



**NATIONAL INSTITUTE FOR RESEARCH AND DEVELOPMENT OF ISOTOPIC
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ITIM activity in Grid and High Performance Computing

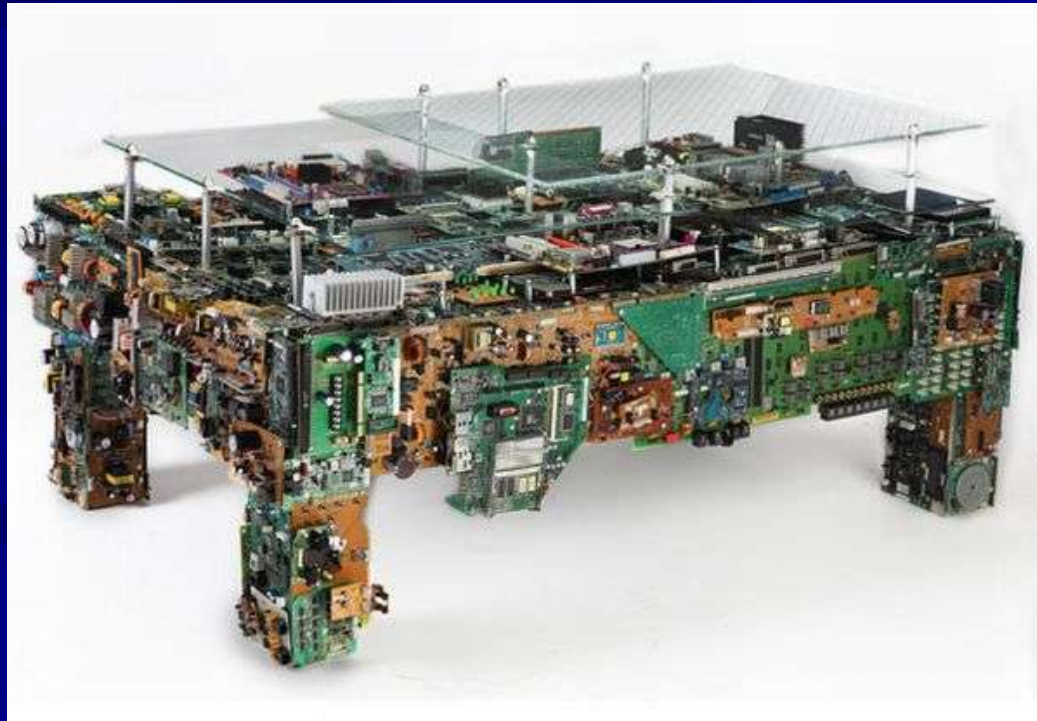
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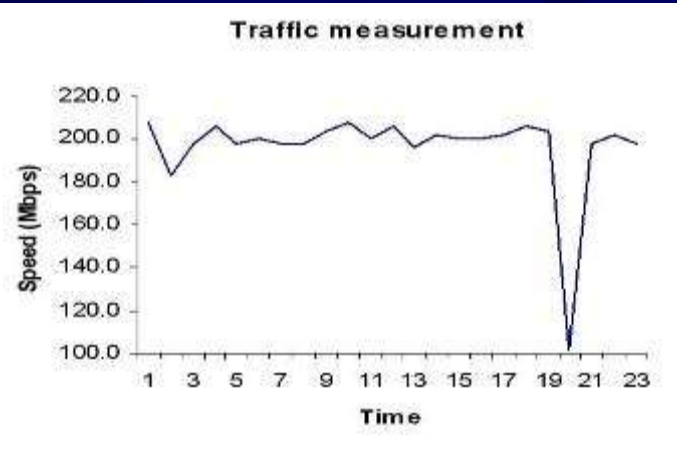
Research teams in INCDTIM

- Physics of multifunctional nanostructure systems
- Isotope separation and labeled compounds
- Mass spectrometry, chromatography and ion physics
 - High-Tech Engineering in ATLAS experiment at LHC Cern Geneva (team4)
- Molecular and Biomolecular physics
 - Numerical Modeling
 - Structural Analysis in Solids
 - Self-Assembled Molecular and Biomolecular Systems

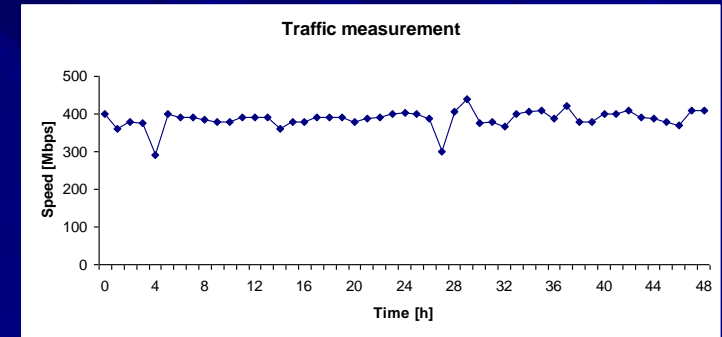
What IT technology do we have in the Institute?



