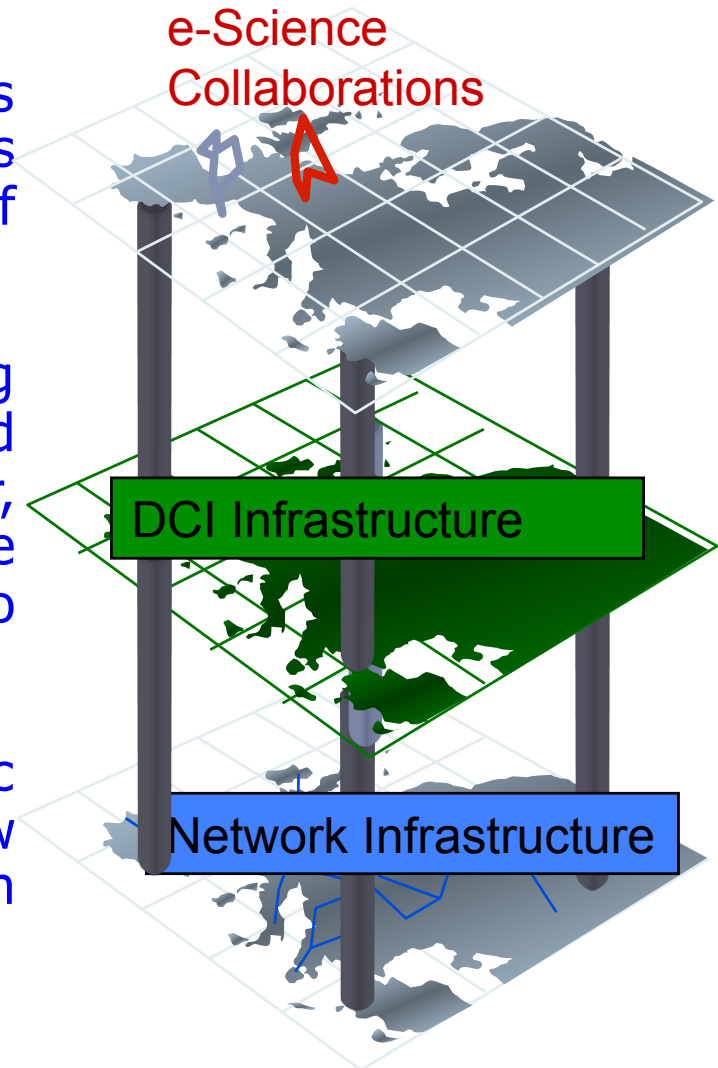


# **Grid and Networking in Armenia**

Hrachya Astsatryan,  
Institute for Informatics and Automation Problem,  
National Academy of Sciences of Armenia

# Outline

- ▶ The Research Network infrastructure provides fast interconnection and advanced services among Research and Education institutes of different countries'
- ▶ The Research Distributed Computing Infrastructure (Grid, HPC) provides a distributed environment for sharing computing power, storage, instruments and databases through the appropriate software (middleware) in order to solve complex application problems
- ▶ This integrated environment is called electronic infrastructure (eInfrastructure) allowing new methods of global collaborative research - often referred to as electronic science (eScience)



## Network Layer: About Armenian NRENs

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- ▶ **Academic Scientific Research Computer Network of Armenia (ASNET-AM)** was established in 1994 by the decision of the presidium of the National Academy of Sciences of the Republic of Armenia (NAS RA). Since the establishment ASNET-AM is operated by the Institute of Informatics and Automated Problems of NAS RA (IIAP NAS RA).

[www.asnet.am](http://www.asnet.am)

- ∨ **Armenian Research and Educational Networking Association (ARENA)** was founded in 2000 by several stakeholders.

