Contribution ID: **27** Type: **Oral Presentation**

Harvesting dispersed computational resources with Openstack: a Cloud infrastructure for the Computational Science community

Friday, 23 March 2018 09:00 (30 minutes)

Harvesting dispersed computational resources is nowadays an important and strategic topic especially in an environment, like the computational science one, where computing needs constantly increase. On the other hand managing dispersed resources might not be neither an easy task not costly effective. We successfully explored the usage of OpenStack middleware to achieve this objective, aiming not only at harvesting resource but also at providing a modern paradigm of computing and data usage access.
The deployment of a multi-sites Cloud [1] implies the management of multiple computing services with the goal of sharing resources between more sites, allowing local data centers to scale out with external assets. The cited scenario immediately points out portability, interoperability and compatibility issues, but on the other side this opens really interesting scenarios and use cases especially in load balancing, disaster recovery and advanced features such as cross-site networks, cross-site storage systems, cross-site scheduling and placement of remote VMs. Moreover, a cloud infrastructure allows the exploitation of Platform as a Service, and software as a server solutions which in the end it is what really matter for the science.
The main goal of the present work is to illustrate a real example on how to build a geographically distributed cloud to share and manage computing and storage resources, owned by heterogeneous cooperating entities. We put together four different entities namely: Department of Physics and Geology - I.N.F.N. Sez. Perugia, Department of Chemistry (UNIPG) also located in Perugia, Department of Pharmacy (UdA) located in Chieti and ASI-SSDC (Space Science Data Center at the Italian Space Agency) located in Rome. The involved sites are, not only geographically dislocated but also a good representatives of the research interest diversity we want to explore in our Cloud infrastructure. We report about the porting of concrete use cases exploiting the available PaaS solutions provided by INDIGO-DataCloud project and following the upcoming EOSC directives. We identified: ab-initio quantum chemistry applications and AMS-02 (Alpha Magnetic Spectrometer on the International Space Station) experiments.
The sites are connected via a SDN[2] technology through encrypted point-to-point channels being the "backbone" for the overlay networks. Specifically openVPN and IPsec have been used, depending on specific networking constraints. Over the point-to-point mesh, OSI L2 Ethernet frames of both the OpenStack management and projects VLAN networks have been encapsulated using the VXLAN [3] protocol. The networking structure has been deployed for the specific purpose of creating a distributed overlay L2 Ethernet to be used by OpenStack.
Finally, to fine tune the network setup and avoid cross site unnecessary traffic, different sites have been logically separated using different availability zones, with VMs on every zone having the capability of independently accessing the Internet through the site where they are physically running.

Mell, Peter, and Tim Grance. "The NIST definition of cloud computing." 28 (2011).

Kreutz, Diego et al. "Software-defined Networking: A comprehensive Survey" arXiv:1406.0440v3.

Mahalingam et al. "Virtual eXtensible Local Area Network (VXLAN): A Framework for Overlaying Virtualized Layer 2 Networks over Layer 3 Networks" - RFC 7348

Primary author: Mr MARIOTTI, Mirko (Department of Physics and Geology, University of Perugia)

Co-authors: Mr GUERRA, Antonio (Space Science Data Center at the Italian Space Agency.); Dr SPIGA, Daniele (INFN sezione di Perugia); Mr VITILLARO, Giuseppe (Istituto di Scienze e Tecnologie Molecolari, Consiglio Nazionale delle Ricerche); Dr STORCHI, Loriano (Dipartimento di Farmacia, Universita' degli Studi "G. D'Annunzio", Chieti.); Mr CIANGOTTINI, Manuel (INFN sezione di Perugia); Dr DURANTI, Matteo (INFN sezione di Perugia); Mr MERGÉ, Matteo (INFN sezione Roma 2); Mr D'ANGELI, Paolo (Space Science Data Center at the Italian Space Agency.); Mr PRIMAVERA, Roberto (Space Science Data Center at the Italian Space Agency.); Mr FORMATO, Valerio (INFN sezione di Perugia)

Presenter: Mr MARIOTTI, Mirko (Department of Physics and Geology, University of Perugia)

Session Classification: Infrastructure Clouds & Virtualisation Session

Track Classification: Infrastructure Clouds and Virtualisation