

# Gestione del ciclo di vita dei server con Foreman e Puppet

Giuseppe Misurelli

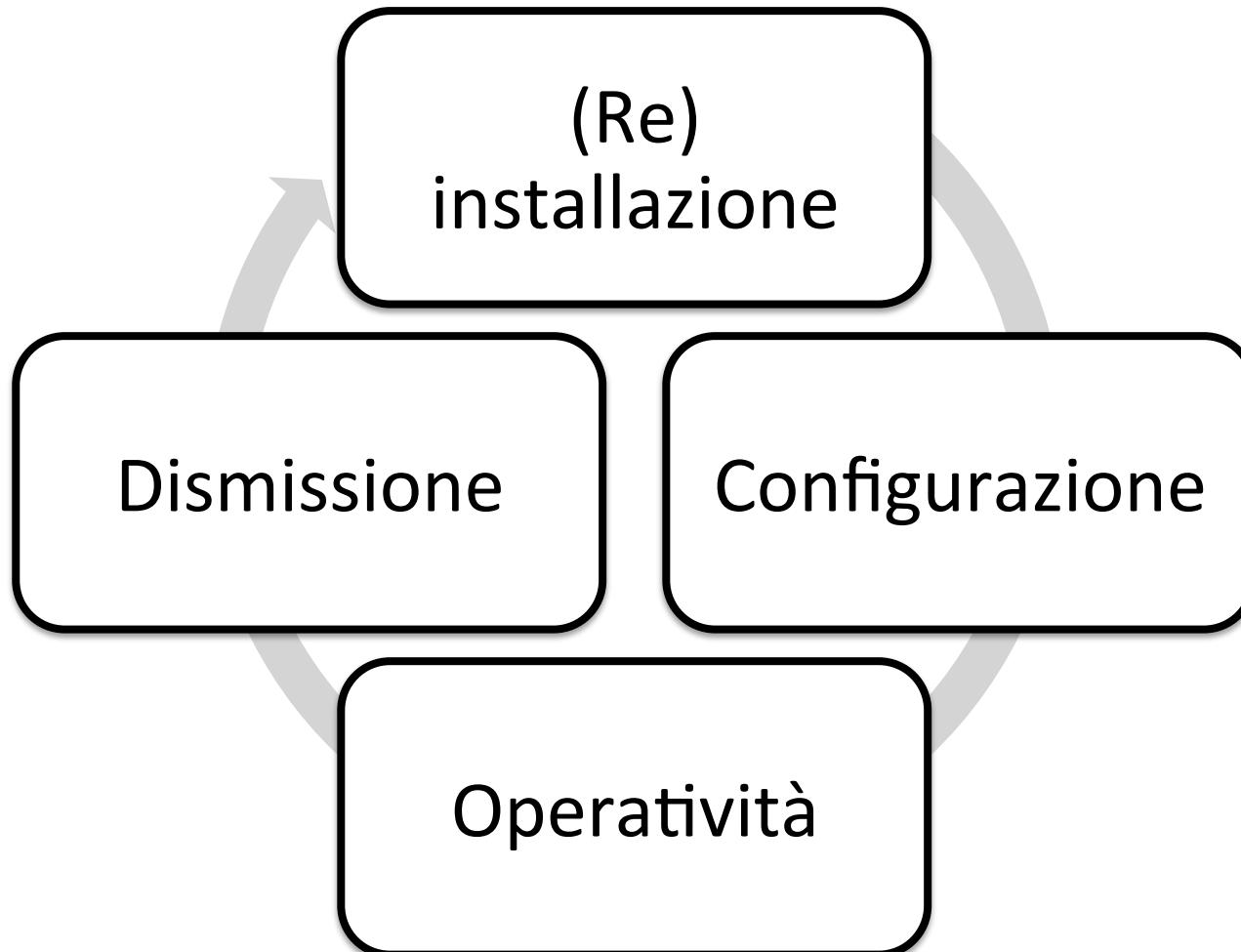
Michele Pezzi

Paolo Veronesi

# Argomenti di discussione

- Descrizione di Foreman (Misurelli)
  - Funzionalità del sistema
- Integrazione di Puppet (Veronesi)
  - Configurazione e reportistica
    - Evoluzione seminario  
[https://agenda.cnaf.infn.it/conferenceDisplay.py?  
confId=579](https://agenda.cnaf.infn.it/conferenceDisplay.py?confId=579)
- Estensione ad altri casi d'uso CNAF (Pezzi)
  - Adozione in altri ambiti

