



BILATERAL S&T COOPERATION BETWEEN



**Efficient Handling and Processing of
PetaByte-Scale Data for the Grid Centers
within the FR Cloud**

2nd JOINT SYMPOSIUM CEA-IFA

HaPPSDaG

- PROJECT PRESENTATION -

- SECOND YEAR PROGRESS REPORT -

S. Constantinescu, M. Dulea

**National Institute for Nuclear Physics and Engineering
'Horia Hulubei' (IFIN-HH)**



BILATERAL S&T COOPERATION BETWEEN

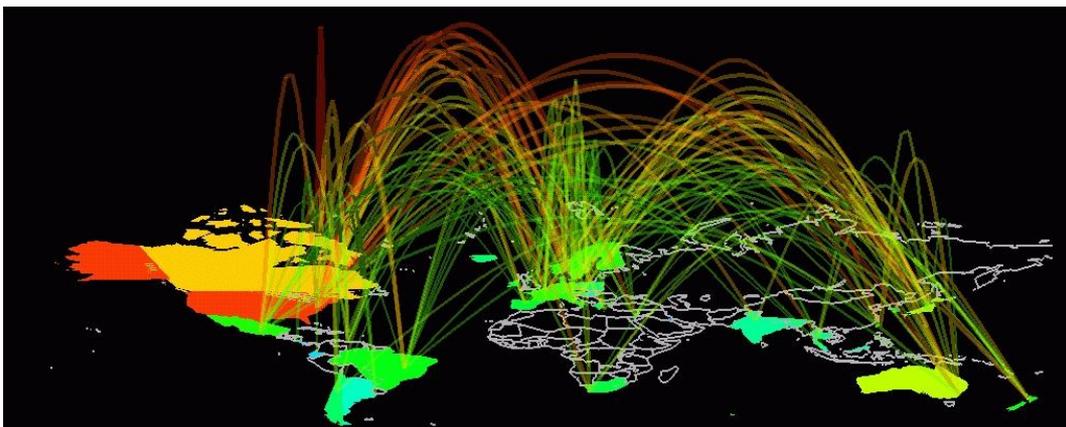


OVERVIEW

- Romanian support for ATLAS computing
- Project topics
- Project objectives
- Project teams
- Second year's results
- Benefits
- Prospects

WHY LHC COMPUTING GRID ?

The discovery of the Higgs-like particle "has only been possible because of the extraordinary achievements of the experiments, infrastructure, and the grid computing" (Rolf Heuer, 4.07.2012)



Subject: Fwd: Congrats from Group Production Coordination
 From: Sabine Crépe-Renaudin <crepe@in2p3.fr>
 Date: Tue, June 26, 2012 10:59 am
 To: ATLAS-LCG-OP-L@in2p3.fr

Bonjour,

If we're going to publish very nice (I hope) results about Higgs search, it will also be thanks to you (see mails below) !

Sabine.

----- Message original -----

Sujet: Congrats from Group Production Coordination
 Date: Mon, 25 Jun 2012 20:35:57 +0200
 De: Alexei Klimentov <Alexei.Klimentov@cem.ch>
 Pour: ADC Operations <atlas-project-adc-operations@cem.ch>, ADC Development <atlas-project-adc-development@cem.ch>

Dear ADCers,

I received e-mail below from Prof. Junji Tojo (ATLAS Group Production Coordinator). Thanks to Operations, SW developers, shifters and ATLAS sites. ...