[www.arena.am](http://www.arena.am)

# Network Layer: ASNET-AM NREN

- ▶ ASNET-AM NREN with over 18 years of experience in networking & IT
- ▶ Approx. 20 employees and five main groups
  - ▶ System Administration
  - ▶ Communications and Telecommunication
  - ▶ Information Technologies
  - ▶ High-Performance Computing
- ▶ All the regular network services: IPv4, multicast, web, mail, DNS, hosting, 3G, virtualization, etc..
- ▶ Member of TERENA (Trans-European Research and Education Networking Association)

> 29 May 2012

**TERENA General Assembly agrees a community strategy is required for Horizon2020**



A strategy must be devised to help the European research networking community achieve its part in the European Commission's vision for the future of research and innovation, 'Horizon2020', agreed representatives of TERENA's member organisations during the TERENA General Assembly meeting held in Reykjavik, Iceland, 24-25 May

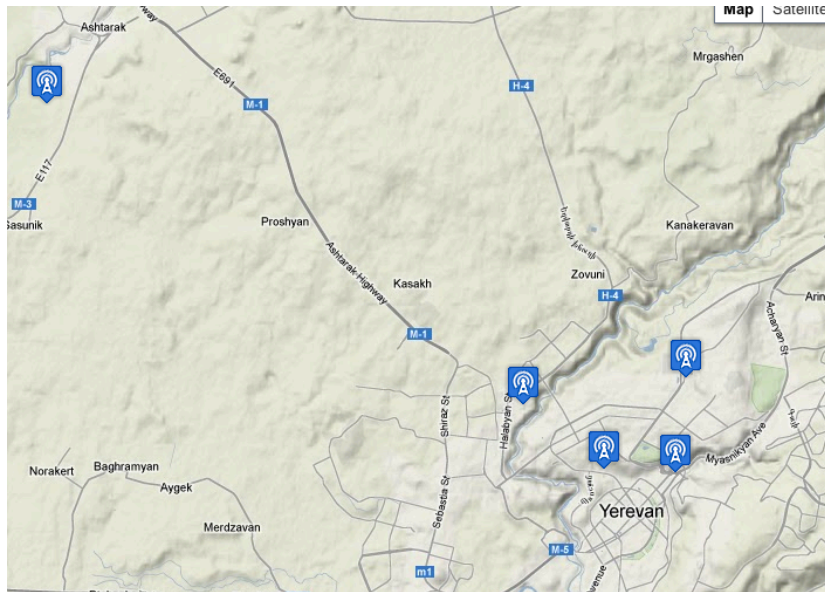
2012.

In addition, the Armenian NREN (ASNET-AM) was admitted as a new national member of the association and Alcatel-Lucent, Google and Telefónica were admitted as associate members. Having served the maximum of six years as TERENA Vice-President for Conferences, Miroslav Milinović (Srce) stepped down from the TERENA Executive Committee and Helmut Sverenyák (CESNET) was elected in this role. Marko Bonač (ARNES) was re-elected as Treasurer. The accounts for 2011 were adopted by the assembly.

[Read more](#)



# Network Layer: ASNET-AM RECENT SERVICES



eduroam infrastructure monitoring

server status

Level	Server Name	Status	Tested realm	Checked with	Accept time	Reject Time	Monitored ts	History
org	ETL RADIUS dk	OK	eduroam-test.org	EAP-TTLS	851	850	2012-10-19 10:05:39	Custom, 24h
	ETL RADIUS nl	OK	eduroam-test.org	EAP-TTLS	723	732	2012-10-19 10:07:10	Custom, 24h

Level	Server Name	Status	Tested realm	Checked with	Accept time	Reject Time	Monitored ts	History
ad	RADIUS server 1	OK	eduroam.ad	EAP-TTLS	1308	2315	2012-10-19 10:11:23	Custom, 24h
am	RADIUS server 1	OK	eduroam.am	EAP-TTLS	21601	21167	2012-10-19 10:13:41	Custom, 24h
	RADIUS server 2	OK	eduroam.am	EAP-TTLS	1597	11593	2012-10-19 10:14:06	Custom, 24h



## IPv6 Prefix: 2a03:1900::/32

- Allocation approved: 25.03.2011
- Announce started: 06.04.2011

## IPv4/IPv6 Dual Stack implementation

## IPv6 Readiness for Network Services DNS, Proxy, Web-hosting, etc

Less than 30% of the GRH participants saw this route.

