FP6 - Research Infrastructures

SEEREN2

South-Eastern European Research & Education Network

Deliverable D10a

SEEREN2 session in TNC2006

Author(s): Valentino Cavalli (Editor), Yannis Mitsos

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Abstract: This document provides a report of the first SEEREN2 Session held on 17 May 2006 at the TERENA Networking Conference (TNC2006) in Catania, Italy.

The SEEREN2 Consortium consists of:

GRNET	Coordinator	Greece
DANTE	Contractor	United Kingdom
TERENA	Contractor	The Netherlands
NIIF	Contractor	Hungary
RoEduNet	Contractor	Romania
ISTF	Contractor	Bulgaria
UoB/AMREJ	Contractor	Serbia-Montenegro
UKIM/MARnet	Contractor	FYR of Macedonia
ASA/INIMA	Contractor	Albania
UPT	Third Party	Albania
UT	Third Party	Albania
BIHARNET	Contractor	Bosnia-Herzegovina
UoTu	Third Party	Bosnia-Herzegovina
UoBL	Third Party	Bosnia-Herzegovina
UoS	Third Party	Bosnia-Herzegovina
UOM/MREN	Contractor	Serbia-Montenegro

The SEEREN2 initiative is funded by the European Commission under the Framework Programme 6 – Research Infrastructures (Contract #026748).

Document Revision History

Date	Issue	Author/Editor/Contributor	Summary of main changes
25 August 2006	a	Valentino Cavalli	Draft document for comments
4 September 2006	b	Yannis Mitsos	**Final version to EC**

Preface

SEEREN2 aims at creating the next generation of the SE European segment of GÉANT, that intends to make leading-edge technologies and services available to the entire Research and Education communities and all scientific sectors without discrimination between users and sites in SE Europe in an attempt to further ease the 'digital divide' that still separates most of the SE European countries from the rest of the continent. The central element of this infrastructure is the SE European R&E backbone network that extends, through the participating National Research and Education Networks (NRENs), to the end-users in all participating countries. With respect to its predecessor, the infrastructure will be substantially enhanced in its performance but more significantly will add a new key item to its fundamental characteristic, the consolidation of the networking and Grid infrastructures, into an eInfrastructure for SE Europe, fully integrated with the pan-European efforts (GÉANT2, EGEE, SEE-GRID, etc). The project involves the NRENs of Albania, Bosnia-Herzegovina, Bulgaria, FYR of Macedonia, Greece, Hungary, Romania, Serbia-Montenegro, as well as TERENA and DANTE.

The main objectives of the SEEREN2 project are to:

1. To continue to assist the incubating and existing NRENs in SE Europe to fully establish themselves and to integrate with related European-wide organisations and initiatives (TERENA, CEENet, e-IRG, EUGridPMA, etc);
2. Create the next generation of the SE European segment of GÉANT, that intends to make leading-edge technologies and services available to the entire SE European R&E community;
3. Provide a significant increase in the network capacity available for communication and experimentation among end users of the research and education community in SE European countries and of the rest of the world.
4. Guarantee the stable operation of the networking infrastructure and interoperability with GÉANT;
5. Ensure that the investment in this resource is effectively exploited with a promotional and training activity involving the distribution of publicity material, presentations at scientific conferences, and other relevant activities that will be undertaken, with an objective to strengthen the human network in the area of eInfrastructures in SE Europe;
6. Increase awareness of IST in SE European non-EU countries and serve as a paradigm for bridging the digital divide in other areas. Provide a platform for cooperation of scientific and educational communities of EU Member States with Associated States and 3rd Countries.
7. Investigate additional sources of funding from the EC, from National funds and international organizations that are actively involved in the SEE region, such as UNESCO, NATO, CEENet, UNDP, WorldBank, USAID.

The expected key results of the project are:

1. NRENs requirements collected and analysed;
2. Promotional package available;
3. Technical and operational requirements analysed;
4. Tenders prepared, suppliers selected, connectivity and equipment contracts signed;
5. Final SEEREN2 topology determined;
6. Operation of the regional networking infrastructure offering GÉANT2 access;
7. Management framework in place and stable network operation;
8. Services/tools selected;
9. SEEREN2 track in YUINFO and sessions at TNC2006/2007 organized;
10. training workshops completed;
11. Services/tools deployed;

The SEEREN2 project has started its activities on October 2005 and is planned to be completed by the end of March 2008. It is led by Dr. Jorge-A. Sanchez-P. of GRNET. Eleven contractors (GRNET, DANTE, TERENA, NIIFI, RoEduNet, ISTF, UoB/AMREJ, UKIM/MARNET, ASA/INIMA, BIHARNET, UoM/MREN) and five third parties (UPT, UT, UoTuzla, UoBanja Luka, UoSarajevo) participate in the project. The total budget is 3.083.856€. The project is co-funded by the European Commission's Sixth Framework Programme for Research & Technological Development and National budgets of SE European Countries.

The Project issued the following deliverables:

Del. no.	Deliverable name	WP no.	Type	Security	Planned delivery
D01a	SEEREN2 project handbook	WP1	R	CO	1/11/2005
D02a	SEEREN2 portal	WP6	R	PU	1/11/2005
D03a	SEEREN2 promotional package	WP6	R	PU	1/12/2005
D04a	Market analysis and requirements for SEEREN2	WP2	R	PU	1/11/2005
D05a	Networking topology options and implementation approaches	WP2	R	CO	1/11/2005
D06a	Tender evaluation results (connectivity and equipment tender)	WP3	R	PU	1/12/2005
D06b	Tender evaluation results (connect. and equip. tender responses)	WP3	R	PU	1/1/2006
D08	SEEREN2 acceptable use policy	WP1	R	PU	1/1/2006
D09a	Acceptance tests specification and network implementation	WP4	O	CO	1/2/2006
D07a	SEEREN2 topology	WP3	R	PU	1/4/2006
D10a	SEEREN2 sessions in TNC2006	WP6	R, O	PU	1/11/2006

The Project plans to issue the following deliverables:

Del. no.	Deliverable name	WP no.	Type	Security	Planned delivery
D05b	Networking topology options and implementation approaches	WP2	R	CO	1/10/2006
D09b	Acceptance tests specification and network implementation	WP4	O	CO	1/10/2006
D07b	SEEREN2 topology	WP3	R	PU	1/10/2006
D11a	Periodic reports (1st period progress report)	WP1	R	CO	1/11/2006
D12a	SEEREN2 management framework and VNOC operations	WP4	R	PU	1/11/2006
D13a	SEEREN2 services/tools specification	WP5	R	PU	1/11/2006
D04b	Market analysis and requirements for SEEREN2	WP2	R	PU	1/2/2007
D14a	SEEREN2 training workshops	WP6	R, O	PU	1/2/2007
D15a	SEEREN2 services/tools assessment	WP5	R	PU	1/5/2007
D16	SEEREN2 conference track in 2007 in the region	WP6	R, O	PU	1/6/2007
D01b	SEEREN2 project handbook	WP1	R	CO	1/10/2007
D10b	SEEREN2 sessions in TNC2007	WP6	R, O	PU	1/11/2007
D11b	Periodic reports (2st period progress report)	WP1	R	CO	1/11/2007
D12b	SEEREN2 management framework and VNOC operations	WP4	R	PU	1/11/2007
D13b	SEEREN2 services/tools specification	WP5	R	PU	1/11/2007
D14b	SEEREN2 training workshops	WP6	R, O	PU	1/12/2007
D02b	SEEREN2 portal	WP6	R	PU	15/3/2008
D03b	SEEREN2 promotional package	WP6	R	PU	15/3/2008
D15b	SEEREN2 services/tools assessment	WP5	R	PU	15/3/2008
D17	SEEREN2 liaison activities and future plans	WP6	R	PU	15/3/2008
D18	Final report	WP1	R	CO	15/3/2008

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Executive summary

What is the focus of this Deliverable?