# Ciclo di vita di un server

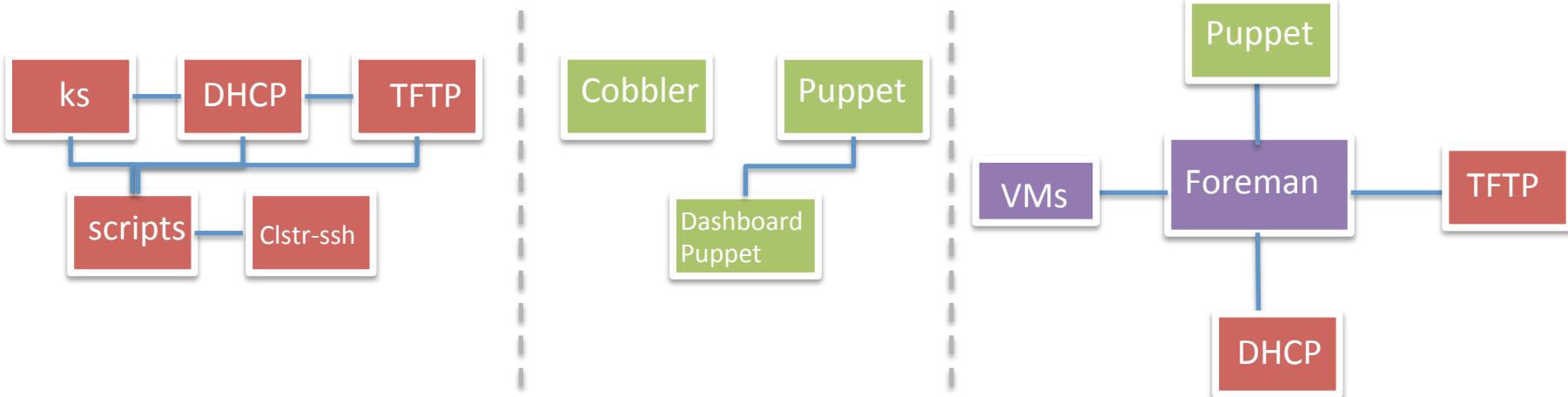


# Evoluzione della gestione nel nostro reparto

PXE, postinstall,  
scripts

Cobbler,  
Puppet

Foreman

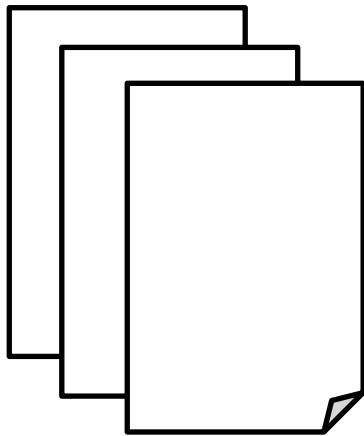


Tutte le volte che installi e configuri ricordati di...

Installazione e configurazione separati

Installazione e configurazione interagiscono in un unico punto

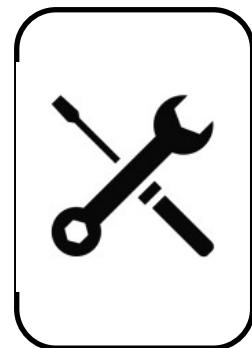
# Cos'è Foreman?



Ruby on Rails app



Web UI, API, CLI



CFG mgmt (Puppet)



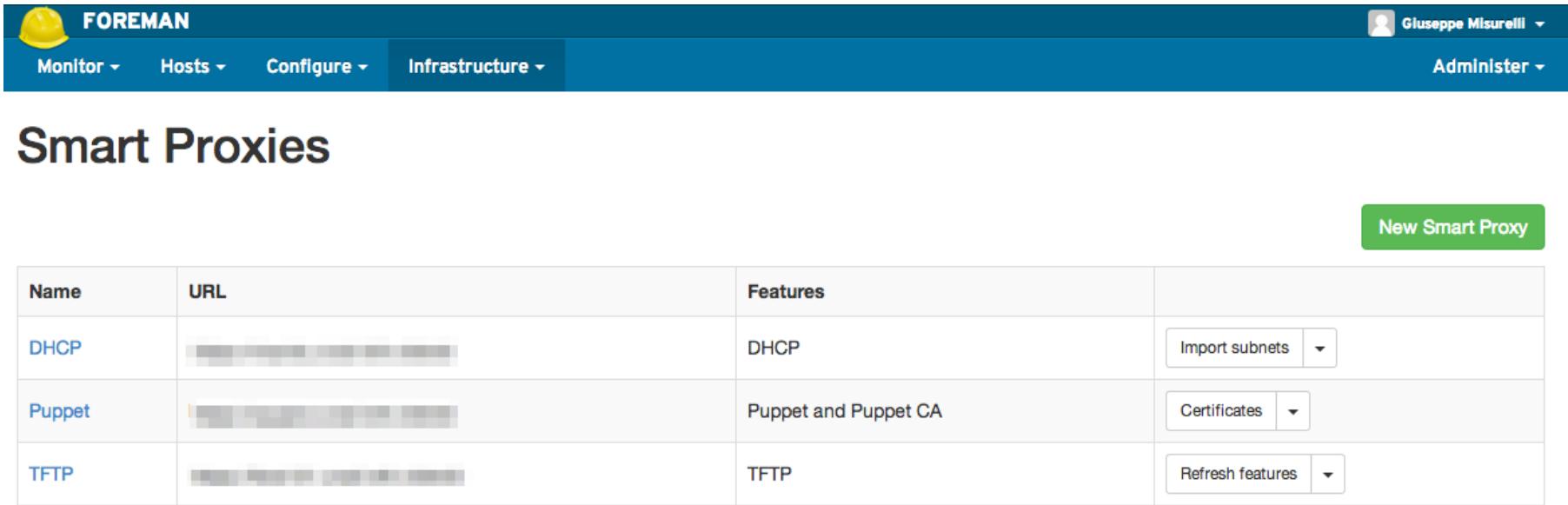
Compute resources

# Limiti di Cobbler – Vantaggi di Foreman

	Cobbler	Foreman
Supporto oVirt/OpenStack/Libvirt	Red	Green
Interazione con Puppet	Green	Green
Integrazione con reportistica Puppet	Red	Green
Gestione utenti e domini di competenza	Red	Green
Separazione del controllo dei servizi TFTP e DHCP	Red	Green

# Concetto di Smart Proxy in Foreman

## Moduli da installare sui servizi coinvolti



The screenshot shows the Foreman web interface with a dark blue header bar. On the left is a yellow hard hat icon labeled 'FOREMAN'. To the right are user profile icons for 'Giuseppe Misurelli' and a dropdown menu for 'Administer'. The header navigation includes 'Monitor', 'Hosts', 'Configure', 'Infrastructure' (selected), and 'Administer'. Below the header is a green button labeled 'New Smart Proxy'. The main content area is titled 'Smart Proxies' and displays a table with three rows. The columns are 'Name', 'URL' (redacted), 'Features', and a dropdown menu. The first row has 'DHCP' in the 'Name' column, 'Import subnets' in the dropdown, and 'DHCP' in the 'Features' column. The second row has 'Puppet' in the 'Name' column, 'Certificates' in the dropdown, and 'Puppet and Puppet CA' in the 'Features' column. The third row has 'TFTP' in the 'Name' column, 'Refresh features' in the dropdown, and 'TFTP' in the 'Features' column.

