From Bare Metal to Cloud

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Intros

ICCLab

- Zurich University for Applied Sciences
- Cloud Computing Research

GWDG

- Service Provider for Max Planck Society and University of Goettingen
- Research

We've Hardware for Cloud!

GWDG Cloud Hardware

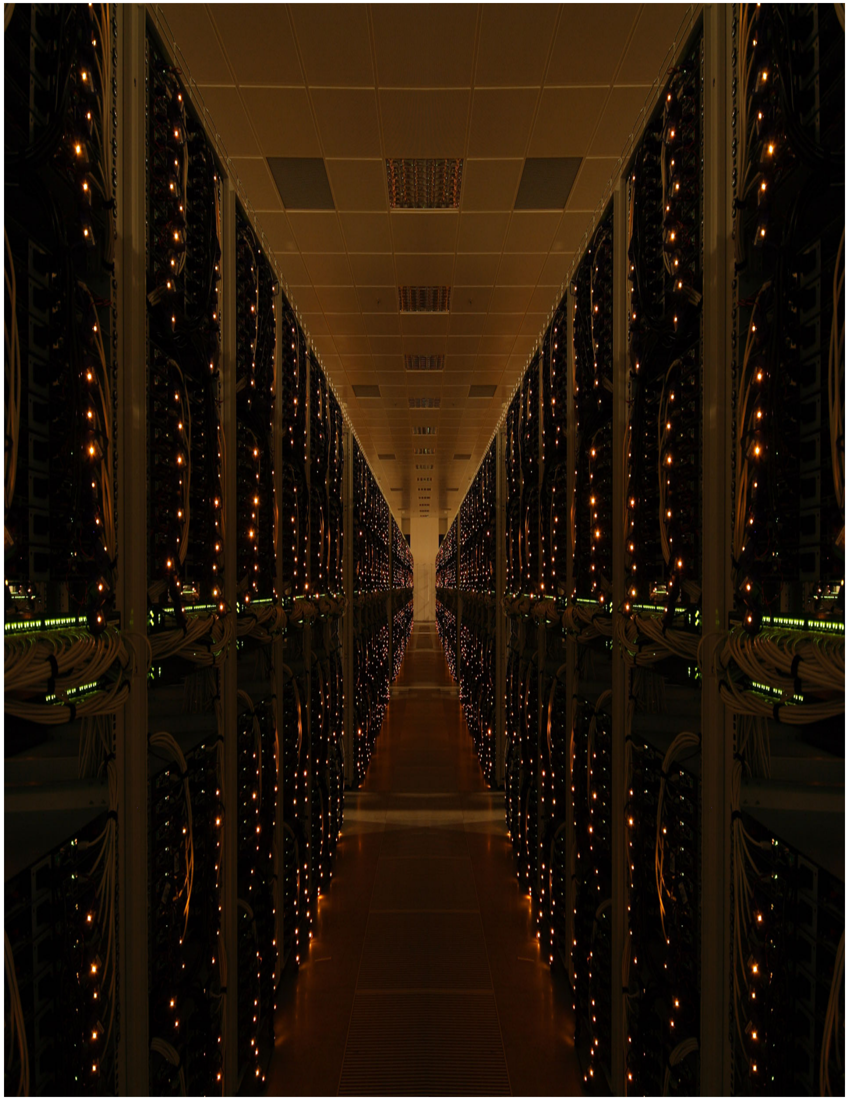
Nodes	38
CPUs	152
Core	2432
Memory	9728 TB

ICCLab Cloud Hardware

Nodes	20
CPUs	80
Core	1280
Memory	1920 TB

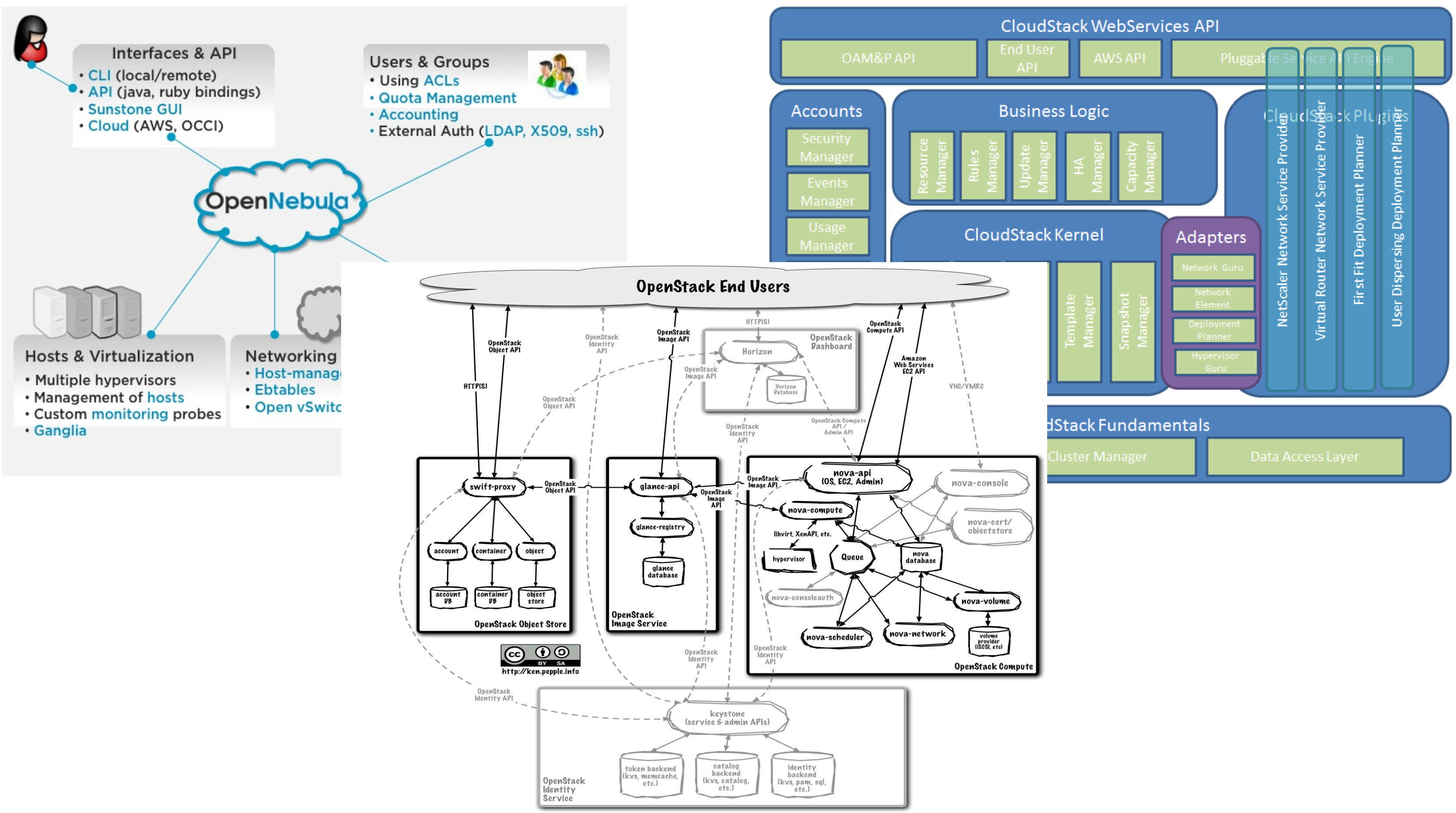
Challenges or Problems?

- Clouds in essence are big data centres
  - Means lots of servers:
    - Manual configuration **not an option**
    - Automation is **required**



Challenges or Problems?

Cloud frameworks **can/are be complicated**!



Challenges or Problems?

- But Clouds are **"cool"** - Aayyy!