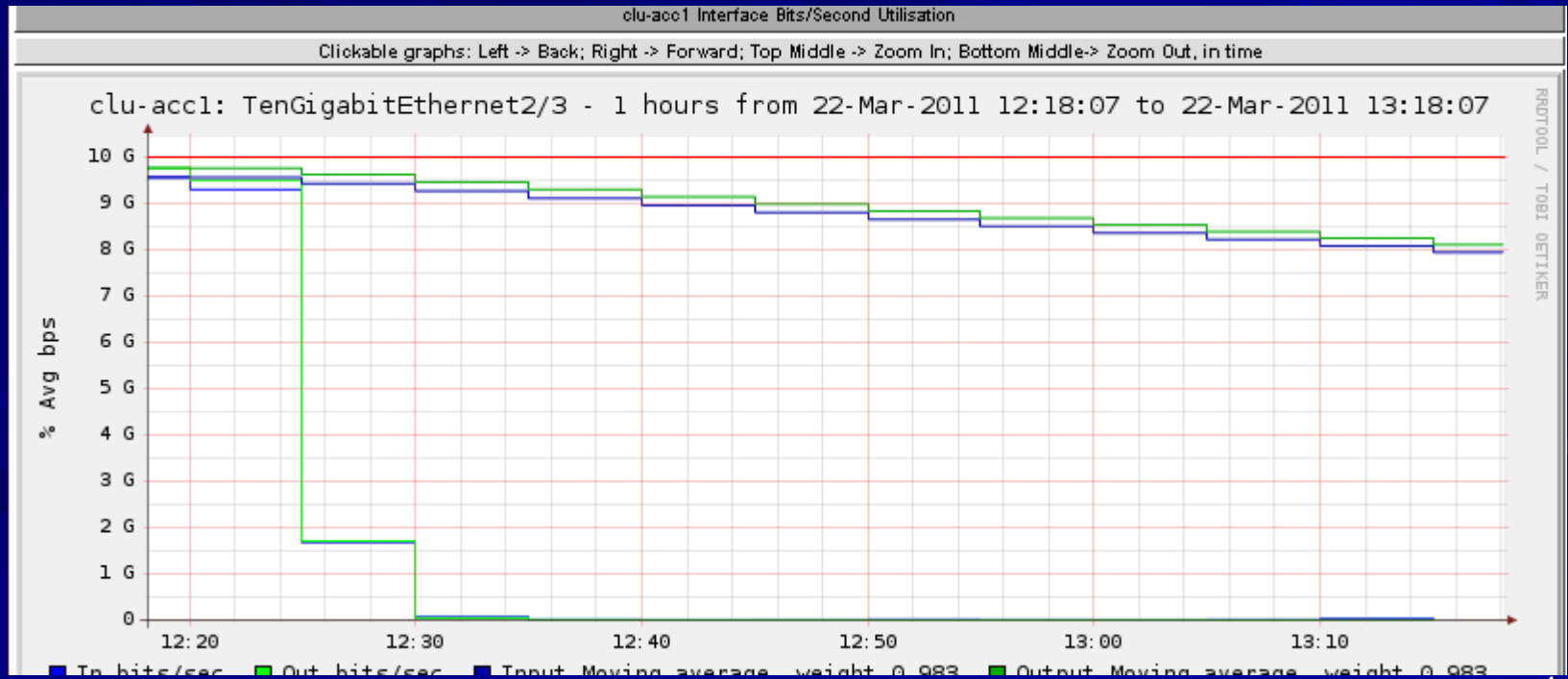
Network abilities



Network Link 2008 Farcas F. - AQTR 2008



Network Link 2009 Farcas F. – CISSE 2009

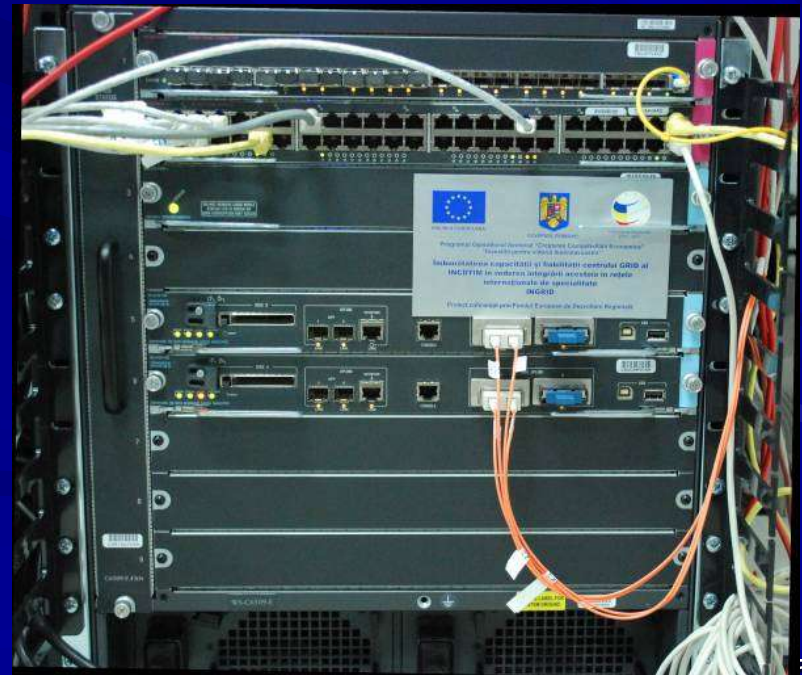


Today - Testing the speed with MGEN program

Network abilities

- Switch Cisco 6509E

- ITIM – RoEduNet 10 GB from 2011



Blade & 1U technology

- **1 U** “Pizza Server” Tech. Intel Server
- IBM and HP Blade system
- One IBM cluster
- Total Core capacity: ~ 2.112 **core**
- Total Storage capacity: **107 TB**,



Blade system and
MSA storage



IBM HPC
Cluster

Do we need protection?

How do we protect our systems ??



Monitoring and Protection system



Power generator
275kW

Power Generator
275kW

Uninterruptible Power Source ~ APC Symetra
of max 160 KVA



Monitoring

Temperature

(20 – 23 C)