Name	URL	Features	
DHCP	[REDACTED]	DHCP	Import subnets ▾
Puppet	[REDACTED]	Puppet and Puppet CA	Certificates ▾
TFTP	[REDACTED]	TFTP	Refresh features ▾

Deleghe a servizi pre-esistenti  
– API usate da Foreman per l'orchestrazione

# Funzionamento dei principali Smart Proxy

## API DHCP (interazione via OMAPI)

DHCP			
/dhcp	GET	Retrieve a list of subnets	
/dhcp/10.1.2.0	GET	Retrieve 10.1.2.0 subnets records	
/dhcp/10.1.2.0/10.1.2.5	GET	Retrieve 10.1.2.5 reservation information	
/dhcp/10.1.2.0/unused_ip	GET	Provides an unused ip address in 10.1.2.0 subnet	
/dhcp/10.1.2.0	POST	creates new reservation in 10.1.2.0 subnet	{"hostname":string, "name":string, "filename":string, "ip":string, "nextserver":string, "mac":string}
/dhcp/10.1.2.0/10.1.2.5	DELETE	Deletes 10.1.2.5 reservation from 10.1.2.0 subnet	

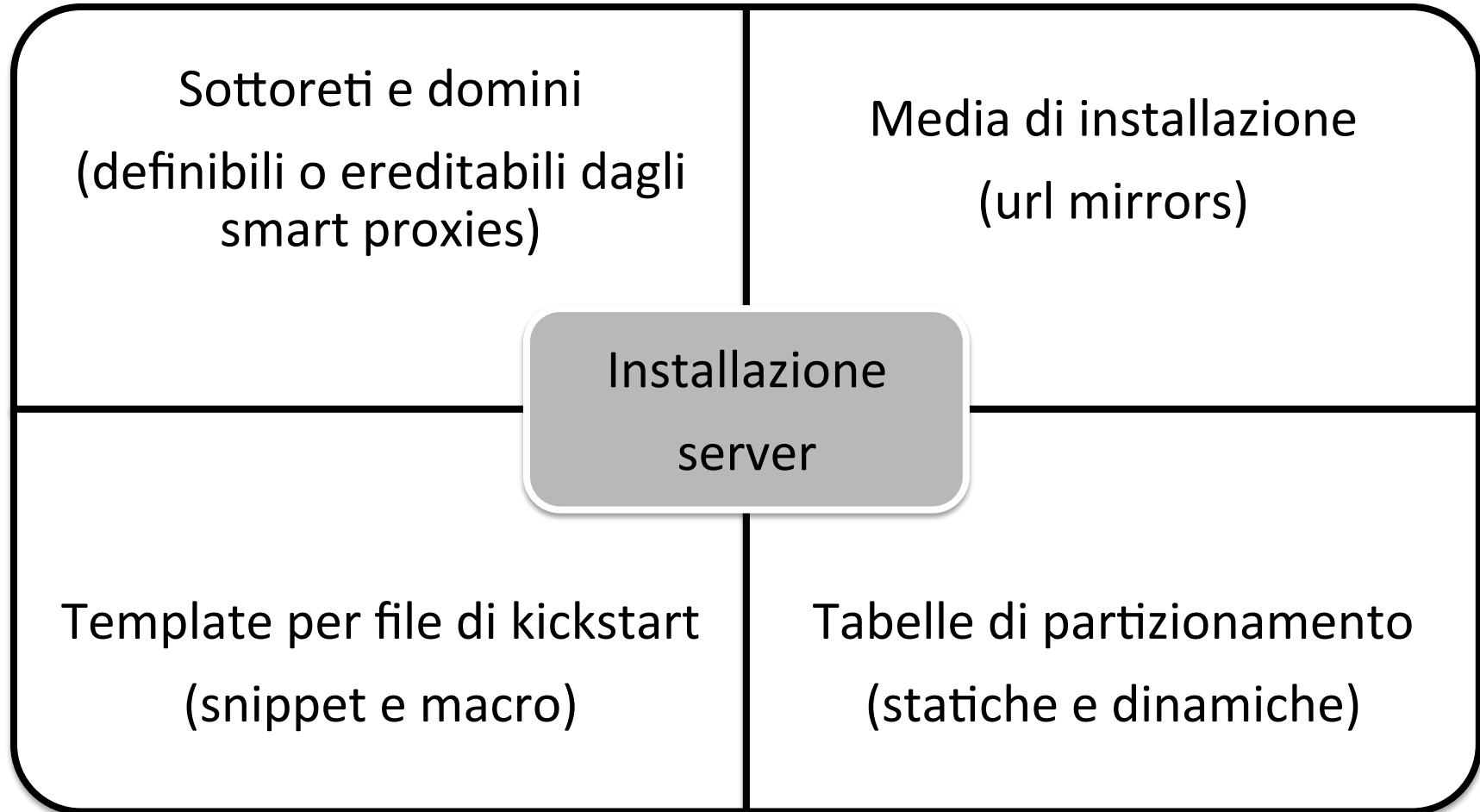
## API TFTP (carica i file pxe e le img di boot)

TFTP			
/tftp/00:11:22:33:44:55	POST	creates pxelinux configuration file for host with MAC address 00:11:22:33:44:55	{"syslinux_config":string}. Implicit variant of "syslinux"
/tftp/<variant>/00:11:22:33:44:55	POST	creates pxeconfig configuration file for host with MAC address 00:11:22:33:44:55	{"pxeconfig":string}. Variant can be "syslinux" or "pxegrub"
/tftp/00:11:22:33:44:55	DELETE	remove pxelinux configuration file for host with MAC address 00:11:22:33:44:55	Implicit variant of "syslinux"
/tftp/<variant>/00:11:22:33:44:55	DELETE	remove pxeconfig configuration file for host with MAC address 00:11:22:33:44:55	Variant can be "syslinux" or "pxegrub"

