

Setting up a cloud data processing facility

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Introduction

The present work was motivated by a desire to streamline and simplify the steps a researcher has to go through in order to use a distributed infrastructure to process or simulate large amounts of data. Specifically, the aim is to prepare for analyzing the data that will now very soon arrive from the Large Hadron Collider at CERN.

The main idea is to strictly support the way most researchers do their computational work: 1) log in to a work station and compile, debug and test a given application, 2) run this same application multiple times¹, either with different parameters or with different input files. Typically 2 is done via some sort of batch or queuing system.

The crucial point here is that in order to painlessly go from step 1 to step 2, exactly the same environment (operating system, installed software and libraries) should be present both on the workstation where the development and initial testing was done *and* on the machine where the jobs are later placed by the mentioned batch or queuing system.

The way we have chosen to address this is via a unified image and software catalog. With images, we here refer to disk images suitable for booting a virtual machine. To manage jobs and interact with this catalog, we are developing a prototype GUI, coined GridPilot.

More detailed, the envisioned working procedure of a researcher on our facility is then:

1. Select, boot up and log in to a virtual machine – this is a one-step procedure, initiated by simply logging in via SSH to the front-end machine, where-after one is asked to choose a virtual machine.²
2. Compile, debug, test.
3. If necessary, save the current state of the virtual machine as a new image and add it to the catalog.³
4. Prepare and run multiple jobs, each requiring to run in the same kind of virtual machine. This is done via the GUI.

Authentication and authorization

X.509, VOs

¹ referred to as running jobs.

² This one-step procedure is not yet implemented. Currently, researchers have to select and boot up the virtual machine either via a

³ This is not yet implemented.

Using Apache HTTPD as data store

Using MySQL as meta-data store

Using OpenNebula and Xen as cloud back-end

Using GridPilot for job, software and file management

Use cases

ATLAS data processing

Statistical epistasis analysis

Variance at risk simulation

Bibliography

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EC2, Amazon Elastic Compute Cloud, <http://aws.amazon.com/ec2/>