

Puppet Configuration Management

code your config

SLAC

06.06.2013

Martin Alfke

<martin.alfke@buero20.org>

© Martin Alfke - 2013

Agenda

puppet environments
puppet modules
puppet templates
puppet and augeas
puppet multi master
puppet without master

Agenda

enc and hiera

puppet db

puppet dashboard

Environments

“admin’s and dev’s cooperate!”

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hierarchical - Puppet DB - Dashboard

© Martin Alfke - 2013

Environments

- Split up modules into several repositories
- “production” is default and always there
- Naming is arbitrary
- Master needs to know about environments
- Client needs to send environment information

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hierarchical - Puppet DB - Dashboard

© Martin Alfke - 2012

Environments

- Each environment may have multiple modulepaths

[master]

[test]

manifest = /etc/puppet/test/manifests/site.pp

modulepath = /etc/puppet/test/modules:/data/puppet/team/test/modules

[mailteam]

manifest = /etc/puppet/mail/manifests/site.pp

modulepath = /etc/puppet/mail/modules:/data/puppet/team/core/modules

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

Environments

- Environments made easy

[master]

manifest = /etc/puppet/\$environment/manifests/site.pp

modulepath = /etc/puppet/core/modules:/data/puppet/\$environment/
modules

[agent]

environment = test

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

Modules

“plug things together simple”

Environments - **Modules** - Templates - Augeas - Master - Masterless -
ENC and Hieradata - Puppet DB - Dashboard

© Martin Alfke - 2013

Modules

- Difference between modules and classes
 - Module:
 - strict directory and file naming for autoloading
 - each module has at least one class
 - Class:
 - available but not applied automatically

Environments - **Modules** - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

Modules

- **directory structure**

```
/etc/puppet/test/modules/ <-- modulepath
  apache/                  <-- modulename
  manifests/              <-- manifests path within module
    init.pp               <-- initial class fetched from autoloader
    server.pp             <-- additional class(es)
  files/                  <-- directory for module file serving
  templates/              <-- directory for module templates
  lib/                    <-- directory for facts or functions
  tests/                  <-- directory for tests during develop
```

Environments - **Modules** - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

Modules

- class, file and template naming structure

/etc/puppet/test/modules/

apache/

manifests/

init.pp

<-- class apache { ... }

server.pp

<-- class apache::server { ... }

files/

<-- “puppet:///modules/apache/<filename>”

templates/

<-- template(‘apache/<filename>’)

lib/

tests/

<-- class { ‘apache’: }

Environments - **Modules** - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

Modules

- class structure

```
class apache {  
  package { 'apache2': ensure => present, }  
  file { '/etc/apache2/apache2.conf':  
    content => template('apache/apache2.conf.erb'),  
  }  
  file { '/etc/apache2/conf.d/charset':  
    source => 'puppet:///modules/apache/charset',  
  }  
  service { 'apache2': ensure => running, }  
}
```

Environments - **Modules** - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

Modules

- use classes on nodes

```
node 'www01.domain.tld' {  
    class { 'apache': }    <-- old: include apache  
}
```

Environments - **Modules** - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

Modules

- resources, classes, parameterized classes

```
resource_type { 'title':  
    attribute => value,  
}
```

Environments - **Modules** - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

Modules

- resources, classes, parameterized classes

```
resource_type { 'title':  
    attribute => value,  
}
```

```
class <title> { ... }
```

```
class <title> ( $variable = value ) { ... }
```

Environments - **Modules** - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

Modules

- resources, classes, parameterized classes

```
resource_type { 'title':  
    attribute => value,  
}
```

```
class <title> { ... }  
class <title> ( $variable = value) { ... }
```

```
class { '<title>': }  
class { '<title>':  
    variable => value,  
}
```

Environments - **Modules** - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

Modules

- using ruby in classes (obsolete)

/etc/puppet/test/modules/apache/manifests/init.rb

```
hostclass :apache do
  package :apache2, :ensure => present
  package :libapache2-php, :ensure => present
  service :apache2, :ensure => running
end
```

Environments - **Modules** - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

Modules

- many modules are already there
 - puppet module forge
 - example42.com
 - github.com

Environments - **Modules** - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

Modules

- some modules are too simple
 - e.g. I want my SSH config to be different on some hosts
- some modules are too complex
 - 100 variables for 25 different distributions? I only use Debian.

Environments - **Modules** - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

Templates

“code your config”

Environments - Modules - **Templates** - Augeas - Master - Masterless -
ENC and Hieradata - Puppet DB - Dashboard

© Martin Alfke - 2013

Templates

- Ruby ERB template engine
- Normally requires in-depth configuration review
- Be aware of variable scoping !