Humidity

Fluid detector

Smoke detector

U
P
S



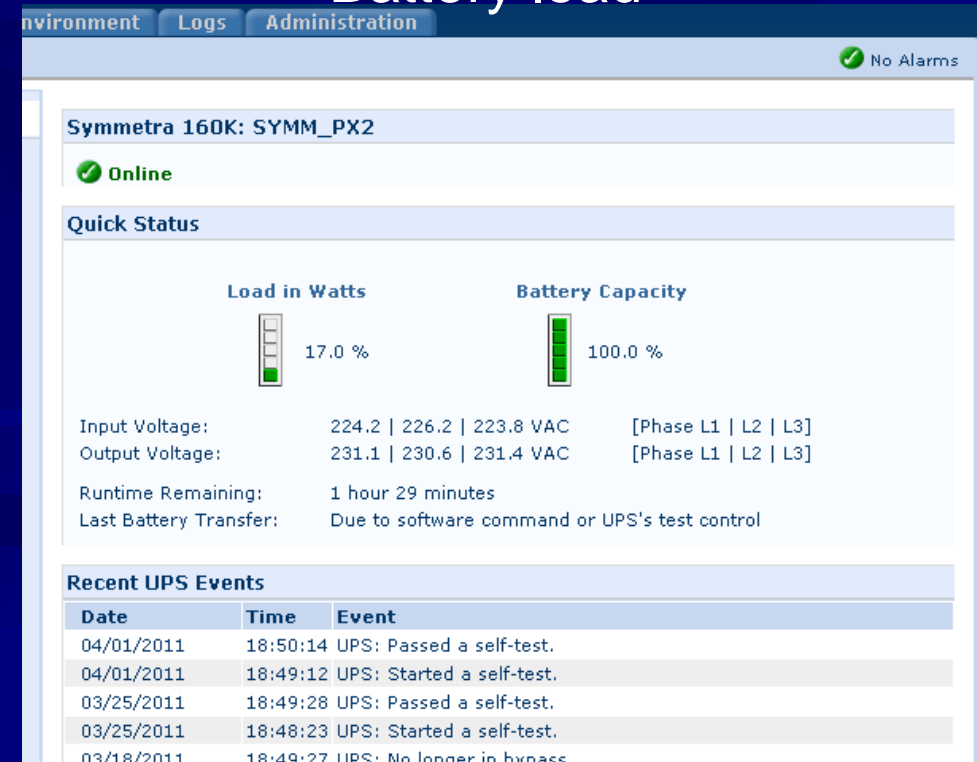
Hardware monitoring

4 system cameras

<https://193.231.25.133>



Battery load



Measurements

Last Battery Transfer:	Due to software command or UPS's test control		
Internal Temperature:	30.0 °C		
Runtime Remaining:	1 hour 29 minutes		
UPS Input	L1	L2	L3
Input Voltage:	223.7 V	225.5 V	223.4 V @ 50.02 Hz
Bypass Input Voltage:	223.6 V	225.5 V	223.3 V
Input Current:	22 A	21 A	22 A
UPS Output	L1	L2	L3
Output Voltage:	231.3 V	231.3 V	231.2 V @ 50.01 Hz
Output Current:	15 A	22 A	25 A
Peak Output Current:	27 A	38 A	42 A
Output Load kVA:	03.53 kVA	05.26 kVA	05.85 kVA
Output Watts at n+0:	9 %	14 %	16 %
Output Watts at n+1:	11 %	17 %	20 %
Output VA at n+0:	11 %	16 %	18 %
Output VA at n+1:	13 %	19 %	21 %
Fault Tolerance			
Redundancy:	n+4		
Present kVA Capacity:	96 kVA		

InfraStruXure Symmetra PX



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Updated: 04/06/2011 at 08:59

Input and Output voltage



How did we
implement the
technology
???

