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Distributed Computing Infrastructure in Moldova: Current State



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What is an e-Infrastructure

- distributed environment based on:
 - modern broadband communications
 - Grid Computing
- shared access to unique or distributed scientific facilities
- a common market of electronic resources, accessible on a 24-hour basis
- unique tool for the development of collaborating applications

Evolution

National

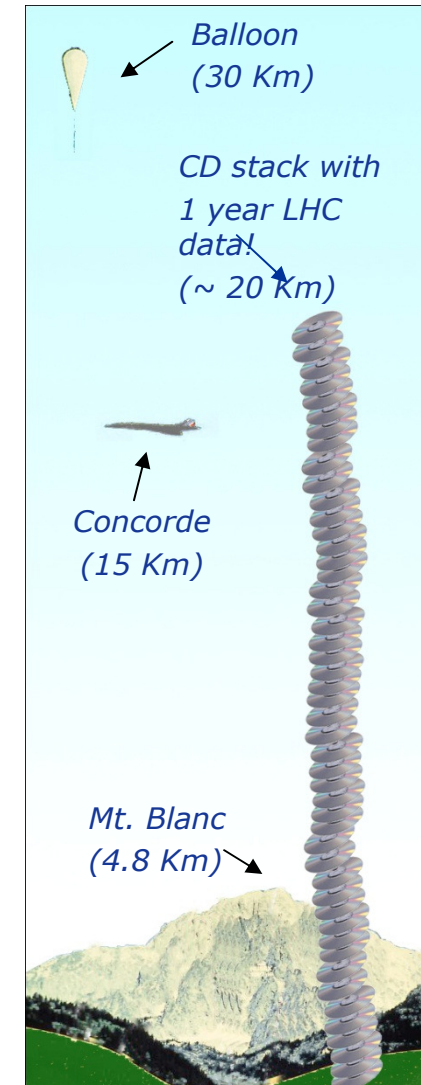


Global



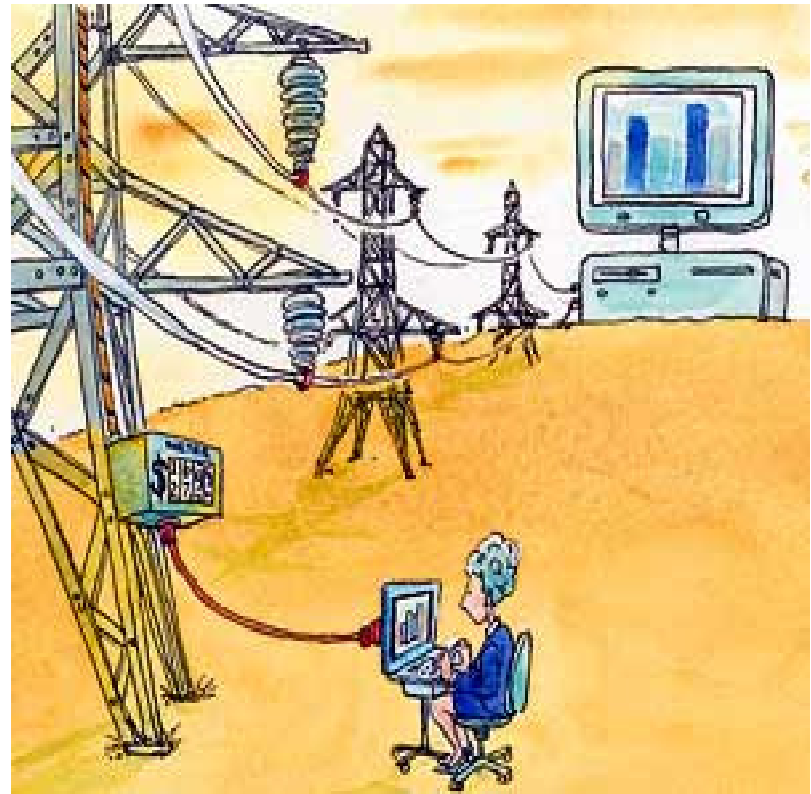
Motivation

- **Why the Grid?**
- Science is becoming increasingly digital and needs to deal with increasing amounts of data
- Particle Physics and other disciplines
 - Large amount of data produced
 - Large worldwide organized collaborations
 - e.g. Large Hadron Collider (LHC) at CERN
 - 40 million collisions per second
 - ~10 petabytes/year (~10 Million GBytes)



