IT Automation with Puppet

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FreeBSD user since 2002
(I guess… FreeBSD 5.0-BETA1)

FreeBSD developer since 2010
(romain@)

Was a Systems Administrator for HeathGrid working on EGI (European Grid Infrastructure)

Discovered Puppet at that time
(~10 years ago… 0.25 -> 2.6)

Photo: Ollivier Robert

Agenda

- Understanding how Puppet works
- Puppet from Zero to Hero
    - Installing
    - Managing Code
    - Organizing Code
    - Hiera
    - Custom Facts
    - PuppetDB
    - Orchestration

As soon as something is unclear, raise your hand!

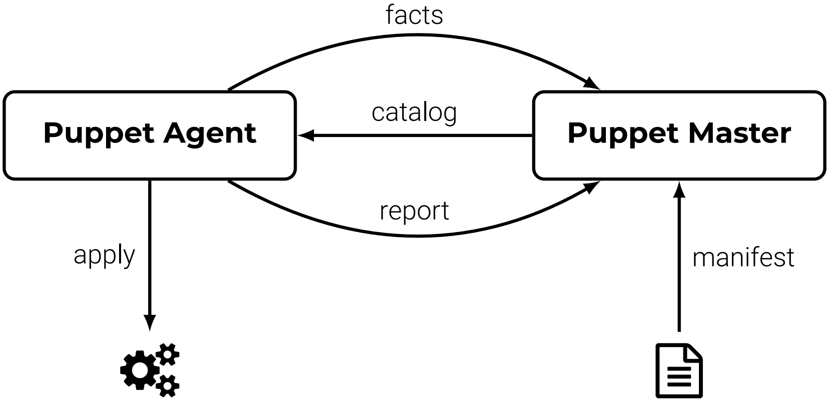
Why would you use Puppet?

Automation!

Why automate?

- Consistency
- Predictability
- Reliability
- Speed

The Big Picture



The Puppet Language

Declaring resources

```
user { 'romain':
  ensure  => present,
  comment => '& Tartiere',
  shell   => '/usr/local/bin/zsh',
}
```

The Puppet Language

Variables

```
$motd = @("EOT")
  This is ${facts['networking']['fqdn']},
  running ${facts['os']['family']} ${facts['os']['architecture']}
  | EOT

file { '/etc/motd':
  ensure  => file,
  owner   => 'root',
  group   => 'wheel',
  content => $motd,
}
```

The Puppet Language

Facts

Facts are collected by `facter(1)`.

```
# facter
[...]
os => {
  architecture => "amd64",
  family => "FreeBSD",
  hardware => "amd64",
  name => "FreeBSD",
  release => {
    full => "11.1-RELEASE-p10",
    major => "11",
    minor => "1-RELEASE-p10"
  }
}
[...]
```

The Puppet Language

Conditionals & functions

```
if versioncmp($foo_version, '1.0') >= 0 {
  service { 'foo':
    ensure => running,
    enable => true,
  }
}

$users = ['foo', 'bar', 'baz']
$users.each |$user| {
  file { "/home/${user}/.foorc":
    ensure => file,
    owner  => $user,
    group  => $user,
  }
}
```

The Puppet Language

Classes

```
class foo {
  package { 'foo':
    ensure => installed,
  }

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

  Package['foo'] -> Service['foo']
}
```

```
include foo
require foo
contain foo
class { 'foo': }
```

The Puppet Language

Defined classes

```
define root_file (
  String $text,
) {
  file { "/${title}":
    ensure  => file,
    content => $text,
  }
}

root_file { 'LICENSE':
  text => "BSD 2 clauses\n",
}
root_file { 'SYSADMINS':
  text => "romain\n",
}
```

The Puppet Language

Node dependent resources

```
node 'foo.example.com' {
  file { '/usr/bin/rsh':
    ensure => absent,
  }
}

node /^foo-/ {
  include foo
}

node default {
  service { 'puppet':
    enable => true,
  }
}
```

Modules

Adding some abstraction

Wrap all resources to manage something (e.g. *apache*, *postgresql*)

Abstracts OS-specific information, e.g.

- Service names;
- Package names;
- Configuration file paths;
- ...

