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Composition and Deployment of Complex Container-Based Application Architectures on Multi-Clouds

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Cloud computing has been established in recent years as the key technology to offer on-demand access to computing and storage resources. This has been exemplified by both public Cloud providers and on-premises Cloud Management Platforms such as OpenNebula and OpenStack, out of which federated large-scale Cloud infrastructures to support scientific computing have been established, such as the EGI Federated Cloud. Indeed, the European Open Science Cloud (EOSC) is foreseen to consist of a federating core which provides seamless access to a wide range of publicly funded services supplied at national, regional, and institutional levels for science and innovation. These last years have witnessed the rise of the OASIS TOSCA (Topology Orchestration for the Specification of Cloud Applications) standard, adopted by several European projects. This standard allows one to specify the components that underpin an application architecture using a high-level YAML-based language which can be extended to include additional components to satisfy the requirements of a wide variety of applications. However, the recent advances in computing have revealed two major trends that can greatly benefit the application delivery and the computational performance: Linux containers and GPU computing.

To this aim, the Horizon 2020 DEEP-Hybrid DataCloud project is developing innovative services to facilitate the composition and deployment of complex cloud application architectures across multiple Clouds (both private and public ones). Therefore, we describe in this presentation the adoption of a visual composition approach of TOSCA templates (based on Alien4Cloud), in order to facilitate the widespread adoption of the standard, and its integration with the INDIGO-DataCloud Orchestrator, which is already part of the EOSC-HUB service catalogue. With this approach, the user can visually compose complex applications that involve, for example, the dynamic deployment of a container orchestration platform on an IaaS Cloud site that executes a highly-available Docker-based application to facilitate application delivery. The users can also deploy an Apache Mesos cluster with GPU support that contains a deep learning application for the recognition of certain plant species, offered as a service to a community of users. This introduces unprecedented flexibility, from visual composition, to the automated application delivery, using a graphical interface that is already integrated with an Orchestrator layer that performs resource provision from multiple Clouds and application configuration.
The integration of easy-to-use graphical interfaces builds a bridge between the users and the orchestration services.It also represents a step forward to foster the adoption of innovative computing services that are hidden from the user, as they can focus on the high-level description of the services requirements and definition, instead of working on their technical implementation.

Type of abstract

Presentation

Summary

The rise of cloud computing has prompted multiple actors (industry and academia) to come up with a broad-coverage standard to allow the composition of topologies runnable on various cloud platforms, TOSCA. It is based on YAML and enables the creation of topologies using reusable and extensible components. To facilitate TOSCA's adoption among non-expert users, the Horizon 2020 DEEP-Hybrid DataCloud project has as one of its core goals, the integration of a GUI (Alien4Cloud) to compose TOSCA topologies graphically. This allows non-expert users to launch their infrastructure/application on heterogeneous clouds through the INDIGO-DataCloud Orchestrator.

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