Environments - Modules - **Templates** - Augeas - Master - Masterless -
ENC and Hierarchical - Puppet DB - Dashboard

© Martin Alfke - 2012

Templates

- use variables from puppet in templates

```
$ntpserver = '10.2.3.4'
```

```
file { '/etc/ntp.conf':
```

```
    content => template('ntp/ntp.conf.erb'),
```

```
}
```

```
# ntp.conf.erb
```

```
<% if @ntpserver %>
```

```
<-- old: if has_variable('ntpserver')
```

```
server <%= @ntpserver %>
```

```
<-- @ syntax is new. uses current scope
```

```
<% else %>
```

```
server pool.ntp.org
```

```
<% end %>
```

Environments - Modules - **Templates** - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

Templates

- use variables from facter in templates

```
use facts_dot_d from stdlib
/etc/facter/facts.d/foo.txt
ntpserver = aa.bb.cc.dd
```

```
# ntp.conf.erb
<% if @ntpserver %>
server <%= @ntpserver %>
<% else %>
server pool.ntp.org
<% end %>
```

Environments - Modules - **Templates** - Augeas - Master - Masterless -
ENC and Hieradata - Puppet DB - Dashboard

© Martin Alfke - 2012

Augeas

“clean your lenses”

Environments - Modules - Templates - **Augeas** - Master - Masterless -
ENC and Hierarchical - Puppet DB - Dashboard

© Martin Alfke - 2013

Augeas

- Make changes to single lines
- Do not manage the complete configuration file in puppet
- Reminder: Puppet is declarative !!!

Environments - Modules - Templates - **Augeas** - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

Augeas

- augeas uses lenses to split up config files

```
augtool print /files/etc/sysctl.conf
```

```
augtool set net.ipv4.forward 1
```

```
augeas { 'set_ipv4_forward':  
    context => '/files/etc/sysctl.conf',  
    changes => "set net.ipv4.forward 1",  
}
```

Environments - Modules - Templates - **Augeas** - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

Augeas

- Attention!
- Not all configuration files are supported !
- Augeas needs key-value pairs
- Within puppet ruby-augeas extension is required

Environments - Modules - Templates - **Augeas** - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

Multi Master

“no one can serve two masters!”

Environments - Modules - Templates - Augeas - **Master** - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2013

Multi Master

- Load-Balancing with SSL separation
- several Data Center
- do you really have more than 1000 nodes?

Environments - Modules - Templates - Augeas - **Master** - Masterless -
ENC and Hieradata - Puppet DB - Dashboard

© Martin Alfke - 2012

Multi Master

- separate puppet ca and puppet master

puppet.conf on puppet ca (single instance)

```
[master]
```

```
ca = true
```

puppet.conf on puppet master

```
[master]
```

```
ca = false
```

puppet.conf on agent

```
[agent]
```

```
ca_server = <puppet ca>
```

```
server = <puppet master>
```

Environments - Modules - Templates - Augeas - **Master** - Masterless -
ENC and Hiera - Puppet DB - Dashboard

Multi Master

- use multiple master (without ca)
 - apache/nginx and loadbalancing
 - ipvsadm

Environments - Modules - Templates - Augeas - **Master** - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

Multi Master

- use multiple master (without ca)
 - pros:
 - file serving handled better
 - more masters compile catalogs
 - cons:
 - single ca only

Environments - Modules - Templates - Augeas - **Master** - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

Multi Master

- avoid multiple masters
 - use templates !
 - templates are generated on the master during catalog compilation
 - files needs to get fetched by the nodes
- use mod_passenger

Environments - Modules - Templates - Augeas - **Master** - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

without Master

“you shall have no master”

Environments - Modules - Templates - Augeas - Master - **Masterless** -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2013

without Master

- Pre-compile catalogs
- Run puppet apply locally

Environments - Modules - Templates - Augeas - Master - **Masterless** -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

without Master

- Very large environment (> 15.000 nodes)
- Multiple locations world wide

Environments - Modules - Templates - Augeas - Master - **Masterless** -
ENC and Hieradata - Puppet DB - Dashboard

© Martin Alfke - 2012

without Master

- Compile catalogs for all nodes on master
 - `puppet master compile <fqdn>`
- Copy catalogs to nodes to execute them
 - `puppet apply --catalog <catalog file name>`

Environments - Modules - Templates - Augeas - Master - **Masterless** -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

without Master

- Pros:
 - no dedicated master, catalog compilation may take place everywhere
- Cons:
 - no modules !!
 - fileserving has to be done locally (e.g. NFS mount)

