SaltStack-Formulas Documentation

Release master

salt-formulas contributors

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Contents

CHAPTER 1

Overview

This project provides scalable and reliable IT automation using SaltStack for installing and operating wide variety of services and resources. Project provides standards to define service models and processes with ability to reuse these components in varying contexts.

CHAPTER 2

Contents

2.1 Project Introduction

Here you will find documentation relevant to architecture and goals of the project. Existing formula ecosystem and undelying metadata standards.

2.1.1 Overview

Chapter 1. Overview

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Project Objectives

Project provides standards to define service models and processes with ability to reuse these components in varying contexts. Metadata model shared accross all services let us explore underlying relationships that ease the management of infrastructures acoross whole life-span.

The project has little different objectives compare to official salt-formulas. The general orientation of project may be similar to the official salt formulas but the major differences lie at meta-data model and clear decomposition which being consistent accross all formulas in SaltStack- Formulas project.

Collateral Goodies

Adhering to the standards allows further services to be declared and configured in dynamic way, consuming metadata of surrounding services. This include following domains:

- Dynamic monitoring: Event collecting, telemetry with dashboards, alarms with notifications
- Dynamic backup: Data backuping and restoring
- Dynamic security: Firewall rules, router configurations
- Dynamic documentation, topology visualizations
- Dynamic audit profiles and beacons

All these can be generated out of your existing infrastructure without need for any further parametrisation.

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Project History

Beginnings

The initial formula structure was created in 2013. The formulas were not even called formulas back then, but states. It was time of great confusion and the quality of newly created salt-formulas was low.

tcp cloud Era

The majority of formulas were rewritten to current standard structure and were used in production for cloud deployments. All the formulas were open-sourced and support metadata were instroduces in 2015.

openstack-salt Project

OpenStack-Salt project was OpenStack Big Tent initiative project in 2015/16 and provided resources for installing and operating OpenStack deployments. It used subset of the formulas and project was abandoned when tcp cloud was bought by Mirantis.

saltstack-formulas Project

The scope of current project is much wider than management of OpenStack installations and provides generic formula ecosystem capable of managing multiple heterogenous infrastructures.

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Introduction to SaltStack

SaltStack-Formulas uses Salt configuration platform to install and manage infrastructures. Salt is an automation platform that greatly simplifies system and application deployment. Salt uses service *formulas* to define resources written in the YAML language that orchestrate the individual parts of system into the working entity.

Pillar Metadata

Pillar is an interface for Salt designed to offer global values that are distributed to all minions. The ext_pillar option allows for any number of external pillar interfaces to be called to populate the pillar data.

Pillars are tree-like structures of data defined on the Salt Master and passed through to the minions. They allow confidential, targeted data to be securely sent only to the relevant minion. Pillar is therefore one of the most important systems when using Salt.

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2.1.2 Quick Start

Chapter 2. Quick start

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Deployment Preparation Guidelines

Let's consider simple deployment of single configuration node with one application and one database node.

- Config node [salt master]
- Application node [python app]
- Database node [postgres db]

To start the simple deployment you need first setup the Salt master. Installation of salt minions on controlled nodes is then very simple.

Salt Master Formulas

States are delivered by formulas and are stored in `/srv/salt/env/<env>/` directory. Environment can be either production [prd] or development [dev]. This directory is correlates with *salt_files* root for given environment. You can serve multiple environments from single salt master at once, but this setup is not recommentded.

Usually production environment formulas are delivered by packages and development environment formulas are delivered by git sourced formulas.

```
/srv/salt/env/<env>/
|-- service1/
|   |-- itit.sls
|   |-- role1/
|   |   |-- service.sls
|   |   `-- resource.sls
|   `-- role2.sls
`-- service2/
    |-- itit.sls
    `-- role.sls
```

For example basic *linux*, *python-app* and *openssh* services for development environment in a little shortened version.

```
/srv/salt/env/dev/
|-- linux/
|   |-- itit.sls
|   |-- system/
|   |   |-- repo.sls
|   |   `-- user.sls
|   `-- network/
|       |-- interface.sls
|       `-- host.sls
```

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```
|-- python-app/
|   |-- itit.sls
|   |-- server.sls
`-- openssh/
    |-- itit.sls
    |-- server.sls
    `-- client.sls
```

More about structure and layout of the formulas can be found in Development documentation.

Salt Master Metadata

Metadata then define what state formulas in given specific context are projected to managed nodes.

Following trees shows simple metadata structure for simple python application deployment. Important parameters are *cluster_name* labeling individual deployments and *cluster.domain* giving the deployment nodes domain part of the FQDN.

```
/srv/salt/reclass/
|-- classes/
|   |-- cluster/
|   |   `-- deployment/
|   |       |-- infra/
|   |       |   `-- config.yml
|   |       |-- python_app/
|   |       |   |-- database.yml
|   |       |   `-- web.yml
|   |       `-- init.yml
|   |-- system/
|   |   |-- python_app/
|   |   |   `-- server/
|   |   |       |-- [dev|prd].yml
|   |   |       `-- [single|cluster].yml
|   |   |-- postgresql/
|   |   |   `-- server/
|   |   |       |-- cluster.yml
|   |   |       `-- single.yml
|   |   |-- linux/
|   |   |   `-- system/
|   |   |       `-- init.yml
|   |   `-- deployment2.yml
|   `-- service/
|       |-- linux/ [formula metadata]
|       |-- python-app/ [formula metadata]
|       `-- openssh/ [formula metadata]
`-- nodes/
    `-- cfg.cluster.domain.yml
```

You start with defining single node *cfg.cluster.domain* in nodes directory and that is core node pointing to your *cluster.deploy.infra.config* class.

Content of the *nodes/cfg.cluster.domain.yml* file:

```
classes:
- cluster.deploy.infra.config
parameters:
```

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```
  _param:
    reclass_data_revision: master
  linux:
    system:
      name: cfg01
      domain: cluster.domain
```

Contains pointer to class *cluster.deploy.infra.config* and some basic parameters.

Content of the *classes/cluster/deploy/infra/config.yml* file:

```
classes:
- system.openssh.client
- system.salt.master.git
- system.salt.master.formula.git
- system.reclass.storage.salt
- cluster.cluster_name
parameters:
  _param:
    salt_master_base_environment: dev
    reclass_data_repository: git@git.domain.com:reclass-models/salt-model.git
    salt_master_environment_repository: "https://github.com/salt-formulas"
    reclass_data_revision: master
    reclass_config_master: ${_param:infra_config_deploy_address}
    single_address: ${_param:infra_config_address}
  reclass:
    storage:
      node:
        python_app01:
          name: app01
          domain: ${_param:cluster_domain}
          classes:
          - cluster.${_param:cluster_name}.python_app.application
          params:
            salt_master_host: ${_param:reclass_config_master}
            single_address: ${_param:python_application_node01_single_address}
            database_address: ${_param:python_database_node01_single_address}
        python_dbs01:
          name: dbs01
          domain: ${_param:cluster_domain}
          classes:
          - cluster.${_param:cluster_name}.python_app.database
          params:
            salt_master_host: ${_param:reclass_config_master}
            single_address: ${_param:python_database_node01_single_address}
```

More about structure and layout of the metadata can be found in Metadata chapter.

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Bootstrap Salt-Formulas infrastructure

This document's describes scripted way to configure Salt Master node.

To setup the environment according to Quickstart Configure specification.

TL;DR

We uses and script that provide functions to install and configure required primitives and dependencies.

Script with function library is to:

- install and configure *salt master* and *minions*
- install and configure reclass
- bootstrap *salt master* with *salt-formulas* common prerequisites in mind
- validate reclass the model / pillar for all nodes

Note: This script is expected to convert to salt formula in a longterm perspective.

Expected usage in shortcut is:

```
git clone https://github.com/salt-formulas/salt-formulas-scripts /srv/salt/scripts
source /srv/salt/scripts/bootstrap.sh
```

Use one of the functions or follow the "setup()" which is executed by default:

```
* source_local_envs()
* install_reclass()
* clone_reclass()

* configure_pkg_repo()
* configure_salt_master()
* configure_salt_minion()

* install_salt_formula_git()
* install_salt_formula_pkg()
* install_salt_master_pip()
* install_salt_master_pkg()
```

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```
* install_salt_minion_pip()
* install_salt_minion_pkg()

* verify_salt_master()
* verify_salt_minion()
* verify_salt_minions()
```

Quick bootstrap

Bootstrap salt-master

(expects salt-formulas reclass model repo)

```
git clone https://github.com/salt-formulas/salt-formulas-scripts /srv/salt/scripts

git clone <model-repository> /srv/salt/reclass
cd /srv/salt/reclass
git submodule update --init --recursive

cd /srv/salt/scripts

CLUSTER_NAME=regionOne HOSTNAME=cfg01 DOMAIN=infra.ci.local ./bootstrap.sh
# OR just
HOSTNAME=cfg01 DOMAIN=infra.ci.local ./bootstrap.sh
```

Note: Creates $PWD/.salt-master-setup.sh.passed if succesfully passed the “setup script” with the aim to avoid subsequent setup.

Bootstrap salt-minion

This is mostly just to makeweight as configure minion as a super simple task that can be achieved by other means as well.

```
export HTTPS_PROXY="http://proxy.your.corp:8080"; export HTTP_PROXY=$HTTPS_PROXY

export MASTER_HOSTNAME=cfg01.infra.ci.local || export MASTER_IP=10.0.0.10
export MINION_ID=$(hostname -f)               || export HOSTNAME=prx01 DOMAIN=infra.ci.
↪local
source <(curl -qL https://raw.githubusercontent.com/salt-formulas/salt-formulas-
↪scripts/master/bootstrap.sh)
install_salt_minion_pkg
```

Advanced usage

The script is fully driven by environment variables. That’s Pros and known Cons of course.

Additional bootstrap ENV variables

(for full list of options see the *bootstrap.sh* source)

```
# reclass
export RECLASS_ADDRESS=<repo url>   ## if not already cloned in /srv/salt/reclass >

# formula
export FORMULAS_BRANCH=master
export FORMULAS_SOURCE=git

# system / host / salt master minion id
export HOSTNAME=cfg01
export DOMAIN=infra.ci.local
# Following variables are calculated from the above if not provided
#export MINION_ID
#export MASTER_HOSTNAME
#export MASTER_IP

# salt
export BOOTSTRAP_SALTSTACK_OPTS=" -dX stable 2016.3"
export EXTRA_FORMULAS="prometeus"
SALT_SOURCE=${SALT_SOURCE:-pkg}
SALT_VERSION=${SALT_VERSION:-latest}

# bootstrap control
export SALT_MASTER_BOOTSTRAP_MINIMIZED=False
export CLUSTER_NAME=<%= cluster %>

# workarounds (forked reclass)
export RECLASS_IGNORE_CLASS_NOTFOUND=False
export EXTRA_FORMULAS="prometheus telegraph"
```

Bootstrap Salt Master in a container for model validation purposes

We use this to check the model during CI. The example count's with using forked version of *Reclass* <*https://github.com/salt-formulas/reclass*> with additional features, like ability to ignore missing classes during the bootstrap.

To spin a container we uses a kitchen-test framework. The setup required you may find in the *Testing formulas section* <*../develop/testing-formulas.html#requirements*

Assume you have a repository with your reclass model. Add to this repository following files. Both files can be found at *salt-formulas/deploy/model* <*https://github.com/salt-formulas/salt-formulas/tree/master/deploy/model*> repo.

`.kitchen.yml`:

```
---
driver:
  name: docker
  use_sudo: false
  volume:
    - <%= ENV['PWD'] %>:/tmp/kitchen

provisioner:
  name: shell
```

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```
  script: verify.sh

platforms:
  <% `find classes/cluster -maxdepth 1 -mindepth 1 -type d | tr '_' '-' |sort -u`.
↪split().each do |cluster| %>
  <% cluster=cluster.split('/')[2] %>
  - name: <%= cluster %>
    driver_config:
      # image: ubuntu:16.04
      image: tcpcloud/salt-models-testing # With preinstalled dependencies (faster)
      platform: ubuntu
      hostname: cfg01.<%= cluster %>.local
      provision_command:
        - apt-get update
        - apt-get install -y git curl python-pip
        - git clone https://github.com/salt-formulas/salt-formulas-scripts /srv/salt/
↪scripts
        - cd /srv/salt/scripts; git pull -r; cd -
        # NOTE: Configure ENV options as needed, example:
        - echo "
          export BOOTSTRAP=1;\n
          export CLUSTER_NAME=<%= cluster %>;\n
          export FORMULAS_SOURCE=pkg;\n
          export RECLASS_VERSION=dev;\n
          export RECLASS_IGNORE_CLASS_NOTFOUND=True;\n
          export EXTRA_FORMULAS="";\n
        " > /kitchen.env
        #export RECLASS_SOURCE_PATH=/usr/lib/python2.7/site-packages/reclass;\n
        #export PYTHONPATH=$RECLASS_SOURCE_PATH:$PYTHONPATH;\n
  <% end %>

suites:
  - name: cluster
```

verify.sh:

```
#!/bin/bash

# ENV variables for MASTER_HOSTNAME composition
# export HOSTNAME=${`hostname -s`}
# export DOMAIN=${`hostname -d`}
cd /srv/salt/scripts; git pull -r || true; source bootstrap.sh || exit 1

# BOOTSTRAP
if [[ $BOOTSTRAP =~ ^(True|true|1|yes)$ ]]; then
  # workarounds for kitchen
  test ! -e /tmp/kitchen  || (mkdir -p /srv/salt/reclass; rsync -avh /tmp/kitchen/ /
↪srv/salt/reclass)
  cd /srv/salt/reclass
  # clone latest system-level if missing
  if [[ -e .gitmodules ]] && [[ ! -e classes/system/linux ]]; then
    git submodule update --init --recursive --remote || true
  fi
  source_local_envs
  /srv/salt/scripts/bootstrap.sh
  if [[ -e /tmp/kitchen ]]; then sed -i '/export BOOTSTRAP=/d' /kitchen.env; fi
fi
```

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```
# VERIFY
export RECLASS_IGNORE_CLASS_NOTFOUND=False
cd /srv/salt/reclass &&\
if [[ -z "$1" ]] ; then
  verify_salt_master &&\
  verify_salt_minions
else
  verify_salt_minion "$1"
fi
```

Then with `kitchen list` command list the models in repository to test and finally converge and salt master instance where you will trigger the validation.

```
$ kitchen list

Instance                                  Driver  Provisioner  Verifier  Transport ␣
↪Last Action     Last Error
-------------------------------------------------------------------------------------
↪-----------------------
cluster-aaa-ha-freeipa                    Docker  Shell        Busser    Ssh       ␣
↪Created
cluster-ceph-ha                           Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-k8s-aio-calico                    Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-k8s-ha-calico                     Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-aio-contrail                  Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-aio-ovs                       Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-ha-contrail                   Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-ha-ovs                        Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-ha-ovs-syndic                 Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-virt-liberty-dvr              Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-virt-liberty-ovs              Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-virt-mitaka-contrail          Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-virt-mitaka-dvr               Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-virt-mitaka-ovs               Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-virt-ocata-aio                Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-virt-ocata-contrail           Docker  Shell        Busser    Ssh       ␣
↪Created
cluster-ost-virt-ocata-contrail-nfv       Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-virt-ocata-dvr                Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
```

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```
cluster-ost-virt-ocata-k8s-calico         Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-virt-ocata-k8s-calico-dyn     Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-virt-ocata-k8s-calico-min     Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-virt-ocata-k8s-contrail       Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-virt-ocata-ovs                Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-virt-ocata-ovs-dpdk           Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-ost-virt-ocata-ovs-ironic         Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
```

To converge an instance:

```
$ kitchen converge cluster-ost-virt-ocata-contrail
```

To verify the model (reclass model)

You may use a custom module build for this purpose in *reclass formula https://github.com/salt-formulas/salt-formula-reclass*.

```
$SUDO salt-call ${SALT_OPTS} --id=${MASTER_HOSTNAME} reclass.validate_yaml
$SUDO salt-call ${SALT_OPTS} --id=${MASTER_HOSTNAME} reclass.validate_pillar
$SUDO salt-call ${SALT_OPTS} --id=${MASTER_HOSTNAME} grains.item roles
$SUDO salt-call ${SALT_OPTS} --id=${MASTER_HOSTNAME} state.show_lowstate
$SUDO salt-call --no-color grains.items
$SUDO salt-call --no-color pillar.data
$SUDO reclass --nodeinfo ${HOSTNAME}
```

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Quick Deploy on OpenStack with Heat

Single node deployments are a great way to setup an SaltStack-Formulas cloud for:

- a service development environment
- an overview of how all of the OpenStack services and roles play together

- a simple lab deployment for testing

It is possible to run full size proof-of-concept deployment on OpenStack with *Heat template*, the stack has following requirements for cluster deployment:

- At least 200GB disk space
- 70GB RAM

The single-node deployment has following requirements:

- At least 80GB disk space
- 16GB RAM

Available Heat Templates

The `app_single` environment consists of three nodes.

FQDN	Role	IP
config.openstack.local	Salt master node	10.10.10.200
control.openstack.local	OpenStack control node	10.10.10.201
compute.openstack.local	OpenStack compute node	10.10.10.202

Heat Client Setup

The preffered way of installing OpenStack clients is isolated Python environment. To creat Python environment and install compatible OpenStack clients, you need to install build tools first.

Installation on Ubuntu

Install required packages:

```
$ apt-get install python-dev python-pip python-virtualenv build-essential
```

Now create and activate virtualenv *venv-heat* so you can install specific versions of OpenStack clients.

```
$ virtualenv venv-heat
$ source ./venv-heat/bin/activate
```

Use following *requirements.txt*. Clients were tested with Juno and Kilo Openstack versions.

```

python-cinderclient>=1.3.1,<1.4.0
python-glanceclient>=0.19.0,<0.20.0
#python-heatclient>=0.6.0,<0.7.0
git+https://github.com/tcpcloud/python-heatclient.git@stable/juno#egg=heatclient
python-keystoneclient>=1.6.0,<1.7.0
python-neutronclient>=2.2.6,<2.3.0
python-novaclient>=2.19.0,<2.20.0
python-swiftclient>=2.5.0,<2.6.0

oslo.config>=2.2.0,<2.3.0
oslo.i18n>=2.3.0,<2.4.0
```

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```
oslo.serialization>=1.8.0,<1.9.0
oslo.utils>=1.4.0,<1.5.0
```

Put requirements into file and install them.

```
$ pip install -r requirements.txt
```

If everything goes right, you should be able to use openstack clients, *heat*, *nova*, etc.

Connecting to OpenStack Cloud

Setup OpenStack credentials so you can use openstack clients. You can download `openrc` file from Openstack dashboard and source it or execute following commands with filled credentials:

```
$ vim ~/openrc

export OS_AUTH_URL=https://<openstack_endpoint>:5000/v2.0
export OS_USERNAME=<username>
export OS_PASSWORD=<password>
export OS_TENANT_NAME=<tenant>
```

Now source the OpenStack credentials:

```
$ source openrc
```

To test your sourced variables:

```
$ env | grep OS
```

Some resources required for heat environment deployment.

Get Network Resource Name

The public network is needed for setting up both testing heat stacks. The network ID can be found in Openstack Dashboard or by running following command:

```
$ neutron net-list
```

Get Image Resource Name

Image ID is required to run OpenStack Salt lab templates, Ubuntu 14.04 LTS is required as config_image and image for one of the supported platforms is required as instance_image, used for OpenStack instances. To lookup for actual installed images run:

```
$ glance image-list
```

Launching the Heat Stack

Download heat templates from this repository.

```
$ git clone git@github.com:openstack/salt-formulas.git
$ cd doc/source/_static/scripts/
```

Now you need to customize env files for stacks, see examples in envs directory `doc/source/_static/scripts/envs` and set required parameters.

Full examples of env files for the two respective stacks:

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Quick Deploy on AWS with CloudFormations

AWS Client Setup

If you already have pip and a supported version of Python, you can install the AWS CLI with the following command:

```
$ pip install awscli --upgrade --user
```

You can then verify that the AWS CLI installed correctly by running aws –version.

```
$ aws --version
```

Connecting to Amazon Cloud

Get the Access Keys

Access keys consist of an access key ID and secret access key, which are used to sign programmatic requests that you make to AWS. If you don't have access keys, you can create them from the AWS Management Console. We recommend that you use IAM access keys instead of AWS account root user access keys. IAM lets you securely control access to AWS services and resources in your AWS account.

For general use, the aws configure command is the fastest way to set up your AWS CLI installation.

```
$ aws configure
AWS Access Key ID [None]: AKIAIOSFODNN7EXAMPLE
AWS Secret Access Key [None]: wJalrXUtnFEMI/K7MDENG/bPxRfiCYEXAMPLEKEY
Default region name [None]: us-west-2
Default output format [None]: json
```

Launching the CFN Stack

After successful login you can test the credentials.

```
aws create-stack --stack-name
```

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Quick Deploy with Vagrant

Single deployments are a great way to setup an infrastructure for:

- a service development environment
- an overview of how all of the OpenStack services and roles play together
- a simple lab deployment for testing

Although single builds aren't suitable for large production deployments, they're great for small proof-of-concept deployments.

It's strongly recommended to have hardware that meets the following requirements before starting an AIO deployment:

- CPU with hardware-assisted virtualization support
- At least 20GB disk space
- 2GB RAM

Vagrant Setup

Installing Vagrant is extremely easy for many operating systems. Go to the Vagrant downloads page and get the appropriate installer or package for your platform. Install the package using standard procedures for your operating system.

The installer will automatically add vagrant to your system path so that it is available in shell. Try logging out and logging back in to your system (this is particularly necessary sometimes for Windows) to get the updated system path up and running.

Add the generic ubuntu1604 image for virtualbox virtualization.

```
$ vagrant box add ubuntu/xenial64

==> box: Loading metadata for box 'ubuntu/xenial64'
    box: URL: https://atlas.hashicorp.com/ubuntu/xenial4
==> box: Adding box 'ubuntu/xenial64' (v20160122.0.0) for provider: virtualbox
    box: Downloading: https://vagrantcloud.com/ubuntu/boxes/xenial64/versions/
↪20160122.0.0/providers/virtualbox.box
==> box: Successfully added box 'ubuntu/xenial64' (v20160122.0.0) for 'virtualbox'!
```

Environment Setup

The environment consists of three nodes.

FQDN	Role	IP
config.cluster.local	Salt master node	10.10.10.200
service.cluster.local	Managed node	10.10.10.201

Minion Configuration Files

Download salt-formulas

Look at configuration files for each node deployed.

`scripts/minions/config.conf` configuration:

```
id: config.cluster.local

master: 10.10.10.200
```

`scripts/minions/service.conf` configuration:

```
id: service.cluster.local

master: 10.10.10.200
```

Vagrant Configuration File

The main vagrant configuration for SaltStack-Formulas deployment is located at `scripts/Vagrantfile`.

```
# -*- mode: ruby -*-
# vi: set ft=ruby :

boxes = {
  'ubuntu/xenial64' => {
    'name'  => 'ubuntu/xenial64',
    'url'   => 'ubuntu/xenial64'
  },
}

Vagrant.configure("2") do |config|

  config.vm.define :cluster_config do |cluster_config|

    cluster_config.vm.hostname = 'config.cluster.local'
    cluster_config.vm.box = 'ubuntu/xenial64'
    cluster_config.vm.box_url = boxes['ubuntu/xenial64']['url']
    cluster_config.vm.network :private_network, ip: "10.10.10.200"

    cluster_config.vm.provider :virtualbox do |vb|
      vb.customize ["modifyvm", :id, "--memory", 512]
      vb.customize ["modifyvm", :id, "--cpus", 1]
      vb.name = 'cluster-config'
      vb.gui = false
    end

    cluster_config.vm.provision :salt do |salt|
      salt.minion_config = "minions/config.conf"
      salt.colorize = true
      salt.bootstrap_options = "-F -c /tmp -P"
    end

  end

  config.vm.define :cluster_service do |cluster_service|

    cluster_service.vm.hostname = 'service.cluster.local'
    cluster_service.vm.box = 'ubuntu/xenial64'
    cluster_service.vm.box_url = boxes['ubuntu/xenial64']['url']
    cluster_service.vm.network :private_network, ip: "10.10.10.201"

    cluster_service.vm.provider :virtualbox do |vb|
      vb.customize ["modifyvm", :id, "--memory", 4096]
      vb.customize ["modifyvm", :id, "--cpus", 1]
      vb.name = 'cluster-servie'
      vb.gui = false
    end

    cluster_service.vm.provision :salt do |salt|
      salt.minion_config = "minions/service.conf"
      salt.colorize = true
      salt.bootstrap_options = "-F -c /tmp -P"
    end

  end

end
```

Launching Vagrant Nodes

Check the status of the deployment environment.

```
$ cd /srv/vagrant-cluster
$ vagrant status

Current machine states:

cluster_config          not created (virtualbox)
cluster_service         not created (virtualbox)
```

Setup config node, launch it and connect to it using following commands, it cannot be provisioned by vagrant salt, as the salt master is not configured yet.

```
$ vagrant up cluster_config
$ vagrant ssh cluster_config
```

Salt master Bootstrap

Bootstrap the salt master service on the config node, it can be configured with following parameters:

```
$ export RECLASS_ADDRESS=https://github.com/salt-formulas/salt-formulas-model.git
$ export CONFIG_HOST=config.cluster.local
```

To deploy salt-master from packages, run on config node:

```
$ /vagrant/bootstrap/salt-master-setup.sh
```

Now setup the server node. Launch it using following command:

```
$ vagrant up cluster_service
```

To orchestrate all defined services accross all nodes, run following command on config node:

```
$ salt-run state.orchestrate orchestrate
```

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2.1.3 Metadata Modelling

Chapter 3. Metadata Authoring Guidelines

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Model-driven Architectures

We have the formula structures covered, now we can proceed to define how the metadata is modelled and key patterns we need to know to build nice standard models.

Model Driven Architecture (MDA) is an answer to growing complexity of systems controlled by configuration management and orchestration tools. It provides unified node classification with atomic service definitions.

Core Principles

Following table shows the core principles for creating model-driven architectures.

Atomicity	Services are separated with such affinity that allows running them on single node.
Reusability / Replacibility	Different services serving the same role can be replaced without affecting connected services.
Service Roles	Services may implement multiple roles, these can be then separated to individual nodes.
Dynamic Resources	Service metadata is alwyas available for definition of dynamic resources.
Change Management	The strength lies not in descibing the static topology of services but more the process of ongoing updates.

Sample Model Architecture

Following figure show sample system that has around 10 services with some outsourced by 3rd party service providers.

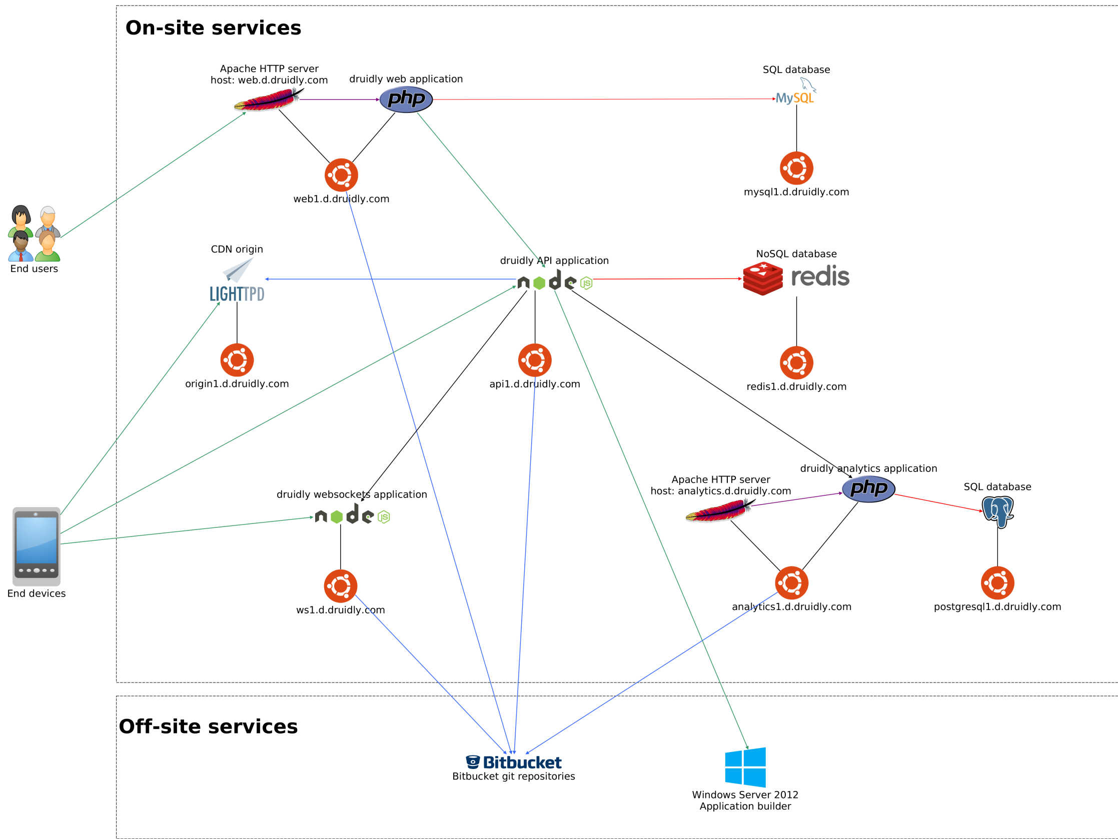
We can identify several subsystem layers within this complex application system.

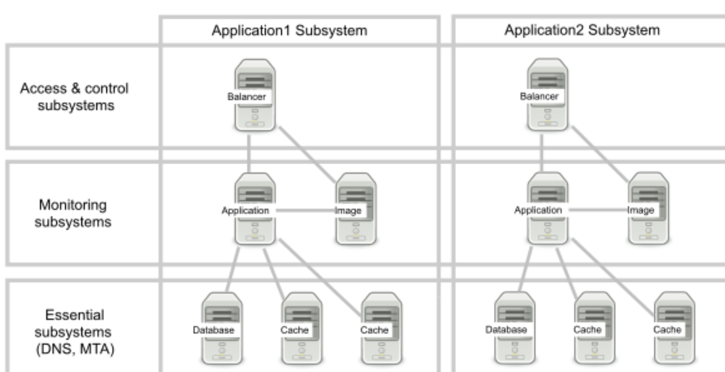
- Proxy service - Distributing load to application layer
- Application service - Application with caches
- Data persistence - Databases and filesystem storage

Horizontally Scaled Services

Certain services span across multiple application systems. These usually play critical roles in system maintenance and are essential for smooth ongoing operations.

These services usually fit into one of following categories:


On-site services
Apache HTTP server
host: web.d.druidly.com
druidly web application
SQL database
web1.d.druidly.com
mysql1.d.druidly.com
End users
CDN origin
druidly API application
NoSQL database
redis
origin1.d.druidly.com
api1.d.druidly.com
redis1.d.druidly.com
Apache HTTP server
host: analytics.d.druidly.com
druidly analytics application
SQL database
druidly websockets application
End devices
ws1.d.druidly.com
analytics1.d.druidly.com
postgresql1.d.druidly.com
Off-site services
Bitbucket
Bitbucket git repositories
Windows Server 2012
Application builder


Application1 Subsystem
Application2 Subsystem
Access & control subsystems
Monitoring subsystems
Essential subsystems (DNS, MTA)
Balancer
Application
Image
Database
Cache
Cache

Access / Control	SSH access, orchestration engine access, user authentication.
Monitoring	Events and metric collections, alarmins, dashboards and notifications.
Essential	Name services, time services, mail transports, etc . . .

These horizontal services are not entirely configured directly but rather reuse the metadata of other surrounding services to configure itself (for example metering agent collects metrics to collect for metadata of surrounding services on the same node, node exports also metadata for external metric collector to pick).

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Standard Metadata Layout

Metadata models are separated into 3 individual layers: service, system and cluster. The layers are firmly isolated from each other and can be aggregated on south-north direction and using service interface agreements for objects on the same level. This approach allows to reuse many already created objects both on service and system layers as building blocks for a new solutions and deployments following the fundamental MDA principles.

Basic Functional Units (Service Class Level)

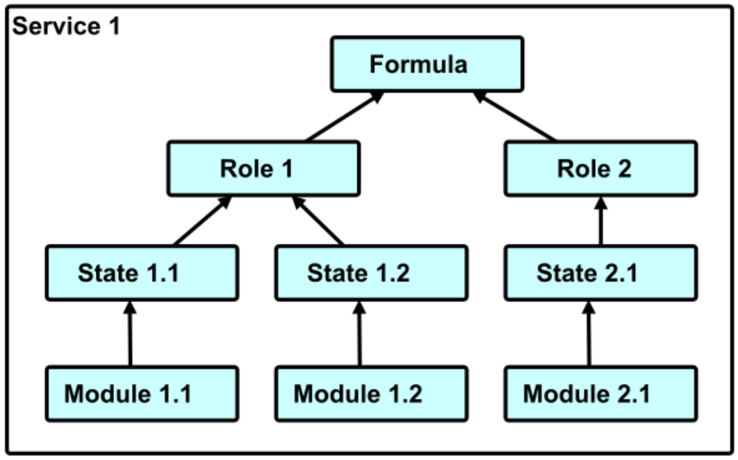
The services are the atomic units of config management. SaltStack formula or Puppet recipe with default metadata set can be considered as a service. Each service implements one or more roles and together with other services form systems. Following list shows decomposition

- Formula - Set of states that perform together atomic service
- State - Declarative definition of various resources (package, files, services)
- Module - Imperative interaction enforcing defined state for each State

Meta-data fragments for individual services are stored in salt formulas and can be reused in multiple contexts. Service level roles set the granularity of service to certain level, role is limited to 1 virtual machine or container aggregation. Service models are used to provide models with defaults for various contexts. This the low level modelling, where models are directly mapped to the Salt formula functions and get projected to the actual nodes.

Given Redis formula from Gitlab example we set basic set of parametes that can be used for actual service configuration as well as support services configuration.

Basic service metadata is present in *metadata/service* directory of every service formula.