Alexei

--- original e-mail

Dear Alexei,

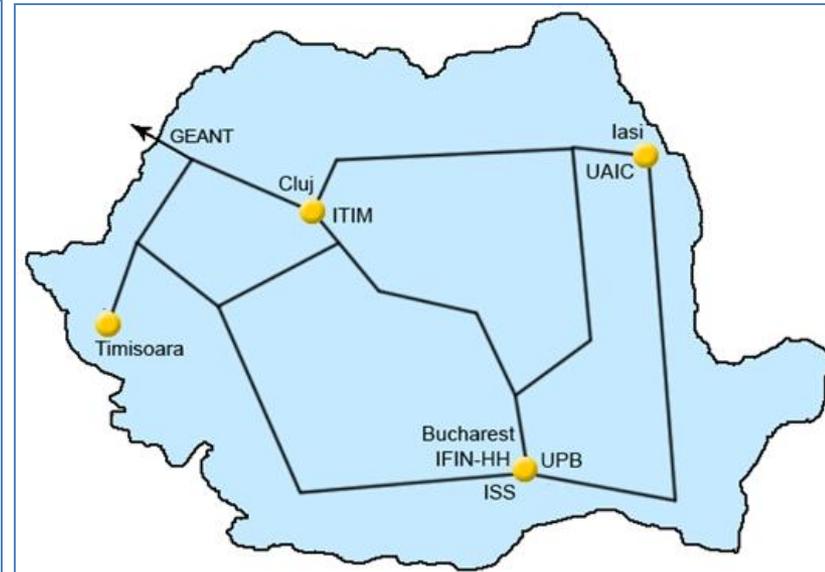
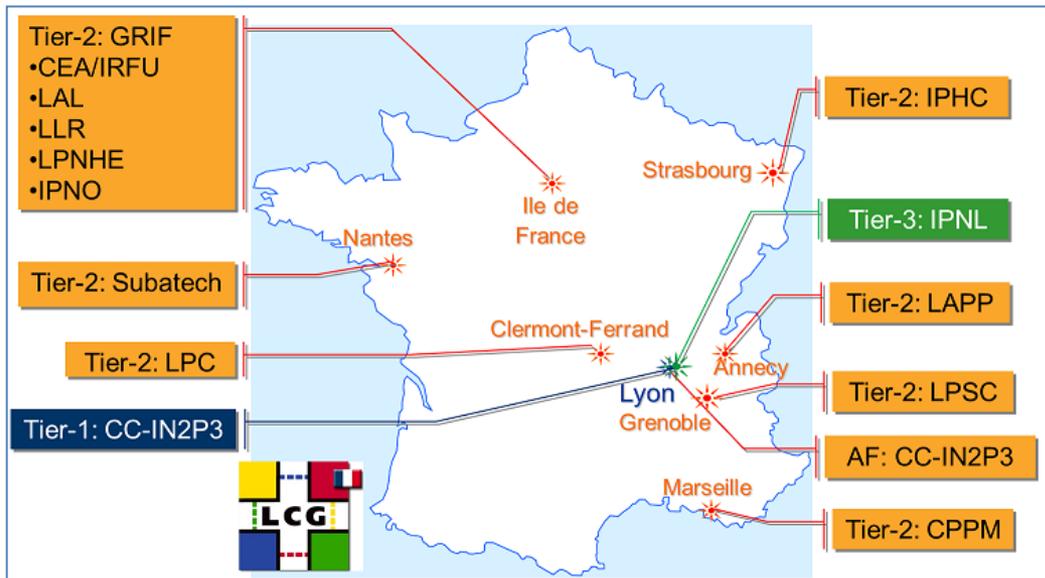
ADC successfully delivered the datasets for H->gamma+gamma and H->4l for all the data taken, in time for the analysis for ICHEP. I would say this is really the big success.

I also would like to thank you and the entire ADC folks for very hard & collaborative works to support the groups. That was my great experience.

Best regards,
 Junji

RO-FR COLLABORATION IN ATLAS COMPUTING

ATLAS FRENCH CLOUD: Grid sites from FR, RO, China, Japan



4 RO sites support ATLAS vo, in the framework of the RO-LCG federation:
RO-07-NIPNE, **RO-02-NIPNE** (IFIN-HH); **RO-14-ITIM** (Cluj), **RO-16-UAIC** (Iasi)
 providing ~ 2500 processing cores and more than 710 TB storage capacity



BILATERAL S&T COOPERATION BETWEEN



AND



PROJECT OBJECTIVES

Strategic objective: provide means for improvement of the processing and handling of large data sets at the **Tier2 centers** which participate in the ATLAS experiment at the LHC computing support. **(RO seen as a case study)**

Specific objectives and partner contributions:

- Improve communication and coordination between GRIF/IN2P3 and RO sites (RO/FR)
- Testing & improving quality of the FR - RO data link for large dataset transfers (RO/FR)
- Implementation of specific measures for increasing ATLAS job load and storage performance on sites (RO)
- Improving large dataset transfer between FR - RO and data analysis (RO/FR)
- Contributing to grid monitoring and technical support within FR-cloud (RO)
- Training regarding grid monitoring and support (FR => RO)
- Dissemination (RO/FR)



