



Enabling Grids for  
E-science in Europe

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*LCG Workshop  
November 2004, CERN*

# Grid accounting with GridICE

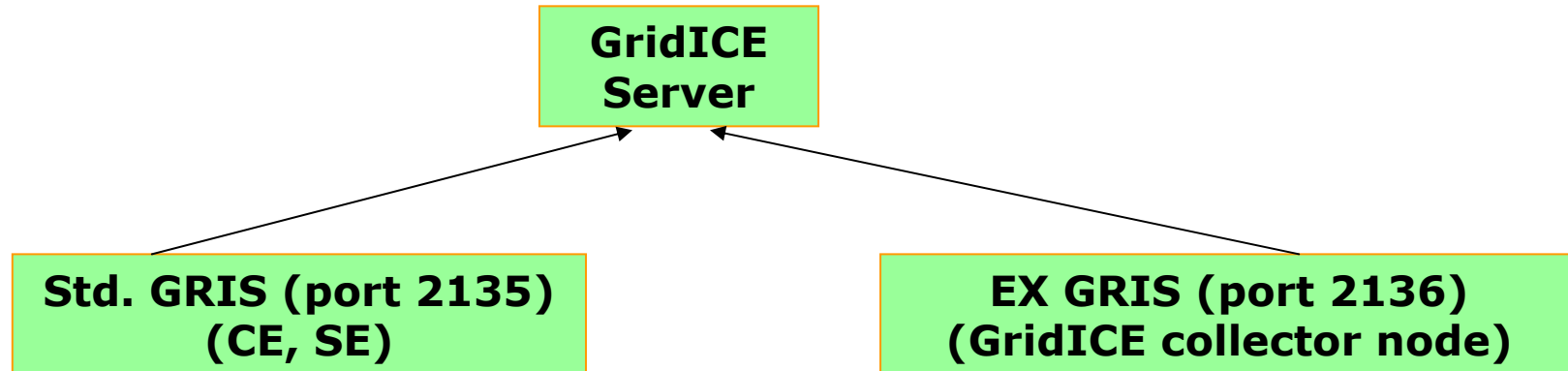
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# Information & Sources



## Basic info:

- Number of **queues**
- **Jobs** running/waiting (simple LRMS publish)
- **Storage Areas** info
- **CPUSLOTS** per queue

## GRIS status info:

- GRIS Service **Online/Offline**

## Extended info:

- **Job Monitoring** (effective VO, user & all related info)
- Disk **partitions** space, **Network Adapters** activity
- **Role** based (CE, SE, RB, RLS, WN,...) user defined **services** (daemons, agents,...)
- More... (MEM, **physical CPU**, swap, interrupts, reg. open files, sockets, procs, INodes, host power w/ HT detection,...)



## Job Monitoring Info (1/2)



- Each job is **related** to the **user certificate**, the **VO**, and the **site (resource)**; a sample of job related metrics stored on the RDBMS:

<b>General Info</b>	
<b>LocalID</b>	local job identifier (given by the LRMS)
<b>GlobalID*</b>	Grid identifier (EDGJobId)
<b>LocalOwner</b>	local user account
<b>GlobalOwner</b>	user certificate subject
<b>ExecutionTarget</b>	execution host
<b>ExitStatus†</b>	exit status given by the LRMS

- \* The GlobalID (EDGJobId) is available for jobs that remain on the LRMS at least for 10/20 minutes (it depends on the frequency configured to run the job monitoring info provider)



## Job Monitoring Info (2/2)



- Each job is **related** to the **user certificate**, the **VO**, and the **site (resource)**; a sample of job related metrics stored on the RDBMS:

<b>Resources Usage Metering Info</b>	
<b>CPUTime</b>	CPU time usage (sec)
<b>WallTime</b>	time on the execution host (sec)
<b>CreationTime</b>	when job was submitted to the LRMS (timestamp)
<b>StartTime</b>	when was started on the execution host (timestamp)
<b>EndTime</b>	when finished (timestamp)
<b>RAMUsed</b>	RAM used (KB)
<b>VirtualUsed</b>	Virtual memory used (KB)



