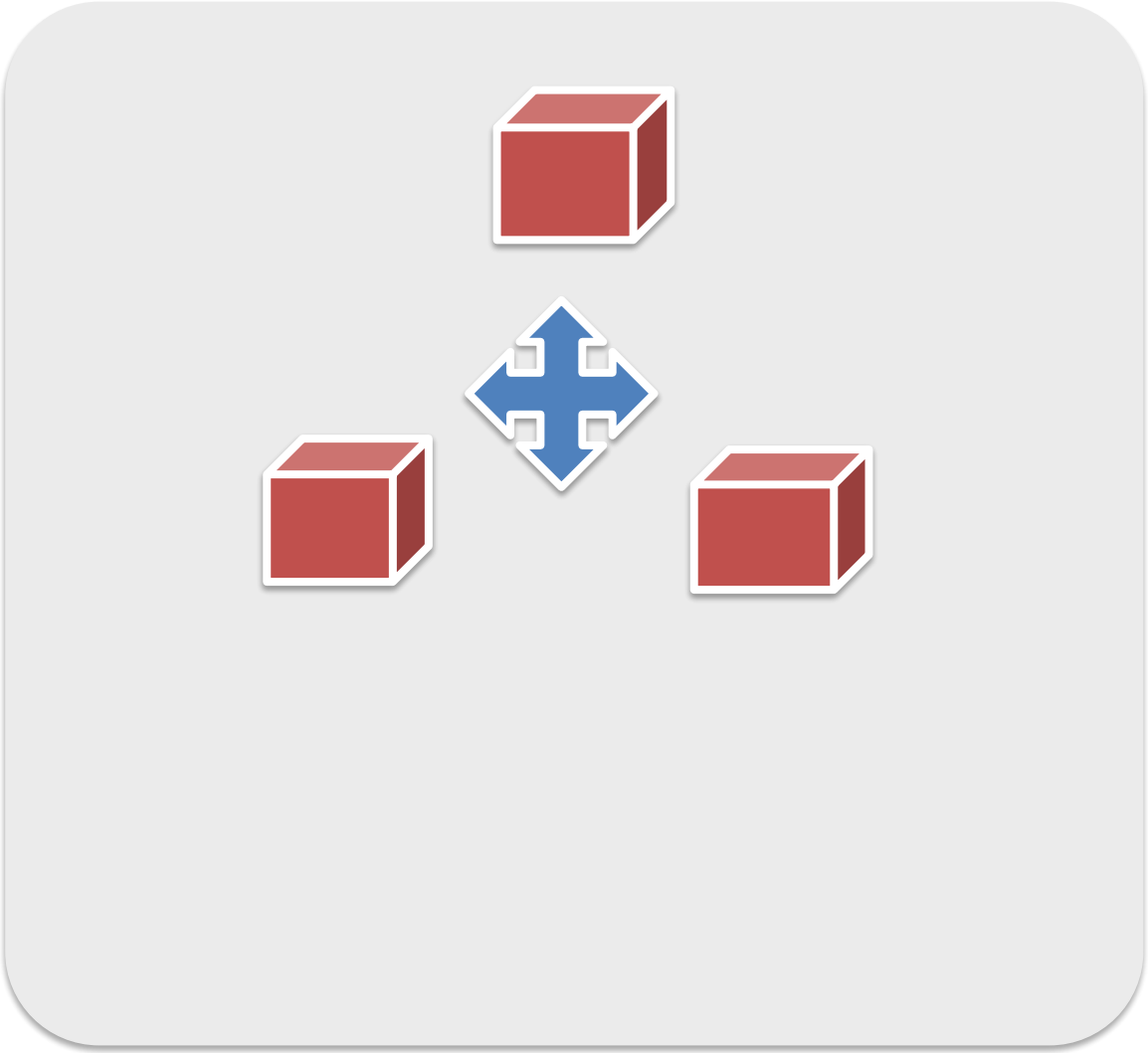
- We took up the challenge of a direct production by the model of CMIP6-compliant netcdf files (matching CF/CMOR standards)
- XIOS underwent major evolutions (Y. Meurdesoif@IPSL) to meet the CMIP6 objectives
- XIOS is now plugged in all model components (S. Senesi@CNRM) : ARPEGE/SURFEX, TRIP, GELATO (XIOS was already in NEMO)
- A new tool, dr2xml, have been developed to produce XIOS configuration files (xml) that fully respects the CMIP6 DR (S. Senesi@CNRM; MP. Moine @Cerfacs)

Ingredients of a coupled model



Model components (ARPEGE, NEMO, …)

Ingredients of a coupled model



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Coupler (OASIS)

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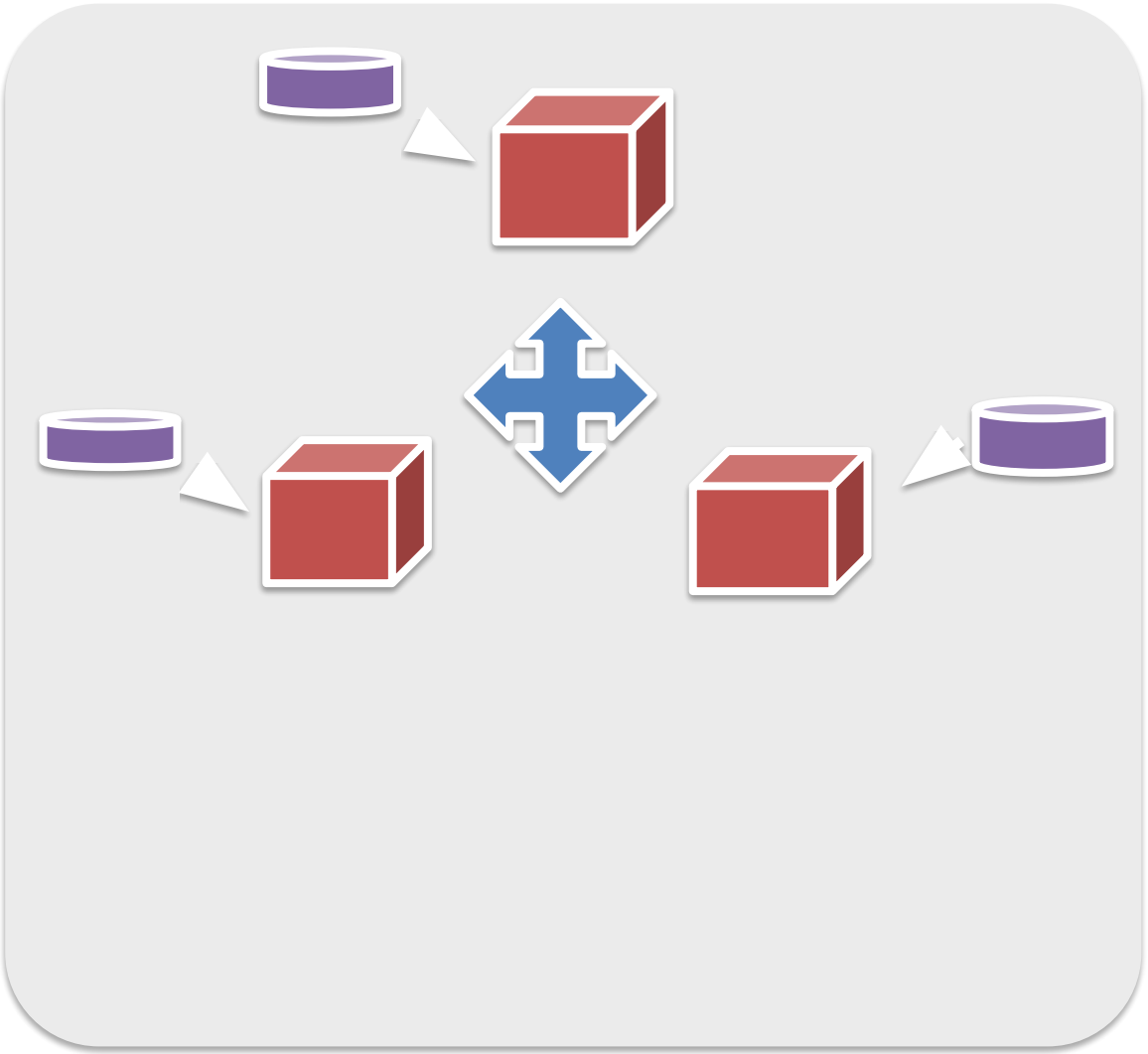
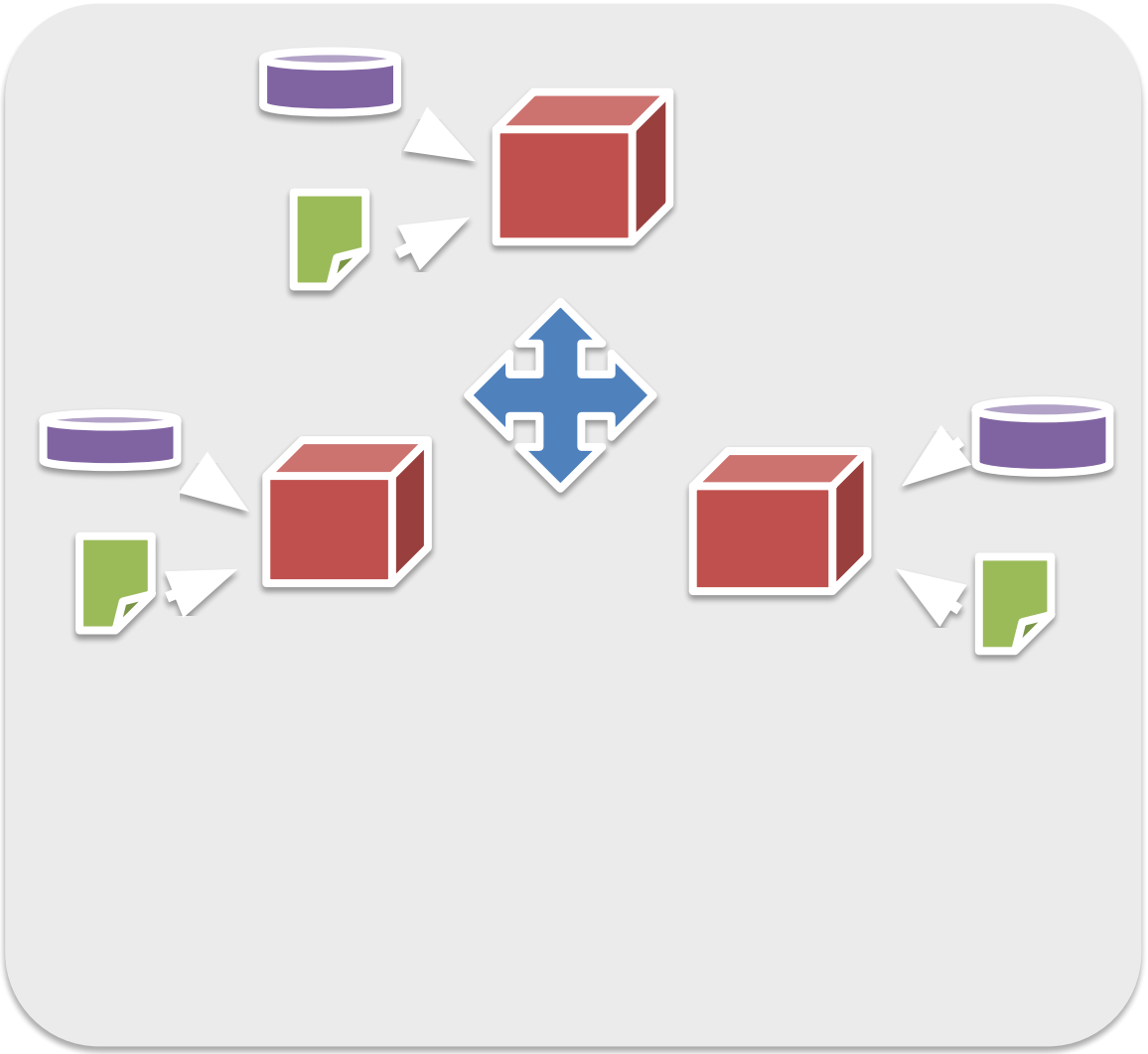


Model components
(ARPEGE, NEMO, …)

Coupler
(OASIS)

Input data
(IC, BC)

