Leveraging version control and continuous integration to improve a Linux HPC eco system.

Yorick Poels

KU Leuven

June 15 2017
CONTENT

INTRO

TOOLS

EVOLUTION OF SETUP

WORKFLOW

CONCLUSION
Tier1: BrENIAC
  ▶ 580 nodes
  ▶ CentOS 7.x
  ▶ Puppet

Tier2: ThinKing - Cerebro
  ▶ 352 nodes - shared memory system
  ▶ RedHat 6.x
  ▶ Bash

Service nodes (tier1 & 2)
  ▶ 25+
  ▶ Foreman + Puppet
```bash
diff --git a/manifests/ibstats.pp b/manifests/ibstats.pp
index 821f05c..d8057d1 100644
--- a/manifests/ibstats.pp
+++ b/manifests/ibstats.pp
@@ -183,10 +183,10 @@ class profile:ibstats {
   command => sub {
     my ($sleep, $file) = @_; 
     system "sleep $sleep; /usr/bin/parse-ib-counters $file 2> /dev/null";
   },
   user => root,
 }
-
commit 68670b64c10f0f96e5e386d9eb0e4b7decaf3f32
Author: Yorick Poels <yorick.poels@ulouvain.be>
Date:   Tue May 16 17:09:59 2017 +0200

   change to cron:job because of mueller:cron mod is used

diff --git a/manifests/ibstats.pp b/manifests/ibstats.pp
index 595c187..d1f117c 100644
--- a/manifests/ibstats.pp
+++ b/manifests/ibstats.pp
@@ -106,7 +106,7 @@ class profile:ibstats {
   command => sub {
     my ($sleep, $file) = @_; 
     system "sleep $sleep; /usr/bin/parse-ib-counters $file 2> /dev/null";
   },
   user => root,
 }
-
commit f98c029631ead8b0d803f2f57a5f22b643ab
Author: Yorick Poels <yorick.poels@ulouvain.be>
Date:   Tue May 16 17:10:35 2017 +0200

   remove if statement

diff --git a/manifests/ibstats.pp b/manifests/ibstats.pp
index 3a939dc..d86f7a5 100644
--- a/manifests/ibstats.pp
+++ b/manifests/ibstats.pp
@@ -1,28 +1,18 @@

# profile to gather inifihb and stats
class profile:ibstats {
  if ($facts->{'cluster_type'} eq 'tier') {
-    $facts->{'networking'}->{'hostname'} = 'login2';
-    $profile->{'ibstat'} = {
-      'parse-ib-counters': {
-        command => 'sleep 30; /usr/bin/parse-ib-counters /dev/null 2>&1',
-        user => root,
-      },
-    }
-  }
+    $profile->{'ibstat'} = {
+      'parse-ib-counters': {
+        command => 'sleep 30; /usr/bin/parse-ib-counters /dev/null 2>&1',
+        user => root,
+      },
+    }
   }

```
<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Author</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>04/10/2003</td>
<td>Yonick Roelo</td>
<td>Change hostgroup to tfs</td>
</tr>
<tr>
<td>#2</td>
<td>04/10/2003</td>
<td>Yonick Roelo</td>
<td>update kst profile for collect hema values</td>
</tr>
<tr>
<td>#3</td>
<td>04/10/2003</td>
<td>Yonick Roelo</td>
<td>update kst profile for tbrox changes</td>
</tr>
<tr>
<td>#4</td>
<td>04/10/2003</td>
<td>Yonick Roelo</td>
<td>move profile zone to tbrox</td>
</tr>
<tr>
<td>#5</td>
<td>04/10/2003</td>
<td>Yonick Roelo</td>
<td>add firewall public zone and services for tbrox</td>
</tr>
<tr>
<td>#6</td>
<td>04/10/2003</td>
<td>Yonick Roelo</td>
<td>Change file names and nlist for ntp files</td>
</tr>
<tr>
<td>#7</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>Updated puppet modules</td>
</tr>
<tr>
<td>#8</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>Add ntp to the dir</td>
</tr>
<tr>
<td>#9</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>Fix the ntp targets</td>
</tr>
<tr>
<td>#10</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>Updated puppet modules</td>
</tr>
<tr>
<td>#11</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>Remove WinChromi account</td>
</tr>
<tr>
<td>#12</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>update kst profile for collect hema</td>
</tr>
<tr>
<td>#13</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>Fix nntp after puppet list update</td>
</tr>
<tr>
<td>#14</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>updated puppet list</td>
</tr>
<tr>
<td>#15</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>Fix no-fail</td>
</tr>
<tr>
<td>#16</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>update puppet list in Gentoo.bk</td>
</tr>
<tr>
<td>#17</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>add collect hema values</td>
</tr>
<tr>
<td>#18</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>bump puppet list to 1.2.0</td>
</tr>
<tr>
<td>#19</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>only allow 1.x and 1.3.0 or 1.6 in public zone on dev3</td>
</tr>
<tr>
<td>#20</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>update foreman proxy ntp defaults for setting box files</td>
</tr>
<tr>
<td>#21</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>cleanup env to balance in profile</td>
</tr>
<tr>
<td>#22</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>new box and tbrox repos should be present on dev3 - not activated</td>
</tr>
<tr>
<td>#23</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>Change Jan's public key</td>
</tr>
<tr>
<td>#24</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>update kst profile for tbrox server</td>
</tr>
<tr>
<td>#25</td>
<td>04/09/2003</td>
<td>Yonick Roelo</td>
<td>add ssh key - add ssh server profile to post 1</td>
</tr>
</tbody>
</table>
# JENKINS

