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WRF4G Tutorial part 2

How to manage WRF4G errors

In this section, we are going to see how to manage WRF4G errors. In order to do that, we are going to create a new experiment called `test_1`, based on `single_test`, in which the `end_date` will be `"2011-08-30_12:00:00"`. Follow the steps below.

```
[user@mycomputer~]$ cd $WRF4G_LOCATION/experiments

[user@mycomputer~]$ ls
single_test  wrfuc_physics  wrfuc_single_serial

[user@mycomputer~]$ cp -r single_test single_test_1

[user@mycomputer~]$ cd single_test_1

[user@mycomputer~]$ cat experiment.wrf4g | grep "experiment_name"
experiment_name = "test"

[user@mycomputer~]$ cat experiment.wrf4g | grep "start_date="
start_date="2011-08-28_12:00:00"

[user@mycomputer~]$ cat experiment.wrf4g | grep "experiment_name"
experiment_name = "test_1"

[user@mycomputer~]$ cat experiment.wrf4g | grep "end_date "
end_date        = "2011-08-30_12:00:00"

[user@mycomputer~]$ wrf4g_prepare
Warning: You are using resources.wrf4g located in the /home/carlos/WRF4G/etc/ directory.
Preparing namelist...
WRFV3/run/namelist.input
WRF Check Warning: CAM radiation selected but paerlev/levsiz/cam_abs_dim1/cam_abs_dim2 was not set. Fixing...
WRF Check Warning: radt is shorter than dx (0.500000)

---> Single params run
---> Continuous run
       ---> cycle_chunks: test_1 2011-08-28_00:00:00 2011-08-30_00:00:00
              ---> chunks 1: test_1 2011-08-28_00:00:00 2011-08-28_12:00:00
              ---> chunks 2: test_1 2011-08-28_12:00:00 2011-08-29_00:00:00
              ---> chunks 3: test_1 2011-08-29_00:00:00 2011-08-29_12:00:00
              ---> chunks 4: test_1 2011-08-29_12:00:00 2011-08-30_00:00:00

[user@mycomputer~]$ wrf4g_status --long
Realization          GW  Stat Chunks Comp.Res   WN         Run.Sta       ext   %
test                 2     D  3/3    mycomputer ciclon     Finished       0 100.00
test_1               -     P  0/4    -          -          Prepared       - 0.00

[user@mycomputer~]$ wrf4g_submit
Submitting realization: "test_1"
       Submitting Chunk 1:     2011-08-28_00:00:00     2011-08-28_12:00:00
       Submitting Chunk 2:     2011-08-28_12:00:00     2011-08-29_00:00:00
       Submitting Chunk 3:     2011-08-29_00:00:00     2011-08-29_12:00:00
       Submitting Chunk 4:     2011-08-29_12:00:00     2011-08-30_00:00:00

[user@mycomputer~]$ wrf4g_status --long
Realization          GW  Stat Chunks Comp.Res   WN         Run.Sta       ext   %
test                 2     D  3/3    mycomputer ciclon     Finished       0 100.00
test_1               3     F  1/4    mycomputer ciclon     Failed        62 0.00
```

Like you can see before, the realization `test_1` has finished with an exit code 62. What happened ? The exit code 62 indicates that ungrib binary had an error during its execution. In order to solve the error, we are going to check out the log of the chunk number 1.

```
[user@mycomputer~]$ cat $WRF4G_LOCATION/etc/resources.wrf4g | grep WRF4G_BASEPATH=
WRF4G_BASEPATH="/home/user/WRF4G/repository/output"

[user@mycomputer~]$ cd $WRF4G_LOCATION/repository/output/test_1/test_1/log/

[user@mycomputer~]$ ls
log_1_4.tar.gz
```

The chunk log name is composed of using chunk number and job identifier (GW).