The solution: The Grid

... securely share distributed resources
(computation, storage, etc) so that users can
collaborate *within* Virtual Organisations (VO)



EGEE to EGI era

- ❖ Two EU FP6 I3 projects
- ❖ EGEE: 04/2004 – 03/2006
- ❖ EGEE-II: 04/2006 – 04/2008
- ❖ EGEE-II budget: 34 M€
- ❖ FP7: EGEE-III started on 05/2008
- ❖ <http://www.eu-egee.org/>
- ❖ <http://www.egi.eu>

EGI.eu

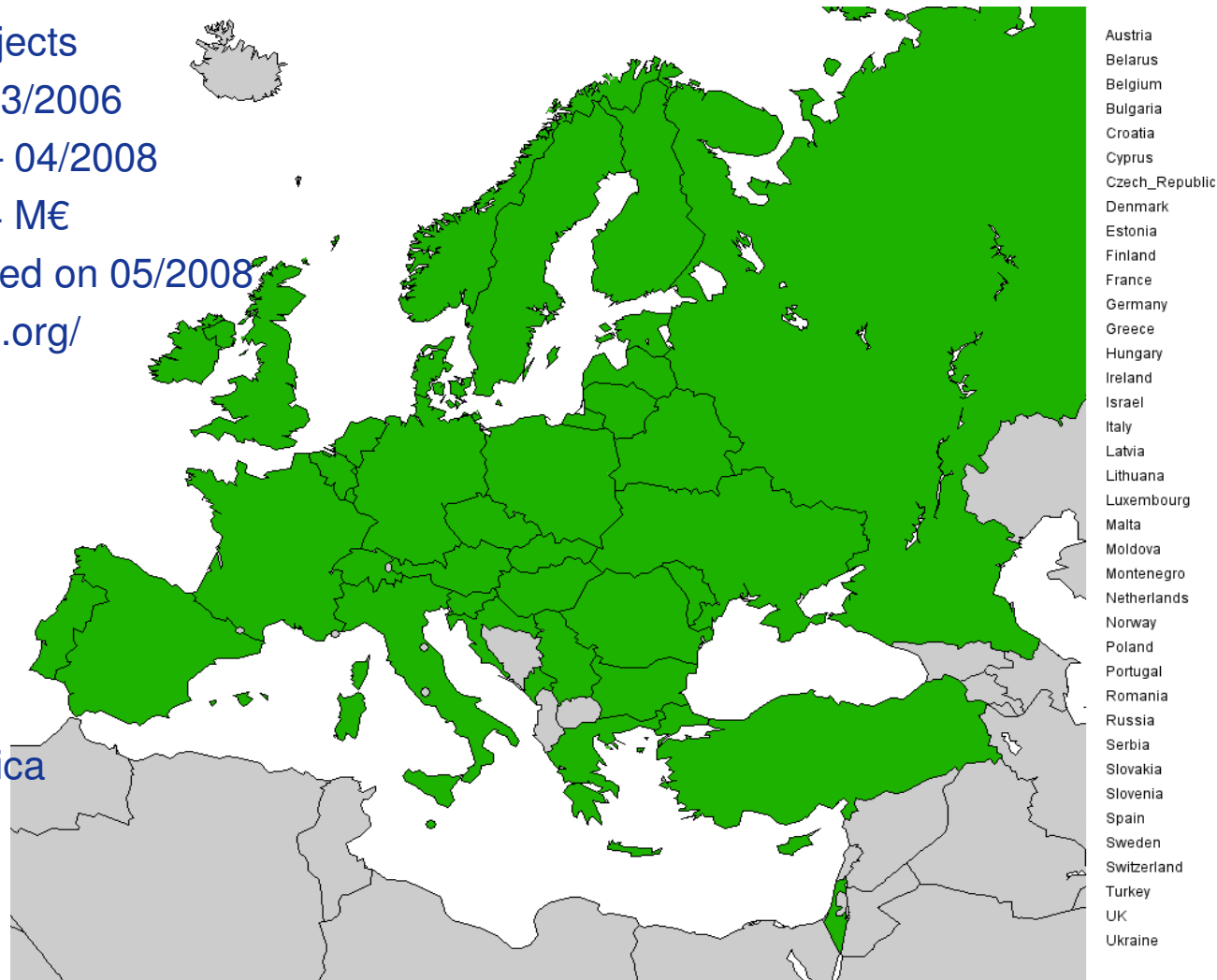
38 European NGIs

+ Asia, US, Latin America

+ PRACE

+ OGF-Europe

+ ...