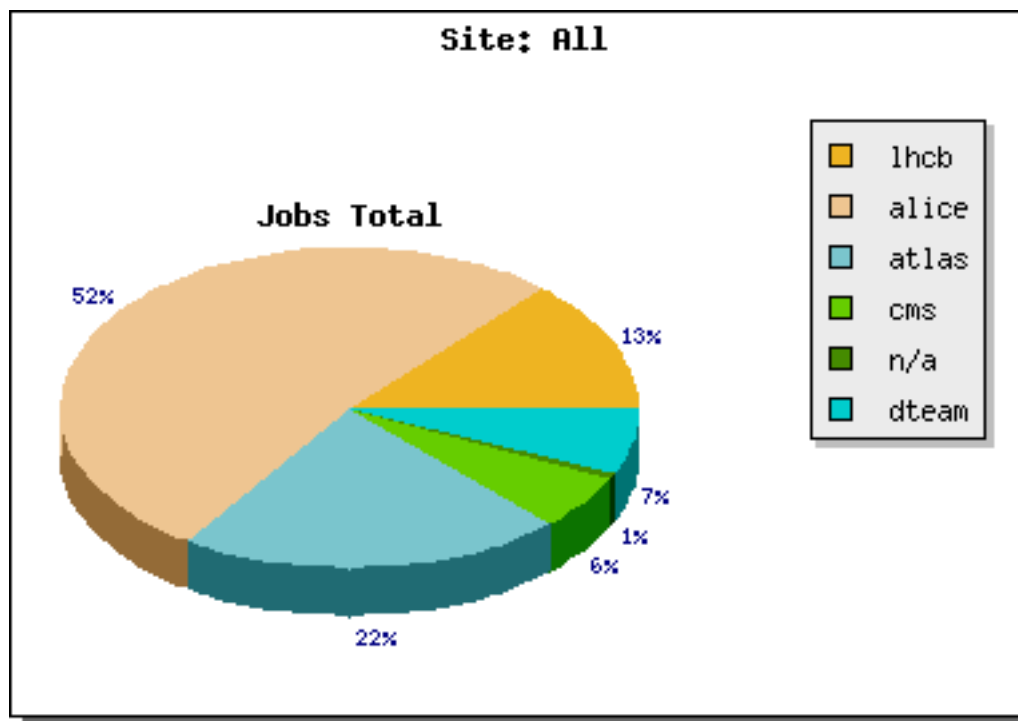
## Info relationship: accounting info



- It is possible to **aggregate**/retrieve the info on different dimensions:
  - per user (DN certificate)
  - per site
  - per VO
- This means that, for example, it is possible to (given a time interval as last few hours/ week/month,...) generate graphs and/or statistic as:
  - Site usage (CPU/RAM) by a single user or an entire VO
  - Total/average usage of all the resources (CPU/RAM) by a single user or VO
  - Site grid usage (number of grid jobs run by the site; CPU usage,...)
  - Number of distinct users that submitted job to the GRID (all the GRID, per site, per VO)

