Cloud Computing in ENEA-GRID: Virtual Machines, Roaming Profile, and Online Storage

Giovanni Ponti*, Alessio Rocchi, Antonio Colavincenzo, Gianfilippo Giannini, Alessandro Secco, Giovanni Bracco, Silvio Migliori,

D. Abate, F. Ambrosino, G. Aprea, T. Bastianelli, F. Beone, M. Caporicci, M. Chinnici, A. Cucurullo, P. D'Angelo, A. Della Casa, M. De Rosa, A. Funel, G. Furini, D. Giammattei, S. Giusepponi, R. Guadagni, G. Guarnieri, A. Italiano, A. Mariano, G. Mencuccini, C. Mercuri, P. Ornelli, S. Pecoraro, A. Perozziello, A. Petricca, S. Pierattini, S. Podda F. Poggi, A. Quintiliani, C. Sciò, and F. Simoni

ENEA - UTICT (Technical Unit for Information and Communications Technology)

GARR Workshop – Calculus and Distributed Storage
Rome – November 29-30, 2012

Computational resources in ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development) are organized in a distributed infrastructure called ENEA-GRID [1]. The grid offers the integration of computing nodes, of storage systems, and of monitoring tools. Such resources are distributed over six ENEA calculus centers, and offer an integrated computational power of more than 50 Tflops, whose main part is supplied by the over 6000 cores of CRESCO HPC systems [2], which have in ENEA Portici Research Center the most relevant site.

ENEA-GRID resources offer support to all the scientific activity in ENEA, and applications have been oriented on high-performance parallel computing and on the massive execution of serial elaborations. This has been possible thanks to the adoption of mature software components, such as multicluster LSF for resource management, the file systems OpenAFS (geographically distributed) and GPFS (for parallel computing), Kerberos 5 as authentication system, and Zabbix for resource monitoring. Moreover, ENEA-GRID offers a user-friendly, versatile, and workable interface, ensuring several ways to access the resources, such as SSH, NX for remote desktop, and the web portal FARO [3].

Over the years, ENEA-GRID has come under remarkable evolutions and improvements, which have led to a wide pool of services and functionalities, that go side by side with the well-established experiences in GRID computing. In such a scenario, ENEA experiences in Cloud Computing have taken place. In a preliminary phase, cloud computing activities have been focused on the improvement of some features exploited since the beginning of the grid, such as distributed storage offered by OpenAFS, services and ad-hoc software applications, and Virtual Labs [4], which offer an environment of utility services for users belonging to a specific scientific community.

In this abstract, we aim to describe the activities oriented to offer virtualized services in ENEA-GRID. In particular, in the following, we are going to describe all the evolutions and the improvements performed after the last year presentation at the GARR conference of 2011, when we discussed some preliminary tests and results on the possibility of setting up virtual machines in ENEA-GRID exploiting OpenNebula platform.

Once noticed that our infrastructure well supports these services and once defined some implementation and architectural choices, the next step has consisted in setting up a set of templates of virtual machines that a user can instantiate in according to his necessity. These virtual machines are on-demand, and they typically have a life cycle bounded to the user session, offering a useful environment customized on specific tasks. Nevertheless, even if these virtual machines are on-demand and not persistent, i.e., no change is saved on the disk of the virtual machine, the main novelty regards the adoption of the user roaming profile, which allows to recover its desktop environment and preferences at every access, although the virtual machine has been destroyed. This has the important

* Corresponding author. Email: giovanni.ponti@enea.it

advantage of preserving user choices but, at the same time, it does not modify the disk of the virtual machine; this allows to instantiate disposable virtual machines, with a consequent optimization of the infrastructure resources. The management of the roaming profile has been possible thanks to the integration of the virtual machines in the AFS ENEA domain, which permits to mount AFS user home at the login. Moreover, this also avoids the creation of users on virtual machines, and, consequently, to reuse every template for more users.

To better handling templates, virtual machines, and users, ACLs for users and groups have been defined in OpenNebula, in such a way that each user can utilize only a subset of templates and manage only its virtual resources. In addition, ACL allows to define limits on the physical resources that each user can occupy, in terms of, e.g., number of instantiated virtual machines, total amount of RAM, number of CPUs, etc.