Analogamente anche per i proxy DNS/Puppet/PuppetCA

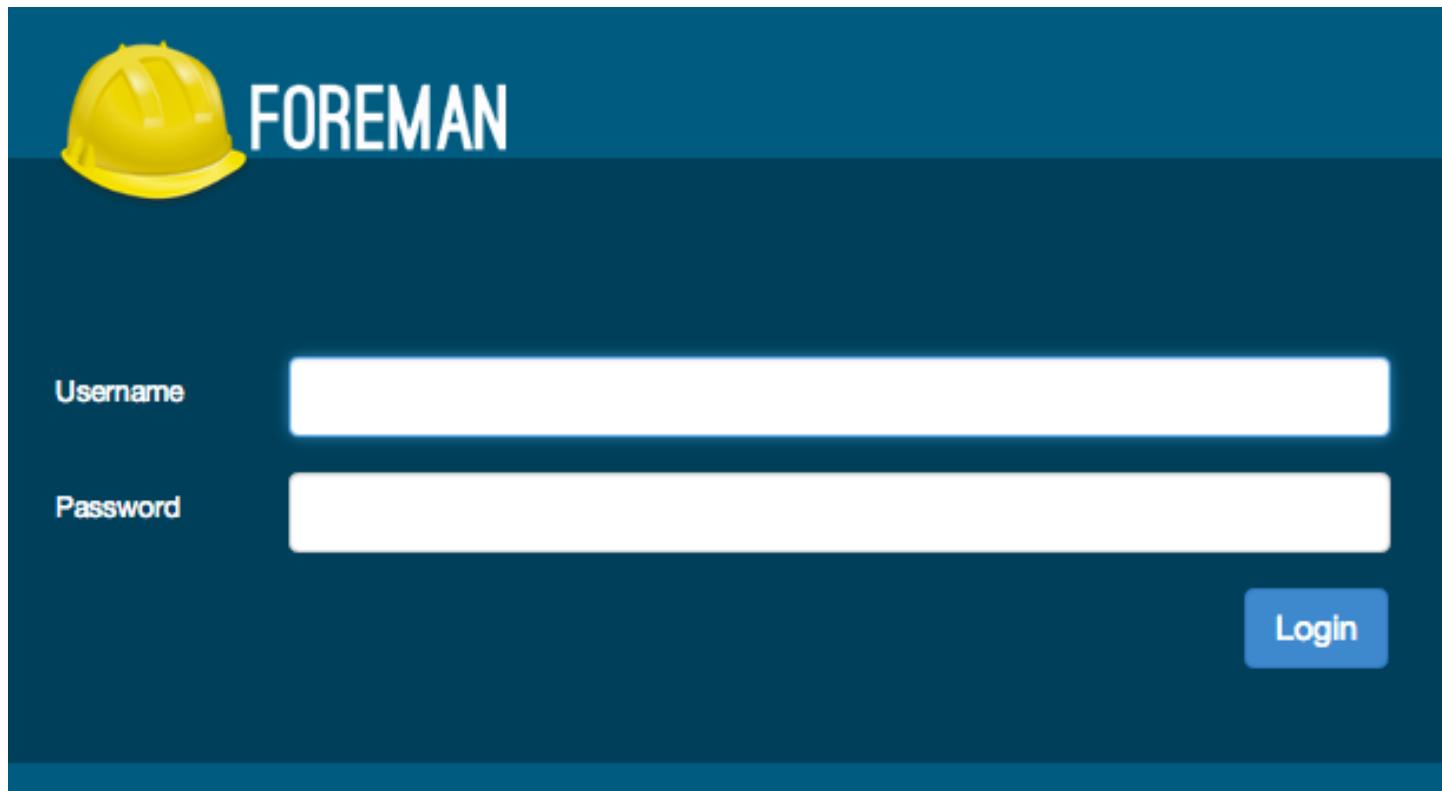
# Principi del funzionamento di Foreman

## Installazione



# Contesti di interazione

Utenti, gruppi, ruoli e profili di competenza  
permettono un ambiente multi-utenza controllato



# Raggruppamenti e domini di competenza /1

Gerarchia, nome, ambiente e smart proxy Puppet

The screenshot shows the Foreman web interface. At the top, there's a navigation bar with tabs for 'Monitor', 'Hosts', 'Configure', 'Infrastructure', and 'Administer'. On the far left is a yellow icon of a person wearing a hard hat. To the right of the icon, the word 'FOREMAN' is written in white capital letters. Next to it is a user profile icon and the name 'Giuseppe Misurelli'. Below the navigation bar, the main content area has a title 'Edit Farming'. Underneath the title, there are several input fields and dropdown menus. The first dropdown is labeled 'Host Group' and is currently set to 'Puppet Classes'. The other dropdowns are labeled 'Parent', 'Name', 'Environment', 'Compute profile', 'Puppet CA', and 'Puppet Master'. Each dropdown has a small arrow icon to its right. Below the 'Puppet CA' and 'Puppet Master' dropdowns, there are explanatory text labels: 'Use this puppet server as a CA server' and 'Use this puppet server as an initial Puppet Server or to execute puppet runs' respectively. At the bottom of the form, there are two buttons: 'Cancel' on the left and 'Submit' on the right.

Edit Farming

Host Group **Puppet Classes** Network Operating System Parameters

**Parent**

**Name**  Farming

**Environment**  production

**Compute profile**

**Puppet CA**  Puppet Use this puppet server as a CA server

**Puppet Master**  Puppet Use this puppet server as an initial Puppet Server or to execute puppet runs

# Raggruppamenti e domini di competenza /2

## Classi Puppet incuse e da includere

### Edit Farming

**Included Classes**

- cnaf-crond
- cnaf-crond::params
- cnaf-puppet
- cnaf-puppet::params
- resolv
- yum

**Available Classes**

- centrallog-client
- cnaf-crond
- cnaf-puppet
- egi-ca
- emi3-igi-siteinfo
- emi3-igi-siteinfo-mpi
- emi3-igi-siteinfo-mpi-sl6
- emi3-topbdii
- emi3-wn
- fail2ban
- lemon
- motd
- nagiosclient
- ntp
- packages
- resolv
- ssh
- stdlib
- test-notify
- yum

[Cancel](#) [Submit](#)

# Raggruppamenti e domini di competenza /3

## Domini e sottoreti di competenza

The screenshot shows the Foreman web interface with a blue header bar. On the left is a yellow hard hat icon, followed by the word "FOREMAN". To the right are navigation links: "Monitor", "Hosts", "Configure", "Infrastructure", and "Administer". A user profile icon with the name "Giuseppe Misurelli" is also present.

