Managing the Virtual Machine Lifecycle of the CernVM Project

Introduction

Development and maintenance of a Virtual Machine Applies involves several steps, ranging from the management of a machine's life cycle, to the automated deployment of software. This process can be complex and time-consuming, requiring the development of specific tools and methodologies to streamline the process.

The lifecycle

The CernVM Lifecycle is a continuous process that consists of the following steps:

1. Process the feedback from the previous release
2. Make necessary changes to the recipe for building the appliance
3. Update the appliance
4. Build the virtual appliance
5. Test the appliance
6. Release it

The problem

Some of these steps (such as building, or repository management), can be performed using existing tools. However, for some others (such as testing) no generic tools existed. Additionally, there is no apparent way to unify these steps within a single and coherent framework that would make it possible to automate the entire process.

The solution

We started by developing the missing software tools. Then we encapsulated each tool within a stand-alone component (built on top of the iAgent framework) that implements a common API, with well-defined input and output. The idea was to create a collection of components that can either be controlled independently, or could be chained together in order to repeatedly perform automated tasks.

Job Agents

The iAgent instances are discovered dynamically. This means that new instances can be added without disrupting ongoing operations.

1. Configuration Agent
   - Holds the recipe for building the virtual machine and initiates the CernVM build cycle.

2. Repository Agent
   - Updates the software repository, builds package, and triggers the build process.

3. Build Agent
   - Builds a virtual machine disk image, according to the specified recipe and repository.

4. Test Agent
   - Instantiates and configures a virtual machine exactly like an end user is expected to do, and runs an extensive test of functionality.

5. Release Agent
   - Publishes the virtual machine image

Management Clients

Since all the components are connected through XMPP, they can be managed by a specialized web client or even a simple chat terminal.

Command-Line Interface

The iAgent provides a built-in, interactive / batch CLI access to all of its local and distributed components.

Future plans

Our immediate plan is to connect this system with our “Long-term preservation of analysis software environment” project, in order to enable on-demand builds of older CernVM versions. Another important development would be addition of support for automated VM deployment, as well as on-the-fly contextualization of newly started VM instances.

We expect to add more features after performing tests of the system at a larger scale and receiving more feedback from users.

Resources and further reading

1. iAgent framework svn: https://cernvm.cern.ch/project/trac/cernvm/browser/iagent
2. Mobile client svn: https://cernvm.cern.ch/project/trac/cernvm/browser/iagent-picolient
6. More details about this poster can be found at: http://cernvm.cern.ch/project/trac/cernvm/browser/iagent/archipel
8. See also our other CernVM posters/talks at this CHEP!