## puppet-hpc-code

<table>
<thead>
<tr>
<th>Branch</th>
<th>Last Success</th>
<th>Last Failure</th>
<th>Last Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>master</td>
<td>21 hr - #500</td>
<td>5 days 10 hr - #464</td>
<td>12 min</td>
</tr>
<tr>
<td>ship</td>
<td>26 days - #1</td>
<td>23 days - #3</td>
<td>16 min</td>
</tr>
<tr>
<td>hpecsi</td>
<td>N/A</td>
<td>13 days - #16</td>
<td>53 sec</td>
</tr>
<tr>
<td>vendor</td>
<td>49 min - #4</td>
<td>1 hr 1 min - #3</td>
<td>15 min</td>
</tr>
<tr>
<td>tensa</td>
<td>2 mo 15 days - #1</td>
<td>N/A</td>
<td>13 min</td>
</tr>
</tbody>
</table>

Legend: RSS for all, RSS for failures, RSS for just latest builds

## Evolution of Setup

### Workflow

- Integrate build tools with automation frameworks such as Jenkins.
- Configure pipelines for continuous integration and deployment.
- Monitor build statuses and failures.
- Integrate with project management tools for better visibility.

## Conclusion

- Automation in the pipeline can significantly reduce development time.
- Monitoring and debugging of issues become easier with automated tools.
- Collaboration among team members is enhanced through shared builds and artifacts.

---

**Image:** Screen shot of a Jenkins dashboard showing a list of branches with their build statuses, last successes, failures, and durations.
Docker

- CentOS 6
- CentOS 7
node default {
  $basic_packages = ['git', 'vim', 'tig']

  package { $basic_packages:
    ensure => 'present',
  }

  service { 'chronyd':
    ensure => 'running',
    enable => 'true',
  }

  user { 'w0053283':
    ensure => 'present',
    managehome => 'true',
  }
}
## Mattermost

<table>
<thead>
<tr>
<th>Celf.lnx-machines</th>
<th>May 24, 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>foreman</strong> 10:29 AM</td>
<td>tier2-p-revprox-2.lcts.hpc.kuleuven.be has been built!</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Celf.lnx-machines</th>
<th>May 24, 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>foreman</strong> 11:14 AM</td>
<td>tier2-p-revprox-1.lcts.hpc.kuleuven.be has been built!</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Celf.lnx-machines</th>
<th>May 11, 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>foreman</strong> 10:25 AM</td>
<td>tier2-p-mam-1.lcts.hpc.kuleuven.be has been built!</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Celf.lnx-machines</th>
<th>May 10, 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>foreman</strong> 3:40 PM</td>
<td>tier2-p-svcs-1.lcts.hpc.kuleuven.be has been built!</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Celf.lnx-machines</th>
<th>May 10, 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>foreman</strong> 10:34 AM</td>
<td>tier2-p-svcs-2.lcts.hpc.kuleuven.be has been built!</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Celf.lnx-machines</th>
<th>May 8, 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>foreman</strong> 10:25 AM</td>
<td>tier2-p-mam-2.lcts.hpc.kuleuven.be has been built!</td>
</tr>
</tbody>
</table>
EVOLUTION OF SETUP