Ingredients of a coupled model



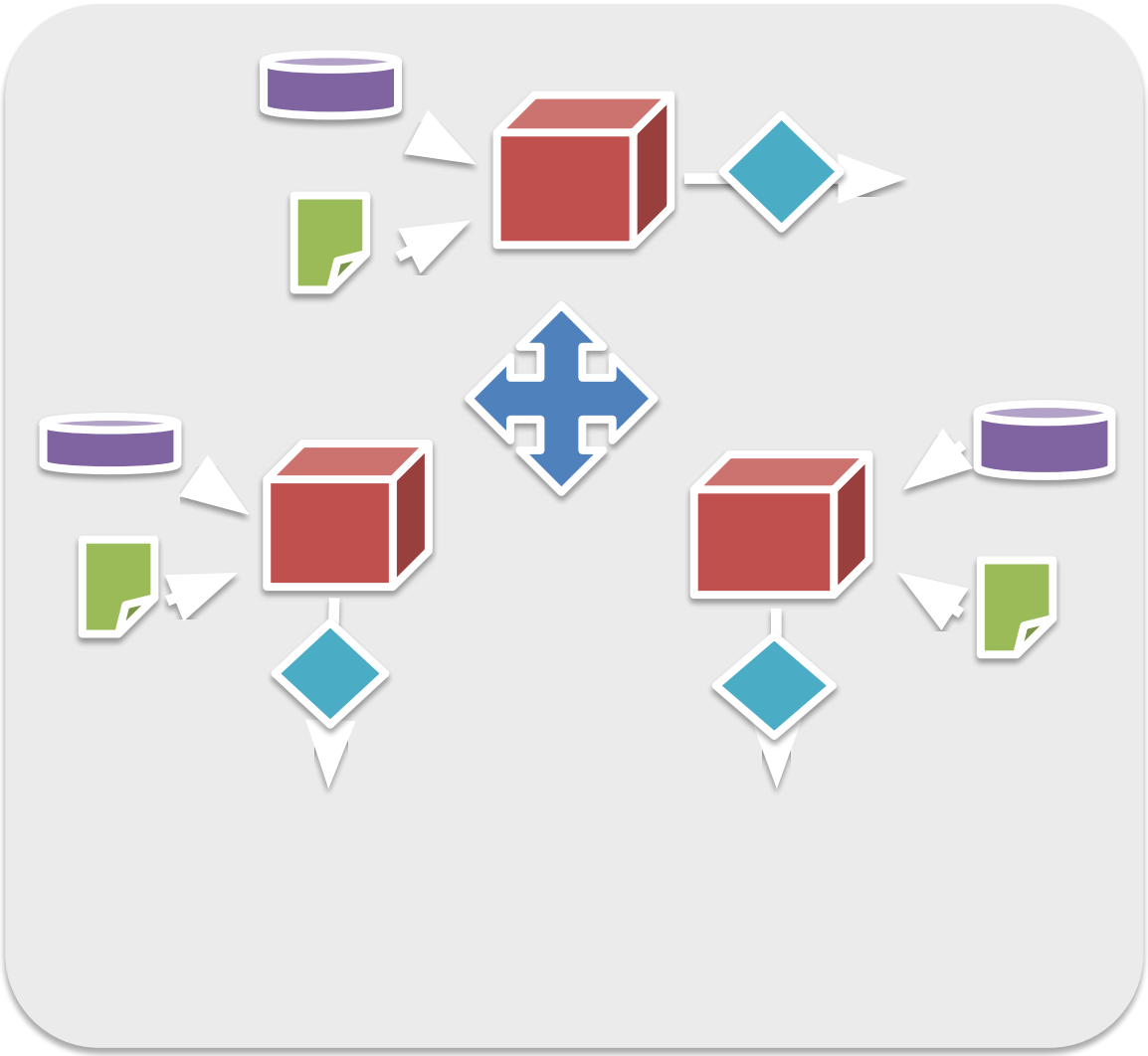
Model components (ARPEGE, NEMO, …)

Coupler (OASIS)

Input data (IC, BC)

Configuration files (namelists)

Ingredients of a coupled model



Model components (ARPEGE, NEMO, …)

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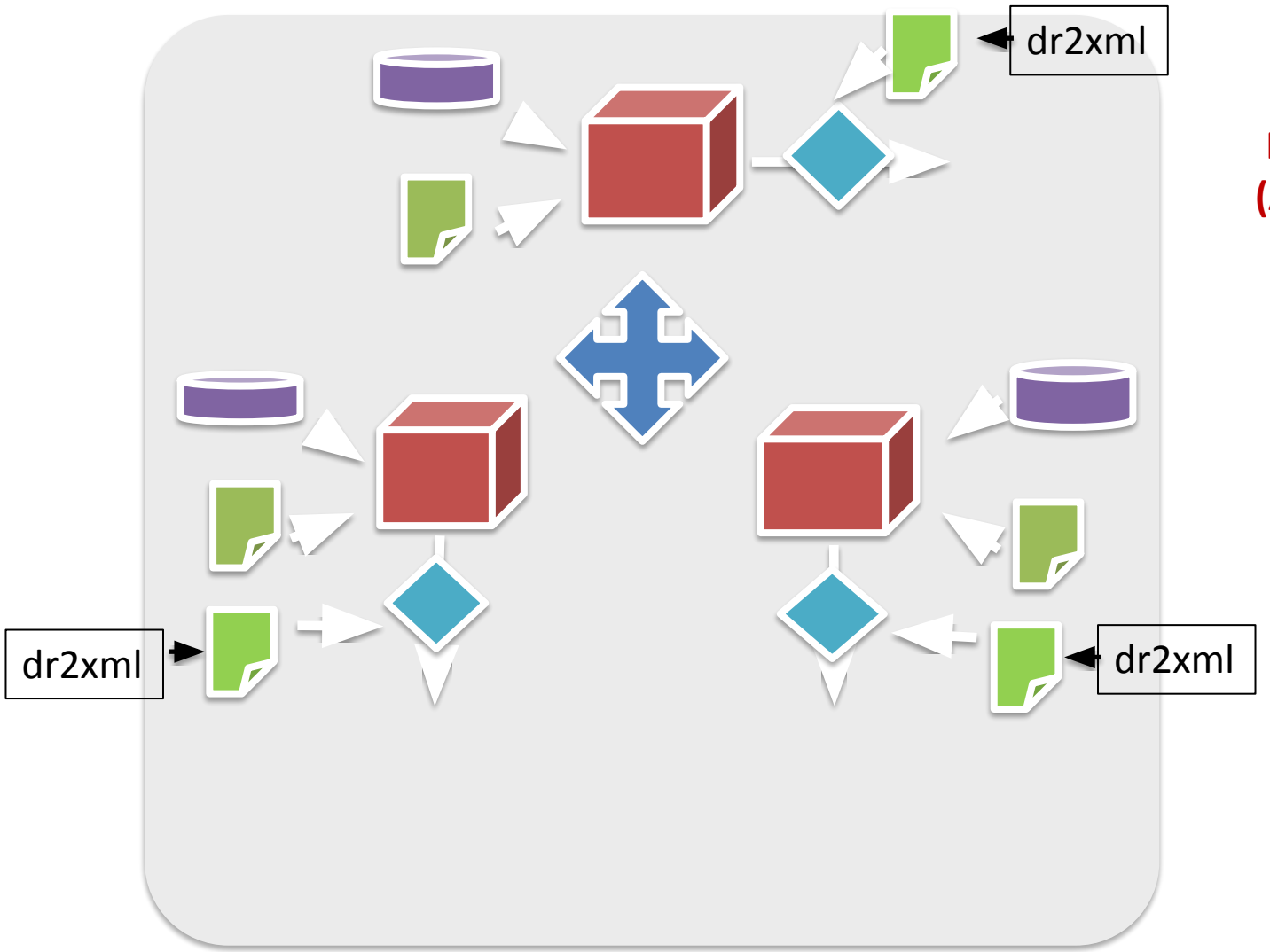

Model components (ARPEGE, NEMO, …)

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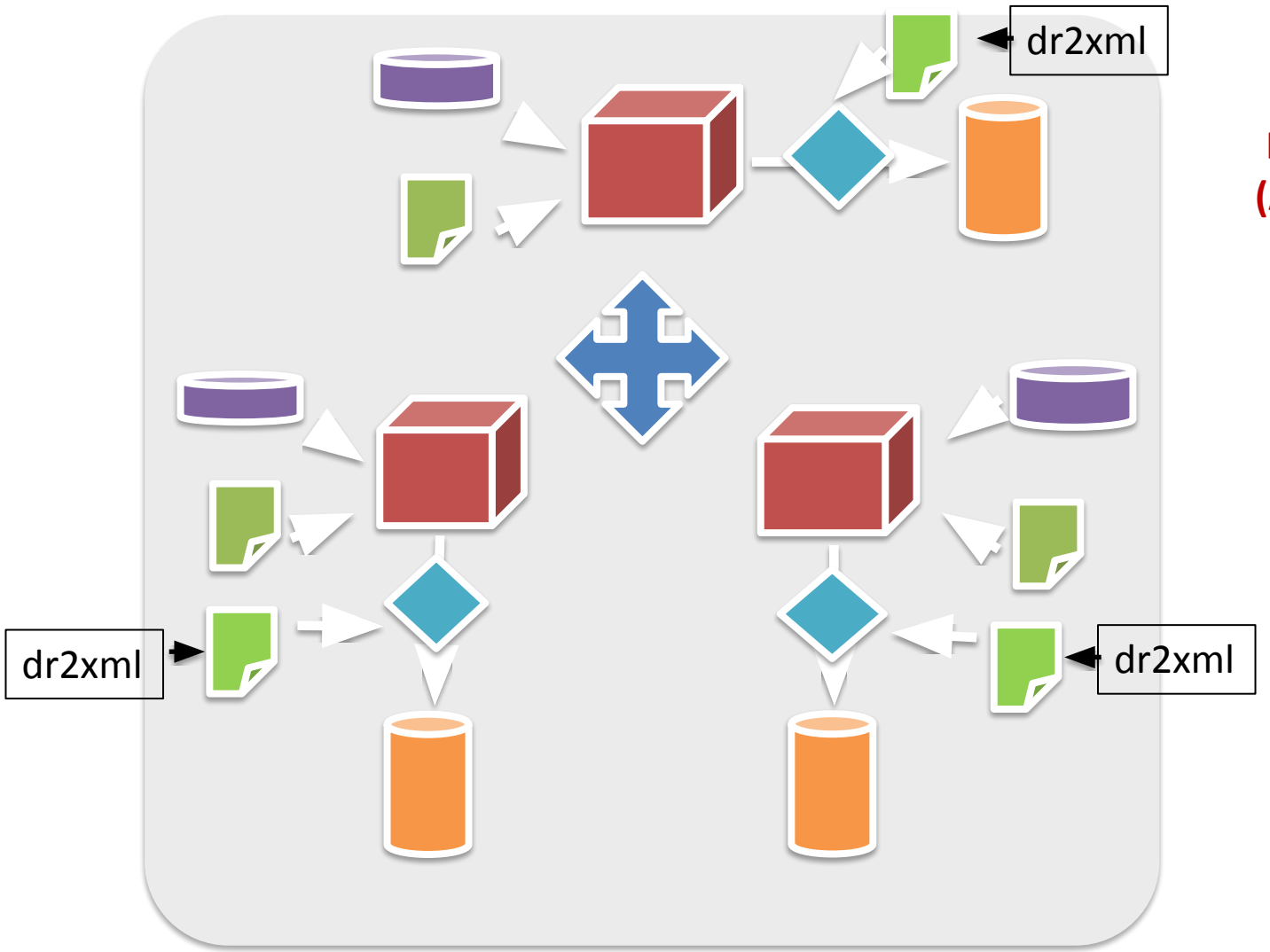

Model components (ARPEGE, NEMO, …)

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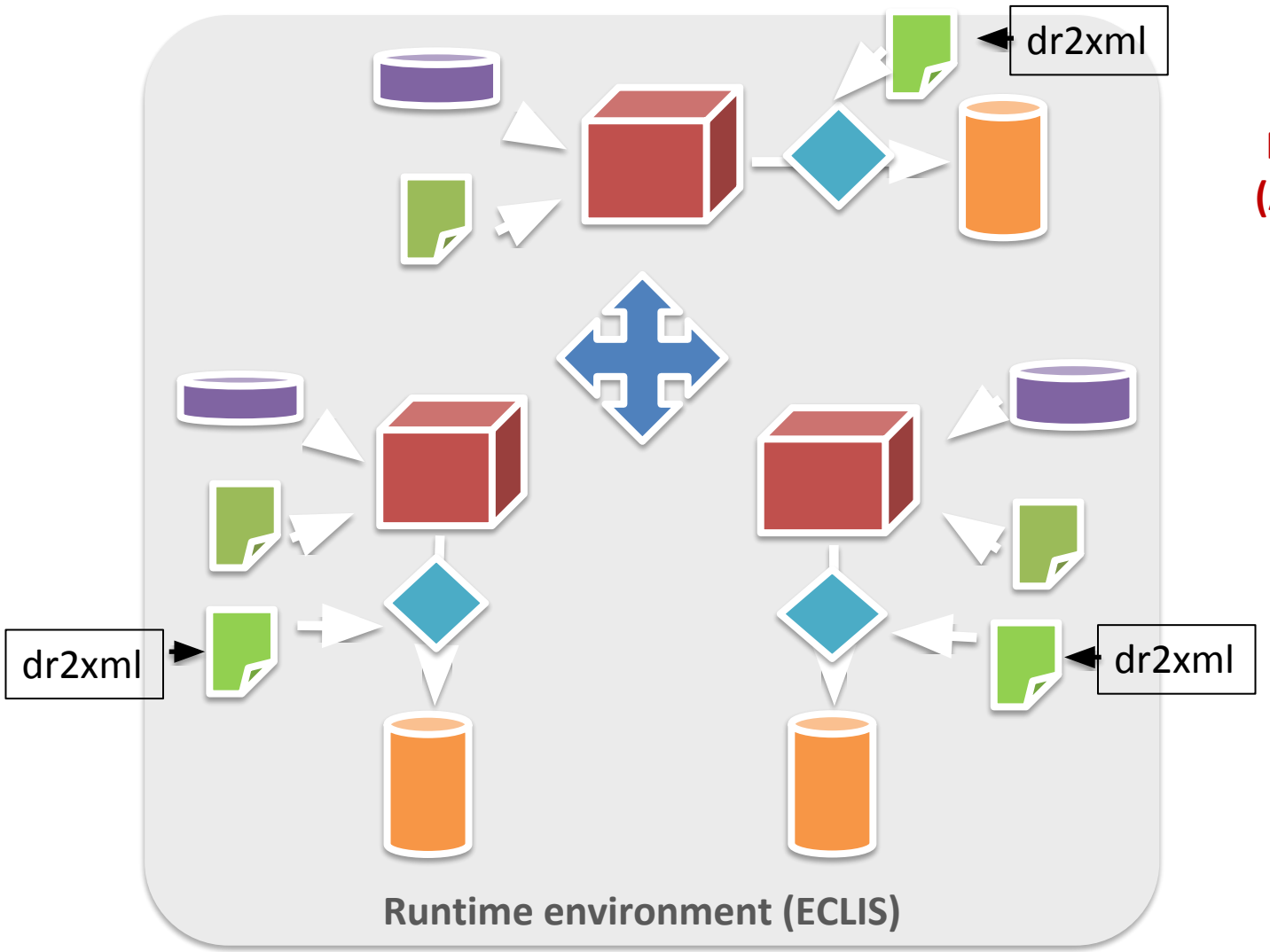
Ingredients of a coupled model