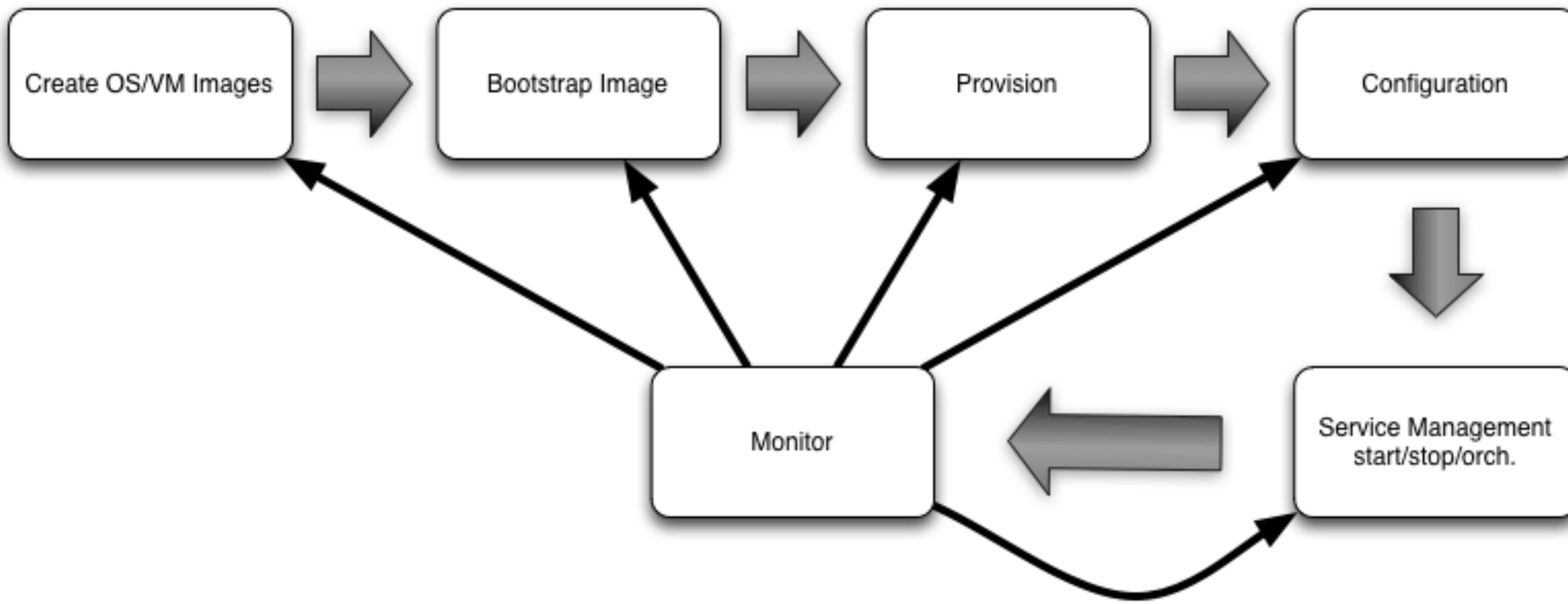
BUT

- How to deploy a "cloud"
  - with **minimal user interaction**?
  - **least number** of "hands"?
  - across **many servers**?

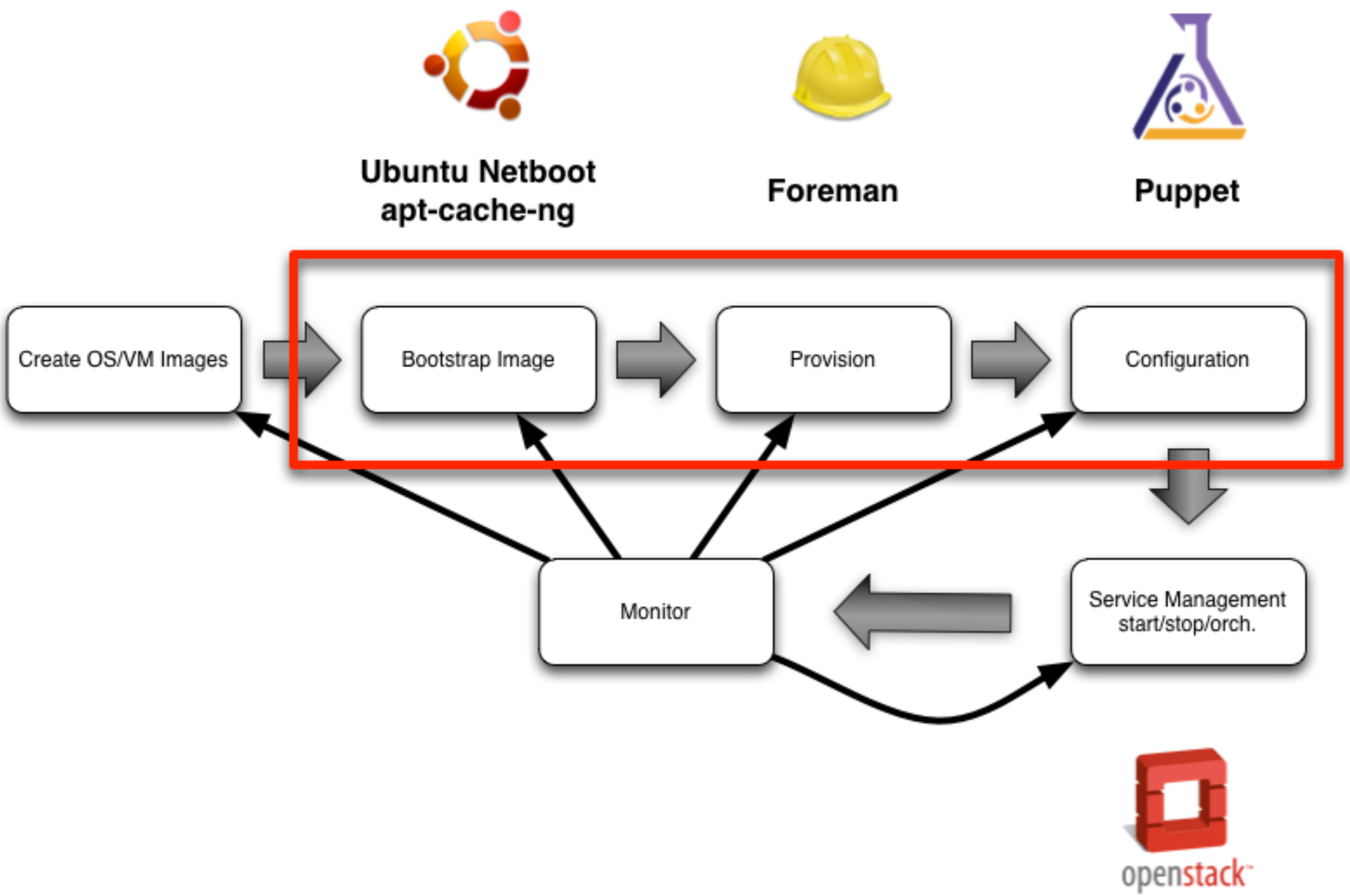
Challenges or Problems?

- How to **share/standardise** these processes?
  - Configuration - drift prevention
  - Testing - configuration, system functionality
  - Compliance - auditing, ITIL
  - Agility
  - Independence
    - Of physical/virtual deployment
    - Of infrastructure