This deliverable reports on the first SEEREN2 session on research and education networking in South East Europe that was held on 17 May 2006 during the TERENA Networking Conference (TNC 2006) in Catania, Italy. The objective of this session was to publicise the SEEREN2 project activities and present highlights of the major relevant results from related projects in the southeast European region. It also provided an opportunity for feedback from the European research and education networking community.

What is next in the process to deliver the SEEREN2 results?

1. Deployment of networking services and tools (e.g., Helpdesk, monitoring tools, statistics, etc).
2. Promote the use of SEEREN by informing the appropriate user groups through special events such as organizing workshops, distributing publicity material, delivering presentations at scientific conferences, setting demonstrations in academic events, all aiming at presenting the new opportunities provided by SEEREN. Individual NRENs will carry out complementary promotional activities in their national user communities as well as participate in activities at the European level.
3. Monitoring the operation. Ensure stable operation.
4. Provision of technical support during stable operation.
5. Evaluate the usefulness of emerging technologies in the context of the SEEREN2 project.
6. Execute an evaluation study on the results of the aforementioned task.
7. Definition of the architecture and the interaction between tools and services. Evaluation of the deployed services/tools.
8. Establish relations with organizations that are actively involved in the SEE region, such as UNESCO and NATO, in order to work out common visions towards reducing the "digital divide" in the Region under question, i.e. the information and technological gaps within the region, as well as between the region and European Member States.
9. Look for other possible sources of funding including funds from the EC, EU States national funds dedicated for assisting development in the region and international organizations that are actively involved in the southeast European region, such as UNESCO, NATO, European Investment Bank, WorldBank. Extra funding will be used so as to ensure network's viability beyond the project's lifetime.
10. Disseminate the knowledge gained. Participation in public events. Organise sessions in TNC 2006-2007.
11. Assessment of project results.

What are the deliverable contents?

The document provides a summary of the session, presentations given and main outcome of the discussions held during the session “Recent Results from eInfrastructures in South East Europe” held on 17 May 2006 during the TERENA Networking Conference (TNC 2006) in Catania, Italy.

1. Introduction

The first SEEREN2 session on research and education networking in South East Europe "Recent Results from eInfrastructures in South East Europe" was held on Wednesday 17 May 2006 during the TERENA Networking Conference (TNC 2006) in Catania, Italy. The objective of this session was to publicise the SEEREN2 project activities and present highlights of the major relevant results from related projects in the southeast European region (SEE). It also provided an opportunity for feedback from the European research and education networking community.

The session was chaired by former project manager of SEEREN2 Jorge Sanchez-Papaspiliou who co-organised it with assistance from TERENA's Valentino Cavalli.

The session included presentations about the provision of true redundancy and traffic protection in the connection of SEE countries to GEANT, a survey of experiences in the deployment of dark fibre from European NRENs and from the SEE region, and finally the technical issues to be addressed in order to enable High Energy Physics, biomedical and Grid applications in South East Europe.

The session "Recent Results from eInfrastructures in South East Europe" ran from 16:00 to 17:30 and contained the following three presentations, followed by a 10 minutes discussion interval:

1. "SEEREN 2 - Bringing Redundancy and Traffic Protection into a Regional Network" - *Zoran Jovanović, Belgrade University Computer Centre*
2. "What is Needed to Build a Dark Fibre-based Network" - *Pavle Vuletić, Belgrade University Computer Centre*
3. "Technical Challenges of Establishing a Pilot Grid Infrastructure" - *Emanouil Atanassov, Institute for Parallel Processing of the Bulgarian Academy of Sciences*

The session was attended by approximately 30 participants including the chairman and speakers. The author of this report was able to identify attendees from the following countries: Serbia, Greece, Albania, Hungary, Algeria, Morocco and Brazil, United Kingdom, the Netherlands. More than hundred participants followed the session via live streaming on the Internet.

Handouts of the presentations are included in Annex 1 of this report. The full proceedings of the session (including video-streaming archive) can be found on the TNC2006 website at:

http://www.terena.nl/events/tnc2006/programme/

2. Summary of the SEEREN2 Session at TNC2006

2.1. SEEREN 2 - Bringing Redundancy and Traffic Protection into a Regional Network

Zoran Jovanović, Belgrade University Computer Centre

Before the SEEREN project started a few years ago southeast European countries were almost completely lacking connection to the European research and education networks. Thanks to SEEREN, some countries in the Balkans were able to obtain a sustainable regional network and access to the GEANT pan-European backbone.

The SEEREN2 project started in October 2005 was going to extend this network, providing more advanced technology and higher bandwidth connections to the GEANT2 network. SEEREN2 does not only provide network connectivity to countries in the region. It also enables advanced services and applications, such as, for instance QoS, IPv6 multicast, Security Incident Handling, roaming (eduroam), performance monitoring, videoconference and IP telephony. In the context of the project the NRENs of Serbia and Hungary have established the first cross border fibre connection in the region, between the towns of Subotica and Szeged. The project is also going to represent a big breakthrough in Bosnia and Herzegovina, where part of the country's network will jump from almost nothing to DF 1GE connecting some of the major universities.

Obtaining dark fibre in the region has not been a straightforward task. In Serbia the government was still the owner of the telecom operator and the direct intervention of prime minister was essential for the achievement. In part of the territory of Bosnia and Herzegovina, again there is a monopoly situation and the result is due to a strong political will. On the HU-CS cross border fibre, there was only one offer available from an operator. Negotiation proved to be effective in that case.

In fact experience in the region showed that it may be easier to obtain dark fibre from state owned monopoly operators then from private or quasi-privatised companies.

This presentation can be found on the web at:

http://www.terena.nl/events/tnc2006/programme/presentations/show.php?pres_id=292

2.2. What is Needed to Build a Dark Fibre-based Network

Pavle Vuletić, Belgrade University Computer Centre

SEEFIRE was an FP6 support activity studying the feasibility of acquiring dark fibre by NRENs in southeast Europe. One of the results of the project, which ended in February 2006, is a document providing practical guidelines for deployment of dark fibre networks.

The presentation showed best practices from the outcome of a questionnaire, which was answered by a number of European NRENs who have moved from telco services to dark fibre in recent years.