Datacenter Logical Schema

CISCO Catalyst 6509

IPv4 and IPv6 addressing

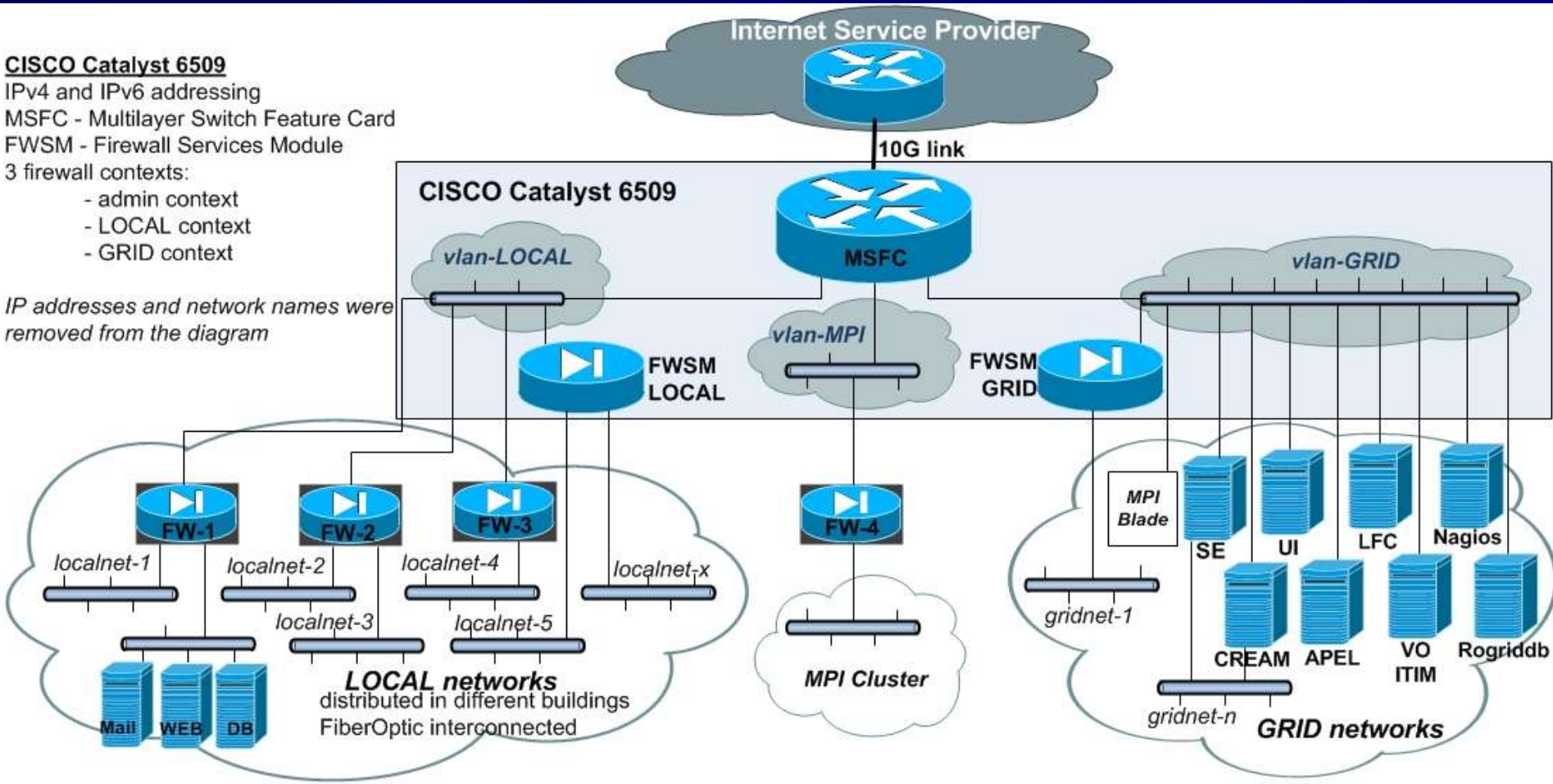
MSFC - Multilayer Switch Feature Card

FWSM - Firewall Services Module

3 firewall contexts:

- admin context
- LOCAL context
- GRID context

IP addresses and network names were removed from the diagram





**What is the result of the
implementation?**

Grid site & HPC Cluster

Grid Site

- Named **RO-14-ITIM**
- Processing power: online **240**
- Storage capacity: online **35 TB**
- Technology **1U + Blade** system (IBM & HP)
- Virtual Organization (**ATLAS, ops, voitim**)
- Operations system SL 64 bit, 5.7
- **Middleware** we use is **gLite 3.2 for 64 bit**, until 1 November
- Regional Authority for Grid certificates (RA)



Blade system and
MSA storage





RO - 14 - ITIM Site Grid Certificat

[HOME](#) [Contact](#)

◀ Scurta descriere a
domeniului

◀ Baza de date a
tuturor site-urilor Grid
din Romania

Procedura pentru
accesarea serviciilor Grid:

◆ Certificarea
potentialului utilizator

◆ Inregistrarea in
organizatia virtuala

◆ Cadru general de
utilizare al Grid-ului

Capacitatea si resursele site-ului RO-14-ITIM

- Capacitatea de stocare 80 TB
- Capacitatea de procesare 400 Core

Site-ul Grid RO-14-ITIM ofera:

- Servicii de certificare a potentialilor utilizatori ai sistemului Grid
- Asistenta tehnica in vederea accesarii si utilizarii sistemului Grid
- Servicii de procesare si stocare de date tertilor prin organizatia virtuala **vo-itim**
- Servicii de procesare de date in domeniul calculului paralel
- Servicii de procesare de date si stocare in cadrul experimentului ATLAS (CERN)



Short Name	Official Name	Location	Status
RO-14-ITIM	Infrastructura de Procesare and Development of Software and Hardware Technologies, Cluj-Napoca, Romania		Active
Timeline			
Management			
Timeline			
Status			
Certification System			
Control			
Users			
PRODUCTION STAGE			
TYPE	C	PRODUCED	
URL	NA_00		
Capacity	80		



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Old v New HPC Cluster

Old Cluster

- HP Blade system
- Made of 16 stations
 - 1 Server, 15 Work nodes
 - 2.93 GHz, 16 GB Ram, 2*HDD 250 GB
- scratch director for processing space



NEW CLUSTER

- IBM Cluster
- Made of 30 stations
 - Total of 1440 core + 1024 Video processing power
 - Memory 64 GB Ram / system
 - Total of 7 TFlops