- `log_{chunk_number}_{job_identifier}.tar.gz`

In our case, chunk log name will be log_1_4.tar.gz because the chunk number is 1 and the job identifier is 4.

```
[user@mycomputer~]$ tar xzvf log_1_4.tar.gz
WRF4G.log
configure.wps
ls.wps
ls.wrf
ungrib_GFS_2011082800.out
```

In each log package you are able to see all WRF log binaries as well as WRF4G logs such as WRF4G.log, wrfgel.out and monitor.log. In our case, we are going to focus on WRF4G.log which the main log of the remote simulation.

```
[user@mycomputer~]$ cat WRF4G.log
* Mon Oct  1 17:27:45 CEST 2012: Creating WRF4G structure ...
`/home/user/WRF4G/repository/apps/WRFbin-3.1.1_r832INTEL_OMPI.tar.gz' -> `/home/user/.gw_user_3/WRFbin-3.1.1_r832INTEL_OMP
`/home/user/WRF4G/repository/output/test_1/test_1/namelist.input' -> `/home/user/.gw_user_3/WRFV3/run/namelist.input'
* Mon Oct  1 17:27:46 CEST 2012: Preparing WRF4G binaries ...
* Mon Oct  1 17:27:46 CEST 2012: Creating parallel environment ...
* Mon Oct  1 17:27:46 CEST 2012: Using default configuration ...
* Mon Oct  1 17:27:46 CEST 2012: Checking restart information ...
* Mon Oct  1 17:27:46 CEST 2012: The boundaries and initial conditions are not available ...
* Mon Oct  1 17:27:46 CEST 2012: Downloading geo_em files and namelist.wps ...
/home/user/.gw_user_3/WRFGEL/vcp -v /home/user/WRF4G/repository/domains/Santander_50km/* .
cp -v -R /home/user/WRF4G/repository/domains/Santander_50km/* /home/user/.gw_user_3/WPS
`/home/user/WRF4G/repository/domains/Santander_50km/geo_em.d01.nc' -> `/home/user/.gw_user_3/WPS/geo_em.d01.nc'
`/home/user/WRF4G/repository/domains/Santander_50km/namelist.wps' -> `/home/user/.gw_user_3/WPS/namelist.wps'
* Mon Oct  1 17:27:46 CEST 2012: Modifying namelist ...
Updating parameter start_date in file: namelist.wps
Updating parameter end_date in file: namelist.wps
Updating parameter max_dom in file: namelist.wps
Updating parameter prefix in file: namelist.wps
Updating parameter interval_seconds in file: namelist.wps
* Mon Oct  1 17:27:46 CEST 2012: About to run preprocessor and Ungrib ...
* Mon Oct  1 17:27:46 CEST 2012: Running preprocessor.default ...
Linking global data from: /home/user/WRF4G/repository/input/NCEP/GFS
`/home/user/.gw_user_3/WPS/grbData/gfs2011082812_00.grb' -> `/home/user/WRF4G/repository/input/NCEP/GFS/2011/gfs2011082812
`/home/user/.gw_user_3/WPS/grbData/gfs2011082812_06.grb' -> `/home/user/WRF4G/repository/input/NCEP/GFS/2011/gfs2011082812
`/home/user/.gw_user_3/WPS/grbData/gfs2011082812_12.grb' -> `/home/user/WRF4G/repository/input/NCEP/GFS/2011/gfs2011082812
`/home/user/.gw_user_3/WPS/grbData/gfs2011082812_18.grb' -> `/home/user/WRF4G/repository/input/NCEP/GFS/2011/gfs2011082812
`/home/user/.gw_user_3/WPS/grbData/gfs2011082812_24.grb' -> `/home/user/WRF4G/repository/input/NCEP/GFS/2011/gfs2011082812
`/home/user/.gw_user_3/WPS/grbData/gfs2011082812_30.grb' -> `/home/user/WRF4G/repository/input/NCEP/GFS/2011/gfs2011082812
`/home/user/.gw_user_3/WPS/grbData/gfs2011082812_36.grb' -> `/home/user/WRF4G/repository/input/NCEP/GFS/2011/gfs2011082812
* Mon Oct  1 17:27:47 CEST 2012: Running ungrib ...
********************************************************************************
WRF4G was deployed in ...
   /home/user/.gw_user_3
```

```
and it ran in ...
   /home/user/.gw_user_3
*******************************************************************************
```

WRF4G.log shows that ungrid was the last WRF binary. Therefore, if you check out ungrib log, you will probably discover the error.

```
[user@mycomputer~]$ tail ungrib_GFS_2011082800.out
200.0  X        X        X        X        X
150.0  X        X        X        X        X
100.0  X        X        X        X        X
 70.0  X        X        X        X        X
 50.0  X        X        X        X        X

Subroutine DATINT: Interpolating 3-d files to fill in any missing data...
Looking for data at time 2011-08-28_00
ERROR: Data not found: 2011-08-28_00:00:00.0000
Begin rrpr

-------------------------------------------------------------------------------
```