The main content area is titled "Edit Farming". At the top, there is a horizontal navigation bar with tabs: "Host Group", "Puppet Classes", "Network" (which is selected), "Operating System", and "Parameters".

Below the tabs, there are two input fields:

- Domain:** A text input field containing "cr.cnaf.infn.it".
- Subnet:** A text input field containing "128 (131.154.128.0/22)".

At the bottom left are two buttons: "Cancel" and "Submit".

# Raggruppamenti e domini di competenza /4

Architetture, SO, media, ...

The screenshot shows the Foreman web interface. At the top, there is a navigation bar with tabs for 'Monitor', 'Hosts', 'Configure', and 'Infrastructure'. On the right side of the bar, there is a user profile icon and the name 'Giuseppe Misurelli'. Below the navigation bar, the title 'Edit Farming' is displayed. The main content area contains several input fields for configuring a host group:

Host Group	Puppet Classes	Network	Operating System	Parameters
Architecture	x86_64			
Operating system	Tier1-SL6 6			
Media	Scientific Linux 6			
Partition table	Kickstart default			
Root password	*****			

Edit Farming

Host Group	Puppet Classes	Network	Operating System	Parameters
Architecture	x86_64			
Operating system	Tier1-SL6 6			
Media	Scientific Linux 6			
Partition table	Kickstart default			
Root password	*****			

Hostgroup funzionali dunque a...

# “Build” di un nuovo host

Compilazione di un form web (abilitazione in Build)

The screenshot shows the Foreman web interface for creating a new host. At the top, there's a navigation bar with links for Monitor, Hosts, Configure, Infrastructure, and Administer. On the left, a sidebar has sections for Host, Puppet Classes, Network, Operating System, Parameters, and Additional Information. The main area is titled 'New Host'. It contains several input fields: 'Name' (seminario), 'Host Group' (Farming), 'Deploy on' (Bare Metal), 'Environment' (production), 'Puppet CA' (Puppet), and 'Puppet Master' (Puppet). Below these fields, there are two notes: 'Use this puppet server as a CA server' and 'Use this puppet server as an initial Puppet Server or to execute puppet runs'. At the bottom left is a 'Submit' button, and at the bottom right is a 'Cancel' button. A red arrow points from the 'Submit' button to the newly created host entry in the 'Hosts' list on the right.

New Host

Host    Puppet Classes    Network    Operating System    Parameters    Additional Information

Name: seminario

Host Group: Farming

Deploy on: Bare Metal

Environment: production

Puppet CA: Puppet

Puppet Master: Puppet

The screenshot shows the Foreman web interface displaying a list of hosts. At the top, there's a search bar with 'seminario' and a 'Search' button. On the right, there's a green 'New Host' button. The main area is titled 'Hosts' and contains a table with columns: Name, Operating system, Environment, Model, Host group, Last report, and Actions (Edit). The table shows one entry: 'seminario.cr.cnaf.infn.it' (Tier1-SL6 6, production, Farming). A red arrow points from the 'Submit' button in the previous screenshot to this host entry in the list.

	Name	Operating system	Environment	Model	Host group	Last report	Actions
<input type="checkbox"/>	seminario.cr.cnaf.infn.it	Tier1-SL6 6	production		Farming		<button>Edit</button>

# Interazione programmatica (verso installazioni cumulative)

<http://theforeman.org/api/apidoc/v1.html>

```
import requests

endpoint = 'https://lifecycle.cnaf.infn.it/api/hosts'
certs = ('mycert.pem', 'mykey.pem')
cafile = 'cafile.pem'
credentials = ('user', 'pass')

# Set requests parameters
payload = {
    'name': 'test-api',
    'environment_id': '2',      # Environment (see hostgroups APIs)
    'domain_id': '1',           # Domain (see domains APIs)
    'ip': '10.10.0.21',
    'mac': 'c8:33:65:52:07:2d',
    'architecture_id': '1',     # Arch (see architectures APIs)
    'operatingsystem_id': '3'   # OS (see operatingsystems APIs)
}

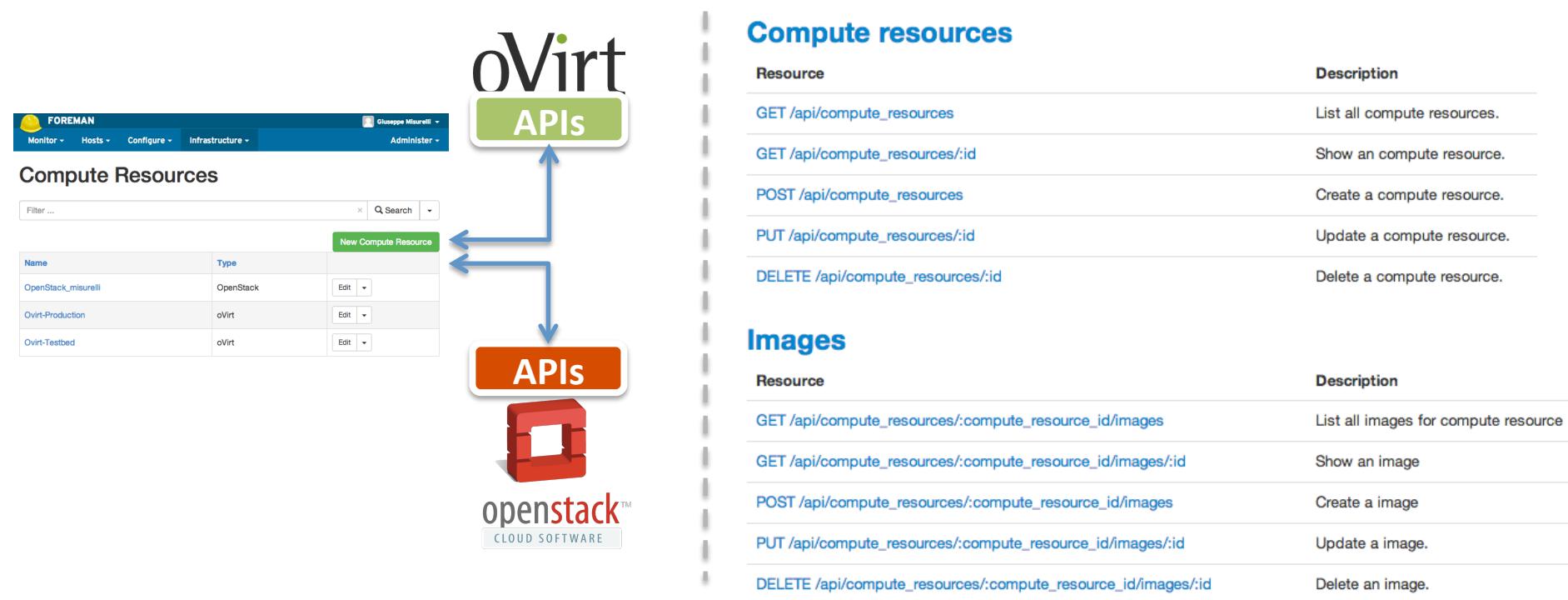
# Post host creation requests
r = requests.post(
    endpoint,
    data=payload,
    cert=certs,
    auth=credentials,
    verify=cafile
)

# Print form-encoded requests
print r.text
```

```
POST /api/hosts
{
    "host": {
        "name": "test-api",
        "environment_id": "2",
        "domain_id": "1",
        "ip": "10.10.0.21",
        "mac": "c8:33:65:52:07:2d",
        "architecture_id": "1",
        "operatingsystem_id": "3",
    }
}
```