Model components (ARPEGE, NEMO, …)

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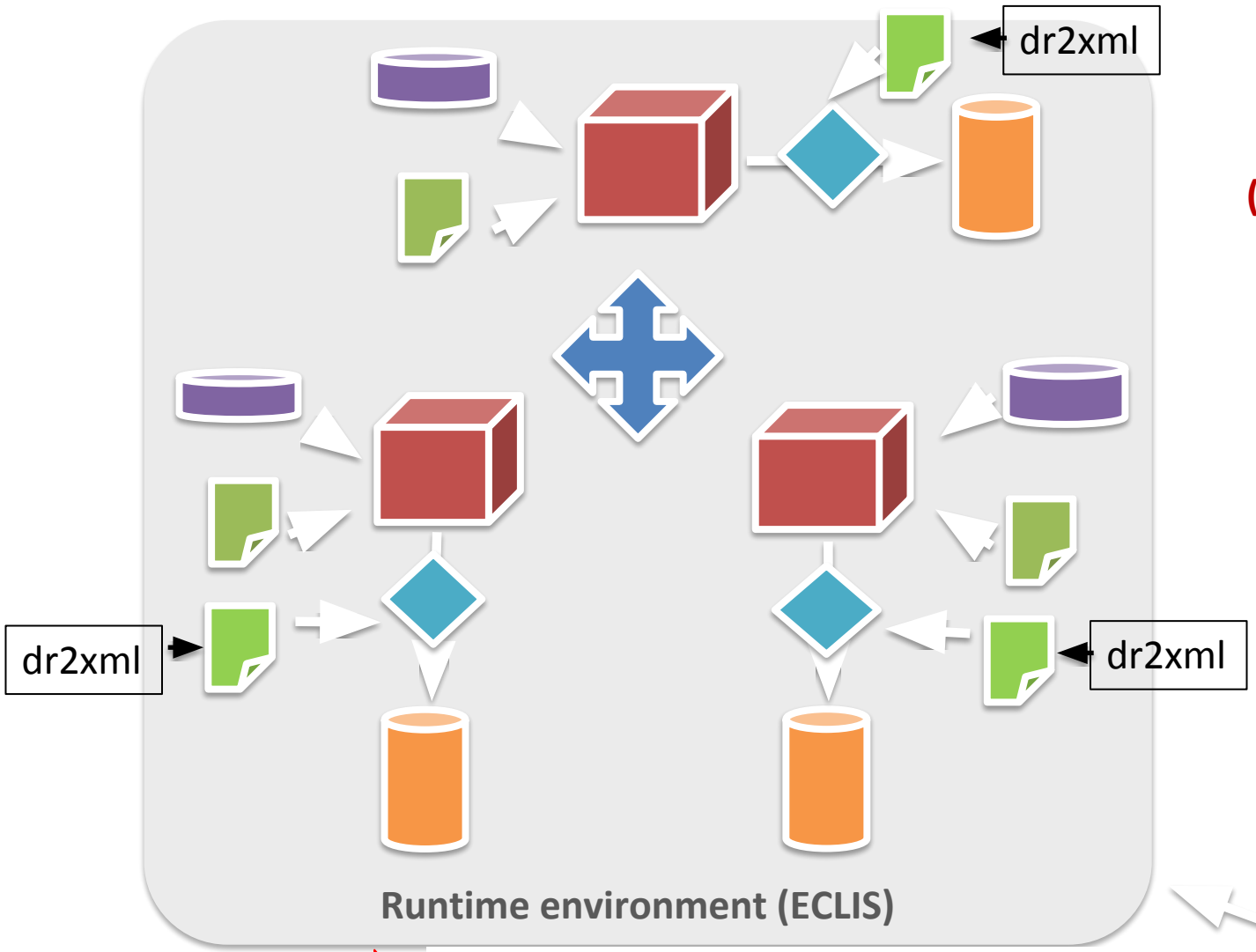


Model components (ARPEGE, NEMO, …)

Coupler (OASIS)

Input data (IC, BC)

Configuration files (namelists)

IO server (XIOS)

Output data

param

Configure your experiment specifying the ingredients: written in a "param" file

ECLIS : *Environment for CLImate Simulations (CNRM©)*

- ECLIS is the “chef d’orchestre” that ensures all the workflow management from experiment **installation**, **execution** to **results storage** on archive machine (***hendrix***), including **resume points**

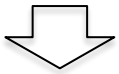
- Set of shell scripts necessary to run CNRM-CM, leaned on “relance” and “mtools”:
  - ***relance*** ensures the sequencing of the experiment
  - ***mtools*** ensures job splitting into ***steps*** and scheduling on appropriate batch queues (***SLURM*** scheduler)

- Used for CNRM-CM on Meteo France super-computer (***beaufix***) simulations but generic and flexible:
  - operational on NEC, BullX, IBM (IDRIS, CEP) and PC
  - 1 (forced) to N models (coupled)
  - plugins functionality
  - additional “model component” (with or without executable; e.g. AGRIF, STOIC)

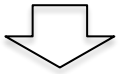
- 2 main scripts:
  - ***install***
  - ***script_couple***

Story line of your simulation with ECLIS

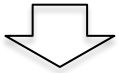
Setup your environnement



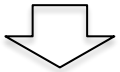
Configure your experiment (write a ***param*** file)



Install and launch



Relaunch, the case being (after a crash)



Get results on hendrix

Setup your environment on beaufix

relance

in your .bash_profile:

```
PATH=$PATH:$HOME/bin:/scratch/CMIP6/V1/eclis/scripts:/scratch/CMIP6/V1/eclis/Ext_tools/relan
export PATH
```

.ftuas

```
$ --> ftmotpasse -u [your_login] -h hendrix
```

.netrc

```
machine hendrix login [your_login] password [your_passwd]
```

```
$ --> chmod 600 .netrc
```

Prepare your param file (1/7)

~/SAVE/param/(MYGROUP)/param_MYSIMU

```
#!/bin/bash
# Config CMIP6/V1

[ -z $EXPID ] && EXPID=$(basename $0 | sed -e 's/param_//g')

ECLIS=$CMIP6/eclis
#
CMIP6=/scratch/CMIP6/V1
GROUP=MYGROUP  # ou CMIP6/*MIP

CONFIG=AOGCM
GEOM=tl127l91r ; GEOMH=tl127 ; GEOMO=eORCA1L75

EXPE=piControl
TITRE="$GROUP $CONFIG $EXPE $GEOM $GEOMO"
RUNMAIL=moine@cerfacs.fr

INIDATE=18500101 ; ENDDATE=40001231 ; INITIME=0
```

Relance mnemonic of the simulation get from param suffix (here: MYSIMU)

Eclis version

Path for binaries, namelists, data… (here the official repository for CMIP6)

Group in wish to store the simulation

Model configuration and spatial resolution -> used for binaries and namelist selection (provided they exist!)

CMIP6 official experiment name -> used for dr2xml settings files selection

Eclis sends messages to this email address in case of crash

Start_date/End_date of your simulation

Prepare your param file (2/7)

Set model executables and namelists…

```
#           MODEL BINARY USED
bindir=${CMIP6}/bin                                  Path for binaries
ATMEXE=${bindir}/atm/MASTER                          ARPEGE/SURFEX binary
UPDCLIARP=${bindir}/atm/UPDCLIARP                    } Auxiliary executables for climatology update
UPDCLISFX=${bindir}/atm/UPDCLISFX                    }
DATRES=${bindir}/atm/datres                          Auxiliary executables to update date in restarts
RIVEXE=${bindir}/riv/TRIP_MASTER                     TRIP binary
OCEEXE=${bindir}/oce/nemo.$GEOMO.$CONFIG             NEMO/GELATO binary
IOSEXE=${bindir}/ios/xios_server.exe                 XIOS executable


#           NAMELISTS USED
namdir=${CMIP6}/namelist                             Path for namelists
ATMNAMREF=$namdir/atm/nam.atm.${GEOM}.${CONFIG}      ARPEGE namelist
SFXNAMREF=$namdir/sfx/OPTIONS.nam.${GEOMH}.${CONFIG} SURFEX namelist
RIVNAMREF=$namdir/riv/TRIP_OPTIONS.nam.${GEOMH}.${CONFIG} TRIP namelist
CPLNAMREF=$namdir/cpl/namcouple.${GEOMH}.${CONFIG}   OASIS namecouple
OCENAMREF=$namdir/oce/namoce.${GEOMO}.${CONFIG}      NEMO namelist
ICENAMREF=$namdir/ice/namgel.${GEOMO}.${CONFIG}      GELATO namelist
```

Prepare your param file (3/7)

Set Initial conditions...

```
#            RESTART FILES
LICEREST=1
LOCEREST=1
EXPREF=${GEOMH}.${CONFIG} ; DATREF=18500101
#MACH_RESTART=hendrix
restarts=${CMIP6}/restart
ATMREST=${restarts}/atm/rst.atm.P${DATREF}.${EXPREF}.fa
SFXREST=${restarts}/sfx/rst.sfx.P${DATREF}.${EXPREF}.fa
SFXPGD=${restarts}/sfx/PGD.${EXPREF}.fa
RIVREST=${restarts}/riv/rst.trp.P${DATREF}.${EXPREF}.nc
OCEREST=${restarts}/oce/rst.oce.P${DATREF}.${EXPREF}.nc.tar
ICEREST=${restarts}/ice/rst.ice.P${DATREF}.${EXPREF}.nc.tar
CPLATMRES=${restarts}/cpl/rst.cpl.atm.P${DATREF}.${EXPREF}.nc
CPLOCERES=${restarts}/cpl/rst.cpl.oce.P${DATREF}.${EXPREF}.nc
CPLRIVRES=${restarts}/cpl/rst.cpl.trp.P${DATREF}.${EXPREF}.nc
```

Sea-Ice restart used

Ocean restart used

Reference simulation and date to start from

Machine where restarts have been stored (the case being)

Path for restart files

ARPEGE restart

SURFEX restart

SURFEX physiographic files

TRIP restart

NEMO restart

GELATO restart

Coupling restarts

Prepare your param file (4/7)

Set boundary conditions and forcings….

```
#           BC
BCOND=${CMIP6}/data/atm/nclim4/nclim4_${GEOMH}l31r_mMM ; YEAR_BCD=no   BC for ARPEGE
DATA_SFX=${CMIP6}/data/sfx/ecoclimap*.bin   BC for SURFEX
DATA_RIV=${CMIP6}/data/riv   BC for TRIP
DATA_CPL=${CMIP6}/data/cpl   BC for OASIS
DATA_OCE=${CMIP6}/data/oce   BC for NEMO/GELATO


#           FORCINGS          Atmospheric forcings (in OCEAN-only forced mode also SST, SIC here)
aero=${CMIP6}/data/atm/FORAER/TACTIC2.3/${GEOMH}/AOD550espece_TACTIC2.3_11avg_YYYYMM.ieee
YEAR_SUL=1850 ; FORSUL=${aero/espece/S4}     Sufate
YEAR_BCA=1850 ; FORBCA=${aero/espece/BC}     Black carbon
YEAR_ORA=1850 ; FORORA=${aero/espece/OM}     Organic matter
YEAR_SDA=1850 ; FORSDA=${aero/espece/DD}     Desert Dust
YEAR_SSA=1850 ; FORSSA=${aero/espece/SS}     Sea Salt
                                                  } Here fixed to 1850 value (piControl)
                                                  TACTIC aerosols
YEAR_VOL=no   ;                                   Volcanic aerosols
FORVOL=${CMIP6}/data/atm/FORVOL/${GEOMH}/aod_volcan_strato_v3_avg1850-2014_MM_${GEOMH}r.ieee
YEAR_OZO=1850 ; FOROZO=${CMIP6}/data/atm/FOROZO/ozone_slarp_${GEOM}/ozone.${GEOM}.7coeffs.YYYYMM.ieee
                                                  Ozone
YEAR_GHG=1850 ; FORGHG=${CMIP6}/data/atm/FORGHG/GHG_HIST.dat   Green House Gases
```

Prepare your param file (5/7)

Configure the IO server…

```
#           XIOS
LIOXOUT=1       outputs are produced by XIOS
LRIVIOS=1       XIOS activated in TRIP
LSFXIOS=1       XIOS activated in ARPEGE/SURFEX
LOCEIOS=1       XIOS activated in NEMO
LICEIOS=1       XIOS activated in GELATO

XMLS=${CMIP6}/namelist/ios          Path for XIOS configuration files (xml)

IOSNAMREF="${XMLS}/iodef.xml"       XIOS simulation configuration file

OTHER_FILES="  ${XMLS}/arpsfx.xml
OTHER_FILES+=
OTHER_FILES+=" ${XMLS}/trip.xml
OTHER_FILES+=" ${XMLS}/nemo.xml
```

XIOS context files

1 XIOS context / model executable

```
${XMLS}/atmo_fields.xml ${XMLS}/aero_fields.xml"
" ${XMLS}/chem_fields.xml ${XMLS}/surfex_fields.xml"
${XMLS}/trip_fields.xml"
${XMLS}/nemo_fields.xml" ${XMLS}/nemo_domains.xml"
```

XIOS field_def and domain_def files

Definitions of model variables and grids

"XIOS namelists"

Prepare your param file (5/7)

