

Public Abstract

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OF USER WORKFLOWS

Emerging interdisciplinary studies in data-intensive fields such as health, manufacturing and geo sciences are challenging virtualized computing and networking. They present unique requirements and demand use of advanced technologies/protocols to deploy resources in distributed environments. Several approaches have been proposed at the application and infrastructure level within cloud platforms such as: Amazon Machine Images, RSpecs in GENI and Virtual Appliances in VMware, in order to describe and orchestrate computing and networking resources based on common abstractions and user workflow needs. However, there are several limitations in current solutions in the context of "Repeatability", "Extensibility" and "Adaptability", particularly when federated resources are involved between user sites and cloud resources.

In this thesis, we address the above challenges in 'bridging user sites to cloud platforms' by proposing a component abstraction model that enables building of "custom templates" that are based on the collection of access network technologies, common infrastructure resource elements and user workflow specifications such as: expectations related to quality of user experience (QoE), application performance and data security. Our model comprises of Macro Operator Components that identify resources, precondition and features such as variables for infrastructure deployment and suggests resource chaining rules. We apply our model to generate custom templates in multiple application use cases in hybrid cloud environments (i.e., Simulation-as-a-Service, PhysicalTherapy-as-a-Service and LIDAR_Analytics-as-a-Service) and show its benefits such as ease-of-instantiation, time-to-instantiation and improved quality of service (QoS).