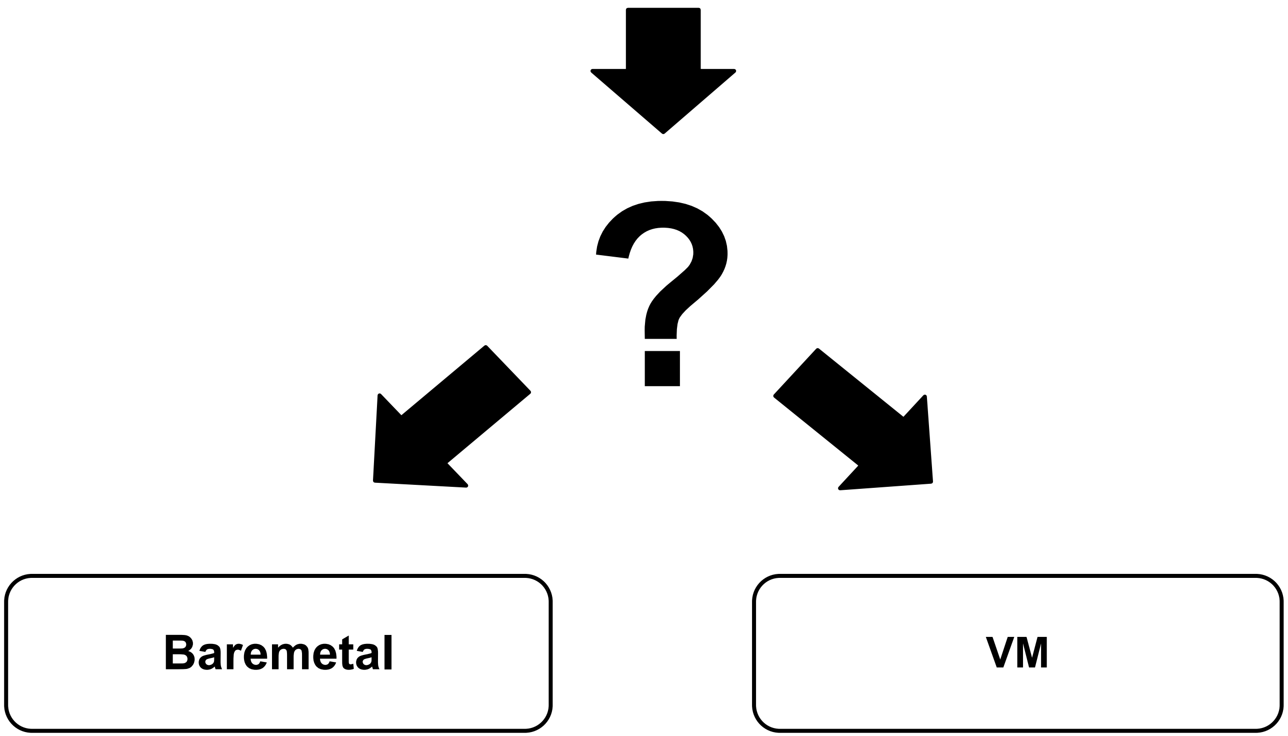
Automation Toolchain



Automation Toolchain



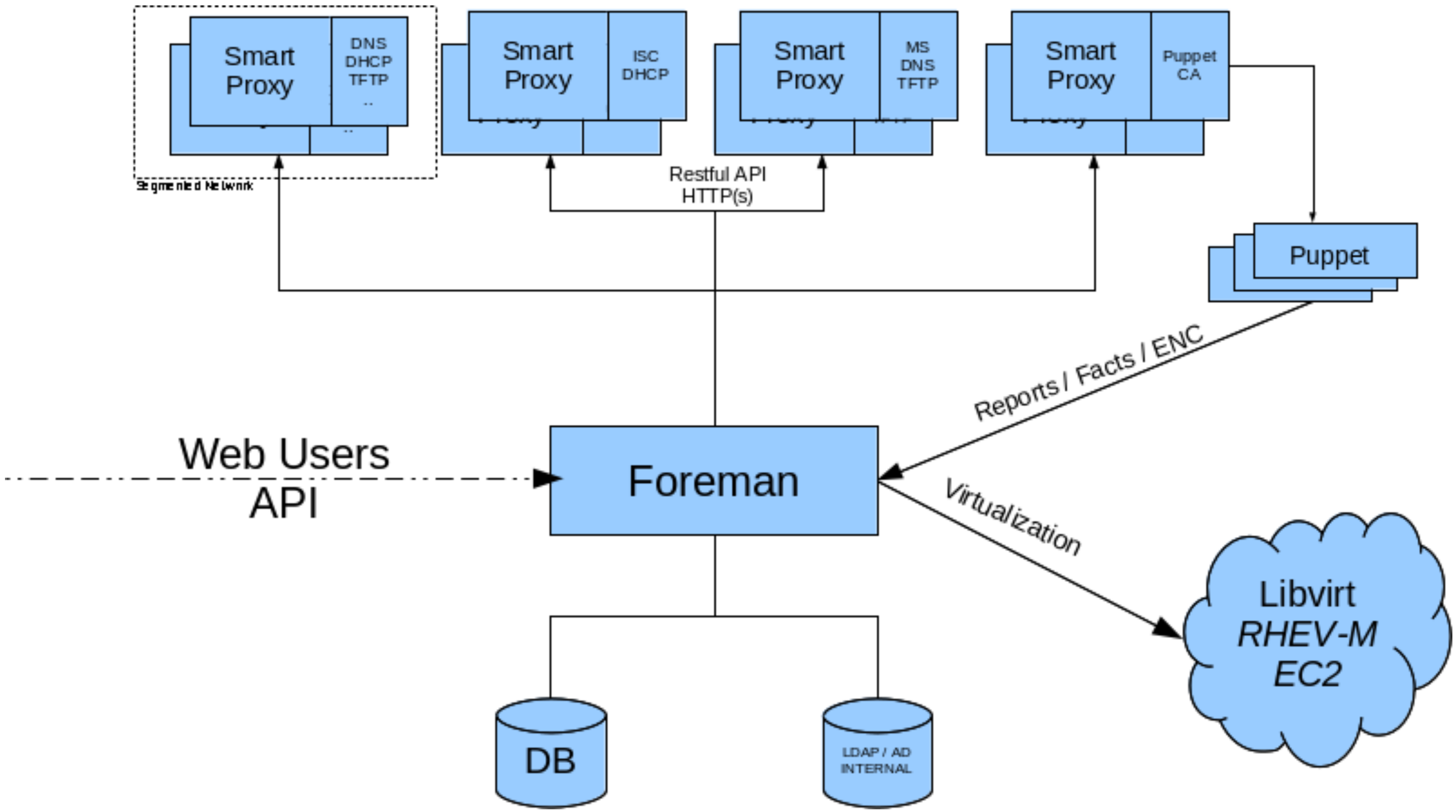
Provision - OS rollout



Provision - Foreman

- "Single Address For All Machines Lifecycle Management".
- Manages or proxies to DNS, DHCP, TFTP, Virtual Machines, PuppetCA, CMDB
- Integrates with Puppet (and acts as web front end to it).
- Provisions:
  - most flavours of *NIX, Windows
  - Virtual machines - libvirt, oVirt
  - Cloud Resources - Amazon EC2, VMware vCenter
- Has an API! :-)