```
service-formula/
`-- metadata/
    `-- service/
        |-- role1/
        |   |-- deployment1.yml
        |   `-- deployment2.yml
        `-- role2/
            `-- deployment3.yml
```

For example RabbitMQ service in various deployments.

```
rabbitmq/
`-- metadata/
    `-- service/
        `-- server/
            |-- single.yml
            `-- cluster.yml
```

The metadata fragment */srv/salt/reclass/classes/service/service-formula* maps to */srv/salt/env/formula-name/metadata/service* so then you can easily refer the metadata as *service.formula-name.role1.deployment1* class for example.

Example *metadata/service/server/cluster.yml* for the cluster setup PostgreSQL server.

```
parameters:
  postgresql:
    server:
      enabled: true
      bind:
        address: '127.0.0.1'
        port: 5432
        protocol: tcp
      clients:
      - '127.0.0.1'
     cluster:
       enabled: true
       members:
       - node01
       - node02
       - node03
```

Example *metadata/service/server/cluster.yml* for the single PostgreSQL server.

```
parameters:
  postgresql:
    server:
      enabled: true
      bind:
        address: '0.0.0.0'
        port: 5432
        protocol: tcp
```

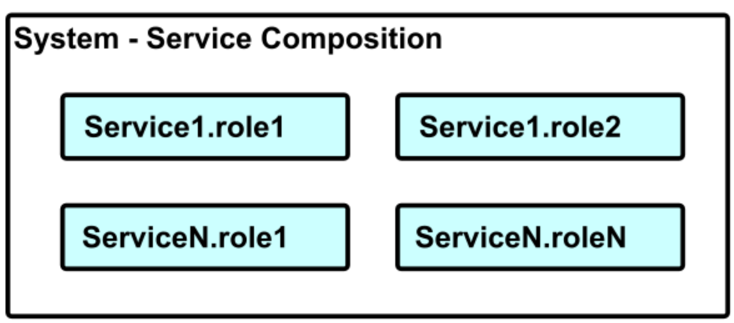
Example *metadata/service/server/cluster.yml* for the standalone PostgreSQL server.

```
parameters:
  postgresql:
    server:
      enabled: true
      bind:
        address: '127.0.0.1'
        port: 5432
        protocol: tcp
      clients:
      - '127.0.0.1'
```

There are about 140 formulas in several categories. You can look at complete Formula Ecosystem chapter.

Business Function Unit (System Class Level)

Aggregation of services performing given role in business IT infrastructure. System level models are the sets of the 'services' combined in a such way that the result of the installation of these services will produce a ready-to-use application (system) on integration level. In the 'system' model, you can not only include the 'services', but also override some 'services' options to get the system with the expected functionality.



The systems are usually one of the following type:

Single

Usually all-in-one application system on a node (Taiga, Gitlab)

Multi

Multiple all-in-one application systems on a node (Horizon, Wordpress)

Cluster

Service is part of a cluster (OpenStack controllers, large-scale web applications)

Container

Service is run as Docker container

For example, in the service 'haproxy' there is only one port configured by default (haproxy_admin_port: 9600) , but the system 'horizon' add to the service 'haproxy' several new ports, extending the service model and getting the system components integrated with each other.

```
system/
`-- business-system/
    |-- role1/
    |   |-- deployment1.yml
    |   `-- deployment2.yml
    `-- role2/
        `-- deployment3.yml
```

For example Graphite server with Carbon collector.

```
system/
`-- graphite/
    |-- server/
    |   |-- single.yml
    |   `-- cluster.yml
    `-- collector/
        |-- single.yml
        `-- cluster.yml
```

Example *classes/system/graphite/collector/single.yml* for the standalone Graphite Carbon installation.

```
classes:
- service.memcached.server.local
- service.graphite.collector.single
parameters:
  _param:
    rabbitmq_monitor_password: password
  carbon:
    relay:
      enabled: false
```

Example *classes/system/graphite/collector/single.yml* for the standalone Graphite web server installation. Where you combine your individual formulas to functional business unit of single node scope.

```
classes:
- service.memcached.server.local
- service.postgresql.server.local
- service.graphite.server.single
- service.apache.server.single
- service.supervisor.server.single
parameters:
  _param:
    graphite_secret_key: secret
    postgresql_graphite_password: password
    apache2_site_graphite_host: ${_param:single_address}
    rabbitmq_graphite_password: password
    rabbitmq_monitor_password: password
    rabbitmq_admin_password: password
    rabbitmq_secret_key: password
  apache:
```

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```
    server:
      modules:
      - wsgi
      site:
        graphite_server:
          enabled: true
          type: graphite
          name: server
          host:
            name: ${_param:apache2_site_graphite_host}
  postgresql:
    server:
      database:
        graphite:
          encoding: UTF8
          locale: cs_CZ
          users:
          - name: graphite
            password: ${_param:postgresql_graphite_password}
            host: 127.0.0.1
            rights: all privileges
```

Product Deployments (Cluster Class Level)

Cluster/deployment level aggregating systems directly referenced by individual host nodes or container services. Cluster is the set of models that combine the already created 'system' objects into different solutions. We can override any settings of 'service' or 'system' level from the 'cluster' level with the highest priority.

Also, for salt-based environments here are specified the list of nodes and some specific parameters for different nodes (future 'inventory' files for salt, future generated pillars that will be used by salt formulas). The actual mapping is defined, where each node is member of specific cluster and is implementing specific role(s) in systems.

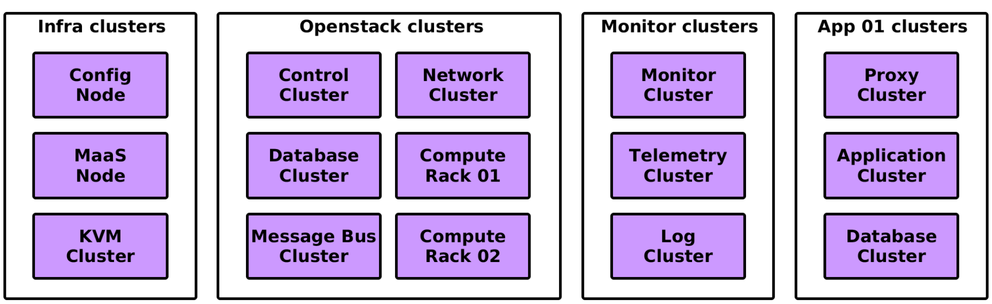

Fig. 1: Cluster level in detail

If we want not just to re-use an object, we can change its behaviour depending of the requirements of a solution. We define basic defaults on service level, then we can override these default params for specific system needs and then if needed provide overrides per deployment basis. For example, a database engine, HA approaches, IO scheduling policy for kernel and other settings may vary from one solution to another.

Default structure for cluster level has following strucuture:

```
cluster/
`-- deployment1/
```

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```
    |-- product1/
    |   |-- cluster1.yml
    |   `-- cluster2.yml
    `-- product2/
        `-- cluster3.yml
```

Where deployments is usually one datacenter, product realises full business units [OpenStack cloud, Kubernetes cluster, etc]

For example deployment Graphite server with Carbon collector.

```
cluster/
`-- demo-lab/
    |-- infra/
    |   |-- config.yml
    |   `-- integration.yml
    `-- monitoring/
        `-- monitor.yml
```

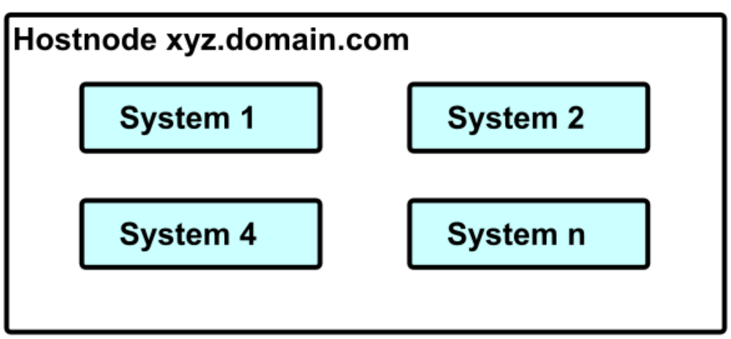
Example `demo-lab/monitoring/monitor.yml` class implementing not only Graphite services butr also grafana sever and sensu server.

```
classes:
- system.grapite.collector.single
- system.grapite.server.single
- system.grafana.server.single
- system.grafana.client.single
- system.sensu.server.cluster
- cluster.demo-lab
```

Cluster level classes can be shared by members of the particular cluster or by single node.

Node/Cluster Classification (Node Level)

Servers contain one or more systems that bring business value and several maintenance systems that are common to any node. Services running on single host can be viewed as at following picture.



Nodes generally include cluster level classes which include relevant system classes and these include service level classes which configure individual formulas to work.

The previous figure shows the real composition of individual metadata fragments that form the complete service catalog for each managed node.

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ReClass - Recursive Classification

reclass in node centric classifier for any configuration management. When reclass parses a node or class definition and encounters a parent class, it recurses to this parent class first before reading any data of the node (or class). When reclass returns from the recursive, depth first walk, it then merges all information of the current node (or class) into the information it obtained during the recursion.

This means any class may define a list of classes it derives metadata from, in which case classes defined further down the list will be able to override classes further up the list.

Resources

Original reclass implementation:

- https://github.com/madduck/reclass

Forked reclass with many additional features:

- https://github.com/salt-formulas/reclass
- https://github.com/salt-formulas/reclass/tree/develop (develop branch)

Core Functions

reclass is very simple and there are only two main concepts.

Deep Data Merging

When retrieving information about a node, reclass first obtains the node definition from the storage backend. Then, it iterates the list of classes defined for the node and recursively asks the storage backend for each class definition. Next, reclass recursively descends each class, looking at the classes it defines, and so on, until a leaf node is reached, i.e. a class that references no other classes.

Now, the merging starts. At every step, the list of applications and the set of parameters at each level is merged into what has been accumulated so far.

Merging of parameters is done "deeply", meaning that lists and dictionaries are extended (recursively), rather than replaced. However, a scalar value does overwrite a dictionary or list value. While the scalar could be appended to an existing list, there is no sane default assumption in the context of a dictionary, so this behaviour seems the most logical. Plus, it allows for a dictionary to be erased by overwriting it with the null value.

After all classes (and the classes they reference) have been visited, reclass finally merges the applications list and parameters defined for the node into what has been accumulated during the processing of the classes, and returns the final result.

Parameter Interpolation

Parameters may reference each other, including deep references, e.g.:

After merging and interpolation, which happens automatically inside the storage modules, the *python-application:server:database:host* parameter will have a value of "hostname.domain.com".

Types are preserved if the value contains nothing but a reference. Hence, the value of *dict_reference* will actually be a dictionary.

Overriding the Metadata

The reclass deals with complex data structures we call 'hard' metadata, these are defined in class files mentioned in previous text. These are rather complex structures that you don't usually need to manage directly, but a special dictionary for so called 'soft' metadata was introduced, that holds simple list of most frequently changed properties of the 'hard' metadata model. It uses the parameter interpolation function of reclass to achieve defining parameter at single location.

The 'Soft' Metadata

In reclass storage is a special dictionary called *_param*, which contains keys that are interpolated to the 'hard' metadata models. These soft parameters can be defaulted at system level or on cluster level and or changed at the node definition. With some modufications to formulas it will be also possible to have ETCD key-value store to replace or ammed the *_params* dictionary.

```
parameters:
  _param:
    service_database_host: hostname.domain.com
```

All of these values are preferably scalar and can be referenced as `${_param:service_database_host}` parameter. These metadata are considered cluster level readable and can be overriden by `reclass.set_cluster_param name value` module.

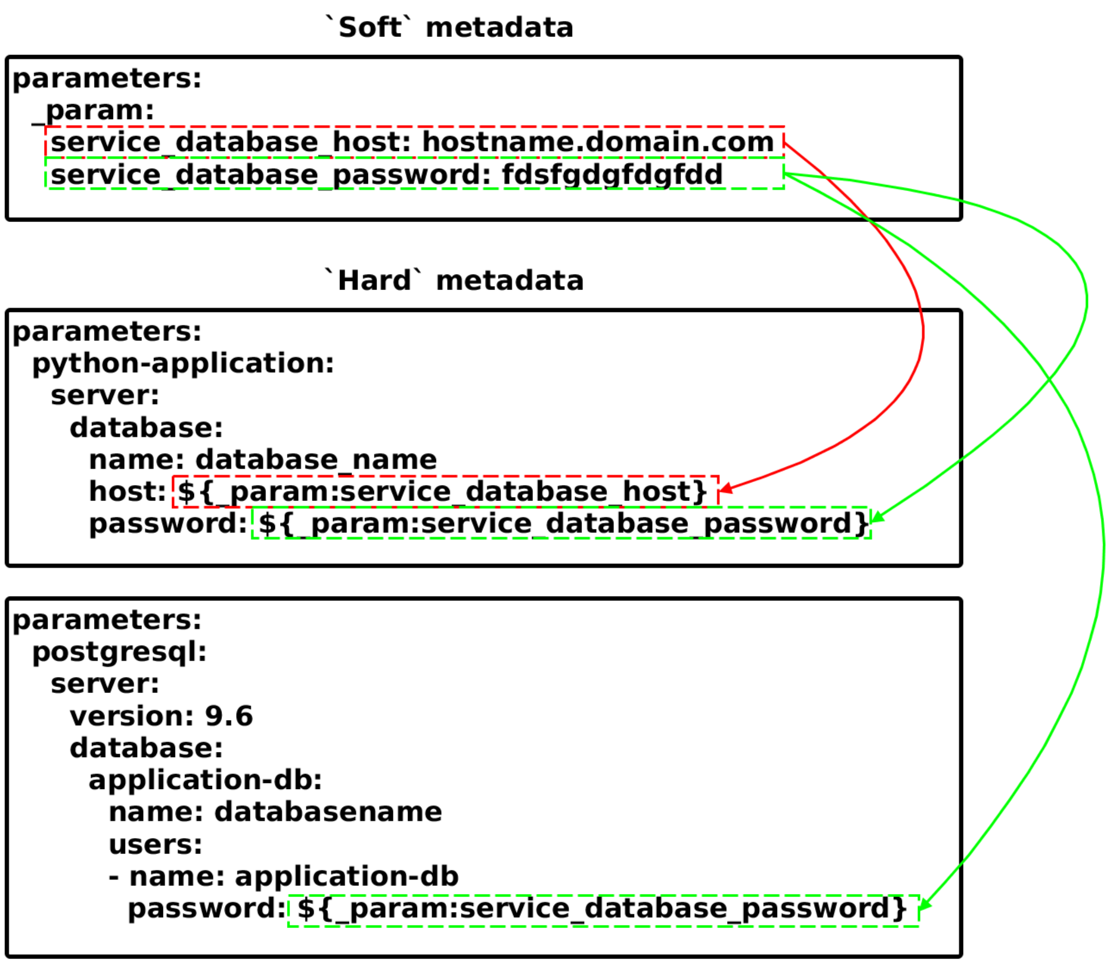

Fig. 2: Parameter interpolation of *soft* parameters to *hard* metadata models

The 'Hard' Metadata

This metadata are the complex metadata structures that can contain interpolation stings pointing to the 'soft' metadata or containing precise values.

```
parameters:
  python-application:
    server:
      database:
        name: database_name
        host: ${_param:service_database_host}
```

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Common Metadata Patterns

When working with metadata a lot of common patterns emerge over the time. The formulas reuse these patterns to maintain the cross-formula consistency.

Creating Service Metadata

Following points are selected as the most frequently asked questions and try to explain the design patters behind our metadata modes.

Service Formula Roles

The service roles provide level of separation for the formulas, if your service can be split across multiple nodes you should use the role. You can imagine role as simple kubernetes Kubernetes Pods. For example a `sensu` formula has following roles defined:

server

Definion of server service that sends commands to the clients andconsumes the responses.

client

Client role is installed on each of the client nodes and uses the support metadata concept to get the metadata from installed services.

dashoboard

Optional definion of Uchiwa dashboard.

You monitoring node can have all 3 roles running on single node, and that is completely OK.

Scalar Parameters

Always keep in mind that we model the resources not the configurations. However tempting can it be to just iterate the config dictionaries and adding all the values, it is not recommended. This approach prevents further parameter schema definition as well as allowing to add the defaults, etc.

Don't do following snippet, it may save you same at the start but with at the price of untestable and unpredictable results:

Warning:

```
service:
  role:
    config:
      option1: value1
      ...
      optionN: valueN
```

Common Service Metadata

When some metadata is reused by multiple roles it is possible to add the new virtual *common* role definition. This common metadata should be then available to every role.

The definition in the pillar metadata file:

```
service:
  common:
    param1: value1
```

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```
    ...
    paramN: valueN
```

And the corresponding code for joining the metadata in the `map.jinja`.

```
{% set raw_server = salt['grains.filter_by']({
    'Debian': {...},
}, merge=salt['pillar.get']('memcached:common')) %}

{% set server = raw_server, merge=salt['pillar.get']('memcached:server')) %}
```

Modelling and Iterating Resource Sets

Resource sets are resources provided by the service formula, for example for MySQL and PostgreSQL formula `database` is a resource set, for NGINX or Apache formula a member of resource set is `vhost`. Users, repositories, packages, jobs, interfaces, routes, mounts etc in the Linux formula are also good example of this pattern.

```
mysql:
  server:
    database:
      database_name:
        param1: value1
        param2: value2
```

Following snippet shows defined *virtual hosts* for the Nginx.

```
nginx:
  server:
    vhost:
      vhost_name:
        param1: value1
        param2: value2
```

Service Network Binding

You can define the address and port on whis the service listens in simple way. For single network binding you can use following code.

```
memcached:
  server:
    enabled: true
    maxconn: 8192
    bind:
      address: 0.0.0.0
      port: 11211
      protocol: tcp
```

Service Backend Structure

When service plugin mechanism allows to add arbitrary plugins to the individual roles, it is advised to use following format. Following snippet shows multiple defined backends, in this case it's pillar data sources.

```
salt:
  master:
    pillar:
      engine: composite
      reclass:
        index: 1
        storage_type: yaml_fs
        inventory_base_uri: /srv/salt/reclass
        propagate_pillar_data_to_reclass: False
        ignore_class_notfound: False
      saltclass:
        path: /srv/salt/saltclass
      nacl:
        index: 99
```

Note: The reason for existence of `engine` parameter is to separate various implementations. For relational databases we can determine what specific database is used to construct proper connection strings.

Client Relationship

The client relationship has form of a dictionary. The name of the dictionary represents the required role [database, cache, identity] and the *engine* parameter then refers to the actual implementation. Following snippet shows single service to service relation.

```
keystone:
  server:
    message_queue:
      engine: rabbitmq
      host: 200.200.200.200
      port: 5672
      user: openstack
      password: redacted
      virtual_host: '/openstack'
      ha_queues: true
```

Following snippet shows backend with multiple members.

```
keystone:
  server:
    cache:
      engine: memcached
      members:
      - host: 200.200.200.200
        port: 11211
      - host: 200.200.200.201
        port: 11211
      - host: 200.200.200.202
        port: 11211
```

SSL Certificates

Multiple service use SSL certificates. There are several possible ways how to obtain a certificate.

TODO

Using Service Support Metadata

You can think of support metadata as the k8s annotations for other services to pickup and be configured accordingly. This concept is heavily used in the definition of monitoring, documentation, etc.

Basics of Support Metadata

In formula there's `meta` directory, each service that needs to extract some data has file with `service.yml` for example `collectd.yml`, `telegrag.yml`.

Service Documentation

Following snippet shows how we can provide metadata for dynamic documentation creation for Glance service.

```
doc:
  name: Glance
  description: The Glance project provides services for discovering, registering, and␣
↪retrieving virtual machine images.
  role:
  {%- if pillar.glance.server is defined %}
  {%- from "glance/map.jinja" import server with context %}
    server:
      name: server
      endpoint:
        glance_api:
          name: glance-api
          type: glance-api
          address: http://{{ server.bind.address }}:{{ server.bind.port }}
          protocol: http
        glance_registry:
          name: glance-registry
          type: glance-registry
          address: http://{{ server.registry.host }}:{{ server.registry.port }}
          protocol: http
      param:
        bind:
          value: {{ server.bind.address }}:{{ server.bind.port }}
        version:
          name: "Version"
          value: {{ server.version }}
        workers:
          name: "Number of workers"
          value: {{ server.workers }}
        database_host:
          name: "Database"
          value: {{ server.database.user }}@{{ server.database.host }}:{{ server.
↪database.port }}//{{ server.database.name }}
        message_queue_ip:
          name: "Message queue"
          value: {{ server.message_queue.user }}@{{ server.message_queue.host }}:{{␣
↪server.message_queue.port }}{{ server.message_queue.virtual_host }}
        identity_host:
```

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```
          name: "Identity service"
          value: {{ server.identity.user }}@{{ server.identity.host }}:{{ server.
↪identity.port }}
        storage_engine:
          name: "Glance storage engine"
          value: {{ server.storage.engine }}
        packages:
          value: |
            {%- for pkg in server.pkgs %}
            {%- set pkg_version = "dpkg -l "+pkg+" | grep "+pkg+" | awk '{print $3}'"
↪%}
            * {{ pkg }}: {{ salt['cmd.run'](pkg_version) }}
            {%- endfor %}
  {%- endif %}
```

Service monitoring checks

Let's have our memcached service and look how the monitoring is defined for this service.

We start with definitions of metric collections.

```
{%- from "memcached/map.jinja" import server with context %}
{%- if server.get('enabled', False) %}
agent:
  input:
    procstat:
      process:
        memcached:
          exe: memcached
    memcached:
      servers:
        - address: {{ server.bind.address | replace("0.0.0.0", "127.0.0.1") }}
          port: {{ server.bind.port }}
{%- endif %}
```

We also define the functional monitoring for the collected metrics.

```
{%- from "memcached/map.jinja" import server with context %}
{%- if server.get('enabled', False) %}
server:
  alert:
    MemcachedProcessDown:
      if: >-
        procstat_running{process_name="memcached"} == 0
      {% raw %}
      labels:
        severity: warning
        service: memcached
      annotations:
        summary: 'Memcached service is down'
        description: 'Memcached service is down on node {{ $labels.host }}'
      {% endraw %}
{%- endif %}
```

Also the definition of the dashboard for the collected metrics is provided.

```
dashboard:
  memcached_prometheus:
    datasource: prometheus
    format: json
    template: memcached/files/grafana_dashboards/memcached_prometheus.json
  memcached_influxdb:
    datasource: influxdb
    format: json
    template: memcached/files/grafana_dashboards/memcached_influxdb.json
  main_influxdb:
    datasource: influxdb
    row:
      ost-middleware:
        title: Middleware
        panel:
          memcached:
            title: Memcached
            links:
            - dashboard: Memcached
              title: Memcached
              type: dashboard
            target:
              cluster_status:
                rawQuery: true
                query: SELECT last(value) FROM cluster_status WHERE cluster_name =
↪'memcached' AND environment_label = '$environment' AND $timeFilter GROUP BY time(
↪$interval) fill(null)
  main_prometheus:
    datasource: prometheus
    row:
      ost-middleware:
        title: Middleware
        panel:
          memcached:
            title: Memcached
            links:
            - dashboard: Memcached
              title: Memcached
              type: dashboard
            target:
              cluster_status:
                expr: avg(memcached_up) by (name)
```

This snippet appends panel to the main dashboard at grafana and creates a new dashboard. The prometheus and influxdb time-series are supported out of box throughout all formulas.

Virtual Machines versus Containers

The containers and services share great deal of parameters, but the way they are delivered is differnt accross various container platforms.

Virtual machine service deployment models

- local deployemnt

- single deployment
- cluster deployment

Container metadata requirements

- Metadata for docker swarm
- Metadata for kubenetes

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Working with Metadata

Every IT solution can be described by using several layers of objects, where the objects of higher layer are combinations of the objects from lower layers. For example, we may install 'apache server' and call it 'apache service', but there are objects that contain multiple services like 'apache service', 'mysql service', and some python scripts (for example keystone), we will call these "keystone system" or "freeipa system" and separate them on a higher (System) layer. The systems represent units of business logic and form working components. We can map systems to individual deployments, where "openstack cluster" consists of "nova system", "neutron system" and others OpenStack systems and "kubernetes cluster" consists of "etcd system" , "calico system" and few others. We can define and map PaaS, IaaS or SaaS solutions of any size and complexity.

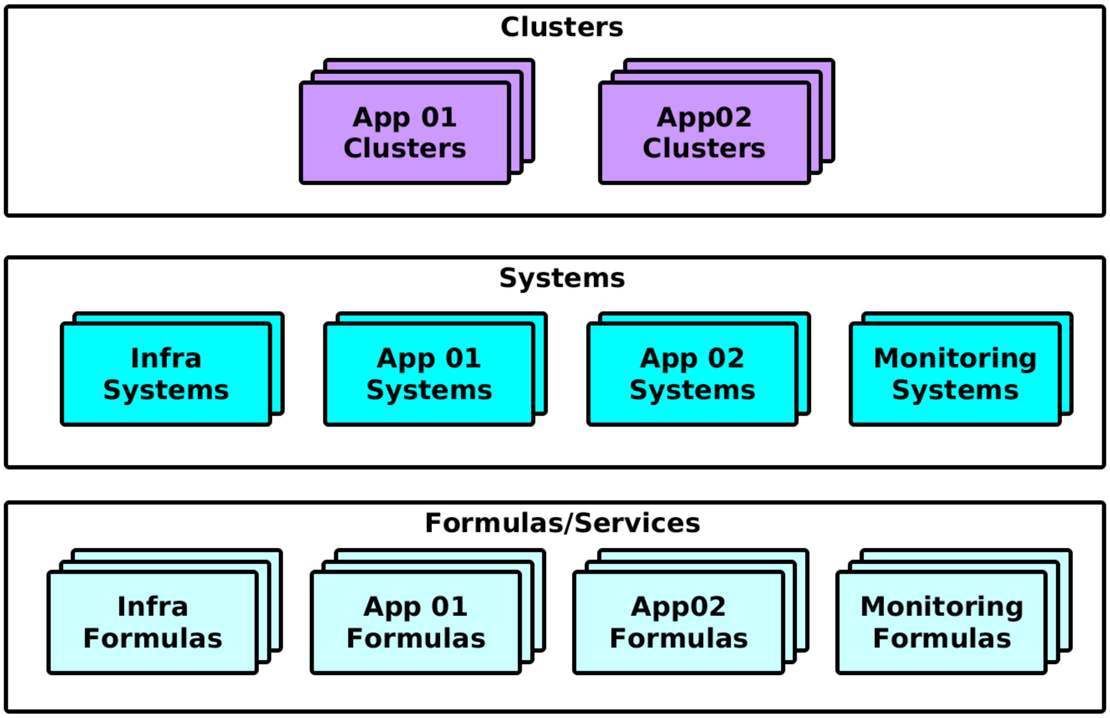

Fig. 3: Decomposition of services, systems and clusters

This model has been developed to cope with huge scopes of services, consisting of hundreds of services running VMs and containers across multiple physical servers or locations. Following text takes apart individual layers and explains them in further detail.

Scaling Metadata Models

Keeping consistency across multiple models/deployments has proven to be the most difficult part of keeping things running smooth over time with evolving configuration management. You have multiple strategies on how to manage your metadata for different scales.

The service level metadata can be handled in common namespace not by formulas itself, but it is recommended to keep the relevant metadata states

Shared Cluster and System Level

If every deployment only defined on system level, you need to keep copy of all system definitions at all deployments. This is suitable only for small number of deployments.

Separate Cluster with Single System Level

With introduction of new features and services shared deployments does not provide necessary flexibility to cope with the change. Having service metadata provided along formulas helps to deliver the up-to-date models to the deployments, but does not reflect changes on the system level. Also the need of multiple parallel deployments lead to adjusting the structure of metadata with new common system level and only cluster level for individual deployment(s). The cluster layer only contains soft parametrization and class references.

Separate Cluster with Multiple System Levels

When customer is reusing the provided system, but also has formulas and system on its own. Customer is free to create its own system level classes.

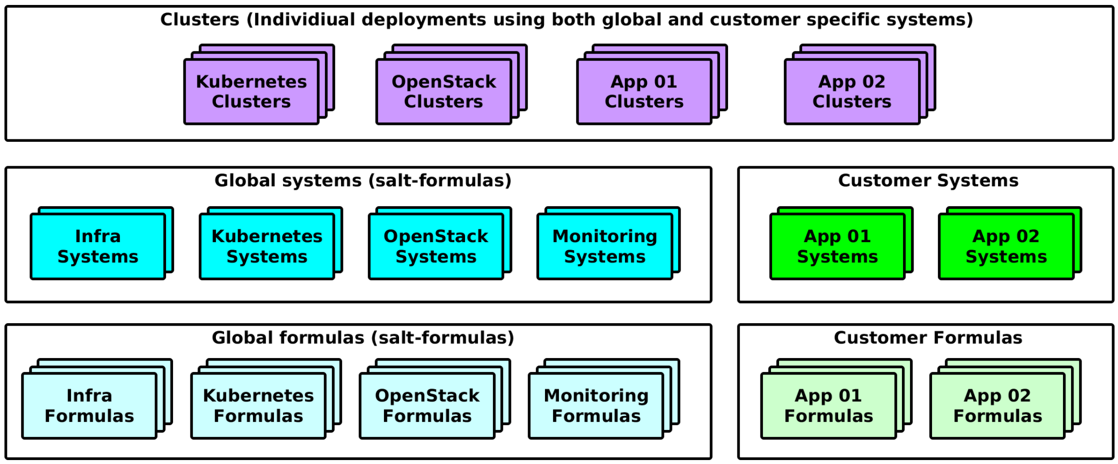

Fig. 4: Multiple system levels for customer services' based payloads

In this setup a customer is free to reuse the generic formulas with generic systems. At the same time he's free to create formulas of it's own as well as custom systems.

Handling Sensitive Metadata

Sensitive data refers to any information that you would not wish to share with anyone accessing a server. This could include data such as passwords, keys, or other information. For sensitive data we use the GPG renderer on salt master to cipher all sensitive data.

To generate a cipher from a secret use following command:

```
$ echo -n "supersecret" | gpg --homedir --armor --encrypt -r <KEY-name>
```

The ciphered secret is stored in block of text within `PGP MESSAGE` delimiters, which are part of cipher.

