

# PSIDE – Parallel Software for Implicit Differential Equations

## Basic usage in GNU/Linux

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## 1 Forewords

This document provides a short usage instructions of compiling and running a test problem with PSIDE. The suitable operational system where tests were performed was GNU/Linux. In the Table below I display the test environmental configurations.

Processor	Intel <sup>®</sup> Core <sup>™</sup> i5-7200U CPU @ 2.50GHz × 4
RAM	7,7 GiB DDR3
Operational System (OS)	Ubuntu 16.04 LTS
OS type	64-bits

Table 1: Computer configurations.

The source files employed here were altered compared with the original ones. The directory **original** contains the latter, while **src** contains the ones which are under improvements, such as implementing modern parallelization techniques. The current changes concern in updating OpenMP directives. Futher improvements will be carry out soon.

## 2 Compiling

The user can choose between some options. Currently, the available compilers are:

- GNU Compiler **gfortran**. Compilation can be achieved with the following script execution:

```
./compile_gfortran.sh test_problem.f
```

for actual source files and

```
./compile_original_gfortran.sh test_problem.f
```

for original PSIDE source file implementation. The **test\_problem.f** denotes the Fortran 77 file which the problem is described (ex.: **hires.f**).

- Intel Compiler **ifort**: Analogously we have

```
./compile_intel.sh test_problem.f Nt
```

for actual source files and

```
./compile_original_intel.sh test_problem.f Nt
```

for the original source files. Here, `Nt` denotes the number of OpenMP threads that will be setted up as environmental variable definition. This argument is optional. If not provided, the compilation will be carried out as default. Otherwise, auto-parallelization will be employed by `ifort` by means of `-parallel` compiler option.

A simple usage example is

```
./compile_intel.sh problems/Beam/beam.f 4
```

The output obtained was

```
Compiler version check:
+++ Version:

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version
  18.0.1.163 Build 20171018
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

+++ Status: OK

Clearing binaries:
+++ Status: OK
Compiling modules:
+++ Number of threads: 4
+++ Initializing...
    ifort -c -parallel ../src/pside.f
    ifort -c -parallel ../src/psidea.f
    ifort -c -parallel ../src/report.f
    ifort -c -parallel ../src/psided.f
+++ Linking...
    ifort -parallel -o ../dotest ../problems/Beam/beam.f psided.o pside.o psidea.o report.o
+++ Status: OK
```

### 3 Running

Running PSIDE is straightforward due to gathering of test problem to the compiled solver is achieved by compilation script described in the previous section. Therefore, running PSIDE consists in executing the following command

```
./dotest
```

**Remark:** The tolerances reading during run-time were suppressed. This modification were employed aiming obtaining a more clear time execution record, suitable to realization of performances comparative studies. The values attributed are  $10^{-10}$  to both relative and absolute errors.