Testing and Continuous Integration

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$\Longrightarrow$ All needs to be carefully tested!

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Most of the above need to be done by hand by developers.

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- Tests to check performance (performance regression tests)

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- We have a number of different computers to run the tests

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  - report results to master

Our test farm

Range of machines:

- intel x86
- PPC
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Range of 'toolchains' (i.e. compilers + libraries):

- foss (gnu compilers), fosscuda
- intel, intelcuda
- different combinations with MPI and OpenMP
- several versions of each toolchain
- different optimizations and set of libraries
- valgrind

The Buildbot GUI

- Main views:
  - Waterfall
  - Grid
  - Console
- Pipeline view: Details of the test runs. (also "Rebuild")
  - Details of the run: Look here for error messages
  - Rebuild button
- Other tabs: builders, pending buildrequests, workers
  - Builders: list of pipelines
  - Pending buildrequests: look here to see how long you might have to wait.
  - Workers: list of machines: might indicate is a machine is 'ill'

Test scripts

Test script (run by buildbot, or locally):

- custom PERL and bash scripts
- allows for simple if constructions in test files
- schedules tests for multi-processor workers
- handles parallelism

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- `oct-run_testsuite.sh`: run groups of tests and schedule the tests
- `oct-run_regression_test.pl`: run individual tests

Testfiles live in: `testsuite/`

Test files

Example test file:

```
Test       : Crank-Nicolson (SPARSKIT)
Program    : octopus
TestGroups : short-run, real_time
Enabled    : Yes

Processors : 1
Input      : 16-sparskit.01-gs.inp
match ; SCF convergence ; GREPCOUNT(static/info, 'SCF converged') ; 1
match ; Initial energy ; GREPFIELD(static/info, 'Total       =', 3) ; -10.60764719

Processors : 4
Input      : 16-sparskit.02-kick.inp
if (available sparskit); then
    match ; Energy [step  1] ; LINEFIELD(td.general/energy, -21, 3) ; -1.058576638440e+01
    match ; Energy [step  5] ; LINEFIELD(td.general/energy, -16, 3) ; -1.043027231981e+01
    match ; Energy [step 10] ; LINEFIELD(td.general/energy, -11, 3) ; -1.043026650500e+01
    match ; Energy [step 15] ; LINEFIELD(td.general/energy, -6, 3) ; -1.043026483491e+01
    match ; Energy [step 20] ; LINEFIELD(td.general/energy, -1, 3) ; -1.043026489604e+01

    match ; Dipole [step  1] ; LINEFIELD(td.general/multipoles, -21, 4) ; 6.723772397619e-13
    match ; Dipole [step  5] ; LINEFIELD(td.general/multipoles, -16, 4) ; -7.295810087049e-01
    match ; Dipole [step 10] ; LINEFIELD(td.general/multipoles, -11, 4) ; -1.339402779435e+00
    match ; Dipole [step 15] ; LINEFIELD(td.general/multipoles, -6, 4) ; -1.833991374772e+00
    match ; Dipole [step 20] ; LINEFIELD(td.general/multipoles, -1, 4) ; -2.215415201335e+00
else
    match; Error missing SPARSKIT; GREPCOUNT(err, 'recompile with SPARSKIT support') ; 1
endif
```

Writing tests

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Guidelines:

- all features should be tested, but not necessarily in one test
- also test error messages
- make calculations as short as possible
- test several relevant quantities (matches are free)
- if possible, provide a unit test (see `main/test.F90`)

Some remarks

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  $\longrightarrow$ when in doubt, check on the buildbot GUI.

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- We have some random failures
  - Numerical noise (e.g. due to parallelization): increase tolerance of test
  - Possible bugs? We don't know yet.
  - Try to rebuild that pipeline.
    If the failure remains, it's probably a bug!
  - Use the testsuite app to find systematic deviations.