Interactive European Grid

Fortran 90 Support in I2G

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Overview

- Motivation
- Testing a Fortran 90 application
- Suggestions

Motivation

- Most researchers (e.g. from physics) use Fortran code
- Support for Fortran 90 applications using MPI has been requested from multiple users in I2G recently
- Support for Fortran 90 in the I2G structure is not available

Current Support

- Currently, I2G does not provide any Fortran 90 compiler "inside" the infrastructure
- Two main possibilities considered were:
  - Static linking
  - Dynamic linking

Used Application

- DD_filtre2 is an environmental simulation written in Fortran 90 and using MPI
- DD_filtre2 is complex:
  - BLAS routines used
  - MPI routines used

Dynamic Linking

- Linking against shared libraries is the default approach for Linux
- Problem: shared objects must be available at runtime
  - For a “transparent” Grid, this means on all cluster nodes of all sites
- For DD_filtre2, this includes
  - Shared Fortran libraries (for example /usr/lib/libgfortran.so.1.0.0)
  - MPI-F77 libraries in Open MPI
  - Gfortran is not installed

Static Linking

- With static linking, the referenced libraries must be static
  - Compiling a static binary from a shared-object MPI library not possible
- Every dependency needs a static library:
  - Static Gfortran (or other Fortran 90) libraries must be available
  - Open MPI had to be statically compiled
  - BLAS needed to be statically linked against the Fortran 90 compiler

Static Linking

- Requirement: when building statically for the Grid, the compiler has to build against the target architecture
  - For I2G, it is safe to assume that all clusters run 32-bit x86 binaries
- Do not optimize against a processor type
- First results for the infrastructure with static binaries are encouraging

Results - Static Linking

- Tested compilers involved:
  - Gfortran v. 4.1.2
    - 8 out of 10 sites successful
  - Intel Fortran Compiler v. 10.0
    - 7 out of 10 sites successful
- Other sites with “Aborted” status – might be site-configuration problem
- No measurements of performance degradation made

Suggestions

- Installing the shared gfortran libraries into all nodes should solve most of the problems with Fortran 90 support
  - Should not be a problem from licensing point of view
- When Gfortran fails, it might be useful to “roll-your-own”:
  - have few UI nodes with a static MPI installation and an alternative compiler (like *ifort*) with license for interface node only
  - A clear documentation on the static compilation process would be very much neededl!
  - Performance?