The problem is that there is not input data to simulate the last chunk.

```
[user@mycomputer~]$cat experiment.wrf4g | grep "extdata_path"
extdata_path = "${WRF4G_INPUT}/NCEP/GFS"

[user@mycomputer~]$ cat $WRF4G_LOCATION/etc/resources.wrf4g | grep "WRF4G_INPUT="
WRF4G_INPUT="/home/user/WRF4G/repository/input"

[user@mycomputer~]$ ls -l /home/user/WRF4G/repository/input/NCEP/GFS/2011/
total 36388
-rw-r--r-- 1 user user 4909850 2012-09-13 11:38 gfs2011082812_00.grb
-rw-r--r-- 1 user user 5411705 2012-09-13 11:38 gfs2011082812_06.grb
-rw-r--r-- 1 user user 5411214 2012-09-13 11:38 gfs2011082812_12.grb
-rw-r--r-- 1 user user 5415031 2012-09-13 11:38 gfs2011082812_18.grb
-rw-r--r-- 1 user user 5397677 2012-09-13 11:38 gfs2011082812_24.grb
-rw-r--r-- 1 user user 5386190 2012-09-13 11:38 gfs2011082812_30.grb
-rw-r--r-- 1 user user 5316014 2012-09-13 11:38 gfs2011082812_36.grb
```

Now, try to ...

How to add new computing resources to WRF4G

WRF4G uses DRM4G to access to different Distributed Resource Managements (DRM) such as:

- PBS/Torque
- SGE
- FORK
- LoadLeveler
- MN SLRUM (only for Red Española de Supercomputación)

In order to add new resources, you need to edit `Computing Resources` section in the framework4g.conf file which is located under `$WRF4G_LOCATION/etc` directory. The file has to contain one resource per line with the format:

```
  resource_name   attributes
...     ...
resource_name   attributes
```

where:

- **resource_name**: is the name of the resource.

  attributes: are the static attributes of the resource and their syntax is:

  <scheme>:*<username>*@*<host>*?*<query>*

  scheme: the URL schemes available are "ssh" and "local".

  - **ssh**: access to remote DRM via SSH
  - **local**: use the local DRM

  - **username**: user name
  - **host**: host name

    query: contains additional information. The query string syntax is:

    - key1=value1;key2=value2;key3=value3

Variable options:

- **LRMS_TYPE**(mandatory): DRM system for execution [pbs | sge | fork | loadleveler | mnslurm]
- **PROJECT**(optional for SGE, PBS and LoadLeveler): specifies the user's project on the resource
- **GW_RUNDIR**(optional): directory on the resource in which simulation jobs are deployed. By default, it is user's home. **Be carefully with this variable**, we recommend you change this directory in production because the home directory usually has a low quote (have to be an absolute path)
- **GW_LOCALDIR**(optional): defines the working directory on the resource (have to be an absolute path)
- **NODECOUNT**(optional): total number of slots on the DRM system (cores)
- **QUEUE_NAME**(optional): the name of the queue to configure

Examples of configuration:

```
mycomputer    local://localhost?LRMS_TYPE=fork;NODECOUNT=2
```

```
PBS_cluster   local://localhost?LRMS_TYPE=pbs;QUEUE_NAME=estadistica
```

```
SGE_cluster   local://localhost?LRMS_TYPE=sge;PROJECT=l.project
```

If you want to configure a remote computing resource through ssh protocol, you need to put your private keys into your ?ssh-agent, and it will handle your authentication thereafter (see Appendix A) or set up SSH login without *password* (see Appendix B).

