

**THE 1st INTERNATIONAL CONFERENCE
RESEARCH AND EDUCATION CHALLENGES TOWARD THE FUTURE
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High Performance Computing – a Response to Research Challenges

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Dear Colleagues,

First of all I need to express special congratulations to the staff of University of Shkodra “Luigj Gurakuqi” for the organization of this Conference, wish them success and hope that it is only the beginning for future conferences and collaboration.

The success of such conferences is based in close collaboration between researchers and educators. The World is living in a period of rapid changes and development that represent serious challenges for the future of research and education. I had the chance to “touch” computers about 40 years ago, in that time we learned from our teachers to work with Kilo-Bytes, today we teach young students about Peta-Bytes, that is 1,000,000,000,000, one thousand billion times more. This is only one small indicator of this development. And it is paving the road towards solving of extreme complex problems in different areas as physics, chemistry, biology, environment, economy etc. Walking in this road is a challenge by itself, which requires close inter-disciplinary collaboration and exploitation of high performance computing capacities (HPC).

I dare to mention HPC because, despite difficulties we are living on, HPC as an expression of *collaboration* and *support* is already within our touch. It is *collaboration* because it is related with ten years of working together within South-Eastern European and Caucasus countries in a suite of European projects that paved the road for integration with the European Research area; it is *support* because we are funded by Framework Programmes of the European Commission and other donators, and within the projects we help and teach each other – engineers and scientists, physicists, chemists, biologists, etc under the masterful coordination of Greek Research and Technology Network (GRNET).

Our steps along this “road of projects” was not easy, but we succeeded at least with the actual FP7 project HP-SEE, a follow-up of SEE-GRID initiative, to realize serious applications and implement a new parallel system in Faculty of Information Technology.

I want to talk in more details about these projects, which presents one success case story and a working model that may help us to face challenges of the future in research and education through inter-disciplinary collaboration and HPC.

There are 14 countries participating in HP-SEE, there are 26 core applications from physics, chemistry and life sciences, there are more than 100 scientific publications. More developed countries in this consortium are offering their HPC capacities to researchers of other countries – there are 23,624 computing cores with capacity 115.26 Teraflops.

Actually we have 4 applications running in HPC platforms: analysis of gravity fields in geophysics, calculation of properties of quarks in high energy physics, modeling of fluid dynamics in nanotubes, and Monte-Carlo simulations. Until now there are more than 10 scientific publications with results of this work. We hope this is only the beginning – the future is open for extension of collaboration with other researchers from different areas.

We have reason to be optimistic for the future of HPC. Not only there is the policy of European Union for research and education through collaboration, materialized in the actions for the development of European Research Area through funding of huge projects for a pan-European HPC infrastructure. We have just implemented a small parallel system in Faculty of Information Technology in disposition of the research community in Albania.

The parallel system in our Faculty is a donation from Chinese government with the support from Ministry of Infrastructure and ICT of Albania. Actually it offers 144 parallel computing cores, with perspective to reach 208 cores. We are teaching our students with parallel processing techniques. We are motivated to collaborate with researchers from different areas to exploit capacities of this modest system, helping each other for more qualitative research, easing the way for integration with the European Research structures.

To conclude, I need to remember that some of you may have today HPC capacities in your personal computers. Modern Graphical Processing Units may offer up to thousands of parallel processing cores in a single desktop of a modest cost. The World is giving so much attention to HPC because requested platforms are becoming widely available, creating technical conditions for solving of complex scientific and engineering problems, and promoting the inter-disciplinary and internationally distributed research and education.

Thank You.