BILATERAL S&T COOPERATION BETWEEN



AND

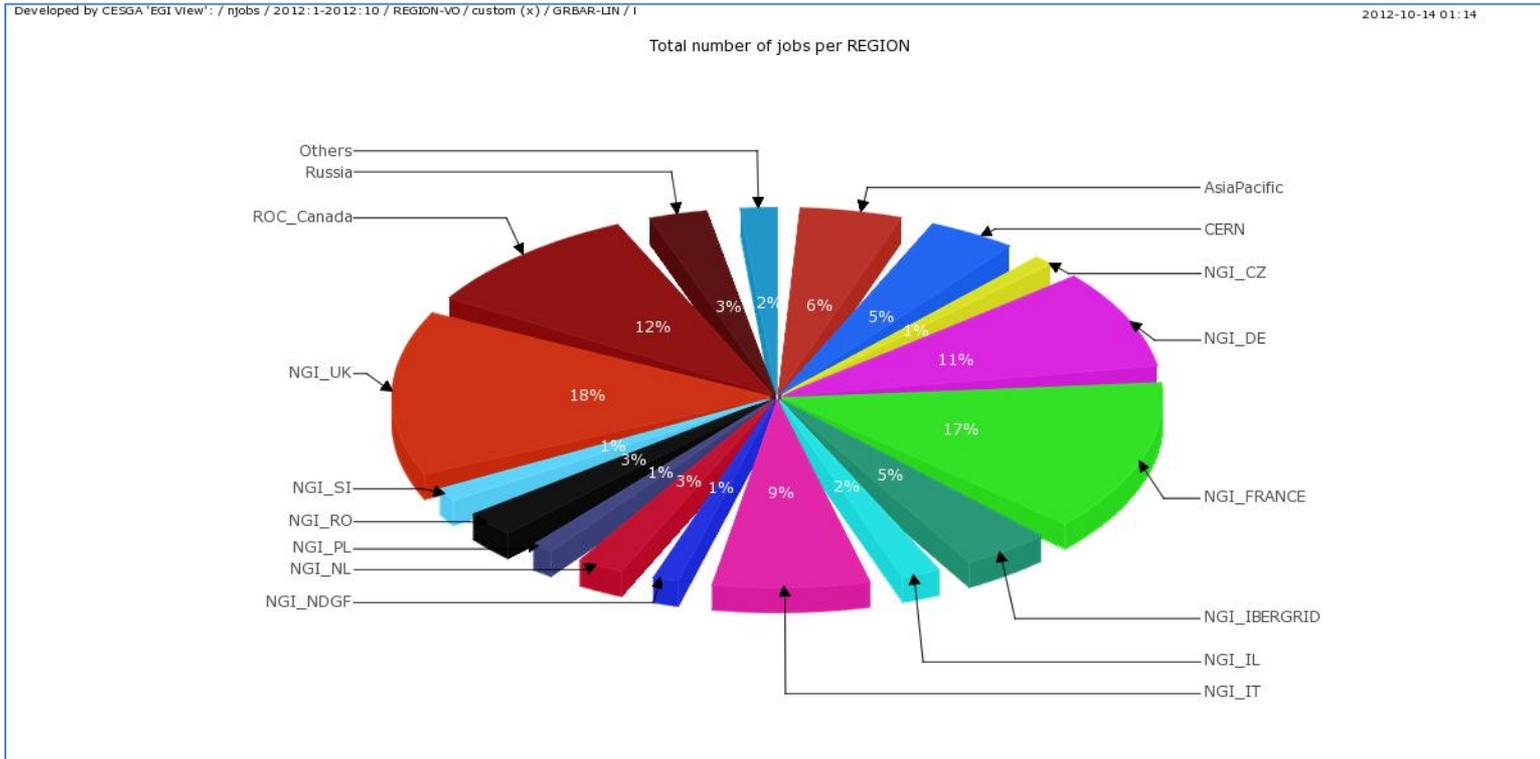


GENERAL INFORMATION

- ❑ **RO Contract** n° C1-06/2010, between IFA and IFIN-HH
- ❑ **PARTNERS:** CEA/IRFU (FR), IFIN-HH (RO)
- ❑ **Start date:** 01/10/2010
- ❑ **Duration:** 27 months
- ❑ **Funding of the RO part of the project:** 400 000 lei (~ 94.000 €)
- ❑ **Funding of the FR part of the project:** 133 000 €
- ❑ **Project coordinators:** Jean-Pierre Meyer (IRFU), Mihnea Dulea (IFIN)
- ❑ **FR team (CEA/IRFU):** Eric LANÇON, Pierrick MICOUT, Christine LEROY, Frédéric SCHAER, Zoulikha GEORGETTE, Adelino GOMEZ
- ❑ **RO team (IFIN-HH):** Serban Constantinescu, Gabriel Stoices, Mihai Ciubancan, Ionut Traian Vasile, Camelia Mihaela Visan

