

Present and Future of One of the largest Grid Infrastructure in Europe



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The Italian Grid infrastructure currently comprises 35 resource centers, which are hosted and operated by various research institutes or consortia (such as INFN, CNR, ENEA, SPACI) and Universities. It is fully integrated with the pan-European Grid infrastructure built and operated under the umbrella of the project EGEE-III, and is currently strengthening its integration with various Italian Grid regional infrastructures.

The Italian Grid infrastructure provides a distributed computing platform based on the principle of resource sharing by users from many scientific disciplines, such as Physics, Astrophysics, Biology, Health, Chemistry, Geophysics, Economy, Finance and extensions to other sectors such as Civil Protection and Industry. The Italian Grid has a central role in Grid development and deployment activities in Italy, from sharing its infrastructure and know-how, to establish platforms for further development of Grid applications.

Application, Grid Services, and Grid Foundation Middleware Relationship



•The Workload Management System (WMS) accepts user jobs, assigns them to a site, records their status and retrieves their output.

•The Logging and Bookkeeping (LB) service tracks jobs managed by the WMS.

•The Storage Resource Manager (SRM) provides dynamic space allocation and file management, defining a standard interface to allow interoperability between different storage systems.

•The LCG File Catalogue (LFC) maintains mappings between Logical File Names, Storage URL and Grid Unique Identifiers.

•The File Transfer Service (FTS) is a low level data movement service which schedules data transfer jobs between source and destination sites according to configurable internal policies.

•The Grid Security Infrastructure is based on public key encryption, X.509 certificates, and the Secure Socket Layer protocol. A system called VOMS (Virtual Organization Management Services) is used to manage information about roles and privileges of users within a Virtual Organization (VO).

•The Computing Element (CE) is a set of services that provide homogenous, managed, and secure access to heterogeneous, remote computing resources.

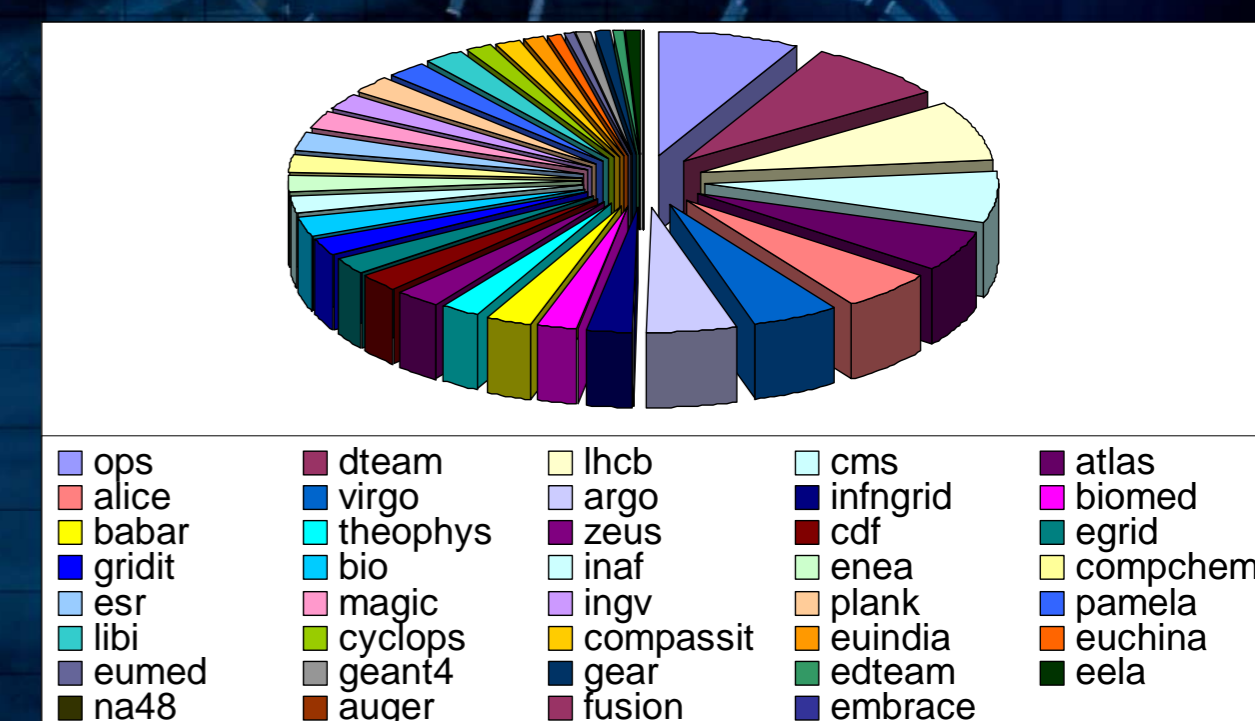
•The monitoring service GridICE collects information according to standard schema and archives historical data in a persistent storage.