# Interazioni con i “compute resources” (oVirt e OpenStack)

- Creazione di server come VM nei domini utente/tenant
- Richieste basate sulle impostazioni fornite dai vari fornitori di compute resources



# Installiamo un nuovo server...



Username

Password

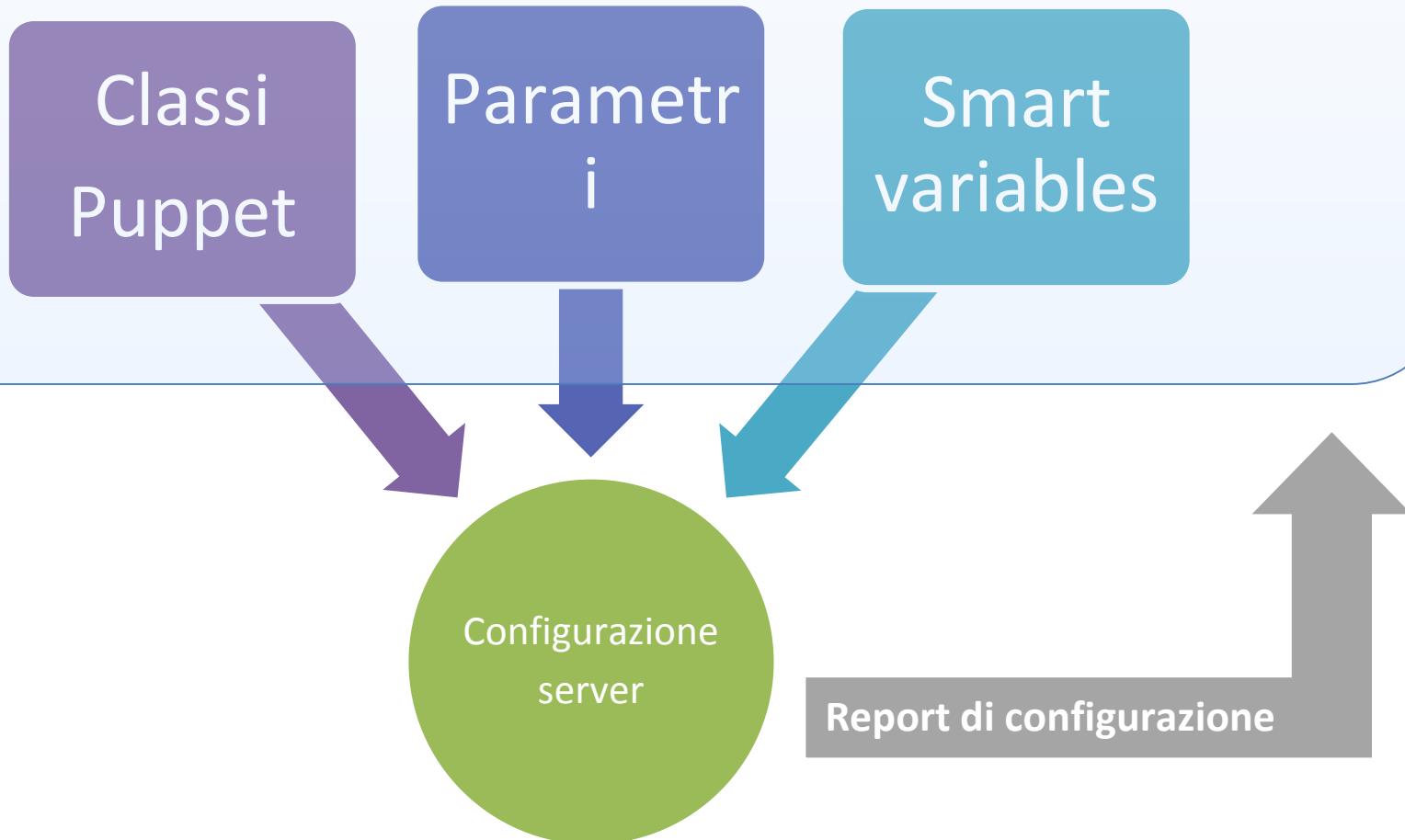
Login

Welcome to Foreman

Version 1.4.0-RC2

# Utilizzo di puppet (attraverso foreman) a runtime

Foreman agisce da **External Node Classifier** fornendo a Puppet YAML descrittivi delle configurazioni da impartire ai nodi



