

UTFSM/CCTVal Data Center (10 Years of Experience)

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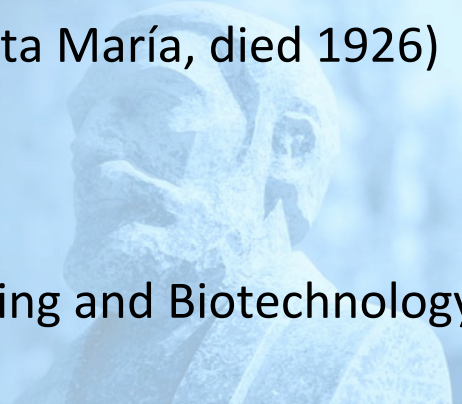


- UTFSM and CCTVal
- Research Projects
- Data Center
 - Brief history
 - Current state
- HPC computing
- Grid computing
 - Grid in Latin America
 - EELA-UTFSM
- Conclusions





- Since 1931 (according to will and testament of Federico Santa María, died 1926)
- Five campuses in Chile and one en Ecuador
- Focus on science and engineering
- Master's Degree in around 20 areas
- PhD in Physics, Chemistry, Informatics, Electronics Engineering and Biotechnology
- Hosts a number of Research Centers, including **CCTVal**

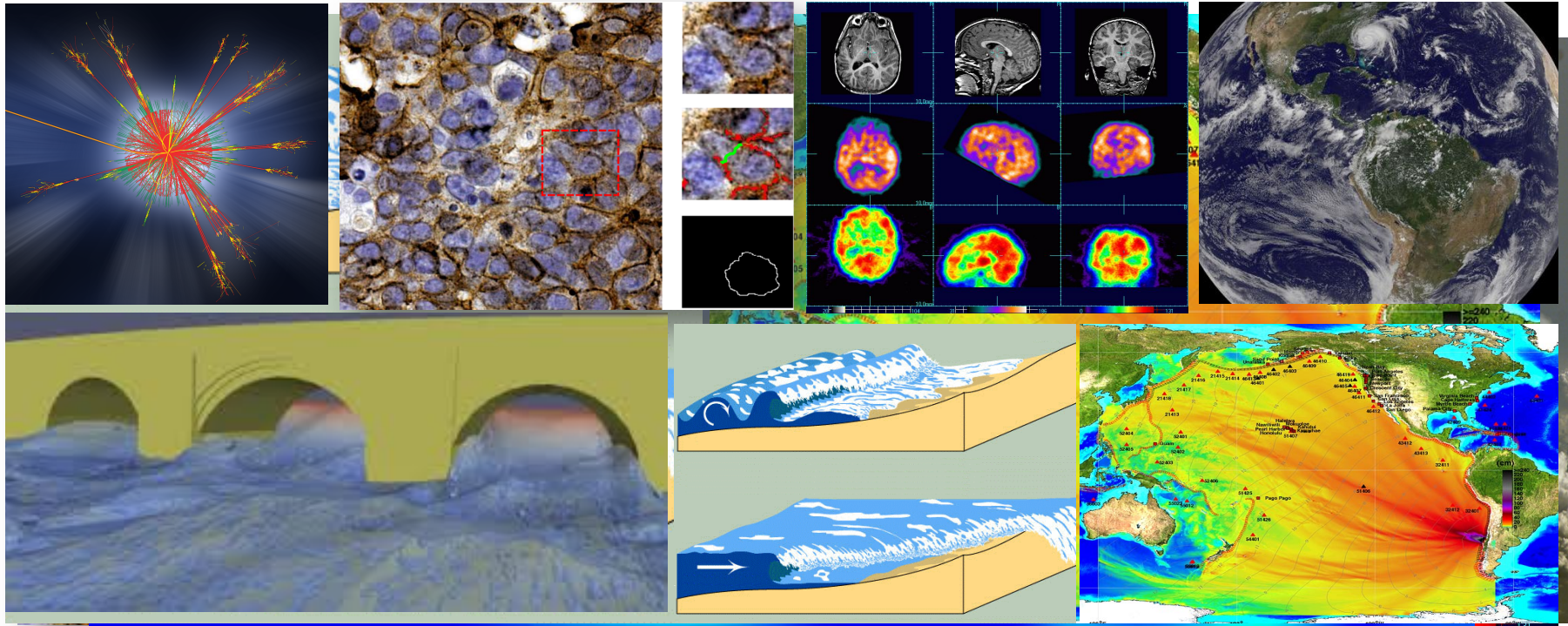




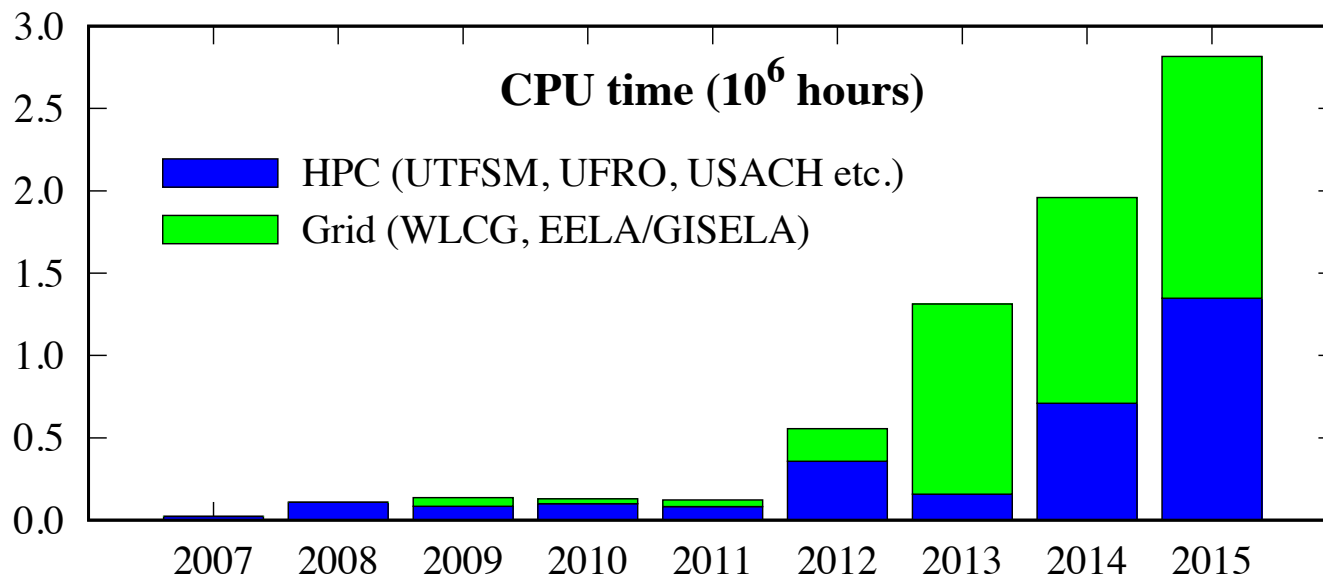
CCTVal (Scientific and Technological Centre of Valparaíso) was created and acknowledged by **CONICYT** (Comisión Nacional de Investigación Científica y Tecnológica - Commission for Scientific and Technological Research) through its backing with the **Basal** Financing program as a Scientific and Technological Centre of Excellence. The main research groups are: **Theoretical Particle Physics, Experimental High Energy Physics, Informatics and Electronics.**