```
-----BEGIN PGP MESSAGE-----
Version: GnuPG v1
-----END PGP MESSAGE-----
```

Following example shows full use of generated cipher for virtually any secret.

```
parameters:
  _param:
    rabbitmq_secret_key: |
      -----BEGIN PGP MESSAGE-----
      Version: GnuPG v1

      hQEMAweRHKaPCfNeAQf9GLTN16hCfXAbPwU6BbBK0unOc7i9/etGuVc5CyU9Q6um
      QuetdvQVLFO/HkrC4lgeNQdM6D9E8PKonMlgJPyUvC8ggxhj0/IPFEKmrsnv2k6+
      cnEfmVexS7o/U1VOVjoyUeliMCJlAz/30RXaME49Cpi6No2+vKD8a4q4nZN1UZcG
      RhkhC0S22zNxOXQ38TBkmtJcqxnqT6YWKTUsjVubW3bVC+u2HGqJHu79wmwuN8tz
```

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```
    m4wBkfCAd8Eyo2jEnWQcM4TcXiF01XPL4z4g1/9AAxh+Q4d8RIRP4fbw7ct4nCJv
    Gr9v2DTF7HNigIMl4ivMIn9fp+EZurJNiQskLgNbktJGAeEKYkqX5iCuB1b693hJ
    FKlwHiJt5yA8X2dDtfk8/Ph1Jx2TwGS+lGjlZaNqp3R1xuAZzXzZMLyZDe5+i3RJ
    skqmFTbOiA==
    =Eqsm
    -----END PGP MESSAGE-----
rabbitmq:
  server:
    secret_key: ${_param:rabbitmq_secret_key}
    ...
```

As you can see the GPG encrypted parameters can be further referenced with reclass interpolation `${_param:rabbitmq_secret_key}` statement.

Creating new Models

Following text shows steps that need to be undertaken to implement new functionality, new system or entire deployment:

Creating a New Formula (Service Level)

If some of required services are missing, you can create a new service formula for Salt with the default model that describe the basic setup of the service. The process of creating new formula is streamlined by Using Cookiecutter and after the formula is created you can check Formula Authoring Guidelines chapter for furher instructions.

If you download formula to salt master, you can point the formula metadata to the proper service level directory:

```
ln -s <service_name>/metadata/service /srv/salt/reclass/classes/service/<service_name>
```

And symlink of the formula content to the specific salt-master file root:

```
ln -s <service_name>/<service_name> /srv/salt/env/<env_name>/<service_name>
```

Creating New Business Units (System Level)

If some 'system' is missing, then you can create a new 'system' from the set of 'services' and extend the 'services' models with necessary settings for the system (additional ports for haproxy, additional network interfaces for linux, etc). Do not introduce too much of *hard* metadata on the system level, try to use class references as much as possible.

Creating New Deployments (Cluster Level)

Determine which products are being used in the selected deployemnt, you can have infrastructure services, applications, monitoring products defined at once for single deployemnt. You need to make suere that all necessary systems was already created and included into global system level, then it can be just referenced. Follow the guidelines further up in this text.

Making Changes to Existing Models

When you have decided to add or modify some options in the existing models, the right place of the modification should be considered depending of the impact of the change:

Updating Existing Formula (Service Level)

Change the model in salt-formula-<service-name> for some service-specific improvements. For example: if the change is related to the change in the new package version of this service; the change is fixing some bug or improve performance or security of the service and should be applied for every cluster. In most cases we introduce new resources or configuration parameters.

Example where the common changes can be applied to the service: https://github.com/openstack/salt-formula-horizon/tree/ master/metadata/service/server/

Updating Business Unit (System Level)

Change the system level for a specific application, if the base services don't provide required configurations for the application functionality. Example where the application-related change can be applied to the service,

Updating Deployment Configurations (Cluster Level)

Changes on the cluster level are related to the requirements that are specific for this particular cluster solution, for example: number and names of nodes; domain name; IP addresses; network interface names and configurations; locations of the specific 'systems' on the specific nodes; and other things that are used by formulas for services.

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2.1.4 Service Ecosystem

Chapter 4. Service Ecosystem

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Actual Service Ecosystem

The SaltStack-Formulas service are divided into several groups according to the target role in the system. All services/formulas share same structure and metadata definions, expose vital information into the Salt Mine for further processing.

Infrastructure services Core services needed for basic infrastructure operation.

Supplemental services Support services as databases, proxies, application servers.

OpenStack services All supported OpenStack cloud platform services.

Monitoring services Monitoring, metering and log collecting tools implementing complete monitoring stack.

Integration services Continuous integration services for automated integration and delivery pipelines.

Each of the service groups contain of several individual service formulas, listed in following tables.

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Infrastructure Services

Core services needed for basic infrastructure operation.

Formula	Repository
aptcacher	https://github.com/salt-formulas/salt-formula-aptcacher
backupninja	https://github.com/salt-formulas/salt-formula-backupninja
ceph	https://github.com/salt-formulas/salt-formula-ceph
chrony	https://github.com/salt-formulas/salt-formula-chrony
freeipa	https://github.com/salt-formulas/salt-formula-freeipa
git	https://github.com/salt-formulas/salt-formula-git
glusterfs	https://github.com/salt-formulas/salt-formula-glusterfs
iptables	https://github.com/salt-formulas/salt-formula-iptables
letsecrypt	https://github.com/salt-formulas/salt-formula-letsecrypt
linux	https://github.com/salt-formulas/salt-formula-linux
network	https://github.com/salt-formulas/salt-formula-network
nfs	https://github.com/salt-formulas/salt-formula-nfs
ntp	https://github.com/salt-formulas/salt-formula-ntp
openssh	https://github.com/salt-formulas/salt-formula-openssh
openvpn	https://github.com/salt-formulas/salt-formula-openvpn
pritunl	https://github.com/salt-formulas/salt-formula-pritunl
reclass	https://github.com/salt-formulas/salt-formula-reclass
salt	https://github.com/salt-formulas/salt-formula-salt
sphinx	https://github.com/salt-formulas/salt-formula-sphinx
squid	https://github.com/salt-formulas/salt-formula-squid

aptcacher

Apt-Cacher NG is a caching HTTP proxy intended for use with download clients of system distribution's package managers.

Sample pillars

Single apt-cacher service

```
aptcacher:
  server:
    enabled: true
    bind:
      address: 0.0.0.0
      port: 3142
```

More advanced setup with Proxy and passthru patterns

```
aptcacher:
  server:
    enabled: true
    bind:
      address: 0.0.0.0
      port: 3142
    proxy: 'http://proxy-user:proxy-pass@proxy-host:9999'
    passthruurl:
      - 'repos.influxdata.com'
      - 'packagecloud.io'
      - 'packagecloud-repositories.s3.dualstack.us-west-1.amazonaws.com'
      - 'launchpad.net'
      - 'apt.dockerproject.org'
    passhthrupattern:
      - '\.key$'
      - '\.gpg$'
      - '\.pub$'
      - '\.jar$'
```

Read more

- https://www.unix-ag.uni-kl.de/~bloch/acng/

Backupninja formula

Backupninja allows you to coordinate system backup by dropping a few simple configuration files into /etc/backup.d/. Most programs you might use for making backups don't have their own configuration file format.

Backupninja provides a centralized way to configure and schedule many different backup utilities. It allows for secure, remote, incremental filesytem backup (via rdiff-backup), compressed incremental data, backup system and hardware info, encrypted remote backups (via duplicity), safe backup of MySQL/PostgreSQL databases, subversion or trac repositories, burn CD/DVDs or create ISOs, incremental rsync with hardlinking.

Sample pillars

Backup client with ssh/rsync remote target

```
backupninja:
  client:
    enabled: true
    target:
      engine: rsync
      host: 10.10.10.208
      user: backupninja
```

Backup client with s3 remote target

```
backupninja:
  client:
    enabled: true
    target:
      engine: dup
      url: s3+http://bucket-name/folder-name
      auth:
        awsaccesskeyid: awsaccesskeyid
        awssecretaccesskey: awssecretaccesskey
```

Backup client with webdav target

```
backupninja:
  client:
    enabled: true
    target:
      engine: dup
      url: webdavs://backup.cloud.example.com/box.example.com/
      auth:
        gss:
          principal: host/${linux:network:fqdn}
          keytab: /etc/krb5.keytab
```

Backup server rsync/rdiff

```
backupninja:
  server:
    enabled: true
    rdiff: true
    key:
      client1.domain.com:
        enabled: true
        key: ssh-key
```

Backup client with local storage

```
backupninja:
  client:
    enabled: true
    target:
      engine: local
```

More information

- https://labs.riseup.net/code/projects/backupninja/wiki/Configuration
- http://www.debian-administration.org/articles/351
- http://duncanlock.net/blog/2013/08/27/comprehensive-linux-backups-with-etckeeper-backupninja/
- https://github.com/riseuplabs/puppet-backupninja
- http://www.ushills.co.uk/2008/02/backup-with-backupninja.html

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

http://salt-formulas.readthedocs.io/

In the unfortunate event that bugs are discovered, they should be reported to the appropriate issue tracker. Use Github issue tracker for specific salt formula:

https://github.com/salt-formulas/salt-formula-backupninja/issues

For feature requests, bug reports or blueprints affecting entire ecosystem, use Launchpad salt-formulas project:

https://launchpad.net/salt-formulas

You can also join salt-formulas-users team and subscribe to mailing list:

https://launchpad.net/~salt-formulas-users

Developers wishing to work on the salt-formulas projects should always base their work on master branch and submit pull request against specific formula.

https://github.com/salt-formulas/salt-formula-backupninja

Any questions or feedback is always welcome so feel free to join our IRC channel:

#salt-formulas @ irc.freenode.net

Ceph formula

Ceph provides extraordinary data storage scalability. Thousands of client hosts or KVMs accessing petabytes to exabytes of data. Each one of your applications can use the object, block or file system interfaces to the same RADOS cluster simultaneously, which means your Ceph storage system serves as a flexible foundation for all of your data storage needs.

Use salt-formula-linux for initial disk partitioning.

Daemons

Ceph uses several daemons to handle data and cluster state. Each daemon type requires different computing capacity and hardware optimization.

These daemons are currently supported by formula:

- MON (*ceph.mon*)
- OSD (*ceph.osd*)
- RGW (*ceph.radosgw*)

Architecture decisions

Please refer to upstream achritecture documents before designing your cluster. Solid understanding of Ceph principles is essential for making architecture decisions described bellow. http://docs.ceph.com/docs/master/architecture/

- Ceph version

There is 3 or 4 stable releases every year and many of nighty/dev release. You should decide which version will be used since the only stable releases are recommended for production. Some of the releases are marked LTS (Long Term Stable) and these releases receive bugfixed for longer period - usually until next LTS version is released.

- Number of MON daemons

Use 1 MON daemon for testing, 3 MONs for smaller production clusters and 5 MONs for very large production cluster. There is no need to have more than 5 MONs in normal environment because there isn't any significant benefit in running more than 5 MONs. Ceph require MONS to form quorum so you need to heve more than 50% of the MONs up and running to have fully operational cluster. Every I/O operation will stop once less than 50% MONs is availabe because they can't form quorum.

- Number of PGs

Placement groups are providing mappping between stored data and OSDs. It is necessary to calculate number of PGs because there should be stored decent amount of PGs on each OSD. Please keep in mind *decreasing number of PGs* isn't possible and *increading* can affect cluster performance.

http://docs.ceph.com/docs/master/rados/operations/placement-groups/ http://ceph.com/pgcalc/

- Daemon colocation

It is recommended to dedicate nodes for MONs and RWG since colocation can have and influence on cluster operations. Howerver, small clusters can be running MONs on OSD node but it is critical to have enough of resources for MON daemons because they are the most important part of the cluster.

Installing RGW on node with other daemons isn't recommended because RGW daemon usually require a lot of bandwith and it harm cluster health.

- Store type (Bluestore/Filestore)

Recent version of Ceph support Bluestore as storage backend and backend should be used if available.

http://docs.ceph.com/docs/master/rados/configuration/bluestore-config-ref/

- Block.db location for Bluestore

There are two ways to setup block.db:

  - **Colocated** block.db partition is created on the same disk as partition for the data. This setup is easier for installation and it doesn't require any other disk to be used. However, colocated setup is significantly slower than dedicated)
  - **Dedicate** block.db is placed on different disk than data (or into partition). This setup can deliver much higher performance than colocated but it require to have more disks in servers. Block.db drives should be carefully selected because high I/O and durability is required.

- Block.wal location for Bluestore

There are two ways to setup block.wal - stores just the internal journal (write-ahead log):

  - **Colocated** block.wal uses free space of the block.db device.
  - **Dedicate** block.wal is placed on different disk than data (better put into partition as the size can be small) and possibly block.db device. This setup can deliver much higher performance than colocated but it require to have more disks in servers. Block.wal drives should be carefully selected because high I/O and durability is required.

- Journal location for Filestore

There are two ways to setup journal:

  - **Colocated** journal is created on the same disk as partition for the data. This setup is easier for installation and it doesn't require any other disk to be used. However, colocated setup is significantly slower than dedicated)
  - **Dedicate** journal is placed on different disk than data (or into partition). This setup can deliver much higher performance than colocated but it require to have more disks in servers. Journal drives should be carefully selected because high I/O and durability is required.

- Cluster and public network

Ceph cluster is accessed using network and thus you need to have decend capacity to handle all the client. There are two networks required for cluster: **public** network and cluster network. Public network is used for client connections and MONs and OSDs are listening on this network. Second network ic called **cluster** networks and this network is used for communication between OSDs.

Both networks should have dedicated interfaces, bonding interfaces and dedicating vlans on bonded interfaces isn't allowed. Good practise is dedicate more throughput for the cluster network because cluster traffic is more important than client traffic.

- Pool parameters (size, min_size, type)

You should setup each pool according to it's expected usage, at least *min_size* and *size* and pool type should be considered.

- Cluster monitoring
- Hardware

Please refer to upstream hardware recommendation guide for general information about hardware.

Ceph servers are required to fulfil special requirements becauce load generated by Ceph can be diametrically opposed to common load.

http://docs.ceph.com/docs/master/start/hardware-recommendations/

Basic management commands

Cluster

- `ceph health` - check if cluster is healthy (`ceph health detail` can provide more information)

```
root@c-01:~# ceph health
HEALTH_OK
```

- `ceph status` - shows basic information about cluster

```
root@c-01:~# ceph status
    cluster e2dc51ae-c5e4-48f0-afc1-9e9e97dfd650
     health HEALTH_OK
     monmap e1: 3 mons at {1=192.168.31.201:6789/0,2=192.168.31.202:6789/0,3=192.168.
↪31.203:6789/0}
            election epoch 38, quorum 0,1,2 1,2,3
     osdmap e226: 6 osds: 6 up, 6 in
      pgmap v27916: 400 pgs, 2 pools, 21233 MB data, 5315 objects
            121 GB used, 10924 GB / 11058 GB avail
                 400 active+clean
  client io 481 kB/s rd, 132 kB/s wr, 185 op/
```

MON

http://ceph.com/docs/master/rados/troubleshooting/troubleshooting-mon/

OSD

http://ceph.com/docs/master/rados/troubleshooting/troubleshooting-osd/

- `ceph osd tree` - show all OSDs and it's state

```
root@c-01:~# ceph osd tree
ID WEIGHT   TYPE NAME     UP/DOWN REWEIGHT PRIMARY-AFFINITY
-4        0 host c-04
-1 10.79993 root default
-2  3.59998     host c-01
 0  1.79999         osd.0      up  1.00000          1.00000
 1  1.79999         osd.1      up  1.00000          1.00000
-3  3.59998     host c-02
 2  1.79999         osd.2      up  1.00000          1.00000
 3  1.79999         osd.3      up  1.00000          1.00000
-5  3.59998     host c-03
 4  1.79999         osd.4      up  1.00000          1.00000
 5  1.79999         osd.5      up  1.00000          1.00000
```

- `ceph osd pools ls` - list of pool

```
root@c-01:~# ceph osd lspools
0 rbd,1 test
```

PG

http://ceph.com/docs/master/rados/troubleshooting/troubleshooting-pg

- `ceph pg ls` - list placement groups

```
root@c-01:~# ceph pg ls | head -n 4
pg_stat       objects mip      degr     misp     unf      bytes    log      disklog state   
↪state_stamp       v        reported         up       up_primary       acting  acting_
↪primary  last_scrub       scrub_stamp      last_deep_scrub deep_scrub_stamp
0.0   11      0        0        0        0        46137344         3044     3044    
↪active+clean     2015-07-02 10:12:40.603692       226'10652        226:1798        [4,
↪2,0] 4        [4,2,0] 4        0'0      2015-07-01 18:38:33.126953       0'0      2015-
↪07-01 18:17:01.904194
0.1   7       0        0        0        0        25165936         3026     3026    
↪active+clean     2015-07-02 10:12:40.585833       226'5808         226:1070        [2,
↪4,1] 2        [2,4,1] 2        0'0      2015-07-01 18:38:32.352721       0'0      2015-
↪07-01 18:17:01.904198
0.2   18      0        0        0        0        75497472         3039     3039    
↪active+clean     2015-07-02 10:12:39.569630       226'17447        226:3213        [3,
↪1,5] 3        [3,1,5] 3        0'0      2015-07-01 18:38:34.308228       0'0      2015-
↪07-01 18:17:01.904199
```

- `ceph pg map 1.1` - show mapping between PG and OSD

```
root@c-01:~# ceph pg map 1.1
osdmap e226 pg 1.1 (1.1) -> up [5,1,2] acting [5,1,2]
```

Sample pillars

Common metadata for all nodes/roles

```
ceph:
  common:
    version: luminous
    config:
      global:
        param1: value1
        param2: value1
        param3: value1
      pool_section:
        param1: value2
        param2: value2
        param3: value2
    fsid: a619c5fc-c4ed-4f22-9ed2-66cf2feca23d
    members:
    - name: cmn01
      host: 10.0.0.1
    - name: cmn02
      host: 10.0.0.2
    - name: cmn03
      host: 10.0.0.3
    keyring:
      admin:
        caps:
          mds: "allow *"
          mgr: "allow *"
          mon: "allow *"
          osd: "allow *"
      bootstrap-osd:
        caps:
          mon: "allow profile bootstrap-osd"
```

Optional definition for cluster and public networks. Cluster network is used for replication. Public network for front-end communication.

```
ceph:
  common:
    version: luminous
    fsid: a619c5fc-c4ed-4f22-9ed2-66cf2feca23d
    ....
    public_network: 10.0.0.0/24, 10.1.0.0/24
    cluster_network: 10.10.0.0/24, 10.11.0.0/24
```

Ceph mon (control) roles

Monitors: A Ceph Monitor maintains maps of the cluster state, including the monitor map, the OSD map, the Placement Group (PG) map, and the CRUSH map. Ceph maintains a history (called an "epoch") of each state change in the Ceph Monitors, Ceph OSD Daemons, and PGs.

```
ceph:
  common:
    config:
```

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```
      mon:
        key: value
  mon:
    enabled: true
    keyring:
      mon:
        caps:
          mon: "allow *"
      admin:
        caps:
          mds: "allow *"
          mgr: "allow *"
          mon: "allow *"
          osd: "allow *"
```

Ceph mgr roles

The Ceph Manager daemon (ceph-mgr) runs alongside monitor daemons, to provide additional monitoring and interfaces to external monitoring and management systems. Since the 12.x (luminous) Ceph release, the ceph-mgr daemon is required for normal operations. The ceph-mgr daemon is an optional component in the 11.x (kraken) Ceph release.

By default, the manager daemon requires no additional configuration, beyond ensuring it is running. If there is no mgr daemon running, you will see a health warning to that effect, and some of the other information in the output of ceph status will be missing or stale until a mgr is started.

```
ceph:
  mgr:
    enabled: true
    dashboard:
      enabled: true
      host: 10.103.255.252
      port: 7000
```

Ceph OSD (storage) roles

```
ceph:
  common:
    version: luminous
    fsid: a619c5fc-c4ed-4f22-9ed2-66cf2feca23d
    public_network: 10.0.0.0/24, 10.1.0.0/24
    cluster_network: 10.10.0.0/24, 10.11.0.0/24
    keyring:
      bootstrap-osd:
        caps:
          mon: "allow profile bootstrap-osd"
      ....
  osd:
    enabled: true
    crush_parent: rack01
    journal_size: 20480                     (20G)
    bluestore_block_db_size: 10073741824    (10G)
    bluestore_block_wal_size: 10073741824   (10G)
    bluestore_block_size: 807374182400     (800G)
```

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```
    backend:
      filestore:
        disks:
        - dev: /dev/sdm
          enabled: false
          journal: /dev/ssd
          journal_partition: 5
          data_partition: 6
          lockbox_partition: 7
          data_partition_size: 12000        (MB)
          class: bestssd
          weight: 1.666
          dmcrypt: true
          journal_dmcrypt: false
        - dev: /dev/sdf
          journal: /dev/ssd
          journal_dmcrypt: true
          class: bestssd
          weight: 1.666
        - dev: /dev/sdl
          journal: /dev/ssd
          class: bestssd
          weight: 1.666
      bluestore:
        disks:
        - dev: /dev/sdb
        - dev: /dev/sdf
          block_db: /dev/ssd
          block_wal: /dev/ssd
          block_db_dmcrypt: true
          block_wal_dmcrypt: true
        - dev: /dev/sdc
          block_db: /dev/ssd
          block_wal: /dev/ssd
          data_partition: 1
          block_partition: 2
          lockbox_partition: 5
          block_db_partition: 3
          block_wal_partition: 4
          class: ssd
          weight: 1.666
          dmcrypt: true
          block_db_dmcrypt: false
          block_wal_dmcrypt: false
        - dev: /dev/sdd
          enabled: false
```

Ceph client roles - . . . Deprecated - use ceph:common instead

Simple ceph client service

```
ceph:
  client:
    config:
      global:
```

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```
        mon initial members: ceph1,ceph2,ceph3
        mon host: 10.103.255.252:6789,10.103.255.253:6789,10.103.255.254:6789
    keyring:
      monitoring:
        key: 00000000000000000000000000000000000000==
```

At OpenStack control settings are usually located at cinder-volume or glance- registry services.

```
ceph:
  client:
    config:
      global:
        fsid: 00000000-0000-0000-0000-000000000000
        mon initial members: ceph1,ceph2,ceph3
        mon host: 10.103.255.252:6789,10.103.255.253:6789,10.103.255.254:6789
        osd_fs_mkfs_arguments_xfs:
        osd_fs_mount_options_xfs: rw,noatime
        network public: 10.0.0.0/24
        network cluster: 10.0.0.0/24
        osd_fs_type: xfs
      osd:
        osd journal size: 7500
        filestore xattr use omap: true
      mon:
        mon debug dump transactions: false
    keyring:
      cinder:
        key: 00000000000000000000000000000000000000==
      glance:
        key: 00000000000000000000000000000000000000==
```

Ceph gateway

Rados gateway with keystone v2 auth backend

```
ceph:
  radosgw:
    enabled: true
    hostname: gw.ceph.lab
    bind:
      address: 10.10.10.1
      port: 8080
    identity:
      engine: keystone
      api_version: 2
      host: 10.10.10.100
      port: 5000
      user: admin
      password: password
      tenant: admin
```

Rados gateway with keystone v3 auth backend

```
ceph:
  radosgw:
```

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```
    enabled: true
    hostname: gw.ceph.lab
    bind:
      address: 10.10.10.1
      port: 8080
    identity:
      engine: keystone
      api_version: 3
      host: 10.10.10.100
      port: 5000
      user: admin
      password: password
      project: admin
      domain: default
```

Ceph setup role

Replicated ceph storage pool

```
  ceph:
    setup:
      pool:
        replicated_pool:
          pg_num: 256
          pgp_num: 256
          type: replicated
          crush_rule: sata
          application: rbd

.. note:: For Kraken and earlier releases please specify crush_rule as a ruleset␣
↪number.
          For Kraken and earlier releases application param is not needed.
```

Erasure ceph storage pool

```
ceph:
  setup:
    pool:
      erasure_pool:
        pg_num: 256
        pgp_num: 256
        type: erasure
        crush_rule: ssd
        application: rbd
```

Inline compression for Bluestore backend

```
ceph:
  setup:
    pool:
      volumes:
        pg_num: 256
        pgp_num: 256
        type: replicated
        crush_rule: hdd
```

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```
        application: rbd
        compression_algorithm: snappy
        compression_mode: aggressive
        compression_required_ratio: .875
        ...
```

Ceph manage keyring keys

Keyrings are dynamically generated unless specified by the following pillar.

```
ceph:
  common:
    manage_keyring: true
    keyring:
      glance:
        name: images
        key: AACf3ulZFFPNDxAAd2DWds3aEkHh4IklZVgIaQ==
        caps:
          mon: "allow r"
          osd: "allow class-read object_prefix rdb_children, allow rwx pool=images"
```

Generate CRUSH map - Recommended way

It is required to define the *type* for crush buckets and these types must start with *root* (top) and end with *host*. OSD daemons will be assigned to hosts according to it's hostname. Weight of the buckets will be calculated according to weight of it's children.

If the pools that are in use have size of 3 it is best to have 3 children of a specific type in the root CRUSH tree to replicate objects across (Specified in rule steps by 'type region').

```
ceph:
  setup:
    crush:
      enabled: True
      tunables:
        choose_total_tries: 50
        choose_local_tries: 0
        choose_local_fallback_tries: 0
        chooseleaf_descend_once: 1
        chooseleaf_vary_r: 1
        chooseleaf_stable: 1
        straw_calc_version: 1
        allowed_bucket_algs: 54
      type:
        - root
        - region
        - rack
        - host
        - osd
      root:
        - name: root-ssd
        - name: root-sata
      region:
```

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```
        - name: eu-1
          parent: root-sata
        - name: eu-2
          parent: root-sata
        - name: eu-3
          parent: root-ssd
        - name: us-1
          parent: root-sata
      rack:
        - name: rack01
          parent: eu-1
        - name: rack02
          parent: eu-2
        - name: rack03
          parent: us-1
      rule:
        sata:
          ruleset: 0
          type: replicated
          min_size: 1
          max_size: 10
          steps:
            - take take root-ssd
            - chooseleaf firstn 0 type region
            - emit
        ssd:
          ruleset: 1
          type: replicated
          min_size: 1
          max_size: 10
          steps:
            - take take root-sata
            - chooseleaf firstn 0 type region
            - emit
```

Generate CRUSH map - Alternative way

It's necessary to create per OSD pillar.

```
ceph:
  osd:
    crush:
      - type: root
        name: root1
      - type: region
        name: eu-1
      - type: rack
        name: rack01
      - type: host
        name: osd001
```

Add OSDs with specific weight

Add OSD device(s) with initial weight set specifically to certain value.

```
ceph:
  osd:
    crush_initial_weight: 0
```

Apply CRUSH map

Before you apply CRUSH map please make sure that settings in generated file in /etc/ceph/crushmap are correct.

```
  ceph:
    setup:
      crush:
        enforce: true
      pool:
        images:
          crush_rule: sata
          application: rbd
        volumes:
          crush_rule: sata
          application: rbd
        vms:
          crush_rule: ssd
          application: rbd

.. note:: For Kraken and earlier releases please specify crush_rule as a ruleset␣
↪number.
          For Kraken and earlier releases application param is not needed.
```

Persist CRUSH map

After the CRUSH map is applied to Ceph it's recommended to persist the same settings even after OSD reboots.

```
ceph:
  osd:
    crush_update: false
```

Ceph monitoring

By default monitoring is setup to collect information from MON and OSD nodes. To change the default values add the following pillar to MON nodes.

```
ceph:
  monitoring:
    space_used_warning_threshold: 0.75
    space_used_critical_threshold: 0.85
    apply_latency_threshold: 0.007
    commit_latency_threshold: 0.7
    pool_space_used_utilization_warning_threshold: 0.75
    pool_space_used_critical_threshold: 0.85
    pool_write_ops_threshold: 200
    pool_write_bytes_threshold: 70000000
    pool_read_bytes_threshold: 70000000
    pool_read_ops_threshold: 1000
```

Ceph monitor backups

Backup client with ssh/rsync remote host

```
ceph:
  backup:
    client:
      enabled: true
      full_backups_to_keep: 3
      hours_before_full: 24
      target:
        host: cfg01
```

Backup client with local backup only

```
ceph:
  backup:
    client:
      enabled: true
      full_backups_to_keep: 3
      hours_before_full: 24
```

Backup server rsync

```
ceph:
  backup:
    server:
      enabled: true
      hours_before_full: 24
      full_backups_to_keep: 5
      key:
        ceph_pub_key:
          enabled: true
          key: ssh_rsa
```

- https://github.com/cloud-ee/ceph-salt-formula
- http://ceph.com/ceph-storage/
- http://ceph.com/docs/master/start/intro/

To learn how to install and update salt-formulas, consult the documentation available online at:

> http://salt-formulas.readthedocs.io/

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chrony

WIP

Documentation and Bugs

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FreeIPA

This forumla installs and configured the FreeIPA Identity Management service and client.

Sample pillars

Client

```
freeipa:
  client:
    enabled: true
    server: ipa.example.com
    domain: {{ salt['grains.get']('domain', '') }}
    realm: {{ salt['grains.get']('domain', '').upper() }}
    hostname: {{ salt['grains.get']('fqdn', '') }}
```

To automatically register the client with FreeIPA, you will first need to create a Kerberos principal. Start by creating a service account in FreeIPA. You may wish to restrict that users permissions to only host creation (see https://www.freeipa.org/page/HowTos#Working_with_FreeIPA). Next, you will need to obtain a kerberos ticket as admin on the IPA server, then generate a service account principal.

kinit admin

ipa-getkeytab -p service-account@EXAMPLE.com -k ./principal.keytab -s freeipahost.example.com

scp ./principal.keytab user@saltmaster.example.com:/srv/salt/freeipa/files/principal.keytab

Then add to your pillar:

This will allow your client to use FreeIPA's JSON interface to create a host entry with a One Time Password and then register to the FreeIPA server. For security purposes, the kerberos principal will only be pushed down to the client if the installer reports it is not registered to the FreeIPA server and will be removed from the client as soon as the endpoint has registered with the FreeIPA server.

Additionally, the openssh formula (see https://github.com/salt-formulas/salt-formula-openssh) is needed and is a dependency for this formula. Configure it thusly:

```
openssh:
  server:
    public_key_auth: true
    gssapi_auth: true
    kerberos_auth: false
    authorized_keys_command:
      command: /usr/bin/sss_ssh_authorizedkeys
      user: nobody
```

If you wish to update DNS records using nsupdate, add:

```
freeipa:
  client:
    nsupdate:
      - name: test.example.com
        ipv4:
          - 8.8.8.8
        ipv6:
          - 2a00:1450:4001:80a::1009
        ttl: 1800
        keytab: /etc/krb5.keytab
```

For requesting certificates using certmonger:

```
freeipa:
  client:
    cert:
      "HTTP/www.example.com":
        user: root
        group: www-data
        mode: 640
        cert: /etc/ssl/certs/http-www.example.com.crt
        key: /etc/ssl/private/http-www.example.com.key
```

Server

```
freeipa:
  server:
    realm: IPA.EXAMPLE.COM
```

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```
    domain: ipa.example.com
    ldap:
      password: secretpassword
```

Server definition for new verion of freeipa (4.3+). Replicas dont require generation of gpg file on master. But principal user has to be defined with

```
freeipa:
  server:
    realm: IPA.EXAMPLE.COM
    domain: ipa.example.com
    principal_user: admin
    admin:
      password: secretpassword
    servers:
    - idm01.ipa.example.com
    - idm02.ipa.example.com
    - idm03.ipa.example.com
```

Disable CA. Default is True.

