

Leveraging the NSFCloud Project for Teaching Cloud-related Computing Concepts

Abstract:

Cloud Computing remains an evolving paradigm. Cloud is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction.¹

This important set of concepts and technology, that is now rapidly becoming a ubiquitous part of all our lives, must be taught in the classroom. Hence we would like to explore using the NSFCloud to teach concepts of cloud computing, including virtualization, networking, and security in the cloud to all Computer Science majors.

Project Description: We realize that this workshop seeks research papers performing experiments using the NSFCloud infrastructure. While ours is not a purely research project, it aims to leverage the infrastructure and services provided by NSFCloud to enhance (and in most cases, begin) the teaching of Cloud-based computing concepts in the classroom. We have had extensive experience working with the GENI project, both in bringing our realistic traffic generation tools to the GENI testbed and in pioneering education about, and on, GENI. We conducted the very first tutorials about using GENI in non-GENI conferences, and we are one of three current projects that is using GENI to teach basic networking concepts using GENI resources. <geni.web.unc.edu>

GENI used the earlier Emulab and Planetlab infrastructure to build out a vast and diverse experimental testbed that is now serving the research and education community. With NSFCloud leveraging GENI resources, we see the potential to bring NSFCloud into the classroom even while the Cloud resources are being built.

Cloud Computing is often not an explicit part of the Computer Science curriculum across departments today. However, we all know that we need to be introducing Cloud Computing concepts in all our Systems courses – Operating Systems, Networking, Security, and others from the various perspectives of the Cloud as it involves a vast variety of technology, deployment, and services. We would like to setup simple clouds, and run simple experiments to study the deployments and services of commercial cloud providers.

We have built several modules which use the GENI infrastructure, to teach simple concepts such as: a) how do two TCP flows share the resources? b) How does a UDP flow “share” the

¹ Peter Mell, Timothy Grance, The NIST Definition of Cloud Computing

bandwidth on a link with a TCP flow, c) how does routing work, and how do the basic routing algorithms keep the network working smoothly, etc.

We plan to use NSFCloud resources to design and run simple experiments to teach cloud computing concepts. We would like to see the adoption of NSFCloud resources in the classroom so that students understand the basics of cloud computing, and will build their own clouds for further experimentation.