The Forge

Where to find modules

`https://forge.puppet.com`

Central repository for modules

5600+ modules available

430+ modules for managing ssh

Some authors do not publish their modules on the forge…

Installing

Puppet Agent

```
# pkg install puppet5

# puppet resource service puppet ensure=running enable=true
```

Installing

Puppet Master

```
# pkg install puppetserver5
```

```
# puppet resource service puppetserver ensure=running enable=true
```

Hint: You may want to adjust `puppetserver_login_class` in `/etc/rc.conf`

Getting started

The first steps

Put your manifest files (`*.pp`) under `/usr/local/etc/puppet/environments/production/manifests/`

Discover the Puppet language; experiment with modules

Hints:

- start with something you master
- start with something that applies to all your nodes (ssh, logging, monitoring, ...)
- stop as soon as you start to copy-paste code

Control repo

Manifests are code

Manifests are code is managed with a VCS

Template: `https://github.com/puppetlabs/control-repo/`

git branch $\Longleftrightarrow$ Puppet environment

Default branch: *production*

Control repo

Deployment with R10K

https://github.com/puppetlabs/r10k

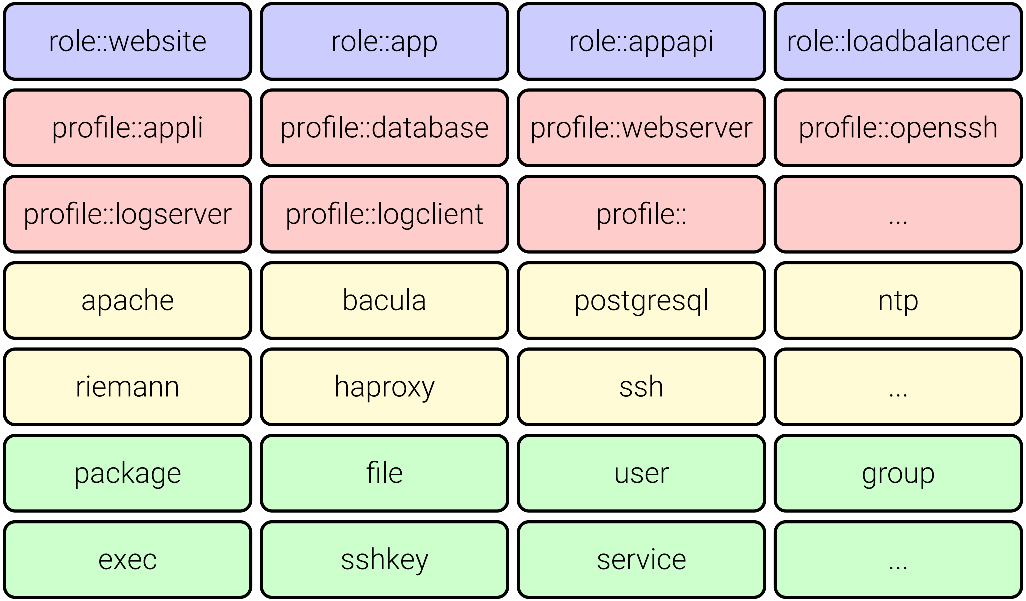
Extracts each branch of the control repo in a separate directory

```
r10k deploy environment production -vp
puppet generate types --environment production
```

Hint: implement a *post-receive* hook

Roles and Profiles

Overview



role::website	role::app	role::appapi	role::loadbalancer
profile::appli	profile::database	profile::webserver	profile::openssh
profile::logserver	profile::logclient	profile::	...
apache	bacula	postgresql	ntp
riemann	haproxy	ssh	...
package	file	user	group
exec	sshkey	service	...