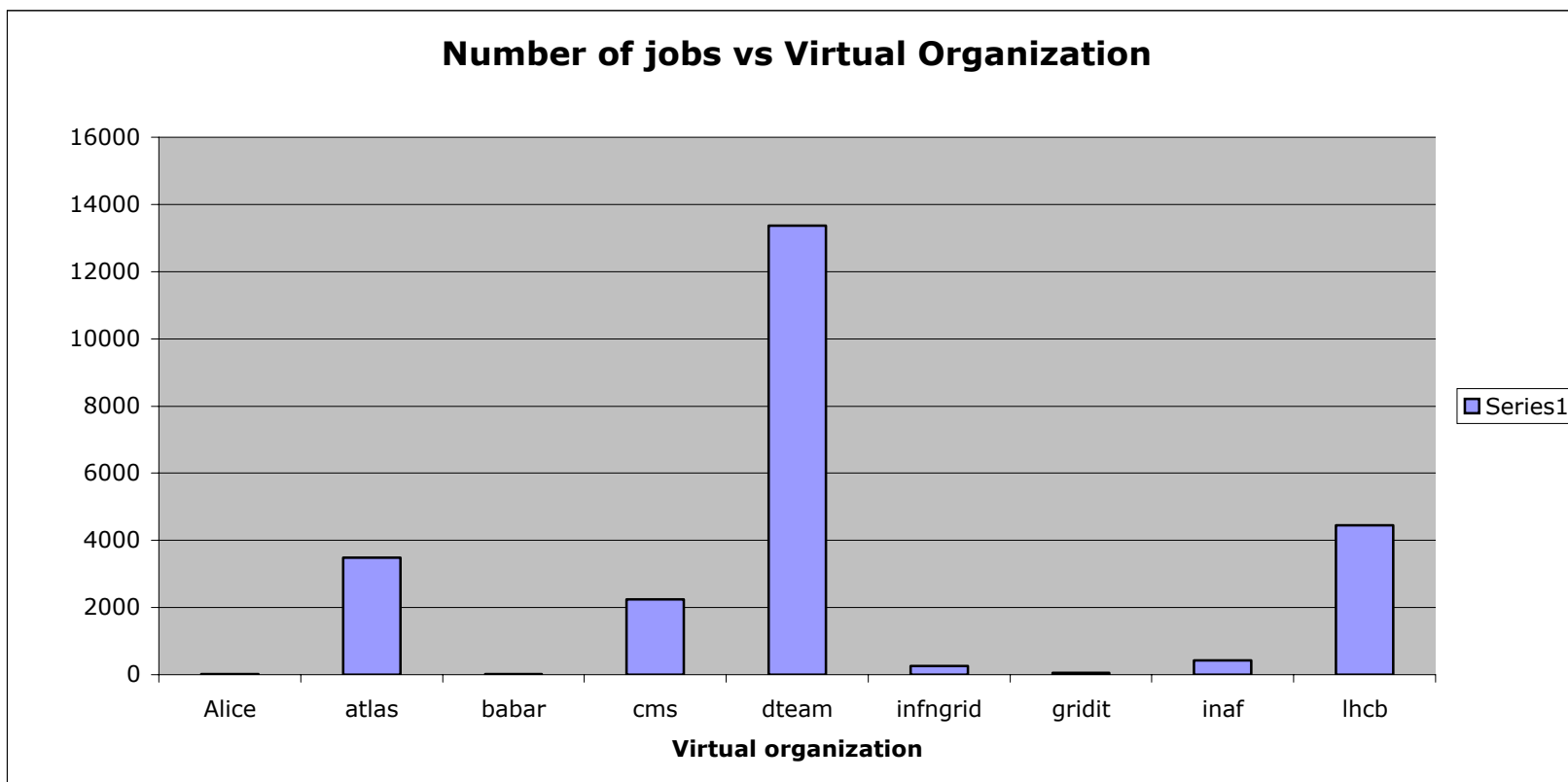


# Screen shot online from Gridice Number of jobs per VO