Configure the IO server…

iodef.xml

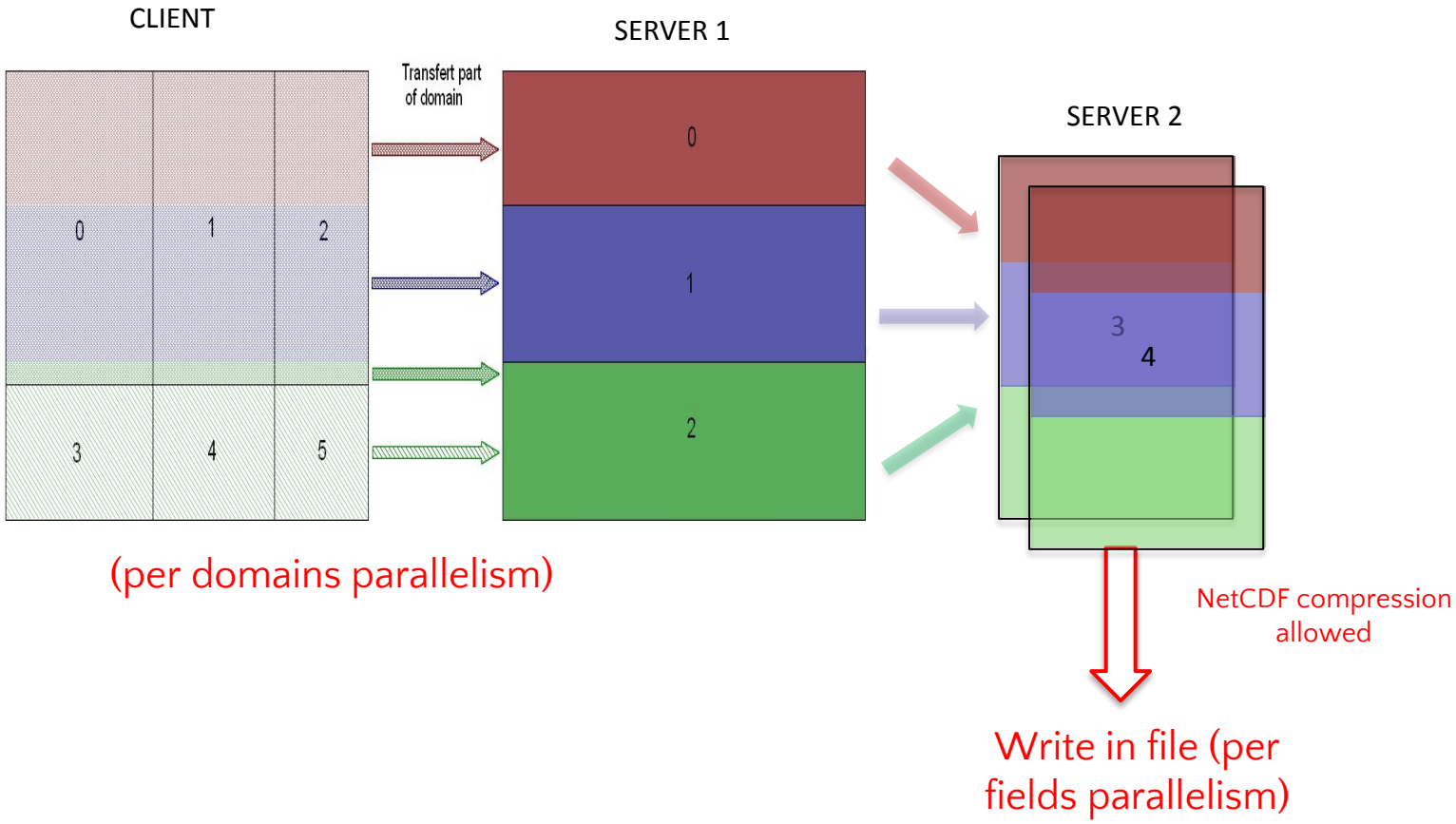
```
<?xml version="1.0"?>
<!--
Root XIOS configuration file for a CNRM-CM6 or CNRM-ESM2 run
First version - 11/2016 - Stephane Senesi
-->
<simulation>

[…]

 <context id="xios">
  <variable_definition>
   <variable id="recv_field_timeout" type="double">500</variable>
   <variable id="min_buffer_size" type="int">1000000</variable>
   <variable id="optimal_buffer_size" type="string">performance</variable>
   <variable id="buffer_factor_size" type="double">0.8</variable>
   <variable id="activate_non_distributed_transformation" type="bool">true</variable>


   <variable_group id="parameters" >
    <variable id="info_level"    type="int">0</variable>
    <variable id="print_file"    type="bool">false</variable>
    <variable id="using_server2" type="bool">true</variable>
        <variable id="ratio_server2" type="int">75</variable>
   </variable_group>


   <variable_group id="coupling">
    <variable id="using_server" type="bool">true</variable>
    <variable id="using_oasis" type="bool">true</variable>
    <variable id="oasis_codes_id" type="string">trip,surfex,oceanx</variable>
   </variable_group>
  </variable_definition>
 </context>


</simulation>
```

Use 2nd level server

% of IO servers are 2nd level ones

Prepare your param file (5/7)

Configure the IO server...



(per domains parallelism)

NetCDF compression allowed

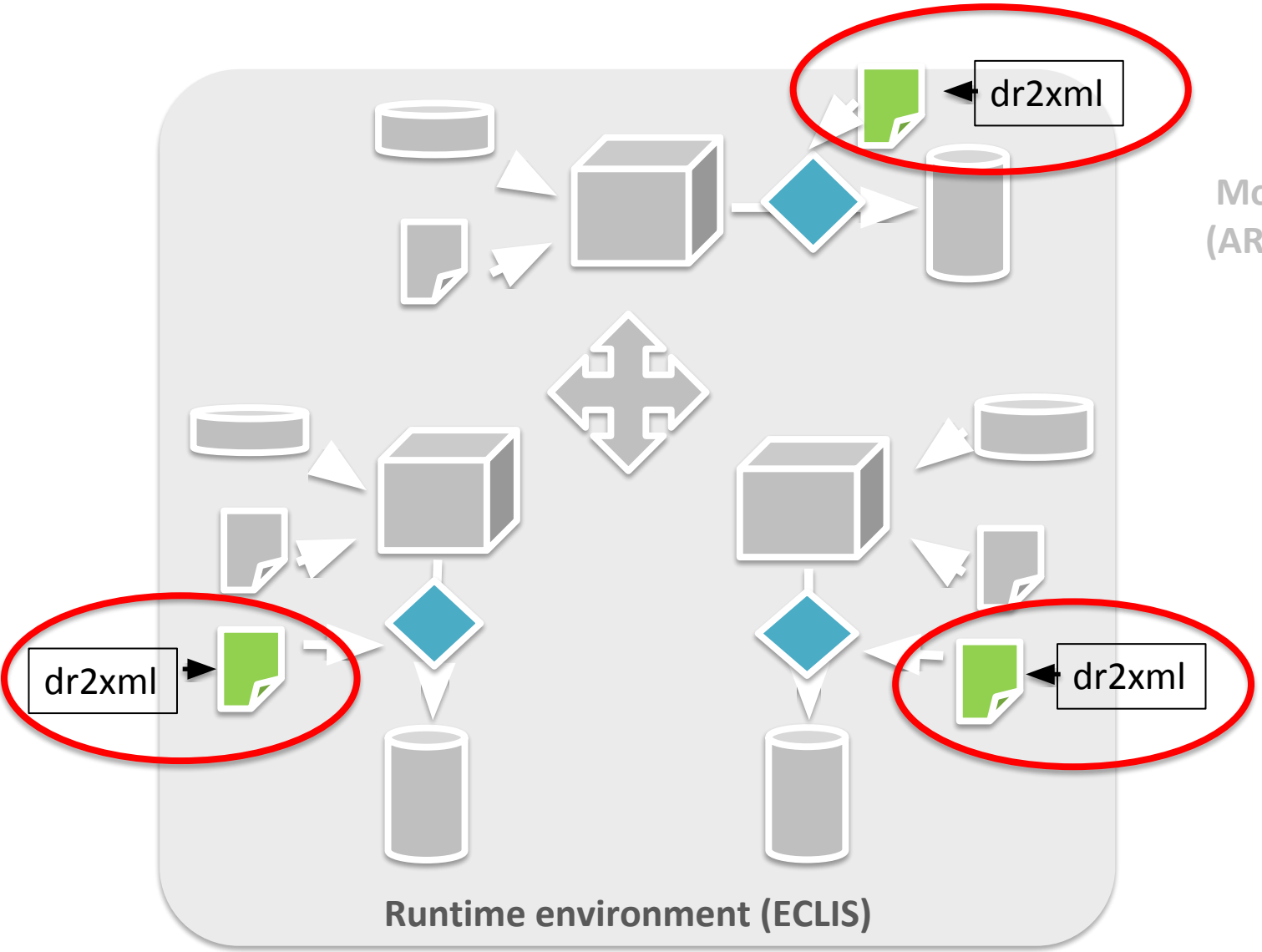
Write in file (per fields parallelism)

Prepare your param file (6/7)

Define the outputs to produce via DR2XML

```
#            DR
LDR=1  Activate DR2XML online
DIR_DR2XML=$CMIP6/bin/dr2xml  Directory for DR2ML sources
DR2XML="$DIR_DR2XML/create_file_defs.sh skip"  DR2XML command line
```

Ingredients of a coupled model



Model components
(ARPEGE, NEMO, …)

Coupler
(OASIS)

Input data
(IC, BC)

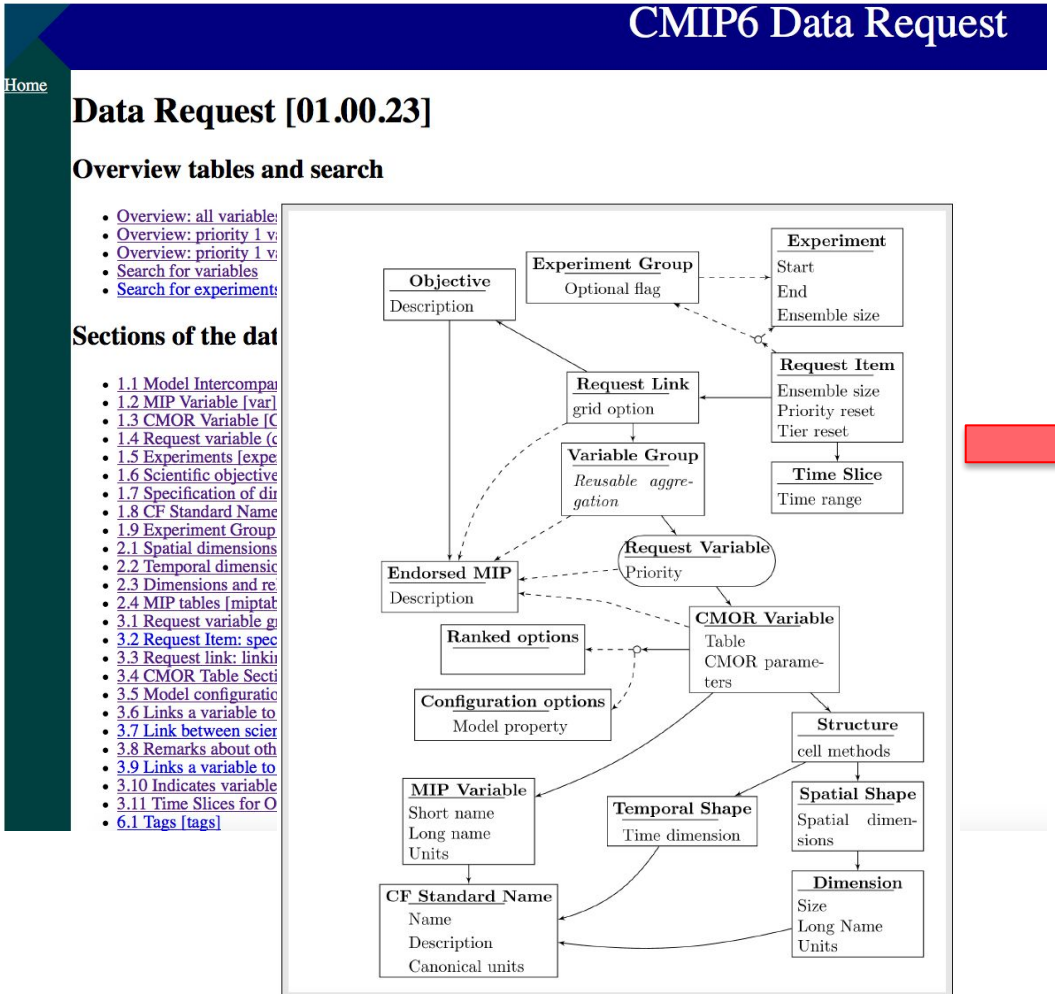
Configuration files (namelists)

IO server (XIOS)

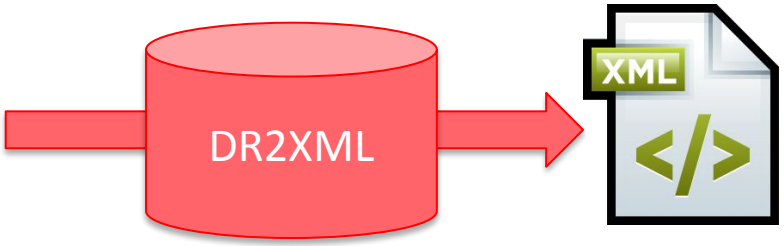
Output data

Define the outputs to produce via DR2XML

Python API



XIOS configuration files (namelist)



- *Arpege/surfex: 28 758 lines !*
- *Nemo/Gelato: 14 840 lines !*
- *Trip: 383 lines*

Prepare your param file (6/7)

Define the outputs to produce via DR2XML

```
#               DR
LDR=1           Activate DR2XML online
DIR_DR2XML=$CMIP6/bin/dr2xml          Directory for DR2ML sources
DR2XML="$DIR_DR2XML/create_file_defs.sh skip"          DR2XML command line

DRXNAMDIR=$CMIP6/namelist/dr2xml                      DR2XML settings
DR_EXP_SET=$DRXNAMDIR/settings/settings_${CONFIG}_${EXPE}_r98.py   <-- simulation settings
DR_LAB_SET=$DRXNAMDIR/settings/settings_CNRM-CERFACS.py            <-- lab settings
```

Prepare your param file (6/7)