LG	Prefix	AS	NetName	Owner	AS	S	Allocated	First seen	Seen by	Last seen (*)
LG	2001:67c:21c::/48	51090	AM-TLD	-Internet Society- Public...	51090	A	2010-05-27	2010-06-06 08:47:41	100%	2012-10-19 08:49:06
LG	2001:4d00::/32	8226	AM-NIC-20050712	Armenian Network Informat...	8226	A	2005-07-12	2005-07-13 11:17:19	100%	2012-10-19 08:49:10
LG	2a00:f38::/32	12297	AM-ARMENTEL-20081127	Armentel Telephone Compan...	12297	A	2008-11-27	2011-12-21 15:33:21	0%	2012-04-30 18:33:14
LG	2a00:1500::/32		AM-WEB-20091019	WEB Ltd		A	2009-10-19		0%	never
LG	2a00:1f28::/32	43733	AM-K-TELECOM-2010041...	K-Telecom CJSC	43733	A	2010-04-15	2012-02-14 12:33:16	100%	2012-10-19 08:49:18
LG	2a00:cc40::/32	44395	AM-UCOM-20120329	Ucom LLC	44395	A	2012-03-29	2012-04-09 14:03:21	0%	2012-09-28 00:34:21
LG	2a01:4000::/32	33852	AM-CORNET-20101201	Cornet-AM Closed Joint St...	33852	A	2010-12-01	2011-01-20 07:18:01	100%	2012-10-19 08:49:19
LG	2a01:4780::/32	42109	AM-ADC-20110607	Armenian Datacom Company	42109	A	2011-06-07	2011-09-08 10:33:20	0%	2012-08-30 20:19:33
LG	2a01:4a00::/32	49363	AM-ORANGE-ARMENIA-20...	-Orange Armenia- CJSC	49363	A	2011-01-28	2011-04-06 13:47:58	100%	2012-10-19 08:49:19
LG	2a01:bbc0::/32	199673	AM-ABC-DOMAIN-201209...	-ABC Domain- LLC	199673	A	2012-09-07		0%	never
LG	2a02:d18::/32	41965	AM-FIBERNET-20090414	FiberNet Communications	41965	A	2009-04-14	2009-04-17 10:47:29	100%	2012-10-19 08:49:20
LG	2a02:29f8::/32		AM-APAGATECHNOLOGIES...	Apaga Technologies CJSC		A	2010-11-19		0%	never
LG	2a02:2a50::/32	49800	AM-GNC-20101124	GNC-Alfa CJSC	49800	A	2010-11-24	2011-04-06 21:48:01	100%	2012-10-19 08:49:21
LG	2a03:1080::/32		AM-ICON-20110811	Icon Communications CJSC		A	2011-08-11		0%	never
LG	2a03:1900::/32	47623	AM-IIAP-20110325	Institute for Informatics...	47623	A	2011-03-25	2011-04-06 13:47:59	100%	2012-10-19 08:49:21
LG	2a03:2300::/32		AM-PX-20110328	Pimox LLC		A	2011-03-28		0%	never
LG	2a03:3d00::/32	21104	AM-NETSYS-20110331	Netsys JVC	21104	A	2011-03-31	2011-04-06 20:18:15	100%	2012-10-19 08:49:21

