The ENES HPC Task Force

Earth System Modelling and Programming Languages

The ENES High Performance Computing Task Force has been established by the European Network for Earth System Modelling (www.enes.org) to take care about the problems common to this scientific field w.r.t. High Performance Computing - which is a major tool for the parties of ENES involved.

One of the problems of this community is the fact that the climate models they develop have a much longer development timescale (on the order of 10 to 20 years) than the lifetime of systems, architectures or even special languages involved (remember developments like HP-Fortran, Chapel, HPjava etc.). The current generation of these climate models are based upon formulas, and are very well expressed in FORTRAN with some use of C and C++. These „mature" climate models are proven, tested, reliable applications which enable the ENES community to concentrate on their scientific problems. But model performance suffers from the ever-changing modern architectures. There are activities like domain-specific/embedded languages (ICON, COSMO consortium) or automatic code generation (UK Gung-Ho), which show that the community is not only aware of, but actively involved in testing, developing and applying modern programming paradigms.

The Task Force observes with growing concern a tendency in the HPC community to propose to use „new" programming languages (like the ones mentioned above) to re-engineer the applications mentioned above for the coming architectures. For the ENES community it is not possible to completely re-write existing climate models in new languages in any "short" time due to the cost involved, where „short" is on the order of 5 - 10 years

The community has recognised the need to invest in radically more scalable codes for the next generation of climate models, but these cannot be developed quickly and we do not have the resources to achieve this and to re-work existing models at the same time. These models also need to undergo continual scientific development, which is of greater importance than "pure technical" improvements. So, FORTRAN based models will be with us for at least the next 10 years.

The community would like to both request the continued support and development of existing language standards for the current generation of models for the next 10 years, at least, and at the same time engage with vendors, system architects and resource providers on longer term plans to find programming solutions suitable for the climate community for the next generation of models and future machines. In fact, there is the potential to find a consensus across both the climate and weather forecasting communities internationally.

The Task Force is actively involved in establishing and maintaining an active dialogue between the HPC community - vendors, scientists, resource providers etc. - and its users. It maintains a series of workshops, is engaged in the meetings and exchange platforms of the field, and ready to participate in language development and standardisation activities. For more information please contact Marie-Alice Foujols (Marie-Alice.Foujols@ipsl.jussieu.fr) or Reinhard Budich (reinhard.budich@mpimet.mpg.de)

On behalf of, and with the collaboration of the ENES HPC Task Force

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