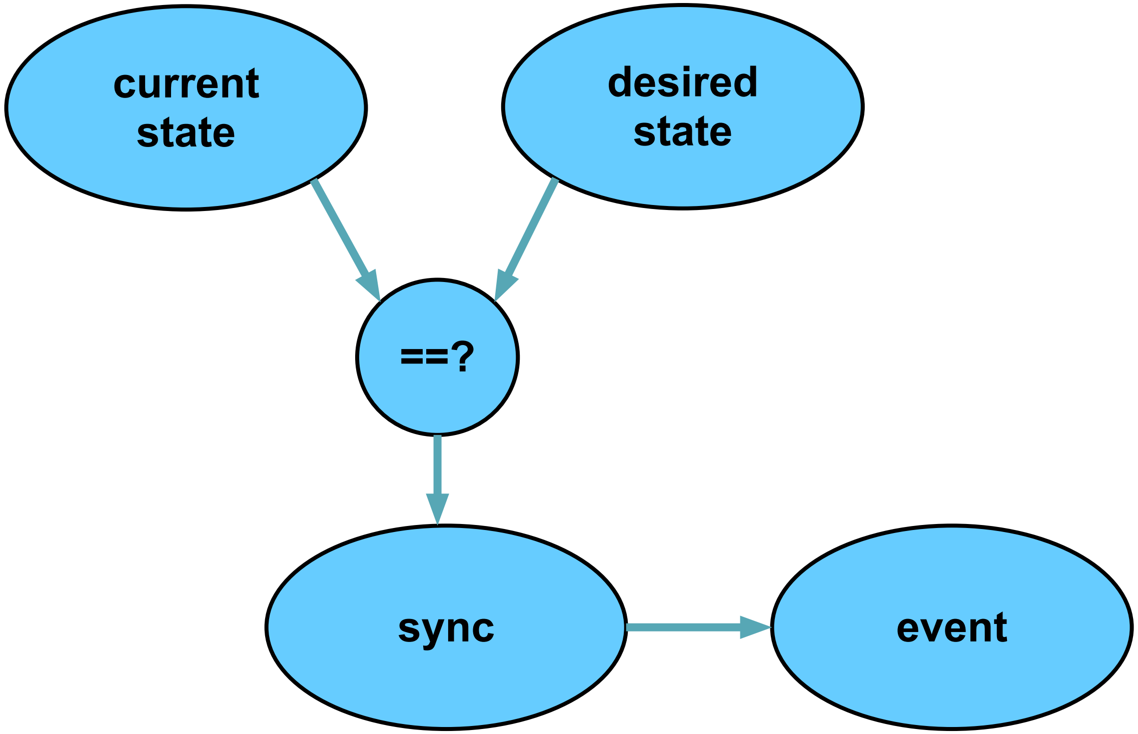
Provision - Foreman Arch



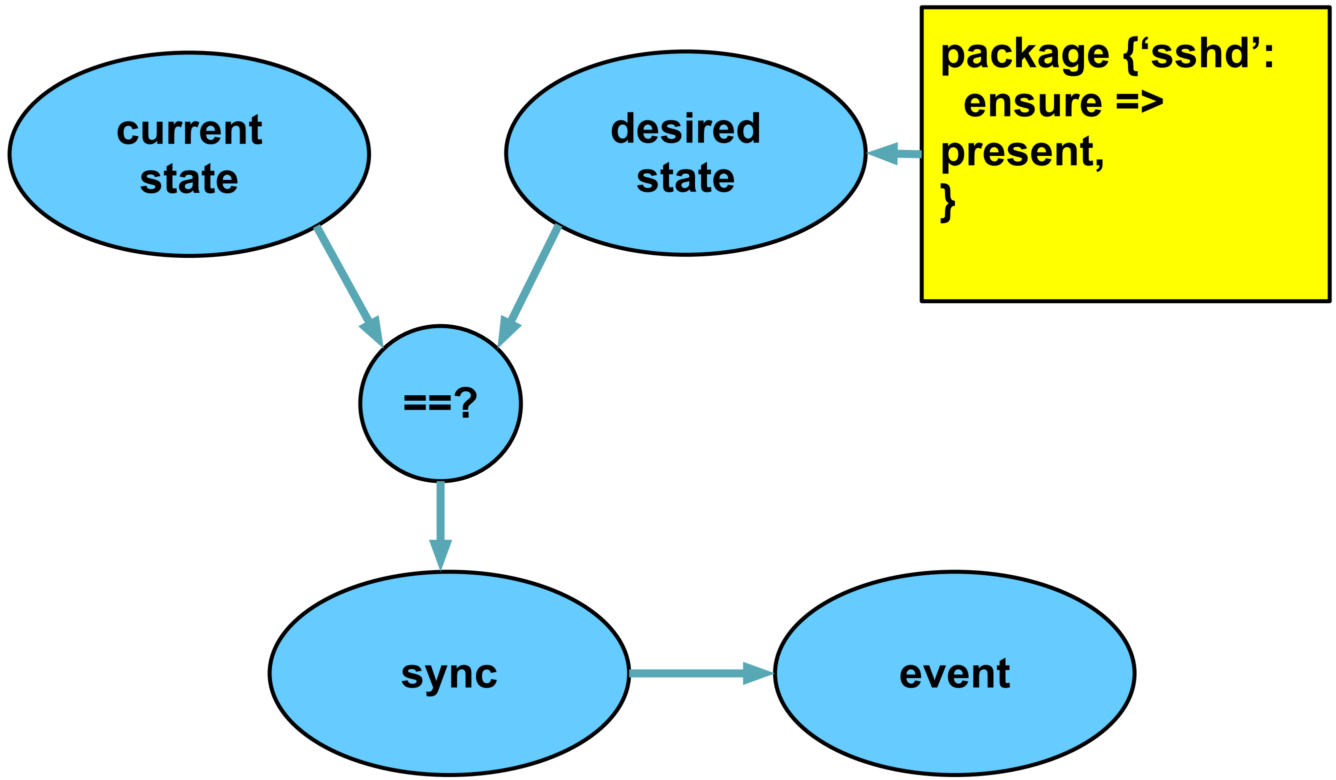
Configuration - Puppet

- Declarative configuration language
  - Describe desired state of a system, not how to achieve it
  - Idempotence
- Different types of resources: software package, service, user, configuration file, mysql database, ...
- Dependencies can be formulated
- Grouping of resources by "class" concept:
  - Way of structuring your descriptions
- Abstraction layer for resources:
  - Independence from system type (different variants of linux, *bsd, mac os, windows, ...)

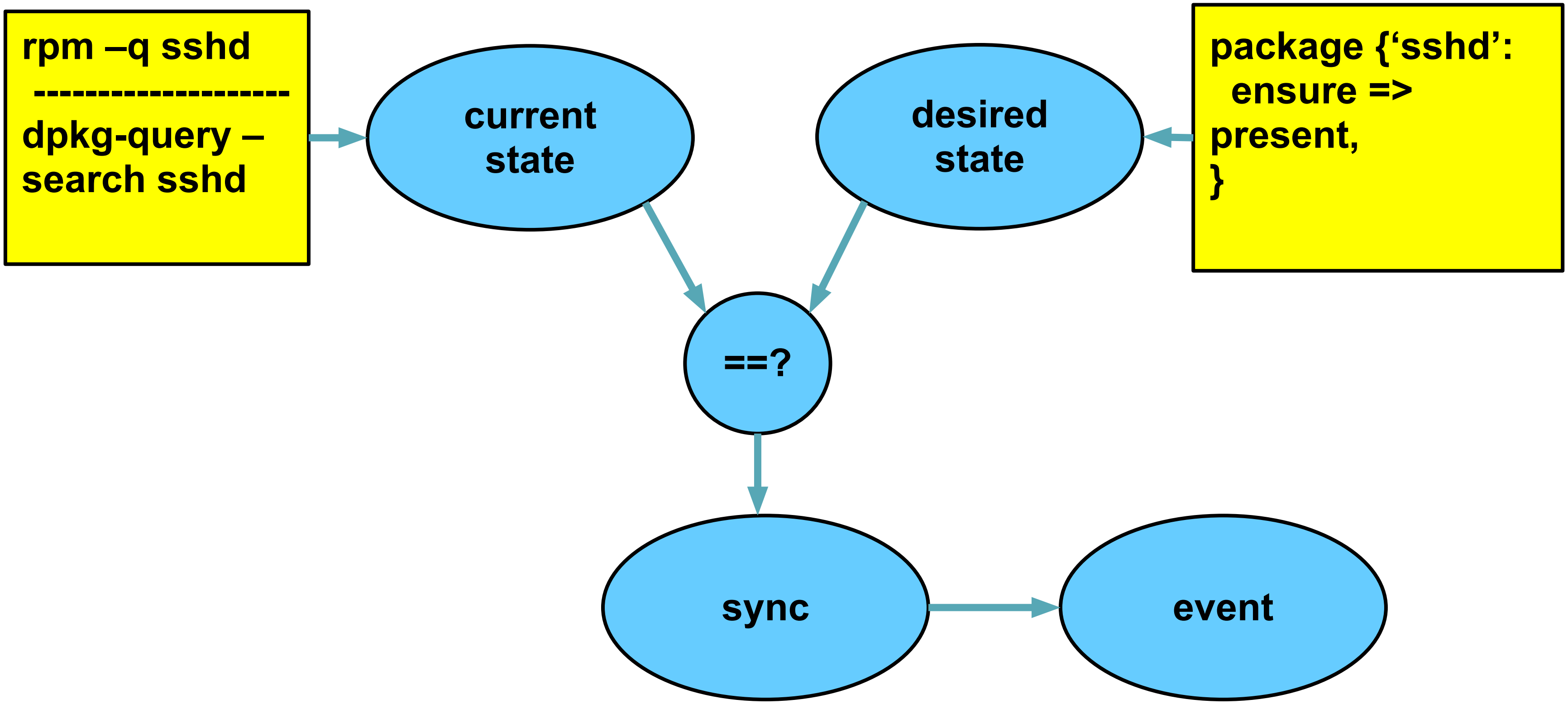
Configuration - Puppet's Model



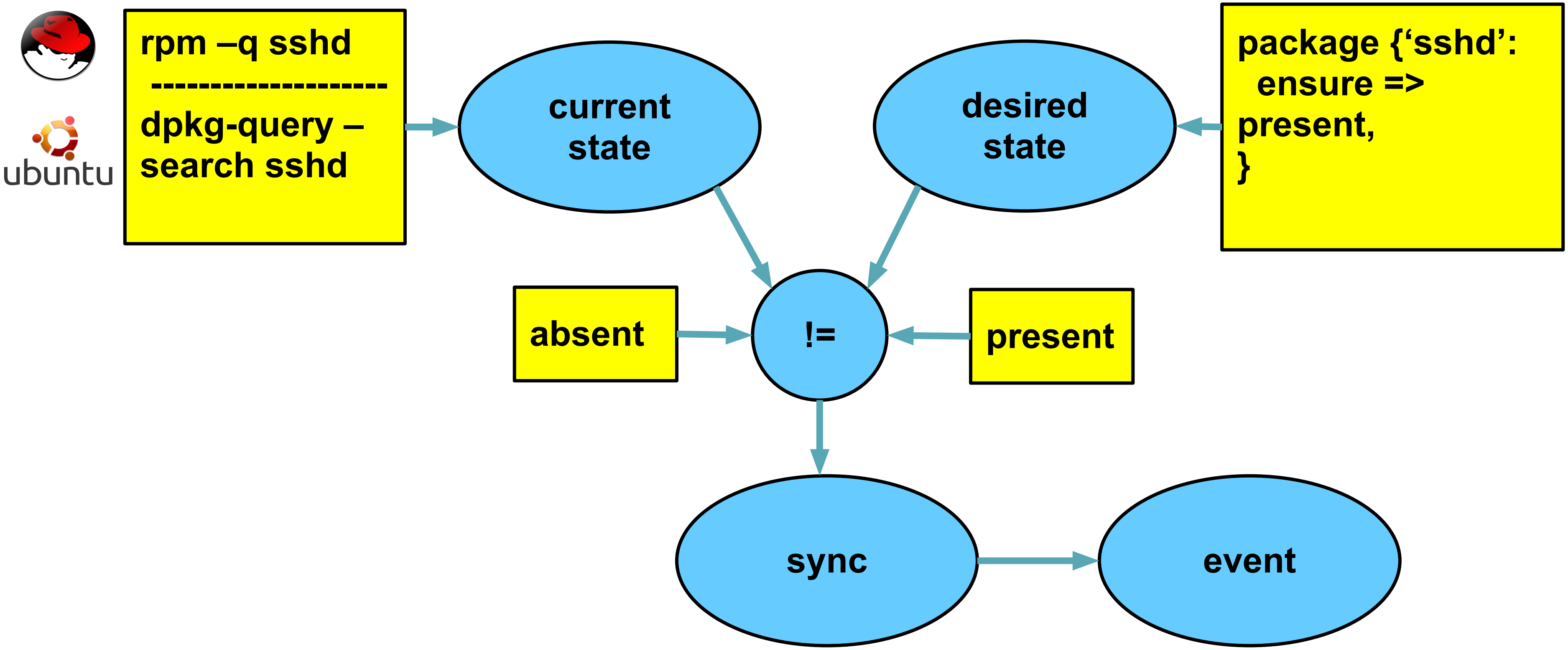
You describe system state...