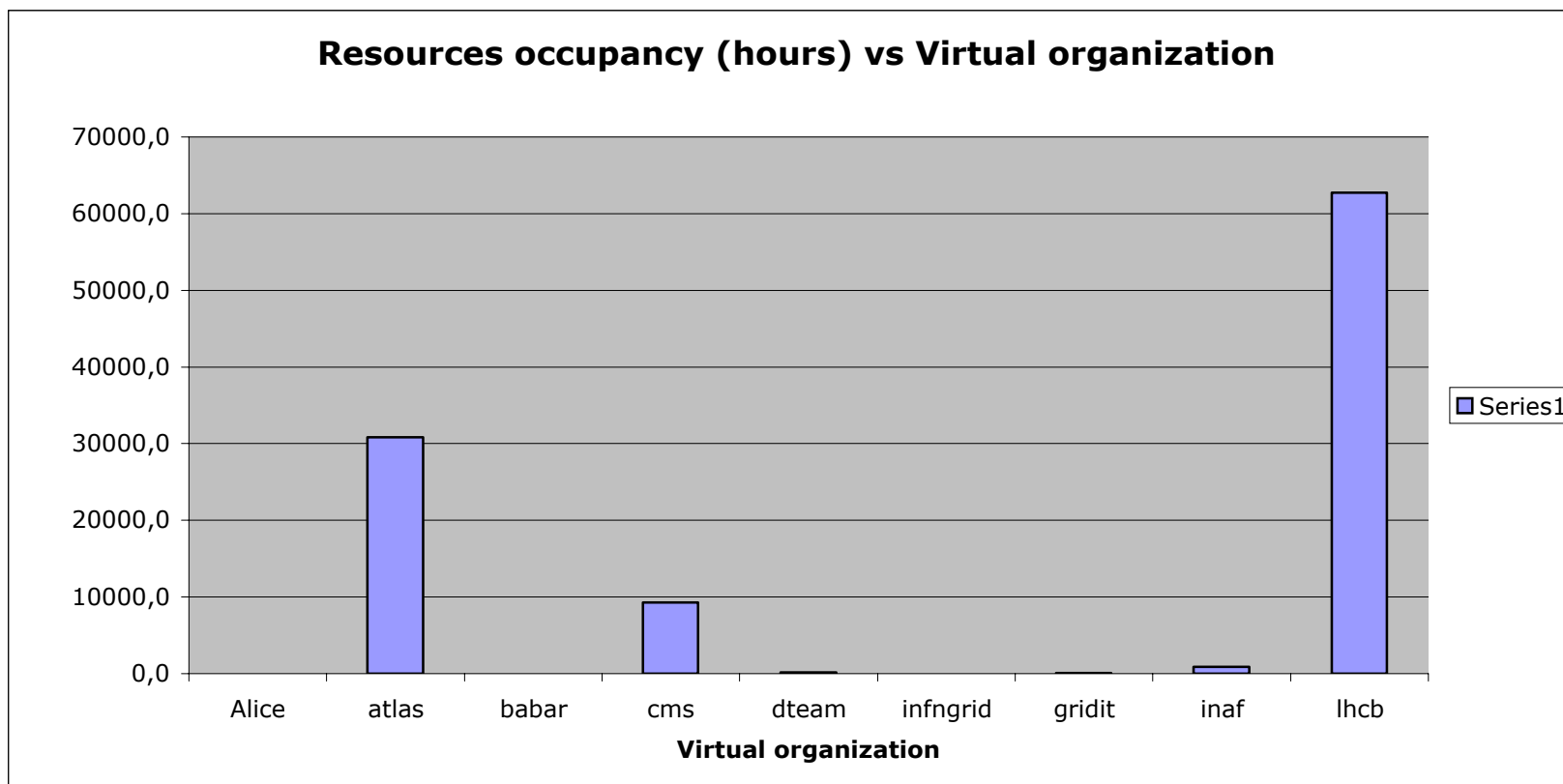
# Number of jobs per VO



Real case (Grid.it) period 1st August to 23th August 2004



