



Research E-Infrastructure Upgrade Project at IMCS UL

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Cluj-Napoca

Basic data about IMCS UL, Latvia University (Part 1)

Latvia -

The territory covers 64,589 km²

Population - 2,217,000 peoples

University of Latvia:

In the academic year 2011/ 2012, the total number of students enrolled at the University of Latvia (UL) comprises 17,790

Institute of Mathematics and Computer Science, University of Latvia (IMCS UL)

Staff- 210

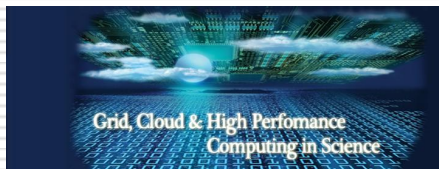
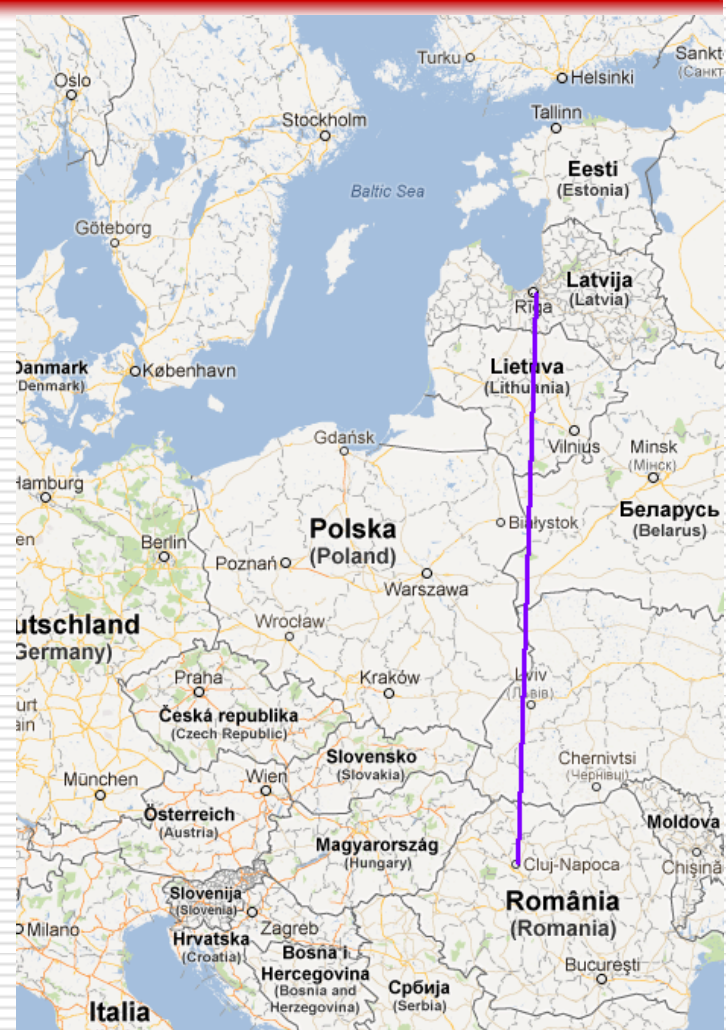
Established- 1959

Income 5 MEuro/ Year

(1/3- contracts,

1/3 EU projects,

1/3-national public financing)



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Latvijas Universitātes
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Basic data about IMCS UL, Latvia University (Part 2)

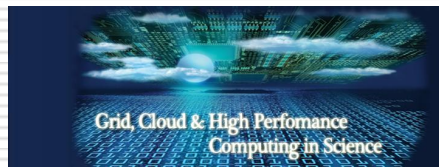
Main research fields

- *Computer Science*

- Mathematical foundations of computer science;
- Complex systems modeling languages and development tools;
- Graph theory and visual information processing;
- Semantic web technologies;
- Real time systems, embedded systems;
- Computational linguistics;
- Bioinformatics;

- *Mathematics*

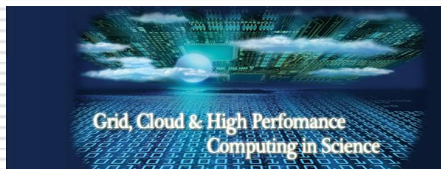
- Mathematical modeling for technologies and natural sciences;
- Theoretical problems of mathematical methods.