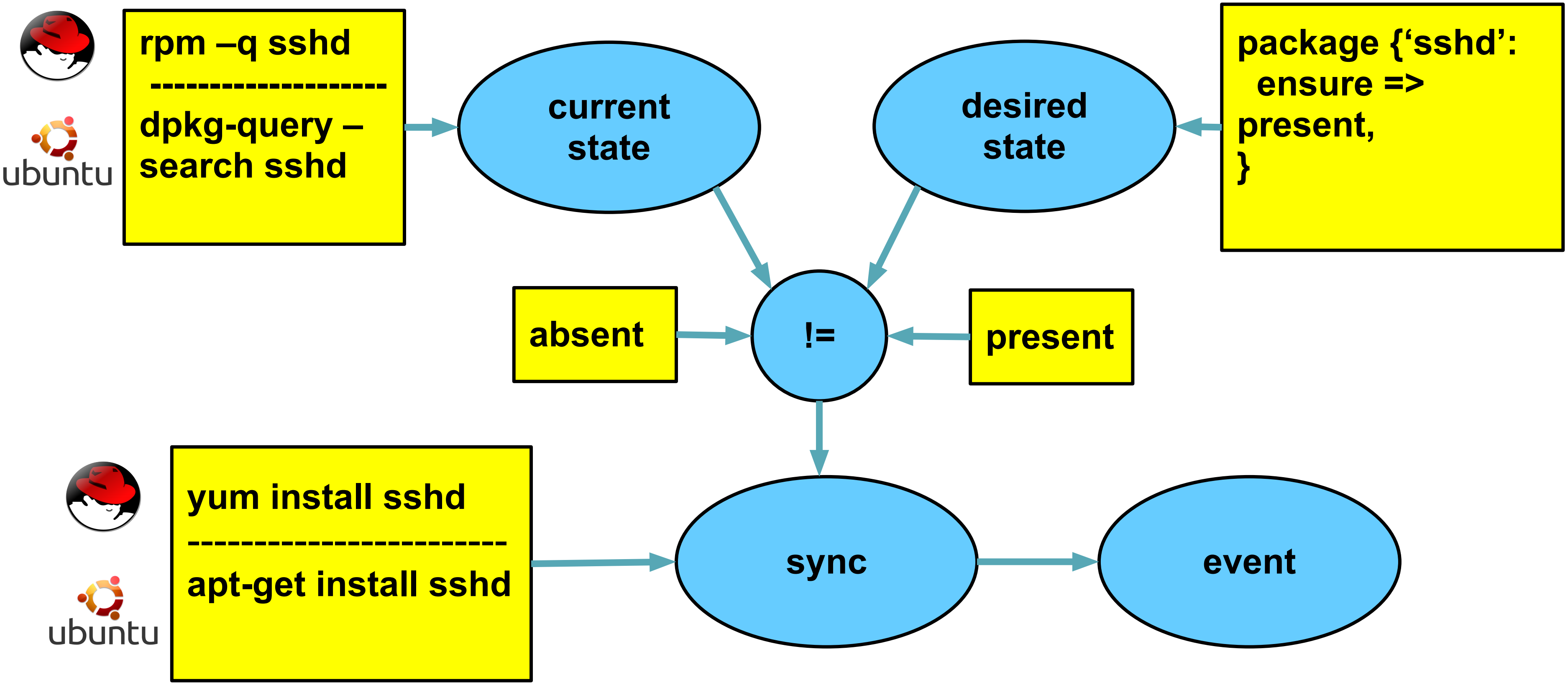
Puppet collects current state...



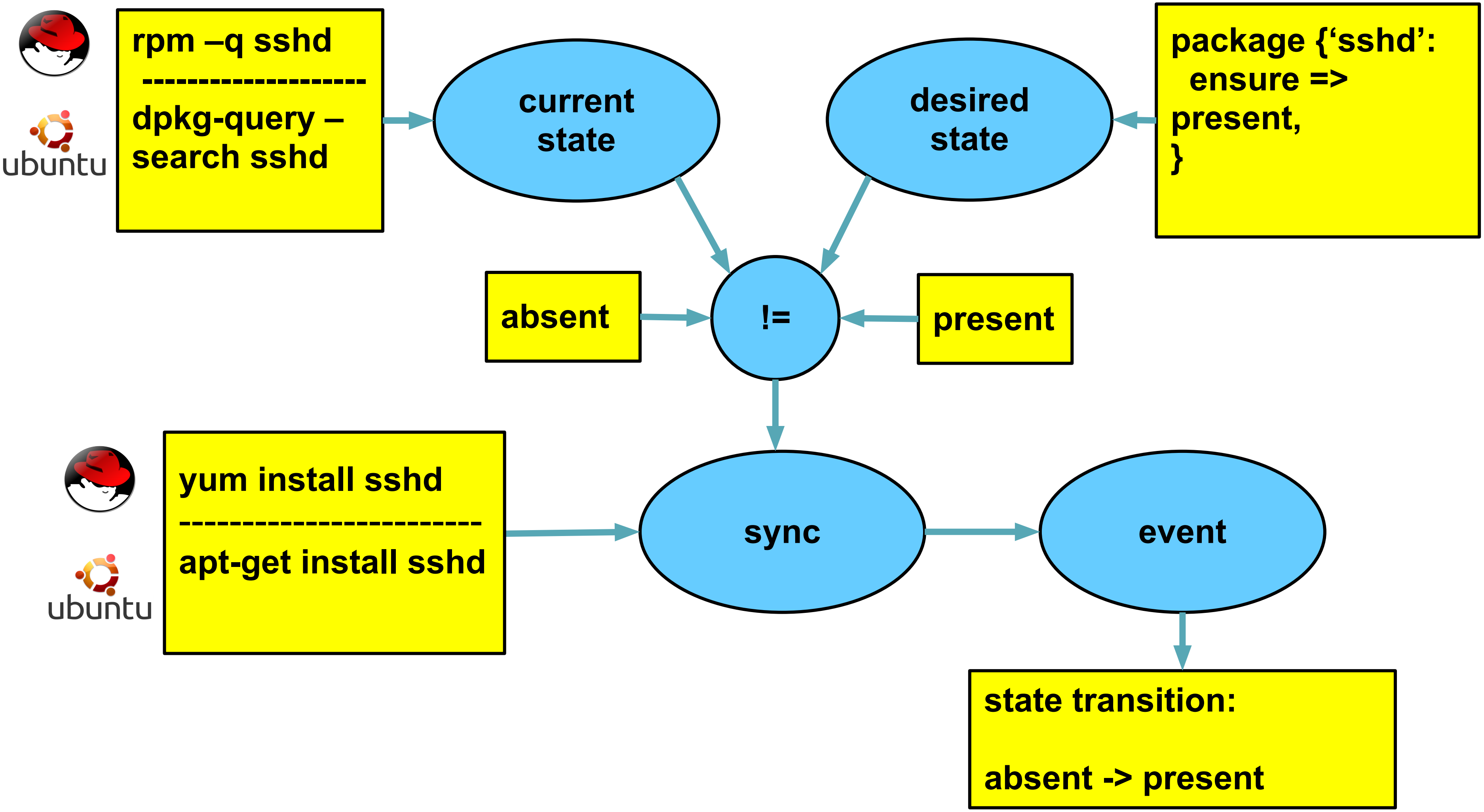
Puppet compares...



Puppet synchronizes...



Puppet logs...


rpm –q sshd
----
dpkg-query –search sshd
current state
desired state
package {‘sshd’:
ensure =>
present,
}
absent
!=
present
yum install sshd
----
apt-get install sshd
sync
event
state transition:
absent -> present

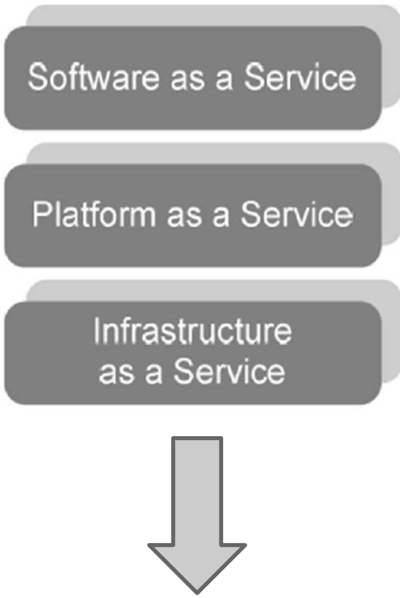
A more complete puppet manifest

```
class ssh::install {
        package { "openssh":
                ensure => present, }
}
class ssh::config {
        file { "/etc/ssh/sshd_config":
                ensure      => present,
                owner       => 'root',
                group       => 'root',
                mode        => 0600,
                source      => "puppet:///modules/ssh/sshd_config",
                require     => Class["ssh::install"],
                notify      => Class["ssh::service"], }
}
class ssh::service {
        service { "sshd":
                ensure          => running,
                hasstatus       => true,
                hasrestart      => true,
                enable          => true,
                require         => Class["ssh::config"], }
}
class ssh {
        include ssh::install, ssh::config, ssh::service
}
```