# Resources occupancy per VO

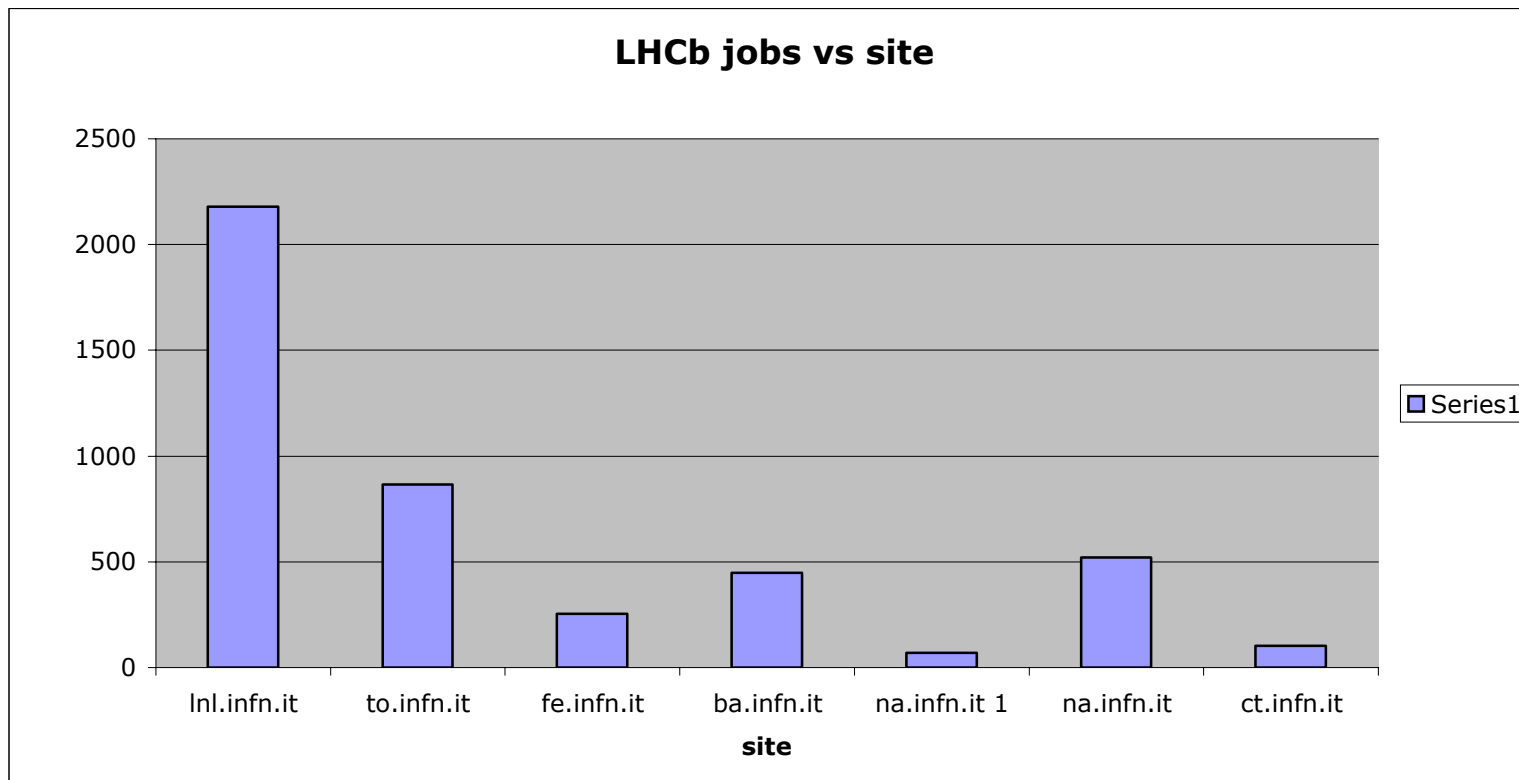


Real case (Grid.it) period 