SEEFIRE has identified a number of potential suppliers of dark fibre, as well as potential PoPs and preferred fibre routes in southeast Europe. Other results of the project are a study on state-of-the-art transmission technologies, reports on the regulatory environment in SEE and the economics of dark-fibre deployment.

The NRENs in the countries concerned have not only invested in intercity links, but also in building metropolitan fibre networks, as it is the case in Skopje, the capital of the FYR of Macedonia and (partially) in the main Serbian university towns.

This presentation can be found on the web at:

http://www.terena.nl/events/tnc2006/programme/presentations/show.php?pres_id=293

2.3. Technical Challenges of Establishing a Pilot Grid Infrastructure

Emanouil Atanassov, Institute for Parallel Processing of the Bulgarian Academy of Sciences

SEE-Grid integrates national Grid initiatives in southeast Europe into the pan-European and worldwide Grid eInfrasructures. The project has been facing a number of challenges at various levels, mostly geographical (due to the relative isolation of the region from other European countries) and technical (under-developed network infrastructure, limited bandwidth, scarcity of computing resources and human expertise). The project has been facing also significant interoperability issues.

Thanks to the improved network connectivity provided by SEEREN and SEEREN2 SEE-Grid has been able to progress the regional competence in Grid applications and work towards a number of achievements, although the experience in southeast Europe shows that fat pipes are not an absolute pre-requisite to run Grids.

The SEE-Grid project is employing a total of 450 CPUs and 5TB of storage, a large Grid cluster has joined the EGEE production service and the project has enabled support of Atlas, CMS, Alice and other projects in the HEP as well as in the biomedical area.

SEE-Grid has developed a volumetric image engine application called VIVE for visualisation of medical images, an on-demand customised search engine called SE4SEE and other applications.

This presentation can be found on the web at:

http://www.terena.nl/events/tnc2006/programme/presentations/show.php?pres_id=294

3. Conclusion

GRNET had submitted a proposal named SEE-Light to the Greek government for providing a lambda facility across the region. The project has created a lot of expectation in the region but did not succeed in 2005. It was hoped that this could be started before the end of 2006.

On the other hand the real target for the region is building a region-wide dark-fibre backbone connecting the dark-fibre islands already in place in Serbia, FYROM, Greece, and in the course of the year Bosnia and Herzegovina, with possibly also Bulgaria and Romania coming soon. This regional backbone should then connect to GEANT2 and really enable southeast Europe to be fully integrated in the ERA.

From a management point of view SEEREN and SEEREN2 have brought other interesting developments, with the ISTF of Bulgaria becoming a full member of the GEANT2 consortium, and AMREJ and MARnet being appointed as observers in the NREN Policy Committee.

The GEANT2 project has also a support activity (part of Networking Activity 4) to assist research and education networking in the less advanced countries in and around Europe. Southeast Europe has been in the spotlight of this support activity since its start in September 2004, with countries like Albania, Romania and Moldova being target of specific investigations and support measures.

Annex 1 - Handouts

SEEREN2

Bringing Redundancy and Traffic Protection into a Regional Network

http://www.seeren.org

Zoran Jovanović
Director NREN of Serbia & Prof. University of Belgrade
zoran@rcub.bg.ac.yu
Jorge A. Sanchez-Papaspiliou, GRNET (GR)
Pavle Vuletić, University of Belgrade (CS)
Slavko Gajin, University of Belgrade (CS)

SEEREN2
SOUTH EASTERN EUROPEAN RESEARCH & EDUCATION NETWORK

The SEEREN2 initiative is co-funded by the European Commission under the FP6 Research Infrastructures contract no. 026748

Before SEEREN

- SEE countries were almost completely out of the European research and education connections
- Total sum of the bandwidths towards European research and education community was less then 10Mbps
- Vision: Ease the digital divide in SEE region and contribute the stabilisation and reconstruction of the region

SEEREN: A “small” step for the SEE NRENs, a big leap for the region…

- Interconnected the Research and Education Networks of AL, BA, BG, MK, CS, HU, RO and GR among them and to GEANT.
- Launched and entered its stable operation on Jan. 2004.
  - in 2005 connectivity is co-funded by GEANT2.
  - SEEREN2 to start at the end of 2006.
- Constituted today the South Eastern European segment of the multi-gigabit pan-European Research and Education network GÉANT
- SEEREN capitalized on the growing aspiration of the SEE countries to integrate to the rest of Europe and eventually be equal peers with advanced European nations. Still a major driving force.
- SEEREN enacted a communication channel between the SEE scientific community. Refocused the R&E community in their common endeavors and wealthy cultural heritage that dates from several hundred years ago.

more at www.seeren.org

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SEEREN2 From basic connectivity to services

- The SEEREN2 project, a special support action benefiting from 3 million euro funding from the European Commission, was officially launched on October 13th 2005 in Athens.
- The project is building on the success of SEEREN which aimed to expand the European research and education network in the Southeast Europe providing GÉANT connectivity to non- GÉANT countries.
- SEEREN2, coordinated by GRNET, will run until April 2008 and during this period will work to create the next generations of the Southeast European segment of GÉANT that intends to make leading-edge technologies and services available to the entire Research and Education communities and all scientific sectors without discrimination between users and sites in southeast Europe.

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SEEREN2 Expected Results

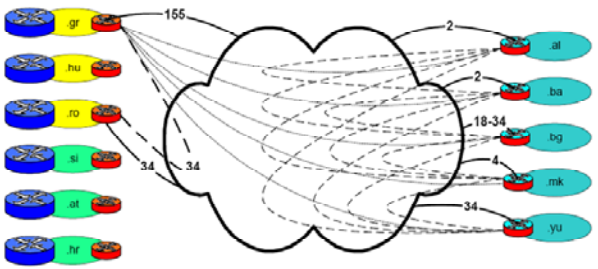
- By its end SEEREN2 will support the Balkan countries to:
  - Create the next generation of the SEE segment of GÉANT
  - Consolidate the networking and Grid infrastructures, into an eInfrastructure for SEE
  - Integrated fully with the pan-European efforts (GÉANT2, EGEE, SEE-GRID etc).
  - Continue to assist to the incubating and existing NRENs in SEE to fully establish themselves and to integrate with related European-wide organisations and initiatives (TERENA, CEENet, e-IRG, EUGridPMA, etc) and eventually become full members of the GÉANT community by the end of the project.
  - Make leading-edge technologies and services available to the entire R&E communities and all scientific sectors
  - Support of services and tools empowering the end-user (researchers, professors, students, etc), responding to dynamic bandwidth requirements and guaranteed and seamless service quality.
  - Serve as reference for further developments and future regional and European collaboration.
  - The ultimate goal is to consolidate the network and services into the pan-European eInfrastructure and the end-users into the European Research Area.