E-infrastructure



**ESFRI Research Communities:
Biology, Physics,
Medical,.....**



European Strategy Forum on Research Infrastructures (ESFRI)





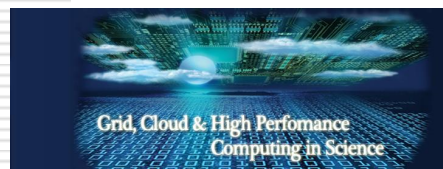
ESFRI Roadmap 2010

48 new - or major upgrade of - Research Infrastructures of pan-European interest
 (+ 3 additional projects from the CERN Council strategic roadmap for particle physics*)

Social Sc. & Hum. (5)	Life Sciences (13)		Environmental Sciences (9)		Energy (7)	Material and Analytical Facilities (6)	Physics and Astronomy (10)		e-Infra-structures (1)
SHARE	BBMRI	ELIXIR	ICOS	EURO-ARGO	ECCSEL	EUROFEL	ELI	TIARA*	PRACE
European Social Survey	ECRIN	INFRA FRONTIER	LIFEWATCH	IAGOS	WindScanner	EMFL	SPIRAL2	CTA	
CESSDA	INSTRUCT	EATRIS	EMSD	EPOS	EU-SOLARIS	European XFEL	E-ELT	SKA	
CLARIN	EU-OPENSREEN	EMBRIC	SIAEOS	EISCAT_3D	JHR	ESRF Upgrade	KM3NeT	FAIR	
DARIAH	Euro BioImaging	ERINHA BSL4 Lab		COPAL	IFMIF	NEUTRON ESS	SLHC-PP*	ILC-HIGRADE*	
	ISBE	MIRRI			HIPER	ILL20/20 Upgrade			
	ANAEE				MYRRHA				

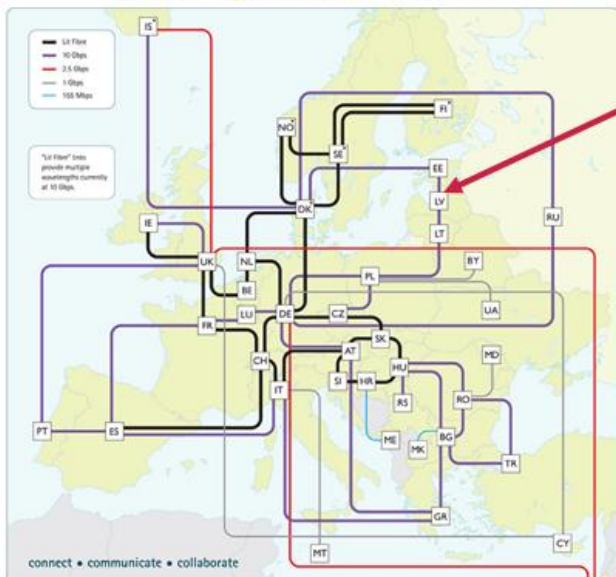
+ Year 2011 and 2012

 Distributed research infrastructures
 Single sited research infrastructures



E-infrastructure at IMCS UL GÉANT

GÉANT  the pan-European
research and education network
Transforming the way users collaborate



Backbone topology as at March 2012. GÉANT is operated by DANTE on behalf of Europe's NRENs.



GÉANT is co-funded by the European Commission within its 7th R&D Framework Programme.

www.sigmanet.lv

sigma Σ net

Latvia

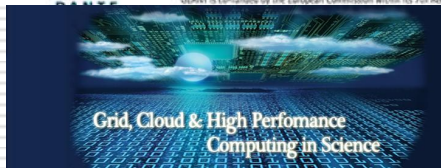


GÉANT  At the Heart of Global Research Networking



DANTE GÉANT
www.dante.eu www.geant.net

connect • communicate • collaborate
GÉANT is co-funded by the European Commission within its 7th R&D Framework Programme.



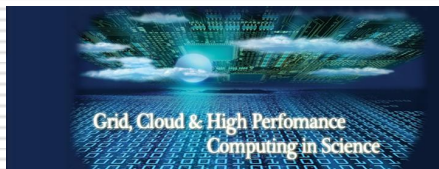
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E-infrastructure at IMCS UL Networking and Computing Layer

- ▶ Networking and international connectivity to GÉANT (IMCS is partner of GN3- <http://www.geant.net> , National NREN Sigmanet);
- ▶ computing environment (GRID computing environment and National Grid Infrastructure - www.grid.lumii.lv Baltic GRID, BGII (Baltic Grid second phase, Nr. 223807); <http://www.egi.eu> and EGI-InSPIRE <http://www.egi.eu/projects/egi-inspire/>,
- ▶ national Cloud prototype with servers (IBM series 3500) and IBM Storage Area Network of ½ Peta Byte capacity);