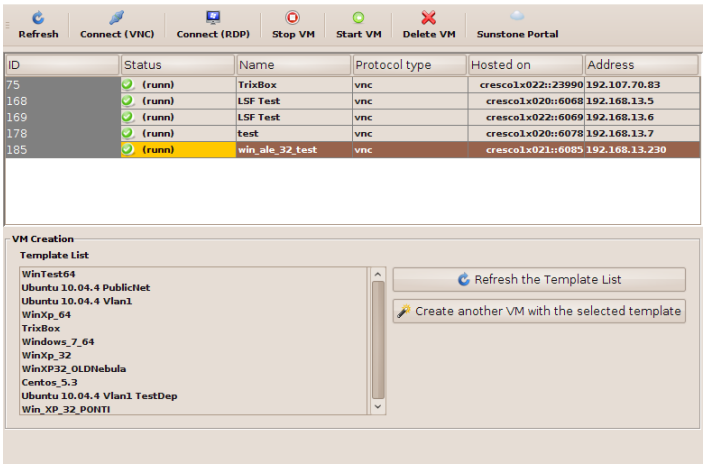

Fig. 1. FARO and OpenNebula — Management front-end in ENEA-GRID

In Figure 1 is shown the management and accessing front-end to the virtual machines, that is accessible and integrated into FARO web portal. Also in this case, ENEA-GRID offers a perfect integration of the OpenNebula APIs, providing a simple, user-friendly, and powerful interface. Respect to the one proposed the last year, this product has been also subjected to remarkable improvements; in fact, it is now possible not only to access to the virtual machines, but also to manage their life cycle providing the most common functions, e.g., starting, stopping, resuming, and destroying a virtual machine. For efficiency reasons, in case that a user wants to access to a Windows virtual machine, the RDP connection protocol can be chosen (in any case, VNC connection is always possible). Moreover, as it can be observed in the figure, a template list is prompted in order to select the desired one to use, allowing for instantiating virtual machines without requesting it to the administrators. This interface provides only a subset of all the functions that a user can perform in our cloud infrastructure; nevertheless, these ones cover the majority of the common use cases. In case of performing advanced features, it is always possible to access to the Sunstone web portal of OpenNebula by means of the appropriate button in the top bar of the interface.

Besides virtual resources, it has also been developed a solution for online storage and collaborative file sharing fully engineered and developed within the ENEA-GRID cloud computing infrastructure. This is OKBox, a new web application which aims to help the user that wants to storage its data in the cloud exploiting the IaaS paradigm. OKBox implements the “Always and Anywhere on” policy, exposing a web portal where users are able to upload and download their files, set ACLs and so on, and only a network connection is required. OKBox relies on Kerberos for the authentication purposes and on OpenAFS for the authorization mechanisms. This aspect is crucial both for the adopting institution, which can take advantage from a natively integrated piece of software, and for the user, who benefits of a series of security policies and privacy preserving mechanism that are more advanced and clear w.r.t. the ones offered by third-part online storage solutions. In addition, OKBox promotes e-collaboration: within OKBox, users can share contents with other people, even though they live and

work outside ENEA and/or they do not have an ENEA-GRID account by simply setting credentials and rights to its contents and sharing them. Moreover, OKBox is particularly useful when employed in virtual machine context, as users can exploit it in transferring data between the remote virtual environment and the local user desktop; in this context, OKBox provides good solution for such a crucial problem.

References

1. ENEA-GRID – http://www.eneagrid.enea.it/
2. CRESCO – http://www.cresco.enea.it/
3. Rocchi A., Pierattini S., Bracco G., Migliori S., Beone F., Sciò C., Petricca A.: FARO: accesso WEB a risorse remote per l'industria e la ricerca. Conferenza GARR, 2010
4. Laboratori Virtuali – http://www.cresco.enea.it/virtulabs.html
5. Ponti G., Secco A., Ambrosino F., Bracco G., Ciavarella R., Colavincenzo A., D'Angelo P., De Rosa M., Funel A., Guarnieri G., Giammattei D., Migliori S., Pecoraro S., Petricca A., Pierattini S., Podda S., Rocchi A., Sciò C.: Esperimenti di Cloud Computing in ENEA-GRID. Conferenza GARR, 2011