•The accounting system (DGAS) performs an accurate Usage Metering related to jobs and users by sensors installed on Computing Elements.

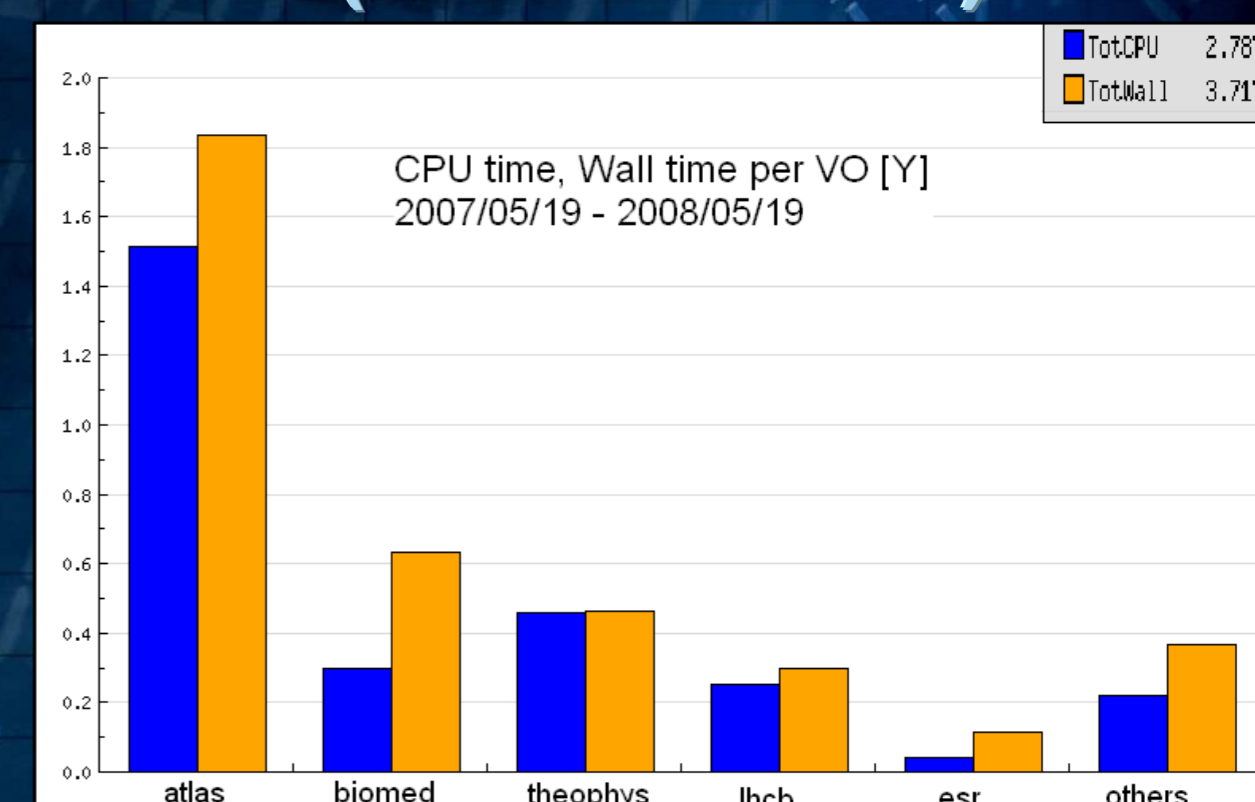