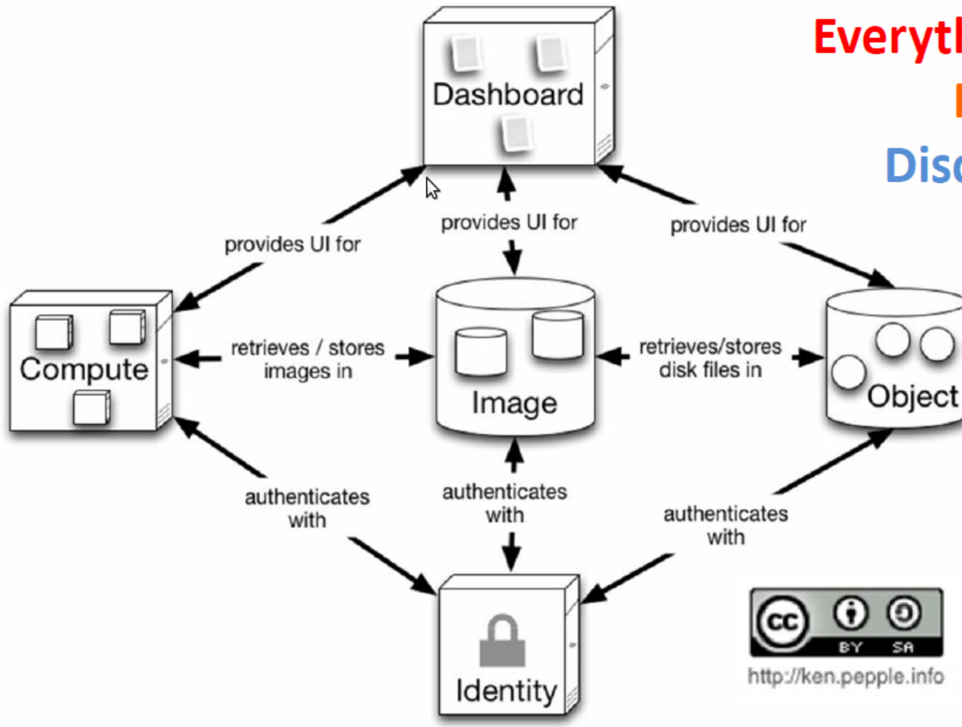
dependency

"if I change..."

OpenStack @ 10,000m, Looks Easy!



openstack™



Everything has an API

Message based

Discrete Pluggable Components

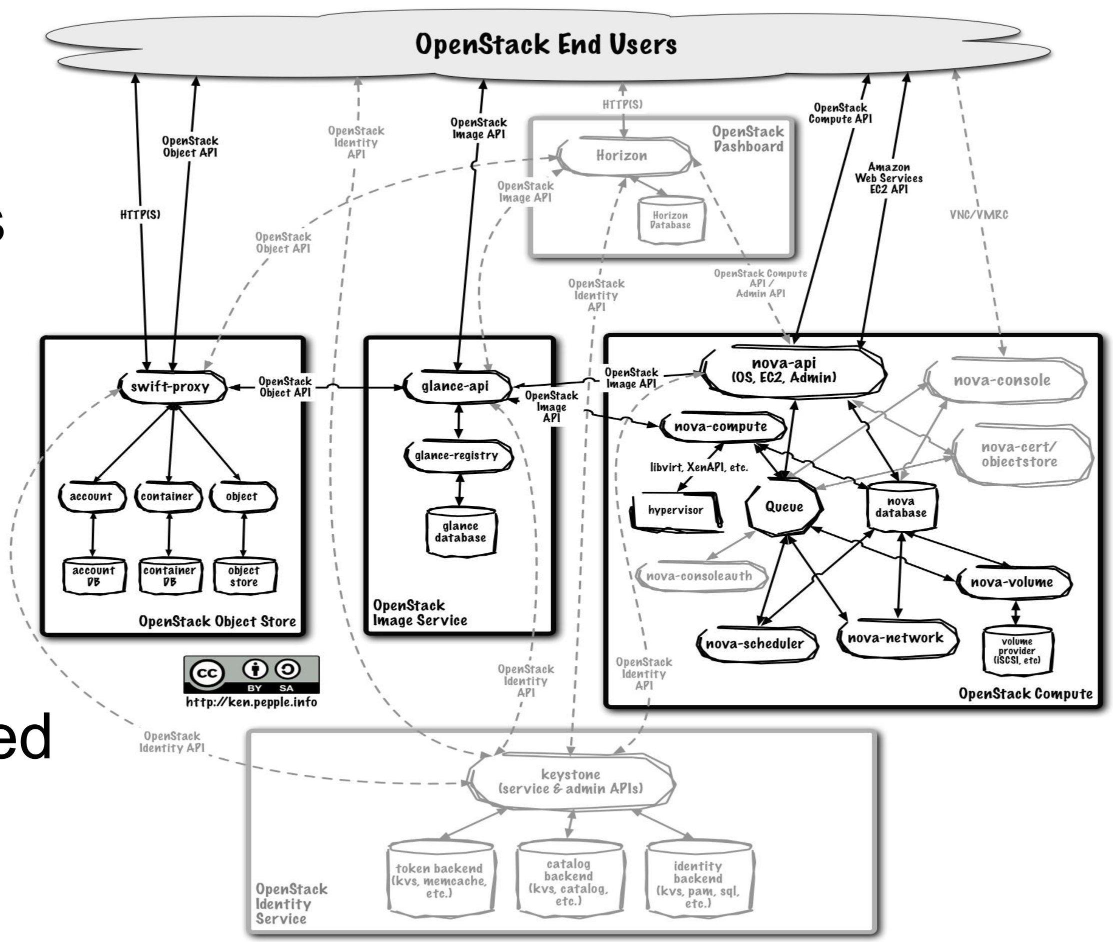
OpenStack - The Ugly Close-up

Complicated

- Many Services
- Many Dependencies

Challenge to deploy

- 100's, 1000's of nodes?



You **need** an automated toolchain!

Apple Moment!

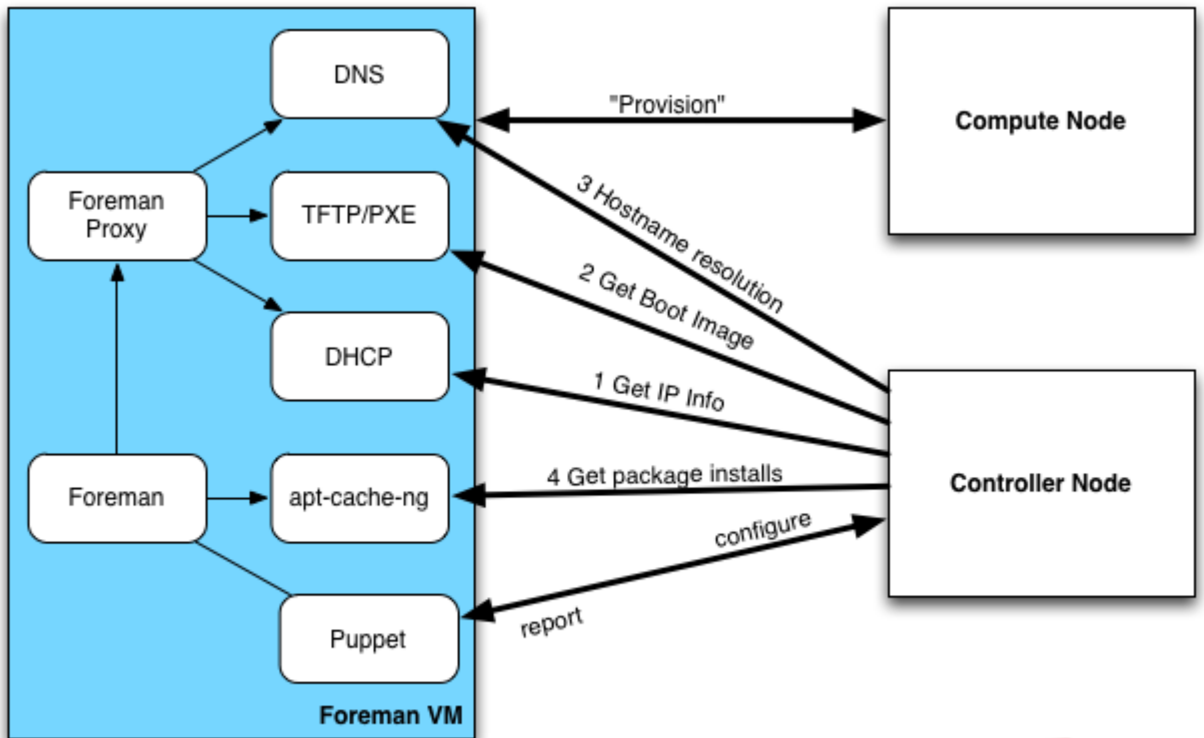
Demo - What could go wrong?!