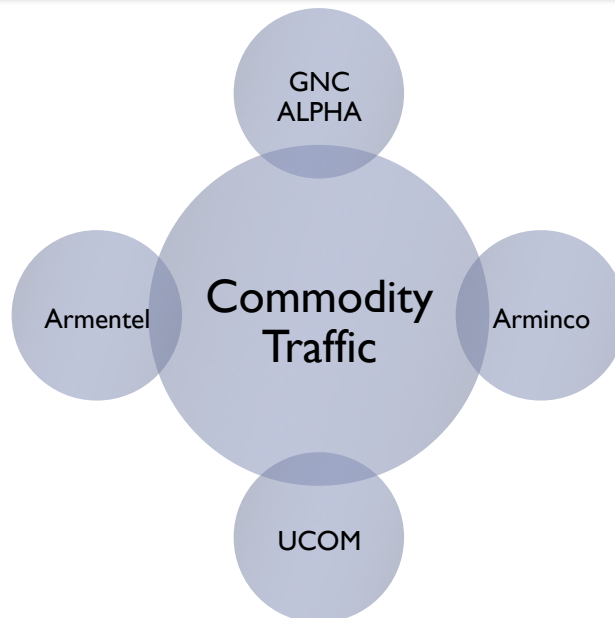
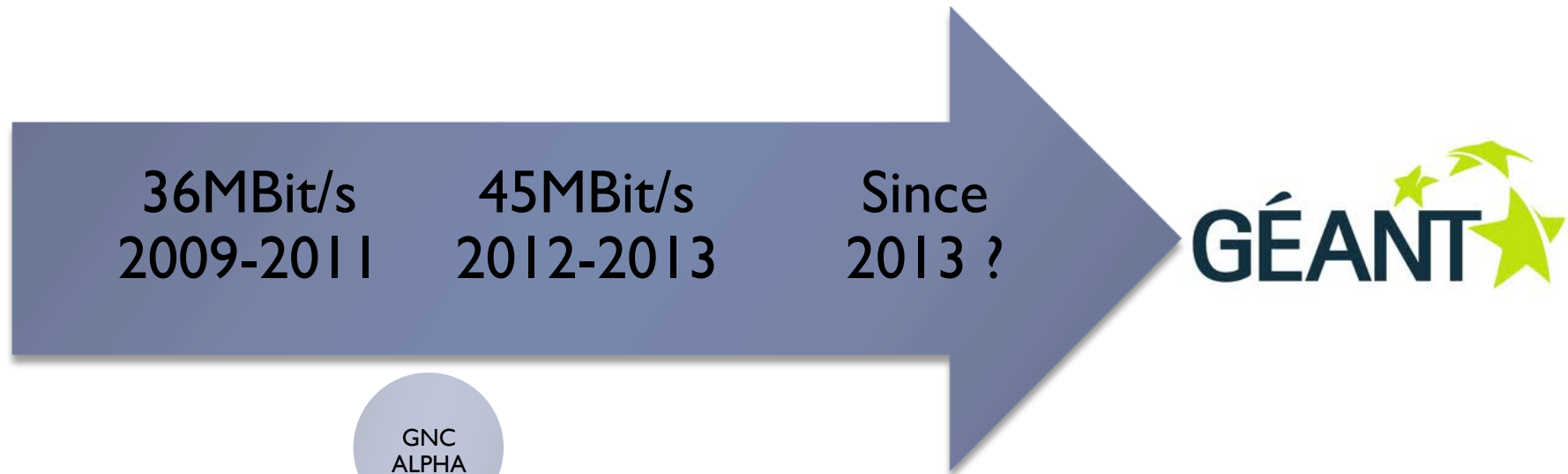
The database currently holds 17 IPv6 Prefixes

Second ATLAS-South Caucasus Software / Computing Workshop & Tutorials, October 23-26, 2012 Tbilisi, Georgia