IBM HPC Cluster

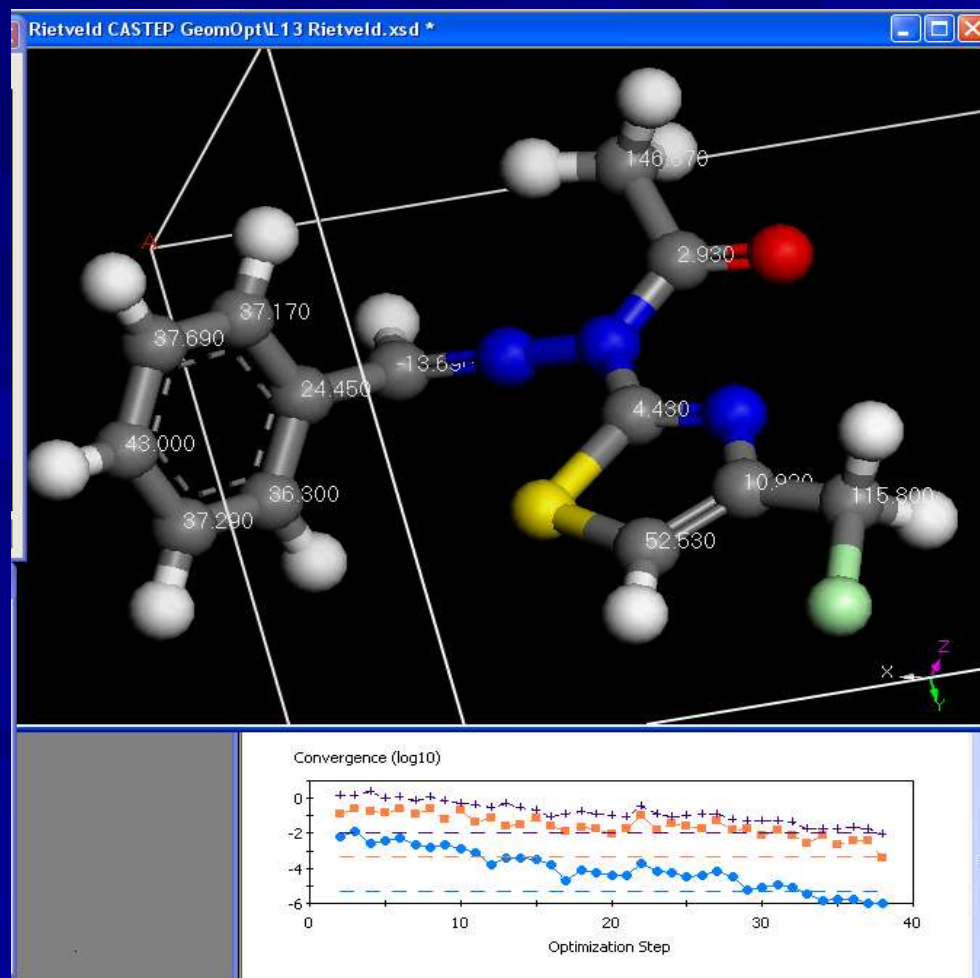
Software in HPC Cluster

■ Program used:

- Gaussian
- MolPro,
- SIESTA
- Quantum Espresso
- ProChem
- Castep (**license**)
- Orca

MATERIALS STUDIO | Remote Gateway cn-smpi.itim-cj.ro