# Demo installazione top-bdii

```
class emi3-topbdii {  
  
    file { 'site-info.def':  
        name  => "/root/igi-siteinfo/site-info.def",  
        ensure => file,  
        owner  => "root",  
        group  => "root",  
        mode   => 600,  
        require => File["/root/igi-siteinfo"],  
        content => template("emi3-topbdii/site-info.def.erb"),  
    }  
  
    # run exec only if /etc/emi-release does not exist  
    exec { "install-emi3-repo":  
        path      => [ "/bin/", "/sbin/", "/usr/bin/", "/usr/sbin/" ],  
        command   => "rpm -vh http://emisoft.web.cern.ch/emisoft/dist/EMI/3/sl6/x86_64/base/emi-release-3.0.0-2.el6.noarch.rpm",  
        creates   => "/etc/emi-release",  
        logoutput => true,  
        require   => [ Package["ca-policy-egi-core"], Service["fail2ban"] ],  
    }  
  
    package { "emi-release":  
        ensure => "latest",  
        require => Exec["install-emi3-repo"],  
    }  
  
    [...]
```

Generazione site-  
info.def

Gestione  
repository EMI3

# Demo installazione top-bdii

[...]

```
package {"emi-bdii-top":  
  ensure => "installed",  
  require => Package["emi-release"],  
}  
  
exec { "yaim-config":  
  command  => "/opt/glite/yaim/bin/yaim -c -d 6 -s /root/igi-siteinfo/site-info.def -n BDII_top",  
  require  => Package["emi-bdii-top"],  
  subscribe => [ File["site-info.def"] ],  
  refreshonly => true,  
  logoutput  => true,  
}  
}
```

Installazione  
metapackage emi-  
top-bdii

Configurazione del  
servizio via yaim



DEMO

# Classi puppet parametriche

- Scrivere bene moduli in puppet non e' facile.
- Se i moduli sono parametrici, e' possibile gestire i parametri con foreman

```
class cnaf-puppet {  
    $autoupgrade = false,  
    $config_file = '/etc/puppet/puppet.conf',  
    $ensure = 'present',  
    $server = 'puparo.cnaf.infn.it',  
    $service_ensure = 'stopped',  
    $service_enable = true,  
    $service_hasstatus = true,  
    $service_hasrestart = true,  
}  
)  
inherits cnaf-puppet::params {  
    case $ensure {  
        /(present)/: {  
            if $autoupgrade == true {  
                $package_ensure = 'latest'  
            } else {  
                $package_ensure = 'present'  
            }  
        }  
        /(absent)/: {  
            $package_ensure = 'absent'  
        }  
        default:  
            fail('ensure parameter must be present or absent')  
    }  
}  
}  
package {$package:  
    ensure => $package_ensure,  
}
```

The screenshot shows the Foreman web interface with a blue header bar containing the Foreman logo and navigation links: Monitor, Hosts, Configure, and Infrastructure. Below the header, the title "Edit Puppet Class cnaf-puppet" is displayed. The main content area has tabs for "Puppet Class", "Smart Class Parameter", and "Smart Variables", with "Puppet Class" selected. A search bar with "Filter By Name" and a dropdown menu are at the top. The "autoupgrade" parameter is listed under the "config file" section. To its right, the "Puppet Environments" dropdown is set to "development and production". The "Parameter" field contains "autoupgrade", and the "Description" field is empty. An "Override" checkbox is checked, with a note explaining it overrides the Puppet class default value. The "service enable" and "service ensure" parameters are also listed. The "service hasstatus" parameter is shown with a "Parameter type" dropdown set to "boolean" and a "Default value" of "false". At the bottom are "Cancel" and "Submit" buttons.

# A proposito di reportistica...

**FOREMAN**

Monitor ▾ Hosts ▾ Configure ▾ Infrastructure ▾ Administer ▾

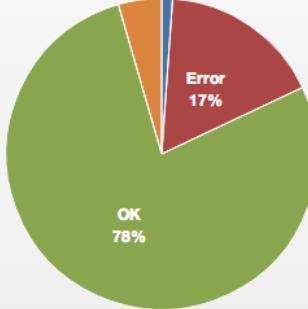
## Overview

Filter ... x Search ▾ Generated at 01 Mar 14:47

### Host Configuration Status

Hosts that had performed modifications without error	1
Hosts in error state	15
Good host reports in the last about 1 hour	69
Hosts that had pending changes	0
Out of sync Hosts	0
Hosts with no reports	4
Hosts with alerts disabled	0