Research projects: UTFSM and other Chilean universities (U. of Chile, U. La Frontera, U. Santiago de Chile):

- Computations in **High Energy** and **Particle physics**, including **ATLAS analysis**
- **Biomedical** image processing (**Digital Pathology** on breast cancer etc.)
- **Satellite** image processing for **Environment protection**
- Modeling of **mechanical constructions** (turbulent flow around bridge piers etc.)
- **Tsunami project**: modeling of **tsunami hydrodynamics**, implementation of an operational database integrated with the **National Tsunami system**



- 2006** EELA cluster: 40 CPU cores 1.6GHz, 2TB
- 2008** Mostly local users, Grid tests
- 2009** EELA-2, WLCG Tier-3
- 2011** HPC cluster: 250 cores, 15TB
- 2012** HPC cluster: 500 cores, 200TB, ATLAS Production
- 2013** HPC cluster: ATLAS Analysis, WLCG Tier-2
- 2014** HPC cluster: GPU (Tsunami), NLHPC
- 2016** HPC cluster: 800 cores, 300TB, 10Gbps internal





CPU: 40 Cores 1.6 GHz (DELL)
Disk: 2 TB



CPU: ~ 800 Cores 2.8-3.1 GHz (DELL, HP)
Disk: ~ 300 TB (DELL, HP, Supermicro)
GPU: nVidia (C1060, M2050, K20m)

“Real” and “Virtual” (KVM, OpenVZ)

