Implementation of Continuous Integration for Linux Images

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Context
Operating System Image Production

- Linux Support Team make images
- Built with Koji
- E.g. accessible from OpenStack:

```bash
% openstack image list
+-----------------+--------------------------------+
| ID | Name                      |
+-----------------+--------------------------------+
| 29262d...3c8fc9 | CC7 - x86_64 [2017-04-06] |
| d8c28e...a9015b | SLC6 - x86_64 [2017-04-06] |
| f1c040...0c92c4 | SLC6 - i686 [2017-04-06] |
| b2b7ba...e5c9c3 | CC7 TEST - x86_64 [2017-04-06] |
| ...            |                             |
```
It’s Critical That...  

- We build images quickly  
- We build images autonomously  
- We make sure images work flawlessly
Testing Out Images

Perform some manual checks:

- Try starting a VM
- Try logging into it
- Check Puppet reports
- Check cloud-init logs
- A list of tests
We Need To...

- Automate test execution
- Perform more thorough tests
- Be able to manage tests
Towards a Variety of Tests
So Far...

GitLab CI
OpenStack
CC7 - x86_64 [2017-04-06]
SLC6 - x86_64 [2017-04-06]
Koji
ssh ./runtests.sh
koji image-build
server create
A Job to Build an Image

- Runs `koji image-build`
- Once a day – check if already built today
- Downloads the image from Koji
- Uploads the image into OpenStack
A Job to Create a Test VM

Koji

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OpenStack
A Test VM

Purpose:
- A prerequisite
- A test in its own right

Not much in Docker image → before_script:
- Copy .repo files
- Install e.g. OpenStack RPMs

What it does:
- Run openstack server create
A Job to Create a Test VM

Koji

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OpenStack

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CentOS Functional Tests

https://github.com/CentOS/sig-core-t_functional

- Utilities (bzip2, curl, grep, ...)
- System bits (kernel, cron, iptables, ...)
- Services (MySQL, Apache, ...)
- Compilers (GCC, JDK, ...)
- File system (root files, ...)
- X Window
- ...
Jobs To Run Each Test

before_script:

- Install SSH
- Keytab/private key from secret variable
- Wait until we can SSH
- SSH and install git
- Clone CentOS functional tests

What they do:

- SSH and ./runtests.sh $TESTNAME
.gitlab-ci.yml

```yaml
job_template: &job_template
    script:
        - ssh root@$TESTNODE "./runtests.sh $CI_JOB_NAME"

p_gcc:
    <<: *job_template
    stage: development

p_git:
    <<: *job_template
    stage: development

p_java-1.6.0-openjdk:
    <<: *job_template
    stage: development
```

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Scaling with Tests

Koji

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OpenStack
Scaling with Tests

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ssh ./runtests.sh
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Which Granularity?

- A fresh VM for each CI job
- Problem of destructive tests
- A fresh VM for each test? Really?
Test VM Pool

Workflows...

• ... to schedule test VMs in OpenStack project
• ... to manage VM life cycle
• CI Runner VM instead? But special privileges.
Interesting Tests

- Access to AFS, EOS, CVMFS, ...
- RPM health
- collectd
- Attaching Cinder volumes
- Performance
A Wider Outreach
Allow End-Users to...

- ... run their own tests...
- ... against their own images
Allow End-Users to Run Their Tests

GitLab CI

OpenStack

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Koji

ssh ./runtests.sh
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Allow End-Users to Run Their Tests

[Diagram showing flow from User Repository to GitLab CI and then to OpenStack through Koji with commands: `koji image-build`, `server create`, `ssh ./runtests.sh`]

CC7 - x86_64 [2017-04-06]
SLC6 - x86_64 [2017-04-06]
Koji

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User Interface

Merge requests either way

- From a CLI?
  
  `imageci run 'CC7 - x86_64 [2017-09-20]' mysql`

- Directly from their git repository?
Querying Results

- GitLab API
- Clear views
- From CLI?

```
imageci results 'CC7 - x86_64 [2017-09-20]' mysql
```

Or simply...
### Sample Runs

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Implementation of CI for Linux Images

<table>
<thead>
<tr>
<th>Package</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>p_gcc</td>
<td>✓</td>
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<tr>
<td>p_gcc-c++</td>
<td>✓</td>
</tr>
<tr>
<td>p_git</td>
<td>✓</td>
</tr>
<tr>
<td>p_java-1.6.0-op...</td>
<td>✗</td>
</tr>
<tr>
<td>p_libxml2-python...</td>
<td>✓</td>
</tr>
<tr>
<td>p_mysql</td>
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<td>p_postgresql</td>
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</tr>
<tr>
<td>p_tar</td>
<td>✓</td>
</tr>
</tbody>
</table>
Concerns and Opportunities

- Jobs running for too long
- How many jobs can we run?
- Work to adapt CentOS functional tests
- Testing Docker images