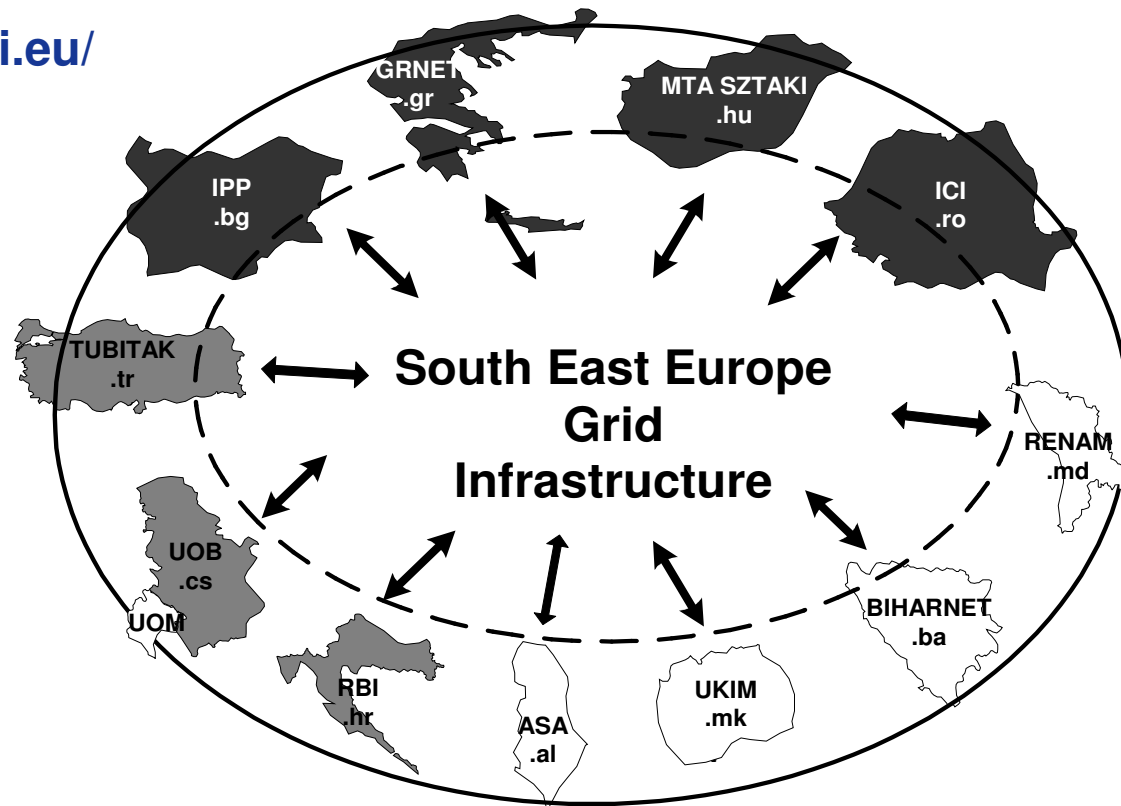


SEE-GRID projects

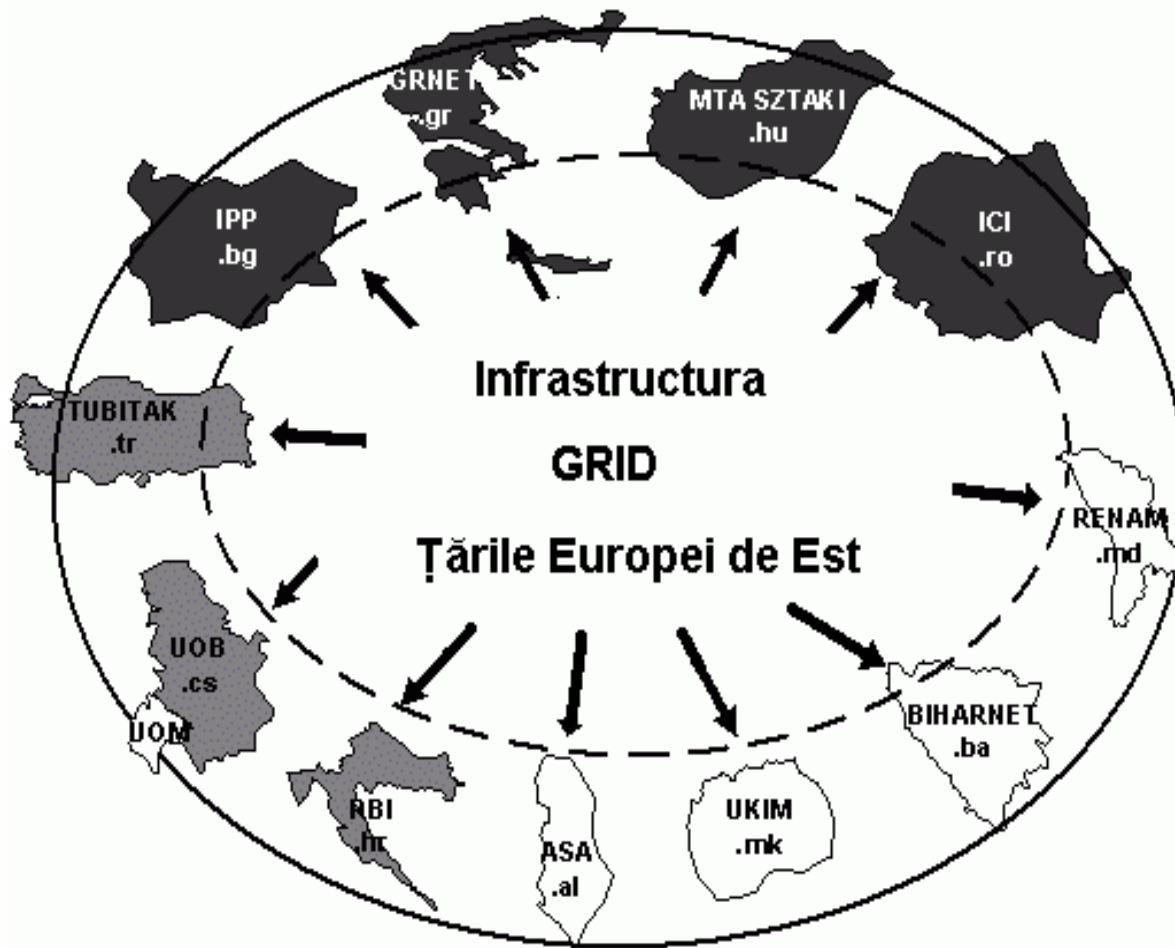
- ❖ Two EU FP6 SSA projects
- ❖ SEE-GRID: 05/2004 – 04/2006
- ❖ SEE-GRID-2: 05/2006 – 04/2008
- ❖ SEE-GRID-2 budget: 2 M€
- ❖ FP7: SEE-GRID-SCI started on 05/2008
- ❖ <http://www.see-grid-sci.eu/>