```
freeipa:
  server:
    ca: false
```

Disable LDAP access logs but enable audit

```
freeipa:
  server:
    ldap:
      logging:
        access: false
        audit: true
```

Read more

- http://www.freeipa.org/page/Quick_Start_Guide

Documentation and Bugs

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> https://github.com/salt-formulas/salt-formula-freeipa/issues

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Git formula

Git is a free and open source distributed version control system designed to handle everything from small to very large projects with speed and efficiency.

Sample pillars

Simplest GIT setup

```
git:
  client:
    enabled: true
```

GIT with user setup

```
git:
  client:
    enabled: true
    user:
    - user:
        name: jdoe
        email: j@doe.com
```

GIT with user and SSL setup

```
git:
  client:
    disable_ssl_verification: True
    enabled: true
    user:
    - user:
        name: jdoe
        email: j@doe.com
```

Reclass with GIT with user setup

```
git:
  client:
    enabled: true
    user:
    - user: ${linux:system:user:jdoe}
```

Reclass with GIT with user and SSL setup

```
git:
  client:
    disable_ssl_verification: True
```

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```
    enabled: true
    user:
    - user: ${linux:system:user:jdoe}
```

Reclass with GIT over HTTP server setup. Requires web server.

```
git:
  server:
    directory: /srv/git
    repos:
      - name: custom-repo-1
      - name: custom-repo-2
```

Reclass with GIT over HTTP server setup. Requires web server. Mirrored upsream repos example.

```
git:
  server:
    directory: /srv/git
    repos:
      - name: gerritlib
        url: https://github.com/openstack-infra/gerritlib.git
      - name: jeepyb
        url: https://github.com/openstack-infra/jeepyb.git
```

Read more

- http://git-scm.com/
- http://git-scm.com/book/en/Customizing-Git-Git-Configuration
- https://github.com/nesi/puppet-git/tree/master/manifests

Documentation and Bugs

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> https://github.com/salt-formulas/salt-formula-git/issues

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GlusterFS

Install and configure GlusterFS server and client.

Available states

- *glusterfs.server*
- *glusterfs.server.service*
- *glusterfs.server.setup*
- *glusterfs.client*

glusterfs.server

Setup GlusterFS server (including both service and setup)

glusterfs.server.service

Setup and start GlusterFS server service

glusterfs.server.setup

Setup GlusterFS peers and volumes

glusterfs.client

Setup GlusterFS client

Available metadata

- *metadata.glusterfs.server*
- *metadata.glusterfs.client*

metadata.glusterfs.server

Setup basic server

metadata.glusterfs.client

Setup client only

Configuration parameters

Example reclass

Example for distributed glance images storage where every control node is gluster peer.

```
classes:
- service.glusterfs.server
- service.glusterfs.client

_param:
  cluster_node01_address: 192.168.1.21
  cluster_node02_address: 192.168.1.22
  cluster_node03_address: 192.168.1.23
parameters:
  glusterfs:
    server:
      peers:
      - ${_param:cluster_node01_address}
      - ${_param:cluster_node02_address}
      - ${_param:cluster_node03_address}
      volumes:
         glance:
           storage: /srv/glusterfs/glance
           replica: 3
           bricks:
           - ${_param:cluster_node01_address}:/srv/glusterfs/glance
           - ${_param:cluster_node02_address}:/srv/glusterfs/glance
           - ${_param:cluster_node03_address}:/srv/glusterfs/glance
           options:
             cluster.readdir-optimize: On
             nfs.disable: On
             network.remote-dio: On
             diagnostics.client-log-level: WARNING
             diagnostics.brick-log-level: WARNING
    client:
      volumes:
        glance:
          path: /var/lib/glance/images
          server: ${_param:cluster_node01_address}
          user: glance
          group: glance
```

Example pillar

Server

```
glusterfs:
  server:
    peers:
    - 192.168.1.21
    - 192.168.1.22
    - 192.168.1.23
    volumes:
```

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```
      glance:
        storage: /srv/glusterfs/glance
        replica: 3
        bricks:
        - 172.168.1.21:/srv/glusterfs/glance
        - 172.168.1.21:/srv/glusterfs/glance
        - 172.168.1.21:/srv/glusterfs/glance
    enabled: true
```

Client

```
glusterfs:
  client:
    volumes:
      glance:
        path: /var/lib/glance/images
        server: 192.168.1.21
        user: glance
        group: glance
    enabled: true
```

Read more

- https://www.gluster.org/

Documentation and Bugs

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> http://salt-formulas.readthedocs.io/

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iptables formula

Iptables is used to set up, maintain, and inspect the tables of IPv4 packet filter rules in the Linux kernel. Several different tables may be defined. Each table contains a number of built-in chains and may also contain user-defined chains. Each chain is a list of rules which can match a set of packets. Each rule specifies what to do with a packet that matches. This is called a *target*, which may be a jump to a user-defined chain in the same table.

Sample pillars

Most common rules - allow traffic on localhost, accept related,established and ping

```
parameters:
  iptables:
    service:
      enabled: True
      chain:
        INPUT:
          rules:
            - in_interface: lo
              jump: ACCEPT
            - connection_state: RELATED,ESTABLISHED
              match: state
              jump: ACCEPT
            - protocol: icmp
              jump: ACCEPT
```

Accept connections on port 22

```
parameters:
  iptables:
    service:
      chain:
        INPUT:
          rules:
            - destination_port: 22
              protocol: tcp
              jump: ACCEPT
```

Set drop policy on INPUT chain:

```
parameters:
  iptables:
    service:
      chain:
        INPUT:
          policy: DROP
```

Redirect privileged port 443 to 8081

```
parameters:
  iptables:
    service:
      chain:
        PREROUTING:
          filter: nat
          destination_port: 443
```

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```
          to_port: 8081
          protocol: tcp
          jump: REDIRECT
```

Allow access from local network

```
parameters:
  iptables:
    service:
      chain:
        INPUT:
          rules:
            - protocol: tcp
              destination_port: 22
              source_network: 192.168.1.0/24
              jump: ACCEPT
              comment: Blah
```

Support logging with custom prefix and log level

```
parameters:
  iptables:
    service:
      chain:
        POSTROUTING:
          rules:
            - table: nat
              protocol: tcp
              match: multiport
              destination_ports:
                - 21
                - 80
                - 443
                - 2220
              source_network: '10.20.30.0/24'
              log_level: 7
              log_prefix: 'iptables-logging: '
              jump: LOG
```

IPv6 is supported as well

```
parameters:
  iptables:
    service:
      enabled: True
      ipv6: True
      chain:
        INPUT:
          rules:
            - protocol: tcp
              family: ipv6
              destination_port: 22
              source_network: 2001:DB8::/32
              jump: ACCEPT
```

Read more

- http://docs.saltstack.com/en/latest/ref/states/all/salt.states.iptables.html
- https://help.ubuntu.com/community/IptablesHowTo
- http://wiki.centos.org/HowTos/Network/IPTables

Documentation and Bugs

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Let's Encrypt

Service letsencrypt description

Sample pillars

Installation

There are 3 installation methods available:

- package (default for Debian)

  For Debian Jessie, you need to use jessie-backports repository. For Ubuntu, use Launchpad PPA providing certbot package. You can use linux formula to manage these APT sources.

  ```
  letsencrypt:
    client:
      source:
        engine: pkg
  ```

  If the `certbot` package doesn't include Systemd `.service` and `.timer` files, you can set them to be installed by this formula by supplying `install_units:  True` and `cli`.

```
letsencrypt:
  client:
    source:
      engine: pkg
      cli: /usr/bin/certbot
      install_units: true
```

- URL to certbot-auto (default)

  This is default installation method for systems with no available certbot package.

```
letsencrypt:
  client:
    source:
      engine: url
      url: "https://dl.eff.org/certbot-auto"
```

- Docker container

  Alternate installation method where Docker image is used to provide certbot tool and executed using wrapper script.

```
letsencrypt:
  client:
    source:
      engine: docker
      image: "deliverous/certbot"
```

Usage

Default authentication method using standalone server on specified port. But this won't work without configuration of apache/nginx (read on) unless you don't have webserver running so you can select port 80 or 443.

```
letsencrypt:
  client:
    email: root@dummy.org
    auth:
      method: standalone
      type: http-01
      port: 9999
    domain:
      dummy.org:
        enabled: true
      www.dummy.org:
        enabled: true
      # Following will produce multidomain certificate:
      site.dummy.org:
        enabled: true
        names:
          - dummy.org
          - www.dummy.org
```

However ACME server always visits port 80 (or 443) where most likely Apache or Nginx is listening. This means that you need to configure `/.well-known/acme-challenge/` to proxy requests on localhost:9999. For example, ensure you have following configuration for Apache:

```
ProxyPass "/.well-known/acme-challenge/" "http://127.0.0.1:9999/.well-known/acme-
↪challenge/" retry=1
ProxyPassReverse "/.well-known/acme-challenge/" "http://127.0.0.1:9999/.well-known/
↪acme-challenge/"

<Location "/.well-known/acme-challenge/">
  ProxyPreserveHost On
  Order allow,deny
  Allow from all
  Require all granted
</Location>
```

You can also use `apache` or `nginx` auth methods and let certbot do what's needed, this should be the simplest option.

```
letsencrypt:
  client:
    auth: apache
```

Alternatively you can use webroot authentication (using eg. existing apache installation serving directory for all sites):

```
letsencrypt:
  client:
    auth:
      method: webroot
      path: /var/www/html
      port: 80
    domain:
      dummy.org:
        enabled: true
      www.dummy.org:
        enabled: true
```

It's also possible to override auth method or other options only for single domain:

```
letsencrypt:
  client:
    email: root@dummy.org
    auth:
      method: standalone
      type: http-01
      port: 9999
    domain:
      dummy.org:
        enabled: true
        auth:
          method: webroot
          path: /var/www/html/dummy.org
          port: 80
      www.dummy.org:
        enabled: true
```

You are able to use multidomain certificates:

```
letsencrypt:
  client:
    email: sylvain@home
    staging: true
```

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```
    auth:
      method: apache
    domain:
      keynotdomain:
        enabled: true
        name: ls.opensource-expert.com
        names:
        - www.ls.opensource-expert.com
        - vim22.opensource-expert.com
        - www.vim22.opensource-expert.com
      rm.opensource-expert.com:
        enabled: true
        names:
        - www.rm.opensource-expert.com
      vim7.opensource-expert.com:
        enabled: true
        names:
        - www.vim7.opensource-expert.com
      vim88.opensource-expert.com:
        enabled: true
        names:
        - www.vim88.opensource-expert.com
        - awk.opensource-expert.com
        - www.awk.opensource-expert.com
```

Legacy configuration

Common metadata:

```
letsencrypt:
  client:
    enabled: true
    config: |
      host = https://acme-v01.api.letsencrypt.org/directory
      email = webmaster@example.com
      authenticator = webroot
      webroot-path = /var/lib/www
      agree-tos = True
      renew-by-default = True
    domainset:
      www:
        - example.com
        - www.example.com
      mail:
        - imap.example.com
        - smtp.example.com
        - mail.example.com
      intranet:
        - intranet.example.com
```

Example of authentication via another port without stopping nginx server:

```
location /.well-known/acme-challenge/ {
    proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
    proxy_set_header Host $http_host;
```

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```
    proxy_redirect off;
    proxy_pass http://{{ site.host.name }}:9999/.well-known/acme-challenge/;
}
```

```
letsencrypt:
  client:
    enabled: true
    config: |
      ...
      renew-by-default = True
      http-01-port = 9999
      standalone-supported-challenges = http-01
    domainset:
      www:
        - example.com
```

Read more

- Certbot authentication plugins

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Linux Fomula

Linux Operating Systems.

- Ubuntu
- CentOS
- RedHat

- Fedora
- Arch

Sample Pillars

Linux System

Basic Linux box

```
linux:
  system:
    enabled: true
    name: 'node1'
    domain: 'domain.com'
    cluster: 'system'
    environment: prod
    timezone: 'Europe/Prague'
    utc: true
```

Linux with system users, some with password set: .. WARNING:: If no 'password' variable has been passed - any predifined password will be removed.

```
linux:
  system:
    ...
    user:
      jdoe:
        name: 'jdoe'
        enabled: true
        sudo: true
        shell: /bin/bash
        full_name: 'Jonh Doe'
        home: '/home/jdoe'
        email: 'jonh@doe.com'
      jsmith:
        name: 'jsmith'
        enabled: true
        full_name: 'With clear password'
        home: '/home/jsmith'
        hash_password: true
        password: "userpassword"
      mark:
        name: 'mark'
        enabled: true
        full_name: "unchange password'
        home: '/home/mark'
        password: false
      elizabeth:
        name: 'elizabeth'
        enabled: true
        full_name: 'With hased password'
        home: '/home/elizabeth'
        password: "$6$nUI7QEz3
↪$dFYjzQqK5cJ6HQ38KqG4gTWA9eJu3aKx6TRVDFh6BVJxJgFWg2akfAA7f1fCxcSUeOJ2arCO6EEI6XXnHXxG10
↪"
```

Configure sudo for users and groups under `/etc/sudoers.d/`. This ways `linux.system.sudo` pillar map to actual sudo attributes:

```
# simplified template:
Cmds_Alias {{ alias }}={{ commands }}
{{ user }}   {{ hosts }}=({{ runas }}) NOPASSWD: {{ commands }}
%{{ group }} {{ hosts }}=({{ runas }}) NOPASSWD: {{ commands }}

# when rendered:
saltuser1 ALL=(ALL) NOPASSWD: ALL
```

```
linux:
  system:
    sudo:
      enabled: true
      aliases:
        host:
          LOCAL:
          - localhost
          PRODUCTION:
          - db1
          - db2
        runas:
          DBA:
          - postgres
          - mysql
          SALT:
          - root
        command:
          # Note: This is not 100% safe when ALL keyword is used, user still may␣
↪modify configs and hide his actions.
          #       Best practice is to specify full list of commands user is allowed␣
↪to run.
          SUPPORT_RESTRICTED:
          - /bin/vi /etc/sudoers*
          - /bin/vim /etc/sudoers*
          - /bin/nano /etc/sudoers*
          - /bin/emacs /etc/sudoers*
          - /bin/su - root
          - /bin/su -
          - /bin/su
          - /usr/sbin/visudo
          SUPPORT_SHELLS:
          - /bin/sh
          - /bin/ksh
          - /bin/bash
          - /bin/rbash
          - /bin/dash
          - /bin/zsh
          - /bin/csh
          - /bin/fish
          - /bin/tcsh
          - /usr/bin/login
          - /usr/bin/su
          - /usr/su
          ALL_SALT_SAFE:
          - /usr/bin/salt state*
          - /usr/bin/salt service*
```

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```
          - /usr/bin/salt pillar*
          - /usr/bin/salt grains*
          - /usr/bin/salt saltutil*
          - /usr/bin/salt-call state*
          - /usr/bin/salt-call service*
          - /usr/bin/salt-call pillar*
          - /usr/bin/salt-call grains*
          - /usr/bin/salt-call saltutil*
          SALT_TRUSTED:
          - /usr/bin/salt*
      users:
        # saltuser1 with default values: saltuser1 ALL=(ALL) NOPASSWD: ALL
        saltuser1: {}
        saltuser2:
          hosts:
          - LOCAL
        # User Alias DBA
        DBA:
          hosts:
          - ALL
          commands:
          - ALL_SALT_SAFE
      groups:
        db-ops:
          hosts:
          - ALL
          - '!PRODUCTION'
          runas:
          - DBA
          commands:
          - /bin/cat *
          - /bin/less *
          - /bin/ls *
        salt-ops:
          hosts:
          - 'ALL'
          runas:
          - SALT
          commands:
          - SUPPORT_SHELLS
        salt-ops-2nd:
          name: salt-ops
          nopasswd: false
          setenv: true # Enable sudo -E option
          runas:
          - DBA
          commands:
          - ALL
          - '!SUPPORT_SHELLS'
          - '!SUPPORT_RESTRICTED'
```

Linux with package, latest version

```
linux:
  system:
    ...
    package:
```

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```
      package-name:
        version: latest
```

Linux with package from certail repo, version with no upgrades

```
linux:
  system:
    ...
    package:
      package-name:
        version: 2132.323
        repo: 'custom-repo'
        hold: true
```

Linux with package from certail repo, version with no GPG verification

```
linux:
  system:
    ...
    package:
      package-name:
        version: 2132.323
        repo: 'custom-repo'
        verify: false
```

Linux with autoupdates (automatically install security package updates)

```
linux:
  system:
    ...
    autoupdates:
      enabled: true
      mail: root@localhost
      mail_only_on_error: true
      remove_unused_dependencies: false
      automatic_reboot: true
      automatic_reboot_time: "02:00"
```

Linux with cron jobs By default it will use name as an identifier, unless identifier key is explicitly set or False (then it will use Salt's default behavior which is identifier same as command resulting in not being able to change it)

```
linux:
  system:
    ...
    job:
      cmd1:
        command: '/cmd/to/run'
        identifier: cmd1
        enabled: true
        user: 'root'
        hour: 2
        minute: 0
```

Linux security limits (limit sensu user memory usage to max 1GB):

```
linux:
  system:
    ...
    limit:
      sensu:
        enabled: true
        domain: sensu
        limits:
          - type: hard
            item: as
            value: 1000000
```

Enable autologin on tty1 (may work only for Ubuntu 14.04):

```
linux:
  system:
    console:
      tty1:
        autologin: root
      # Enable serial console
      ttyS0:
        autologin: root
        rate: 115200
        term: xterm
```

To disable set autologin to *false*.

Set `policy-rc.d` on Debian-based systems. Action can be any available command in `while true` loop and `case` context. Following will disallow dpkg to stop/start services for cassandra package automatically:

```
linux:
  system:
    policyrcd:
      - package: cassandra
        action: exit 101
      - package: '*'
        action: switch
```

Set system locales:

```
linux:
  system:
    locale:
      en_US.UTF-8:
        default: true
      "cs_CZ.UTF-8 UTF-8":
        enabled: true
```

Systemd settings:

```
linux:
  system:
    ...
    systemd:
      system:
        Manager:
          DefaultLimitNOFILE: 307200
```

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```
        DefaultLimitNPROC: 307200
    user:
      Manager:
        DefaultLimitCPU: 2
        DefaultLimitNPROC: 4
```

Ensure presence of directory:

```
linux:
  system:
    directory:
      /tmp/test:
        user: root
        group: root
        mode: 700
        makedirs: true
```

Ensure presence of file by specifying it's source:

```
linux:
  system:
    file:
      /tmp/test.txt:
        source: http://example.com/test.txt
        user: root #optional
        group: root #optional
        mode: 700 #optional
        dir_mode: 700 #optional
        encoding: utf-8 #optional
        hash: <<hash>> or <<URI to hash>> #optional
        makedirs: true #optional

linux:
  system:
    file:
      test.txt:
        name: /tmp/test.txt
        source: http://example.com/test.txt
```

Ensure presence of file by specifying it's contents:

```
linux:
  system:
    file:
      /tmp/test.txt:
        contents: |
          line1
          line2

linux:
  system:
    file:
      /tmp/test.txt:
        contents_pillar: linux:network:hostname

linux:
  system:
```

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```
    file:
      /tmp/test.txt:
        contents_grains: motd
```

Kernel

Install always up to date LTS kernel and headers from Ubuntu trusty:

```
linux:
  system:
    kernel:
      type: generic
      lts: trusty
      headers: true
```

Load kernel modules and add them to */etc/modules*:

```
linux:
  system:
    kernel:
      modules:
        - nf_conntrack
        - tp_smapi
        - 8021q
```

Configure or blacklist kernel modules with additional options to */etc/modprobe.d* following example will add */etc/modprobe.d/nf_conntrack.conf* file with line *options nf_conntrack hashsize=262144*:

```
linux:
  system:
    kernel:
      module:
        nf_conntrack:
          option:
            hashsize: 262144
```

Install specific kernel version and ensure all other kernel packages are not present. Also install extra modules and headers for this kernel:

```
linux:
  system:
    kernel:
      type: generic
      extra: true
      headers: true
      version: 4.2.0-22
```

Systcl kernel parameters

```
linux:
  system:
    kernel:
      sysctl:
        net.ipv4.tcp_keepalive_intvl: 3
```

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```
        net.ipv4.tcp_keepalive_time: 30
        net.ipv4.tcp_keepalive_probes: 8
```

Configure kernel boot options:

```
linux:
  system:
    kernel:
      boot_options:
        - elevator=deadline
        - spectre_v2=off
        - nopti
```

CPU

Enable cpufreq governor for every cpu:

```
linux:
  system:
    cpu:
      governor: performance
```

CGROUPS

Setup linux cgroups:

```
linux:
  system:
    cgroup:
      enabled: true
      group:
        ceph_group_1:
          controller:
            cpu:
              shares:
                value: 250
            cpuacct:
              usage:
                value: 0
            cpuset:
              cpus:
                value: 1,2,3
            memory:
              limit_in_bytes:
                value: 2G
              memsw.limit_in_bytes:
                value: 3G
          mapping:
            subjects:
            - '@ceph'
        generic_group_1:
          controller:
            cpu:
```

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```
              shares:
                value: 250
            cpuacct:
              usage:
                value: 0
          mapping:
            subjects:
            - '*:firefox'
            - 'student:cp'
```

Shared Libraries

Set additional shared library to Linux system library path

```
linux:
  system:
    ld:
      library:
        java:
          - /usr/lib/jvm/jre-openjdk/lib/amd64/server
          - /opt/java/jre/lib/amd64/server
```

Certificates

Add certificate authority into system trusted CA bundle

```
linux:
  system:
    ca_certificates:
      mycert: |
        -----BEGIN CERTIFICATE-----
        MIICPDCCAaUCEHC65B0Q2Sk0tjjKewPMur8wDQYJKoZIhvcNAQECBQAwXzELMAkG
        A1UEBhMCVVMxFzAVBgNVBAoTDlZlcmlTaWduLCBJbmMuMTcwNQYDVQQLEy5DbGFz
        cyAzIFB1YmxpYyBQcmltYXJ5IENlcnRpZmljYXRpb24gQXV0aG9yaXR5MB4XDTk2
        MDEyOTAwMDAwMFoXDTI4MDgwMTIzNTk1OVowXzELMAkGA1UEBhMCVVMxFzAVBgNV
        BAoTDlZlcmlTaWduLCBJbmMuMTcwNQYDVQQLEy5DbGFzcyAzIFB1YmxpYyBQcmlt
        YXJ5IENlcnRpZmljYXRpb24gQXV0aG9yaXR5MIGfMA0GCSqGSIb3DQEBAQUAA4GN
        ADCBiQKBgQDJXFme8huKARS0EN8EQNvjV69qRUCPhAwL0TPZ2RHP7gJYHyX3KqhE
        BarsAx94f56TuZoAqiN91qyFomNFx3InzPRMxnVx0jnvT0Lwdd8KkMaOIG+YD/is
        I19wKTakyYbnsZogy1Olhec9vn2a/iRFM9x2Fe0PonFkTGUugWhFpwIDAQABMA0G
        CSqGSIb3DQEBAgUAA4GBALtMEivPLCYATxQT3ab7/AoRhIzzKBxnki98tsX63/Do
        lbwdj2wsqFHMc9ikwFPwTtYmwHYBV4GSXiHx0bH/59AhWM1pF+NEHJwZRDmJXNyc
        AA9WjQKZ7aKQRUzkuxCkPfAyAw7xzvjoyVGM5mKf5p/AfbdynMk2OmufTqj/ZA1k
        -----END CERTIFICATE-----
```

Sysfs

Install sysfsutils and set sysfs attributes:

```
linux:
  system:
```

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```
    sysfs:
      scheduler:
        block/sda/queue/scheduler: deadline
      power:
        mode:
          power/state: 0660
        owner:
          power/state: "root:power"
        devices/system/cpu/cpu0/cpufreq/scaling_governor: powersave
```

Huge Pages

Huge Pages give a performance boost to applications that intensively deal with memory allocation/deallocation by decreasing memory fragmentation.

```
linux:
  system:
    kernel:
      hugepages:
        small:
          size: 2M
          count: 107520
          mount_point: /mnt/hugepages_2MB
          mount: false/true # default false
        large:
          default: true # default automatically mounted
          size: 1G
          count: 210
          mount_point: /mnt/hugepages_1GB
```

Note: not recommended to use both pagesizes in concurrently.

Intel SR-IOV

PCI-SIG Single Root I/O Virtualization and Sharing (SR-IOV) specification defines a standardized mechanism to virtualize PCIe devices. The mechanism can virtualize a single PCIe Ethernet controller to appear as multiple PCIe devices.

```
linux:
  system:
    kernel:
      sriov: True
      unsafe_interrupts: False # Default is false. for older platforms and AMD we␣
↪need to add interrupt remapping workaround
    rc:
      local: |
        #!/bin/sh -e
        # Enable 7 VF on eth1
        echo 7 > /sys/class/net/eth1/device/sriov_numvfs; sleep 2; ifup -a
        exit 0
```

Isolate CPU options

Remove the specified CPUs, as defined by the cpu_number values, from the general kernel SMP balancing and scheduler algroithms. The only way to move a process onto or off an “isolated” CPU is via the CPU affinity syscalls. cpu_number begins at 0, so the maximum value is 1 less than the number of CPUs on the system.

```
linux:
  system:
    kernel:
      isolcpu: 1,2,3,4,5,6,7 # isolate first cpu 0
```

Repositories

RedHat based Linux with additional OpenStack repo

```
linux:
  system:
    ...
    repo:
      rdo-icehouse:
        enabled: true
        source: 'http://repos.fedorapeople.org/repos/openstack/openstack-icehouse/
↪epel-6/'
        pgpcheck: 0
```

Ensure system repository to use czech Debian mirror (`default: true`) Also pin it’s packages with priority 900.

```
linux:
  system:
    repo:
      debian:
        default: true
        source: "deb http://ftp.cz.debian.org/debian/ jessie main contrib non-free"
        # Import signing key from URL if needed
        key_url: "http://dummy.com/public.gpg"
        pin:
          - pin: 'origin "ftp.cz.debian.org"'
            priority: 900
            package: '*'
```

Package manager proxy setup globally:

```
linux:
  system:
    ...
    repo:
      apt-mk:
        source: "deb http://apt-mk.mirantis.com/ stable main salt"
    ...
    proxy:
      pkg:
        enabled: true
        ftp:   ftp://ftp-proxy-for-apt.host.local:2121
      ...
      # NOTE: Global defaults for any other componet that configure proxy on the␣
↪system.
```

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```
      #       If your environment has just one simple proxy, set it on␣
↪linux:system:proxy.
      #
      # fall back system defaults if linux:system:proxy:pkg has no protocol specific␣
↪entries
      # as for https and http
      ftp:   ftp://proxy.host.local:2121
      http:  http://proxy.host.local:3142
      https: https://proxy.host.local:3143
```

Package manager proxy setup per repository:

```
linux:
  system:
    ...
    repo:
      debian:
        source: "deb http://apt-mk.mirantis.com/ stable main salt"
    ...
      apt-mk:
        source: "deb http://apt-mk.mirantis.com/ stable main salt"
        # per repository proxy
        proxy:
          enabled: true
          http:  http://maas-01:8080
          https: http://maas-01:8080
    ...
    proxy:
      # package manager fallback defaults
      # used if linux:system:repo:apt-mk:proxy has no protocol specific entries
      pkg:
        enabled: true
        ftp:   ftp://proxy.host.local:2121
        #http:  http://proxy.host.local:3142
        #https: https://proxy.host.local:3143
      ...
      # global system fallback system defaults
      ftp:   ftp://proxy.host.local:2121
      http:  http://proxy.host.local:3142
      https: https://proxy.host.local:3143
```

Remove all repositories:

```
linux:
  system:
    purge_repos: true
```

Setup custom apt config options:

```
linux:
  system:
    apt:
      config:
        compression-workaround:
          "Acquire::CompressionTypes::Order": "gz"
        docker-clean:
          "DPkg::Post-Invoke":
```

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```
            - "rm -f /var/cache/apt/archives/*.deb /var/cache/apt/archives/partial/*.
↪deb /var/cache/apt/*.bin || true"
          "APT::Update::Post-Invoke":
            - "rm -f /var/cache/apt/archives/*.deb /var/cache/apt/archives/partial/*.
↪deb /var/cache/apt/*.bin || true"
```

RC

rc.local example

```
linux:
  system:
    rc:
      local: |
        #!/bin/sh -e
        #
        # rc.local
        #
        # This script is executed at the end of each multiuser runlevel.
        # Make sure that the script will "exit 0" on success or any other
        # value on error.
        #
        # In order to enable or disable this script just change the execution
        # bits.
        #
        # By default this script does nothing.
        exit 0
```

Prompt

Setting prompt is implemented by creating `/etc/profile.d/prompt.sh`. Every user can have different prompt.

```
linux:
  system:
    prompt:
      root: \\n\\[\\033[0;37m\\]\\D{%y/%m/%d %H:%M:%S} $(hostname -
↪f)\\[\\e[0m\\]\\n\\[\\e[1;31m\\][\\u@\\h:\\w]\\[\\e[0m\\]
      default: \\n\\D{%y/%m/%d %H:%M:%S} $(hostname -f)\\n[\\u@\\h:\\w]
```

On Debian systems to set prompt system-wide it's necessary to remove setting PS1 in `/etc/bash.bashrc` and `~/.bashrc` (which comes from `/etc/skel/.bashrc`). This formula will do this automatically, but will not touch existing user's `~/.bashrc` files except root.

Bash

Fix bash configuration to preserve history across sessions (like ZSH does by default).

```
linux:
  system:
    bash:
      preserve_history: true
```

Message of the day

`pam_motd` from package `update-motd` is used for dynamic messages of the day. Setting custom motd will cleanup existing ones.

```
linux:
  system:
    motd:
      - release: |
          #!/bin/sh
          [ -r /etc/lsb-release ] && . /etc/lsb-release

          if [ -z "$DISTRIB_DESCRIPTION" ] && [ -x /usr/bin/lsb_release ]; then
            # Fall back to using the very slow lsb_release utility
            DISTRIB_DESCRIPTION=$(lsb_release -s -d)
          fi

          printf "Welcome to %s (%s %s %s)\n" "$DISTRIB_DESCRIPTION" "$(uname -o)" "
↪$(uname -r)" "$(uname -m)"
      - warning: |
          #!/bin/sh
          printf "This is [company name] network.\n"
          printf "Unauthorized access strictly prohibited.\n"
```

Services

Stop and disable linux service:

```
linux:
  system:
    service:
      apt-daily.timer:
        status: dead
```

Possible status is dead (disable service by default), running (enable service by default), enabled, disabled.

Linux with atop service:

```
linux:
  system:
    atop:
      enabled: true
      interval: 20
      logpath: "/var/log/atop"
      outfile: "/var/log/atop/daily.log"
```

RHEL / CentOS

Unfortunately `update-motd` is currently not available for RHEL so there's no native support for dynamic motd. You can still set static one, only pillar structure differs:

```
linux:
  system:
    motd: |
```

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```
      This is [company name] network.
      Unauthorized access strictly prohibited.
```

Haveged

If you are running headless server and are low on entropy, it may be a good idea to setup Haveged.

```
linux:
  system:
    haveged:
      enabled: true
```

Linux network

Linux with network manager

```
linux:
  network:
    enabled: true
    network_manager: true
```

Linux with default static network interfaces, default gateway interface and DNS servers

```
linux:
  network:
    enabled: true
    interface:
      eth0:
        enabled: true
        type: eth
        address: 192.168.0.102
        netmask: 255.255.255.0
        gateway: 192.168.0.1
        name_servers:
        - 8.8.8.8
        - 8.8.4.4
        mtu: 1500
```

Linux with bonded interfaces and disabled NetworkManager

```
linux:
  network:
    enabled: true
    interface:
      eth0:
        type: eth
        ...
      eth1:
        type: eth
        ...
      bond0:
        enabled: true
        type: bond
```

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```
        address: 192.168.0.102
        netmask: 255.255.255.0
        mtu: 1500
        use_in:
        - interface: ${linux:interface:eth0}
        - interface: ${linux:interface:eth0}
    network_manager:
      disable: true
```

Linux with vlan interface_params

```
linux:
  network:
    enabled: true
    interface:
      vlan69:
        type: vlan
        use_interfaces:
        - interface: ${linux:interface:bond0}
```

Linux with wireless interface parameters

```
linux:
  network:
    enabled: true
    gateway: 10.0.0.1
    default_interface: eth0
    interface:
      wlan0:
        type: eth
        wireless:
          essid: example
          key: example_key
          security: wpa
          priority: 1
```

Linux networks with routes defined

```
linux:
  network:
    enabled: true
    gateway: 10.0.0.1
    default_interface: eth0
    interface:
      eth0:
        type: eth
        route:
          default:
            address: 192.168.0.123
            netmask: 255.255.255.0
            gateway: 192.168.0.1
```

Native Linux Bridges

```
linux:
  network:
```

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```
    interface:
      eth1:
        enabled: true
        type: eth
        proto: manual
        up_cmds:
        - ip address add 0/0 dev $IFACE
        - ip link set $IFACE up
        down_cmds:
        - ip link set $IFACE down
      br-ex:
        enabled: true
        type: bridge
        address: ${linux:network:host:public_local:address}
        netmask: 255.255.255.0
        use_interfaces:
        - eth1
```

OpenVswitch Bridges

```
linux:
  network:
    bridge: openvswitch
    interface:
      eth1:
        enabled: true
        type: eth
        proto: manual
        up_cmds:
        - ip address add 0/0 dev $IFACE
        - ip link set $IFACE up
        down_cmds:
        - ip link set $IFACE down
      br-ex:
        enabled: true
        type: bridge
        address: ${linux:network:host:public_local:address}
        netmask: 255.255.255.0
        use_interfaces:
        - eth1
      br-prv:
        enabled: true
        type: ovs_bridge
        mtu: 65000
      br-ens7:
        enabled: true
        name: br-ens7
        type: ovs_bridge
        proto: manual
        mtu: 9000
        use_interfaces:
        - ens7
      patch-br-ens7-br-prv:
        enabled: true
        name: ens7-prv
        ovs_type: ovs_port
        type: ovs_port
```

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```
        bridge: br-ens7
        port_type: patch
        peer: prv-ens7
        mtu: 65000
      patch-br-prv-br-ens7:
        enabled: true
        name: prv-ens7
        bridge: br-prv
        ovs_type: ovs_port
        type: ovs_port
        port_type: patch
        peer: ens7-prv
        mtu: 65000
      ens7:
        enabled: true
        name: ens7
        proto: manual
        ovs_port_type: OVSPort
        type: ovs_port
        ovs_bridge: br-ens7
        bridge: br-ens7
```

Debian manual proto interfaces

When you are changing interface proto from static in up state to manual, you may need to flush ip addresses. For example, if you want to use the interface and the ip on the bridge. This can be done by setting the `ipflush_onchange` to true.