1. Bash scripts
2. Puppet code + version control
3. Puppet code rpm in Jenkins
4. Puppet code rpm in Jenkins, multiple git branches
5. Lots of tests (lint, rspec, catalog,...)
Error: puppet syntax error in code/environments/production/modules/profile/manifests/fw.pp (see above)
Error: 1 syntax error(s) found in puppet manifests. Commit will be aborted.
Skipping puppet-lint check due to prior errors.
Error: 1 subhooks failed. Please fix above errors.
# Jenkins Tests

<table>
<thead>
<tr>
<th>Average stage times:</th>
<th>[main] Running job</th>
<th>Setup environment</th>
<th>Deploy modules</th>
<th>Test hiera</th>
<th>Test ERB</th>
<th>Test PP</th>
<th>Test Lint</th>
<th>Test Lint</th>
<th>Test catalogs</th>
<th>Build RPMS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>154ms</td>
<td>4s</td>
<td>6s</td>
<td>2s</td>
<td>2s</td>
<td>6s</td>
<td>4s</td>
<td>NaN</td>
<td>NaN</td>
<td>17s</td>
</tr>
<tr>
<td>#506</td>
<td>196ms</td>
<td>1s</td>
<td>5s</td>
<td>2s</td>
<td>2s</td>
<td>7s</td>
<td>4s</td>
<td>5s</td>
<td>20s</td>
<td>97ms</td>
</tr>
</tbody>
</table>

**Jun 06 14:24**

1 commits
I JUST LEARNT I CAN PREVENT THIS

BY USING PUPPET-LINT
PUPPET-LINT

15:40:45 modules/profile/manifets/amod.pp should have no syntax error
15:40:45 modules/profile/manifets/resolvconf.pp should have no syntax error
15:40:45 modules/profile/manifets/hpc_ext.pp should have no syntax error
15:40:45 modules/profile/manifets/init.pp should have no syntax error
15:40:45 modules/profile/manifets/accelerator.pp - WARNING: string containing only a variable on line 13
15:40:45 modules/profile/manifets/accelerator.pp - WARNING: string containing only a variable on line 13
15:40:45 modules/profile/manifets/accelerator.pp - WARNING: variable not enclosed in {} on line 13
15:40:45 modules/profile/manifets/accelerator.pp - WARNING: variable not enclosed in {} on line 13
15:40:45 modules/profile/manifets/accelerator.pp should have no syntax error (FAILED - 1)
15:40:45 modules/profile/manifets/limits.pp should have no syntax error
15:40:45 modules/profile/manifets/collectd.pp should have no syntax error
15:40:45 modules/profile/manifets/keepalived.pp should have no syntax error
15:40:45 modules/profile/manifets/keepalived.pp should have no syntax error
JENKINS - PUPPET-CATALOG-TEST

Stage Logs (Test catalogs)

16:16:45 You should probably keep only one of them.
16:16:45 While it's not a problem now, it could cause errors if you change the version of just one of them later.
16:16:45 Your Gemfile lists the gem safe_yaml (=> 1.0.4) more than once.
16:16:45 You should probably keep only one of them.
16:16:45 While it's not a problem now, it could cause errors if you change the version of just one of them later.
16:16:45 Your Gemfile lists the gem librarian-puppet (>= 0) more than once.
16:16:45 You should probably keep only one of them.
16:16:45 While it's not a problem now, it could cause errors if you change the version of just one of them later.
16:16:46 [INFO] Using puppet 4.8.1
16:17:01 [PASSED] tier2-p-svcs-1.icts.hpc.kuleuven.be (compile time: 15.262439351 seconds)
16:17:01 [PASSED] login1.tier1.hpc.kuleuven.be (compile time: 0.008651917 seconds)
16:17:01 [PASSED] tier1-p-moab-1.tier1.hpc.kuleuven.be (compile time: 0.008209054 seconds)
16:17:01 [PASSED] r01i02n1.tier1.hpc.kuleuven.be (compile time: 0.007266043 seconds)
16:17:02 [PASSED] tier1-p-svcs-1.tier1.hpc.kuleuven.be (compile time: 15.351039313 seconds)
16:17:02 make: Leaving directory `~/jenkins/workspace/_HPC_puppet-hpc-code_master-EK32UX3QGwBITTIPSPZAAB155PZGT2NF3C6JHTOPFAUQX24w7DDQ/src'
# Jenkins Build

|------------------|-------------------------------|------------------------|--------------------------|-------------------|-----------------------|-------------------|------------------------|------------------------|--------------------------------|
JENKINS - MATTERMOSST