Available storage per Virtual Organization

- 4 PB of disk space
- 1 PB of tape storage

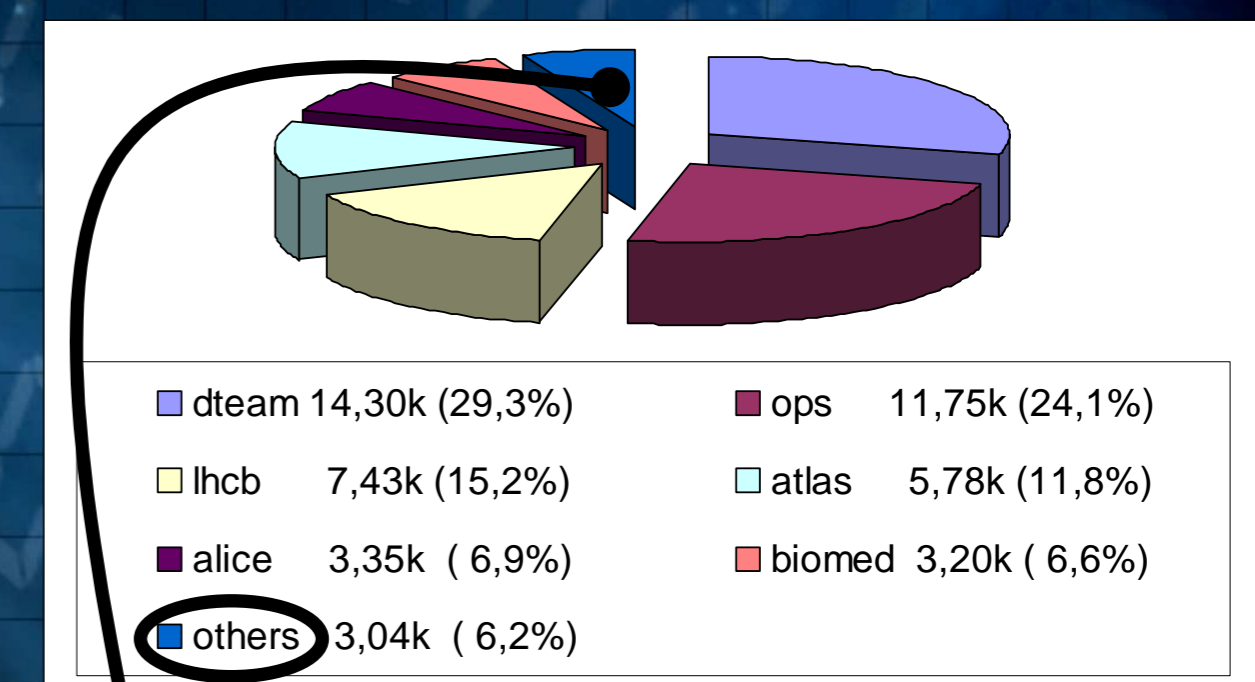


Accounting per VO (last 12 months)