Roles and Profiles

Nodes

Find me in `manifests/*.pp`

```
node 'ns48724.example.com' {
  include role::website
}

node 'ns38711.example.com' {
  include role::product
}

node default {
  include role::base
}
```

Roles and Profiles

Roles

Find me in `site/role/manifests/*.pp`

```
class role::base {
  include profile::openssh
  include profile::syslog
}

class role::website inherits role::base {
  include profile::webserver
  include profile::example_com_website
}

class role::product inherits role::base {
  include profile::database
  include profile::product_runner
}
```

Roles and Profiles

Profiles

Find me in `site/profile/manifests/*.pp`

```
class profile::webserver {
  class { 'apache':
    default_vhost => false,
    default_mods  => false,
    mpm_module    => 'event',
    server_tokens => 'Prod',
  }

  class { 'apache::mod::ssl':
    ssl_cipher   => 'HIGH:!aNULL:!MD5:!RC4',
   ssl_protocol => ['all', '-SSLv2', '-SSLv3', '-TLSv1', '-TLSv1.1'],
  }

  # ...
}
```

Interlude

include vs. resource-style declaration

```
include apache
```

```
include apache
```

```
class { 'apache':
  mpm_module    => 'event',
  server_tokens => 'Prod',
}
```

```
class { 'apache':
  mpm_module    => 'prefork',
  server_tokens => 'Full',
}
```

Roles and Profiles

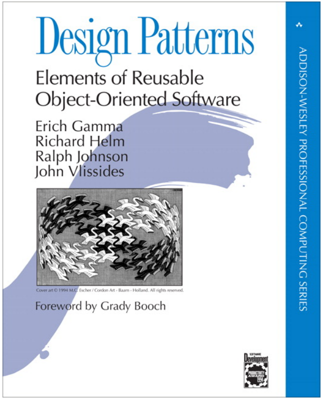
Profiles with parameters

```
class profile::mailserver (
  Enum['relayhost', 'smarthost'] $configuration = 'smarthost',
) {
  $listen_address = $configuration ? {
    'relayhost' => ['::1', '127.0.0.1'],
    'smarthost' => ['::', '0.0.0.0'],
  }
  # ...

  class { 'postfix':
    listen => $listen_address,
    # ...
  }
}
```

Roles and Profiles

...while talking about patterns


Design Patterns
Elements of Reusable Object-Oriented Software
Erich Gamma
Richard Helm
Ralph Johnson
John Vlissides
Cover art © 1994 M.C. Escher / Cordon Art - Baarn - Holland. All rights reserved.
Foreword by Grady Booch
ADDISON-WESLEY PROFESSIONAL COMPUTING SERIES

Think *Facade* and *Adapter* design patterns

A facade is used when a simple interface to a complex or difficult to understand system is desired.

Interfaces may be incompatible, but the inner functionnality should suit the need. The adapter design pattern allows otherwise incompatible classes to work together by converting the interface of one class into an interface expected by the the client.

Roles and Profiles

Summary

Nodes

- include a single role

Roles

- include any number of profiles
- are named after business names

Profiles

- declare actual resources
- are named after technology stack

Hiera

Used for *Automatic Parameter Lookup*

Configured in `hiera.yaml` and `data/**/*.yaml`

alpha	beta	gamma	delta	`nodes/%{facts.hostname}.yaml`
dc1			dc2	`dc/%{facts.datacenter}.yaml`
n/a				`common.yaml`

```
---
profile::mailserver::configuration: 'relayhost'
```

Custom Facts

Helps classification

Room number (e.g. *B21*)

Encodes:

- Building (first letter)
- Floor (first digit)
- Actual number of the room (last digit)

Can be static or dynamically inferred from:

- hostname (e.g. *b21-02*)
- ipaddress (e.g. each room has it's own IPv4 /24)

Custom Facts

Structured Data Facts

Can be set in `/usr/local/etc/facter/facts.d/room.yaml`:

```
---
room: B21
building: B
floor: 2
room_number: 1
```

Custom Facts

Dynamic Facts

Usually set in a module in `<module>/lib/facter/room.rb`:

```
Facter.add(:room) do
  setcode do
    if Facter.value('hostname').match(/\A([a-c]\d\d)-\d+\z/)
      $1.upcase
    end
  end
end

Facter.add(:building) do
  setcode do
    if room = Facter.value('room')
      room[0]
    fi
  end
end
```

Custom Facts

External Facts

Usually set in a module in `<module>/facts.d/room`:

```
#!/bin/sh
room=$(hostname | sed -o '^...' | tr 'a-z' 'A-Z')
set -- $(echo $room | sed -e 's/\(.\)/\1 /g')

cat <<EOT
room=$room
building=$1
floor=$2
room_number=$3
EOT
```