	Server Name	Server Category
Installed Servers	AC	Polymer
Gateway Data	AdsorptionLocator	Docking
Jobs	AmorphousCellConstruct	Polymer
Logs	Blends	Polymer
Web Server Info	CASTEP	Quantum





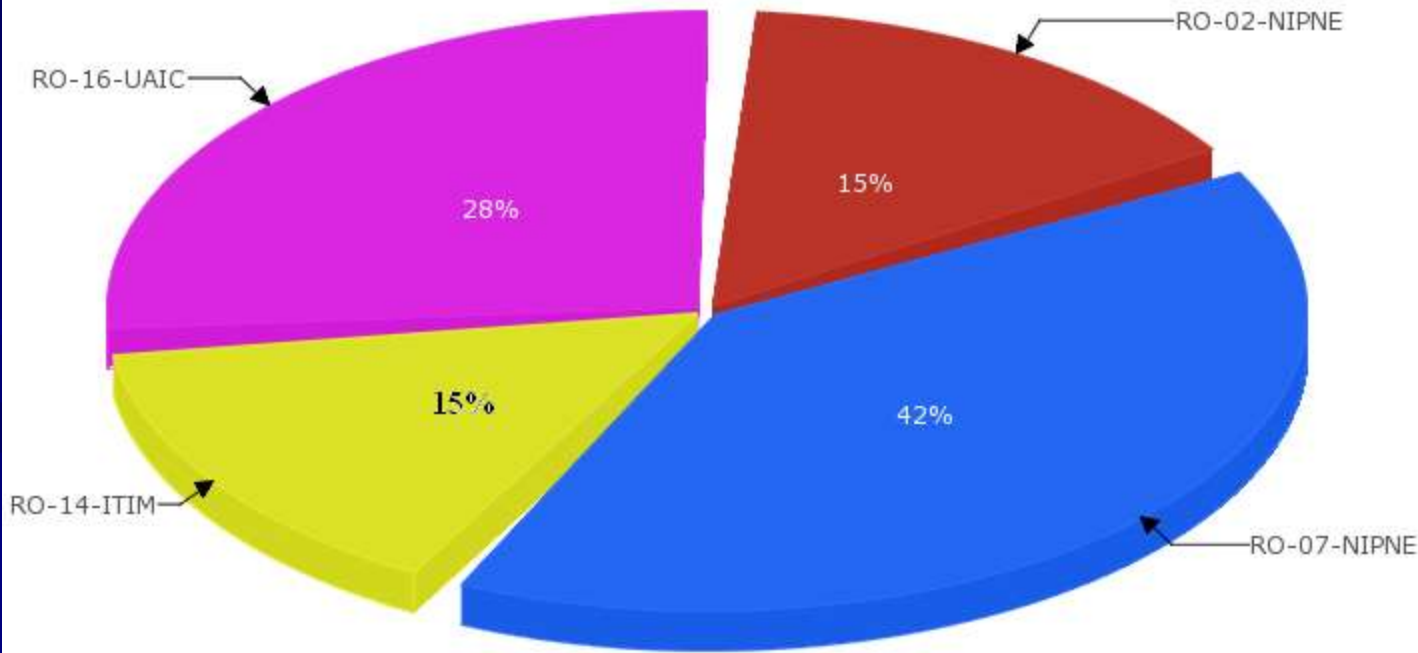
How do our results look like ?