Pan-European
Production-level
Grid Infrastructure



Partners of the SEE-GRID-2 project



❖ Contractors:

- GRNET Greece
- CERN Switzerland
- SZTAKI Hungary
- IPP-BAS Bulgaria
- ICI Romania
- TUBITAK Turkey
- ASA/INIMA Albania
- UoBL Bosnia-Herzegovina
- UKIM FYR of Macedonia
- UOB Serbia
- UoM Montenegro
- **RENAM + FRT UTM, Moldova**
- RBI Croatia

❖ Third organizations:

- 27 universities/orgs

Partners of the SEE-GRID-SCI project

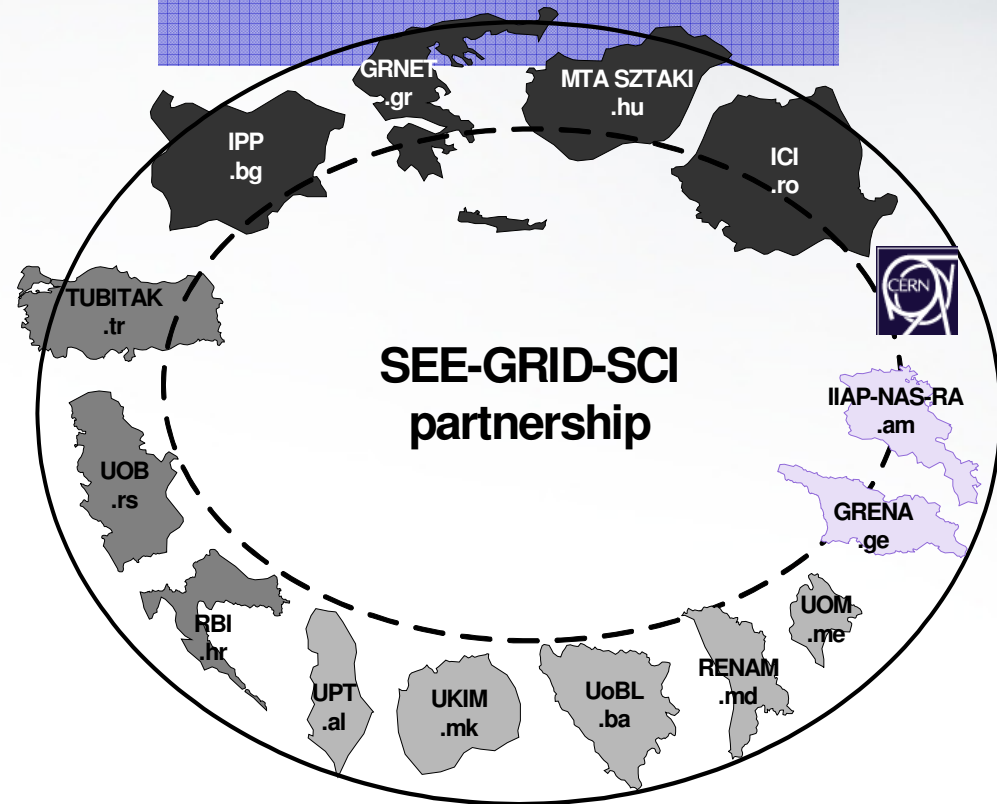
Contractors

GRNET	Greece
CERN	Switzerland
SZTAKI	Hungary
IPP-BAS	Bulgaria
ICI	Romania
TUBITAK	Turkey
ASA/INIMA	Albania
UoBL	Bosnia-Herzegovina
UKIM	FYR of Macedonia
UOB	Serbia
UoM	Montenegro
RENAM	Moldova
RBI Croatia	
IIAP-NAS-RA	Armenia - <i>new</i>
GRENA	Georgia - <i>new</i>