Define the outputs to produce via DR2XML

simulation_settings.py

```
simulation_settings={

    #--- DR experiment name to process. See htt
    "experiment_id"  : "hist-1950",

    #--- Either describe the model (source_id) and its component
    #--- 'configuration' or provide a 'source_id' and a 'source
    "configuration"  : "AOGCM"  ,

    #"project"        : "CMIP6",  # CMIP6

    #--- The default priority level for v
    'max_priority'   : 2,

    #--- Member id
    "realization_index"    : 1, # Value may be omitted if = 1
    "initialization_index" : 1, # Value ma
    "physics_index"        : 1, # Value ma
    "forcing_index"        : 2, # Should be the same for all exp
    #
    #--- All about the branching scheme
    # See note 4 of https://docs.google.com/document/d/1h0r8RZr_
    #_NOTE_MPM: desormais tire du CMIP6_CV  "parent_experiment_i
                                             # (remaining parer
    "branch_method"        : "standard", # default value='standa
                                         # (this is not necessari
    'parent_time_ref_year' : 1850,       # MUST BE CONSISTENT WI
    "branch_year_in_parent": 1980,       # if your calendar is Gr
    # otherwise,use next two entries
    #"branch_time_in_parent": "365.0D0", # a
    #'parent_time_units'    : "" #in case it

    'child_time_ref_year'  : 1850,       # MUST BE CONSISTENT WI
                                         # (this is not necessari
    "branch_year_in_child" : 1950,       #

    #'parent_variant_label' :""  #Default to 'same as child'. Ot
    #"parent_mip_era"       : 'CMIP5'   # set it only in special
    #'parent_source_id'     : 'CNRM-CM5.1' # set it only in spec
    #
    "sub_experiment_id"    : "none", # Optional, default is 'nor
    "sub_experiment"       : "none", # Optional, default is 'nor
    "history"              : "none", # Used when a simulation is
        },
~
```

Give your CMIP6 experiment name

Give the Model configuration to use for this experiment (AGCM, AOCGM, AESM, AOESM, …)

Give the CMIP6 output priority to consider

Give the CMIP6 member id (here: r1i1p1f2)

Give branch times in parent/child experiments (if applies)

Prepare your param file (6/7)

Define the outputs to produce via DR2XML

lab and model settings.py

```
lab_and_model_settings={

    'institution_id': "CNRM-CERFACS", # institution full description will be read in CMIP6_CV

    #--- Contact and more info pointers
    'references'     : "http://www.umr-cnrm.fr/cmip6/references",
    'info_url'       : "http://www.umr-cnrm.fr/cmip6/",
    'contact'        : 'contact.cmip6@cerfacs.fr',

    #--- 'configurations' are shortcuts for a triplet (model, source_type, unused_contexts)
    #--- CMIP6 component conventions are described at
    #-            https://github.com/WCRP-CMIP/CMIP6_CVs/blob/master/CMIP6_source_type.json
    'configurations' : {
        "AGCM":    ("CNRM-CM6-1"    ,"AGCM"                , ['nemo']),
        "AESM":    ("CNRM-ESM2-1"   ,"AGCM BGC AER CHEM"   , ['nemo']),
        "AOGCM":   ("CNRM-CM6-1"    ,"AOGCM"               , []      ),
        "AOESM":   ("CNRM-ESM2-1"   ,"AOGCM BGC AER CHEM"  , []      ),
        "AGCMHR":  ("CNRM-CM6-1-HR","AGCM"                 , ['nemo']),
        "AESMHR":  ("CNRM-ESM2-1"   ,"AGCM BGC AER"        , []      ),
        "AOGCMHR":("CNRM-CM6-1-HR","AOGCM"                 , []      ),
        #"AOGCMHR":("CNRM-CM6-0-HR","AOGCM"                  , []      ),
        "AOESMHR":("CNRM-ESM2-1"   ,"AOGCM BGC AER"        , []      ),
        "LGCM":    ("CNRM-CM6-1"    ,"LAND"                , ['nemo']),
        "LESM":    ("CNRM-ESM2-1"   ,"LAND BGC"            , ['nemo']),
        "OGCM":    ("CNRM-CM6-1"    ,"OGCM"                , ['surfex','trip']),
        "OESM":    ("CNRM-ESM2-1"   ,"OGCM BGC"            , ['surfex','trip']) },


    #--- Which are the MIPs the lab is taking part in. This should not be changed.
    #--- MIPS list is at http://clipc-services.ceda.ac.uk/dreq/index/mip.html
    'mips' : {
        "LR" : {'AerChemMIP','C4MIP','CFMIP','DAMIP', 'FAFMIP', 'GeoMIP','GMMIP','ISMIP6',\
                'LS3MIP','LUMIP','OMIP','PMIP','RFMIP','ScenarioMIP','CORDEX','SIMIP',\
                'HighResMIP', 'DCPP', 'CMIP6', 'CMIP'},
        "HR" : {'OMIP','ScenarioMIP', 'HighResMIP', 'DCPP','CMIP6', 'CMIP'},
        },

    #--- A character string containing additional information about the models. Will be
    #--- with the experiment's specific comment string
    "comment"              : "",
```

Some metadata related to the modelling group

Definition of the various model configurations

MIPs in which each model resolution is involved

Prepare your param file (6/7)

Define the outputs to produce via DR2XML

lab and model settings.py

```
#--- The default priority level for variables to produce. Can be changed on a per experiment basis
#--- For generating ping_files templates, you would set it to 3
'max_priority'  : 1,

#--- Next value is used when creating ping_files templates
'tierMax'       : 1,

#--- Handling variables to produce : We exclude
#--- - pfull and phalf because we have a pressure based hydrid coordinate, and
#--- - <GHG>xxxClim because we always have inter-annual variation (except for piControl
#---   but we want a regular scheme)
#--- Note : Names must match DR MIPvarnames (and **NOT** CMOR standard_names)
"excluded_vars" : ['pfull', 'phalf',\
                   'n2oClim', 'ch4globalClim', 'co2massClim', \
                   'n2oglobalClim', 'ch4Clim', 'o3Clim', 'co2Clim'],


#--- For test purpose, we can alternatively specify an inclusive list of
#--- variables to process. This has precedence over the excluded_vars stuff
#"included_vars" : ['ccb' ],

#--- You can specifically exclude some pairs (vars,tables), here in lab_settin
#--- and also (in addition) in experiment_settings
"excluded_pairs" : [ ('sfdsi','SImon') ] ,

#--- The list of CMIP6 tables is at http://clipc-services.ceda.ac.uk/dreq/inde
#--- For test purpose, you may exclude some tables, using entry "excluded_tab
#--- an inclusive list of tables to process, using entry "included_tables"
"excluded_tables"  : [ "Eyr", "Oyr", "Odec", "IfxAnt", "ImonAnt" ],
#"included_tables"  : [ "E1hrClimMon" ],    # This entry has precedence over excluded_tables. Used for debug

#
#--- Handling field shapes
"excluded_spshapes": ["XYA-na","XYG-na", # GreenLand and Antarctic grids we do not want to produce
                      "na-A",           # RFMIP.OfflineRad : rld, rlu, rsd, rsu in table Efx ?????
                      #"Y-P19","Y-P39", "Y-A","Y-na"
                      ],
```

You are allowed to reduce the list of output data by excluding:

- variables
- entire Tables
- Pairs of variable/table
- variables with given spatial shapes

Alternatively, you can include only some variables and/or tables

Prepare your param file (6/7)

Define the outputs to produce via DR2XML

lab and model settings.py

Sampling frequency for vertical interpolation performed by XIOS (model levels -> pressure levels)

Output grids definitions

```
#--- dr2xml will drive vertical interpolation to pressure levels. This is a costly step if done
#--- at every timestep
"vertical_interpolation_sample_freq" : "3h",  # use Xios duration syntax
"vertical_interpolation_operation"   : "instant", # LMD prefers 'average'

#--- dr2xml allows for the lab to choose among various
#---  - DR or None : always follow DR requirement
#---  - native     : never follow DR spec (always use native or close-to-native grid)
#---  - native+DR  : always produce on the union of grids
#---  - adhoc      : decide on each case, based on CMORvar attributes, using a
#---                 lab-specific scheme implemented in a lab-provided Python
#---                 function lab_adhoc_grid_policy in grids.py
"grid_policy" : "adhoc",
#--- at the time of writing, CNRM choice is :
#---  - tos and sos are provided on those DR requested grids which are among ("native", "1deg")
#---  - other vars are provided on DR requested grids except on "1deg", "2deg", "100km", "50km"

#--- Output grids description : per model resolution and per context :
"grids" : {
  "LR"    : {
      "surfex" : [ "gr", "complete", "glat","250 km", "data regridded to a T127 gaussian grid "+\
                 "(128x256 latlon) from a native atmosphere T127l reduced gaussian grid"] ,
      #"surfex" : [ "gn", "" , "250 km", "native T127 reduced gaussian grid"] ,
      "trip" : [ "gn", "",  "","50 km", "regular 1/2 lat-lon grid" ],
      "nemo" : [ "gn", "",  "","100 km", "native ocean tri-polar grid with 105 k ocean cells" ],},


  "HR"    : {
      "surfex" : [ "gr","complete", "glat","50 km", "data regridded to a 359 gaussian grid "+\
                 "(360x720 latlon) from a native atmosphere T359l reduced gaussian grid"] ,
      "trip" : [ "gn", "", "", "50 km", "regular 1/2 lat-lon grid" ],
      "nemo" : [ "gn", "", "", "25 km", "native ocean tri-polar grid with 1.47 M ocean cells" ],},
},

#--- Basic sampling timestep set in your field definition (used to feed metadata 'interval_operation')
"sampling_timestep" : {
          "LR"    : { "surfex":900., "nemo":1800., "trip":1800. },
          "HR"    : { "surfex":900., "nemo":1800., "trip":1800. },
},
```

Prepare your param file (6/7)

Define the outputs to produce via DR2XML

```
#           DR
LDR=1Activate DR2XML online
DIR_DR2XML=$CMIP6/bin/dr2xml      Directory for DR2ML sources
DR2XML="$DIR_DR2XML/create_file_defs.sh skip"      DR2XML command line
```

lab and model settings.py

```
DRXNAMDIR=$CMIP6/namelist/dr2xml                    DR2XML settings
DR_EXP_SET=$DRXNAMDIR/settings/settings_${CONFIG}_${EXPE}_r98.py
DR_LAB_SET=$DRXNAMDIR/settings/settings_CNRM-CERFACS.py
```

<- - simulation settings

<- - lab settings

```
OTHER_FILES+=" $XMLS/ping_surfex.xml $XMLS/ping_trip.xml"
OTHER_FILES+=" $XMLS/ping_nemo.xml $XMLS/ping_nemo_gelato.xml $XMLS/ping_nemo_ocnBgChem.xml"
```

ping files

Prepare your param file (6/7)

Define the outputs to produce via DR2XML

Ping_files.xml

Ping files are xml files where the correspondence between CMIP6 variables and the model ones is defined.

Ping file sample:

CMIP6 variable **Model variable** **With possibly arithmetic operations on model variable**

```
<field id="CMIP6_sos"      field_ref="sss" >  this * $convSpsu  </field> <!-- P1 (0.001) sea_surface_salinity :
<field id="CMIP6_sosga"    field_ref="ssstot" >  this * $convSpsu  </field> <!-- P1 (0.001) sea_surface_salinity
<field id="CMIP6_sossq"    field_ref="sss2" >  this * $convSpsu * $convSpsu  </field> <!-- P3 (1e-06) square_of_
<field id="CMIP6_t20d"     field_ref="20d"              /> <!-- P1 (m) depth_of_isosurface_of_sea_water_potenti
```

Prepare your param file (6/7)

Define the outputs to produce via DR2XML

```
#                DR
LDR=1  Activate DR2XML online
DIR_DR2XML=$CMIP6/bin/dr2xml          Directory for DR2ML sources
DR2XML="$DIR_DR2XML/create_file_defs.sh skip"          DR2XML command line
```

```
DRXNAMDIR=$CMIP6/namelist/dr2xml                    DR2XML settings
DR_EXP_SET=$DRXNAMDIR/settings/settings_${CONFIG}_${EXPE}_r98.py
DR_LAB_SET=$DRXNAMDIR/settings/settings_CNRM-CERFACS.py
```

```
OTHER_FILES+=" $XMLS/ping_surfex.xml $XMLS/ping_trip.xml"                    ping files
OTHER_FILES+=" $XMLS/ping_nemo.xml $XMLS/ping_nemo_gelato.xml $XMLS/ping_nemo_ocnBgChem.xml"
```

```
P=$DRXNAMDIR/home_data_request/home_data_request
HOMEDR="${P}_arpege_GCM.txt ${P}_surfex_GCM.txt ${P}_trip_GCM.txt ${P}_nemo_GCM.txt "   home data request
PATH_EXTRA_TABLES=$DRXNAMDIR/Tables
```

Prepare your param file (6/7)

Define the outputs to produce via DR2XML

Home Data Request:

It is possible to request more outputs than the ones requested by CMIP6

home_data_request.txt

```
#-------------------------------------------------------------------------------------------------------------------------------------------
#TYPE;    VARNAME;         REALM;     FREQUENCY;     TABLE;          TEMPORAL_SHP;        SPATIAL_SHP;       EXPNAME;                MIP
#-------------------------------------------------------------------------------------------------------------------------------------------
cmor;     psl;             atmos;     mon;             CMIP_Amon;    time-mean;             XY-na;            ANY;                    ANY
cmor;     clic;            atmos;     mon;            CMIP_CFmon;    time-mean;              XY-A;            ["amip","amip-4xCO2"]   ANY
extra;    zg;              atmos;     mon;        CNRM_HOMEPmon;     ANY;                XY-P7HM;            ANY;                    ANY
~
```

3 types of additionnal variables:

- **perso** = purely home var, non standard
- **cmor** = ask for a variable already defined in CMIP6 World (DR/CMOR)
- **extra** = additional variable is defined in an extra-Table, similar to CMIP6 ones (json file), including all of the CMOR attributes (units, standard name, long name, dimensions, cell methods, etc.)