In addition, you will probably need to update `WRF4G_BASEPATH`, `WRF4G_DOMAINPATH`, `WRF4G_INPUT` and `WRF4G_APPS` variables, which are defined in resources.wrf4g . Due to the fact that these variables may point to other machines. See running environment for more information.

```
remote_PBS    ssh://user@meteo1.macc.unican.es?LRMS_TYPE=pbs;QUEUE_NAME=short
```

After modifying `Computing Resources` section, in order to make changes effective, you have to execute:

```
wrf4g_framework reload
```

Now, try to update the `uc_phys` experiment and then resubmit it again

How to use `wrf4g_kill` command

In this example, we are going to simulate an experiment with independent realizations which has multiple_parameters flag activated. The experiment is compose of five realizations with three chunk per realization. In order to use wrf4g_kill command, we are going to first submit the experiment.

```
[user@mycomputer~]$ cd $WRF4G_LOCATION/experiments/wrfuc_physics

[user@mycomputer~]$ ls
experiment.wrf4g

[user@mycomputer~]$ cat experiment.wrf4g | grep "param"
multiple_parameters=1
 multiparams_variables="mp_physics,cu_physics,ra_lw_physics,ra_sw_physics,sf_sfclay_physics,bl_pbl_physics,sf_surface_phys
 multiparams_nitems="${max_dom},${max_dom},${max_dom},${max_dom},${max_dom},${max_dom},${max_dom}"
 multiparams_combinations="5,1:1:0,1,1,2,2,2/4,1:1:0,1,1,1,1,2/4,1:1:0,1,1,2,2,2/4,1:1:0,1,1,7,7,2/4,3:3:0,1,1,7,7,2  "
```

```
 multiparams_labels="phys1/phys2/phys3/phys4/phys5"

[user@mycomputer~]$ wrf4g_prepare
Warning: You are using resources.wrf4g located in the /home/carlos/WRF4G/etc/ directory.
Preparing namelist...
WRFV3/run/namelist.input
WRF Check Warning: CAM radiation selected but paerlev/levsiz/cam_abs_dim1/cam_abs_dim2 was not set. Fixing...
WRF Check Warning: radt is shorter than dx (0.500000)

--->Realization: multiparams=phys1 2011-08-28_12:00:00 2011-08-30_00:00:00
Updating parameter mp_physics in file: namelist.input
Updating parameter cu_physics in file: namelist.input
Updating parameter ra_lw_physics in file: namelist.input
Updating parameter ra_sw_physics in file: namelist.input
Updating parameter sf_sfclay_physics in file: namelist.input
Updating parameter bl_pbl_physics in file: namelist.input
Updating parameter sf_surface_physics in file: namelist.input
---> Continuous run
       ---> cycle_chunks: uc_phys__phys1 2011-08-28_12:00:00 2011-08-30_00:00:00
               ---> chunks 1: uc_phys__phys1 2011-08-28_12:00:00 2011-08-29_00:00:00
               ---> chunks 2: uc_phys__phys1 2011-08-29_00:00:00 2011-08-29_12:00:00
               ---> chunks 3: uc_phys__phys1 2011-08-29_12:00:00 2011-08-30_00:00:00

--->Realization: multiparams=phys2 2011-08-28_12:00:00 2011-08-30_00:00:00
Updating parameter mp_physics in file: namelist.input
Updating parameter cu_physics in file: namelist.input
Updating parameter ra_lw_physics in file: namelist.input
Updating parameter ra_sw_physics in file: namelist.input
Updating parameter sf_sfclay_physics in file: namelist.input
Updating parameter bl_pbl_physics in file: namelist.input
Updating parameter sf_surface_physics in file: namelist.input
---> Continuous run
       ---> cycle_chunks: uc_phys__phys2 2011-08-28_12:00:00 2011-08-30_00:00:00
               ---> chunks 1: uc_phys__phys2 2011-08-28_12:00:00 2011-08-29_00:00:00
               ---> chunks 2: uc_phys__phys2 2011-08-29_00:00:00 2011-08-29_12:00:00
               ---> chunks 3: uc_phys__phys2 2011-08-29_12:00:00 2011-08-30_00:00:00

--->Realization: multiparams=phys3 2011-08-28_12:00:00 2011-08-30_00:00:00
Updating parameter mp_physics in file: namelist.input
Updating parameter cu_physics in file: namelist.input
Updating parameter ra_lw_physics in file: namelist.input
Updating parameter ra_sw_physics in file: namelist.input
Updating parameter sf_sfclay_physics in file: namelist.input
Updating parameter bl_pbl_physics in file: namelist.input
Updating parameter sf_surface_physics in file: namelist.input
---> Continuous run
       ---> cycle_chunks: uc_phys__phys3 2011-08-28_12:00:00 2011-08-30_00:00:00
               ---> chunks 1: uc_phys__phys3 2011-08-28_12:00:00 2011-08-29_00:00:00
               ---> chunks 2: uc_phys__phys3 2011-08-29_00:00:00 2011-08-29_12:00:00
               ---> chunks 3: uc_phys__phys3 2011-08-29_12:00:00 2011-08-30_00:00:00

--->Realization: multiparams=phys4 2011-08-28_12:00:00 2011-08-30_00:00:00
Updating parameter mp_physics in file: namelist.input
