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On Creation of Computational Infrastructure for Development of Science in Armenia.

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The vital necessity of new research methods based on the usage of perspective computing resources, data collections and scientific tools (i. e. e-science) promises to assist to scientific inventions. Numerous advanced countries have accepted the direction of e-science, which gives high importance to the construction and development of e-infrastructures assisting it. An important part of e-science is the computational science [1, 2, 3].

The Computational science is a rapidly growing multidisciplinary field that uses advanced computing capabilities to understand and solve complex problems. CS fuses three distinct elements [2]: numerical and non-numerical algorithms and modeling and simulation software developed to solve science (e.g., biological, physical, and social), engineering, and humanities problems; advanced system hardware, software, networking and data management components developed through computer and information science to solve computationally demanding problems; **the computational infrastructure that supports both science and engineering problem solving and development of computer and information science.**

The application of computers and mathematical methods for the decision of scientific and technical tasks was one of the basic tasks put in front of science in Armenia still in the initial period of creation of computer facilities and cybernetics in our country. An essential progress is certainly made in development of connection of the Armenian scientific and educational community with two modern and important directions of computational infrastructure: the European GEANT network and grid-structure for e-science within the framework of the European seventh frame program. Now it is beginning to be formed the so-called virtual research environments in Armenia, which allow considerably to expand opportunities of scientific cooperation and uses of the distributed databases. Simultaneously it has begun to be formed scientific databases in the field of astrophysics, archeology, seismology, etc. [4, 5, 9, 10, 11].

Currently e-infrastructures are formed of five interconnected components [2] :

network – a network with the large bandwidth for information interchange uniting affiliated scientific-educational networks, computer centers, forming a global network; grids – service allowing by means of the Internet to supply distribution of computing capacities and memory of the data; the scientific data – the purpose is the maintenance of regulation of their accelerated growth, development of new methods of their storage and use,

maintenance of uniformity at distribution; global virtual communities – uniting multidisciplinary cooperation of the international cooperation.

There are problems on all above-stated components in Armenia. They can be grouped in the following way: effective use of e-infrastructures for development of computer and information science; choice of scientific research directions for the creation and development of the corresponding computational solvers; creation of the general program of development of a computational infrastructure for e-science in Armenia in view of the above-stated components and formation of some conceptual documents determining the basic ways of its realization.

Effective use of e-infrastructure for the development of computer and information science

There exists a dynamic link between the development of e-infrastructures and that of informatics. Let us consider the levels of e-infrastructure which are network (switches, routers, cables, etc.), resources (supercomputers, servers, memories and sensors), middleware (computing access, communication service, grid service, operation system, etc.), applications and service (virtual organizations, users' interfaces). Taking into consideration that hardware performance has exponential growth and scientific researches require processing of very large scale data, it is possible to predict numerous problems coherent to computer and information science. So a necessity arises to reconsider the modification and development of mathematical, engineering research priorities of the mentioned sphere in Armenia in assistance to the creation of an advanced e-infrastructure in the country.

Choice of scientific research directions for the creation and development of the computational solvers for the scientific problems

Here the following problems are important.

- To collect the research areas requiring multidisciplinary approaches and high performance computing means in Armenia.
- To move the possibilities of e-infrastructures for science into the over scientific spheres (e-government, e-education, e-healthcare, etc.).

There are some achievements on the solutions to the both problems. There has been a report on the first problem in CSIT and other conferences, thus corresponding virtual organizations have been formed [4-8]. For the second problem the following results are attained: the Weather Research and Forecast Model for the Territory of Armenia is in elaboration by the Armenian state hydrometeorology for an operative use, as well as for the protection and elaboration of seismic data, ELF (Earthquake Location Finding) program package installation for the early announcement of an operative decision of earthquake basic parameters (close to real time) [9].

National program of development of e-infrastructure ***in Armenia***

The importance of e-science has grown up for the elaboration of the program of development of e-infrastructure in Armenia. Its main aim must be in creation and formation of such an infrastructure based on perspective approach which will provide accomplishment of high-level scientific researches during the next 5-10 years. It must assist to the integration into European scientific area as well as to the formation of the generation of young scientists. One of the most important portals will be the collaboration with international and national centers via GEANT network and Armenian National Grid Initiative (ArmNGI) [12]. New public projects must be put forward by means of which the above stated program will be

performed. The mentioned program is appropriate to be elaborated by the participation of all the interested organizations of the academic and educational system.

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