- *Home data request is usually used as a **"safety net"** to get insured that fundamental diagnostics will be produced*
- *It can also be used to fully personalize your own (non-CMIP6) experiment, beneficing from the DR/DR2XML workflow (in such case, use exclusion/inclusion in lab_settings to get ride of all CMIP6 request)*
- *The home Data request is not affected by the exclusion mechanism offered in lab_settings*
- *"cmor" type: if already requested in the DR for the current experiment, then won't be output twice*

Prepare your param file (6/7)

Define the outputs to produce via DR2XML

```
#                DR
LDR=1  Activate DR2XML online
DIR_DR2XML=$CMIP6/bin/dr2xml        Directory for DR2ML sources
DR2XML="$DIR_DR2XML/create_file_defs.sh skip"        DR2XML command line

DRXNAMDIR=$CMIP6/namelist/dr2xml                    DR2XML settings
DR_EXP_SET=$DRXNAMDIR/settings/settings_${CONFIG}_${EXPE}_r98.py
DR_LAB_SET=$DRXNAMDIR/settings/settings_CNRM-CERFACS.py

OTHER_FILES+=" $XMLS/ping_surfex.xml $XMLS/ping_trip.xml"                    ping files
OTHER_FILES+=" $XMLS/ping_nemo.xml $XMLS/ping_nemo_gelato.xml $XMLS/ping_nemo_ocnBgChem.xml"

P=$DRXNAMDIR/home_data_request/home_data_request
                                                    home data request
HOMEDR="${P}_arpege_GCM.txt ${P}_surfex_GCM.txt ${P}_trip_GCM.txt ${P}_nemo_GCM.txt "
PATH_EXTRA_TABLES=$DRXNAMDIR/Tables

DATA_DRX=${CMIP6}/data/dr2xml/$GEOMH
                                                    auxiliary input data for
OTHER_FILES+=" $DATA_DRX/areacella_complete_CMIP6_$GEOMH.nc $DATA_DRX/cfsites_grid.nc DR2XML
$DATA_DRX/xios_interpolation_weights_surfex_FULL_cfsites_domain.nc "
```

LDR_EXPID=1 means that your simulation acronym won't be the param suffix but the official CMIP6 experiment name (according to the experiment name chosen in DR2XML simulation settings)

Prepare your param file (6/7)

Define the outputs to produce via DR2XML

Experiment and Files naming: illustration & good practices

param_MYSIMU

LDR_EXPID=1

(a CMIP6 production run)

"experiment_id" : "control-1950"
"configuration" : "AOGCM"
"realization_index" : 1 ← realization_index < 90 because of LDR_EXPID=1
"initialization_index" : 1
"physics_index" : 1
"forcing_index" : 2

```
MYGROUP/CNRM-CM6-1_control-1950/tasmin_Amon_CNRM-CM6-1_control-1950_r1i1p1f2_gr_195001-195012.nc
```

param_MYSIMU

LDR_EXPID=1

(a CMIP6 production run)

"experiment_id" : "control-1950"
"configuration" : "AOGCMHR" ← HR configuration
"realization_index" : 1
"initialization_index" : 1
"physics_index" : 1
"forcing_index" : 2

```
MYGROUP/CNRM-CM6-1-HR_control-1950/tasmin_Amon_CNRM-CM6-1-HR_control-1950_r1i1p1f2_gr_195001-195012.nc
```

Prepare your param file (6/7)

Define the outputs to produce via DR2XML

Experiment and Files naming: illustration & good practices

param_MYSIMU

LDR_EXPID=0

(not a CMIP6 production run)

```
"experiment_id"  : "control-1950"
"configuration"  : "AOGCM"
"realization_index"    : 99
"initialization_index" : 1
"physics_index"        : 1
"forcing_index"        : 2
```

realization_index >= 90 because of LDR_EXPID=0

```
MYGROUP/MYSIMU/tasmin_Amon_CNRM-CM6-1_control-1950_r99i1p1f2_gr_195001-195012.nc
```

param_MYSIMU

LDR_EXPID=0

(not a CMIP6 production run)

```
"experiment_id"  : "control-1950"
"expid_in_filename"  : "myexpe"
"configuration"  : "AOGCM"
"realization_index"    : 99
"initialization_index" : 1
"physics_index"        : 1
"forcing_index"        : 2
```

Means we lean on DR for control-1950 (with possibly exclusion/inclusion)...

...But files are named differently

```
MYGROUP/MYSIMU/tasmin_Amon_CNRM-CM6-1_myexpe_r99i1p1f2_gr_195001-195012.nc
```

Prepare your param file (7/7)

Set job parameters…

```
#           JOBS CHARACTERISTICS
NMONTH=12 ;    duration of a macro-job (in months)
QUEUE=normal64;    computing queue (model execution)
ELAPSFRONT=00:40:00 ; MEMFRONT=100Mb    elapse time and memory requested on frontend (transfers)
ELAPS=00:59:00 ; MEM=60Gb    elapse time and memory requested on computing nodes (model execution)

NPROC_ARP=384 ; NPROC_OCE=127; NPROC_RIV=1 ;
NPROC_IOS=8 ; NPROC_CPL=0 ;
                                    number of processors requested for each model component

SAVE_RESTART_PER=12  frequency of model restart backups (in months)
SAVE_CPL_FILES=0     frequency of coupling files backups (in months)
IOXSAVEPER=12        frequency of xios files backups (in months)
SAVE_LISTING="AX"
IOSLISTOUT="xios_client*.out xios_server*.out"

ACCOUNT=cgie   account on which CPU hours will be imputed
FTPUTOPT="-u cgie005"
FTGETOPT="-u cgie005"    Ftput/ftget options -> account on which to store output data

ARCHIVING=DURING  means that model execution for macro-job N starts meanwhile archiving
                  of macro-job N-1 is running

INSTALLER=${ECLIS?}/scripts/install    install script
[[  "$*"  != *nogo* ]] && . $INSTALLER $*
```

Installing your experiment…

```
$ --> ./param_MYSIMU
```

```
Installing experiment MYSIMU in group MYGROUP

 ****** Creating the experiment 'relance' directory as
 ****** /home/ext/cf/cglo/moinemp/relances/MYGROUP/MYSIMU
 ******  Activated plugins list :

 ****** Fetching namelists
 ****** Cleaning incremental files on ARCHIVE

 ****** Creating restart directories needed on
 ****** /scratch/utmp/ftdir/moinemp/eclis/transfers/MYSIMU/restart
 ****** Retrieving restarts from hendrix with options : '-u cgie005'
 ****** Copying restarts to hendrix (with option '-u cgie005',and renamed with MYSIMU and 19500101)
 ****** Renaming oce restart pieces
 ****** Renaming ice restart pieces
 ****** Copying auxilliary files in RELDIR :  arpsfx.xml atmo_fields.xml aero_fields.xml […]
 ****** Copying namelists and param_MYSIMU on archive
 ****** Writing experiment configuration file MYSIMU.conf
[…]
Experiment MYSIMU is now installed in /home/ext/cf/cglo/moinemp/relances/MYGROUP/MYSIMU
Do you want to launch it NOW ? (y/n)
y
```

What is installed and where ?

`in : ~/relances/MYGROUP/MYSIMU/`

= the "reldir" of your simulation

aero_fields.xml
areacella_complete_CMIP6_tl127.nc
arpsfx.xml
atmo_fields.xml
cfsites_grid.nc
chem_fields.xml
dr_experiment_settings.py
dr_laboratory_settings.py
EXSEG1.nam
fort.4
ftexp/ = prestaging area before archiving restarts and results on hendrix
gltpar
iodef.xml
iox_backups
iox_index
listings/ = Repository of XIOS and DR2XML listings
MYSIMU.conf = Eclis config file of the simulation
MYSIMU_his = Eclis history file of the simulation
namcouple
namelist_cfg
nemo_domains.xml
nemo_fields.xml
nemo.xml
ping_nemo_gelato.xml
ping_nemo_ocnBgChem.xml
ping_nemo.xml
ping_surfex.xml
ping_trip.xml
Plugins/
surfex_fields.xml
trip_fields.xml
TRIP_OPTIONS.nam
trip.xml
xios_interpolation_weights_surfex_FULL_cfsites_domain.nc

... and starting it !

Experiment MYSIMU is now installed in /home/ext/cf/cglo/moinemp/relances/MYGROUP/MYSIMU

Thu Apr 19 08:03:09 UTC 2018 relan MYSIMU ==>
(Gestion d'un sequencement simple)
Version courante des procedures de relance : /scratch/CMIP6/V1/eclis/Ext_tools/relan
Version demandee : /scratch/CMIP6/V1/eclis/Ext_tools/relan
Le repertoire de relance est : /home/ext/cf/cglo/moinemp/relances/MYGROUP/MYSIMU

Test etat relance

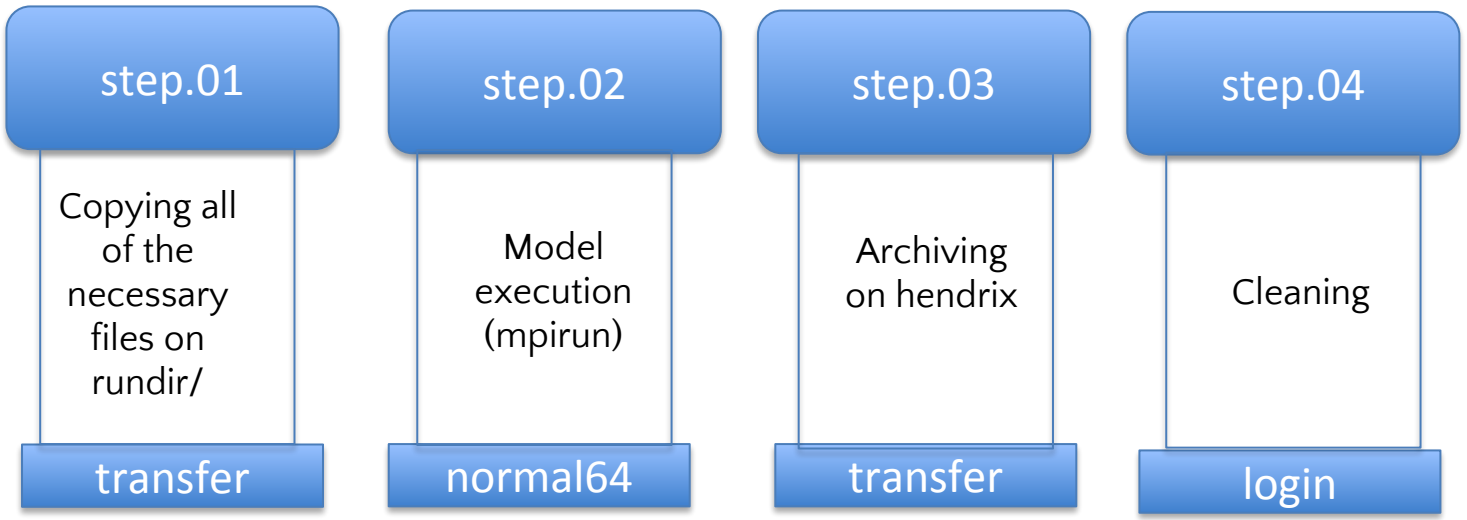
Date courante=18491231
Date finie courante=18591231
(Derniere date=> 40001231)
date a traiter => 18500101

[…]

[Mtool::Filter][info] processing job < /home/ext/cf/cglo/moinemp/relances/MYGROUP/MYSIMU/work/MYSIMU_195001 >
[Mtool::Filter][info] **processing step 01** (id = ftget / target = beaufixfe)
[Mtool::Filter][info] **processing step 02** (id = compute / target = beaufixcn)
[Mtool::Filter][info] **processing step 03** (id = ftput / target = beaufixfe)
[Mtool::Filter][info] **processing step 04** (id = autolog / target = beaufixfe)
mkdir /scratch/mtool/moinemp/depot/mstep_003057_CPLLRHIST1950P2v2meshmask195001
mkdir /scratch/mtool/moinemp/spool/spool_003057_CPLLRHIST1950P2v2meshmask195001
[main][line:73] spawn sbatch, -o, /scratch/mtool/moinemp/depot/mstep_003057_MYSIMU195001/step.01.out, -e,
/scratch/mtool/moinemp/depot/mstep_003057_MYSIMU195001/step.01.out,
/scratch/mtool/moinemp/depot/mstep_003057_MYSIMU195001/step.01
Submitted batch job 42740640
[Mtool::Filter][info] current depot is /scratch/mtool/moinemp/depot/mstep_003057_MYSIMU195001
[Mtool::Filter][info] job < /home/ext/cf/cglo/moinemp/relances/MYGROUP/MYSIMU/work/MYSIMU_195001 > processed
---
Memorisation de la date de demarrage du job
Lancement termine normalement.
Thu Apr 19 08:03:11 UTC 2018 Fin de relan.

How is your simulation running ?

Mtool splits the complete job into sub-jobs named “steps”:



ARCHIVING=DURING:

What's new in your reldir once your simulation started ?

`in : ~/relances/MYGROUP/MYSIMU/`

steps/ = Repository of jobs-per-steps

rundir/ = Execution directory

last_NODE.001_01 = ARPEGE/SURFEX log file

last_nout.000000 = OASIS log file

last_ocean.output = NEMO/GELATO log file

last_TRIP_RUN_LISTING.txt = TRIP log file

last_run_stderr = model execution standard error

last_run_stdout = model execution standard output

MYSIMU_195001.o19934 = job standard output

last_stdo_datres.lst
last_stdo_datres_riv.lst
last_stdo_datres_sfx.lst
= logs of process changing restarts

last_stdo_updcliarp.lst
last_stdo_updclisfx.lst
= logs of process updating climatology

Useful ./param options

```
$ --> ./param_MYSIMU -tdr
```

Only for testing DR2XML process (the model is not launched = dry-run).
It is recommended to always use this option before launching a simulation

```
$ --> ./param_MYSIMU -nrst
```

To avoid re-transferring the restart files (in case already done in a previous install)

```
$ --> ./param_MYSIMU -noask
```

To avoid confirmation query for re-installing

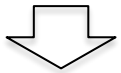
```
$ --> ./param_MYSIMU -go
```

To avoid confirmation query for launching

How to be sure my simulation run will output all the diags I requested ?

