

ECMWF training course – 2017

Compiling environment – ecgate

Practical solutions

Have a look at the Makefile in `.solutions/Makefile`

EXERCISE 1 (Compiling, linking)

```
% gfortran -o hello hello.f
% ./hello
```

EXERCISE 2 (Creating libraries)

Static version:

```
% gfortran -c prime.f
% ar -rv libmy.a prime.o
% gfortran -o primecheck primecheck.f -L. -lmy
```

Or:

```
% gfortran -o primecheck primecheck.f libmy.a
% ./primecheck
(% rm libmy.a; ./primecheck)
```

Dynamic (shared library) version:

```
% gfortran -c -fPIC prime.f
% gfortran -shared -o libmy.so prime.o
% gfortran -o primecheck primecheck.f -L$PWD -Wl,-rpath,$PWD -lmy
```

EXERCISE 3 (Using libraries)

```
% gfortran -o grdemo grdemo.f90 $ECCODES_INCLUDE $ECCODES_LIB
% ./grdemo
```

```
% gfortran -o bfdemo bfdemo.f90 $ECCODES_INCLUDE $ECCODES_LIB
% ./bfdemo
```

EXERCISE 4 (Basic Debugging)

```
% gfortran -o debug debug.f
% ./debug
```

What can you do to get more information about the problems? (see lecture notes)

```
% gfortran -ffpe-trap=overflow,invalid,zero -o debug debug.f
% ./debug
```

Generate a core and read with gdb ...

```
% ulimit -c unlimited
% ./debug
% gdb -c core.* debug
```

You may want to use gdb internal commands like where, print...

EXERCISE 5 (Profiling and 'optimisation')

```
% gfortran -o primecheck primecheck.f prime.f
% time ./primecheck
```

Any trivial way to improve the execution time of this program?

```
% gfortran -O3 -o primecheck primecheck.f prime.f
% time ./primecheck
```

To obtain a profile?

```
% gfortran -O0 -g -pg -o primecheck primecheck.f prime.f
% gprof primecheck gmon.out
```

Extra: NAS Benchmark

```
% cd $SCRATCH
% tar xf /home/ectrain/trx/intro/NPB3.3-SER.tar.gz
% cd NPB3.3-SER/
% less README.install
% cp config/NAS.samples/make.def_gcc_x86 config/make.def
```

Edit config/make.def with the right values for FFLAGS, FLINKFLAGS, CFLAGS, CLINKFLAGS. Play with flags like -O0, -O3, -g -pg for profile... Example:

```
% make BT CLASS=A
```

The executables are in bin/*. Consider testing in a job. You can make the whole class A suite with suite with:

```
% sed s/S/A/ config/suite.def.template > config/suite.def
% make suite
```