Updating parameter cu_physics in file: namelist.input
Updating parameter ra_lw_physics in file: namelist.input
Updating parameter ra_sw_physics in file: namelist.input
Updating parameter sf_sfclay_physics in file: namelist.input
Updating parameter bl_pbl_physics in file: namelist.input
Updating parameter sf_surface_physics in file: namelist.input
---> Continuous run
       ---> cycle_chunks: uc_phys__phys4 2011-08-28_12:00:00 2011-08-30_00:00:00
```

```
               ---> chunks 1: uc_phys__phys4 2011-08-28_12:00:00 2011-08-29_00:00:00
               ---> chunks 2: uc_phys__phys4 2011-08-29_00:00:00 2011-08-29_12:00:00
               ---> chunks 3: uc_phys__phys4 2011-08-29_12:00:00 2011-08-30_00:00:00

--->Realization: multiparams=phys5 2011-08-28_12:00:00 2011-08-30_00:00:00
Updating parameter mp_physics in file: namelist.input
Updating parameter cu_physics in file: namelist.input
Updating parameter ra_lw_physics in file: namelist.input
Updating parameter ra_sw_physics in file: namelist.input
Updating parameter sf_sfclay_physics in file: namelist.input
Updating parameter bl_pbl_physics in file: namelist.input
Updating parameter sf_surface_physics in file: namelist.input
---> Continuous run
       ---> cycle_chunks: uc_phys__phys5 2011-08-28_12:00:00 2011-08-30_00:00:00
               ---> chunks 1: uc_phys__phys5 2011-08-28_12:00:00 2011-08-29_00:00:00
               ---> chunks 2: uc_phys__phys5 2011-08-29_00:00:00 2011-08-29_12:00:00
               ---> chunks 3: uc_phys__phys5 2011-08-29_12:00:00 2011-08-30_00:00:00

[user@mycomputer~]$ wrf4g_status --long
Realization          GW  Stat Chunks Comp.Res   WN         Run.Sta       ext   %
uc_phys__phys1       -     P  0/3    -          -          Prepared       - 0.00
uc_phys__phys2       -     P  0/3    -          -          Prepared       - 0.00
uc_phys__phys3       -     P  0/3    -          -          Prepared       - 0.00
uc_phys__phys4       -     P  0/3    -          -          Prepared       - 0.00
uc_phys__phys5       -     P  0/3    -          -          Prepared       - 0.00

[user@mycomputer~]$ wrf4g_submit
Submitting realization: "uc_phys__phys1"
       Submitting Chunk 1:     2011-08-28_12:00:00     2011-08-29_00:00:00
       Submitting Chunk 2:     2011-08-29_00:00:00     2011-08-29_12:00:00
       Submitting Chunk 3:     2011-08-29_12:00:00     2011-08-30_00:00:00
Submitting realization: "uc_phys__phys2"
       Submitting Chunk 1:     2011-08-28_12:00:00     2011-08-29_00:00:00
       Submitting Chunk 2:     2011-08-29_00:00:00     2011-08-29_12:00:00
       Submitting Chunk 3:     2011-08-29_12:00:00     2011-08-30_00:00:00
Submitting realization: "uc_phys__phys3"
       Submitting Chunk 1:     2011-08-28_12:00:00     2011-08-29_00:00:00
       Submitting Chunk 2:     2011-08-29_00:00:00     2011-08-29_12:00:00
       Submitting Chunk 3:     2011-08-29_12:00:00     2011-08-30_00:00:00
Submitting realization: "uc_phys__phys4"
       Submitting Chunk 1:     2011-08-28_12:00:00     2011-08-29_00:00:00
       Submitting Chunk 2:     2011-08-29_00:00:00     2011-08-29_12:00:00
       Submitting Chunk 3:     2011-08-29_12:00:00     2011-08-30_00:00:00
Submitting realization: "uc_phys__phys5"
       Submitting Chunk 1:     2011-08-28_12:00:00     2011-08-29_00:00:00
       Submitting Chunk 2:     2011-08-29_00:00:00     2011-08-29_12:00:00
       Submitting Chunk 3:     2011-08-29_12:00:00     2011-08-30_00:00:00

[user@mycomputer~]$ wrf4g_status --long
Realization          GW  Stat Chunks Comp.Res   WN         Run.Sta       ext   %
uc_phys__phys1       0     W  1/3    -          -          Submitted      - 0.00
uc_phys__phys2       3     W  1/3    -          -          Submitted      - 0.00
uc_phys__phys3       6     W  1/3    -          -          Submitted      - 0.00
uc_phys__phys4       9     W  1/3    -          -          Submitted      - 0.00
uc_phys__phys5       12    W  1/3    -          -          Submitted      - 0.00

[user@mycomputer~]$ wrf4g_status --long
Realization          GW  Stat Chunks Comp.Res   WN         Run.Sta       ext   %
uc_phys__phys1       0     R  1/3    mycomputer ciclogenes WRF            - 0.00
uc_phys__phys2       3     W  1/3    -          -          Submitted      - 0.00
uc_phys__phys3       6     W  1/3    -          -          Submitted      - 0.00
```

```
uc_phys__phys4       9     W  1/3    -          -          Submitted      - 0.00
uc_phys__phys5       12    W  1/3    -          -          Submitted      - 0.00
```