# Network Layer: EXTERNAL CONNECTIVITIES



# DCI Infrastructure: First Steps

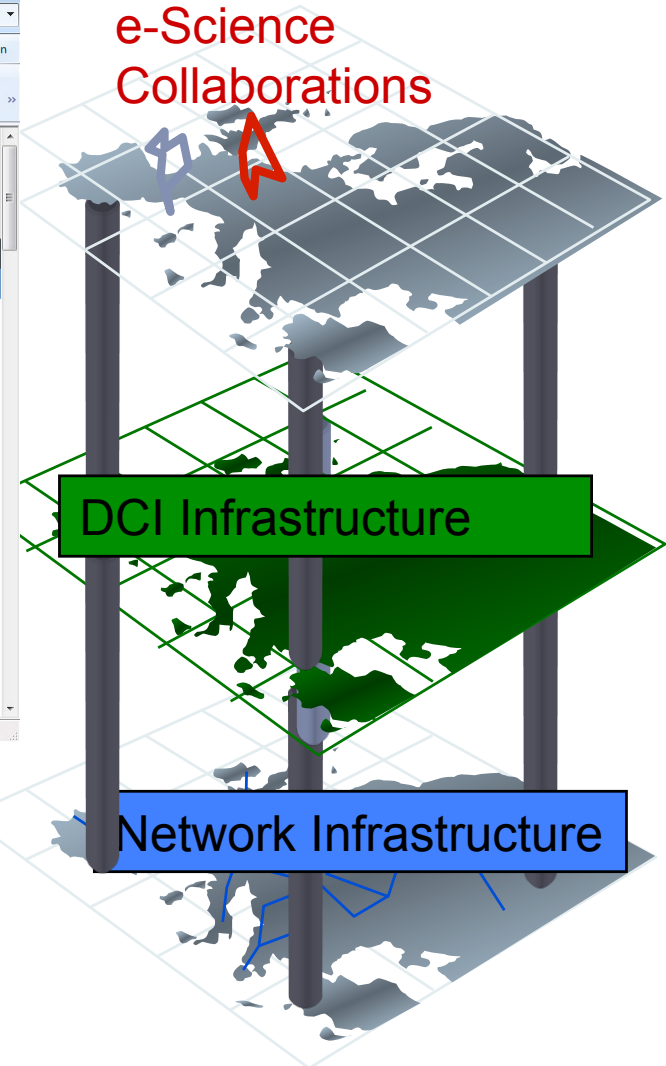
TOP 50 | Суперкомпьютеры - Windows Internet Explorer

http://www.supercomputers.ru/?page=archive&rating=1

Архив рейтинга

1-ая редакция от 07.12.2004

№	Место	Мал-во CPU/ядер	Архитектура (тип процессора / сеть)	Производительность		Разработчик
				Грасск	Пикселе	
1	Минск <a href="#">ОИП НАНБ</a> 2004 г.	576/576	узлов: 288 (2xOpteron 248 2.2 GHz 4 GB RAM) сети: InfiniBand/Gigabit Ethernet/СКИФ-ServNet	2032	2534.4	СКИФ
2	Москва <a href="#">МЦЦ РАН</a> 2004 г.	336/336	узлов: 168 (2xPowerPC 970 1.6 GHz 4 GB RAM) сети: Myrinet/2xGigabit Ethernet	1401	2150.4	ФГУП "Квант", ИПМ РАН, МЦЦ
3	Москва <a href="#">МЦЦ РАН</a> 2001 г.	768/768	узлов: 384 (2xAlpha 21264A 667 MHz 1 GB RAM) сети: Myrinet 2000/Fast Ethernet	734.6	1176.6	ФГУП "Квант", ИПМ РАН, МЦЦ
4	Москва <a href="#">НИИЦ МГУ</a> 2004 г.	160/160	узлов: 80 (2xOpteron 248 2.2 GHz 4 GB RAM) сети: InfiniBand/Gigabit Ethernet/Fast Ethernet	512	704	Hewlett-Packard
5	Ереван <a href="#">ИПИА НАН РА</a> 2004 г.	128/128	узлов: 64 (2xXeon 3 GHz 1 GB RAM) сети: Myrinet/Gigabit Ethernet	483.6	783.36	ИПИА НАН РА, ИСП РАН, С.I.Technology
6	Минск <a href="#">ОИП НАНБ</a> 2003 г.	128/128	узлов: 64 (2xXeon 2.8 GHz 2 GB RAM) сети: SCI/Gigabit Ethernet/СКИФ-ServNet	475.3	716.8	СКИФ





# DCI Infrastructures in Armenia

- ▶ The establishment of the Armenian National Grid Initiative (ArmNGI) is quite good balanced unit:
- ▶ Stakeholders: State Scientific Committee of the Ministry of Education and Science of the Republic of Armenia, National Academy of Sciences of the Republic of Armenia
- ▶ Leading Universities: State Engineering University of Armenia, Yerevan State University
- ▶ Leading Research Organizations: Yerevan Physics Institute after A. Alikhanian, Institute for Informatics and Automation Problems of the National Academy of Sciences of the Republic of Armenia
- ▶ Private: Armenian e-Science Foundation