SEEREN 1 Physical topology

- Hub and spoke
- All NRENs connected to Greece
- Serbian NREN – E3
- ISTF – E3
- MARNET – 2xE1
- INIMA – E1
- BIHARNET – E1

SEEREN 1 Logical topology

- Full mesh of BGP peerings between all NRENs through OTEGlobe MPLS network
- Backup for the connection GRNET – GEANT – E3 towards RoEduNet
- IPv6 established through the 6PE mechanism (IPv6 over IPv4 MPLS backbone)



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SEEREN1 Experiences

- Network was performing very well
- SLA reports: 100% availability for all links for the last 6 months
- Collaborative management
- Distributes the Network Management & Operations to competent Academic Groups in the Region (the Virtual Network Operations Center – VNOC concept developed by GRNET)
- A one-stop-shop for all the open source tools/applications setup by the SEEREN VNOC to monitor and manage the SEEREN infrastructure is available at: http://admin.seeren.org

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SEEREN1 & SEEREN2 Services

- SEEREN1 established mainly basic networking services:
  - Connectivity
  - Routing and switching
  - IPv4 and IPv6 unicast traffic
  - DNS
  - Monitoring
  - Helpdesk
  - Mail
  - MPLS, MPLS VPN
- SEEREN2 – new services:
  - NTP
  - Trouble ticket system
  - QoS
  - IPv4 and IPv6 multicast
  - Integration of different active and passive monitoring tools
  - CSIRT
  - DDoS prevention and detection
  - Video conferencing
  - Video streaming
  - IP telephony
  - Directory services
  - EduRoam

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SEEREN2 Physical topology

- BG became GEANT PoP
- CS – SEEREN (BG) – STM1
- SEEREN (BG) – SEEREN (GR) – STM1
- MARNET – SEEREN (GR) – E3
- CS – MREN – E3
- INIMA – GRNET – E1
- BIHARNET – CS – 1Gbps over dark fibre

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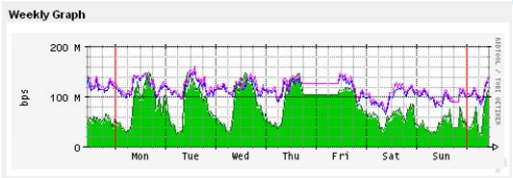
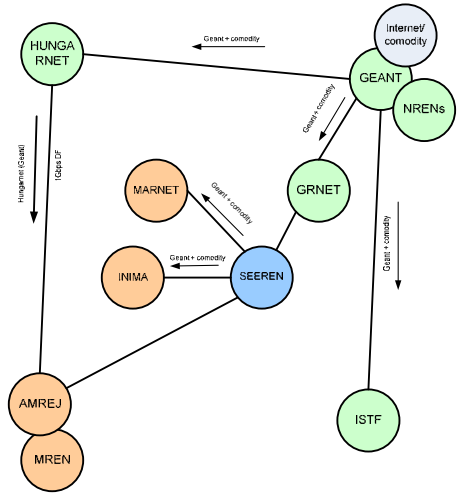
First SEE CBF Subotica - Szeged

- Established at the end of October 2005 between Subotica(CS) and Szeged (HU)
- 52km of dark fibre
- 1Gbps Ethernet
- At the moment exists only traffic exchange between CS and HU NRENs
- Problem: how to organize the access to Geant and comodity traffic for a non-Geant NREN through 2(3) GEANT PoPs



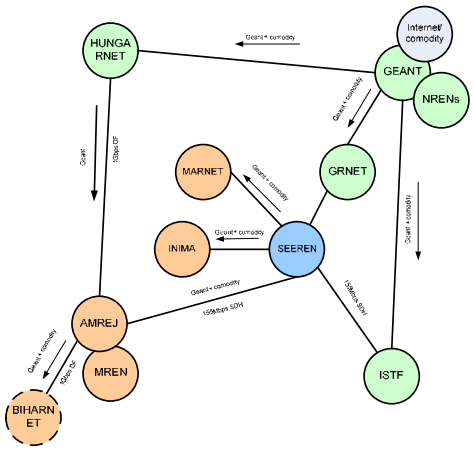
AS connectivity before the start of SEEREN2

- AMREJ – HUNGARNET – only IPv4 and IPv6 traffic exchange (used mainly for some GRID applications)
- ISTF as a GEANT PoP had only one exit point towards GEANT



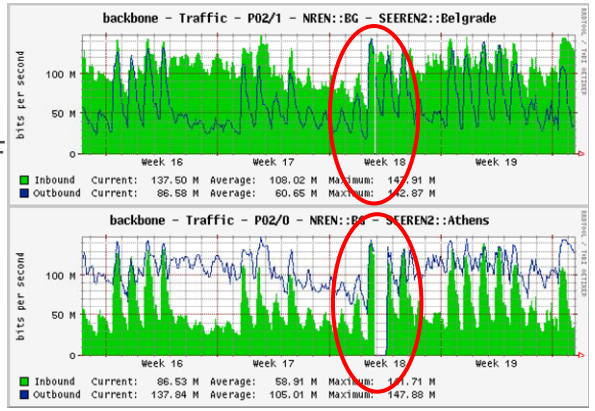
AS connectivity in SEEREN2

- IPv6 established through dual-stack implementation
- MREN doesn't have AS number yet. They recently got their address space
- BIHARNET not yet connected
- INIMA not yet connected



Problems 3.-4. May 2006.

- SEEREN router in Greece had memory problems
- Link BG – GR was down
- All the traffic from AMREJ, MREN routed through ISTF GEANT PoP



Thanks to

- All the participants of the SEEREN2 project, especially to Vedrin Jelizakov (ISTF - BG)

SEEFIRE

What is needed to build a dark fibre-based network?

www.seefire.org

Pavle Vuletić
University of Belgrade/AMREJ
Serbia and Montenegro

Valentino Cavalli (TERENA)
Jorge Sanchez Papaspiliou (GRNET)
Stanislav Sima (CESNET)
Dai Davies (DANTE)
Claire Milne (TERENA/Antelope)

The SEEFIRE initiative is co-funded by the European Commission under the FP6 Research Infrastructures contract no. 15817

What is needed to build a dark fibre based network?