Infrastructure

Net: DNS, Proxy, perfSONAR

Info: APEL, Site BDII

Auth: Kerberos, LDAP, ARGUS

Services: Mail, SVN, Web

User

UI (ui01..ui04)

Compute

Batch: PBS, CE

WN (wn01..wn34)

GPU (gp01..gp09)

Storage

FS (fs01..fs09): NFS, ZFS, Gluster

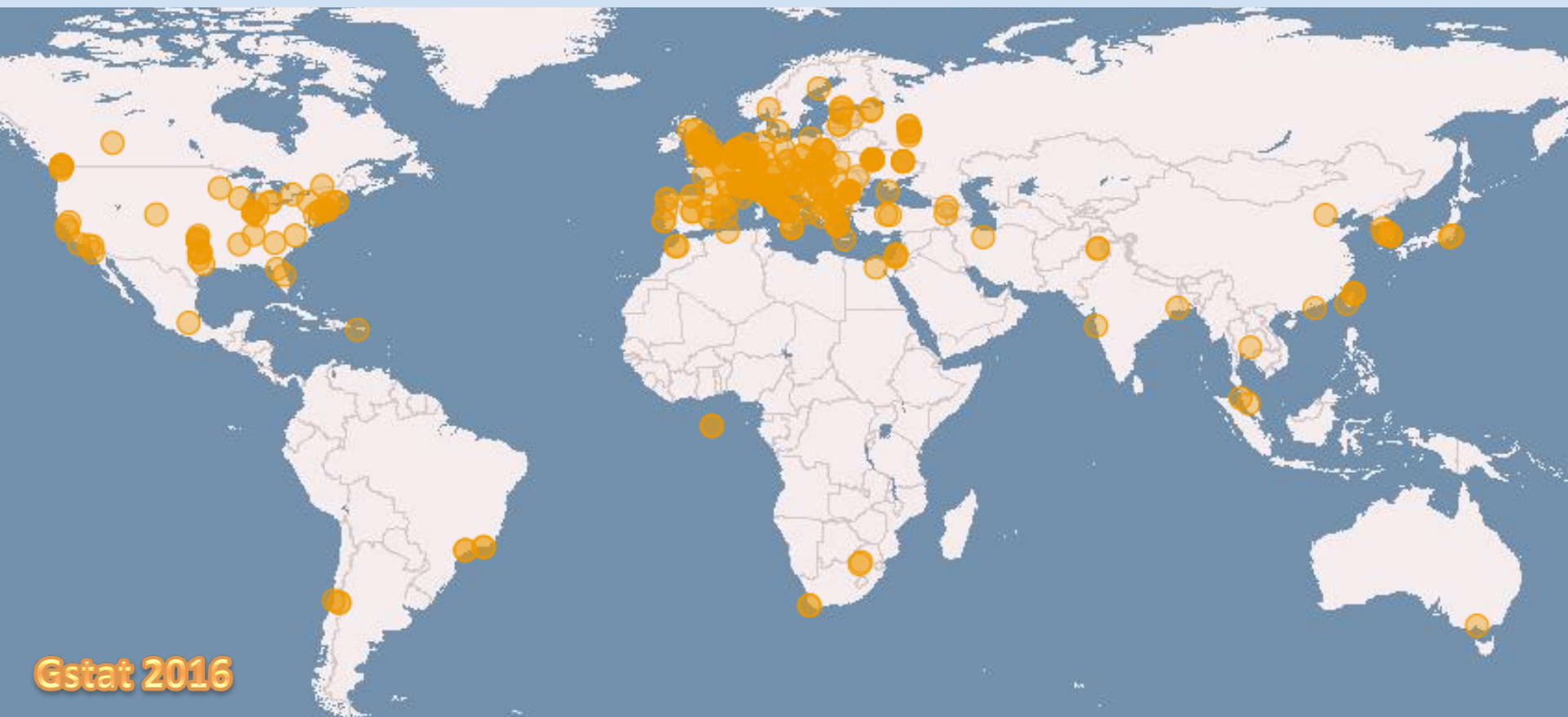
CernVM-FS

SE (se+sp01..sp05): dCache (GridFTP, SRM, WebDAV, xrootd)

- Hardware:
 - Hundreds of CPU and *enough* memory per core
 - Big Storage (100 TB and more)
 - High speed internal and good external network
- Software:
 - Compilers: C/C++, FORTRAN, Python, ...
 - Packages: GEANT, OpenFOAM, Pythia, ROOT, ...
 - Parallel code: MPI (MPICH, OpenMPI)
 - GPU programming: nVidia CUDA
 - Operating System (RHEL compatible)