```
linux:
  network:
    interface:
      eth1:
        enabled: true
        type: eth
        proto: manual
        mtu: 9100
        ipflush_onchange: true
```

Debian static proto interfaces

When you are changing interface proto from dhcp in up state to static, you may need to flush ip addresses and restart interface to assign ip address from a managed file. For example, if you want to use the interface and the ip on the bridge. This can be done by setting the `ipflush_onchange` with combination `restart_on_ipflush` param set to to true.

```
linux:
  network:
    interface:
      eth1:
        enabled: true
        type: eth
        proto: static
        address: 10.1.0.22
        netmask: 255.255.255.0
        ipflush_onchange: true
        restart_on_ipflush: true
```

Concatinating and removing interface files

Debian based distributions have */etc/network/interfaces.d/* directory, where you can store configuration of network interfaces in separate files. You can concatinate the files to the defined destination when needed, this operation removes the file from the */etc/network/interfaces.d/*. If you just need to remove iface files, you can use the *remove_iface_files* key.

```
linux:
  network:
    concat_iface_files:
    - src: '/etc/network/interfaces.d/50-cloud-init.cfg'
      dst: '/etc/network/interfaces'
    remove_iface_files:
    - '/etc/network/interfaces.d/90-custom.cfg'
```

DHCP client configuration

None of the keys is mandatory, include only those you really need. For full list of available options under send, supersede, prepend, append refer to dhcp-options(5)

```
linux:
  network:
    dhclient:
      enabled: true
      backoff_cutoff: 15
      initial_interval: 10
      reboot: 10
      retry: 60
      select_timeout: 0
      timeout: 120
      send:
        - option: host-name
          declaration: "= gethostname()"
      supersede:
        - option: host-name
          declaration: "spaceship"
        - option: domain-name
          declaration: "domain.home"
        #- option: arp-cache-timeout
        #  declaration: 20
      prepend:
        - option: domain-name-servers
          declaration:
            - 8.8.8.8
            - 8.8.4.4
        - option: domain-search
          declaration:
            - example.com
            - eng.example.com
      #append:
        #- option: domain-name-servers
        #  declaration: 127.0.0.1
      # ip or subnet to reject dhcp offer from
      reject:
        - 192.33.137.209
        - 10.0.2.0/24
      request:
        - subnet-mask
        - broadcast-address
        - time-offset
```

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```
        - routers
        - domain-name
        - domain-name-servers
        - domain-search
        - host-name
        - dhcp6.name-servers
        - dhcp6.domain-search
        - dhcp6.fqdn
        - dhcp6.sntp-servers
        - netbios-name-servers
        - netbios-scope
        - interface-mtu
        - rfc3442-classless-static-routes
        - ntp-servers
      require:
        - subnet-mask
        - domain-name-servers
      # if per interface configuration required add below
      interface:
        ens2:
          initial_interval: 11
          reject:
            - 192.33.137.210
        ens3:
          initial_interval: 12
          reject:
            - 192.33.137.211
```

Linux network systemd settings:

```
linux:
  network:
    ...
    systemd:
      link:
        10-iface-dmz:
          Match:
            MACAddress: c8:5b:67:fa:1a:af
            OriginalName: eth0
          Link:
            Name: dmz0
      netdev:
        20-bridge-dmz:
          match:
            name: dmz0
          network:
            mescription: bridge
            bridge: br-dmz0
      network:
      # works with lowercase, keys are by default capitalized
        40-dhcp:
          match:
            name: '*'
          network:
            DHCP: yes
```

Configure global environment variables

Use `/etc/environment` for static system wide variable assignment after boot. Variable expansion is frequently not supported.

```
linux:
  system:
    env:
      BOB_VARIABLE: Alice
      ...
      BOB_PATH:
        - /srv/alice/bin
        - /srv/bob/bin
      ...
      ftp_proxy:   none
      http_proxy:  http://global-http-proxy.host.local:8080
      https_proxy: ${linux:system:proxy:https}
      no_proxy:
        - 192.168.0.80
        - 192.168.1.80
        - .domain.com
        - .local
    ...
    # NOTE: global defaults proxy configuration.
    proxy:
      ftp:   ftp://proxy.host.local:2121
      http:  http://proxy.host.local:3142
      https: https://proxy.host.local:3143
      noproxy:
        - .domain.com
        - .local
```

Configure profile.d scripts

The profile.d scripts are being sourced during .sh execution and support variable expansion in opposite to /etc/environment global settings in `/etc/environment`.

```
linux:
  system:
    profile:
      locales: |
        export LANG=C
        export LC_ALL=C
      ...
      vi_flavors.sh: |
        export PAGER=view
        export EDITOR=vim
        alias vi=vim
      shell_locales.sh: |
        export LANG=en_US
        export LC_ALL=en_US.UTF-8
      shell_proxies.sh: |
        export FTP_PROXY=ftp://127.0.3.3:2121
        export NO_PROXY='.local'
```

Linux with hosts

Parameter purge_hosts will enforce whole /etc/hosts file, removing entries that are not defined in model except defaults for both IPv4 and IPv6 localhost and hostname + fqdn.

It's good to use this option if you want to ensure /etc/hosts is always in a clean state however it's not enabled by default for safety.

```
linux:
  network:
    purge_hosts: true
    host:
      # No need to define this one if purge_hosts is true
      hostname:
        address: 127.0.1.1
        names:
        - ${linux:network:fqdn}
        - ${linux:network:hostname}
      node1:
        address: 192.168.10.200
        names:
        - node2.domain.com
        - service2.domain.com
      node2:
        address: 192.168.10.201
        names:
        - node2.domain.com
        - service2.domain.com
```

Linux with hosts collected from mine

In this case all dns records defined within infrastrucuture will be passed to local hosts records or any DNS server. Only hosts with *grain* parameter to true will be propagated to the mine.

```
linux:
  network:
    purge_hosts: true
    mine_dns_records: true
    host:
      node1:
        address: 192.168.10.200
        grain: true
        names:
        - node2.domain.com
        - service2.domain.com
```

Setup resolv.conf, nameservers, domain and search domains

```
linux:
  network:
    resolv:
      dns:
      - 8.8.4.4
      - 8.8.8.8
      domain: my.example.com
      search:
      - my.example.com
      - example.com
      options:
      - ndots: 5
      - timeout: 2
      - attempts: 2
```

setting custom TX queue length for tap interfaces

```
linux:
  network:
    tap_custom_txqueuelen: 10000
```

DPDK OVS interfaces

DPDK OVS NIC

```
linux:
  network:
    bridge: openvswitch
    dpdk:
      enabled: true
      driver: uio/vfio
    openvswitch:
      pmd_cpu_mask: "0x6"
      dpdk_socket_mem: "1024,1024"
      dpdk_lcore_mask: "0x400"
      memory_channels: 2
    interface:
      dpkd0:
        name: ${_param:dpdk_nic}
        pci: 0000:06:00.0
        driver: igb_uio/vfio-pci
        enabled: true
        type: dpdk_ovs_port
        n_rxq: 2
        pmd_rxq_affinity: "0:1,1:2"
        bridge: br-prv
        mtu: 9000
      br-prv:
        enabled: true
        type: dpdk_ovs_bridge
```

DPDK OVS Bond

```
linux:
  network:
    bridge: openvswitch
    dpdk:
      enabled: true
      driver: uio/vfio
    openvswitch:
      pmd_cpu_mask: "0x6"
      dpdk_socket_mem: "1024,1024"
      dpdk_lcore_mask: "0x400"
      memory_channels: 2
    interface:
      dpdk_second_nic:
        name: ${_param:primary_second_nic}
        pci: 0000:06:00.0
        driver: igb_uio/vfio-pci
        bond: dpdkbond0
        enabled: true
        type: dpdk_ovs_port
        n_rxq: 2
        pmd_rxq_affinity: "0:1,1:2"
        mtu: 9000
```

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```
      dpdk_first_nic:
        name: ${_param:primary_first_nic}
        pci: 0000:05:00.0
        driver: igb_uio/vfio-pci
        bond: dpdkbond0
        enabled: true
        type: dpdk_ovs_port
        n_rxq: 2
        pmd_rxq_affinity: "0:1,1:2"
        mtu: 9000
      dpdkbond0:
        enabled: true
        bridge: br-prv
        type: dpdk_ovs_bond
        mode: active-backup
      br-prv:
        enabled: true
        type: dpdk_ovs_bridge
```

DPDK OVS bridge for VXLAN

If VXLAN is used as tenant segmentation then ip address must be set on br-prv

```
linux:
  network:
    ...
    interface:
      br-prv:
        enabled: true
        type: dpdk_ovs_bridge
        address: 192.168.50.0
        netmask: 255.255.255.0
        tag: 101
        mtu: 9000
```

Linux storage

Linux with mounted Samba

```
linux:
  storage:
    enabled: true
    mount:
      samba1:
      - enabled: true
      - path: /media/myuser/public/
      - device: //192.168.0.1/storage
      - file_system: cifs
      - options: guest,uid=myuser,iocharset=utf8,file_mode=0777,dir_mode=0777,noperm
```

NFS mount

```
linux:
  storage:
    enabled: true
```

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```
    mount:
      nfs_glance:
        enabled: true
        path: /var/lib/glance/images
        device: 172.16.10.110:/var/nfs/glance
        file_system: nfs
        opts: rw,sync
```

File swap configuration

```
linux:
  storage:
    enabled: true
    swap:
      file:
        enabled: true
        engine: file
        device: /swapfile
        size: 1024
```

Partition swap configuration

```
linux:
  storage:
    enabled: true
    swap:
      partition:
        enabled: true
        engine: partition
        device: /dev/vg0/swap
```

LVM group *vg1* with one device and *data* volume mounted into */mnt/data*

```
parameters:
  linux:
    storage:
      mount:
        data:
          enabled: true
          device: /dev/vg1/data
          file_system: ext4
          path: /mnt/data
      lvm:
        vg1:
          enabled: true
          devices:
            - /dev/sdb
          volume:
            data:
              size: 40G
              mount: ${linux:storage:mount:data}
```

Create partitions on disk. Specify size in MB. It expects empty disk without any existing partitions. (set startsector=1, if you want to start partitions from 2048)

```
linux:
  storage:
    disk:
      first_drive:
        startsector: 1
        name: /dev/loop1
        type: gpt
        partitions:
          - size: 200 #size in MB
            type: fat32
          - size: 300 #size in MB
            mkfs: True
            type: xfs
      /dev/vda1:
        partitions:
          - size: 5
            type: ext2
          - size: 10
            type: ext4
```

Multipath with Fujitsu Eternus DXL

```
parameters:
  linux:
    storage:
      multipath:
        enabled: true
        blacklist_devices:
        - /dev/sda
        - /dev/sdb
        backends:
        - fujitsu_eternus_dxl
```

Multipath with Hitachi VSP 1000

```
parameters:
  linux:
    storage:
      multipath:
        enabled: true
        blacklist_devices:
        - /dev/sda
        - /dev/sdb
        backends:
        - hitachi_vsp1000
```

Multipath with IBM Storwize

```
parameters:
  linux:
    storage:
      multipath:
        enabled: true
        blacklist_devices:
        - /dev/sda
        - /dev/sdb
        backends:
        - ibm_storwize
```

Multipath with multiple backends

```
parameters:
  linux:
    storage:
      multipath:
        enabled: true
        blacklist_devices:
        - /dev/sda
        - /dev/sdb
        - /dev/sdc
        - /dev/sdd
        backends:
        - ibm_storwize
        - fujitsu_eternus_dxl
        - hitachi_vsp1000
```

PAM LDAP integration

```
parameters:
  linux:
    system:
      auth:
        enabled: true
        ldap:
          enabled: true
          binddn: cn=bind,ou=service_users,dc=example,dc=com
          bindpw: secret
          uri: ldap://127.0.0.1
          base: ou=users,dc=example,dc=com
          ldap_version: 3
          pagesize: 65536
          referrals: off
          filter:
            passwd: (&(&(objectClass=person)(uidNumber=*))(unixHomeDirectory=*))
            shadow: (&(&(objectClass=person)(uidNumber=*))(unixHomeDirectory=*))
            group:  (&(objectClass=group)(gidNumber=*))
```

Disabled multipath (the default setup)

```
parameters:
  linux:
    storage:
      multipath:
        enabled: false
```

Linux with local loopback device

```
linux:
  storage:
    loopback:
      disk1:
        file: /srv/disk1
        size: 50G
```

External config generation

You are able to use config support metadata between formulas and only generate config files for external use, eg. docker, etc.

```
parameters:
  linux:
    system:
      config:
        pillar:
          jenkins:
            master:
              home: /srv/volumes/jenkins
              approved_scripts:
                - method java.net.URL openConnection
              credentials:
                - type: username_password
                  scope: global
                  id: test
                  desc: Testing credentials
                  username: test
                  password: test
```

Netconsole Remote Kernel Logging

Netconsole logger could be configured for configfs-enabled kernels (*CONFIG_NETCONSOLE_DYNAMIC* should be enabled). Configuration applies both in runtime (if network is already configured), and on-boot after interface initialization. Notes:

- receiver could be located only in same L3 domain (or you need to configure gateway MAC manually)
- receiver's MAC is detected only on configuration time
- using broadcast MAC is not recommended

```
parameters:
  linux:
    system:
      netconsole:
        enabled: true
        port: 514 (optional)
        loglevel: debug (optional)
        target:
          192.168.0.1:
            interface: bond0
            mac: "ff:ff:ff:ff:ff:ff" (optional)
```

Usage

Set mtu of network interface eth0 to 1400

```
ip link set dev eth0 mtu 1400
```

Read more

- https://www.archlinux.org/
- http://askubuntu.com/questions/175172/how-do-i-configure-proxies-in-ubuntu-server-or-minimal-cli-ubuntu

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

http://salt-formulas.readthedocs.io/

In the unfortunate event that bugs are discovered, they should be reported to the appropriate issue tracker. Use Github issue tracker for specific salt formula:

https://github.com/salt-formulas/salt-formula-linux/issues

For feature requests, bug reports or blueprints affecting entire ecosystem, use Launchpad salt-formulas project:

https://launchpad.net/salt-formulas

You can also join salt-formulas-users team and subscribe to mailing list:

https://launchpad.net/~salt-formulas-users

Developers wishing to work on the salt-formulas projects should always base their work on master branch and submit pull request against specific formula.

https://github.com/salt-formulas/salt-formula-linux

Any questions or feedback is always welcome so feel free to join our IRC channel:

#salt-formulas @ irc.freenode.net

network configuration formula

Sets up network devices.

Sample pillars

Single network config snippet

```
network:
  control:
    enabled: true
    config:
      switch_vlan:
        eth0-0-1:
          address: 10.0.0.1/24
        eth0-0-2:
          address: 10.0.0.2/24
        eth0-0-3:
          address: 10.0.0.3/24
    device:
      vsrx1:
        interface:
          eth0-0-1: ${network:conrol:config:switch_vlan}
```

JunOS VSRX device

```
network:
  control:
    enabled: true
    managed: true
    device:
      vsrx1:
        type: junos
        auth:
          password: $1$gpbfk/Jr$
        interface:
          eth0-0-1:
            address: 10.0.0.1/24
```

Read more

- links

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

http://salt-formulas.readthedocs.io/

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https://github.com/salt-formulas/salt-formula-network/issues

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NFS Formula

Sample Pillars

NFS Server: Basic sharing

```
nfs:
  server:
    enabled: true
```

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```
    share:
      home_majklk:
        path: /home/majklk
        host:
          inter:
            host: 10.10.10.0/24
            params:
            - rw
            - no_root_squash
            - sync
          pub:
            host: 10.0.0.0/24
            params:
            - rw
            - no_root_squash
            - sync
```

NFS Client with mounted directory

```
nfs:
  client:
    enabled: true
    mount:
      samba1:
        path: /media/myuser/public/
        fstype: nfs
        device: 192.168.0.1:/home/majklk
```

NFS mount

```
linux:
  storage:
    mount:
      nfs:
        enabled: true
        path: /var/lib/glance
        file_system: nfs
        device: 10.0.103.152:/storage/glance/vpc20
```

More Information

- http://wiki.ubuntu.cz/nfs

NTP

Network time synchronisation services.

Sample pillars

NTP client

```
ntp:
  client:
    enabled: true
    strata:
    - ntp.cesnet.cz
    - ntp.nic.cz
```

Read more

- https://collectd.org/wiki/index.php/Plugin:NTPd

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OpenSSH

OpenSSH is a FREE version of the SSH connectivity tools that technical users of the Internet rely on. Users of telnet, rlogin, and ftp may not realize that their password is transmitted across the Internet unencrypted, but it is. OpenSSH encrypts all traffic (including passwords) to effectively eliminate eavesdropping, connection hijacking, and other attacks. Additionally, OpenSSH provides secure tunneling capabilities and several authentication methods, and supports all SSH protocol versions.

Sample pillar

OpenSSH client

OpenSSH client with shared private key

```
openssh:
  client:
    enabled: true
    use_dns: False
    user:
      root:
        enabled: true
        private_key:
          type: rsa
          key: ${_param:root_private_key}
        user: ${linux:system:user:root}
```

OpenSSH client with individual private key and known host

```
openssh:
  client:
    enabled: true
    user:
      root:
        enabled: true
        user: ${linux:system:user:root}
        known_hosts:
        - name: repo.domain.com
          type: rsa
          fingerprint: dd:fa:e8:68:b1:ea:ea:a0:63:f1:5a:55:48:e1:7e:37
          fingerprint_hash_type: sha256|md5
```

Configure keep alive settings:

```
openssh:
  client:
    alive:
      interval: 600
      count: 3
```

OpenSSH server

OpenSSH server with configuration parameters

```
openssh:
  server:
    enabled: true
    permit_root_login: true
    public_key_auth: true
    password_auth: true
    host_auth: true
    banner: Welcome to server!
    bind:
      address: 0.0.0.0
      port: 22
```

OpenSSH server with auth keys for users. Parameter `purge` will ensure exact authorized_keys contents co undefined keys will be removed.

```
openssh:
  server:
    enabled: true
    bind:
      address: 0.0.0.0
      port: 22
    ...
    user:
      newt:
        enabled: true
        user: ${linux:system:user:newt}
        public_keys:
        - ${public_keys:newt}
      root:
        enabled: true
        purge: true
        user: ${linux:system:user:root}
        public_keys:
        - ${public_keys:newt}
```

You can also bind openssh on multiple addresses and ports:

```
openssh:
  server:
    enabled: true
    binds:
      - address: 127.0.0.1
        port: 22
      - address: 192.168.1.1
        port: 2222
```

OpenSSH server for use with FreeIPA

```
openssh:
  server:
    enabled: true
    bind:
      address: 0.0.0.0
      port: 22
    public_key_auth: true
    authorized_keys_command:
      command: /usr/bin/sss_ssh_authorizedkeys
      user: nobody
```

Configure keep alive settings:

```
openssh:
  server:
    alive:
      keep: yes
      interval: 600
      count: 3
#
# will give you an timeout of 30 minutes (600 sec x 3)
```

Enable DSA legacy keys:

```
openssh:
  server:
    dss_enabled: true
```

Read more

- http://www.openssh.org/manual.html
- https://help.ubuntu.com/community/SSH/OpenSSH/Configuring
- http://www.cyberciti.biz/tips/linux-unix-bsd-openssh-server-best-practices.html
- http://www.zeitoun.net/articles/ssh-through-http-proxy/start

Documentation and Bugs

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OpenVPN

OpenVPN can tunnel any IP subnetwork or virtual ethernet adapter over a single UDP or TCP port, configure a scalable, load-balanced VPN server farm using one or more machines which can handle thousands of dynamic connections from incoming VPN clients.

Sample pillars

Simple OpenVPN server

```
openvpn:
  server:
    enabled: true
    device: tun
```

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```
    ssl:
      authority: Domain_Service_CA
      certificate: server.domain.com
    bind:
      address: 0.0.0.0
      port: 1194
      protocol: tcp
```

OpenVPN server with private subnet with DHCP and predefined clients

```
openvpn:
  server:
    ...
    interface:
      topology: subnet
      network: 10.0.8.0
      netmask: 255.255.255.0
      dhcp_pool:
        start: 10.0.8.100
        end: 10.0.8.199
      clients:
      - name: client1.domain.com
        address: 10.0.8.12
      - name: client2.domain.com
        address: 10.0.8.13
```

```
openvpn:
  server:
    ...
    topology: subnet
    interface:
      network: 10.0.8.0
      netmask: 255.255.255.0
    dhcp_pool:
      start: 10.0.8.100
      end: 10.0.8.199
    topology: gateway
    device: tun
    mode: p2p
    interface:
      network: 10.0.8.0
      netmask: 255.255.255.0
    endpoint:
      local: 10.8.0.1
      remote: 10.8.0.2
    dhcp_pool:
      start: 10.8.0.4
      end: 10.8.0.255
    routes:
    - network: 10.8.0.1
      netmask: 255.255.255.255
    - network: 10.0.110.0
      netmask: 255.255.255.0
    - network: 10.0.101.0
      netmask: 255.255.255.0
```

OpenVPN server with custom auth

```
openvpn:
  server:
    ...
    interface:
      topology: subnet
      network: 10.0.8.0
      netmask: 255.255.255.0
    auth:
      engine: pam/google-authenticator
    ssl:
      authority: Domain_Service_CA
      certificate: server.domain.com
```

Single OpenVPN client with multiple servers

```
openvpn:
  client:
    enabled: true
    tunnel:
      tunnel_name:
        autostart: true
        servers:
        - host: 10.0.0.1
          port: 1194
        - host: 10.0.0.2
          port: 1194
        protocol: tcp
        device: tup
        compression: true
        ssl:
          authority: Domain_Service_CA
          certificate: client.domain.com
```

Multiple OpenVPN clients

```
openvpn:
  client:
    enabled: true
    tunnel:
      tunnel01:
        autostart: true
        server:
          host: 10.0.0.1
          port: 1194
        protocol: tcp
        device: tup
        compression: true
        ssl:
          engine: salt
          authority: Domain_Service_CA
          certificate: client.domain.com
      tunnel02:
        autostart: true
        server:
          host: 10.0.0.1
          port: 1194
        protocol: tcp
```

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```
        device: tup
        compression: true
        ssl:
          engine: salt
          authority: Domain_Service_CA
          certificate: client.domain.com
```

OpenVPN client auth

```
openvpn:
  client:
    enabled: true
    tunnel:
      tunnel01:
        auth:
          engine: pam/google-authenticator
        ssl:
          engine: salt
          authority: Domain_Service_CA
          certificate: client.domain.com
```

Read more

- https://github.com/luxflux/puppet-openvpn
- https://github.com/ConsumerAffairs/salt-states/blob/master/openvpn.sls
- https://help.ubuntu.com/lts/serverguide/openvpn.html

Documentation and Bugs

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> https://github.com/salt-formulas/salt-formula-openvpn/issues

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pritunl

Pritunl is a distributed enterprise vpn server built using the OpenVPN protocol.

Sample pillars

Single pritunl service

```
pritunl:
  server:
    enabled: true
```

Read more

- https://github.com/pritunl/pritunl

Documentation and Bugs

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> http://salt-formulas.readthedocs.io/

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> https://github.com/salt-formulas/salt-formula-pritunl/issues

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> https://github.com/salt-formulas/salt-formula-pritunl

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Reclass Formula

reclass is an "external node classifier" (ENC) as can be used with automation tools, such as Puppet, Salt, and Ansible. It is also a stand-alone tool for merging data sources recursively.

Sample Metadata

Install sources from [repository, git, pip]

```
salt:
  source:
    engine: pkg
...
  source:
    engine: git
    repo: git+https://github.com/salt-formulas/reclass
    branch: master
...
  source:
    engine: pip
...
```

If reclass is pre-installed, set the engine to None to avoid updates.

```
salt:
  source:
    engine: None
```

Reclass storage with data fetched from git

```
reclass:
  storage:
    enabled: true
    base_dir: /srv/reclass
    source:
      engine: git
      repo: git+https://github.com/salt-formulas/reclass
      branch: master
```

Reclass storage with local data source

```
reclass:
  storage:
    enabled: true
    base_dir: /srv/reclass
    data_source:
      engine: local
```

Reclass storage with archive data source

```
reclass:
  storage:
    enabled: true
    base_dir: /srv/reclass
    data_source:
      engine: archive
      address: salt://path/reclass-project.tar
```

Reclass storage with archive data source with content hash check

```
reclass:
  storage:
    enabled: true
    base_dir: /srv/reclass
    data_source:
      engine: archive
```

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```
      address: https://mydomain.tld/bar.tar.gz
      hash: sha1=5edb7d584b82ddcbf76e311601f5d4442974aaa5
```

Reclass model with single node definition

```
reclass:
  storage:
    enabled: true
    node:
      service_node01:
        name: svc01
        domain: deployment.local
        classes:
        - cluster.deployment_name.service.role
        params:
          salt_master_host: <<salt-master-ip>>
          linux_system_codename: trusty
          single_address: <<node-ip>>
```

Reclass model with multiple node defined

```
reclass:
  storage:
    enabled: true
    repeat_replace_symbol: <<count>>
    node:
      service_node01:
        name: node<<count>>
        domain: deployment.local
        classes:
        - cluster.deployment.service.role
        repeat:
          count: 2
          start: 5
          digits: 2
          params:
            single_address:
              value: 10.0.0.<<count>>
              start: 100
            deploy_address:
              value: part-<<count>>-whole
              start: 5
              digits: 3
        params:
          salt_master_host: <<salt-master-ip>>
          linux_system_codename: trusty
```

Reclass model with multiple node defined and interpolation enabled

```
reclass:
  storage:
    enabled: true
    repeat_replace_symbol: <<count>>
    node:
      service_node01:
        name: node<<count>>
        domain: deployment.local
```

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```
        classes:
        - cluster.deployment.service.role
        repeat:
          count: 2
          start: 5
          digits: 2
          params:
            single_address:
              value: ceph_osd_node<<count>>_address
              start: 1
              digits: 2
              interpolate: true
        params:
          salt_master_host: <<salt-master-ip>>
          linux_system_codename: trusty
```

Reclass storage with simple class mappings

```
reclass:
  storage:
    enabled: true
    class_mappings:
    - target: '\*'
      class: default
    ignore_class_notfound: true
```

Reclass models with dynamic node classification

```
reclass:
  storage:
    enabled: true
    class_mapping:
      common_node:
        expression: all
        node_param:
          single_address:
            value_template: <<node_ip>>
          linux_system_codename:
            value_template: <<node_os>>
          salt_master_host:
            value_template: <<node_master_ip>>
      infra_config:
        expression: <<node_hostname>>__startswith__cfg
        cluster_param:
          infra_config_address:
            value_template: <<node_ip>>
          infra_config_deploy_address:
            value_template: <<node_ip>>
      infra_proxy:
        expression: <<node_hostname>>__startswith__prx
        node_class:
          value_template:
            - cluster.<<node_cluster>>.stacklight.proxy
      kubernetes_control01:
        expression: <<node_hostname>>__equals__ctl01
        cluster_param:
          kubernetes_control_node01_address:
```

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```
            value_template: <<node_ip>>
      kubernetes_control02:
        expression: <<node_hostname>>__equals__ctl02
        cluster_param:
          kubernetes_control_node02_address:
            value_template: <<node_ip>>
      kubernetes_control03:
        expression: <<node_hostname>>__equals__ctl03
        cluster_param:
          kubernetes_control_node03_address:
            value_template: <<node_ip>>
      kubernetes_compute:
        expression: <<node_hostname>>__startswith__cmp
        node_class:
          value_template:
            - cluster.<<node_cluster>>.kubernetes.compute
```

Classify node after creation and unclassify on node deletion

```
salt:
  master:
    reactor:
      reclass/minion/classify:
      - salt://reclass/reactor/node_register.sls
      reclass/minion/declassify:
      - salt://reclass/reactor/node_unregister.sls
```

Event to trigger the node classification

```
salt-call event.send 'reclass/minion/classify' "{'node_master_ip': '$config_host',
↪'node_ip': '${node_ip}', 'node_domain': '$node_domain', 'node_cluster': '$node_
↪cluster', 'node_hostname': '$node_hostname', 'node_os': '$node_os'}"
```

Note: You can send any parameters in the event payload, all will be checked against dynamic node classification conditions.

Both actions will use the minion ID as the node_name to be updated.

Event to trigger the node declassification

```
salt-call event.send 'reclass/minion/declassify'
```

More Information

- http://reclass.pantsfullofunix.net/index.html
- http://reclass.pantsfullofunix.net/operations.html

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Salt Formula

Salt is a new approach to infrastructure management. Easy enough to get running in minutes, scalable enough to manage tens of thousands of servers, and fast enough to communicate with them in seconds.

Salt delivers a dynamic communication bus for infrastructures that can be used for orchestration, remote execution, configuration management and much more.