RESULTS: ATLAS JOB STATISTICS

2012: More than 7 million ATLAS jobs ran, i.e. almost 3% of total; position 10/29
 First year of HAPPSDAG: 3.741.426 ATLAS jobs (1,51%)
 Second year: 8.902.028 ATLAS jobs (2,71%)



IMPROVING NETWORK PERFORMANCE

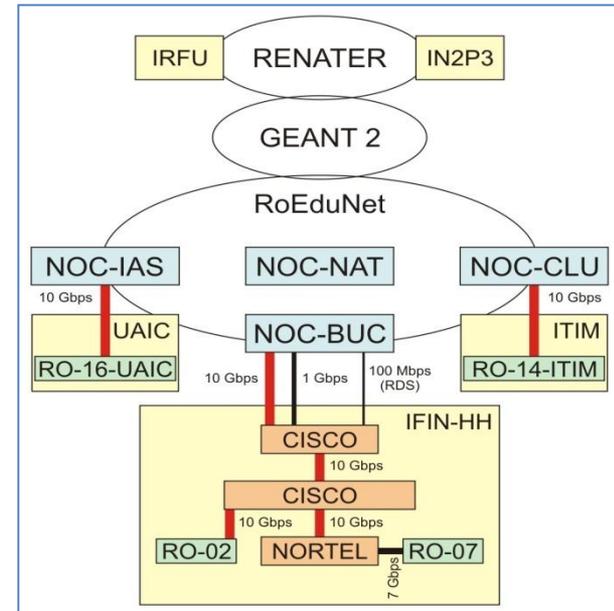
Objective: identify the weak points of the FR-RO data connection and adoption of measures for improving the transfer capacity of large datasets.

Network structure: complex, various owners and administrators => more difficult to act

Section	Centres	Administrator	Owner	Location
IFIN-HH LAN	RO-02-NIPNE RO-07-NIPNE	DFCTI	IFIN-HH	Magurele
IFIN - UPB	UPB	ICOMM	IFIN-HH	UPB
RoEduNet	RO-14-ITIM RO-16-UAIC	AARNIEC	MECTS	Romania
GEANT2	In 34 States	EU DANTE	EU NRENs	EU

Activities (RO-FR)

- Testing connectivity & transport capacity with various tools
- Finding routing paths and points of data traffic delay
- Comparing performances of RO-CERN link with those of RO-IN2P3



Conclusions: a) necessary to improve performance at RoEduNet / GEANT2 interface
b) remove bottlenecks on some of the RoEduNet routers



BILATERAL S&T COOPERATION BETWEEN



IMPROVING NETWORK PERFORMANCE

LCG is moving from the hierarchical to the mesh model

New category of grid sites : Direct T2s (**T2Ds**)

- Primary hosts for datasets (analysis) and for group analysis
- Get and send data from different clouds
- Participate in cross cloud production

To become a T2D(or a Super T2) we have to improve our network transfers. For this we have deployed several perfSonar servers:

2 in our datacenter(1 for bandwidth 1 for latency) and other 2 servers in Regional RoEduNet POP and in National RoEduNet POP .

PerfSonar is a tool analysing the point-to-point throughput of a link. In the next 2 slides:

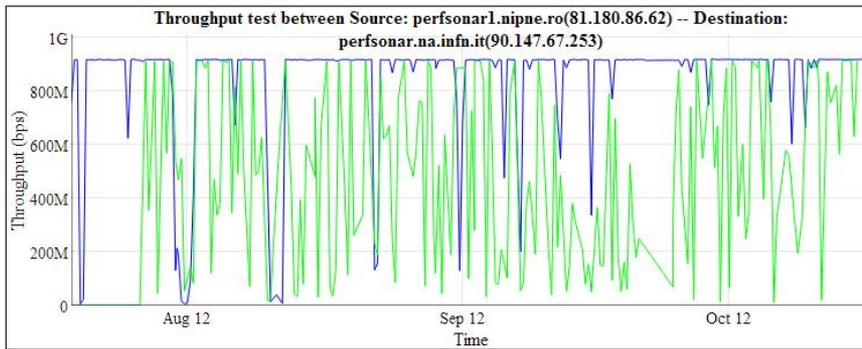
measurements of network connectivity between IFIN-HH and RoEduNet:



perfSONAR-PS bandwidth graph - Google Chrome

perfsonar1.nipne.ro/serviceTest/bandwidthGraph.cgi?url=http://localhost:8085/perfSONAR_PS/services/psB&key=4f54bc0f153269822726d2cf92deff3&keyR=e6a8b2e7cc1bda1af593ff8f1033ecaa&dstIP=90.147.67.253&srcIP=81.180.86.62&dst=perfsonar.na.infni.it&src=perfsonar1.nipne.ro&type=TCF

perfSONAR BWCTL Graph



Graph Key

- Src-Dst throughput
- Dst-Src throughput

<- 1 month

1 month ->

Timezone: Daylight Time)

Direction	Max throughput(bps)	Mean throughput(bps)	Min throughput(bps)
Src-Dst	921.12M	844.34M	5.77M
Dst-Src	916.52M	453.67M	1.07M

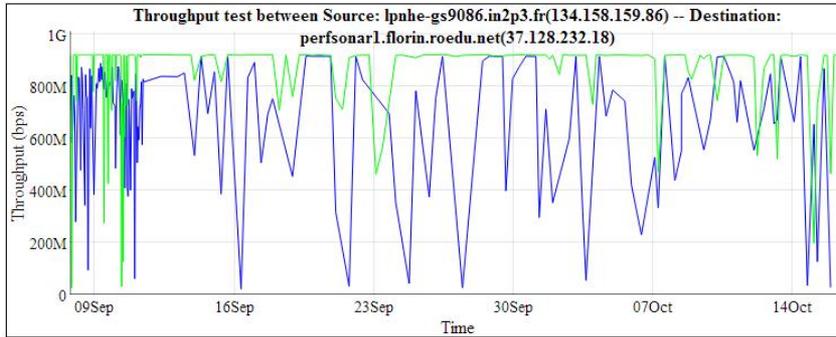
Show/Hide Link

For help on how to zoom in, zoom out, use the menu options and interact with the graph, [click here](#)



perfSONAR BWCTL Graph

perfSONAR



Graph Key

- Src-Dst throughput
- Dst-Src throughput

[<- 1 month](#)

[1 month ->](#)

Timezone: Daylight Time)

Direction	Max throughput(bps)	Mean throughput(bps)	Min throughput(bps)
Src-Dst	918.2M	675.6M	20.78M
Dst-Src	924.39M	869.33M	24.78M

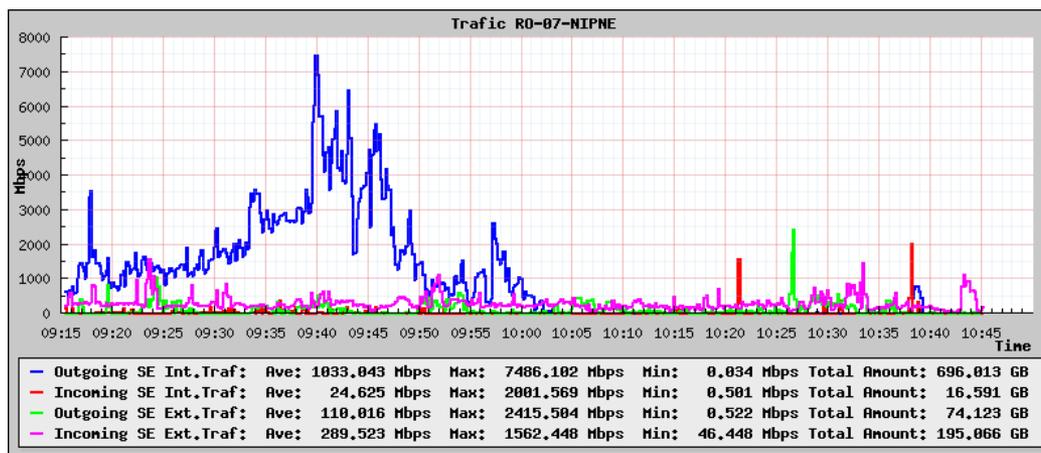
[Show/Hide Link](#)