Perform a dr2xml dry-run first & check dr2xml.out !

```
mylogin@beaufixlogin0: ~/SAVE/param/MYGROUP
$ --> ./param_MYSIMU -tdr
```



tmp_dr2xml_MYSIMU/

- dr2xml_MYSIMU.out
- dr2xml_nemo.xml
- dr2xml_surfex.xml
- dr2xml_trip.xml

Check dr2xml.out (1/4)

dr2xml_MYSIMU.out

```
**************************************************
*
*              dr2xml version:  1.8
*   CMIP6 conventions version:  v6.2.4
*  CMIP6 Data Request version:  01.00.21
*
**************************************************

**************************************************

Processing context  nemo

**************************************************

Number of Request Links which apply to MIPS set(['DCPP', 'CMIP', 'HighResMIP', 'ScenarioMIP', 'CMIP6', 'OMIP'])  is:  98
Number of Request Links after filtering by excluded_request_links is:  98
Number of Request Links after filtering by included_request_links is:  98
Filtering for experiment control-1950
Number of Request Links which apply to experiment  control-1950 and MIPs set(['DCPP', 'CMIP', 'HighResMIP', 'ScenarioMIP', '
Number of (CMOR variable, grid) pairs for these requestLinks is :484
Number once filtered by excluded/included vars and tables and spatial shapes is : 353
Number of distinct CMOR variables (whatever the grid) : 337
        These variables will be processed with multiple grids (rerun with print_multiple_grids set to True for details) :[]
Number of distinct var labels is : 269
Number of simplified vars is : 337
Issues with standard names are : ['od550no3', 'od550so4', 'pod0', 'sitimefrac']
```

Software versions used

one dr2xml execution per context (i.e. model executable)

CMIP6 experiment_id

Total number of output diags

Check dr2xml.out (2/4)

dr2xml_MYSIMU.out

```
Processing realm 'ocean seaIce' of context 'nemo'
Processing realm 'ocnBgChem' of context 'nemo'
Processing realm 'seaIce ocean' of context 'nemo'
Duplicate variable hfsifrazil,hfsifrazil in table Omon is skipped, preferred is hfsifrazil2d

file_def written as ./dr2xml_nemo.xml

Skipped variables (i.e. whose alias is not present in the pingfile):
>>> TABLE:           Oclim 02/02 ----> zfullo(1) zhalfo(1)
>>> TABLE:        HOMOImon 01/12 ----> sozomatr(1.0)
>>> TABLE:        PrimOmon 11/13 ----> opottemptend(1.0) tomint(1.0) u2o(1.
>>> TABLE:       Prim6hrPt 01/01 ----> tso(1.0)
>>> TABLE:            Omon 24/66 ----> dissi13cos(1) dissi14cabioos(1) diss
1) fgco2nat(1) fsitherm(1) hfcorr(0) hfsifrazil2d(1) msftbarot(1) o2satos(1
rr(1) wfcorr(0) zfullo(1) zhalfo(1)
```

Realms handled by the current context

Final xml file for configuring XIOS outputs

Variables requested but not output because no corresponding model variable name were provided in the ping_file

dr2xml_MYSIMU.out

Check dr2xml.out (3/4)

freq shape table prio count list_of_vars

```
Some Statistics on actually written variables per frequency+shape...
                                 Ofx P1    1 :  ['areacello']
        fx      XY-na    -------- ---    1

        fx  --------     -------- ---    1

                                Emon P1    2 :  ['hcont300', 't20d']
                             HOMOImon P1    8 :  [u'hc2000', u'hc700', u'heatc', u'sialb', u'sisnvol', u'sitimef
                             PrimOmon P1    1 :  [u'somint']
                                SImon P1   12 :  ['siconc', 'simass', 'sisnconc', 'sisnmass', 'sisnthick', 'sisp
                                SImon P2    5 :  ['sidmassdyn', 'sidmassth', 'sihc', 'sisnhc', 'sitempsnic']
                                SImon P3    1 :  ['sisaltmass']
                                 Omon P1   15 :  ['hfds', 'mlotst', 'mlotstmax', 'mlotstmin', 'pbo', 'sfdsi', 's
                                 Omon P2    5 :  ['ficeberg2d', 'friver', 'hfx', 'hfy', 'rsntds']
       mon      XY-na    -------- ---   49

                             HOMOImon P1    1 :  [u'rhop']
                             PrimOmon P1    1 :  [u'wo']
                                 Omon P1   12 :  ['bigthetao', 'masscello', 'obvfsq', 'so', 'thetao', 'thkcello'
       mon       XY-O    -------- ---   14

                             HOMOImon P1    2 :  [u'snovoln', u'snovols']
                                SImon P2    4 :  ['siextentn', 'siextents', 'sivoln', 'sivols']
                                 Omon P1    8 :  ['bigthetaoga', 'masso', 'soga', 'sosga', 'thetaoga', 'tosga',
       mon      na-na    -------- ---   14

                                 Omon P2    1 :  ['mfo']
       mon      TR-na    -------- ---    1

       mon  --------     -------- ---   78


                                SIday P1    4 :  ['siconc', 'sithick', 'siu', 'siv']
                                 Oday P1    3 :  ['omldamax', 'tos', 'tossq']
                             PrimSIday P1    6 :  [u'sidivvel', u'sistrxdtop', u'sistrxubot', u'sistrydtop', u'si
                              PrimOday P1    4 :  [u'mlotst', u'tauuo', u'tauvo', u'zos']
       day      XY-na    -------- ---   17

       day  --------     -------- ---   17


----------  --------     -------- ---   96
```

Check freq/tables consistency

Check all you are expecting is there !

dr2xml_MYSIMU.out

Check dr2xml.out (4/4)

* freq_table_shape_prio

```
------------------------
--- VARNAME:  sitempsnic : Temperature at snow-ice interface
------------------------
              *  mon_SImon_XY-na_2
----------------------
--- VARNAME:  sitemptop : Surface temperature of sea ice
----------------------
              *  mon_SImon_XY-na_1
--------------------
--- VARNAME:  sithick : Sea Ice Thickness
--------------------
              *  day_SIday_XY-na_1
              *  mon_SImon_XY-na_1
------------------------
--- VARNAME:  sitimefrac : Fraction of time steps with sea ice
------------------------
              *  day_PrimSIday_XY-na_1.0
              *  mon_SImon_XY-na_1
--------------------------
--- VARNAME:  sitimefrac15 : Fraction of time steps with sea ice greater than 15 percent
--------------------------
              *  mon_HOMOImon_XY-na_1.0
-----------------
--- VARNAME:  sits : surface temperature
-----------------
              *  mon_HOMOImon_XY-na_1.0
----------------
--- VARNAME:  siu : X-component of sea ice velocity
----------------
              *  day_SIday_XY-na_1
              *  mon_SImon_XY-na_1
```

- ✓ check for redundancies
- ✓ if some to be suppressed, modify lab_settings (exclusion) or home DR
- ✓ do a dr2xml dry-run again

Recommendations on RELDIR

- ✓ Never rename nor erase you RELDIR by hand !
- ✓ Avoid modifying files in your RELDIR apart if:
  - `MYSIMU_his`: for rerun or simulation extension
  - `MYSIMU.conf`: to change elapse and cpu times in case of a time limit crash
- ✓ If a change is needed (namelist parameter, software version, etc.) rather choose to reinstall your experiment (if simulation run is not far advanced) or configure a new one.
- ✓ To properly remove an experiment use:

```
$ --> delexp MYSIMU
```

How to supervise your simulation run ? (1/2)

Queue querying:

```
$ --> squeue -u <your_login>
```

```
JOBID PARTITION     NAME     USER ST       TIME  NODES NODELIST(REASON)
43328355  normal64 MYSIMU_1  moinemp  R       0:29     14 beaufix[504-517]
```

More details about a job:

```
$ --> scontrol show job <JOBID>
```

To cancel a simulation:

```
$ --> scancel <JOBID>
```

Beaufix board possible operations:

- Preemption (prioritary job): `$ --> /opt/softs/bin/ja <JOBID>` (State: PREEMPTED)
- Requeuing (in case of node failure): no auto-requeing if: `#SBATCH --no-requeue`

How to supervise your simulation run ? (2/2)

History file

`~/relances/MYGROUP/MYSIMU/MYSIMU_his`

```
EXPE "PRIMAVERA AOGCM tl127l91r eORCA1L75"
# -*- mode: shell-script -*-
MSGE Procedure utilisateur executee
#####################################################################
# DACT is the last date for which a job has been launched
DACT 20400101
# DAFC is the last date for which a job terminated successfully
DAFC 20391231
# DATF is last date you want to process (usually last day of a month)
DATF 20491231
#####################################################################
# INFD lists job start dates
INFD Date 20400101 DATE= 18-04-21/12:13:46
INFD Date 20390101 DATE= 18-04-21/07:37:55
[ . . . ]
INFD Date 19500101 DATE= 18-03-29/10:24:00
INFD
# INFA lists job end dates and job durations
INFA Date 20391231 DATE= 18-04-21/12:13:39 => 04:35:44
INFA Date 20381231 DATE= 18-04-21/07:37:48 => 04:55:10
[ . . . ]
INFA Date 19501231 DATE= 18-03-29/15:23:01 => 04:59:01
INFA
MODA AAAAMMJJ
```

What to do if your simulation crashes ? (1/2)

1) Read the message you received by email :

- its does not systematically identify the problem for you…
- But sometime it does, for e.g. in case of TIME LIMIT, CANCELING, ….
- and at least put on the track (tells you in which step the bug occurred)

2) Look at the history file

- Check if the message is coherent with last try date

3) Inspect the log files:

- execution std error (last_run_stderr)
- model components logs (last_NODE.001_01, last_ocean.output, …)
- steps logs (usually: step.02.out, step.03.out)

4) Check the production of output netCDF files:

- Check if files are produced and stored on hendrix (each NMONTH) under:

mylogin_hendrix@hendrix:~/MYGROUP/MYSIMU/iox/output

- At the end of the simulation or after a crach that is not explicitly a step.03 crash, check if netcdf files are not traped in the ftexp directory :

mylogin_beaufix@beaufixlogin0: ~/relances/MYGROUP/MYSIMU/ftexp

What to do if my simulation crashes ? (2/2)

5) Restart the simulation (dry-run first !)

```
$ --> xrelan MYSIMU
```

E.g: After a blocking in step.03:

```
# This a dry run, i.e. just showing what would be done if argument '-go' was provided
--------------------------------------------------------------------------------

# Experiment has ARCHIVING=DURING
# No step2 running and experiment is not finished, must re-launch at least one of the steps
# According to lock file, a crash occurred for step.03 for 19880101. We copy the lock for tracability
(cd /home/ext/cf/cglo/moinemp/relances/PRIMAVERA/CNRM-CM6-1_control-1950_r1i1p1f2; cp -pf ftexp/a_postpro_is_pen

# We restart crashed step.03 for 19880101 with JobId '-J xrelan_CNRM-CM6-1_control-1950_r1i1p1f2_'
(cd /scratch/mtool/moinemp/depot/mstep_002777_1950r1i1p1f2198801_1control_CM6_CNRM ; sbatch -J xrelan_CNRM-CM6-1

# Because ARCHIVING=DURING, and there is a blocked step.03 for 19890101, we re-submit it
# but chained after step.03 for 19880101 (chaining through sbatch option 'singleton').
# This will resume normal experiment run
(cd /home/ext/cf/cglo/moinemp/relances/PRIMAVERA/CNRM-CM6-1_control-1950_r1i1p1f2/steps ; export NEXTDATE=198901

--------------------------------------------------------------------------------

If the analysis above seems OK, just rerun as :

    /scratch/CMIP6/V1/eclis/scripts/xrelan CNRM-CM6-1_control-1950_r1i1p1f2 -go

BUT REMEMBER TO CURE THE BASIC PROBLEM BEFOREHAND (except if you think you're that lucky)!
```

If you agree with what xrelan is about to do, then go !

```
$ --> xrelan MYSIMU -go
```

How to access output data archived on hendrix ?

```
$ --> lftp hendrix
```

```
$ --> cd ~/MYGROUP/MYSIMU/iox/output
```

Contains results (netCDF files)

```
lftp cgie005@hendrix:~/MYGROUP/MYSIMU/iox/output> ls
-rw-r--r-- 1 cgie005 cgie 111779 May  2 01:10 tas_Amon_CNRM-CM6-1_hist-1950_r98i1p1f2_gr_195001-195001.nc
```

```
$ --> cd ~/MYGROUP/MYSIMU/atm*/restart
```

Contains restart files (native format)

```
*alt.: sfx, riv, oce, ice, cpl
```

To get your results:

- from beaufix, use ftget or ftp
- from cerfacs, use ftp
- More integrated/secured/efficient script exists (remonte_hendrix). Ask me if you want to use it…

How to rerun over a sub-period or extend my simulation?

Requires CMIP6/V2 (eclis V6.33)

Use relan and not xrelan !

0 – Get insured the last job of your simulation has properly finished (DATF reached)

1 – Set RERUN and REAL_END_DATE in your history file MYSIMU_his (alt. in conf file MYSIMU.conf):

```
VARI export RERUN=1
VARI export REAL_END_DATE=19491231  # real end date
```

2 – Clean `relances/MYGROUP/MYSIMU/ftexp/iox` directory

3 – Modify MYSIMU_his to indicate the period to rerun, e.g.:

```
DACT=18520100
DAFC=18520100
DATF=18541231
```

4 – Launch the rerun job:

```
$ --> relan MYSIMU
```

5 – Put back MYSIMU_his file in his initial state (alt. MYSIMU.conf) once the rerun finished

6 – Suppress lines corresponding to the rerun in iox_backup file, e.g.:

```
[…]
19500101
~~18530101~~
~~18540101~~
~~18550101~~
```

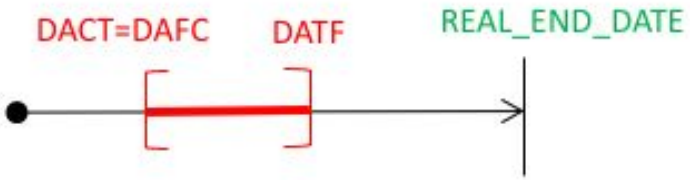
How to rerun over a sub-period or extend my simulation?