1st August to 23th August 2004





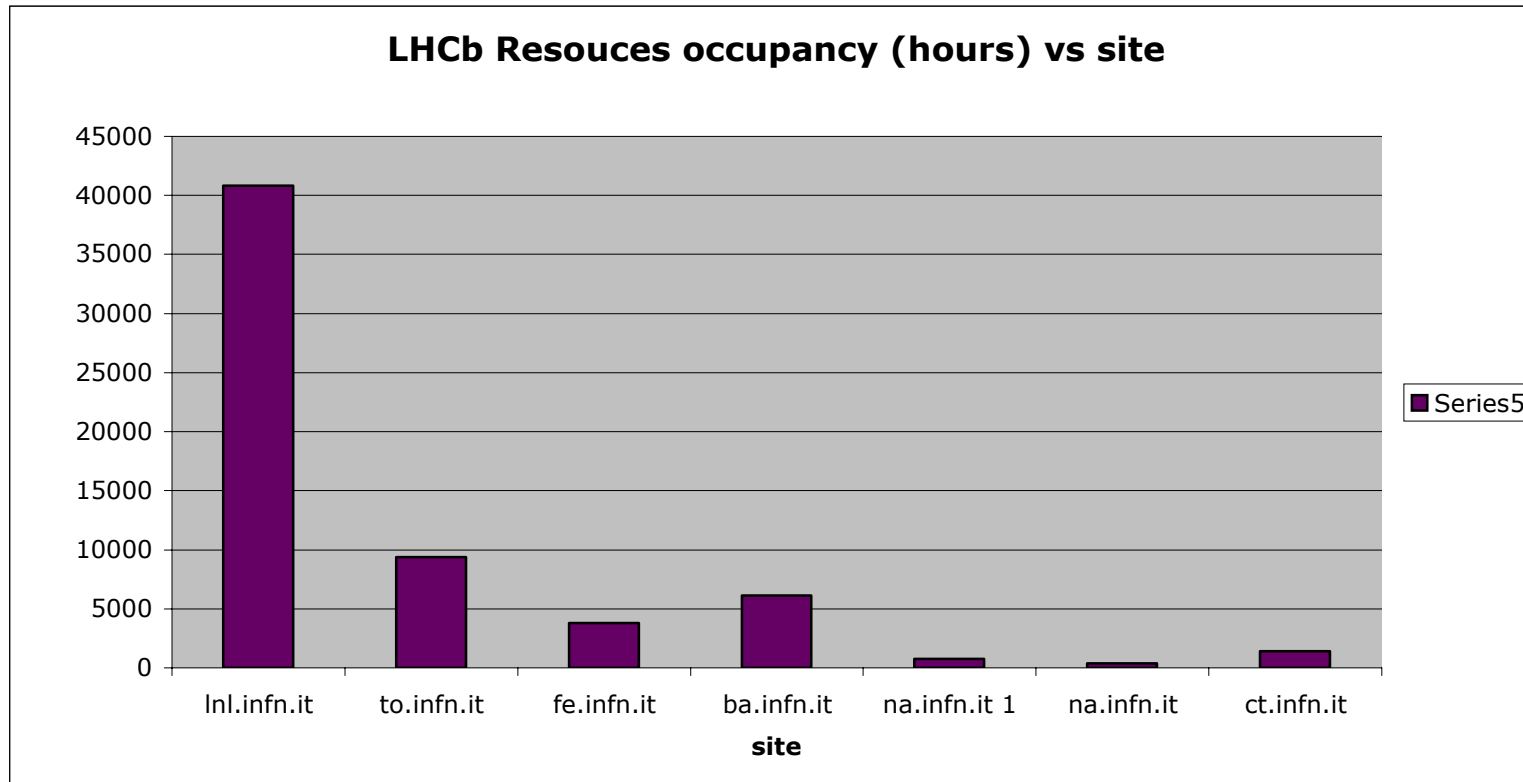
## Lhcb vs site (number of jobs)