Multi-node OpenStack Installation

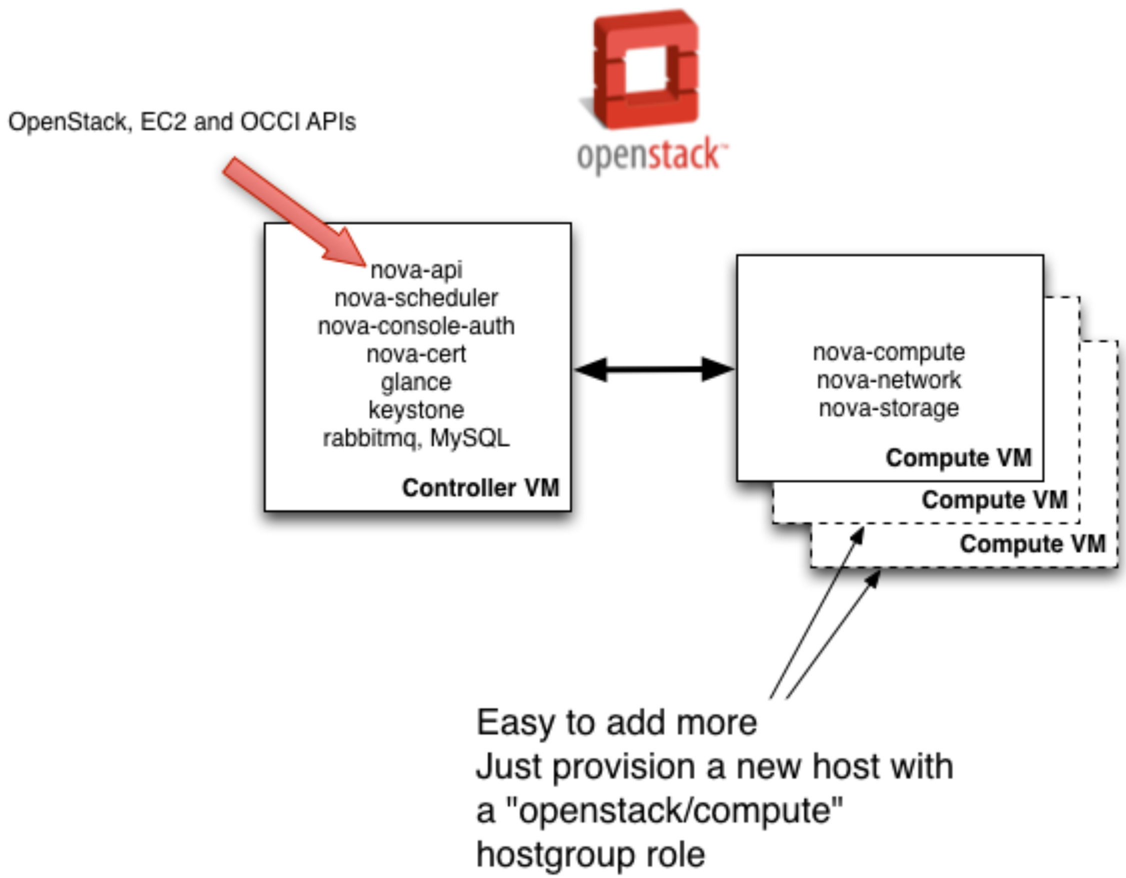
- 1 controller node
  - "boss"
- 1 compute node
  - "worker1"

- More time? Easy to add more.

Demo: Deployment Architecture



Demo: OpenStack Component Deployment



Demo: Code/Config Details

- There are 2 roles (*hostgroups*)
  - **openstack/controller** - `controller.pp`
  - **openstack/compute** - `compute.pp`

- Both have different puppet manifests
  - Same 'icclab' module

```
root@foreman:/etc/puppet/modules/iaas# tree icclab
icclab
└── manifests
    └── all_in_one.pp
    └── controller.pp
    └── compute.pp
    └── params.pp

1 directory, 4 files
```

What's in a controller node?

```
class icclab::controller{

  include icclab::params

  $admin_password          = 'admin_pass'
  $keystone_admin_token    = 'keystone_pass'

  class { 'openstack::controller':

    public_address          => $icclab::params::controller_node_public,
    public_interface        => $icclab::params::public_interface,
    private_interface       => $icclab::params::private_interface,
    internal_address        => $icclab::params::controller_node_internal,
    floating_range          => '192.168.56.128/25',
    fixed_range             => $icclab::params::fixed_range,
    multi_host              => true,
    network_manager         => $icclab::params::network_manager,
    verbose                 => true,
    auto_assign_floating_ip => false,
    mysql_root_password     => 'mysql_root_password',
    admin_email             => 'admin@iownz.you',
    admin_password          => $admin_password,
    keystone_db_password    => 'keystone_db_password',
    keystone_admin_token    => $keystone_admin_token,
    glance_db_password      => 'glance_pass',
    glance_user_password    => 'glance_pass',
    nova_user_password      => 'nova_pass',
    nova_user_password      => $icclab::params::nova_user_password,
    rabbit_password         => $icclab::params::rabbit_password,
    rabbit_user             => $icclab::params::rabbit_user,
    export_resources        => false,

  }

  # Optional: include if you want authorisation information
  #           stored in a local file, located in /root/
  class { 'openstack::auth_file':

    admin_password       => $admin_password,
    keystone_admin_token => $keystone_admin_token,
    controller_node      => $icclab::params::controller_node_internal,

  }

}
```

What's in a compute node?

```
class icclab::compute{

  include icclab::params

  class { 'openstack::compute':

    public_interface   => $icclab::params::public_interface,
    private_interface  => $icclab::params::private_interface,
    internal_address   => $ipaddress_eth0,
    libvirt_type       => 'qemu',
    fixed_range        => $icclab::params::fixed_range,
    network_manager    => $icclab::params::network_manager,
    multi_host         => true,
    sql_connection     => $icclab::params::sql_connection,
    nova_user_password => $icclab::params::nova_user_password,
    rabbit_host        => $icclab::params::controller_node_internal,
    rabbit_password    => $icclab::params::rabbit_password,
    rabbit_user        => $icclab::params::rabbit_user,
    glance_api_servers => "${icclab::params::controller_node_internal}:9292",
    vncproxy_host      => $icclab::params::controller_node_public,
    vnc_enabled        => true,
    verbose            => true,
    manage_volumes     => true,
    nova_volume        => 'nova-volumes'

  }

}
```

Conclusions/Learnings

- Automation is essential
- Puppet codifies learnings, makes sharing easy
- Foreman a central management point, full lifecycle, adaptable to other services
- Dependence on infrastructure service management frameworks is lessened
  - Fast and efficient to install new ones with a tool chain
- Other than SLA guarantees, the only guarantee to maintain is the API between provider and customer and this is where standard APIs are need such as OCCI/CDMI/OVF.

Next Steps

- OpenStack to be rolled-out in ICCLab
  - New data centre, rolled-out within the month
  - Will include all OS Nova (Essex) and Swift services
    - Including OCCI interface
      - puppetlab-nova pull-request available
- OpenStack to be rolled-out in GWDG
  - Will include all OS Nova (Essex) and Swift services
  - Providing production-quality OpenStack services

Thanks!
Questions?

Everything Presented is Documented at:

http://www.cloudcomp.ch
http://cloud.gwdg.de

Including:

