

Open Network for High-Performance Computing on Complex Environments



Participating countries: BE, DE, BU, CH, CY, DK, ES, FI, FR, GR, HU, IR, IL, IT, LI, NL, NO, PL, PO, RO, RU, SE, SI, TR, UK

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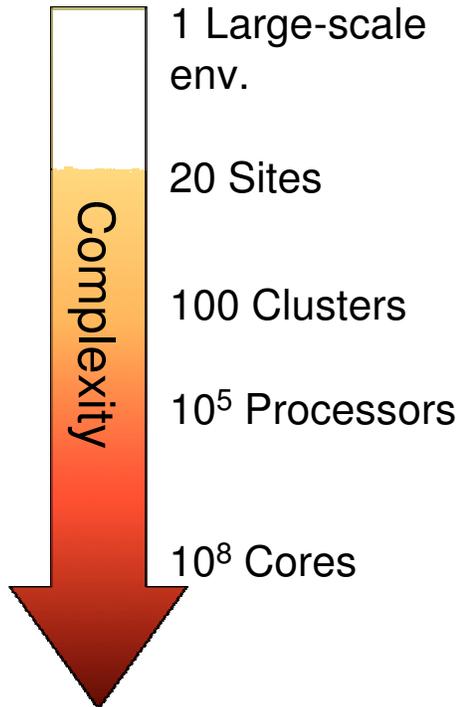


Figure 1: The complexity of today computing infrastructure

Objectives:

- **Coordinate European groups** working on the use of heterogeneous and hierarchical systems for HPC as well as the development of collaborative activities among the involved research groups.
- **Overcome research fragmentation:** foster HPC efforts to increase Europe competitiveness
- **Tackle the problem at every level** (from cores to large-scale environments)
- **Vertical integration:** provide new integrated solutions for large-scale computing for future platforms
- **Train new generations of scientists** in high-performance and heterogeneous computing

Working Group 1

Numerical analysis for hierarchical and heterogeneous and multicore systems.

The goal of this Working Group is to tackle scientific problem that arise in the field of linear algebra, differential equation solvers, pre-conditioners, etc. Such problems are of key importance when high-performance is the target. Moreover, in this Working Group, participants will address these issues at every level of the architecture (from the core to the large-scale). The long-term objective is to have a set of libraries and tools that will efficiently use nowadays complex systems.

Working Group 2

Efficient use of complex systems with an emphasis of computational library and communication library.

Efficiently programming complex systems is an extremely difficult challenge. The development of applications that use all the power of the available architecture and that are also portable requires the development of low-level libraries. With these libraries, programmers will easily design new applications that will work on today and future architectures. In this Working Group, partners will work on the design, implementation and test of libraries for an efficient use of modern complex systems. In particular, an emphasis on GPUs (Graphical Processing Unit), multicore processors and heterogeneous network is given.

Working Group 3

Algorithms and tools for mapping and executing applications onto distributed and heterogeneous systems.

The resources that compose the complex systems targeted in this Action are of three types: computing resources, network resources and storage resources. The performance of an application greatly depends on the way these resources are chosen to execute it. The goal of this Working Group is to work on algorithms for mapping, scheduling and executing applications on large-scale and complex systems. Members of this Working Group will work on creating new algorithms for this area taking into account the complexity of today infrastructure as well as the different criteria that need to be optimized in this context. Examples of researches that will be carried-out in the Working Group are given next.

Working Group 4

Applications of hierarchical-heterogeneous systems.

Nowadays applications process larger and larger data sets. Therefore, they require a larger number of processing units as well as more and more of memory. In this Action, the challenge of efficiently executing applications onto complex infrastructures will be taken. A set of applications that members of this Working Group already agree to develop is given here. Due to the nature of the target infrastructures (hierarchical, heterogeneous and large-scale), addressing this challenge requires solving a lot issues. Therefore, this Working Group will use the results of the three above Working Group to design and implement the proposed applications when necessary.

Main Achievements:

- We have gathered more than 60 researchers from the different participating countries at the first action meeting that took place in October 2009 in Lisbon.
- We have launched a set of collaborative works between participants through 18 STSMs.
- We have launched activities on highly strategic topics such as GPU or multicore.