Real case (Grid.it) period 1st August to 23th August 2004



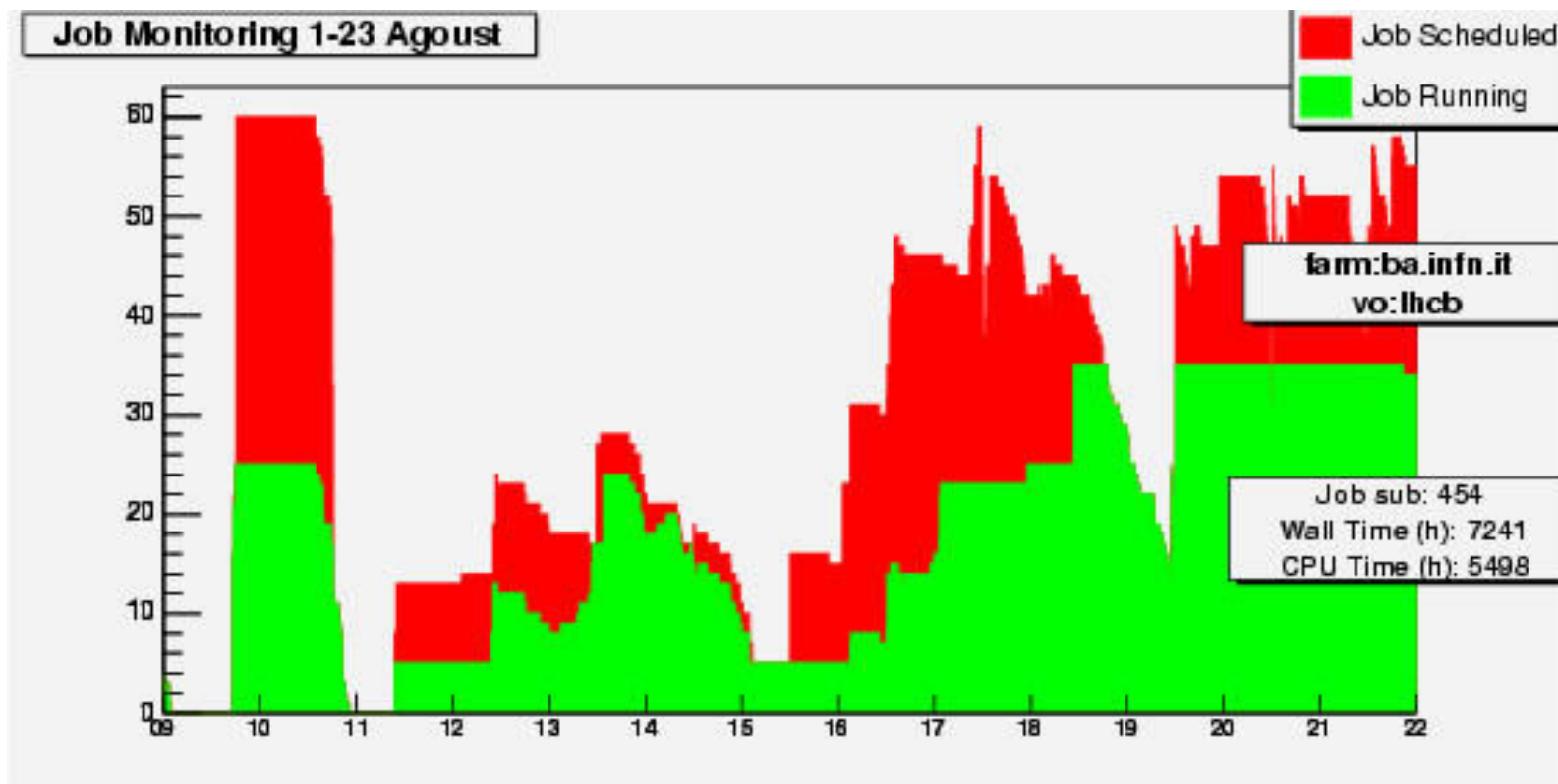
# Lhcb vs site (resources occupancy (CPU hours))



Real case (Grid.it) period 1st August to 23th August 2004



# Reconstructed time profile per FARM: ba.infn.it and VO: LHCb





## Highlights



- Each job can be associated to all the execution host metrics (load, cpu, file system, network adapter, ...)
- **LSF** has native support, but also **PBS** and **TORQUE** are as well supported by our info providers.
- Online usage metering: **continuous metering** of all resource usage (no need to send local accounting DB) since the job is submitted; info are ready to be processed at every time.
- We **only record GRID resources activity** with a single local info provider (it is possible to turn on also the recording of local activity if the local site manager turn it on).
- Through the **GlobalID** we can:
  - Interoperate with other accounting/monitoring systems
  - Relationship our collected info with L&B systems
  - Statistics of RBs usage against resources