Third Parties

30 universities / research centres

Start date: 01/05/2008
Duration: 24 months
Total Budget: 2,499,969 €



Partners of the SEE-GRID-SCI project

Participant organisation name	Short name	Country
Greek Research and Technology Network	GRNET	GR
European Organization for Nuclear Research	CERN	CH
Institute for Parallel Processing - BAS	IPP	BG
National Institute for Research & Development in Informatics	ICI	RO
The Scientific and Technological Research Council of Turkey	TUBITAK	TR
Computer and Automation Research Institute	SZTAKI	HU
Polytechnic University of Tirana	UPT	AL
University of Banja Luka	UoBL	BA
SS. Cyril and Methodius University of Skopje	UKIM	MK
University of Belgrade	UOB	RS
University of Montenegro	UOM	ME
Research and Educational Networking Association of Moldova	RENAM	MD
Ruđer Bošković Institute	RBI	HR
Institute for Informatics and Automation Problems, National Academy of Sciences of Armenia	IIAP-NAS-RA	AM
Georgian Research and Educational Networking Association	GRENA	GE

← Moldova

WWW.GRID.MD

MD-Grid National Grid Initiative



MdGrid Consortium

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- [NANO-2007 Symposium](#)
- [First Moldavian Grid cluster](#)
- [ITSEC-2007 Conference](#)
- [ICMCS-2007 Conference](#)

MdGrid Consortium



MD-Grid - National Grid Initiative of Moldova

MD-Grid - National Grid Initiative of Moldova was officially inaugurated on the plenary session entitled "National Grid Initiative MD-Grid: presentation and inauguration" of RENAM Users Conference – 2007 on May, 14 2007 after receiving approval letters from [Ministry of Information Development of Moldova](#) and the [Academy of Sciences of Moldova](#). The MD-Grid NGI Consortium governed by RENAM as its Coordinating NREN joins 6 partners: research, education and industry institutions that expressed their intent to participate in the processes of National Grid Infrastructure building and using.

Objectives

- To increase awareness about MD-GRID activities and benefits among potential users
- To encourage and facilitate the involvement of other interested and competent institutions nation wide
- To support the development of the MD-GRID integrated project as a consistent and coherent part of the European R&D activity in this field

Main results

- Participation in FP6 SEE-GRID-2 Project as Joint Research Unit
- Co-ordination of the implementation of the National Grid Infrastructure.

Partners



MD-GRID Certification Authority

Creation date: 6 of April 2009 , under the umbrella of EuGridPMA

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MD-Grid CA provides PKI services to the Moldavian academic and research communities which either participate in national or international Grid activities or are the members of R&E community.

The MD-Grid CA issues **user** (which have been involved in MD-Grid NGI or who's institutions are members of R&E community), **host** (nodes or computing units from Moldavian R&E community) and **service** certificates (processes that are running on the hosts).

MD-Grid CA was established and is operated by the **Research and Educational Networking Association of Moldova** (RENAM).