- Possibility to get fibres
- Enough knowledge about transmission technologies and equipment/trainings
- Existing solutions analysis
- DF and equipment market analysis
- Analysis of different models of dark fibre deployment (leased vs. owned)
- Design of the network (needs, available resources)
- Plan of the deployment
- Tenders for the dark fibre, for the equipment
- Contracts, acceptance
- Other equipment needed for efficient network functioning
- Monitoring
- …

- The aim of the SEEFIRE project (South East European Fibre Infrastructure for Research and Education) was to give answers on some/all of those questions or to show examples of successful dark fibre deployments

SEEFIRE Overview

- Project co-funded by the EC (6th FP) with 1 year duration
- SEEFIRE builds on the results of previous IST projects (SEEREN, SERENATE and GN1)
- Partners: TERENA (NL), GRNET (GR), CESNET (CZ), NIIF/HUNGARNET (HU), AMREJ (CS), DANTE (UK), RoEduNet (RO), ISTF (BG), INIMA (AL), BIHARNET (BH), MARNET (MK)
- Aim: Studies on the options available for acquiring an optical fibre network infrastructure and strategies for the development of research and education networking in southeast Europe.
- www.seefire.org

Background

- There is a significant digital divide in Europe which affects many countries in southeast Europe
- The SEEREN initiative helped in providing international connectivity to countries in the region
- Longer-term, cost-effective solutions are needed in the future
- SERENATE recommended the acquisition of dark fibre by NRENs as a way of decreasing the digital divide in a cost-effective way
- There are dark-fibre deployment experiences in the region, which should be sustained and supported
- Southeast European countries are entering the eInfrastructures community
- When a network is built from scratch, it is wiser to jump into a latest technological wave
- Long-term vision: to create a southeast European fibre backbone fostering collaboration of researchers and students

Guidelines for the deployment of customer empowered fiber infrastructure

- Guidelines for the deployment of customer empowered fiber infrastructure
- Topics:
  - Guidelines on the technical organization of the NREN based on DF
  - Guidelines on the topology and L2 and L3 organization of the network
  - Collection of procurement templates for DF and transmission equipment
  - Set of Best practices, examples and solutions of the transmission equipment used in SEE for lighting DF in different layers in the network, transition processes from telco based to DF based NREN
  - Set of Case studies in which SEE NRENs estimated the cost of the future backbone of their network.
  - Guidelines on hardware and software features of the equipment, and examples of costs

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Motivation - Changes

- Switch from network based on leased lines to CEF based network introduces partially different model of NREN functioning
  - NRENs have to take care about (different) Layer 1 issues and different technologies
  - NRENs might own a part or whole infrastructure between their sites
  - Fiber maintenance is different from maintenance of leased lines
  - Different L2 technologies are used
  - Some technical solutions in upper layers are different
  - New solutions for the topology establishment of the network can be found due to new possibilities in multiplexing
  - New applications emerge (UCLP)

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Motivation

- We want to try to find suggestions for the answers on some of the following questions:
  - Which equipment do we need for lighting fiber?
  - What do we need for maintenance, monitoring, measurement, cleaning connectors, etc?
  - What else do we need if we have optical network? (logistics)
  - How many specialists do we need for CEF based network?
  - Do they need to have special skills/trainings in optical technologies?
  - Which technologies (amplification, multiplexing, transmission,…) should we use?

Methodology

- Questionnaire sent to CESNET, PIONEER, SWITCH, SURFNET, ARNES, SANET, ARNES and AMREJ (May 2005)
- There is no “one size fits all” solution
- Each NREN is different from others in many aspects
  - Institutions connecting
  - Model of financing
  - Annual budget
  - Staff number, education and responsibilities
  - Position in telecommunications regulation and market

Owned vs. leased dark fiber

NREN	Owned	Leased	Plan to have owned fiber	Maintenance
PIONIER	3000km	440km	Yes	Owner, Maintenance company
SANET	30km MAN	1600km	Yes	Owner, Maintenance company
SWITCH	5km MAN Co-ownership	1350km	No	Owner, Maintenance company
CESNET	0km	4200km	No	Owner/provider
SURFNET	0km	6000km	No	Owner
ARNES	0km	Yes/ (length NA)	No	Owner
AMREJ	10km MAN	400km (1700km)	No	Owner/provider

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Fiber types, multiplexing, amplification

NREN	Fibre type	Multiplexing	Amplification
PIONIER	G.652, G.655	DWDM	EDFA
SANET	G.652	CWDM	No
SWITCH	G.652 – 92% G.655 – 8%	DWDM, CWDM	EDFA
CESNET	G.652 – 94% G.655 – 6%	DWDM, CWDM	EDFA, Raman, PDFA, SOA
SURFNET	G.652 – 90% G.655 – 10%	DWDM, CWDM	EDFA
ARNES	G.652	DWDM experimental, CWDM	No
AMREJ	G.652	CWDM	No

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L2 technologies

NREN	Ethernet Technologies	Other L2 technologies
PIONIER	10GE, 1GE, 802.1q	-
SANET	1GE, 802.1q	-
SWITCH	10GE, 1GE, no tagging	EoMPLS
CESNET	10GE, 1GE, 802.1q	EoMPLS, PoS
SURFNET	10GE, 1GE, 802.1q	_
ARNES	10GE, 1GE, 802.1q	-
AMREJ	1GE, 802.1q	-

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Measurement equipment

NREN	OTDR	Power meter	Spectrum analyzers	PMD measurement	CD measurement
PIONIER	+	+	-	-	-
SANET	+	+	-	-	-
SWITCH	+	+	-	-	-
CESNET	+	+	+	-	+
SURFNET	-	-	-	-	-
ARNES	-	-	-	-	-
AMREJ	+	-	-	-	-

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Splicing, fiber cleaning equipment

NREN	Splicing equipment	Isopropyl alcohol	Cotton swabs, soft tissues	Compressed air	Microscope
PIONIER	+	+	+	+	-
SANET	-	+	+	-	-
SWITCH	-	+	+	-	+
CESNET	+	+	+	-	+
SURFNET	-	-	-	-	-
ARNES	-	-	-	-	-
AMREJ	-	-	-	-	-

Staff

NREN	Number of fiber specialists	Other duties	Special courses
PIONIER	6	+	-
SANET	0(?)	+	-
SWITCH	3	+	-
CESNET	3	+	-
SURFNET	2	+	-
ARNES	2	+	-
AMREJ	0 (5)	+	-

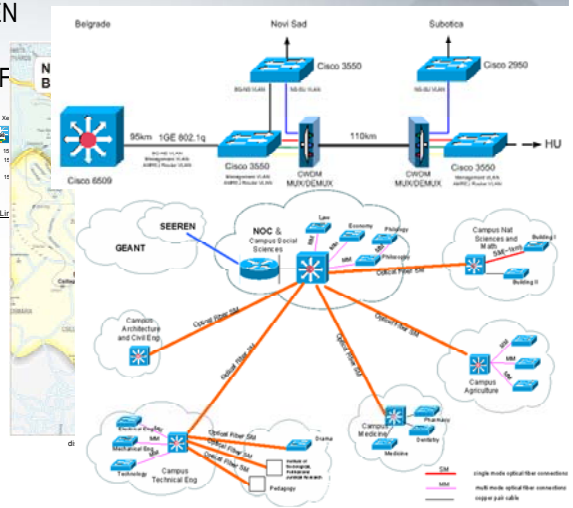
Reliability - experiences

- Number of unexpected or unannounced incidents (interruptions) in past three years

NREN	PIONIER	SANET	SWITCH	CESNET	SURFNET	ARNES	AMREJ
Number of incidents	7 (2004)	4	4	<5	1	1	<10