For help on how to zoom in, zoom out, use the menu options and interact with the graph, [click here](#)

IMPROVING DATA TRANSFER PERFORMANCE

The increase of the number of analysis jobs that need to be concurrently processed leads to a higher bandwidth consumption which can create bottlenecks in the local network, and the abortion of the jobs that reach the time limit. To prevent this situation, measures were taken to upgrade the bandwidth through switch cascading, building stack configurations. This allows to preserve the scalability of the grid cluster, by increasing the bandwidth available for data transfer at a constant rate whenever the storage capacity is upgraded.

Traffic from SE to WNs



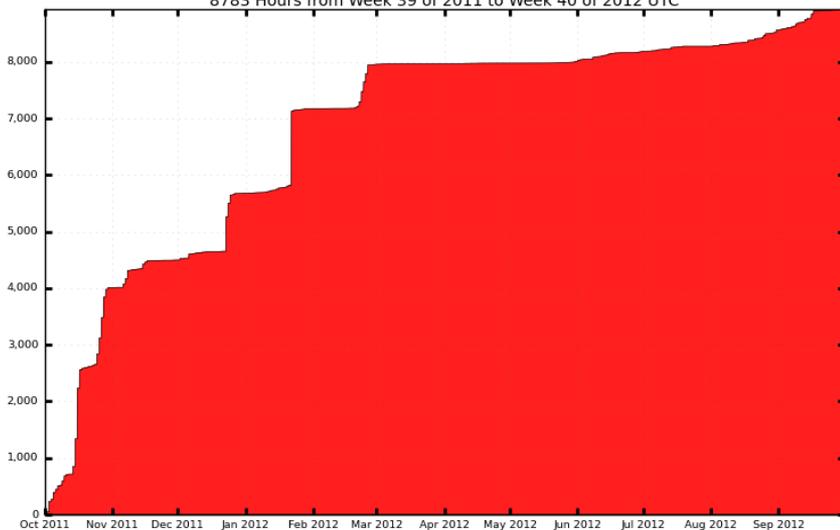
Max at 7,4 Gbps, 150 concurrent jobs

GLOBAL IMPROVEMENT of EFFICIENCY -1

Mean efficiency of ATLAS job execution in 2012: > 91%

NEvents Processed in MEvents (Million Events)

8783 Hours from Week 39 of 2011 to Week 40 of 2012 UTC

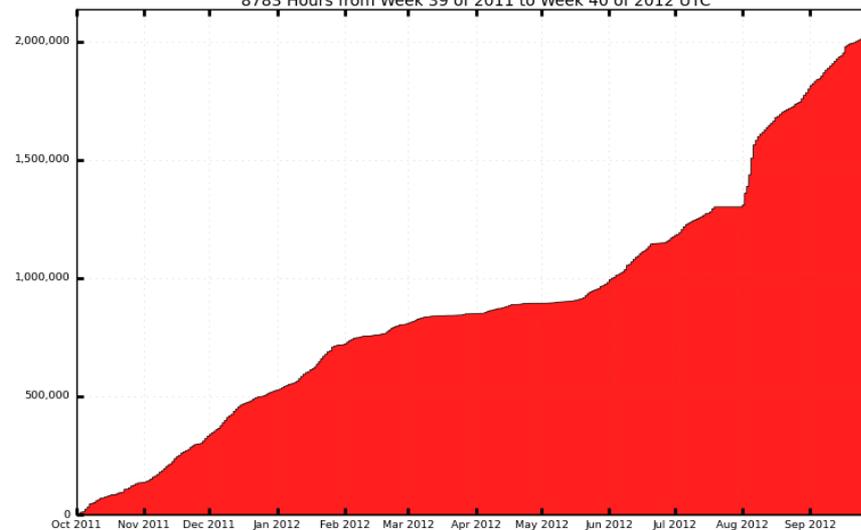


■ RO-07-NIPNE (8,932)