SITE	Total	%
RO-02-NIPNE	2,106,588	15.48%
RO-07-NIPNE	5,669,681	41.65%
RO-14-ITIM	2,092,215	15.37%
RO-16-UAIC	3,743,857	27.50%
Total	13,612,341	
Percentage		100.00%

Results for the Grid site Normalized CPU Time

NGI_RO Normalised CPU time (kSI2K) per SITE



CPU efficiency for all RO sites processing ATLAS jobs

CPU Efficiency (%) by SITE and VO			
SITE	atlas	Total	
RO-02-IIPHE	91.9	91.9	91.9
RO-07-IIPHE	89.9	89.9	89.9
RO-14-ITIM	93.7	93.7	93.7
RO-16-UAIC	93.7	93.7	93.7
Total	91.6	91.6	91.6

Key: 0% <= eff < 50%; 50% <= eff < 60%; 60% <= eff < 75%; 75% <= eff < 90%; 90% <= eff < 100%; eff >= 100% (parallel jobs)

Total CPU efficiency = **91.6**

Region	atlas
NGI_CZ	93.8
NGI_NDGF	93.6
NGI_NL	93.4
NGI_RO	91.6
NGI_SI	91.2
NGI_IBER GRID	91.1

CPU efficiency in EGI
RO_NGI is in **position 4**

Ganglia Monitoring MPI Cluster

- <http://cn-smpi.itim-cj.ro/ganglia/> - free access
- <http://cn-smpi.itim-cj.ro/twiki/bin/view/>