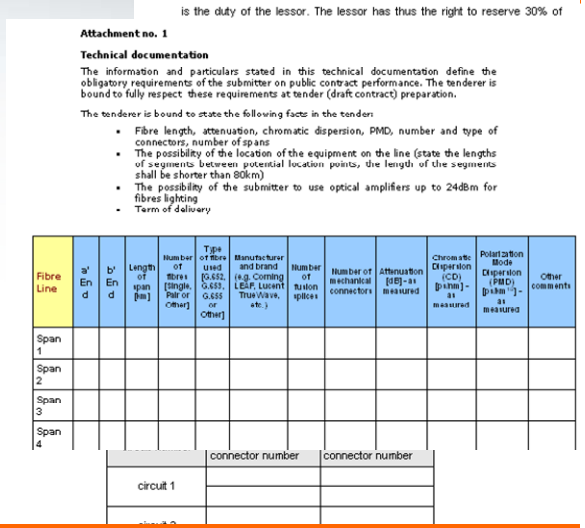
Learn from other's experiences

- Set of best practices from participant NREN networks
- Different solutions for MAN, WAN and CBF networks from different NRENs
- Described technologies: 1Gbps Ethernet, 10Gbps Ethernet, CWDM, DWDM, NIL, amplifiers,…



Procurement documents and contracts

- GRNET dark fibre and transmission equipment procurement documents
- CESNET dark fibre and transmission equipment procurement documents
- CESNET contract example, and example of the acceptance procedure
- GEANT dark fibre and equipment procurement documentation
- Experiences already used for the definition of the dark fibre acceptance procedure for SEEREN2



is the duty of the lessor. The lessor has thus the right to reserve 30% of

Attachment no. 1

Technical documentation

The information and particulars stated in this technical documentation define the obligatory requirements of the submitter on public contract performance. The tenderer is bound to fully respect these requirements at tender (draft contract) preparation.

The tenderer is bound to state the following facts in the tender:

- Fibre length, attenuation, chromatic dispersion, PMD, number and type of connectors, number of spans
- The possibility of the location of the equipment on the line (state the lengths of segments between potential location points, the length of the segments shall be shorter than 80km)
- The possibility of the submitter to use optical amplifiers up to 24dBm for fibres lighting
- Term of delivery

Fibre Line	a' End	b' End	Length of span [km]	Number of fibres [Single, Pair or Other]	Type of fibre used [G.652, G.653, G.655 or Other]	Manufacturer and brand (e.g. Corning LEAF, Lucent TrueWave, etc.)	Number of fusion splices	Number of mechanical connectors	Attenuation [dB] - as measured	Chromatic Dispersion (CD) [ps/nm] - as measured	Polarization Mode Dispersion (PMD) [ps/km$^{1/2}$] - as measured	Other comments
Span 1												
Span 2												
Span 3												
Span 4												

	connector number	connector number
circuit 1		

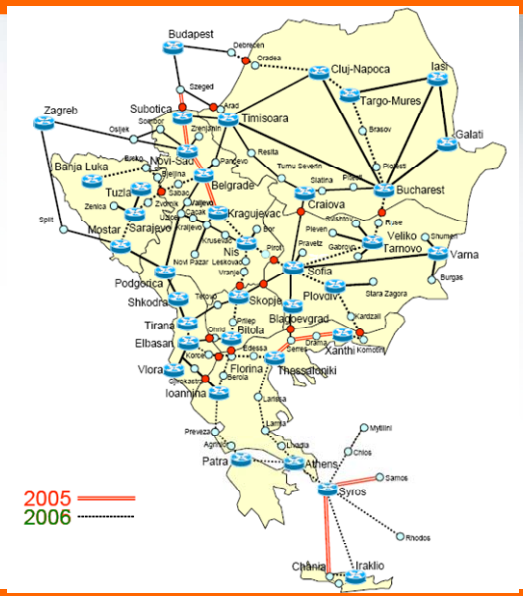
Other achievements

- Created a benchmark of existing and potentially available optical fibre for NRENs in the southeast European region
- Detailed analysis of the technical options available for the deployment of dark fibre and the management of optical transmission by NRENs in the region
- Study of regulatory and legal issues in SEE countries related to the dark fibre use in NRENs
- Developed an economic model for the acquisition and operation of own network connectivity by NRENs
- Information dissemination about dark-fibre deployment both at technical and policy-making levels

Study on (dark) fibre acquisition

- **Dark Fibre footprint database**
  - **Delivered a database of available (dark) fibre (and planting projects) in SEE** that will assist SEE-NRENs in their National and International fibre acquisition roadmaps
  - **Identify (dark) fibre interconnection points and cross-border connections in SEE (and determined which ones should be established for seamless interconnection)** that will assist SEE-NRENs in National and International interconnectivity plans
- **Dark fibre installation and long term acquisition experiences in SEE**
  - **Reported on the status of SEE NRENs** that will assist SEE NRENs in benchmarking their progress and update their sustainability plans
  - **Described and the status of (all) SEE NRENs owned national connectivity and related acquisition projects** that will accelerate (via best practices) SEE NRENs fibre acquisition plans

PoPs in SEE and preferred routes



Transmission technology study

- **Dark fibre lighting technologies**
  - "dark fibre cookbook"
  - focus on available technologies and equipment for enabling a dark-fibre infrastructure at different levels: metro, national, regional and international.
  - evaluated a multiplicity of approaches and technological options in terms of equipment for lighting dark fibre and creating point-to-point lambdas.
  - provide detailed information on technical specifications of equipment
- **Guidelines for support of deployment of NREN-empowered fibre infrastructure**
  - Guidelines for future deployment of own fibre infrastructure by NRENs, transition from telco-SDH services to a dark-fibre based network, gradually upgrade transfer rate on heavy-traffic lines
  - Examples of documents and specifications successfully used for procurement of DF and transmission equipment
  - Described SEE NRENs experience about equipment functionality, installation principles, redundancy and protection issues

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Regulatory and economic study

- **Study on the regulatory and legal framework**
  - Current regulatory status and plans for adopting the EU communication package
  - Status of competition to supply dark fibre in the country – price dependency
  - Procedures and costs for obtaining permissions for civil works (also about cross-border links)
  - Strength and independence of the regulatory body
  - Etc.
- **Economical model for the acquisition and operation of dark fibre networks in SE Europe**
  - Analysis of different parameters affecting economic model for dark fibre and DWDM equipment
  - Cost Categories
    - -Fibre (basis for acquisition)
    - -Hardware – Granularity of Costs
    - -Management and Maintenance
    - -Housing costs
    - - Length of contract
  - Provided a simple economic model and tool for the estimation of the expenses for the dark fibre network, for both dark fibre and transmission equipment

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Conclusions

- SEEFIRE is an example of the methodology needed in the preparation of the transition to dark fibre based network
- SEEFIRE provides a comprehensive set of documents which are good introduction into the field of dark fibre, not only for SEE networks
- There is no “one size fits all” solution for building a dark fibre network. Each NREN can find the model which best suits its needs and the position in its own country.
- Learning from other experiences is very important
- Changes in the procedures of network design and maintenance and also needs new knowledge from network designers and administrators are needed, but those changes are not dramatic and big
- NRENs from SEE and other less developed regions which are building their infrastructure from scratch can immediately without huge investments jump into the latest technological wave and try to avoid investing into equipment and technologies which are now past in developed European NRENs