Total: 8,932 , Average Rate: 0.00 /s

NFiles Processed

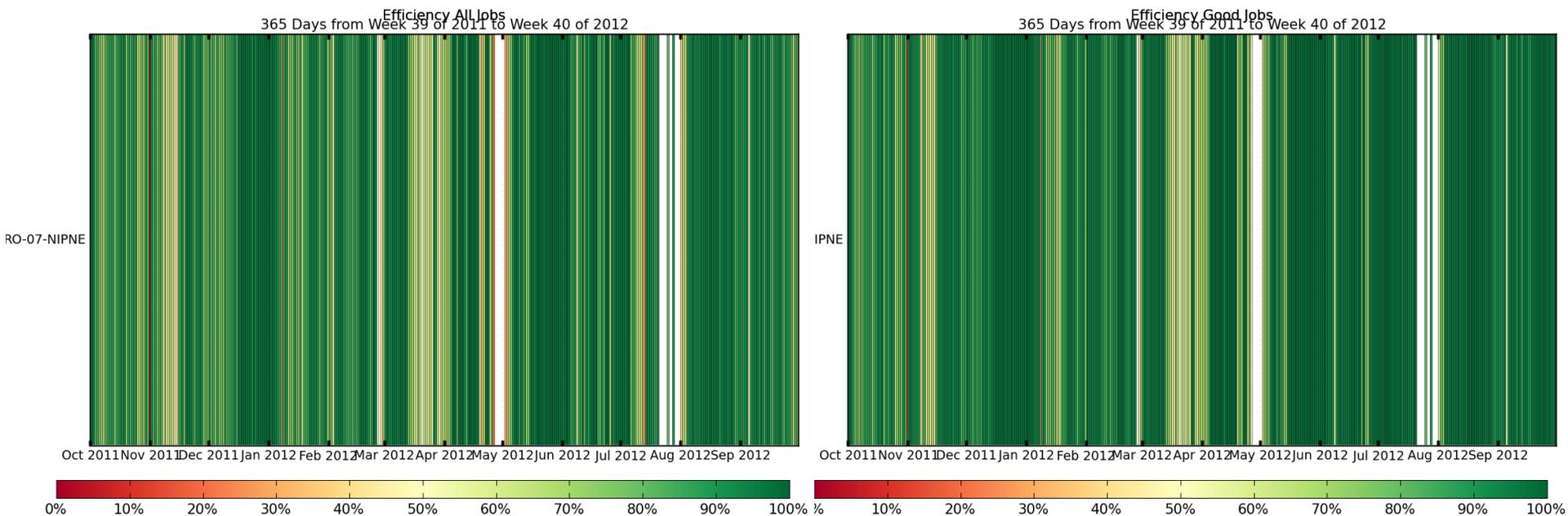
8783 Hours from Week 39 of 2011 to Week 40 of 2012 UTC