As the experiment is working now, we are going to stop the ckunks of the `uc_phys__phys1` realization using `wrf4g_kill` command.

```
[user@mycomputer~]$ wrf4g_kill -r uc_phys__phys1

[user@mycomputer~]$ wrf4g_status --long
Realization          GW  Stat Chunks Comp.Res   WN         Run.Sta       ext   %
uc_phys__phys1       -     P  0/3    -          -          Prepared       - 0.00
uc_phys__phys2       3     W  1/3    -          -          Submitted      - 0.00
uc_phys__phys3       6     W  1/3    -          -          Submitted      - 0.00
uc_phys__phys4       9     W  1/3    -          -          Submitted      - 0.00
uc_phys__phys5       12    W  1/3    -          -          Submitted      - 0.00
```

Note that, `Run.Sta` has changed into Prepared value. If you want you submit again the realization, you only need to execute `wrf4g_submit -r uc_phys__phys1`.

```
[user@mycomputer~]$ wrf4g_submit -r uc_phys__phys1
Submitting realization: "uc_phys__phys1"
       Submitting Chunk 1:     2011-08-28_12:00:00     2011-08-29_00:00:00
       Submitting Chunk 2:     2011-08-29_00:00:00     2011-08-29_12:00:00
       Submitting Chunk 3:     2011-08-29_12:00:00     2011-08-30_00:00:00

[user@mycomputer~]$ wrf4g_status --long
Realization          GW  Stat Chunks Comp.Res   WN         Run.Sta       ext   %
uc_phys__phys1       15    W  1/3    -          -          Submitted      - 0.00
uc_phys__phys2       3     R  1/3    mycomputer ciclogenes real           - 0.00
uc_phys__phys3       6     W  1/3    -          -          Submitted      - 0.00
uc_phys__phys4       9     W  1/3    -          -          Submitted      - 0.00
uc_phys__phys5       12    W  1/3    -          -          Submitted      - 0.00

[user@mycomputer~]$ wrf4g_status --long
Realization          GW  Stat Chunks Comp.Res   WN         Run.Sta       ext   %
uc_phys__phys1       15    W  1/3    -          -          Submitted      - 0.00
uc_phys__phys2       3     R  1/3    mycomputer ciclogenes WRF            - 0.00
uc_phys__phys3       6     W  1/3    -          -          Submitted      - 0.00
uc_phys__phys4       9     W  1/3    -          -          Submitted      - 0.00
uc_phys__phys5       12    W  1/3    -          -          Submitted      - 0.00
```

The `uc_phys__phys2` is running because all realizations are independents.

Now, try to stop the `uc_phys` experiment and then resubmit it again