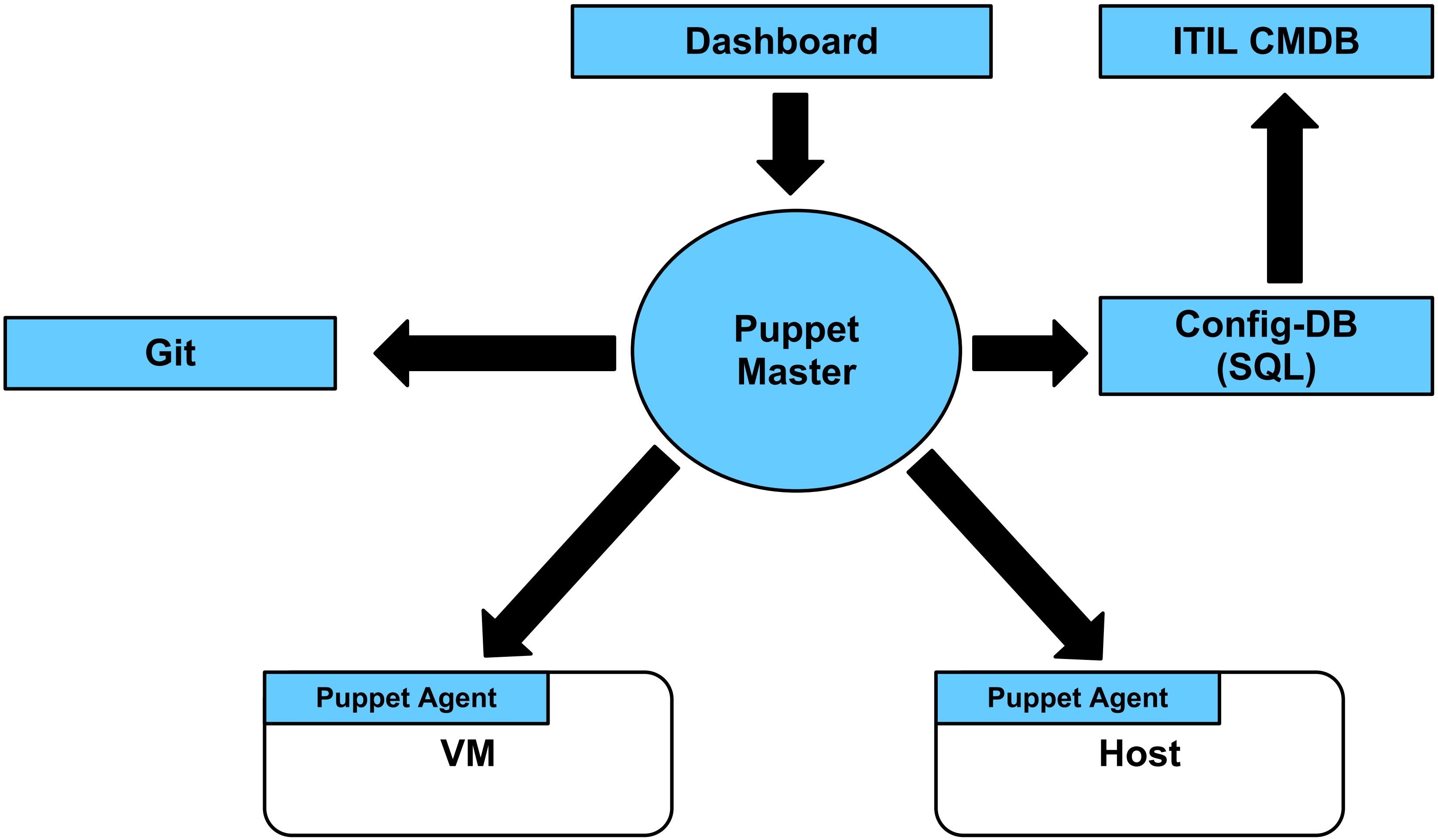
- HOWTOs

- Foreman, Puppet, OpenStack installs

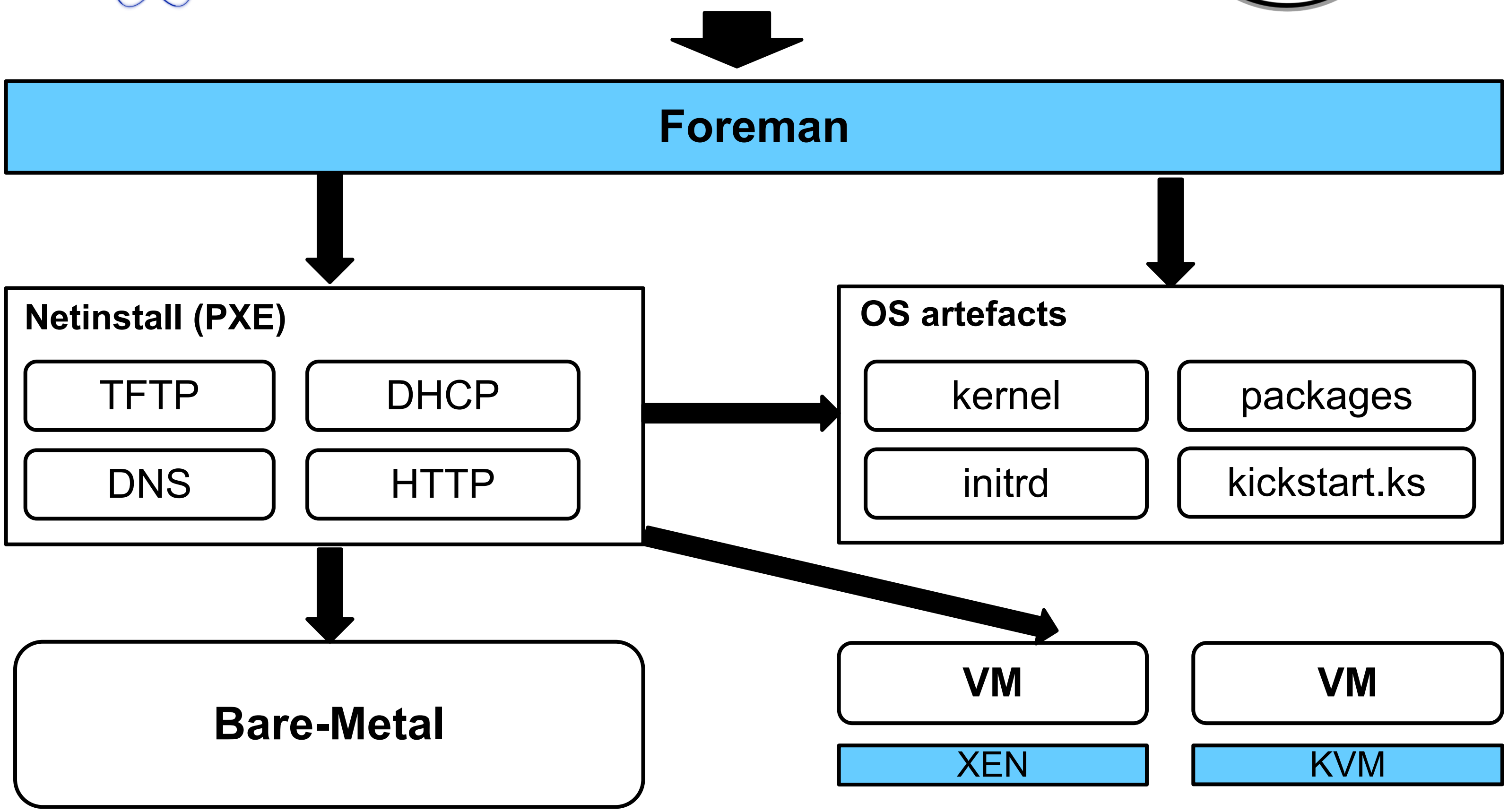
- Virtual Machine images

Backup slides

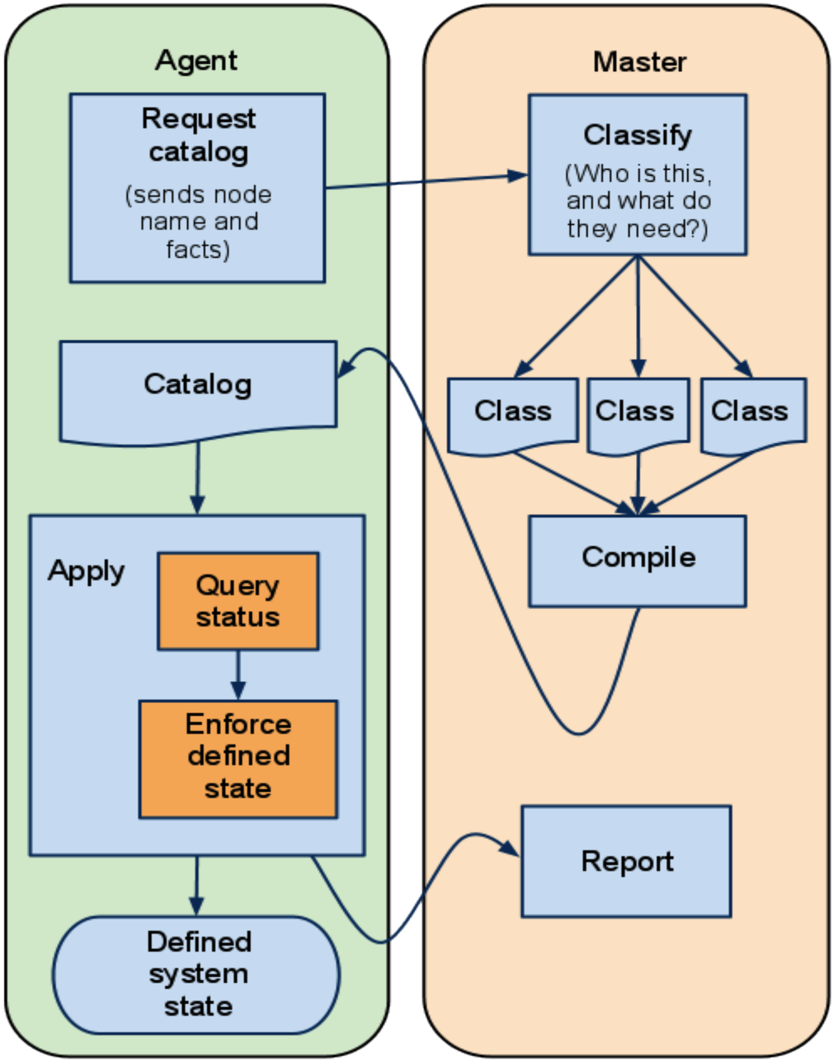
Toolchain map



Foreman Arch



Puppetmaster <-> agent interaction



What are the common config params?

```
class icclab::params{


  /* -----------Shared Connection Settings-------------*/

  ########### Important to set! ############
  $controller_node_address  = '192.168.56.3'

  $controller_node_public   = controller_node_address
  $controller_node_internal = controller_node_address
  $sql_connection           = "mysql://nova:${icclab::params::nova_db_password}@${controller_node_internal}/nova"

  /* -------------------------------------------------*/


  /* -------------Shared Auth Settings----------------*/
  $nova_user_password       = 'nova_pass'
  $rabbit_password          = 'rabbit_pass'
  $rabbit_user              = 'rabbit_user'
  /* -------------------------------------------------*/


  /* ----------Shared Networking Settings-------------*/
  $network_manager          = 'nova.network.manager.FlatDHCPManager'
  $fixed_range              = '10.0.0.0/24'
  $public_interface         = 'eth0'
  $private_interface        = 'eth1'
  /* -------------------------------------------------*/

}
```

GWDG Cloud topology