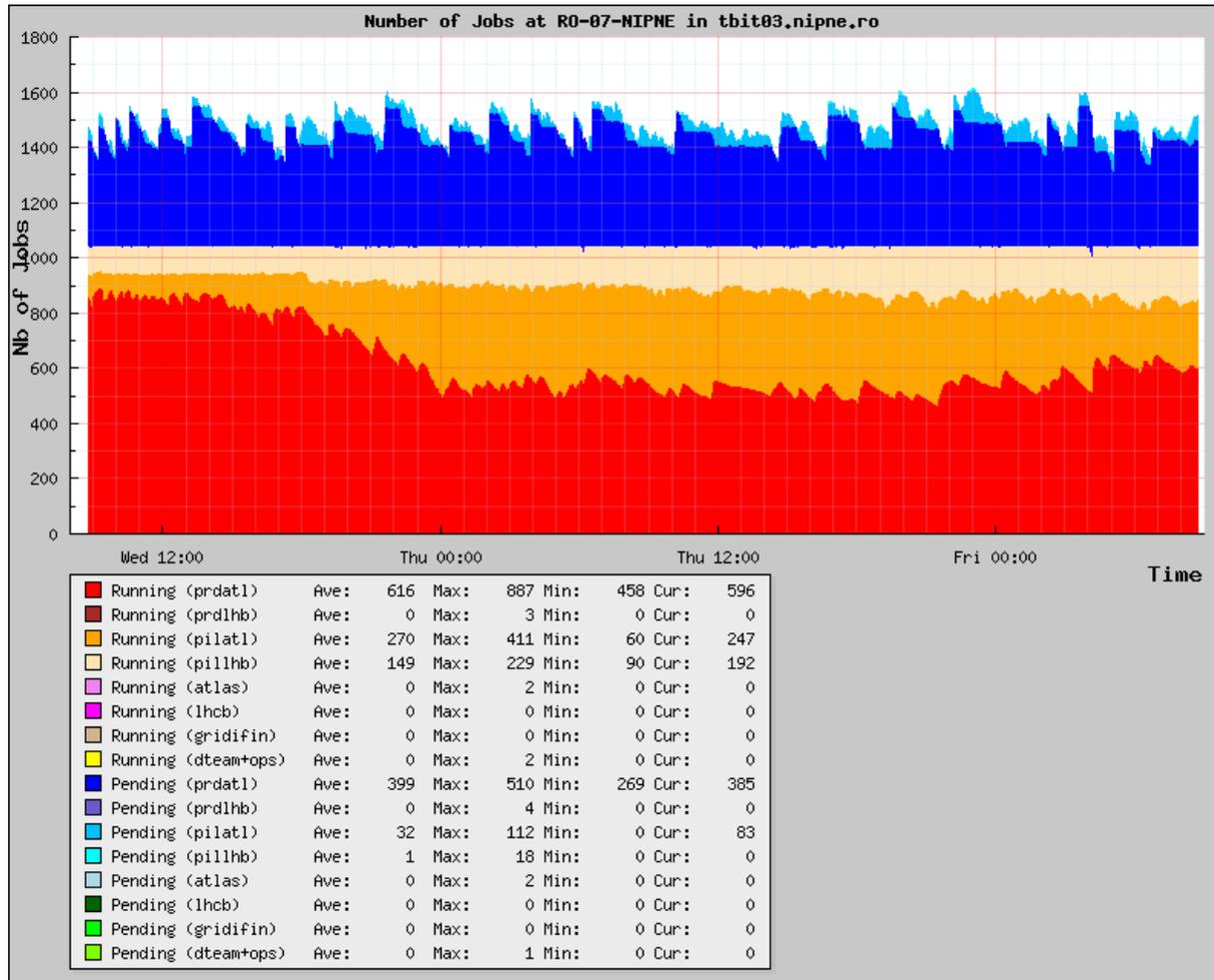
■ RO-07-NIPNE (2,136,878)

Total: 2,136,878 , Average Rate: 0.07 /s

GLOBAL IMPROVEMENT of EFFICIENCY -2



GLOBAL IMPROVEMENT of EFFICIENCY -3



411 concurrent analysis jobs



BILATERAL S&T COOPERATION BETWEEN



MOBILITY/MEETINGS - Y2

- ❑ HAPPSDAG workshop and technical meeting in Bucharest (28-30.11.2011)
(Jean-Pierre Meyer, Christine Leroy, Sabine Crepe)
- ❑ Second training on monitoring and support in Saclay and Grenoble
(France)(C.M. Visan, 28.04-08.05.2012)
ATLAS Distributed Computing Operations Shift & support team of FR Cloud
(Squad)
- ❑ M.Ciubancan, G. Stoicea attending ATLAS FR-Cloud Regional Centers
Meeting
- ❑ Project meeting at IRFU (S. Constantinescu, M. Ciubancan, M. Dulea, C.
Visan, 24.09-27.09.2012)



BILATERAL S&T COOPERATION BETWEEN



BENEFITS

CEA/IRFU

- The results of the project contribute to global improvement of FR Cloud efficiency
- Elaboration, in collaboration, of general guidelines for interaction between grid centres in ATLAS clouds
- Using FR-RO interaction as a representative case study for sharing best practices with smaller sites

IFIN-HH

- General efficiency improvement of the activity of the RO sites
- Better integration and visibility in the framework of the computing support for ATLAS collaboration
- High-level training of RO technical staff



BILATERAL S&T COOPERATION BETWEEN



PROSPECTS

- Further development of methods and procedures for improving the performance of the RO sites within the FR Cloud; network, LHCONE, T2D
- Provide general guidelines regarding the improvement in efficiency of the grid centers which are associated to ATLAS clouds
- Continuation of Participation of IFIN-HH to site and job monitoring in ADC shifts (ATLAS Distributed Computing) and in the monitoring team of FR Cloud.
- The continuation of the collaboration after 2012 will be beneficial for both partners



BILATERAL S&T COOPERATION BETWEEN



AND



THANK YOU FOR YOUR ATTENTION !

Questions?