PuppetDB

Put Your Data to Work

Stores:

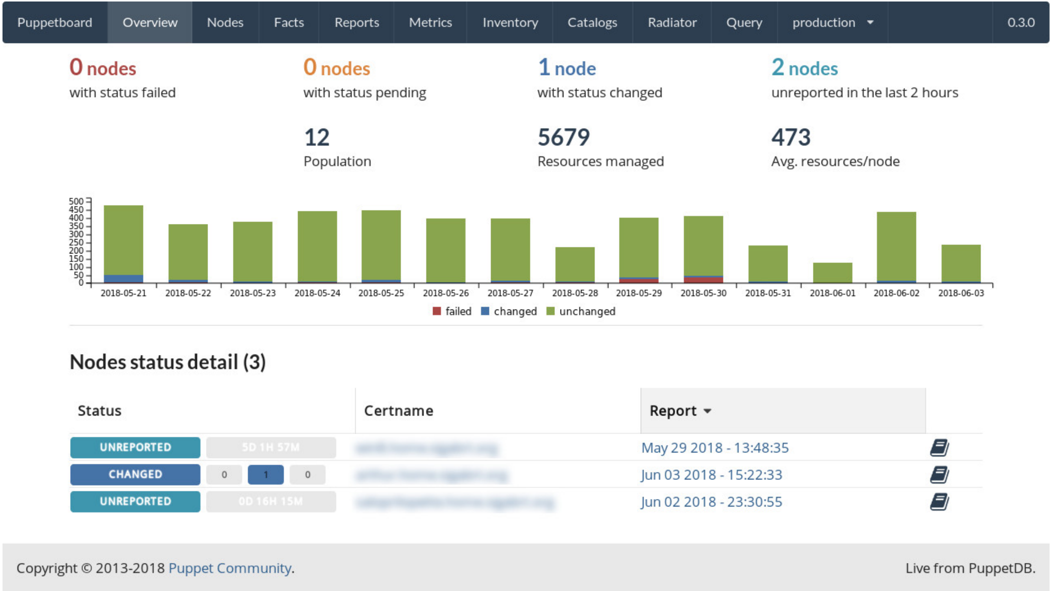
- Facts
- Catalogs
- Reports

Puppet Query Language

Allows exporting resources when configuring a node and collecting them on another node
Use cases: ssh keys fingerprints, backups, …

PuppetDB

Puppetboard



Puppetboard | Overview | Nodes | Facts | Reports | Metrics | Inventory | Catalogs | Radiator | Query | production ▾ | 0.3.0

0 nodes
with status failed

0 nodes
with status pending

1 node
with status changed

2 nodes
unreported in the last 2 hours

12
Population

5679
Resources managed

473
Avg. resources/node

Nodes status detail (3)

Status		Certname	Report ▾	
UNREPORTED	5D 1H 57M	[redacted]	May 29 2018 - 13:48:35	📘
CHANGED	0 1 0	[redacted]	Jun 03 2018 - 15:22:33	📘
UNREPORTED	0D 16H 15M	[redacted]	Jun 02 2018 - 23:30:55	📘

Live from PuppetDB.

Orchestration

Configuration Management vs. Orchestration

The Marionette Collective

- A lot of options to choose from
- Usability depends on your choices
- Security depends on your choices

Choria

- Secure by default
- Easy to maintain
- Production ready

Choria

Work In Progress Ports

Get the WIP `sysutils/choria` port:
`https://github.com/smortex/puppet5/`

For assistance: `#choria` channel on *puppetcommunity* slack
`https://puppetcommunity.slack.com/messages/C9KFTKRU3/`

Jumping in!

Try it!
`https://wiki.freebsd.org/Puppet/GettingStarted`

Report success & failures to `puppet@`

For assistance: `#freebsd` channel on *puppetcommunity* slack
`https://puppetcommunity.slack.com/messages/C6CK0UGB1/`

As usual, Problem Reports are welcome!

Contributing with upstream

Most projects are public on GitHub:
`https://github.com/puppetlabs/`

You'll have to sign a *Contributor License Agreement* (CLA)

You'll also need a Jira Account on
`https://tickets.puppetlabs.com/`

Pull-Requests are merged

Thanks!