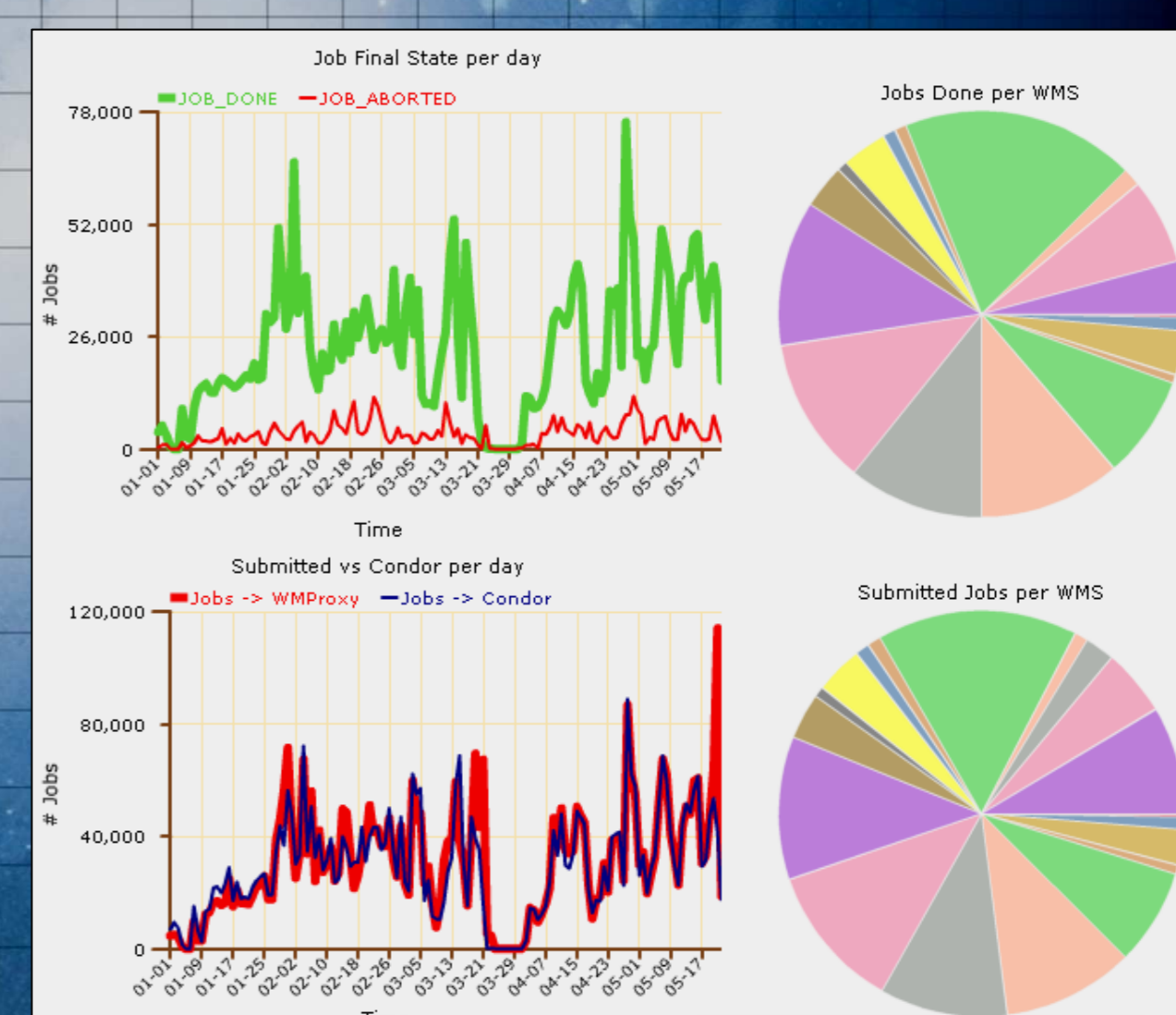


Computing job types

- The Message Passing Interface (MPI): a commonly used standard library for parallel programming. WMS handles MPI jobs as a set of processes that run on different Worker Nodes (WN) in the same CE.
- Collections: sets of independent jobs.
- Checkpointable jobs: the WMS saves intermediate job states in the LB;
- Direct Acyclic Graphs: sets of jobs linked by relative dependencies;
- Partitionable jobs: sets of independent sub-jobs, plus an initial pre-job and a final aggregator job;
- Parametric jobs: collections where the jobs are identical, but for the value of a running parameter;
- Interactive jobs: they open a real time connection with a remote host. The job standard streams are redirected from/to the remote host.



Jobs submitted via WMS



Evolution of the Operational Model

The current operational model will evolve in order to support the management of resources and services of an infrastructure which is expected to quickly grow in scale, in terms of number users, services, sites operated and middleware stacks supported. The guidelines of this transition will be the autonomy of national Grid, self-functionality and the full integration with the operational model adopted by the pan-European Grid infrastructure.