E-infrastructure at IMCS UL Integration in EU research infrastructure

EU ESFRI eScience functional application of e-infrastructure:

CLARIN- Common Language Resources and Technology Infrastructure

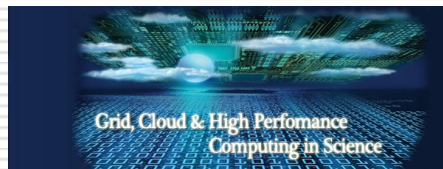
<http://www.clarin.eu>

ELIXIR- A sustainable infrastructure for biological information in Europe

<http://www.elixir-europe.org>

PRACE - A partnership for advanced computing in Europe

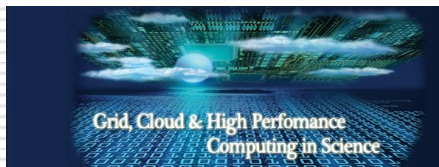
Radio astronomy data streaming facility from Irbene radiotelescop



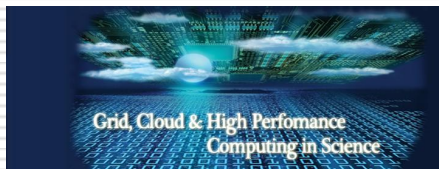
E-infrastructure at IMCS UL

Public services, national responsibilities

- ❑ e-infrastructure development;
- ❑ Data security (CERT.LV);
- ❑ Domain name administration .lv
- ❑ Future Internet Forum (EU politics development)
- ❑ OSIRIS(Towards an Open and Sustainable
ICT Research Infrastructure Strategy, Nr. 248295);

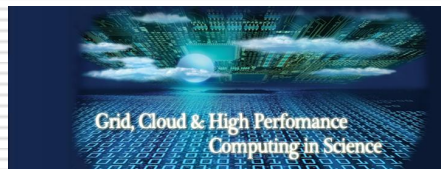


- ❑ 1) maintains common electronic information space monitoring;
- ❑ 2) provides support in information technologies security incident prevention or coordinates their prevention;
- ❑ 3) maintains in a publicly accessible way in line with the actual threats recommendations on the current information technologies risks;
- ❑ 4) conducts research, organizes educational events, education and training in the field of information technologies security;
- ❑ 5) provides support to state institutions in safeguarding national security, as well as crime and other crime detection (investigation) in the field of information technologies, complying with statutory restrictions on data processing;
- ❑ 6) monitors state and local government institutions and telecommunication operators compliance with the duties prescribed by this Law;
- ❑ 7) cooperates with internationally recognized information technologies security incident prevention institutions (teams);
- ❑ 8) carries out other obligations under laws and regulations.



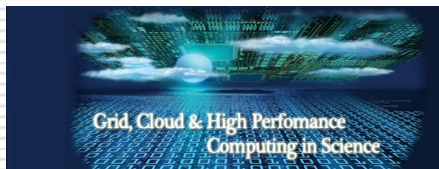
In 1993 NIC.lv formed top level domain .lv registry delegation received from Internet Assigned Numbers Authority (IANA), Internet Corporation for Assigned Names and Numbers (ICANN).

- maintains secure and stable domain name system and ensures continuous operation and availability of the system;
- - ensures accessibility of the top level domain .lv to the servers of the global domain name system;
- - manages domain name registration and maintenance in top level domain .lv;
- - maintains the accuracy and completeness of the Registry database;
- - provides 24 x 7 online service for domain name applications and modifications;
- - provides 24 x 7 online Whois service for .lv domain;
- - offers domain name registration client support.



Membership in International organizations

- ❑ Trans European Research and Education Networking Association (TERENA);
- ❑ Central and Eastern European Networking Association (CEENet);
- ❑ Council of European National Top Level Domain Registries (CENTR);
- ❑ Réseaux IP Européens Network Coordination Centre (RIPE NCC);
- ❑ Internet Corporation for Assigned Names and Numbers (ICANN);
- ❑ ARTEMIS Industrial Association (ARTEMISIA);
- ❑ European Grid Initiative (EGI);
- ❑ International Mathematical Union;
- ❑ Association Informatics Europe