Environments - Modules - Templates - Augeas - Master - **Masterless** -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

ENC and Hiera

“data, data, data”

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2013

ENC and Hiera

- External Nodes Classifier
 - executable with one parameter (fqdn)
 - can be anything
 - get info from filesystem: `cat $1.yaml`
 - get info from inventory database

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

ENC and Hiera

- Hiera - hierarchial data structure
 - built in into Puppet 3.x
 - add-on in Puppet 2.7.x

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

ENC and Hiera

- ENC in puppet

```
/etc/puppet/puppet.conf
```

```
[master]
```

```
node_terminus = exec
```

```
external_nodes = /etc/puppet/bin/my_great_enc.exe
```

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

ENC and Hiera

- `/etc/puppet/bin/my_great_enc.exe www1.domain.tld`

parameters:

location: de-ber2

classes:

ntp:

ntpserver: 10.2.2.2

apache:

mysql:

environment: production

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

ENC and Hiera

- Hiera configuration

```
/etc/puppet/hiera.yaml
```

```
:hierarchy:
```

- %{operatingsystem}
- common
- %{datacenter}
- %{serverfunction}

```
:backends:
```

- yaml

```
:yaml:
```

```
:datadir: '/etc/puppet/hieradata'
```

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

ENC and Hiera

- Hiera data

```
/etc/puppet/hieradata/Debian.yaml
```

```
---
```

```
ssh_packages: openssh-server, openssh-client, openssh-blacklist
```

```
/etc/puppet/hieradata/CentOS.yaml
```

```
---
```

```
ssh_packages: openssh, openssh-clients, openssh-server
```

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

ENC and Hiera

- Hiera usage

```
/etc/puppet/modules/ssh/manifests/init.pp
```

```
class ssh ( $ssh_packages = 'default' ) {                                <-- Puppet 3.x
    $ssh_packages = hiera('ssh_packages')                                <-- Puppet 2.7.x
    package { "${ssh_packages}": ensure => present }
}
```

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - Dashboard

© Martin Alfke - 2012

PuppetDB

“getting it all”

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hiera - **Puppet DB** - Dashboard

© Martin Alfke - 2013

PuppetDB

- Used for storeconfigs and exported resources
- Schema for PostgreSQL
- Will get more features soon

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hiera - **Puppet DB** - Dashboard

© Martin Alfke - 2012

Dashboard

“management needs graphs”

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - **Dashboard**

© Martin Alfke - 2013

Dashboard

- Open Source Dashboard is dead end
- PuppetLabs is working on other tools

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - **Dashboard**

© Martin Alfke - 2012

Dashboard

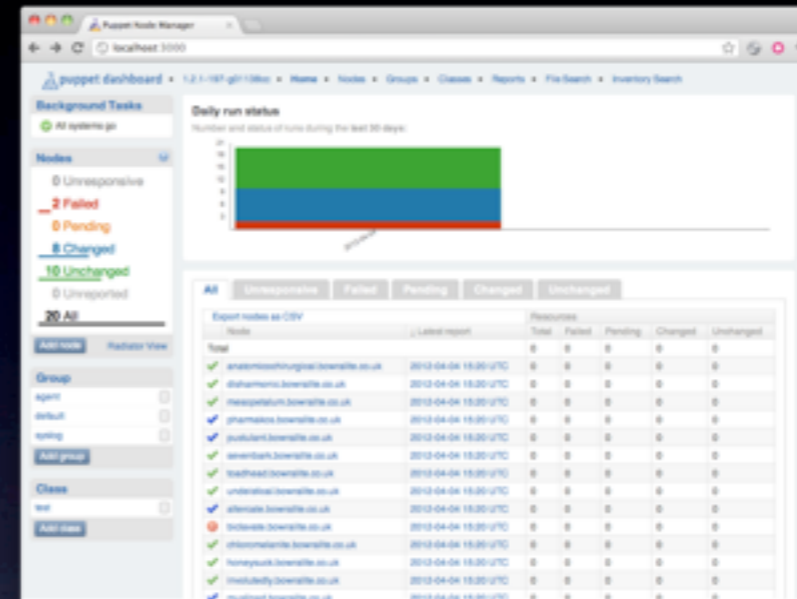
- Razor
- Foreman
- initr (Redmine plugin - ENC)
- OpenNMS Puppet Node Pusher (ENC)

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - **Dashboard**

© Martin Alfke - 2012

Dashboard

- Dashboard
 - ENC
 - Reporting
 - Live Management (Enterprise only)
 - Auditing (Enterprise only)
 - MCollective Frontend (Enterprise only)



Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - **Dashboard**

Dashboard

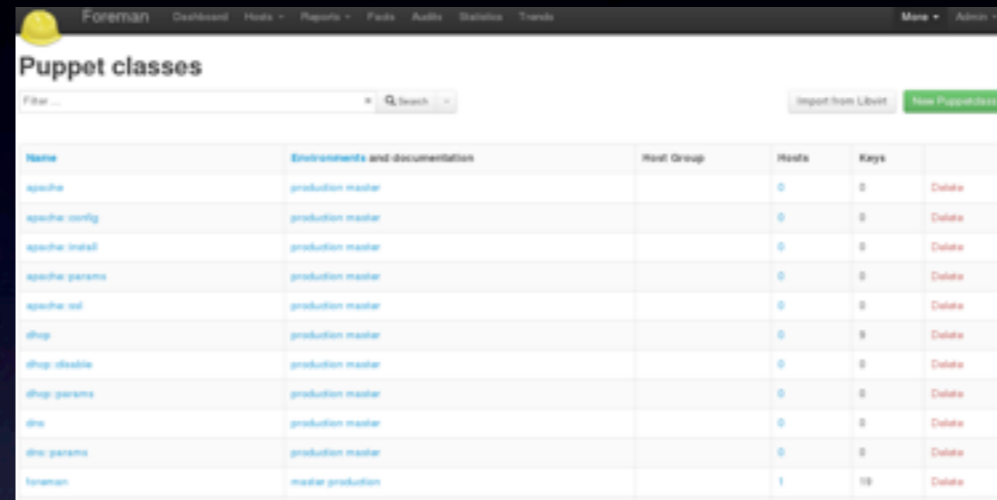
- Razor
 - Provisioning
 - needs MongoDB, NodeJS, NPM
 - DHCP, TFTP, PXE
 - puppetlabs-razor module (CentOS, RHEL)

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - **Dashboard**

© Martin Alfke - 2012

Dashboard

- Foreman
 - ENC
 - Reporting
 - Provisioning



The screenshot shows the 'Puppet classes' dashboard in Foreman. It features a search bar, a 'Filter' dropdown, and a 'New Puppet class' button. Below is a table listing various puppet classes.

Name	Environments and documentation	Host Group	Hosts	Keys	
apache	production master		0	0	Delete
apache-verify	production master		0	0	Delete
apache-install	production master		0	0	Delete
apache-params	production master		0	0	Delete
apache-ssl	production master		0	0	Delete
httpd	production master		0	0	Delete
httpd-disable	production master		0	0	Delete
httpd-params	production master		0	0	Delete
httpd	production master		0	0	Delete
httpd-params	production master		0	0	Delete
foreman	master production		1	10	Delete

Environments - Modules - Templates - Augeas - Master - Masterless -
ENC and Hiera - Puppet DB - **Dashboard**

© Martin Alfke - 2012

Puppet Configuration Management

Demo

- hiera
- facts.d
- Foreman
 - mco
- PuppetDB

Puppet Configuration Management

Questions?

Martin Alfke
<martin.alfke@buero20.org>

© Martin Alfke - 2013

Puppet Training

24.06.-26.06.2013

30.10.-01.11.2013

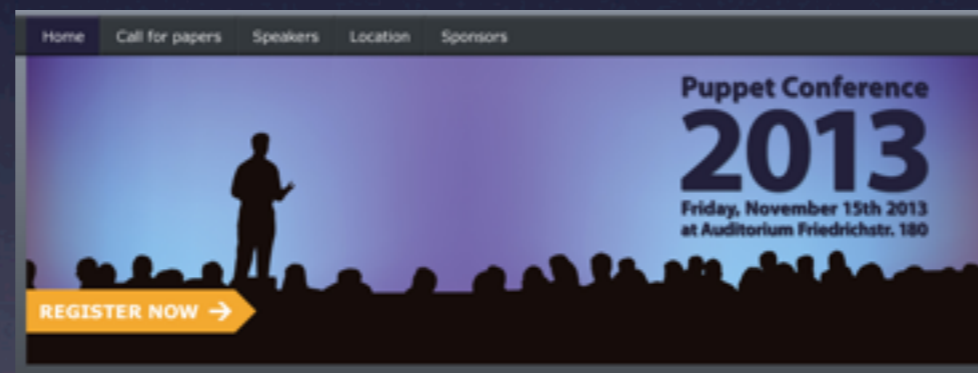
www.heinlein-support.de/schulung/puppet

© Martin Alfke - 2013

1st PuppetCamp Berlin

15.11.2013

code-your-config.com



Website and registration launches in late July