Sample Metadata

Salt Master

Salt master with base formulas and pillar metadata backend

```
git:
  client:
    enabled: true
linux:
  system:
    enabled: true
salt:
  master:
    enabled: true
    command_timeout: 5
    worker_threads: 2
    base_environment: prd
    environment:
      prd:
        formula:
          service01:
            source: git
            address: 'git@git.domain.com/service01-formula.git'
            revision: master
          service02:
            source: pkg
            name: salt-formula-service02
```

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```
    pillar:
      engine: salt
      source:
        engine: git
        address: 'git@repo.domain.com:salt/pillar-demo.git'
        branch: 'master'
```

Salt master with reclass ENC metadata backend

```
git:
  client:
    enabled: true
linux:
  system:
    enabled: true
reclass:
  storage:
    enabled: true
    data_source:
      engine: git
      address:  'git@git.domain.com'
      branch: master
salt:
  master:
    enabled: true
    command_timeout: 5
    worker_threads: 2
    base_environment: prd
    environment:
      prd:
        formula:
          service01:
            source: git
            address: 'git@git.domain.com/service01-formula.git'
            revision: master
          service02:
            source: pkg
            name: salt-formula-service02
    pillar:
      engine: reclass
      reclass:
        storage_type: yaml_fs
        inventory_base_uri: /srv/salt/reclass
        propagate_pillar_data_to_reclass: False
        reclass_source_path: /tmp/reclass
```

Salt master with Architect ENC metadata backend

```
salt:
  master:
    enabled: true
    pillar:
      engine: architect
      project: project-name
      host: architect-api
      port: 8181
      username: salt
```

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```
      password: password
```

Salt master with multiple ext_pillars

```
git:
  client:
    enabled: true
linux:
  system:
    enabled: true
reclass:
  storage:
    enabled: true
    data_source:
      engine: git
      branch: master
      address: 'https://github.com/salt-formulas/openstack-salt.git'
salt:
  master:
    enabled: true
    command_timeout: 5
    worker_threads: 2
    base_environment: prd
    pillar_safe_render_error: False
    #environment:
    # prd:
    #   formula:
    #     python:
    #       source: git
    #       address: 'https://github.com/salt-formulas/salt-formula-python.git'
    #       revision: master
    pillar:
      engine: composite
      reclass:
        # index: 1 is default value
        index: 1
        storage_type: yaml_fs
        inventory_base_uri: /srv/salt/reclass_encrypted
        class_mappings:
          - target: '/^cfg\d+/'
            class:  system.non-existing.class
        ignore_class_notfound: True
        ignore_class_regexp:
          - 'service.*'
          - '*.fluentd'
        propagate_pillar_data_to_reclass: False
      stack: # not yet implemented
        # https://docs.saltstack.com/en/latest/ref/pillar/all/salt.pillar.stack.html
        #option 1
        #path:
        #  - /path/to/stack.cfg
        #option 2
        pillar:environment:
          dev: path/to/dev/stasck.cfg
          prod: path/to/prod/stasck.cfg
        grains:custom:grain:
          value:
```

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```
            - /path/to/stack1.cfg
            - /path/to/stack2.cfg
      saltclass:
        path: /srv/salt/saltclass
      nacl:
        # if order is provided 99 is used to compose "99-nacl" key name which is␣
↪later used to order entries
        index: 99
      gpg: {}
      vault-1: # not yet implemented
        name: vault
        path: secret/salt
      vault-2: # not yet implemented
        name: vault
        path: secret/root
    vault: # not yet implemented
      # https://docs.saltstack.com/en/latest/ref/modules/all/salt.modules.vault.html
      name: myvault
      url: https://vault.service.domain:8200
      auth:
          method: token
          token: 11111111-2222-3333-4444-555555555555
      policies:
          - saltstack/minions
          - saltstack/minion/{minion}
    nacl:
      # https://docs.saltstack.com/en/develop/ref/modules/all/salt.modules.nacl.html
      box_type: sealedbox
      sk_file: /etc/salt/pki/master/nacl
      pk_file: /etc/salt/pki/master/nacl.pub
      #sk: None
      #pk: None
```

Salt master with API

```
git:
  client:
    enabled: true
linux:
  system:
    enabled: true
salt:
  master:
    command_timeout: 5
    worker_threads: 2
    enabled: true
    source:
      engine: pkg
    pillar:
      engine: salt
      source:
        engine: local
    environment:
      prd:
        formula: {}
  api:
    enabled: true
```

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```
    ssl:
      engine: salt
    bind:
      address: 0.0.0.0
      port: 8000
```

Salt master with defined user ACLs

```
git:
  client:
    enabled: true
linux:
  system:
    enabled: true
salt:
  master:
    command_timeout: 5
    worker_threads: 3
    enabled: true
    source:
      engine: pkg
    pillar:
      engine: salt
      source:
        engine: local
    environment:
      prd:
        formula: {}
    user:
      peter:
        enabled: true
        permissions:
        - 'fs.fs'
        - 'fs.\*'
```

Salt master with preset minions

```
salt:
  master:
    enabled: true
    minions:
    - name: 'node1.system.location.domain.com'
```

Salt master with pip based installation (optional)

```
salt:
  master:
    enabled: true
    ...
    source:
      engine: pip
      version: 2016.3.0rc2
```

Install formula through system package management

```
salt:
  master:
```

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```
    enabled: true
    ...
    environment:
      prd:
        keystone:
          source: pkg
          name: salt-formula-keystone
        nova:
          source: pkg
          name: salt-formula-keystone
          version: 0.1+0~20160818133412.24~1.gbp6e1ebb
        postresql:
          source: pkg
          name: salt-formula-postgresql
          version: purged
```

Formula keystone is installed latest version and the formulas without version are installed in one call to aptpkg module. If the version attribute is present sls iterates over formulas and take action to install specific version or remove it. The version attribute may have these values `[latest|purged|removed|<VERSION>]`.

Clone master branch of keystone formula as local feature branch

```
salt:
  master:
    enabled: true
    ...
    environment:
      dev:
        formula:
          keystone:
            source: git
            address: git@github.com:openstack/salt-formula-keystone.git
            revision: master
            branch: feature
```

Salt master with specified formula refs (for example for Gerrit review)

```
salt:
  master:
    enabled: true
    ...
    environment:
      dev:
        formula:
          keystone:
            source: git
            address: https://git.openstack.org/openstack/salt-formula-keystone
            revision: refs/changes/56/123456/1
```

Salt master with logging handlers

```
salt:
  master:
    enabled: true
    handler:
      handler01:
        engine: udp
```

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```
        bind:
          host: 127.0.0.1
          port: 9999
  minion:
    handler:
      handler01:
        engine: udp
        bind:
          host: 127.0.0.1
          port: 9999
      handler02:
        engine: zmq
        bind:
          host: 127.0.0.1
          port: 9999
```

Salt engine definition for saltgraph metadata collector

```
salt:
  master:
    engine:
      graph_metadata:
        engine: saltgraph
        host: 127.0.0.1
        port: 5432
        user: salt
        password: salt
        database: salt
```

Salt engine definition for Architect service

```
salt:
  master:
    engine:
      architect:
        engine: architect
        project: project-name
        host: architect-api
        port: 8181
        username: salt
        password: password
```

Salt engine definition for sending events from docker events

```
salt:
  master:
    engine:
      docker_events:
        docker_url: unix://var/run/docker.sock
```

Salt master peer setup for remote certificate signing

```
salt:
  master:
    peer:
      ".*":
      - x509.sign_remote_certificate
```

Salt master backup configuration

```
salt:
  master:
    backup: true
    initial_data:
      engine: backupninja
      source: backup-node-host
      host: original-salt-master-id
```

Configure verbosity of state output (used for *salt* command)

```
salt:
  master:
    state_output: changes
```

Pass pillar render error to minion log

Note: When set to *False* this option is great for debuging. However it is not recomended for any production environment as it may contain templating data as passwords, etc… , that minion should not expose.

```
salt:
  master:
    pillar_safe_render_error: False
```

Event/Reactor Systems

Salt synchronise node pillar and modules after start

```
salt:
  master:
    reactor:
      salt/minion/*/start:
      - salt://salt/reactor/node_start.sls
```

Trigger basic node install

```
salt:
  master:
    reactor:
      salt/minion/install:
      - salt://salt/reactor/node_install.sls
```

Sample event to trigger the node installation

```
salt-call event.send 'salt/minion/install'
```

Run any defined orchestration pipeline

```
salt:
  master:
    reactor:
      salt/orchestrate/start:
      - salt://salt/reactor/orchestrate_start.sls
```

Event to trigger the orchestration pipeline

```
salt-call event.send 'salt/orchestrate/start' "{'orchestrate': 'salt/orchestrate/
↪infra_install.sls'}"
```

Synchronise modules and pillars on minion start.

```
salt:
  master:
    reactor:
      'salt/minion/*/start':
      - salt://salt/reactor/minion_start.sls
```

Add and/or remove the minion key

```
salt:
  master:
    reactor:
      salt/key/create:
      - salt://salt/reactor/key_create.sls
      salt/key/remove:
      - salt://salt/reactor/key_remove.sls
```

Event to trigger the key creation

```
salt-call event.send 'salt/key/create' \
> "{'node_id': 'id-of-minion', 'node_host': '172.16.10.100', 'orch_post_create':
↪'kubernetes.orchestrate.compute_install', 'post_create_pillar': {'node_name': 'id-
↪of-minion'}}"
```

Note: You can add pass additional *orch_pre_create*, *orch_post_create*, *orch_pre_remove* or *orch_post_remove* parameters to the event to call extra orchestrate files. This can be useful for example for registering/unregistering nodes from the monitoring alarms or dashboards.

The key creation event needs to be run from other machine than the one being registered.

Event to trigger the key removal

```
salt-call event.send 'salt/key/remove'
```

Encrypted Pillars

Note: NACL + below configuration will be available in Salt > 2017.7.

External resources:

- Tutorial to configure salt + reclass ext_pillar and nacl: http://apealive.net/post/2017-09-salt-nacl-ext-pillar/
- Saltstack documentation: https://docs.saltstack.com/en/latest/ref/modules/all/salt.modules.nacl.html

Configure salt NACL module:

```
pip install --upgrade libnacl===1.5.2
salt-call --local nacl.keygen /etc/salt/pki/master/nacl
```

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```
  local:
      saved sk_file:/etc/salt/pki/master/nacl  pk_file: /etc/salt/pki/master/nacl.pub
```

```
salt:
  master:
    pillar:
      reclass: *reclass
      nacl:
        index: 99
    nacl:
      box_type: sealedbox
      sk_file: /etc/salt/pki/master/nacl
      pk_file: /etc/salt/pki/master/nacl.pub
      #sk: None
      #pk: None
```

NACL encrypt secrets:

salt-call –local nacl.enc 'my_secret_value' pk_file=/etc/salt/pki/master/nacl.pub
hXTkJpC1hcKMS7yZVGESutWrkvzusXfETXkacSklIxYjfWDlMJmR37MlmthdIgjXpg4f2AlBKb8tc9Woma7q

or salt-run nacl.enc 'myotherpass'

ADDFD0Rav6p6+63sojl7Htfrncp5rrDVyeE4BSPO7ipq8fZuLDIVAzQLf4PCbDqi+Fau5KD3/J/E+Pw=

NACL encrypted values on pillar:

Use Boxed syntax *NACL[CryptedValue=]* to encode value on pillar:

```
my_pillar:
  my_nacl:
      key0: unencrypted_value
      key1:
↪NACL[hXTkJpC1hcKMS7yZVGESutWrkvzusXfETXkacSklIxYjfWDlMJmR37MlmthdIgjXpg4f2AlBKb8tc9Woma7q]
```

NACL large files:

NACL within template/native pillars:

pillarexample: user: root password1: {{salt.nacl.dec('DRB7Q6/X5gGSRCTpZyxS6hlbWj0llUA+uaVyvou3vJ4=')|json}}
cert_key: {{salt.nacl.dec_file('/srv/salt/env/dev/certs/example.com/cert.nacl')|json}} cert_key2: {{salt.nacl.dec_file('salt:///certs/example.com/cert2.nacl')|json}}

Salt Syndic

The master of masters

```
salt:
  master:
    enabled: true
    order_masters: True
```

Lower syndicated master

```
salt:
  syndic:
    enabled: true
```

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```
    master:
      host: master-of-master-host
    timeout: 5
```

Syndicated master with multiple master of masters

```
salt:
  syndic:
    enabled: true
    masters:
    - host: master-of-master-host1
    - host: master-of-master-host2
    timeout: 5
```

Salt Minion

Simplest Salt minion setup with central configuration node

```

```

```
salt:
  minion:
    enabled: true
    master:
      host: config01.dc01.domain.com
```

Multi-master Salt minion setup

```
salt:
  minion:
    enabled: true
    masters:
    - host: config01.dc01.domain.com
    - host: config02.dc01.domain.com
```

Salt minion with salt mine options

```
salt:
  minion:
    enabled: true
    mine:
      interval: 60
      module:
        grains.items: []
        network.interfaces: []
```

Salt minion with graphing dependencies

```
salt:
  minion:
    enabled: true
    graph_states: true
```

Salt minion behind HTTP proxy

```
salt:
  minion:
    proxy:
      host: 127.0.0.1
      port: 3128
```

Salt minion to specify non-default HTTP backend. The default tornado backend does not respect HTTP proxy settings set as environment variables. This is useful for cases where you need to set no_proxy lists.

```
salt:
  minion:
    backend: urllib2
```

Salt minion with PKI certificate authority (CA)

```
salt:
  minion:
    enabled: true
    ca:
      salt-ca-default:
        common_name: Test CA Default
        country: Czech
        state: Prague
        locality: Zizkov
        days_valid:
          authority: 3650
          certificate: 90
        signing_policy:
          cert_server:
            type: v3_edge_cert_server
            minions: '*'
          cert_client:
            type: v3_edge_cert_client
            minions: '*'
          ca_edge:
            type: v3_edge_ca
            minions: '*'
          ca_intermediate:
            type: v3_intermediate_ca
            minions: '*'
      salt-ca-test:
        common_name: Test CA Testing
        country: Czech
        state: Prague
        locality: Karlin
        days_valid:
          authority: 3650
          certificate: 90
        signing_policy:
          cert_server:
            type: v3_edge_cert_server
            minions: '*'
          cert_client:
            type: v3_edge_cert_client
            minions: '*'
          ca_edge:
            type: v3_edge_ca
```

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```
            minions: '*'
          ca_intermediate:
            type: v3_intermediate_ca
            minions: '*'
      salt-ca-alt:
        common_name: Alt CA Testing
        country: Czech
        state: Prague
        locality: Cesky Krumlov
        days_valid:
          authority: 3650
          certificate: 90
        signing_policy:
          cert_server:
            type: v3_edge_cert_server
            minions: '*'
          cert_client:
            type: v3_edge_cert_client
            minions: '*'
          ca_edge:
            type: v3_edge_ca
            minions: '*'
          ca_intermediate:
            type: v3_intermediate_ca
            minions: '*'
        ca_file: '/etc/test/ca.crt'
        ca_key_file: '/etc/test/ca.key'
        user: test
        group: test
```

Salt minion using PKI certificate

```
salt:
  #master:
  # enabled: true
  # accept_policy:
  #   open_mode
  # peer:
  #   '.*':
  #     - x509.sign_remote_certificate
  minion:
    enabled: true
    trusted_ca_minions:
     - cfg01
    cert:
      ceph_cert:
          alternative_names:
              IP:127.0.0.1,DNS:salt.ci.local,DNS:ceph.ci.local,DNS:radosgw.ci.local,
↪DNS:swift.ci.local
          cert_file:
              /srv/salt/pki/ci/ceph.ci.local.crt
          common_name:
              ceph_mon.ci.local
          key_file:
              /srv/salt/pki/ci/ceph.ci.local.key
          country: CZ
          state: Prague
```

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```
          locality: Karlin
          signing_cert:
              /etc/pki/ca/salt-ca-test/ca.crt
          signing_private_key:
              /etc/pki/ca/salt-ca-test/ca.key
          # Kitchen-Salt CI trigger `salt-call --local`, below attributes
          # can't be used as there is no required SaltMaster connectivity
          authority:
              salt-ca-test
          #host:
          #    salt.ci.local
          #signing_policy:
          #    cert_server
      proxy_cert:
          alternative_names:
              IP:127.0.0.1,DNS:salt.ci.local,DNS:proxy.ci.local
          cert_file:
              /srv/salt/pki/ci/prx.ci.local.crt
          common_name:
              prx.ci.local
          key_file:
              /srv/salt/pki/ci/prx.ci.local.key
          country: CZ
          state: Prague
          locality: Zizkov
          signing_cert:
              /etc/pki/ca/salt-ca-default/ca.crt
          signing_private_key:
              /etc/pki/ca/salt-ca-default/ca.key
          # Kitchen-Salt CI trigger `salt-call --local`, below attributes
          # can't be used as there is no required SaltMaster connectivity
          authority:
             salt-ca-default
          #host:
          #   salt.ci.local
          #signing_policy:
          #   cert_server
      test_cert:
          alternative_names:
              IP:127.0.0.1,DNS:salt.ci.local,DNS:test.ci.local
          cert_file:
              /srv/salt/pki/ci/test.ci.local.crt
          common_name:
              test.ci.local
          key_file:
              /srv/salt/pki/ci/test.ci.local.key
          country: CZ
          state: Prague
          locality: Cesky Krumlov
          signing_cert:
              /etc/test/ca.crt
          signing_private_key:
              /etc/test/ca.key
          # Kitchen-Salt CI trigger `salt-call --local`, below attributes
          # can't be used as there is no required SaltMaster connectivity
          authority:
             salt-ca-alt
```

Salt minion trust CA certificates issued by salt CA on a specific host (ie: salt-master node)

```
salt:
  minion:
    trusted_ca_minions:
      - cfg01
```

Salt Minion Proxy

Salt proxy pillar

```
salt:
  minion:
    proxy_minion:
      master: localhost
      device:
        vsrx01.mydomain.local:
          enabled: true
          engine: napalm
        csr1000v.mydomain.local:
          enabled: true
          engine: napalm
```

Note: This is pillar of the the real salt-minion

Proxy pillar for IOS device

```
proxy:
  proxytype: napalm
  driver: ios
  host: csr1000v.mydomain.local
  username: root
  passwd: r00tme
```

Note: This is pillar of the node thats not able to run salt-minion itself

Proxy pillar for JunOS device

```
proxy:
  proxytype: napalm
  driver: junos
  host: vsrx01.mydomain.local
  username: root
  passwd: r00tme
  optional_args:
    config_format: set
```

Note: This is pillar of the node thats not able to run salt-minion itself

Salt SSH

Salt SSH with sudoer using key

```
git:
  client:
    enabled: true
linux:
  system:
    enabled: true
salt:
  master:
    command_timeout: 5
    worker_threads: 2
    enabled: true
    source:
      engine: pkg
    pillar:
      engine: salt
      source:
        engine: local
    environment:
      prd:
        formula: {}
    ssh:
      minion:
        node01:
          host: 10.0.0.1
          user: saltssh
          sudo: true
          key_file: /path/to/the/key
          port: 22
```

Salt SSH with sudoer using password

```
git:
  client:
    enabled: true
linux:
  system:
    enabled: true
salt:
  master:
    command_timeout: 5
    worker_threads: 2
    enabled: true
    source:
      engine: pkg
    pillar:
      engine: salt
      source:
        engine: local
    environment:
      prd:
        formula: {}
    ssh:
      minion:
```

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```
        node01:
          host: 10.0.0.1
          user: saltssh
          sudo: true
          password: password
          port: 22
```

Salt SSH with root using password

```
git:
  client:
    enabled: true
linux:
  system:
    enabled: true
salt:
  master:
    command_timeout: 5
    worker_threads: 2
    enabled: true
    source:
      engine: pkg
    pillar:
      engine: salt
      source:
        engine: local
    environment:
      prd:
        formula: {}
    ssh:
      minion:
        node01:
          host: 10.0.0.1
          user: root
          password: password
          port: 22
```

Salt control (cloud/kvm/docker)

Salt cloud with local OpenStack provider

```
salt:
  control:
    enabled: true
    cloud_enabled: true
    provider:
      openstack_account:
        engine: openstack
        insecure: true
        region: RegionOne
        identity_url: 'https://10.0.0.2:35357'
        tenant: project
        user: user
        password: 'password'
        fixed_networks:
```

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```
        - 123d3332-18be-4d1d-8d4d-5f5a54456554e
        floating_networks:
        - public
        ignore_cidr: 192.168.0.0/16
    cluster:
      dc01_prd:
        domain: dc01.prd.domain.com
        engine: cloud
        config:
          engine: salt
          host: master.dc01.domain.com
        node:
          ubuntu1:
            provider: openstack_account
            image: Ubuntu14.04 x86_64
            size: m1.medium
          ubuntu2:
            provider: openstack_account
            image: Ubuntu14.04 x86_64
            size: m1.medium
```

Salt cloud with Digital Ocean provider

```
salt:
  control:
    enabled: true
    cloud_enabled: true
    provider:
      digitalocean_account:
        engine: digital_ocean
        region: New York 1
        client_key: xxxxxxx
        api_key: xxxxxxx
    cluster:
      dc01_prd:
        domain: dc01.prd.domain.com
        engine: cloud
        config:
          engine: salt
          host: master.dc01.domain.com
        node:
          ubuntu1:
            provider: digitalocean_account
            image: Ubuntu14.04 x86_64
            size: m1.medium
          ubuntu2:
            provider: digitalocean_account
            image: Ubuntu14.04 x86_64
            size: m1.medium
```

Salt virt with KVM cluster

```
virt:
  disk:
    three_disks:
      - system:
          size: 4096
```

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```
          image: ubuntu.qcow
      - repository_snapshot:
          size: 8192
          image: snapshot.qcow
      - cinder-volume:
          size: 2048
salt:
  minion:
    enabled: true
    master:
      host: config01.dc01.domain.com
  control:
    enabled: true
    virt_enabled: true
    size:
      small:
        cpu: 1
        ram: 1
      medium:
        cpu: 2
        ram: 4
      large:
        cpu: 4
        ram: 8
      medium_three_disks:
        cpu: 2
        ram: 4
        disk_profile: three_disks
    cluster:
      vpc20_infra:
        domain: neco.virt.domain.com
        engine: virt
        config:
          engine: salt
          host: master.domain.com
        node:
          ubuntu1:
            provider: node01.domain.com
            image: ubuntu.qcow
            size: medium
          ubuntu2:
            provider: node02.domain.com
            image: bubuntu.qcomw
            size: small
          ubuntu3:
            provider: node03.domain.com
            image: meowbuntu.qcom2
            size: medium_three_disks
```

salt virt with custom destination for image file

```
virt:
  disk:
    three_disks:
      - system:
          size: 4096
          image: ubuntu.qcow
```

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```
      - repository_snapshot:
          size: 8192
          image: snapshot.qcow
      - cinder-volume:
          size: 2048
salt:
  minion:
    enabled: true
    master:
      host: config01.dc01.domain.com
  control:
    enabled: true
    virt_enabled: true
    size:
      small:
        cpu: 1
        ram: 1
      medium:
        cpu: 2
        ram: 4
      large:
        cpu: 4
        ram: 8
      medium_three_disks:
        cpu: 2
        ram: 4
        disk_profile: three_disks
    cluster:
      vpc20_infra:
        domain: neco.virt.domain.com
        engine: virt
        config:
          engine: salt
          host: master.domain.com
        node:
          ubuntu1:
            provider: node01.domain.com
            image: ubuntu.qcow
            size: medium
            img_dest: /var/lib/libvirt/ssdimages
          ubuntu2:
            provider: node02.domain.com
            image: bubuntu.qcomw
            size: small
            img_dest: /var/lib/libvirt/hddimages
          ubuntu3:
            provider: node03.domain.com
            image: meowbuntu.qcom2
            size: medium_three_disks
```

Usage

Working with salt-cloud

```
salt-cloud -m /path/to/map --assume-yes
```

Debug LIBCLOUD for salt-cloud connection

```
export LIBCLOUD_DEBUG=/dev/stderr; salt-cloud --list-sizes provider_name --log-level␣
↪all
```

References

- http://salt.readthedocs.org/en/latest/
- https://github.com/DanielBryan/salt-state-graph
- http://karlgrz.com/testing-salt-states-rapidly-with-docker/
- https://mywushublog.com/2013/03/configuration-management-with-salt-stack/
- http://russell.ballestrini.net/replace-the-nagios-scheduler-and-nrpe-with-salt-stack/
- https://github.com/saltstack-formulas/salt-formula
- http://docs.saltstack.com/en/latest/topics/tutorials/multimaster.html

salt-cloud

- http://www.blog.sandro-mathys.ch/2013/07/setting-user-password-when-launching.html
- http://cloudinit.readthedocs.org/en/latest/topics/examples.html
- http://salt-cloud.readthedocs.org/en/latest/topics/install/index.html
- http://docs.saltstack.com/topics/cloud/digitalocean.html
- http://salt-cloud.readthedocs.org/en/latest/topics/rackspace.html
- http://salt-cloud.readthedocs.org/en/latest/topics/map.html
- http://docs.saltstack.com/en/latest/topics/tutorials/multimaster.html

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

> http://salt-formulas.readthedocs.io/

In the unfortunate event that bugs are discovered, they should be reported to the appropriate issue tracker. Use Github issue tracker for specific salt formula:

> https://github.com/salt-formulas/salt-formula-salt/issues

For feature requests, bug reports or blueprints affecting entire ecosystem, use Launchpad salt-formulas project:

> https://launchpad.net/salt-formulas

You can also join salt-formulas-users team and subscribe to mailing list:

> https://launchpad.net/~salt-formulas-users

Developers wishing to work on the salt-formulas projects should always base their work on master branch and submit pull request against specific formula.

https://github.com/salt-formulas/salt-formula-salt

Any questions or feedback is always welcome so feel free to join our IRC channel:

#salt-formulas @ irc.freenode.net

Sphinx

Sphinx is a tool that makes it easy to create intelligent and beautiful documentation, written by Georg Brandl and licensed under the BSD license. It was originally created for the new Python documentation, and it has excellent facilities for the documentation of Python projects, but C/C++ is already supported as well, and it is planned to add special support for other languages as well.

Sample pillars

Simple documentation with local source

```
sphinx:
  server:
    enabled: true
    doc:
      board:
        builder: 'html'
        source:
          engine: local
          path: '/path/to/sphinx/documentation'
```

Simple documentation with Git source

```
sphinx:
  server:
    enabled: true
    doc:
      board:
        builder: 'html'
        source:
          engine: git
          address: 'git@repo1.domain.com/repo.git'
          revision: master
```

Simple documentation with reclass source

```
sphinx:
  server:
    enabled: true
    doc:
      board:
        builder: 'html'
        source:
          engine: reclass
```

Read more

- http://sphinx-doc.org/tutorial.html

Documentation and Bugs

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http://salt-formulas.readthedocs.io/

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https://github.com/salt-formulas/salt-formula-sphinx/issues

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https://github.com/salt-formulas/salt-formula-sphinx

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Squid Formula

Sample Pillars

Squid as proxy

```
squid:
  proxy:
    enabled: true
    admin:
      user: manager
      password: passwd
    deny:
    - 192.168.2.30
    allow:
    - localnet
```

More Information

- https://raw.githubusercontent.com/saltstack-formulas/squid-formula
- http://itkia.com/using-squid-to-cache-apt-updates-for-debian-and-ubuntu/
- http://serverascode.com/2014/03/29/squid-cache-yum.html

- Documentation Home
- Project Introduction
- Installation and Operations Manual

- Development Documentation

Home SaltStack-Formulas Project Introduction

Supplemental Services

Support services as databases, proxies, application servers.

Formula	Repository
apache	https://github.com/salt-formulas/salt-formula-apache
bind	https://github.com/salt-formulas/salt-formula-bind
bird	https://github.com/salt-formulas/salt-formula-bird
cadf	https://github.com/salt-formulas/salt-formula-cadf
cassandra	https://github.com/salt-formulas/salt-formula-cassandra
dovecot	https://github.com/salt-formulas/salt-formula-dovecot
elasticsearch	https://github.com/salt-formulas/salt-formula-elasticsearch
etcd	https://github.com/salt-formulas/salt-formula-etcd
galera	https://github.com/salt-formulas/salt-formula-galera
haproxy	https://github.com/salt-formulas/salt-formula-haproxy
keepalived	https://github.com/salt-formulas/salt-formula-keepalived
knot	https://github.com/salt-formulas/salt-formula-knot
letsencrypt	https://github.com/salt-formulas/salt-formula-letsencrypt
logrotate	https://github.com/salt-formulas/salt-formula-logrotate
memcached	https://github.com/salt-formulas/salt-formula-memcached
mosquitto	https://github.com/salt-formulas/salt-formula-mosquitto
mongodb	https://github.com/salt-formulas/salt-formula-mongodb
mysql	https://github.com/salt-formulas/salt-formula-mysql
nginx	https://github.com/salt-formulas/salt-formula-nginx
openldap	https://github.com/salt-formulas/salt-formula-openldap
postfix	https://github.com/salt-formulas/salt-formula-postfix
postgresql	https://github.com/salt-formulas/salt-formula-postgresql
powerdns	https://github.com/salt-formulas/salt-formula-powerdns
rabbitmq	https://github.com/salt-formulas/salt-formula-rabbitmq
redis	https://github.com/salt-formulas/salt-formula-redis
rsync	https://github.com/salt-formulas/salt-formula-rsync
supervisor	https://github.com/salt-formulas/salt-formula-supervisor
varnish	https://github.com/salt-formulas/salt-formula-varnish
zookeeper	https://github.com/salt-formulas/salt-formula-zookeeper

Apache Formula

Install and configure Apache webserver

Sample Pillars

Simple Apache proxy

```
apache:
  server:
    enabled: true
```

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```
    bind:
      address: '0.0.0.0'
      ports:
      - 80
    modules:
    - proxy
    - proxy_http
    - proxy_balancer
```

Apache plain static sites (eg. sphinx generated, from git/hg sources)

```
apache:
  server:
    enabled: true
    bind:
      address: '0.0.0.0'
      ports:
      - 80
    modules:
    - rewrite
    - status
    site:
    - enabled: true
      name: 'sphinxdoc'
      type: 'static'
      host:
        name: 'doc.domain.com'
        port: 80
      source:
        engine: local
    - enabled: true
      name: 'impressjs'
      type: 'static'
      host:
        name: 'pres.domain.com'
        port: 80
      source:
        engine: git
        address: 'git@repo1.domain.cz:impress/billometer.git'
        revision: 'master'
```

Tune settings of mpm_prefork

```
parameters:
  apache:
    mpm:
      prefork:
        max_clients: 250
        servers:
          min: 32
          max: 64
          max_requests: 4000
```

Apache kerberos authentication:

```
parameters
  apache:
```

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```
    server:
      site:
        auth:
         engine: kerberos
         name: "Kerberos Authentication"
         require:
           - "ldap-attribute memberOf='cn=somegroup,cn=groups,cn=accounts,dc=example,
↪dc=com'"

         kerberos:
           realms:
             - EXAMPLE.COM
           # Bellow is optional
           keytab: /etc/apache2/ipa.keytab
           service: HTTP
           method:
             negotiate: true
             k5passwd: true

         ldap:
           url: "ldaps://idm01.example.com/dc=example,dc=com?krbPrincipalName"
           # mech is optional
           mech: GSSAPI
```

Tune security settings (these are default):

```
parameters:
  apache:
    server:
      # ServerTokens
      tokens: Prod
      # ServerSignature, can be also set per-site
      signature: false
      # TraceEnable, can be also set per-site
      trace: false
      # Deny access to .git, .svn, .hg directories
      secure_scm: true
      # Required for settings bellow
      modules:
        - headers
      # Set X-Content-Type-Options
      content_type_options: nosniff
      # Set X-Frame-Options
      frame_options: sameorigin
```

Tuned up log configuration.

```
parameters:
  apache:
    server:
      site:
        foo:
          enabled: true
          type: static
          log:
            custom:
              enabled: true
```

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```
              file: /var/log/apache2/mylittleponysitecustom.log
              format: >-
                 %{X-Forwarded-For}i %l %u %t \"%r\" %>s %b %D \"%{Referer}i\" \"%
↪{User-Agent}i\"
            error:
              enabled: false
              file: /var/log/apache2/foo.error.log
              level: notice
```

Apache wsgi application.

```
apache:
  server:
    enabled: true
    default_mpm: event
    site:
      manila:
        enabled: false
        available: true
        type: wsgi
        name: manila
        wsgi:
          daemon_process: manila-api
          threads: 2
          user: manila
          group: manila
          display_name: '%{GROUP}'
          script_alias: '/ /usr/bin/manila-wsgi'
          application_group: '%{GLOBAL}'
          authorization: 'On'
        limits:
          request_body: 114688
```

Roundcube webmail, postfixadmin and mailman

```
classes:
- service.apache.server.single
parameters:
  apache:
    server:
      enabled: true
      modules:
        - cgi
        - php
      site:
        roundcube:
          enabled: true
          type: static
          name: roundcube
          root: /usr/share/roundcube
          locations:
            - uri: /admin
              path: /usr/share/postfixadmin
            - uri: /mailman
              path: /usr/lib/cgi-bin/mailman
              script: true
            - uri: /pipermail
```

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```
              path: /var/lib/mailman/archives/public
            - uri: /images/mailman
              path: /usr/share/images/mailman
          host:
            name: mail.example.com
            aliases:
              - mail.example.com
              - lists.example.com
              - mail01.example.com
              - mail01
```

More Information

- https://httpd.apache.org/docs/

Documentation and Bugs

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Bind formula

BIND is open source software that enables you to publish your Domain Name System (DNS) information on the Internet, and to resolve DNS queries for your users. The name BIND stands for "Berkeley Internet Name Domain", because the software originated in the early 1980s at the University of California at Berkeley.