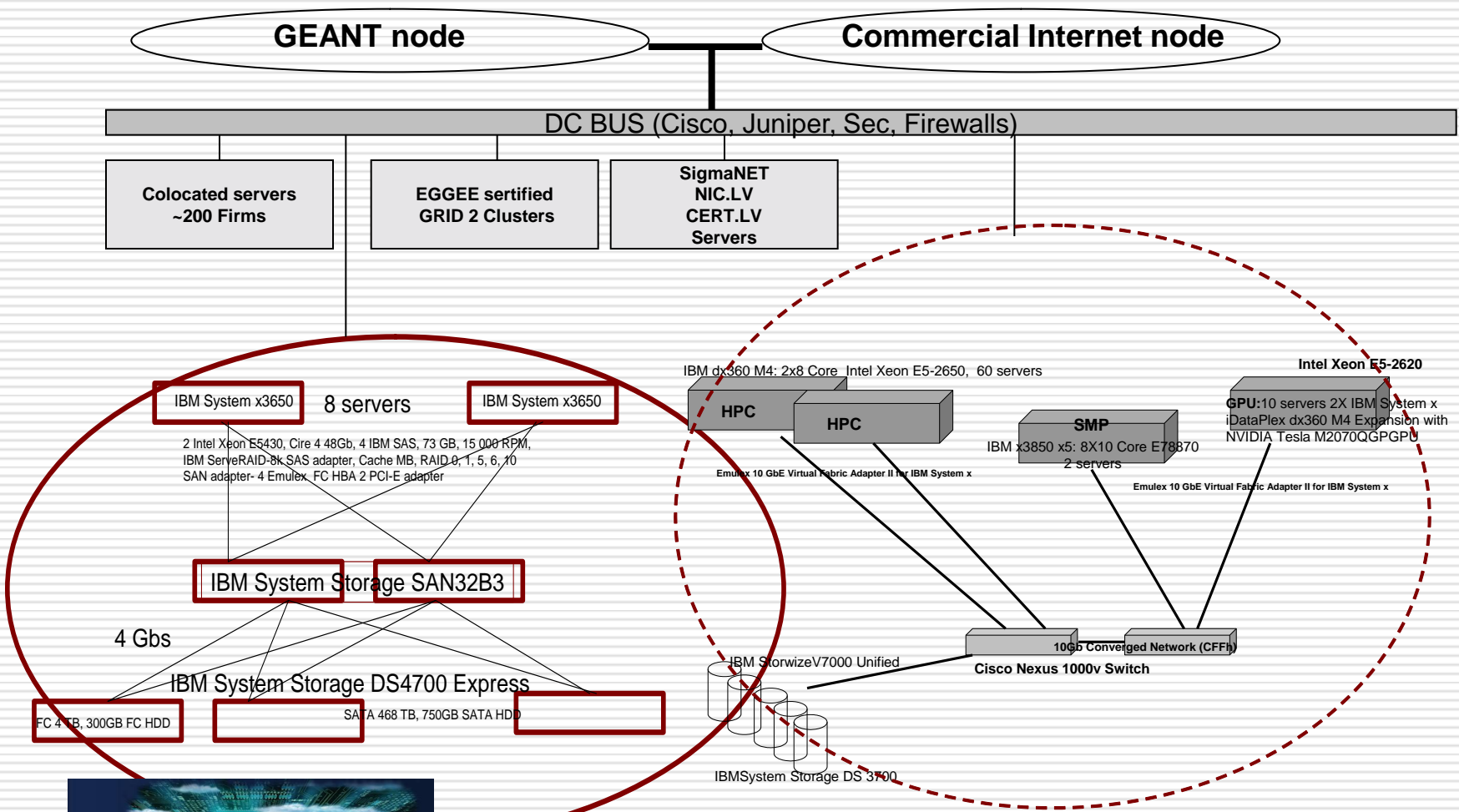


Other activities

- School Informatics and Mathematics:
 - organizing Olympiads in informatics for pupils;
(since 1994 anual regional, National, International, Baltic level)
 - preparing tasks for school olimpiads in mathematics;
 - original Mathematical puzzles -
<http://www.mathedpage.org/puzzles/supertangrams/>
- Museum of Computer Science in IMCS UL.
- Research on History of technologies
(history of Computer Centre development - international partners)
- Social networking vizualization and analysis
- Moving secondary schools to the Cloud



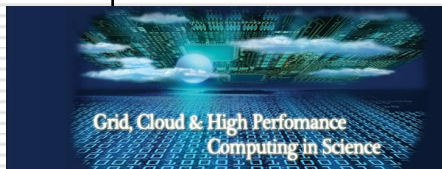
Existing and developed (----) Computing Facility at IMCS UL