Specificity of Latin American Grid:

- Low “density” of sites, no NGIs
- Most of sites dedicated only to one experiment or project
- Network: far from major computer centers, low external bandwidth



Gstat 2016



Network cables

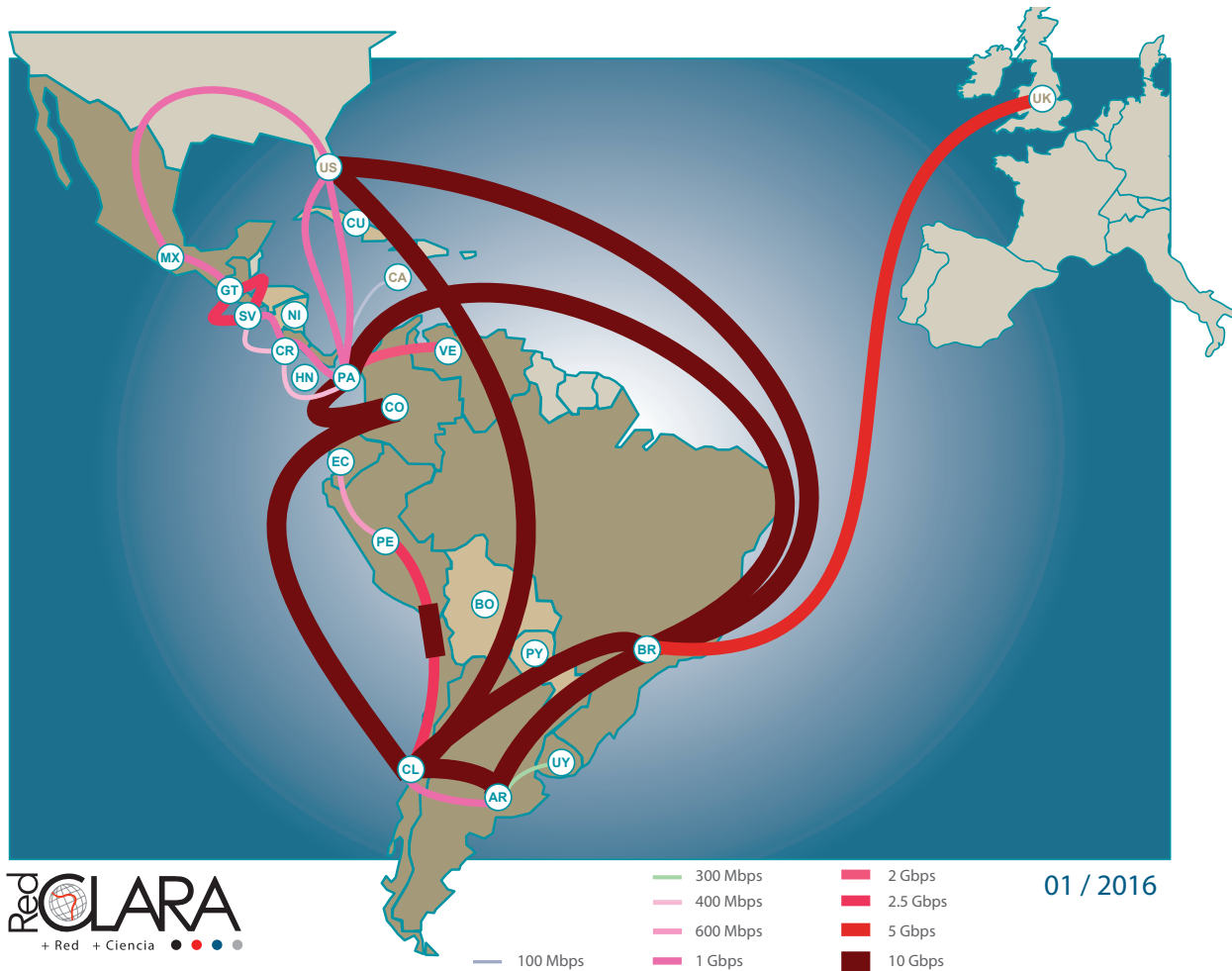


A NEW MAP of the SUBMARINE CABLES connecting the World, according to the best Authorities with all the latest Discoveries to the PRESENT PERIOD, 2015.