Sample pillars

Server

```
bind:
  server:
    enabled: true
    key:
      keyname:
        secret: xyz
        algorithm: hmac-sha512
    server:
      8.8.8.8:
        keys:
          - keyname
    control:
      local:
        enabled: true
        bind:
          address: 127.0.0.1
          port: 953
        allow:
          - 127.0.0.1
        keys:
          - xyz
    zone:
      sub.domain.com:
        ttl: 86400
        root: "hostmaster@domain.com"
        type: master
        records:
        - name: @
          type: A
          ttl: 7200
          value: 192.168.0.5
      1.168.192.in-addr.arpa:
        type: master
        notify: false
      slave.domain.com:
        type: slave
        notify: true
        masters:
          # Masters must be specified by IP address
          - 8.8.8.8
          - 8.8.4.4
    dnssec:
      enabled: true
    # Don't hide version
    version: true
    # Allow recursion, better don't on public dns servers
    recursion:
      hosts:
        - localhost
```

You can use following command to generate key:

```
dnssec-keygen -a HMAC-SHA512 -b 512 -n HOST -r /dev/urandom mykey
```

Client

```
bind:
  client:
    enabled: true
    option:
      default:
        server: localhost
        port: 953
        key: keyname
    key:
      keyname:
        secret: xyz
        algorithm: hmac-sha512
    server:
      8.8.8.8:
        keys:
          - keyname
```

Read more

- https://github.com/theforeman/puppet-dns
- https://help.ubuntu.com/community/BIND9ServerHowto
- https://www.isc.org/downloads/bind/

Documentation and Bugs

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> http://salt-formulas.readthedocs.io/

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> https://github.com/salt-formulas/salt-formula-bind/issues

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> https://launchpad.net/salt-formulas

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> https://launchpad.net/~salt-formulas-users

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> https://github.com/salt-formulas/salt-formula-bind

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BIRD Formula

The BIRD project aims to develop a fully functional dynamic IP routing daemon primarily targeted on (but not limited to) Linux, FreeBSD and other UNIX-like systems and distributed under the GNU General Public License.

Sample Pillars

```
bird:
  server:
    enabled: True
    logging:
      engine: syslog
    protocol:
      my_ospf:
        type: ospf
        tick: 2
        rfc1583compat: True
        ecmp: True
        area:
          0.0.0.0:
            interface:
              p3p1:
                type: ptp
                paramX: xxx
              p3p2:
                type: ptp
                paramX: xxx
              tap0: {}
              vhost0:
                hello: 9
                type: broadcast
                paramX: xxx
```

More Information

- http://bird.network.cz/
- https://gitlab.labs.nic.cz/labs/bird/wikis/home

CADF Formula

The Cloud Auditing Data Federation (CADF) standard defines a full event model anyone can use to fill in the essential data needed to certify, self-manage and self-audit application security in cloud environments.

Sample Pillars

Single cadf service

```
cadf:
  distpather:
    enabled: true
```

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```
  listener:
    enabled: true
```

Documentation and Bugs

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https://github.com/salt-formulas/salt-formula-cadf/issues

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cassandra

Service cassandra description

Sample pillars

Single cassandra service

```
cassandra:
  server:
    enabled: true
    version: icehouse
```

Backup client with ssh/rsync remote host

```
  cassandra:
    backup:
      client:
        enabled: true
        full_backups_to_keep: 3
        hours_before_full: 24
        target:
          host: cfg01
```

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```
.. note:: full_backups_to_keep param states how many backup will be stored locally on␣
↪cassandra client.
          More options to relocate local backups can be done using salt-formula-
↪backupninja.
```

Backup client with local backup only

```
  cassandra:
    backup:
      client:
        enabled: true
        full_backups_to_keep: 3
        hours_before_full: 24

.. note:: full_backups_to_keep param states how many backup will be stored locally on␣
↪cassandra client
```

Backup server rsync

```
cassandra:
  backup:
    server:
      enabled: true
      hours_before_full: 24
      full_backups_to_keep: 5
      key:
        cassandra_pub_key:
          enabled: true
          key: ssh_rsa
```

Client restore from local backup:

```
  cassandra:
    backup:
      client:
        enabled: true
        full_backups_to_keep: 3
        hours_before_full: 24
        target:
          host: cfg01
        restore_latest: 1
        restore_from: local

.. note:: restore_latest param with a value of 1 means to restore db from the last␣
↪full backup. 2 would mean to restore second latest full backup.
```

Client restore from remote backup:

```
  cassandra:
    backup:
      client:
        enabled: true
        full_backups_to_keep: 3
        hours_before_full: 24
        target:
          host: cfg01
```

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```
        restore_latest: 1
        restore_from: remote

.. note:: restore_latest param with a value of 1 means to restore db from the last␣
↪full backup. 2 would mean to restore second latest full backup.
```

Read more

- links

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dovecot

Install and configure dovecot.

Available states

- *dovecot.server*

`dovecot.server`

Setup dovecot server

Available metadata

- *metadata.dovecot.server*

metadata.dovecot.server

Setup dovecot server

Requirements

- linux
- mysql (for mysql backend)

Optional

- glusterfs (to serve as mail storage backend)
- postfix
- roundcube

Configuration parameters

For complete list of parameters, please check `metadata/service/server.yml`

Example reclass

Server

```
classes:
  - service.dovecot.server
parameters:
 _param:
   dovecot_origin: mail.eru
   mysql_mailserver_password: Peixeilaephahmoosa2daihoh4yiaThe
 dovecot:
   server:
     origin: ${_param:dovecot_origin}
 mysql:
   server:
     database:
       mailserver:
         encoding: UTF8
         locale: cs_CZ
         users:
         - name: mailserver
           password: ${_param:mysql_mailserver_password}
```

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```
          host: 127.0.0.1
          rights: all privileges
apache:
  server:
    site:
      dovecotadmin:
        enabled: true
        type: static
        name: dovecotadmin
        root: /usr/share/dovecotadmin
        host:
          name: ${_param:dovecot_origin}
          aliases:
            - ${linux:system:name}.${linux:system:domain}
            - ${linux:system:name}
```

LDAP and GSSAPI

```
parameters:
  dovecot:
    server:
      gssapi:
        host: imap01.example.com
        keytab: /etc/dovecot/krb5.keytab
        realms:
          - example.com
        default_realm: example.com

      userdb:
        driver: ldap
      passdb:
        driver: ldap
      ldap:
        servers:
          - ldaps://idm01.example.com
          - ldaps://idm02.example.com
        basedn: dc=example,dc=com
        bind:
          dn: uid=dovecot,cn=users,cn=accounts,dc=example,dc=com
          password: password
        # Auth users by binding as them
        auth_bind:
          enabled: true
          userdn: "mail=%u,cn=users,cn=accounts,dc=example,dc=com"
        user_filter: "(&(objectClass=posixAccount)(mail=%u))"
```

Director

Dovecot Director is used to ensure connection affinity to specific backends. This seems to be a must-have for shared storage such as NFS, GlusterFS, etc. otherwise you are going to meet split-brains, corrupted files and other issues.

Unfortunately director for LMTP can't be used when director and backend servers are the same.

See http://wiki2.dovecot.org/Director for more informations.

```yaml
dovecot:
  server:
    admin: postmaster@${_param:postfix_origin}
    # GlusterFS storage is used
    nfs: true
    service:
      director:
        enabled: true
        port: 9090
        backends:
          - ${_param:cluster_node01_address}
          - ${_param:cluster_node02_address}
        directors:
          - ${_param:cluster_node01_address}
          - ${_param:cluster_node02_address}
      lmtp:
        inet_enabled: true
        port: 24
postfix:
  server:
    dovecot_lmtp:
      enabled: true
      type: inet
      address: "localhost:24"
```

Example pillar

Server

```yaml
dovecot:
  server:
    origin: ${_param:dovecot_origin}
    admin:
      enabled: false
```

Read more

- http://wiki2.dovecot.org/

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Elasticsearch

Elasticsearch provides a distributed, multitenant-capable full-text search engine with a HTTP web interface and schema-free JSON documents.

Sample pillars

Single-node elasticsearch with clustering disabled:

```
elasticsearch:
  server:
    enabled: true
    bind:
      address: 0.0.0.0
      port: 9200
    cluster:
      multicast: false
    index:
      shards: 1
      replicas: 0
```

Setup shared repository for snapshots:

```
elasticsearch:
  server:
    snapshot:
      reponame:
        path: /var/lib/glusterfs/repo
        compress: true
```

Cluster with manually defined members:

```
elasticsearch:
  server:
    enabled: true
    bind:
      address: 0.0.0.0
      port: 9200
    cluster:
      multicast: false
      members:
        - host: elastic01
          port: 9300
        - host: elastic02
```

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```
          port: 9300
        - host: elastic03
          port: 9300
    index:
      shards: 5
      replicas: 1
```

Common definition for curator:

```
elasticsearch:
  server:
    curator:
      timeout: 900
      logfile: /var/log/elasticsearch/curator.log
      logformat: json
      master_only: true
      actions:
        - action: delete_indices
          description: >-
            Delete indices older than 45 days (based on index name).
            Ignore the error if the filter does not result in an actionable
            list of indices (ignore_empty_list) and exit cleanly.
          options:
            ignore_empty_list: True
            continue_if_exception: False
            disable_action: False
          filters:
            - filtertype: pattern
              kind: regex
              value: '.*\-\d\d\d\d\.\d\d\.\d\d$'
            - filtertype: age
              source: name
              direction: older
              timestring: '%Y.%m.%d'
              unit: days
              unit_count: 90
        - action: replicas
          description: >-
            Reduce the replica count to 0 for indices older than 30 days
            (based on index creation_date)
          options:
            count: 0
            wait_for_completion: False
            continue_if_exception: False
            disable_action: False
          filters:
            - filtertype: pattern
              kind: regex
              value: '.*\-\d\d\d\d\.\d\d\.\d\d$'
            - filtertype: age
              source: creation_date
              direction: older
              unit: days
              unit_count: 30
        - action: forcemerge
          description: >-
            forceMerge indices older than 2 days (based on index
```

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```
            creation_date) to 2 segments per shard.  Delay 120 seconds
            between each forceMerge operation to allow the cluster to
            quiesce.
            This action will ignore indices already forceMerged to the same
            or fewer number of segments per shard, so the 'forcemerged'
            filter is unneeded.
          options:
            max_num_segments: 2
            delay: 120
            continue_if_exception: False
            disable_action: True
          filters:
            - filtertype: pattern
              kind: regex
              value: '.*\-\d\d\d\d\.\d\d\.\d\d$'
            - filtertype: age
              source: creation_date
              direction: older
              unit: days
              unit_count: 2
```

Client setup

Client with host and port:

```
elasticsearch:
  client:
    enabled: true
    server:
      host: elasticsearch.host
      port: 9200
```

Client where you download an index template that is stored in the directory *files/*:

```
elasticsearch:
  client:
    enabled: true
    server:
      host: elasticsearch.host
      port: 9200
    index:
      my_index:
        enabled: true
        template: elasticsearch/files/my_index_template.json
```

Client where you download an index template from the metadata definition and force index creation:

```
elasticsearch:
  client:
    enabled: true
    server:
      host: elasticsearch.host
      port: 9200
    index:
      my_index:
```

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```
        enabled: true
        force_operation: true
        definition:
          template: notifications
          settings:
            number_of_shards: 5
            number_of_replicas: 1
          mappings:
            notification:
              properties:
                applicationId:
                  type: long
                content:
                  type: text
                  fields:
                    keyword:
                      type: keyword
                      ignore_above: 256
```

Read more

- https://www.elastic.co/
- http://alex.nederlof.com/blog/2012/11/19/installing-elasticsearch-with-jenkins-on-ubuntu/
- http://websightdesigns.com/wiki/Setting_up_Centralized_Event_Parsing_on_Ubuntu_12.04
- https://gist.github.com/wingdspur/2026107

Documentation and Bugs

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etcd Formula

Service etcd description

Possible *source.engine*:

- **pkg** - install etcd package (default)
- **docker_hybrid** - copy binaries from docker image (specified in *server.image*)

Sample pillars

Certificates

Use certificate authentication (for peers and clients). Certificates must be prepared in advance.

```
etcd:
  server:
    enabled: true
    ssl:
      enabled: true
    bind:
      host: 10.0.175.101
    token: $(uuidgen)
    members:
    - host: 10.0.175.101
      name: etcd01
      port: 4001
```

Single etcd service

```
etcd:
  server:
    enabled: true
    bind:
      host: 10.0.175.101
    token: $(uuidgen)
    members:
    - host: 10.0.175.101
      name: etcd01
      port: 4001
```

Cluster etcd service

```
etcd:
  server:
    enabled: true
    bind:
      host: 10.0.175.101
    token: $(uuidgen)
    members:
    - host: 10.0.175.101
```

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```
      name: etcd01
      port: 4001
    - host: 10.0.175.102
      name: etcd02
      port: 4001
    - host: 10.0.175.103
      name: etcd03
      port: 4001
```

etcd proxy

```
etcd:
  server:
    enabled: true
    bind:
      host: 10.0.175.101
    proxy: true
    members:
    - host: 10.0.175.101
      name: etcd01
    - host: 10.0.175.102
      name: etcd02
    - host: 10.0.175.103
      name: etcd03
```

Run etcd on k8s

```
etcd:
  server:
    engine: kubernetes
    image: etcd:latest
```

Copy etcd binary from container

```
etcd:
  server:
    image: quay.io/coreos/etcd:latest
```

Read more

- https://github.com/coreos/etcd

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Galera

Galera Cluster for MySQL is a true Multimaster Cluster based on synchronous replication. Galera Cluster is an easy-to-use, high-availability solution, which provides high system uptime, no data loss and scalability for future growth.

Sample pillars

Galera cluster master node

```
galera:
  version:
    mysql: 5.6
    galera: 3
  master:
    enabled: true
    name: openstack
    bind:
      address: 192.168.0.1
      port: 3306
    members:
    - host: 192.168.0.1
      port: 4567
    - host: 192.168.0.2
      port: 4567
    admin:
      user: root
      password: pass
    database:
      name:
        encoding: 'utf8'
        users:
        - name: 'username'
          password: 'password'
          host: 'localhost'
          rights: 'all privileges'
```

Galera cluster slave node

```
galera:
  slave:
    enabled: true
    name: openstack
    bind:
      address: 192.168.0.2
      port: 3306
    members:
    - host: 192.168.0.1
      port: 4567
    - host: 192.168.0.2
      port: 4567
    admin:
      user: root
      password: pass
```

Enable TLS support:

```
galera:
   slave or master:
     ssl:
      enabled: True

      # path
      cert_file: /etc/mysql/ssl/cert.pem
      key_file: /etc/mysql/ssl/key.pem
      ca_file: /etc/mysql/ssl/ca.pem

      # content (not required if files already exists)
      key: << body of key >>
      cert: << body of cert >>
      cacert_chain: << body of ca certs chain >>
```

Additional mysql users:

```
mysql:
  server:
    users:
      - name: clustercheck
        password: clustercheck
        database: '*.*'
        grants: PROCESS
      - name: inspector
        host: 127.0.0.1
        password: password
        databases:
          mydb:
            - database: mydb
            - table: mytable
            - grant_option: True
            - grants:
              - all privileges
```

Additional mysql SSL grants:

```
mysql:
  server:
```

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```
    users:
      - name: clustercheck
        password: clustercheck
        database: '*.*'
        grants: PROCESS
        ssl_option:
          - SSL: True
          - X509: True
          - SUBJECT: <subject>
          - ISSUER: <issuer>
          - CIPHER: <cipher>
```

Additional check params:

```
galera:
  clustercheck:
    - enabled: True
    - user: clustercheck
    - password: clustercheck
    - available_when_donor: 0
    - available_when_readonly: 1
    - port 9200
```

Configurable soft parameters

- **galera_innodb_buffer_pool_size** - the default value is 3138M
- **galera_max_connections** - the default value is 20000

Usage: .. code-block:: yaml

> **_param:** galera_innodb_buffer_pool_size: 1024M galera_max_connections: 200

Usage

MySQL Galera check sripts

```
mysql> SHOW STATUS LIKE 'wsrep%';

mysql> SHOW STATUS LIKE 'wsrep_cluster_size' ;"
```

Galera monitoring command, performed from extra server

```
garbd -a gcomm://ipaddrofone:4567 -g my_wsrep_cluster -l /tmp/1.out -d
```

1. salt-call state.sls mysql
2. Comment everything starting wsrep* (wsrep_provider, wsrep_cluster, wsrep_sst)
3. service mysql start
4. run on each node mysql_secure_install and filling root password.

```
Enter current password for root (enter for none):
OK, successfully used password, moving on...

Setting the root password ensures that nobody can log into the MySQL
root user without the proper authorisation.

Set root password? [Y/n] y
New password:
Re-enter new password:
Password updated successfully!
Reloading privilege tables..
 ... Success!

By default, a MySQL installation has an anonymous user, allowing anyone
to log into MySQL without having to have a user account created for
them.  This is intended only for testing, and to make the installation
go a bit smoother.  You should remove them before moving into a
production environment.

Remove anonymous users? [Y/n] y
 ... Success!

Normally, root should only be allowed to connect from 'localhost'.  This
ensures that someone cannot guess at the root password from the network.

Disallow root login remotely? [Y/n] n
 ... skipping.

By default, MySQL comes with a database named 'test' that anyone can
access.  This is also intended only for testing, and should be removed
before moving into a production environment.

Remove test database and access to it? [Y/n] y
 - Dropping test database...
 ... Success!
 - Removing privileges on test database...
 ... Success!

Reloading the privilege tables will ensure that all changes made so far
will take effect immediately.

Reload privilege tables now? [Y/n] y
 ... Success!

Cleaning up...
```

5. service mysql stop
6. uncomment all wsrep* lines except first server, where leave only in my.cnf wsrep_cluster_address='gcomm://';
7. start first node
8. Start third node which is connected to first one
9. Start second node which is connected to third one
10. After starting cluster, it must be change cluster address at first starting node without restart database and change config my.cnf.

```
mysql> SET GLOBAL wsrep_cluster_address='gcomm://10.0.0.2';
```

Read more

- https://github.com/CaptTofu/ansible-galera
- http://www.sebastien-han.fr/blog/2012/04/15/active-passive-failover-cluster-on-a-mysql-galera-cluster-with-haproxy-lsb-agent/
- http://opentodo.net/2012/12/mysql-multi-master-replication-with-galera/
- http://www.codership.com/wiki/doku.php
- Best one: - http://www.sebastien-han.fr/blog/2012/04/01/mysql-multi-master-replication-with-galera/

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HAproxy

The Reliable, High Performance TCP/HTTP Load Balancer.

Sample pillars

Simple admin listener

```
haproxy:
  proxy:
    enabled: True
    listen:
      admin_page:
        type: admin
```

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```
        binds:
        - address: 0.0.0.0
          port: 8801
        user: fsdfdsfds
        password: dsfdsf
```

Simple stats listener

```
haproxy:
  proxy:
    enabled: True
    listen:
      admin_page:
        type: stats
        binds:
        - address: 0.0.0.0
          port: 8801
```

Sample pillar with admin

```
haproxy:
  proxy:
    enabled: True
    mode: http/tcp
    logging: syslog
    maxconn: 1024
    timeout:
      connect: 5000
      client: 50000
      server: 50000
    listen:
      https-in:
        binds:
        - address: 0.0.0.0
          port: 443
        servers:
        - name: server1
          host: 10.0.0.1
          port: 8443
        - name: server2
          host: 10.0.0.2
          port: 8443
          params: 'maxconn 256'
```

Sample pillar with custom logging

```
haproxy:
  proxy:
    enabled: True
    mode: http/tcp
    logging: syslog
    maxconn: 1024
    timeout:
      connect: 5000
      client: 50000
      server: 50000
    listen:
```

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```
      https-in:
        binds:
          address: 0.0.0.0
          port: 443
        servers:
        - name: server1
          host: 10.0.0.1
          port: 8443
        - name: server2
          host: 10.0.0.2
          port: 8443
          params: 'maxconn 256'
```

```
haproxy:
  proxy:
    enabled: true
    mode: tcp
    logging: syslog
    max_connections: 1024
    listen:
      mysql:
        type: mysql
        binds:
        - address: 10.0.88.70
          port: 3306
        servers:
        - name: node1
          host: 10.0.88.13
          port: 3306
          params: check inter 15s fastinter 2s downinter 1s rise 5 fall 3
        - name: node2
          host: 10.0.88.14
          port: 3306
          params: check inter 15s fastinter 2s downinter 1s rise 5 fall 3 backup
        - name: node3
          host: 10.0.88.15
          port: 3306
          params: check inter 15s fastinter 2s downinter 1s rise 5 fall 3 backup
      rabbitmq:
        type: rabbitmq
        binds:
        - address: 10.0.88.70
          port: 5672
        servers:
        - name: node1
          host: 10.0.88.13
          port: 5673
          params: check inter 5000 rise 2 fall 3
        - name: node2
          host: 10.0.88.14
          port: 5673
          params: check inter 5000 rise 2 fall 3 backup
        - name: node3
          host: 10.0.88.15
          port: 5673
          params: check inter 5000 rise 2 fall 3 backup
```

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```
      keystone-1:
        type: general-service
        binds:
        - address: 10.0.106.170
          port: 5000
        servers:
        - name: node1
          host: 10.0.88.13
          port: 5000
          params: check
```

```
haproxy:
  proxy:
    enabled: true
    mode: tcp
    logging: syslog
    max_connections: 1024
    listen:
      mysql:
        type: mysql
        binds:
        - address: 10.0.88.70
          port: 3306
        servers:
        - name: node1
          host: 10.0.88.13
          port: 3306
          params: check inter 15s fastinter 2s downinter 1s rise 5 fall 3
        - name: node2
          host: 10.0.88.14
          port: 3306
          params: check inter 15s fastinter 2s downinter 1s rise 5 fall 3 backup
        - name: node3
          host: 10.0.88.15
          port: 3306
          params: check inter 15s fastinter 2s downinter 1s rise 5 fall 3 backup
      rabbitmq:
        type: rabbitmq
        binds:
        - address: 10.0.88.70
          port: 5672
        servers:
        - name: node1
          host: 10.0.88.13
          port: 5673
          params: check inter 5000 rise 2 fall 3
        - name: node2
          host: 10.0.88.14
          port: 5673
          params: check inter 5000 rise 2 fall 3 backup
        - name: node3
          host: 10.0.88.15
          port: 5673
          params: check inter 5000 rise 2 fall 3 backup
      keystone-1:
        type: general-service
```

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```
        binds:
        - address: 10.0.106.170
          port: 5000
        servers:
        - name: node1
          host: 10.0.88.13
          port: 5000
          params: check
```

Custom more complex listener (for Artifactory and subdomains for docker registries)

```
haproxy:
  proxy:
    listen:
      artifactory:
        mode: http
        options:
          - forwardfor
          - forwardfor header X-Real-IP
          - httpchk
          - httpclose
          - httplog
        sticks:
          - stick on src
          - stick-table type ip size 200k expire 2m
        acl:
          is_docker: "path_reg ^/v[12][/.]*"
        http_request:
          - action: "set-path /artifactory/api/docker/%[req.hdr(host),lower,field(1,'.
↪')]%[path]"
            condition: "if is_docker"
        balance: source
        binds:
          - address: ${_param:cluster_vip_address}
            port: 8082
            ssl:
              enabled: true
              # This PEM file needs to contain key, cert, CA and possibly
              # intermediate certificates
              pem_file: /etc/haproxy/ssl/server.pem
        servers:
          - name: ${_param:cluster_node01_name}
            host: ${_param:cluster_node01_address}
            port: 8082
            params: check
          - name: ${_param:cluster_node02_name}
            host: ${_param:cluster_node02_address}
            port: 8082
            params: backup check
```

It's also possible to use multiple certificates for one listener (eg. when it's bind on multiple interfaces):

```
haproxy:
  proxy:
    listen:
      dummy_site:
        mode: http
```

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```
        binds:
          - address: 127.0.0.1
            port: 8080
            ssl:
              enabled: true
              key: |
                my super secret key follows
              cert: |
                certificate
              chain: |
                CA chain (if any)
          - address: 127.0.1.1
            port: 8081
            ssl:
              enabled: true
              key: |
                my super secret key follows
              cert: |
                certificate
              chain: |
                CA chain (if any)
```

Definition above will result in creation of `/etc/haproxy/ssl/dummy_site` directory with files `1-all.pem` and `2-all.pem` (per binds).

Custom listener with tcp-check options specified (for Redis cluster with Sentinel)

```
haproxy:
  proxy:
    listen:
      redis_cluster:
        service_name: redis
        health-check:
          tcp:
            enabled: True
            options:
              - send PING\r\n
              - expect string +PONG
              - send info\ replication\r\n
              - expect string role:master
              - send QUIT\r\n
              - expect string +OK
        binds:
          - address: ${_param:cluster_address}
            port: 6379
        servers:
          - name: ${_param:cluster_node01_name}
            host: ${_param:cluster_node01_address}
            port: 6379
            params: check inter 1s
          - name: ${_param:cluster_node02_name}
            host: ${_param:cluster_node02_address}
            port: 6379
            params: check inter 1s
          - name: ${_param:cluster_node03_name}
            host: ${_param:cluster_node03_address}
            port: 6379
```

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```
            params: check inter 1s
```

Frontend for routing between exists listeners via URL with SSL an redirects. You can use one backend for several URLs.

```
haproxy:
  proxy:
    listen:
      service_proxy:
        mode: http
        balance: source
        format: end
        binds:
         - address: ${_param:haproxy_bind_address}
           port: 80
           ssl: ${_param:haproxy_frontend_ssl}
           ssl_port: 443
        redirects:
         - code: 301
           location: domain.com/images
           conditions:
             - type: hdr_dom(host)
               condition: images.domain.com
        acls:
         - name: gerrit
           conditions:
             - type: hdr_dom(host)
               condition: gerrit.domain.com
         - name: jenkins
           conditions:
             - type: hdr_dom(host)
               condition: jenkins.domain.com
         - name: docker
           backend: artifactroy
           conditions:
             - type: hdr_dom(host)
               condition: docker.domain.com
```

Enable customisable `forwardfor` option in `defaults` section.

```
haproxy:
  proxy:
    enabled: true
    mode: tcp
    logging: syslog
    max_connections: 1024
    forwardfor:
      enabled: true
      except:
      header:
      if-none: false
```

```
haproxy:
  proxy:
    enabled: true
    mode: tcp
```

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```
    logging: syslog
    max_connections: 1024
    forwardfor:
      enabled: true
      except: 127.0.0.1
      header: X-Real-IP
      if-none: false
```

Sample pillar with multiprocess multicore configuration

```
haproxy:
  proxy:
    enabled: True
    nbproc: 4
    cpu_map:
      1: 0
      2: 1
      3: 2
      4: 3
    stats_bind_process: "1 2"
    mode: http/tcp
    logging: syslog
    maxconn: 1024
    timeout:
      connect: 5000
      client: 50000
      server: 50000
    listen:
      https-in:
        bind_process: "1 2 3 4"
        binds:
        - address: 0.0.0.0
          port: 443
        servers:
        - name: server1
          host: 10.0.0.1
          port: 8443
        - name: server2
          host: 10.0.0.2
          port: 8443
          params: 'maxconn 256'
```

Read more

- https://github.com/jesusaurus/hpcs-salt-state/tree/master/haproxy
- http://www.nineproductions.com/saltstack-ossec-state-using-reactor/ - example reactor usage.
- https://gist.github.com/tomeduarte/6340205 - example on how to use peer from within a config file (using jinja)
- http://youtu.be/jJJ8cfDjcTc?t=8m58s - from 9:00 on, a good overview of peer vs mine
- https://github.com/russki/cluster-agents

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Keepalived

Keepalived is a routing software written in C. The main goal of this project is to provide simple and robust facilities for loadbalancing and high-availability to Linux system and Linux based infrastructures. Loadbalancing framework relies on well-known and widely used Linux Virtual Server (IPVS) kernel module providing Layer4 loadbalancing. Keepalived implements a set of checkers to dynamically and adaptively maintain and manage loadbalanced server pool according their health. On the other hand high-availability is achieved by VRRP protocol. VRRP is a fundamental brick for router failover. In addition, Keepalived implements a set of hooks to the VRRP finite state machine providing low-level and high-speed protocol interactions. Keepalived frameworks can be used independently or all together to provide resilient infrastructures.

Sample pillar

Simple virtual IP on an interface

```
keepalived:
  cluster:
    enabled: True
    instance:
      VIP1:
        nopreempt: True
        priority: 100 (highest priority must be on primary server, different for␣
↪cluster members)
        virtual_router_id: 51
        auth_type: AH
        password: pass
        address: 192.168.10.1
        interface: eth0
      VIP2:
        nopreempt: True
```

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```
        priority: 150 (highest priority must be on primary server, different for␣
↪cluster members)
        virtual_router_id: 52
        auth_type: PASS
        password: pass
        address: 10.0.0.5
        interface: eth1
```

Multiple virtual IPs on single interface

```
keepalived:
  cluster:
    enabled: True
    instance:
      VIP1:
        nopreempt: True
        priority: 100 (highest priority must be on primary server, different for␣
↪cluster members)
        virtual_router_id: 51
        password: pass
        addresses:
        - 192.168.10.1
        - 192.168.10.2
        interface: eth0
```

Use unicast

```
keepalived:
  cluster:
    enabled: True
    instance:
      VIP1:
        nopreempt: True
        priority: 100 (highest priority must be on primary server, different for␣
↪cluster members)
        virtual_router_id: 51
        password: pass
        address: 192.168.10.1
        interface: eth0
        unicast_src_ip: 172.16.10.1
        unicast_peer:
          172.16.10.2
          172.16.10.3
```

Disable nopreempt mode to have Master. Highest priority is taken in all cases.