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Project activities for support national and IMCS UL research groups

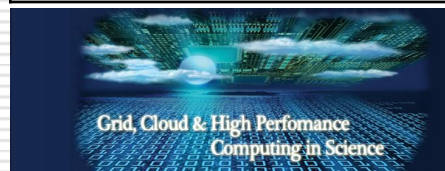
<i>Direction</i>	<i>Activity</i>
1. Research Infrastructure development	1.1. Fundamental ICT researches, signal processing and mathematical modelling
	1.2. Improvement of GRID computing environment to provide extra functionality
	1.3. High Performance Computing environment
	1.4. Cloud Computing and virtualization
2. Interdisciplinary research	2.1. Language technologies
	2.2. Bioinformatics and Medicine
	2.3. Intermediate field signal processing and wireless sensors' network usage
3. Information processing methods	3.1. Semantic web technologies, semantic methods of information's processing
	3.2. Data security
	3.3. Software development tools and technologies
4. Space data retrieving and processing	4.1. Space data retrieving, correlation determination and real time streaming
	4.2. Archiving of space's scientific data
	4.3. HPC for space data processing



Design of Unified computing facility combines modern computing concepts

The aim is to combine all resources, both computing and data storage resources in a Unified computing facility under Cloud Computing umbrella

Computing concepts to be explained	Networking services (GÉANT) to be used	Computer facility design concepts
<ul style="list-style-type: none">- CLOUD computing- CLOUD computing federation- High performance computing- Commodity computing,- Commodity services- High throughput computing- GPU computing- Data intensive computing- Streaming computing- Batch stream computing- Urgent computing- Social networks	<ul style="list-style-type: none">- IP (IPv4 and IPv6) connectivity (unicast)- A virtual private network- Multicast- Dedicated point to point connectivity- GÉANT Lambda- Bandwidth on demand- Networking security- Taking videoconferencing	<ul style="list-style-type: none">- Green computing- Data centre- Unified computing- Open Fabrics- Converged Infrastructure



Project specification picture

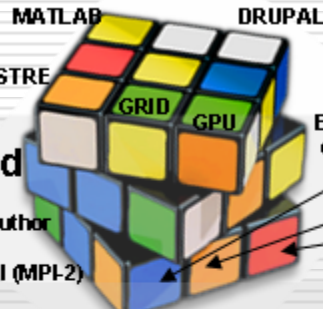
Applications

Platform as a Service

OpenSTACK federated Cloud

Identity Authentif/ Author

Open MPI (MPI-2)



RedHat6 Ent LINUX

Citrix Xen Server 6.5 Ent Hipervisor
Windows HPC Server 2008

GPU:10 servers 2X
IBM System x iDataPlex dx360
M4 Expansion with
NVIDIA Tesla M2070QGPU

SMP:IBM x3850 x5: 8X10
Core E78870 2 servers

HPC:IBM dx360 M4: 2x8 Core
Intel Xeon E5-2650, 60 servers

IBM StorwizeV7000 Unified

IBMSystem Storage DS DS 3700

Emulex 40 GbE Virtual Fabric Adapter II for IBM System x

FCoE, CFFh

Virtual Fabric Adapter

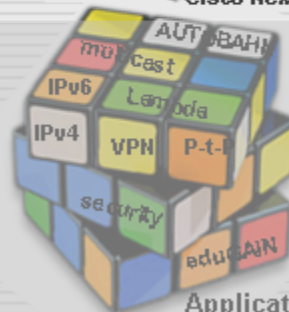
Cisco Nexus 1000v Switch

Storage Area Network

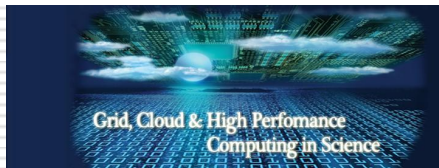
Network connectivity

GÉANT Network Performance Service:
security/ eduPERT/ perfSONAR

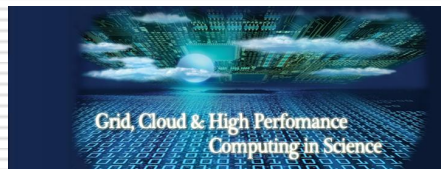
Networking



Applications:
eduroam/ eduGAIN/ eduPKI/ eduCONF/ GIdP



Thank you for attention !



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