IArmNGI is a member of European Grid Initiative

Grid infrastructure provided for academic & research purposes

# ArmNGI: Computational & Storage Resources

**Number of GRID sites: 6**

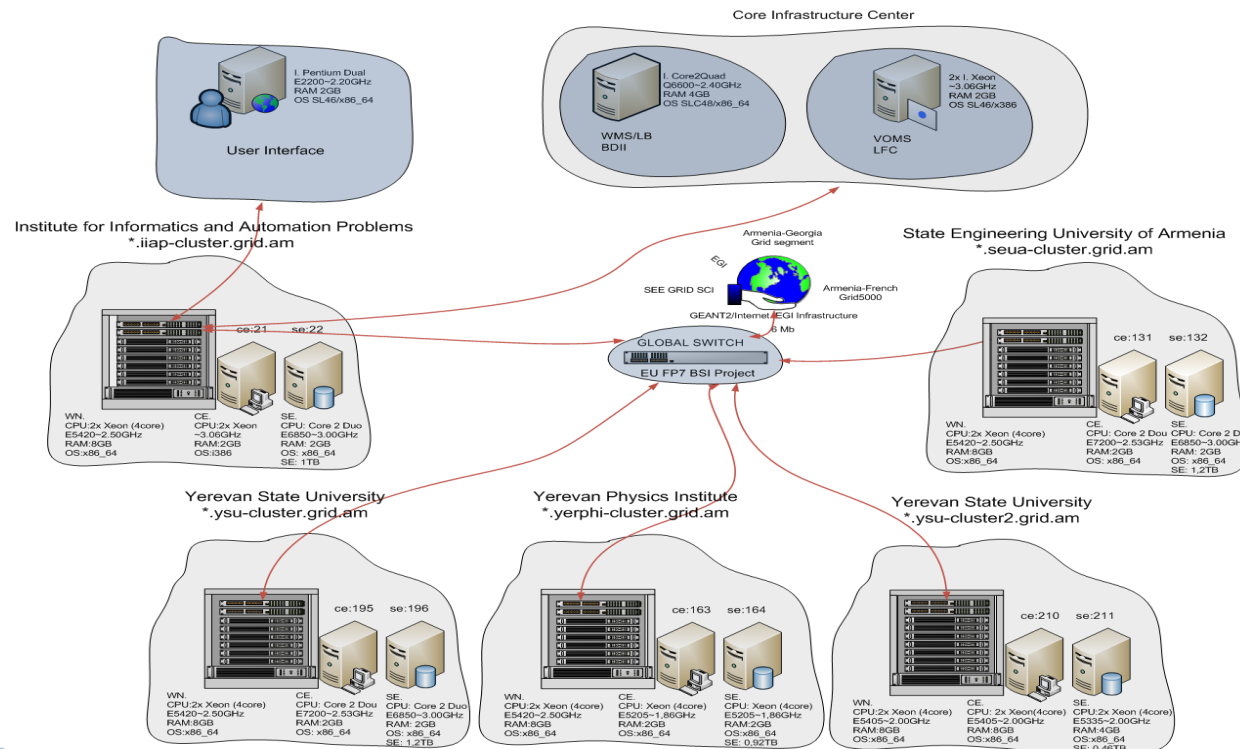
**Computational Resources: 496**

**Available Storage Resources**

- YERPHI: 50TB
- IIAP: 16TB
- YSU: 1TB
- SEUA: 1TB
- IRPHE: 1TB

## Armenian National Grid Initiative

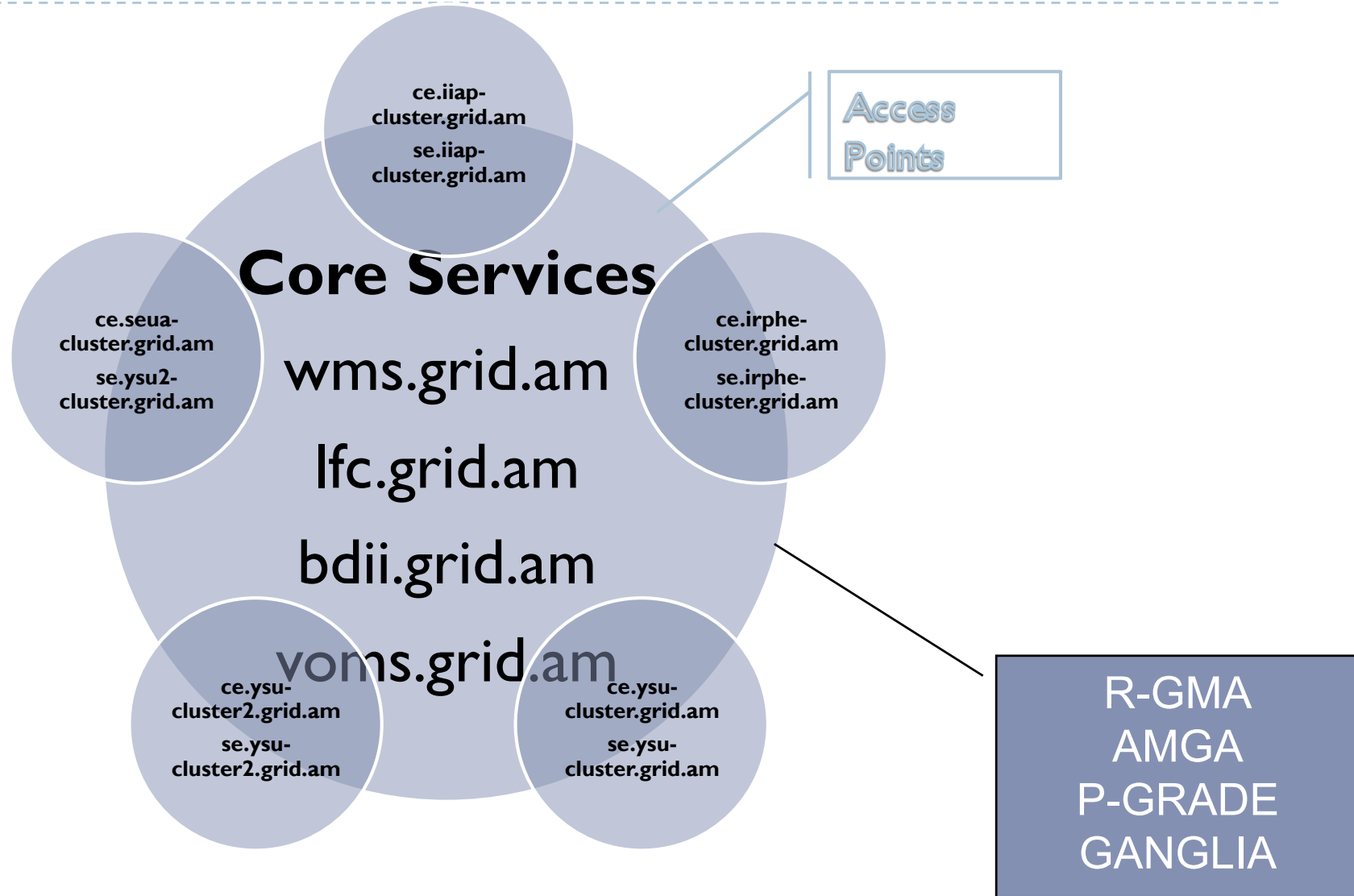
GRID-AM / 93.187.165/255(Registered in the RIPE Database)



## GPU Computing



# ArmNGI: Core Services



# ArmNGI: Software Components

## Middleware

### Sites

- Rocks Cluster Distribution
- Torque, Maui batch system
- Ganglia monitoring system

### Grid

- gLite 3.1, 3.2
- EMI (European Middleware Initiative) 1, 2

### Libraries

- BLAS (Basic Linear Algebra Subprogramms)
- SCALAPACK (Scalable Linear Algebra PACKage)

### Compilers

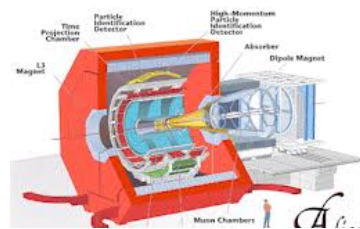
- GCC
- MKL

## Ported Applications

- NAMD: parallel molecular dynamics code designed for high-performance simulation of large biomolecular systems
- GROMACS: performs molecular dynamics, i.e. simulate the Newtonian equations of motion for systems with hundreds to millions of particles.
- WRF: next-generation mesoscale numerical weather prediction system
- GRASS: Geographic Information System software used for geospatial data management and analysis, image processing, graphics/maps production
- CMAQ: consists of a suite of programs for conducting air quality model simulations
- MKL: Intel Math Kernel Library
- SWAT: PManagement decisions on water, sediment, nutrient and pesticide yields with reasonable accuracy on large, unged river basins.