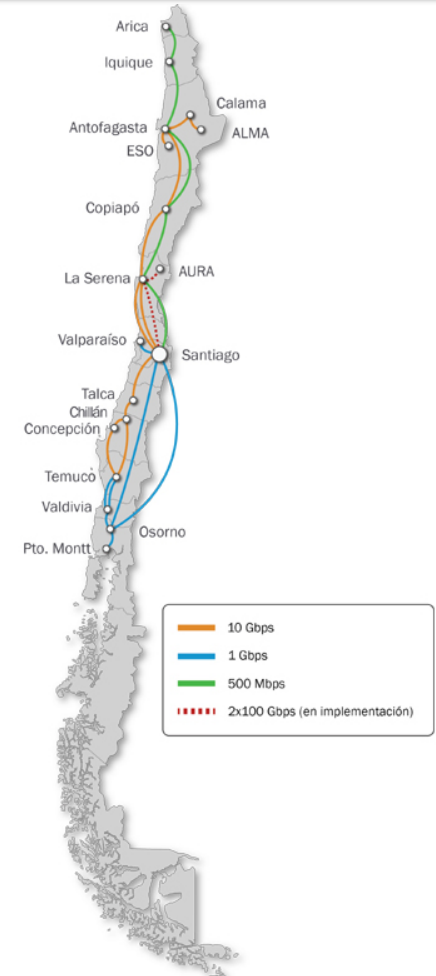
Red CLARA, REUNA



REUNA

Ciencia y Educación en Red

100 + 50 Mbps only!



RedCLARA - Cooperación Latino Americana de Redes Avanzadas (since 2003). Established for regional interconnection and linked to GEANT2 in 2004 via the ALICE Project. Provides regional interconnection and connection to the world through its international links to GEANT2 and Internet2 (USA) and, through them, to the advanced networks of the Caribbean (C@ribnet), Asia (APAN, TEIN), among others. Thanks to the ALICE2 Project, between December 2008 and March 2012, RedCLARA could significantly improve the capacity of its network and expand its benefits for its members and regional research communities.

2004-2008: Early years

- **Standalone:** CBPF, UNIANDES (CERN catch-all ROC); SPRACE (OSG)...
- **EELA** (**E**-infrastructure shared between **E**urope and **L**atin **A**merica)

2009-2010: Rising

- **EELA-2:** EU (CIEMAT, LIP) + LA (UFRJ, EELA-UNLP, EELA-UTFSM, ...)
- **ROC-LA:** CBPF, ICN-UNAM, SAMPA, UNIANDES, EELA-UTFSM
- **ROC-IGALC** (mostly non LHC projects): CEFET-RJ, UFRJ, ...

2011-2016: Production

- **GISELA** (successor of EELA, EELA-2): sites from ROC-LA and ROC-IGALC
- **ROC-LA:** LHC (ALICE, ATLAS, LHCb)
- **Tier-2 Latin America Federation**



Tier-2 Latin-American Federation



Site Name	Logical CPU	HEP SPEC06	Disk (TB)
CBPF (ALICE, LHCb)	536	10400	200
EELA-UTFSM (ATLAS)	384	4400	190
ICN-UNAM (ALICE)	856	9000	1600
SAMPA (ALICE, LHCb)	2400	28800	90
UERJ (CMS)	600	4800	> 1