jenkins BOT 2:25 PM

```text
team-faciliteiten-voor-onderzoek/rpms/HPC/puppet-hpc-code/master - #506 master el6 started by changes from yorick.poels (open, console)
```

jenkins BOT 2:30 PM

```text
team-faciliteiten-voor-onderzoek/rpms/HPC/puppet-hpc-code/master - #506 master el6 ✔ Success after 5 min 36 sec (open, console)
```

jenkins BOT 2:30 PM

```text
team-faciliteiten-voor-onderzoek/rpms/HPC/puppet-hpc-code/master - #506 master el7 started by changes from yorick.poels (open, console)
```

jenkins BOT 2:36 PM

```text
team-faciliteiten-voor-onderzoek/rpms/HPC/puppet-hpc-code/master - #506 master el7 ✔ Success after 5 min 32 sec (open, console)
```
Deploy

1. `> -`
2. `puppet`
3. `puppet`
PUPPET-HPC SCRIPT

```bash
# PUPPET-HPC

function do_yum()
{
    YUM_REPOS="--disablerepo=--enablerepo=mul","puppet","octs="*
    export PATH=/opt/puppetlabs/bin:/opt/puppetlabs/puppet/bin
    MAX_TRIES=300
    PUPPET_ROOT=/var/lib/hpc-puppet

    if [[ ! -f /etc/puppet/facts.d/cluster.txt* ]];
    then
        PRIMARY_IP=$(hostname -I | grep -o '10[\ .]\d\.[\ .]118\.[\ .]18-IP\ ]' | head -n 1 | sed 's/\./:/')
        HEX_IP=$(printf "HEXIP="$PRIMARY_IP" | sed 's/\//\x/')

        case "$HEX_IP" in
            0A:76:E[0-9]*:*) # 10.118.2[24-31]
                CLUSTER_TYPE=tier2
                CLUSTER_INSTALLATION=2014
            ;;
            0A:76:C[8-5]*:*) # 10.118.20[0-7]
                CLUSTER_TYPE=tier1
                CLUSTER_INSTALLATION=2014
            ;;
            0A:76:F2:*:*)  # 10.118.242.0/24
                CLUSTER_TYPE=tier3
            ;;
            *)
        esac
    fi
}
```

Deploy multiple

```
[icon]
```

```
puppet
```

```
[server1] [server2] [server3] [server4] [server5] [server6] [server7] [server8] [server9] [server10]
```

```
[icon] puppet
```

```
[server1] [server2] [server3] [server4] [server5] [server6] [server7] [server8] [server9] [server10]
```

```
[icon] puppet
```

```
[server1] [server2] [server3] [server4] [server5] [server6] [server7] [server8] [server9] [server10]
```

```
[icon] puppet
```

```
[server1] [server2] [server3] [server4] [server5] [server6] [server7] [server8] [server9] [server10]
```

```
[icon] puppet
```

```
[server1] [server2] [server3] [server4] [server5] [server6] [server7] [server8] [server9] [server10]
```

```
[icon] puppet
```

```
[server1] [server2] [server3] [server4] [server5] [server6] [server7] [server8] [server9] [server10]
```

```
[icon] puppet
```

```
[server1] [server2] [server3] [server4] [server5] [server6] [server7] [server8] [server9] [server10]
```
CONCLUSION

Disadvantages

- Slower than file based setup
- Logical mistakes still happen
- Learning curve
Advantages

- Lot of errors caught during testing
- Versioning (rpms)
- Reproducible builds / code
- (More) predictable outcome
- Puppet code as documentation
Future

- Spec tests (serverspec,...)
- Production branch
- Code review
- ...

Future

Spec tests (serverspec,...)
Production branch
Code review
...
▶ Step by step
▶ Fail early & often (before breaking too much ;) )
▶ Small improvements
▶ Version control
▶ Lint
▶ Suitable solution
▶ ...

ToC
INTRO

TOOLS

EVOLUTION OF SETUP

WORKFLOW

CONCLUSION

...
REFS

- http://puppet-lint.com
- http://serverspec.org
- http://www.kuwata-lab.com/kwalify
- https://about.mattermost.com
- https://git-scm.com
- https://github.com/42wim/matterstuff
- https://github.com/cea-hpc/clustershell
- https://github.com/drwahl/puppet-git-hooks
- https://github.com/github/octocatalog-diff
- https://github.com/grondo/pdsh
- https://github.com/invadersmustdie/puppet-catalog-test
- https://github.com/voxpupuli/librarian-puppet
- https://jenkins.io
- https://puppet.com
- https://www.theforeman.org