# ArmNGI: Supported Vos and Monitoring Systems



# E-Science Collaboration



- ▶ Integrating Armenia into ERA: Information and Communication Technologies (INARMERA-ICT)
- ▶ European Grid Initiative: Integrated Sustainable Pan-European Infrastructure for Researchers in Europe
- ▶ High-Performance Computing Infrastructure for South East Europe's Research Communities
- ▶ Central and Eastern European Networking Engine



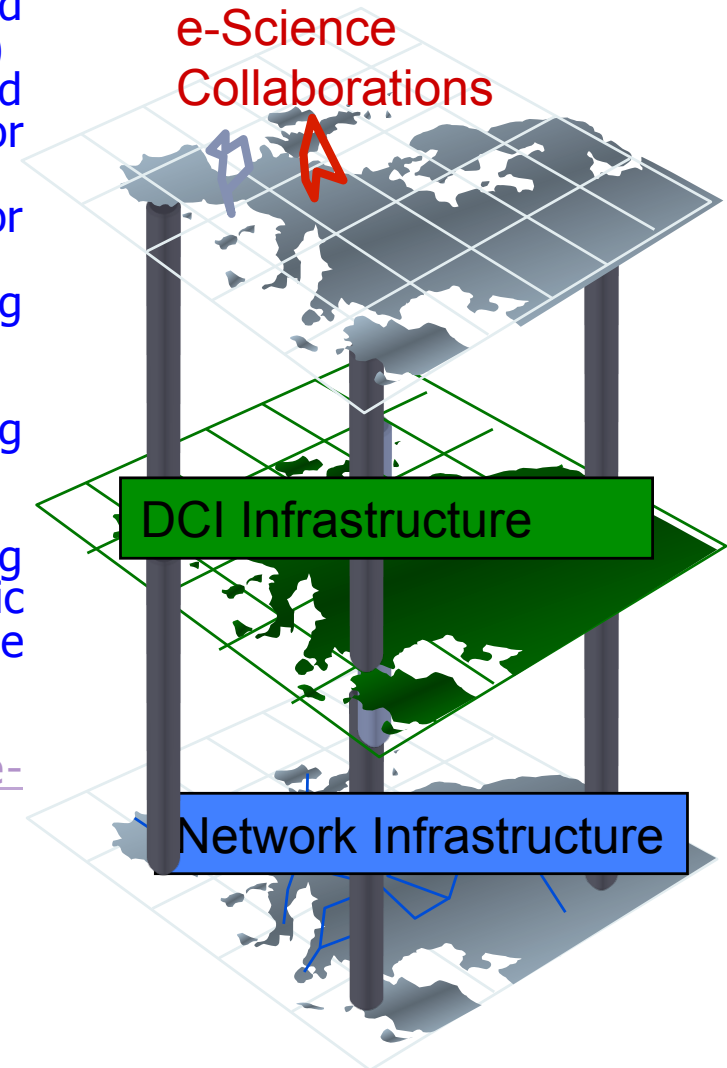
- ▶ Deploying Armenian Distributed Processing Capacities for Environmental GEOspatial Data



- ▶ Leading Developer of Distributed Computing Development of a Second Generation Scientific Computing Infrastructure Based on P-Grade Portal



- ▶ Development of National Computing e-Infrastructure (2012-2014)



# THANK YOU FOR YOU ATTENTION

- Armenian National Grid Initiative
  - <http://www.grid.am>
- Academic Scientific Research Network of Armenia
  - <http://www.asnet.am>
- Institute for Informatics and Automation Problems of NAS RA
  - <http://iiap.sci.am>
- National Academy of Sciences of Armenia
  - <http://www.sci.am>
- Yerevan Physics Institute
  - <http://www.yerphi.am>