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Technical Challenges of Establishing a Pilot Grid Infrastructure in South Eastern Europe

SEE-GRID
South Eastern European GRid-enabled eInfrastructure Development

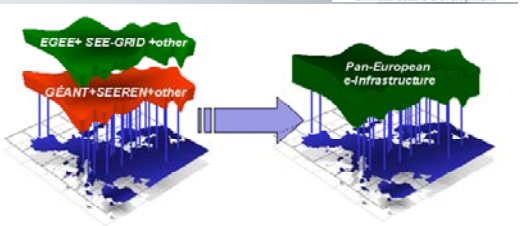
Emanouil Atanassov on behalf of the SEE-GRID consortium
www.see-grid.org

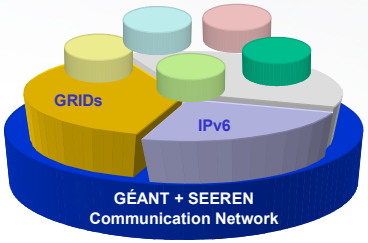
Outline

- SEE-GRID objectives
- SEE Regional challenges
- Technical challenges
- Interoperability issues
- HEP and biomed applications in SEE-GRID
- Official SEE-GRID applications
- Other SEE-GRID applications
- Conclusion

SEE-GRID objectives

- Integrate SEE National Grid Initiatives in the Pan-EU and worldwide Grid Infrastructures
  - Establish a seamless and interoperable pilot-Grid infrastructure that will expand and support the ERA.
  - Create a Human network in the area of eScience in the SEE region
  - Allow smaller, less-equipped sites to access computing resources that would otherwise be unaffordable.
  - Ease the digital divide and release the scientific & productive talents of the region





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SEE-GRID Contractors

GRNET (Co-ord.)	Greece
CERN	Switzerland
SZTAKI	Hungary
IPP-BAS	Bulgaria
ICI	Romania
TUBITAK	Turkey
INIMA	Albania
BIHARNET	Bosnia-Herzegovina
UKIM	FYROM
UOB	Serbia-Montenegro
RBI	Croatia

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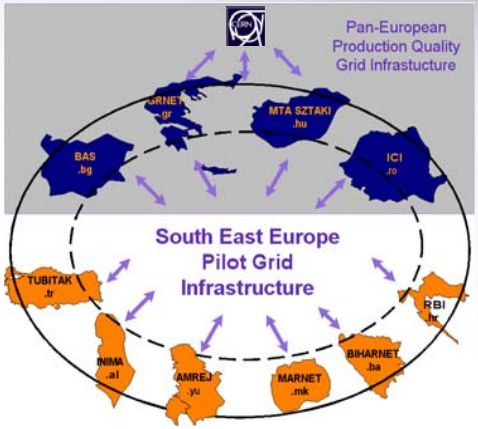
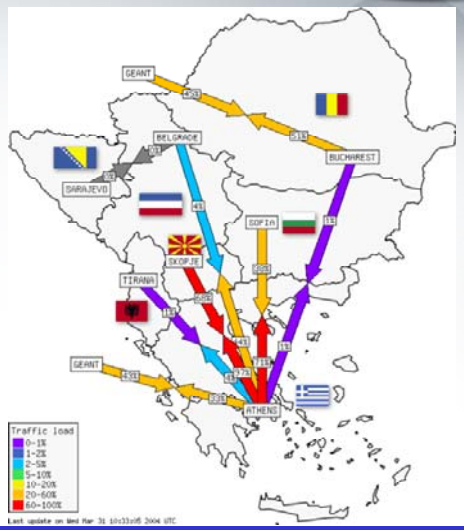
SEE regional challenges

- In order for e-Infrastructures to be deployed in "greenfield" regions, there is need for coordinated and complementary actions
- Evolution steps (in technological / political / financial environment) can be fast-tracked but they cannot be skipped altogether
- Need to respect and take into account the available infrastructure and resources in the new regions, and make provisions for alternative technical roadmaps
- Status of National Grid Initiatives



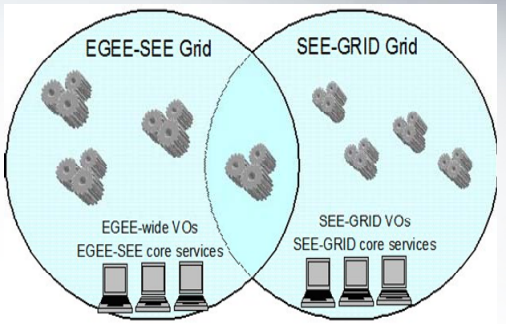
SEE-GRID technical challenges

- Underdeveloped network infrastructure – some countries do not have NREN. Other countries have limited connectivity – one order of magnitude less than the rest of Europe.
- Scarcity of hardware resources
- Lack of technical expertise



Interoperability challenges

- SEE-GRID must be interoperable with the larger EGEE project
- Heterogeneous structure of SEE-GRID in terms of size and type of sites
- Users from many countries with specific applications
- Technical solution: Venn diagram of the two overlapping grids, with appropriately configured core services



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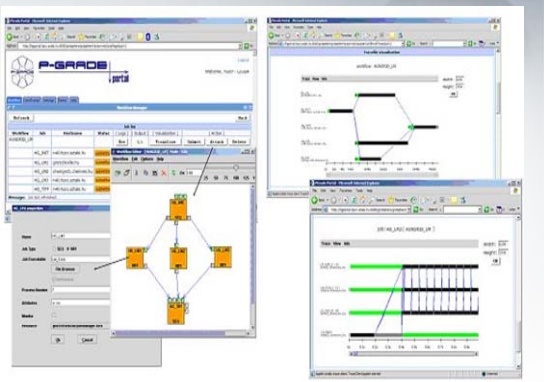
Interoperability issues

- The P-GRADE portal interconnects several grids, including SEE-GRID and EGEE, and solves the interoperability problem from user's point of view
- Easy to use interface to grid functionality simplifies development and testing of Grid applications



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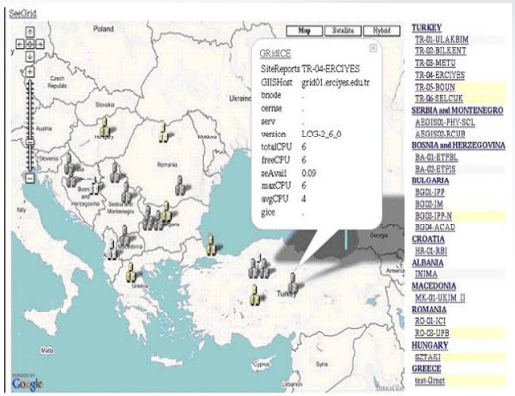
SEE-GRID technical achievements

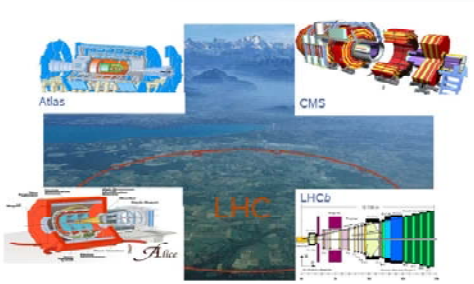
Improved network connectivity thanks to the SEEREN2 project and GN2