CA certificate

PEM format

DER format

SHA1 Fingerprint

07c0fe544e28292b2c9ac2bf3e073751e4bb0472

MD5 Fingerprint

d825e4b50f44ad9ccf9d2358698b5afe

CRL

Last CRL

Last CRL in DER format

CRL date last modified:

07 . 06 . 2011

Members of MD-Grid NGI

- RENAM - Coordinator
- FRT - Faculty of Radioelectronics and Telecommunications of Technical University of Moldova
- IMI ASM - Institute of Mathematics and Computer Science of Academy of Sciences of Moldova
- IGS-Institute of Geophysics and Seismology of ASM
- SHMS-State Hydrometeorological Service
- SPH - School of Public Health. State Medical and Pharmacy University of Moldova
- IFA ASM - Institute of Applied Physics of ASM

Future Members of MD-Grid NGI

- Free International University of Moldova
- State University of Moldova
- Academy of Economic Studies
- Institute of Ecology and Geography of ASM
- Institute of Economy, Financing and Statistics of the Ministry of Economy and Trade
- Department of Exceptional Situations Protection
 - ...*the list is open*

NGI-MD Resources

NGI-MD site	Available CPUs	Storage	Network
Certified sites			
MD-01-TUM	5 Intel P-IV 3,0 GHz CPUs	320 GB	100 Mbit Ethernet
MD-03-SUMP	5 x CPU AMD Athlon 64 X2 6000+	650 GB	100 Mbit Ethernet
MD-04-RENAM	6 Quad Core Xeon 5130 CPUs	2 TB	100 Mbit Ethernet
Experimental sites (not certified yet)			
MD-02-IMI	12 Quad Core Xeon 5130 CPUs	3,5 TB	100 Mbit Ethernet
Planned to be integrated into MD-GRID NGI			
MD-05-SUM	14 Dual Core AMD 280 CPUs	1,5 TB	100 Mbit Ethernet

Application Development

Environmental sciences

- GreenView, developed in collaboration with Technical University of Cluj-Napoca, Romania

Application will provide the user community the possibility to get information on the current status and to make prediction on the future evolution of the vegetation and environment. The quality of the environment will be supervised in order to carry out the appropriate actions and take the best decisions.

Computational Physics

- AMR_PAR (Parallel algorithm and program for the solving of continuum mechanics equations using Adaptive Mesh Refinement), being developed in the Institute of Mathematics and Computer Science of the Academy of Sciences of Moldova.

HP-SEE

High-Performance Computing Infrastructure for South East Europe's Research Communities

- ❖ Link existing and upcoming HPC facilities in the region in a common infrastructure, and provide operational solutions for it
- ❖ Open this HPC infrastructure to a wide range of new user communities, including those of less-resourced countries
- ❖ Ensure establishment of national HPC initiatives, aiming to attract local political & financial support for long-term sustainable eInfrastructure
- ❖ Contribute to stabilisation and development of South-East Europe, enabling collaborative high-quality research across a spectrum of scientific fields

HPC Resources

Bulgaria - Blue Gene/P supercomputer

Executive Agency “Electronic Communications Networks and Information Systems” in the Bulgarian Supercomputing Centre (BGSC), 2048 PowerPC 450 based compute nodes, 8192 processor cores and a total of 4 TB random access memory. Supported parallel programming paradigms are MPI and OpenMP

HPCG cluster located at ICT of Bulgarian Academy of Sciences.
576 computing cores. The storage and management nodes have 128 cores.

There is an agreement with the partner institution West University of Timisoara, Romania, concerning access of Moldavian researchers to Blue Gene/P supercomputer which deployment finishes in the nearest future.

MoU with JINR, Russia

May 2010:

RENAM and the Laboratory of Information Technologies of the Joint Institute for Nuclear Research had signed a Memorandum of Understanding. The MoU was approved by the Academy of Sciences of Moldova and General Director of the Joint Institute for Nuclear Research:

- concerning collaboration
- development of joint Grid and HPC infrastructure
- running complex tasks remotely
- No necessity for scientists to travel abroad
- strengthen the collaboration between the researchers of two countries

MD-GRID NGI long-term strategy

- Pursuing joint R&D efforts among countries in the region
- Increasing the retention of talented scientists in the region
- Making available the benefits of the Information Society for citizens
- Improvement of regional competitiveness in all market sectors
- Creation the basis for new applications and continuous national grid infrastructure development

Thank you for your attention



Q&A

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