Requires CMIP6/V2 (eclis V6.33) *

Use relan and not xrelan !

Cas n°1:

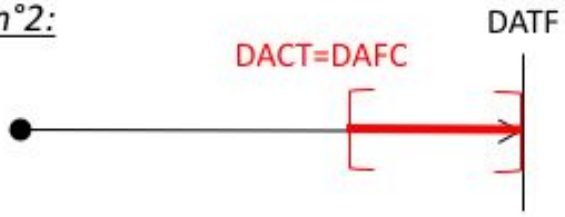
Re-run sur une sous-période




```
VARI export REAL_END_DATE=date_fin (_his)
VARI export RERUN=1 (_his)
```

Cas n°2:

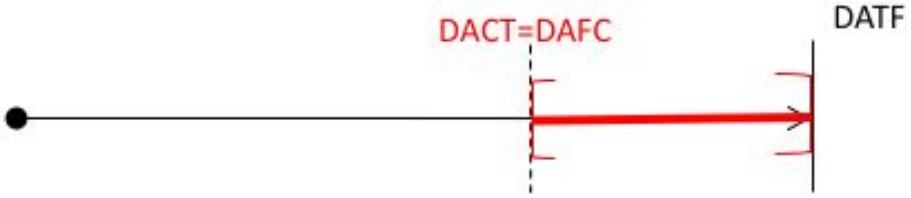
Re-run en fin de période




```
VARI export RERUN=1 (_his)
```

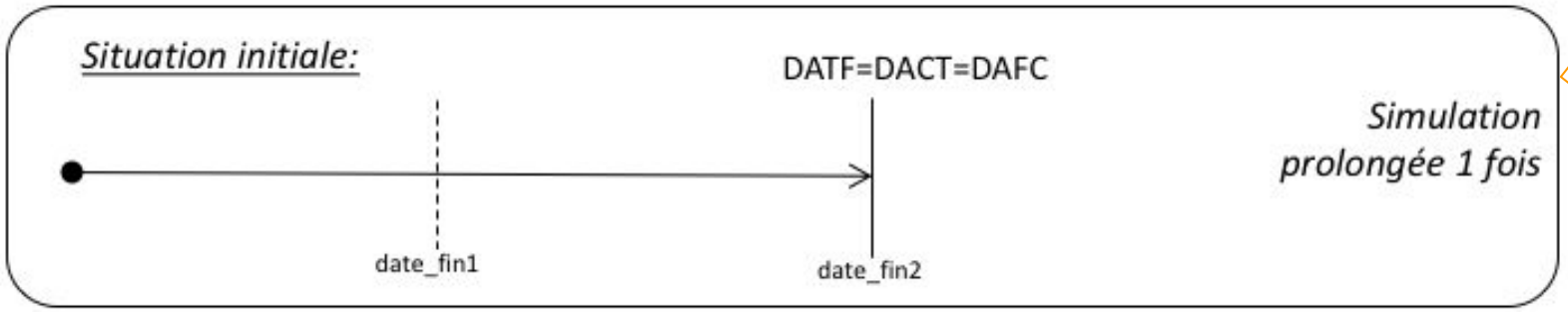
Cas n°3:

Prolongation




```
INIDATE=DAFC+1mois (.conf)
```

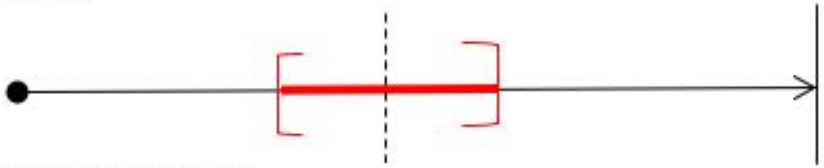
How to rerun over a sub-period or extend my simulation?



Requires CMIP6/V2 (eclis V6.33) *

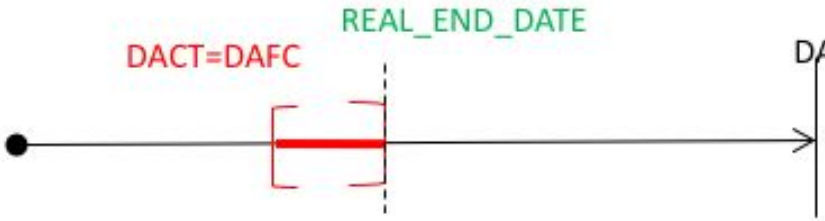
Use relan and not xrelan !

Cas n°4:

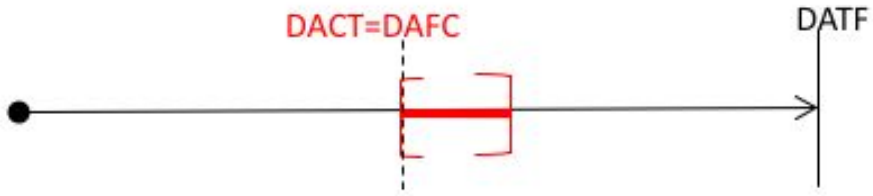


Re-run à cheval sur la première date de fin

A décomposer en:




```
VARI export REAL_END_DATE=date_fin1 (_his)
VARI export RERUN=1 (_his)
```

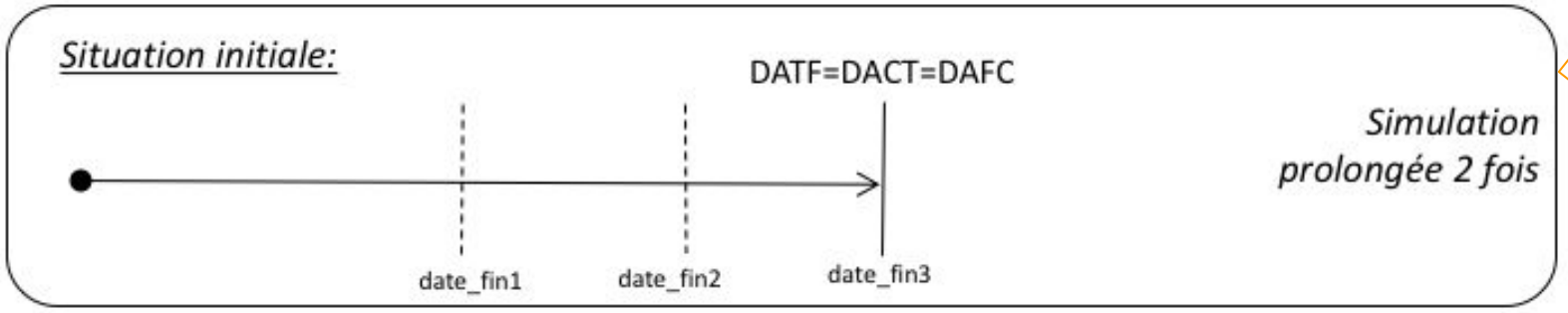



```
VARI export RERUN=1 (_his)
```

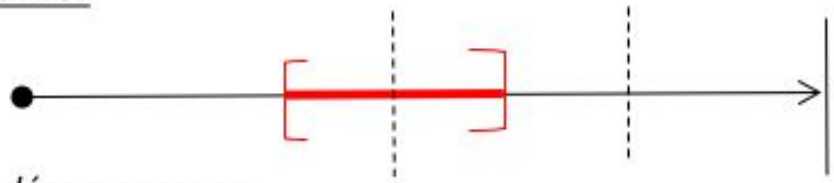
How to rerun over a sub-period or extend my simulation?

Requires CMIP6/V2 (eclis V6.33) *

Use relan and not xrelan !



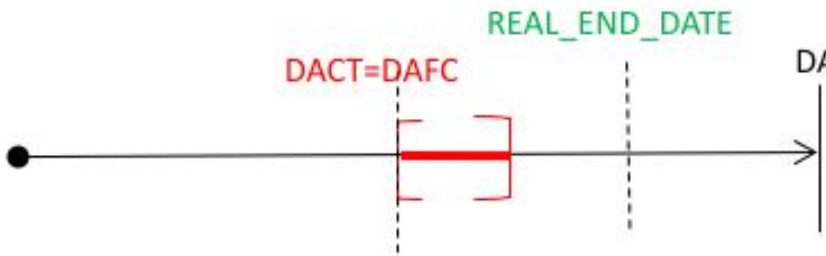
Cas n°5:



Re-run à cheval sur la première date de fin

A décomposer en:


```
VARI export REAL_END_DATE=date_fin1 (_his)
VARI export RERUN=1 (_his)
```




```
VARI export REAL_END_DATE=date_fin2 (_his)
VARI export RERUN=1 (_his)
```

How to rerun over a sub-period or extend my simulation?

Requires CMIP6/V2 (eclis V6.33) *

Use relan and not xrelan !

⚠ * in ALL CASES: *do not forget to* ***change ECLIS version*** *in* ***MYSIMU_his*** *and* ***MYSIMU.conf*** *if the simulation has been performed with a former version.*

⚠ * in ALL CASES: *after an ECLIS version change, some netcdf files may be missing in* ***iox_index****. In such case you will encounter a* ***step.01 crash*** *without any e-mail alert. What you have to do is add by end the lines corresponding to the missing files in iox_index before relaunching.*

⚠ * in ALL CASES: *be sure your* ***ftexp/iox directory is empty*** *before relaunching. If not, delete the netcdf files it contains.*

⚠ in case of PROLONGATION: *do not forget to set* ***"end_date"*** *in* ***dr_experiment_settings.py*** *to your target end date in case your simulation runs beyond the official CMIP6 DR end date.*

Documentation

Beaufix:

- http://intranet.cerfacs.fr/index.php?page=/ressources_informatiques/ressources_externes.php

ECLIS:

- https://inle.cerfacs.fr/projects/cnrm-cm6/wiki/_Doc_ECLIS_

CMIP6 Data Request:

- https://earthsystemcog.org/projects/wip/CMIP6DataRequest

Home Data Request:

- https://github.com/senesis/dr2pub/blob/master/doc/Guide_utilisateur_variables_maison_dr2xml_v2.odt

Dr2xml:

- Fully commented settings dictionaries in code header (/scratch/CMIP6/V1/bin/dr2xml_v1.8/dr2xml.py)

XIOS:

- forge.ipsl.jussieu.fr/ioserver/raw-attachment/wiki/WikiStart/XIOS_user_guide.pdf
- forge.ipsl.jussieu.fr/ioserver/raw-attachment/wiki/WikiStart/XIOS-tutorial.pdf

Now, it's your turn to play !

☺

Some useful commands on hendrix

Connect hendrix from beaufix (telnet):

```
<your_login>@beaufixlogin0:
 $ --> telnet hendrix
login: <your_login@hendrix> (cgloXXX or cgieYYY)
Password:
Jeu de commandes reduit
[...]
Taper 'aide ou help' pour voir les commandes
disponibles
```

Detailed accounting:

```
$ --> acct -v
```

```
bash-4.1$ acct -v
=============================================================
Hendrix detailed accounting for user :              biellid |
-------------------------------------------------------------
Accouting Date: 2018-04-23 20:18:03                         |
-------------------------------------------------------------
|         COS Name          |  File Count  |  Volume (Go) |
-----------------------------+--------------+---------------
| Group_3_single_copy_large |         1074 |          375 |
-----------------------------+--------------+---------------
| Group_3_single_copy_small |           27 |            0 |
-----------------------------+--------------+---------------
|          Total            |         1101 |          375 |

bash-4.1$
```

```
$ --> acct -g -v
```

```
bash-4.1$ acct -g -v
=============================================================
Hendrix detailed accounting for group :                mpup |
-------------------------------------------------------------
Accouting Date: 2018-04-23 20:18:03                         |
-------------------------------------------------------------
|         User Name          |  File Count  |  Volume (Go) |
-----------------------------+--------------+---------------
| biellid                    |         1101 |          375 |
-----------------------------+--------------+---------------
| urgence                    |       243190 |          210 |
-----------------------------+--------------+---------------
| mpup910                    |         3844 |           84 |
-----------------------------+--------------+---------------
| mpup999                    |       221729 |           56 |
-----------------------------+--------------+---------------
| jacf                       |          108 |            5 |
-----------------------------+--------------+---------------
| repessess                  |            2 |            0 |
-----------------------------+--------------+---------------
| vandecasteelee             |            1 |            0 |
-----------------------------+--------------+---------------
| mpupftp                    |            1 |            0 |
-----------------------------+--------------+---------------
|          Total             |       469976 |          730 |

-------------------------------------------------------------
|         COS Name          |  File Count  |  Volume (Go) |
-----------------------------+--------------+---------------
| Group_3_single_copy_large |        17833 |          585 |
-----------------------------+--------------+---------------
| Group_2_single_copy_large |         1687 |          115 |
-----------------------------+--------------+---------------
| Group_3_single_copy_small |       212426 |           24 |
-----------------------------+--------------+---------------
| Group_2_single_copy_small |       238022 |            6 |
-----------------------------+--------------+---------------
| Group_2_double_copy_small |            5 |            0 |
-----------------------------+--------------+---------------
| Group_1_double_copy_small |            2 |            0 |
-----------------------------+--------------+---------------
| Group_1_single_copy_small |            1 |            0 |
-----------------------------+--------------+---------------
|          Total            |       469976 |          730 |

bash-4.1$
```

Some useful commands on hendrix

Volumes & number of files per repository:

```
hshell>dirstat (expect for a public usage)
```