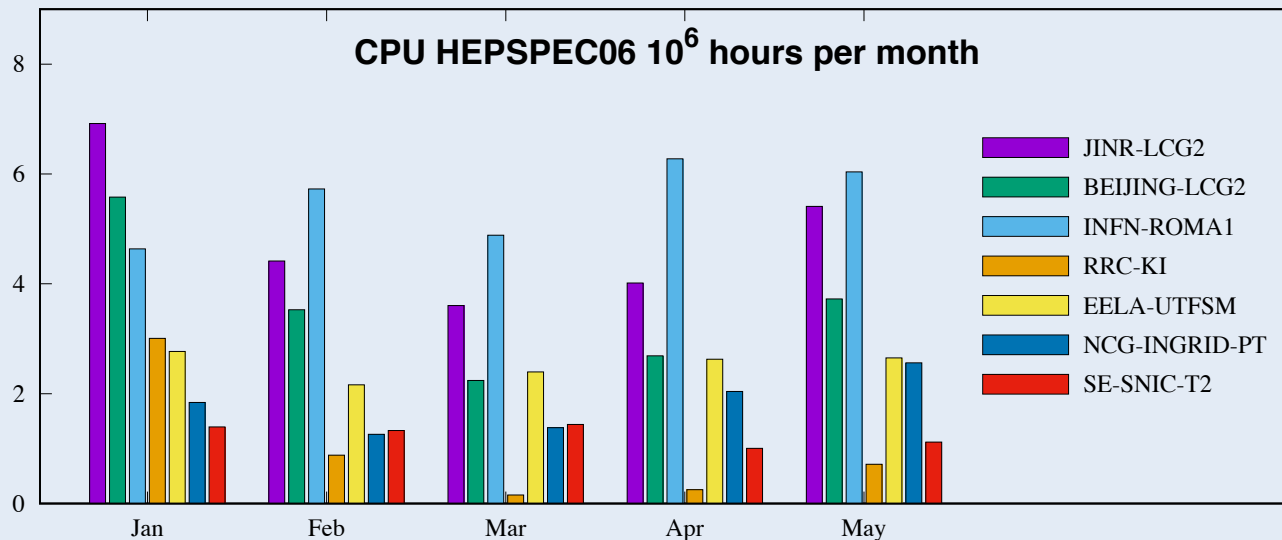
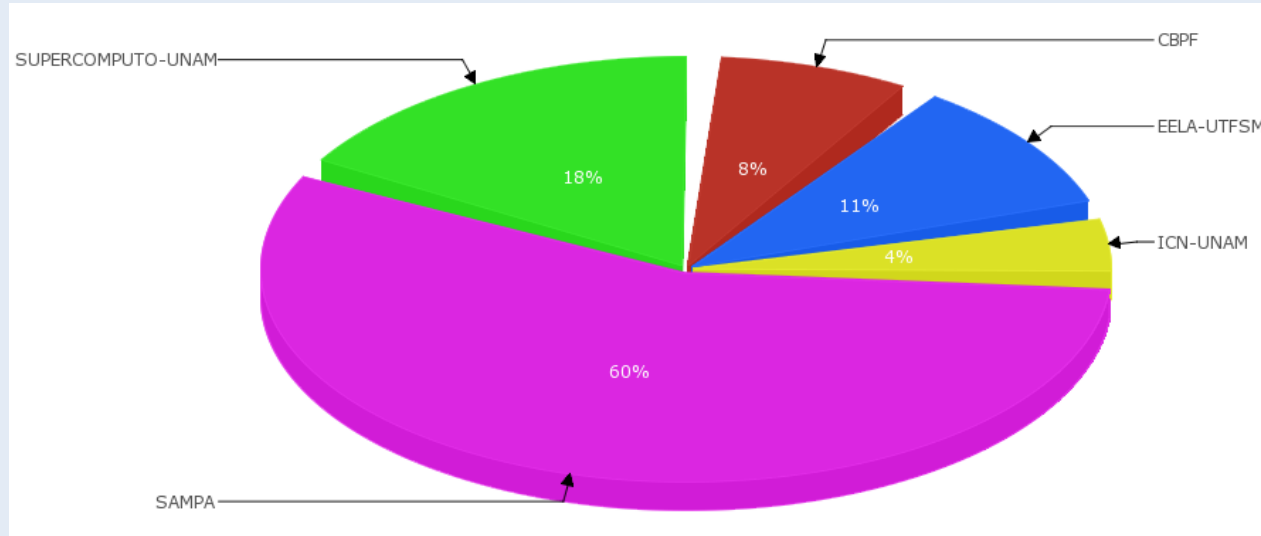
The **MoU** between **Centro Latinoamericano de Física (CLAF)** and **WLCG** has been signed 10 September 2013. **CLAF** is an international organization aimed to promote and coordinate efforts in development of physics in Latin America (Argentina, Brazil, Colombia, Chile and many others). **CLAF** maintains special relations with many other international organizations (**CERN**, **JINR**, etc.). **CLAF** will work as an “umbrella” to all **ROC-LA** sites. The financing is coming from the hosting institutions, not from central sources.



EGI Accounting



Normalized CPU time for ROC-LA sites (January - June 2016)





Installation/configuration stage:

- ✓ Proper hardware: servers (computing, storage), network etc.
- ✓ Location, backup power lines, cooling systems etc.
- ✓ Software: OS (RHEL 3..7, Ubuntu?), packages, services etc.

Maintenance stage:

- ✓ Regular replacement/reparation (hard drives, UPS batteries, etc.)
- ✓ Regular hardware and software updates and new installations
- ✓ Reliable network channel: good ISP required!
- ✓ Users support: web, tutorials, online etc.

Human resources (always):

- ✓ Qualified personnel (Don't know? We'll train you!)
- ✓ Some strong internal motivation to keep everything running...



Thank you for your attention!