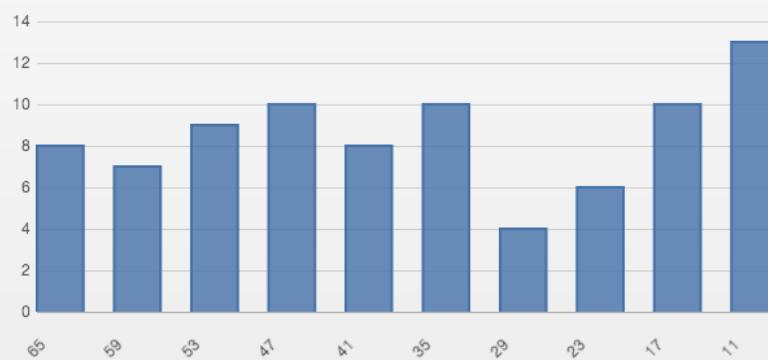
Total Hosts: 89



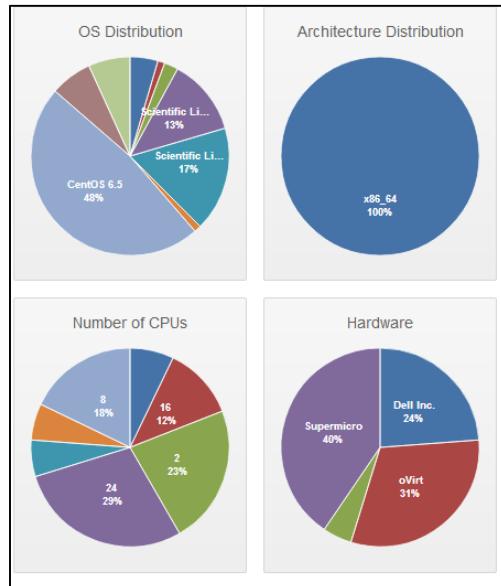
### Latest Events

Host	A	R	F	FR	S	P
wn09.cnaf.i...	0	0	3	0	2	0
wn12.cnaf.i...	0	0	3	0	2	0
wn17.cnaf.i...	0	0	3	0	2	0
wn20.cnaf.i...	0	0	3	0	2	0
wn13.cnaf.i...	0	0	3	0	2	0
wn06.cnaf.i...	0	0	3	0	2	0

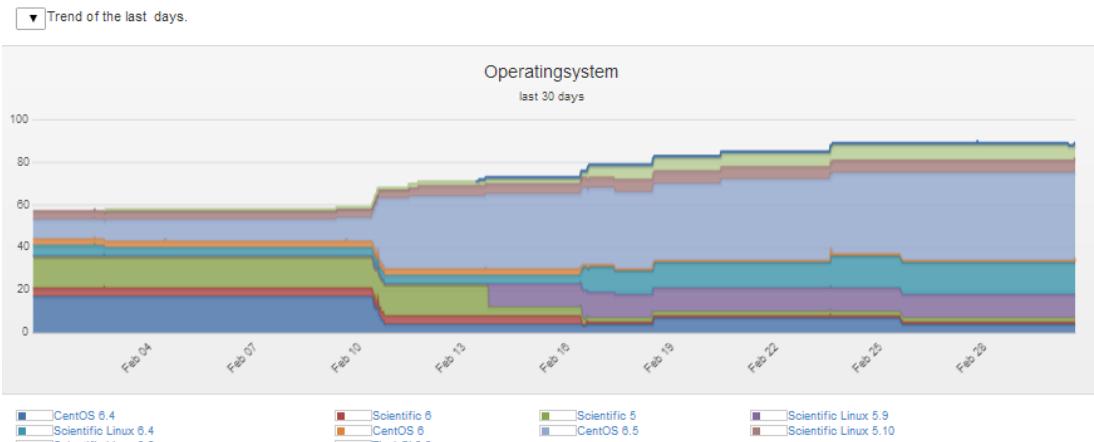
### Run distribution in the last 65 minutes



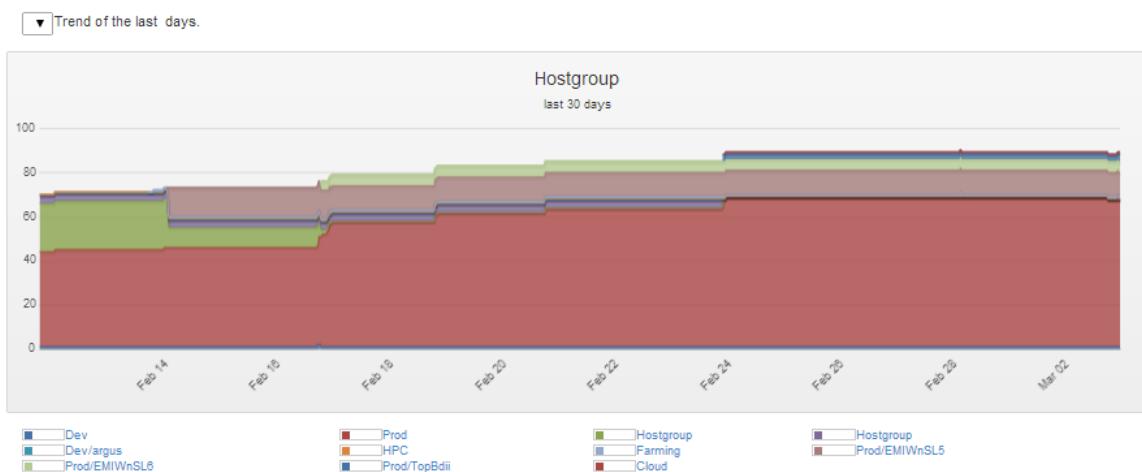
# Esempi di report



## Trends for Operatingsystem



## Trends for Hostgroup



# Puppet at Cnaf-Storage

- Making of
- What we need
- What we do
- Prospect

Manifest :  
where machine are defined

Modules :  
where “action-to-do” are  
defined

Factor :  
information about machine

# Puppet at Cnaf-Storage

- Making of
- **What we need**
- What we do
- Prospect
- Package provider definition (rpm, deb ... )
- Upgrade/downgrade pkg & kernel
- Change conf file
- Network configuration

# Puppet at Cnaf-Storage

- Making of
- What we need
- **What we do**
- Prospect

Package provider

```
Package { provider => "aptrpm" }
```

Upgrade/Downgrade:  
fix software version

Configuration file :  
managing via template

# Puppet at Cnaf-Storage

- Making of
- What we need
- **What we do**
- Prospect

Network configuration:

- common config
- bonding (conf file & module)
- bridge
- routing
- 10 Gb
- squid proxy

# Puppet at Cnaf-Storage

- Making of
- What we need
- What we do
- **Prospect**

Puppet can work together with other software like cobbler and foreman.

Our work (modules) can be integrated inside forman.

# Verso un ambiente di produzione

- Alta affidabilità per Foreman/Puppet
  - Come webapp con DB da integrare in un cluster?
- Orientamenti altre realtà (CERN)
  - Più di 4000 macchine; circa 100 gruppi di host
- Installazioni cumulative
  - Approcci alla <https://github.com/plytro/foreman-bulk-provision>
- Sponsors
  - Redhat, Rackspace, ...

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