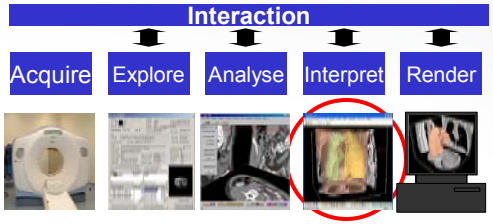
→ Clusters in all participant countries



SEE-GRID technical achievements

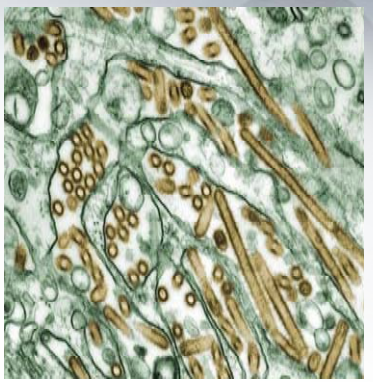
- SEE-GRID has a total of ~450 CPUs and 5TB of storage
- The largest SEE-GRID clusters AEGIS01-PHY-SCL, HR-01-RBI, MK-01-UKIM_II and TR-01-ULAKBIM, from the SEE-GRID beneficial countries joined EGEE production service
- They supported the activities of Atlas, CMS, Alice, LHCb VOs and the Biomed VO





SEE-GRID sites participate in HEP and Biomed Challenges

- During the period January 2005 – April 2006 Serbia ranked 10th in CMS VO usage according to EGEE accounting data.
- For the same period, Croatia ranked 10th in Biomed VO usage.
- At this moment, 5 SEE-GRID clusters support the 2nd Biomed Data challenge on drug discovery, this time searching a cure for avian flu.



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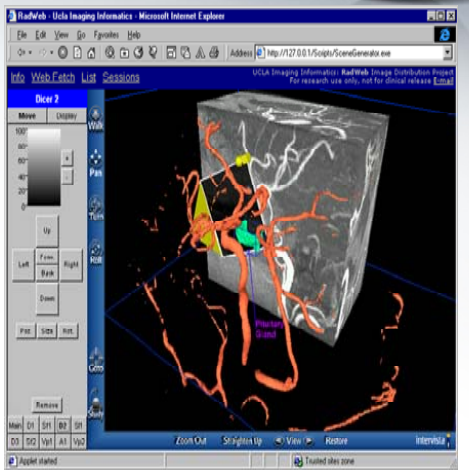
SEE-GRID official applications - VIVE

- VIVE – volumetric image engine application for visualization of medical images
- Combines the power of several worker nodes in order to perform the computations, needed for rendering a complex 3D scene.
- Startup time of this application must be acceptable for users – this can not be assured by current middleware.
- An application portal was developed in order to solve this issue.



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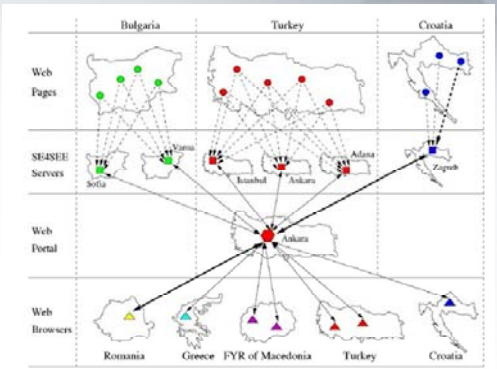
SEE-GRID official applications – SE4SEE

- SE4SEE – Search Engine for South East Europe
- On demand, customized search engine



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Other SEE-GRID applications - EnvMod

- Other applications developed by SEE-GRID partners also use the infrastructure.
- Example application from IPP – EnvMod for environmental modelling
- Performing the transition from High performance computing to Grid computing

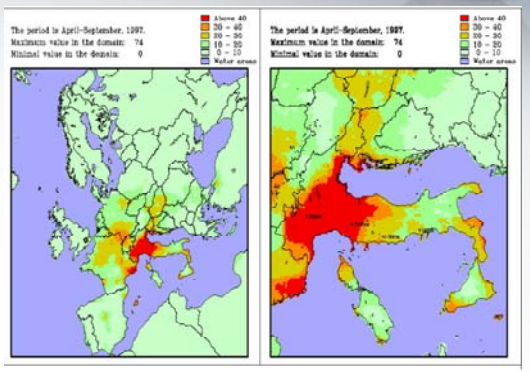

Fig.2: Number of days with an 8-hour average ozone concentration more than the critical value (60 ppb.) in 1997.

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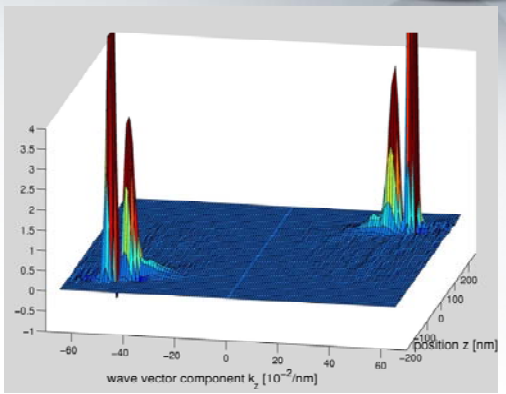
Other SEE-GRID applications - SALUTE

- SALUTE – Stochastic Algorithms for Ultra-fast Transport in Semiconductors – an application developed in Department of Parallel Algorithms in the area of nano-technology
- MPI and single CPU version with bulk job submission developed, in order to fully utilize the available CPU power.



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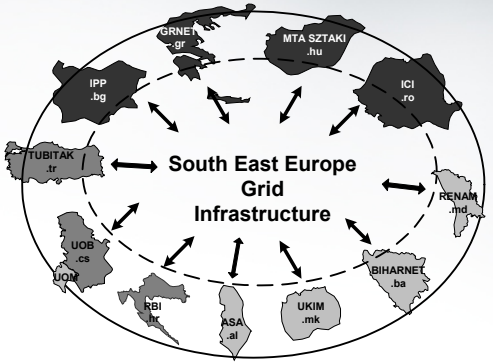
Conclusion

- The first phase of the SEE-GRID project attracted a critical mass of users, applications, and resources, and accelerated the development and expansion of the National Grid initiatives in the South East Europe region.
- During the second phase of the project we pursue to increase and integrate the created SEE-GRID infrastructure and services, to capitalize on the regional human network in Grids in order to achieve sustainability of the grid eInfrastucture on regional level.
- Two new partners will participate in SEE-GRID2 – Moldova and Montenegro.
- The actual usage of the Grid infrastructure will be stimulated by the deployment and support of a range of Grid applications in order to engage as many user communities as possible.

Pan-European Production-level Grid Infrastucture



SEE-GRID2 partnership

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