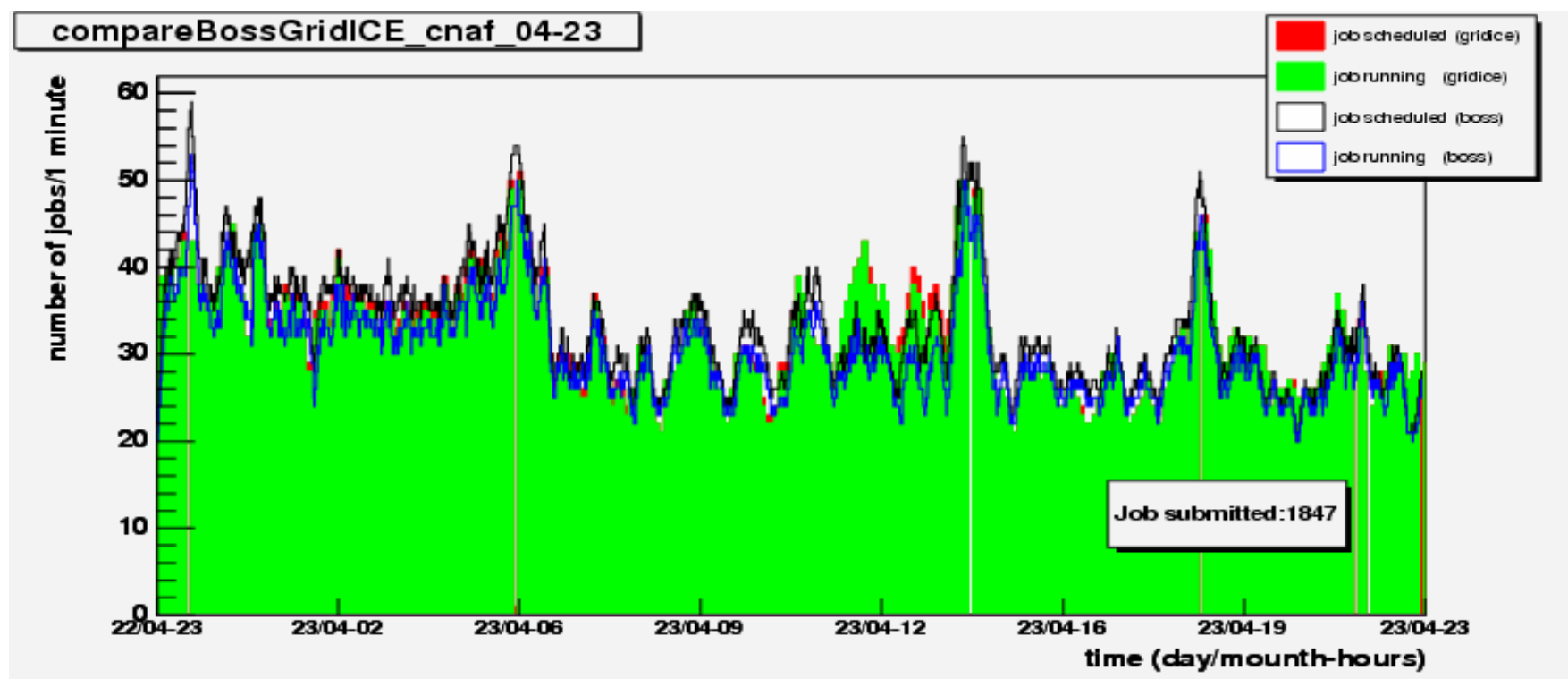


## Next Steps



- We will improve the WEB interface to obtain reports, graphs and statistics about the accounting.
- Maybe we can think to send by e-mail to key people (GOC, CIC, ROC) reports on a regularly base.
- We need input to understand what information are needed (type of reports, graphs and statistics).

- With the CMS DC04 datachallenge we got a validation of the data recorded by GridICE vs. BOSS CMS application confirming that the acquired data was good.



graph and analysis provided by: M. Maggi et al. – INFN Bari CMS group