CPU's Total: **112**
 Hosts up: **14**
 Hosts down: **0**

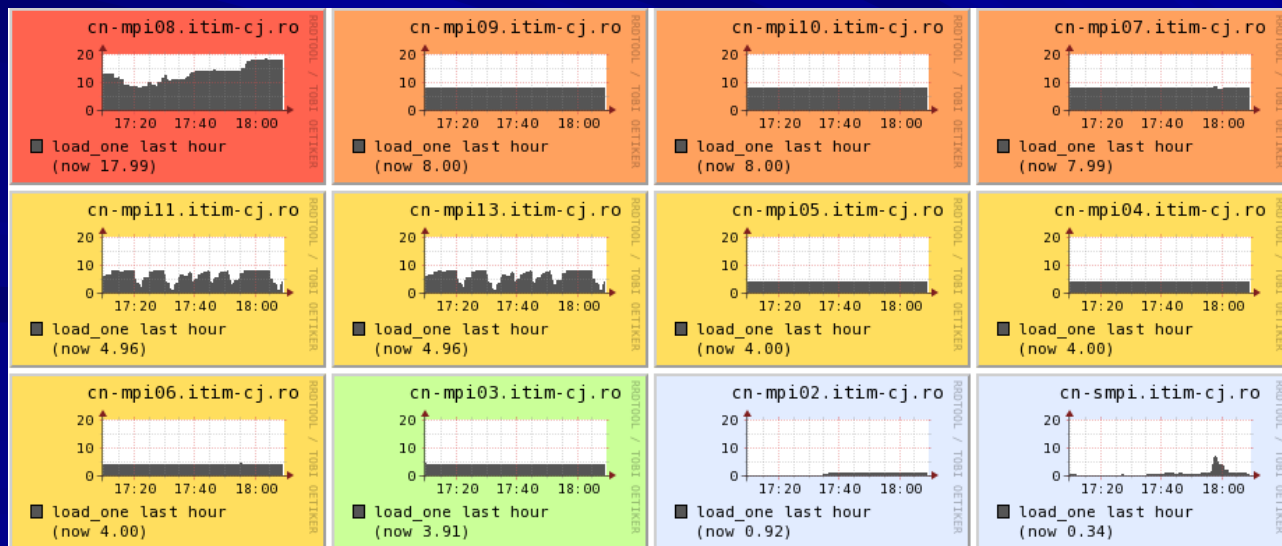
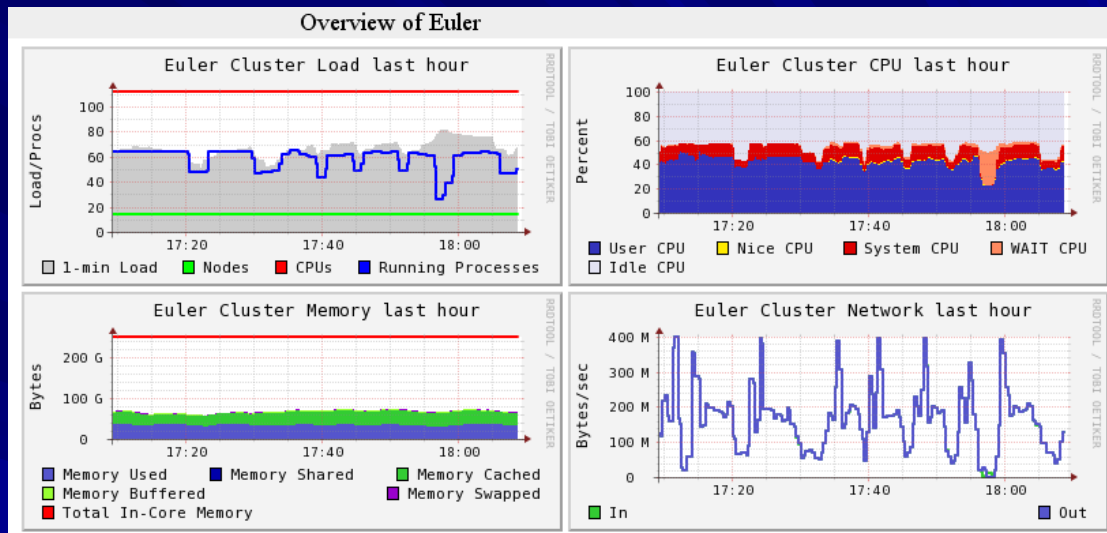
Avg Load (15, 5, 1m):
62%, 62%, 62%

Localtime:
2011-06-24 18:08

Cluster Load Percentages



- 100+ (7.14%)
- 75-100 (21.43%)
- 50-75 (35.71%)
- 25-50 (7.14%)
- 0-25 (28.57%)



In the period 1-15 November
the site will be in **downtime!!**

1. **The Blade system are functioning for 3 years without interruption => BIOS update**
2. **Adding storage ~ 55 TB**
3. **Installing EMI (I think version 2)**
4. **Installing CVMFS**
5. **Adding 128 Core (16 blades) until middle next year**
6. **Rearranging power cables for the Blade system, because of some imbalances in the power grid**
7. **Changing a Rack 48 U -> 42 U**

Future plans

- We would improve the storage capacity until 2013 for analyzing ATLAS data
- We are open for a storage federation
- We plan to Test IPv6 in the Grid site and HPC Cluster
- We would like to try a sharing storage with the RO-16-UAIC in 2013



Projects for developing the Grid Site

1. Fund through National Authority for Science Research (ANCS)
2. **SINDEGRID**, closed project
3. **12 EU – 8EU** – ConDeGrid / 2009 – present
4. **15 EU – 7EU** / 2008 – present
5. POS-CCE **192/2719**, Sectorial Operational Program, “Increase of Economic Competitiveness”, contract 42/11.05.2009 Axis 2, Operation 2.2.3~ *Improving the capacity and reliability of INCDTIM GRID center for integration in international networks (INGRID)*, **Value: 2.345.800 lei ~ 500.000 Euro**
6. POS-CCE 536, Axis 2, operation 2.1.2, software acquisition.
7. **Cooperation program** “Hulubei-Meshcheryakov” together with the Laboratory of Information Technologies at JINR –Dubna



Thank you for your time



Your question please...