```
keepalived:
  cluster:
    enabled: True
    instance:
      VIP1:
        nopreempt: False
        priority: 100 (highest priority must be on primary server, different for␣
↪cluster members)
        virtual_router_id: 51
        password: pass
        addresses:
```

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```
        - 192.168.10.1
        - 192.168.10.2
        interface: eth0
```

Notify action in keepalived.

```
keepalived:
  cluster:
    enabled: True
    instance:
      VIP1:
        nopreempt: True
        notify_action:
          master:
            - /usr/bin/docker start jenkins
            - /usr/bin/docker start gerrit
          backup:
            - /usr/bin/docker stop jenkins
            - /usr/bin/docker stop gerrit
          fault:
            - /usr/bin/docker stop jenkins
            - /usr/bin/docker stop gerrit
        priority: 100 # highest priority must be on primary server, different for␣
↪cluster members
        virtual_router_id: 51
        password: pass
        addresses:
        - 192.168.10.1
        - 192.168.10.2
        interface: eth0
```

Track/vrrp scripts for keepalived instance:

```
keepalived:
  cluster:
    enabled: True
    instance:
      VIP2:
        priority: 100
        virtual_router_id: 10
        password: pass
        addresses:
        - 192.168.11.1
        - 192.168.11.2
        interface: eth0
        track_script: check_haproxy
      VIP3:
        priority: 100
        virtual_router_id: 11
        password: pass
        addresses:
        - 192.168.10.1
        - 192.168.10.2
        interface: eth0
        track_script:
          check_random_exit:
            interval: 10
```

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```
          check_port:
            weight: 50
    vrrp_scripts:
      check_haproxy:
        name: check_pidof
        args:
          - haproxy
      check_mysql_port:
        name: check_port
        args:
          - 3306
          - TCP
          - 4
      check_ssh:
        name: check_port
        args: "22"
      check_mysql_cluster:
        args:
          # github: olafz/percona-clustercheck
          # <user> <pass> <available_when_donor=0|1> <log_file> <available_when_
↪readonly=0|1> <defaults_extra_file>
          - clustercheck
          - clustercheck
          - available_when_donor=0
          - available_when_readonly=0
      check_random_exit:
        interval: 10
        content: |
          #!/bin/bash
          exit $(($RANDOM%2))
        weight: 50
```

Read more

- https://raymii.org/s/tutorials/Keepalived-Simple-IP-failover-on-Ubuntu.html

Documentation and Bugs

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Knot

Knot DNS is a high-performance authoritative-only DNS server which supports all key features of the modern domain name system.

Sample pillars

Simple server

```
knot:
  server:
    enabled: true
```

Server dns templates

```
knot:
  server:
    enabled: true
    template:
      default:
        storage: /var/lib/knot/master
      signed:
        storage: /var/lib/knot/signed
      slave:
        storage: /var/lib/knot/slave
```

Server dns zones

```
knot:
  server:
    enabled: true
    zone:
      example1.com: {}
      example2.com:
        semantic-checks: False
        template: default
```

Read more

- https://www.knot-dns.cz/

Salt Logrotate Formula

Logrotate is designed to ease administration of systems that generate large numbers of log files. It allows automatic rotation, compression, removal, and mailing of log files. Each log file may be handled daily, weekly, monthly, or when it grows too large.

Example pillar

Configuration for syslog from Ubuntu 14.04 (trusty):

```
logrotate:
  server:
    enabled: true
    job:
      rsyslog:
        - files:
          - /var/log/mail.info
          - /var/log/mail.warn
          - /var/log/mail.err
          - /var/log/mail.log
          - /var/log/daemon.log
          - /var/log/kern.log
          - /var/log/auth.log
          - /var/log/user.log
          - /var/log/lpr.log
          - /var/log/cron.log
          - /var/log/debug
          - /var/log/messages
        options:
          - rotate: 4
          - weekly
          - missingok
          - notifempty
          - compress
          - delaycompress
          - sharedscripts
          - postrotate: "reload rsyslog >/dev/null 2>&1 || true"
      - files:
          - /var/log/syslog
        options:
          - rotate: 7
          - daily
          - missingok
          - notifempty
          - delaycompress
          - compress
          - postrotate: "reload rsyslog >/dev/null 2>&1 || true"
```

Change parameters in main logrotate.conf file:

```
logrotate:
  server:
    enabled: true
    global_conf:
      compress: true
      rotate: daily
      keep_rotate: 6
      dateext: true
```

Cross-formula relationship

It’s possible to use support meta to define logrotate rules from within other formula.

Example `meta/logrotate.yml` for horizon formula:

```
job:
  horizon:
    - files:
        - /var/log/horizon/*.log
      options:
        - compress
        - delaycompress
        - missingok
        - notifempty
        - rotate: 10
        - daily
        - minsize: 20M
        - maxsize: 500M
        - postrotate: "if /etc/init.d/apache2 status > /dev/null; then /etc/init.d/
↪apache2 reload > /dev/null; fi"
```

Reference

- http://www.linuxcommand.org/man_pages/logrotate8.html

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https://github.com/salt-formulas/salt-formula-logrotate/issues

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Memcached Formula

Memcached is an in-memory key-value store for small chunks of arbitrary data (strings, objects) from results of database calls, API calls, or page rendering.

Sample Metadata

```
memcached:
  server:
    enabled: true
    cache_size: 64
    bind:
      address: 0.0.0.0
      port: 11211
      protocol: tcp
```

References

- http://memcached.org/

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> https://github.com/salt-formulas/salt-formula-memcached/issues

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MongoDB

MongoDB (from "humongous") is an open-source document database, and the leading NoSQL database. Written in C++.

Available states

- *mongodb.server*

`mongodb.server`

Setup MongoDB server

Available metadata

- *metadata.mongodb.server.single*
- *metadata.mongodb.server.cluster*

`metadata.mongodb.server.single`

Single-node MongoDB setup

`metadata.mongodb.server.cluster`

Clustered MongoDB setup

Configuration parameters

Example reclass

Setup MongoDB with database for ceilometer.

```
classes:
- service.mongodb.server.cluster
parameters:
   _param:
     mongodb_server_replica_set: ceilometer
     mongodb_ceilometer_password: cloudlab
     mongodb_admin_password: cloudlab
     mongodb_shared_key: xxx
   mongodb:
     server:
       database:
         ceilometer:
           enabled: true
           password: ${_param:mongodb_ceilometer_password}
           users:
           -  name: ceilometer
              password: ${_param:mongodb_ceilometer_password}
```

Sample pillars

Simple single server

```yaml
mongodb:
  server:
    enabled: true
    bind:
      address: 0.0.0.0
      port: 27017
    admin:
      username: admin
      password: magicunicorn
    database:
      dbname:
        enabled: true
        encoding: 'utf8'
        users:
        - name: 'username'
          password: 'password'
```

Cluster of 3 nodes

```yaml
mongodb:
  server:
    enabled: true
    logging:
      verbose: false
      logLevel: 1
      oplogLevel: 0
    admin:
      user: admin
      password: magicunicorn
    master: mongo01
    members:
      - host: 192.168.1.11
        priority: 2
      - host: 192.168.1.12
      - host: 192.168.1.13
    replica_set: default
    shared_key: magicunicorn
```

It's possible that first Salt run on master node won't pass correctly before all slave nodes are up and ready. Simply run salt again on master node to setup cluster, databases and users.

To check cluster status, execute following:

```
mongo 127.0.0.1:27017/admin -u admin -p magicunicorn --eval "rs.status()"
```

Read more

- http://docs.mongodb.org/manual/
- http://docs.mongodb.org/manual/tutorial/install-mongodb-on-ubuntu/
- https://www.linode.com/docs/databases/mongodb/creating-a-mongodb-replication-set-on-ubuntu-12-04-precise

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Mosquitto formula

Mosquitto is an open source (EPL/EDL licensed) message broker that implements the MQTT protocol versions 3.1 and 3.1.1. MQTT provides a lightweight method of carrying out messaging using a publish/subscribe model.

Sample metadata

Single mosquitto service

```
mosquitto:
  server:
    enabled: true
```

References

- http://mosquitto.org/

Documentation and Bugs

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http://salt-formulas.readthedocs.io/

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https://github.com/salt-formulas/salt-formula-mosquitto/issues

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MySQL Formula

MySQL is the world's second most widely used open-source relational database management system (RDBMS).

Sample Metadata

Standalone setups

Standalone MySQL server

```
mysql:
  server:
    enabled: true
    version: '5.5'
    admin:
      user: root
      password: pass
    bind:
      address: '127.0.0.1'
      port: 3306
    database:
      name:
        encoding: 'utf8'
        users:
        - name: 'username'
          password: 'password'
          host: 'localhost'
          rights: 'all privileges'
```

MySQL replication master with SSL

```
mysql:
  server:
    enabled: true
    version: 5.5
    replication:
      role: master
    ssl:
      enabled: true
      authority: Org_CA
      certificate: name_of_service
    admin:
      user: root
      password: pass
    bind:
```

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```
      address: '127.0.0.1'
      port: 3306
```

MySQL replication slave with SSL

```
mysql:
  server:
    enabled: true
    version: '5.5'
    replication:
      role: slave
      master: master.salt.id
    ssl:
      enabled: true
      authority: Org_CA
      certificate: name_of_service
      client_certificate: name_of_client_cert
    admin:
      user: root
      password: pass
    bind:
      address: '127.0.0.1'
      port: 3306
```

Tuned up MySQL server

```
mysql:
  server:
    enabled: true
    version: '5.5'
    admin:
      user: root
      password: pass
    bind:
      address: '127.0.0.1'
      port: 3306
    key_buffer: 250M
    max_allowed_packet: 32M
    max_connections: 1000
    thread_stack: 512K
    thread_cache_size: 64
    query_cache_limit: 16M
    query_cache_size: 96M
    force_encoding: utf8
    sql_mode: "ONLY_FULL_GROUP_BY,STRICT_TRANS_TABLES,NO_ZERO_IN_DATE,ERROR_FOR_
↪DIVISION_BY_ZERO,NO_AUTO_CREATE_USER,NO_ENGINE_SUBSTITUTION"
    database:
      name:
        encoding: 'utf8'
        users:
        - name: 'username'
          password: 'password'
          host: 'localhost'
          rights: 'all privileges'
```

MySQL Galera cluster

MySQL Galera cluster is configured for ring connection between 3 nodes. Each node should have just one member.

Galera initial server (master)

```
mysql:
  cluster:
    enabled: true
    name: openstack
    role:master
    bind:
      address: 192.168.0.1
    members:
    - host: 192.168.0.1
      port: 4567
    user:
      name: wsrep_sst
      password: password
 server:
    enabled: true
    version: 5.5
    admin:
      user: root
      password: pass
    bind:
      address: 192.168.0.1
    database:
      name:
        encoding: 'utf8'
        users:
        - name: 'username'
          password: 'password'
          host: 'localhost'
          rights: 'all privileges'
```

MySQL client

Database with initial data (Restore DB)

```
mysql:
  client:
    server:
      database:
        admin:
          host: localhost
          port: 3306
          user: ${_param:mysql_admin_user}
          password: ${_param:mysql_admin_password}
          encoding: utf8
        database:
          neutron_upgrade:
            encoding: utf8
            users:
            - name: neutron
              password: ${_param:mysql_neutron_password}
```

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```
              host: '%'
              rights: all
            - name: neutron
              password: ${_param:mysql_neutron_password}
              host: ${_param:single_address}
              rights: all
            initial_data:
              engine: backupninja
              source: ${_param:backupninja_backup_host}
              host: ${linux:network:fqdn}
              database: neutron
```

Note: This client role needs to be put directly on dbs node. The provided setup restores db named neutron_upgrade with data from db called neutron.

Database management on remote MySQL server

```
mysql:
  client:
    enabled: true
    server:
      server01:
        admin:
          host: database.host
          port: 3306
          user: root
          password: password
          encoding: utf8
        database:
          database01:
            encoding: utf8
            users:
            - name: username
              password: 'password'
              host: 'localhost'
              rights: 'all privileges'
```

User management on remote MySQL server

```
mysql:
  client:
    enabled: true
    server:
      server01:
        admin:
          host: database.host
          port: 3306
          user: root
          password: password
          encoding: utf8
        users:
        - name: user01
          host: "*"
          password: 'sdgdsgdsgd'
        - name: user02
```

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```
          host: "localhost"
```

Sample Usage

MySQL Galera check sripts

```
mysql> SHOW STATUS LIKE 'wsrep%';

mysql> SHOW STATUS LIKE 'wsrep_cluster_size' ;"
```

Galera monitoring command, performed from extra server

```
garbd -a gcomm://ipaddrofone:4567 -g my_wsrep_cluster -l /tmp/1.out -d
```

1. salt-call state.sls mysql
2. Comment everything starting wsrep* (wsrep_provider, wsrep_cluster, wsrep_sst)
3. service mysql start
4. run on each node mysql_secure_install and filling root password.

```
Enter current password for root (enter for none):
OK, successfully used password, moving on...

Setting the root password ensures that nobody can log into the MySQL
root user without the proper authorisation.

Set root password? [Y/n] y
New password:
Re-enter new password:
Password updated successfully!
Reloading privilege tables..
 ... Success!

By default, a MySQL installation has an anonymous user, allowing anyone
to log into MySQL without having to have a user account created for
them.  This is intended only for testing, and to make the installation
go a bit smoother.  You should remove them before moving into a
production environment.

Remove anonymous users? [Y/n] y
 ... Success!

Normally, root should only be allowed to connect from 'localhost'.  This
ensures that someone cannot guess at the root password from the network.

Disallow root login remotely? [Y/n] n
 ... skipping.

By default, MySQL comes with a database named 'test' that anyone can
access.  This is also intended only for testing, and should be removed
before moving into a production environment.

Remove test database and access to it? [Y/n] y
 - Dropping test database...
```

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```
 ... Success!
 - Removing privileges on test database...
 ... Success!

Reloading the privilege tables will ensure that all changes made so far
will take effect immediately.

Reload privilege tables now? [Y/n] y
 ... Success!

Cleaning up...
```

5. service mysql stop
6. uncomment all wsrep* lines except first server, where leave only in my.cnf wsrep_cluster_address='gcomm://';
7. start first node
8. Start third node which is connected to first one
9. Start second node which is connected to third one
10. After starting cluster, it must be change cluster address at first starting node without restart database and change config my.cnf.

```
mysql> SET GLOBAL wsrep_cluster_address='gcomm://10.0.0.2';
```

More Information

- http://dev.mysql.com/doc/
- http://www.slideshare.net/osscube/mysql-performance-tuning-top-10-tips
- http://sourceforge.net/projects/automysqlbackup/
- https://labs.riseup.net/code/projects/backupninja/wiki
- http://wiki.zmanda.com/index.php/Mysql-zrm

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Nginx Formula

Nginx is an open source reverse proxy server for HTTP, HTTPS, SMTP, POP3, and IMAP protocols, as well as a load balancer, HTTP cache, and a web server (origin server). The nginx project started with a strong focus on high concurrency, high performance and low memory usage.

Sample Pillars

Gitlab server setup

```
nginx:
  server:
    enabled: true
    bind:
      address: '0.0.0.0'
      ports:
      - 80
    site:
      gitlab_domain:
        enabled: true
        type: gitlab
        name: domain
        ssl:
          enabled: true
          key: |
            -----BEGIN RSA PRIVATE KEY-----
            ...
          cert: |
            xyz
          chain: |
            my_chain..
        host:
          name: gitlab.domain.com
          port: 80
```

Simple static HTTP site

```
nginx:
  server:
    site:
      nginx_static_site01:
        enabled: true
        type: nginx_static
        name: site01
        host:
          name: gitlab.domain.com
          port: 80
```

Simple load balancer

```
nginx:
  server:
    upstream:
      horizon-upstream:
        backend1:
          address: 10.10.10.113
          port: 8078
          opts: weight=3
        backend2:
          address: 10.10.10.114
    site:
      nginx_proxy_openstack_web:
        enabled: true
        type: nginx_proxy
        name: openstack_web
        proxy:
          upstream_proxy_pass: http://horizon-upstream
        host:
          name: 192.168.0.1
          port: 31337
```

Static site with access policy

```
nginx:
  server:
    site:
      nginx_static_site01:
        enabled: true
        type: nginx_static
        name: site01
        access_policy:
          allow:
          - 192.168.1.1/24
          - 127.0.0.1
          deny:
          - 192.168.1.2
          - all
        host:
          name: gitlab.domain.com
          port: 80
```

Simple TCP/UDP proxy

```
nginx:
  server:
    stream:
      rabbitmq:
        host:
          port: 5672
        backend:
          server1:
            address: 10.10.10.113
            port: 5672
            least_conn: true
            hash: "$remote_addr consistent"
      unbound:
        host:
```

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```
          bind: 127.0.0.1
          port: 53
          protocol: udp
        backend:
          server1:
            address: 10.10.10.113
            port: 5353
```

Simple HTTP proxy

```
nginx:
  server:
    site:
      nginx_proxy_site01:
        enabled: true
        type: nginx_proxy
        name: site01
        proxy:
          host: local.domain.com
          port: 80
          protocol: http
        host:
          name: gitlab.domain.com
          port: 80
```

Simple Websocket proxy

```
nginx:
  server:
    site:
      nginx_proxy_site02:
        enabled: true
        type: nginx_proxy
        name: site02
        proxy:
          websocket: true
          host: local.domain.com
          port: 80
          protocol: http
        host:
          name: gitlab.domain.com
          port: 80
```

Content filtering proxy

```
nginx:
  server:
    enabled: true
    site:
      nginx_proxy_site03:
        enabled: true
        type: nginx_proxy
        name: site03
        proxy:
          host: local.domain.com
          port: 80
          protocol: http
```

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```
          filter:
            search: https://www.domain.com
            replace: http://10.10.10.10
        host:
          name: gitlab.domain.com
          port: 80
```

Proxy with access policy

```
nginx:
  server:
    site:
      nginx_proxy_site01:
        enabled: true
        type: nginx_proxy
        name: site01
        access_policy:
          allow:
          - 192.168.1.1/24
          - 127.0.0.1
          deny:
          - 192.168.1.2
          - all
        proxy:
          host: local.domain.com
          port: 80
          protocol: http
        host:
          name: gitlab.domain.com
          port: 80
```

Gitlab server with user for basic auth

```
nginx:
  server:
    enabled: true
    user:
      username1:
        enabled: true
        password: magicunicorn
        htpasswd: htpasswd-site1
      username2:
        enabled: true
        password: magicunicorn
```

Proxy buffering

```
nginx:
  server:
    enabled: true
    bind:
      address: '0.0.0.0'
      ports:
      - 80
    site:
      gitlab_proxy:
        enabled: true
```

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```
        type: nginx_proxy
        proxy:
          request_buffer: false
          buffer:
            number: 8
            size: 16
        host:
          name: gitlab.domain.com
          port: 80
```

Let’s Encrypt

```
nginx:
  server:
    enabled: true
    bind:
      address: '0.0.0.0'
      ports:
      - 443
    site:
      gitlab_domain:
        enabled: true
        type: gitlab
        name: domain
        ssl:
          enabled: true
          engine: letsencrypt
        host:
          name: gitlab.domain.com
          port: 443
```

SSL using already deployed key and cert file. Note that cert file should already contain CA cert and complete chain.

```
nginx:
  server:
    enabled: true
    site:
      mysite:
        ssl:
          enabled: true
          key_file: /etc/ssl/private/mykey.key
          cert_file: /etc/ssl/cert/mycert.crt
```

Nginx stats server (required by collectd nginx plugin)

```
nginx:
  server:
    enabled: true
    site:
      nginx_stats_server:
        enabled: true
        type: nginx_stats
        name: server
        host:
          name: 127.0.0.1
          port: 8888
```

Change nginx server ssl protocol options in openstack/proxy.yml

More Information

- http://wiki.nginx.org/Main
- https://wiki.mozilla.org/Security/Server_Side_TLS#Modern_compatibility
- http://nginx.com/resources/admin-guide/reverse-proxy/
- https://mozilla.github.io/server-side-tls/ssl-config-generator/

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openldap

Sample pillars

Client

```
openldap:
  client:
    server:
      basedn: dc=example,dc=local
      host: ldap.example.local
      tls: true
      port: 389
      auth:
        user: cn=admin,dc=example,dc=local
        password: dummypass
    entry:
```

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```
      people:
        type: ou
        classes:
          - top
          - organizationalUnit
        entry:
          jdoe:
            type: cn
            # Change attributes that already exists with different content
            action: replace
            # Delete all other attributes
            purge: true
            attr:
              uid: jdoe
              uidNumber: 20001
              gidNumber: 20001
              gecos: John Doe
              givenName: John
              sn: Doe
              homeDirectory: /home/jdoe
              loginShell: /bin/bash
            classes:
              - posixAccount
              - inetOrgPerson
              - top
              - ldapPublicKey
              - shadowAccount
          karel:
            # Simply remove cn=karel
            type: cn
            enabled: false
```

Read more

- https://docs.saltstack.com/en/latest/ref/states/all/salt.states.ldap.html#manage-entries-in-an-ldap-database

Postfix

Install and configure Postfix.

Available states

- *postfix.server*
- *postfix.relay*
- *postfix.backupmx*

`postfix.server`

Setup postfix server

`postfix.relay`

Setup postfix relay

`postfix.backupmx`

Setup postfix backup MX

Available metadata

- *metadata.postfix.server*
- *postfix.relay*
- *postfix.backupmx*

`metadata.postfix.server`

Setup postfix server

`postfix.relay`

Setup postfix relay

`postfix.backupmx`

Setup postfix backup MX

Requirements

- linux
- mysql (for mysql backend and postfixadmin)
- apache (for postfixadmin)

Optional

- glusterfs (to serve as mail storage backend)
- dovecot
- roundcube

Configuration parameters

For complete list of parameters, please check `metadata/service/server.yml`

Example reclass

Server

```
classes:
  - service.postfix.server
parameters:
 _param:
   postfix_origin: mail.eru
   mysql_mailserver_password: Peixeilaephahmoosa2daihoh4yiaThe
 postfix:
   server:
     origin: ${_param:postfix_origin}
     ssl:
       enabled: true
       key: ${_secret:ssl_domain_wild_key}
       cert: ${_secret:ssl_domain_wild_cert}
       chain: ${_secret:ssl_domain_wild_chain}
       # Set smtpd_tls_security_level to encrypt and require TLS encryption
       required: true
 mysql:
   server:
     database:
       mailserver:
         encoding: UTF8
         locale: cs_CZ
         users:
         - name: mailserver
           password: ${_param:mysql_mailserver_password}
           host: 127.0.0.1
           rights: all privileges
 apache:
   server:
     site:
       postfixadmin:
         enabled: true
         type: static
         name: postfixadmin
         root: /usr/share/postfixadmin
         host:
           name: ${_param:postfix_origin}
           aliases:
             - ${linux:system:name}.${linux:system:domain}
             - ${linux:system:name}
```

Example pillar

Server

Setup without postfixadmin:

```
postfix:
  server:
    origin: ${_param:postfix_origin}
    admin:
      enabled: false
```

DKIM

```
postfix:
  server:
    dkim:
      enabled: true
      domains:
        - name: example.com
          selector: mail
          key: |
            super_secret_private_key
```

First you need to generate private and public key, eg.:

```
opendkim-genkey -r -s mail -d example.com
```

And set public key in your DNS records, see *mail.txt* for public key.

Mailman

```
postfix:
  server:
    mailman:
      enabled: true
      admin_password: SaiS0kai
      distributed: true
      use_https: false
      lists:
        - name: support
          admin: test@lxc.eru
          password: test
          domain: lxc.eru
          domainweb: lists.lxc.eru
          members:
            - test@lxc.eru
```

It's also good idea to mount GlusterFS volume on `/var/lib/mailman` for multi-master setup. In that case distributed has to be true to bind-mount qfiles directory which must not be shared.

Parameter `use_https` needs to be set before setting up any lists, otherwise you need to fix lists urls manually using:

```
withlist -l -a -r fix_url
```

You can also set per-list parameters. For example you can setup private mailing list with these options:

```
lists:
  - name: support
```

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```
    admin: test@lxc.eru
    password: test
    domain: lxc.eru
    domainweb: lists.lxc.eru
    members:
      - test@lxc.eru
    parameters:
      real_name: support
      description: "Support mailing list"
      # Don't be advertised
      advertised: 0
      # Require admin to confirm subscription
      subscribe_policy: 2
      # Show members only to admins
      private_roster: 2
      # Archive only for members
      archive_private: 1
```

To list all available configuration options for given list, see output of folliwing command:

```
config_list -o - <list_name>
```

Warning: If you want to have list on your domain, eg. support@example.com instead of support@lists.example.com, you may need to set up aliases like this, depending on your setup:

```
support-owner@example.com -> support-owner@lists.example.com
support-admin@example.com -> support-admin@lists.example.com
support-request@example.com -> support-request@lists.example.com
support-confirm@example.com -> support-confirm@lists.example.com
support-join@example.com -> support-join@lists.example.com
support-leave@example.com -> support-leave@lists.example.com
support-subscribe@example.com -> support-subscribe@lists.example.com
support-unsubscribe@example.com -> support-unsubscribe@lists.example.com
support-bounces@example.com -> support-bounces@lists.example.com
support@example.com -> support@lists.example.com
```

Relay

```
postfix:
  relay:
    # Postfix will listen only on localhost
    interfaces: loopback-only
    host: mail.cloudlab.cz
    domain: cloudlab.cz
    sasl:
      user: test
      password: changeme
```

Backup MX

```
postfix:
  backupmx:
    domains:
      - cloudlab.cz
      - lists.cloudlab.cz
```

Development and testing

Development and test workflow with Test Kitchen and kitchen-salt provisioner plugin.

Test Kitchen is a test harness tool to execute your configured code on one or more platforms in isolation. There is a `.kitchen.yml` in main directory that defines *platforms* to be tested and *suites* to execute on them.

Kitchen CI can spin instances locally or remote, based on used *driver*. For local development `.kitchen.yml` defines a vagrant or docker driver.

To use backend drivers or implement your CI follow the section **'INTEGRATION.rst#Continuous Integration'__**.

A listing of scenarios to be executed:

```
$ kitchen list

Instance                    Driver   Provisioner  Verifier  Transport  Last Action

server-bento-ubuntu-1404    Vagrant  SaltSolo     Busser    Ssh        <Not Created>
server-bento-ubuntu-1604    Vagrant  SaltSolo     Busser    Ssh        Created
server-bento-centos-71      Vagrant  SaltSolo     Busser    Ssh        <Not Created>
relay-bento-ubuntu-1404     Vagrant  SaltSolo     Busser    Ssh        <Not Created>
relay-bento-ubuntu-1604     Vagrant  SaltSolo     Busser    Ssh        <Not Created>
relay-bento-centos-71       Vagrant  SaltSolo     Busser    Ssh        <Not Created>
backupmx-bento-ubuntu-1404  Vagrant  SaltSolo     Busser    Ssh        <Not Created>
backupmx-bento-ubuntu-1604  Vagrant  SaltSolo     Busser    Ssh        <Not Created>
backupmx-bento-centos-71    Vagrant  SaltSolo     Busser    Ssh        <Not Created>
```

The Busser *Verifier* is used to setup and run tests implementated in *<repo>/test/integration*. It installs the particular driver to tested instance (Serverspec, InSpec, Shell, Bats, . . .) prior the verification is executed.

Usage:

```
# manually
kitchen [test || [create|converge|verify|exec|login|destroy|...]] -t tests/integration

# or with provided Makefile within CI pipeline
make kitchen
```

Read more

- http://doc.postfix.com/
- http://fog.ccsf.edu/~msapiro/scripts/
- http://wiki.list.org/DOC/Making%20Sure%20Your%20Lists%20Are%20Private

Documentation and Bugs

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PostgreSQL Formula

PostgreSQL, often simply Postgres, is an object-relational database management system available for many platforms including Linux, FreeBSD, Solaris, Microsoft Windows and Mac OS X. It is released under the PostgreSQL License, which is an MIT-style license, and is thus free and open source software. PostgreSQL is developed by the PostgreSQL Global Development Group, consisting of a handful of volunteers employed and supervised by companies such as Red Hat and EnterpriseDB.

Sample pillars

Single deployment

Single database server with empty database

```
postgresql:
  server:
    enabled: true
    version: 9.1
    bind:
      address: 127.0.0.1
      port: 5432
      protocol: tcp
    clients:
    - 127.0.0.1
    database:
      databasename:
        encoding: 'UTF8'
        locale: 'cs_CZ'
        users:
```

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```
          - name: 'username'
            password: 'password'
            host: 'localhost'
            rights: 'all privileges'
```

Single database server with initial data

```
postgresql:
  server:
    enabled: true
    version: 9.1
    bind:
    - address: 127.0.0.1
      port: 5432
      protocol: tcp
    clients:
    - 127.0.0.1
    database:
      databasename:
        encoding: 'UTF8'
        locale: 'cs_CZ'
        initial_data:
          engine: backupninja
          source: backup.host
          host: original-host-name
          database: original-database-name
        users:
        - name: 'username'
          password: 'password'
          host: 'localhost'
          rights: 'all privileges'
```

User with createdb privileges

```
postgresql:
  server:
    enabled: true
    version: 9.1
    bind:
      address: 127.0.0.1
      port: 5432
      protocol: tcp
    clients:
    - 127.0.0.1
    database:
      databasename:
        encoding: 'UTF8'
        locale: 'cs_CZ'
        users:
          - name: 'username'
            password: 'password'
            host: 'localhost'
            createdb: true
            rights: 'all privileges'
```

Database extensions

```
postgresql:
  server:
    enabled: true
    version: 9.1
    bind:
      address: 127.0.0.1
      port: 5432
      protocol: tcp
    clients:
    - 127.0.0.1
    database:
      databasename:
        encoding: 'UTF8'
        locale: 'cs_CZ'
        users:
          - name: 'username'
            password: 'password'
            host: 'localhost'
            createdb: true
            rights: 'all privileges'
        extension:
          postgis_topology:
            enabled: true
          fuzzystrmatch:
            enabled: true
          postgis_tiger_geocoder:
            enabled: true
          postgis:
            enabled: true
            pkgs:
            - postgresql-9.1-postgis-2.1
```

Master-slave cluster

Master node

```
postgresql:
  server:
    enabled: true
    version: 9.6
    bind:
      address: 0.0.0.0
    database:
      mydb: ...
  cluster:
    enabled: true
    role: master
    mode: hot_standby
    members:
    - host: "172.16.10.101"
    - host: "172.16.10.102"
    - host: "172.16.10.103"
    replication_user:
      name: repuser
      password: password
keepalived:
```

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```
  cluster:
    enabled: True
    instance:
      VIP:
        notify_action:
          master:
            - 'if [ -f /root/postgresql/flags/failover ]; then touch /var/lib/
↪postgresql/${postgresql:server:version}/main/trigger; fi'
          backup:
            - 'if [ -f /root/postgresql/flags/failover ]; then service postgresql␣
↪stop; fi'
          fault:
            - 'if [ -f /root/postgresql/flags/failover ]; then service postgresql␣
↪stop; fi'
```

Slave nodes

```
postgresql:
  server:
    enabled: true
    version: 9.6
    bind:
      address: 0.0.0.0
  cluster:
    enabled: true
    role: slave
    mode: hot_standby
    master:
      host: "172.16.10.100"
      port: 5432
      user: repuser
      password: password
keepalived:
  cluster:
    enabled: True
    instance:
      VIP:
        notify_action:
          master:
            - 'if [ -f /root/postgresql/flags/failover ]; then touch /var/lib/
↪postgresql/${postgresql:server:version}/main/trigger; fi'
          backup:
            - 'if [ -f /root/postgresql/flags/failover ]; then service postgresql␣
↪stop; fi'
          fault:
            - 'if [ -f /root/postgresql/flags/failover ]; then service postgresql␣
↪stop; fi'
```

Multi-master cluster

Multi-master cluster with 2ndQuadrant bi-directional replication plugin

Master node

```
postgresql:
  server:
    enabled: true
    version: 9.4
    bind:
      address: 0.0.0.0
    database:
      mydb:
        extension:
          bdr:
            enabled: true
          btree_gist:
            enabled: true
  cluster:
    enabled: true
    mode: bdr
    role: master
    members:
    - host: "172.16.10.101"
    - host: "172.16.10.102"
    - host: "172.16.10.101"
    local: "172.16.10.101"
    replication_user:
      name: repuser
      password: password
```

Slave node

```
postgresql:
  server:
    enabled: true
    version: 9.4
    bind:
      address: 0.0.0.0
    database:
      mydb:
        extension:
          bdr:
            enabled: true
          btree_gist:
            enabled: true
  cluster:
    enabled: true
    mode: bdr
    role: master
    members:
    - host: "172.16.10.101"
    - host: "172.16.10.102"
    - host: "172.16.10.101"
    local: "172.16.10.102"
    master: "172.16.10.101"
    replication_user:
      name: repuser
      password: password
```

Client

```
postgresql:
  client:
    server:
      server01:
        admin:
          host: database.host
          port: 5432
          user: root
          password: password
        database:
          mydb:
            enabled: true
            encoding: 'UTF8'
            locale: 'en_US'
            users:
            - name: test
              password: test
              host: localhost
              createdb: true
              rights: all privileges
            init:
              maintenance_db: mydb
              queries:
              - INSERT INTO login VALUES (11, 1) ;
              - INSERT INTO device VALUES (1, 11, 42);
```

Sample usage

Init database cluster with given locale

```
sudo su - postgres -c "/usr/lib/postgresql/9.3/bin/initdb /var/lib/postgresql/9.3/
↪main --locale=C"
```

Convert PostgreSQL cluster from 9.1 to 9.3

```
sudo su - postgres -c '/usr/lib/postgresql/9.3/bin/pg_upgrade -b /usr/lib/postgresql/
↪9.1/bin -B /usr/lib/postgresql/9.3/bin -d /var/lib/postgresql/9.1/main/ -D /var/lib/
↪postgresql/9.3/main/ -O "-c config_file=/etc/postgresql/9.3/main/postgresql.conf" -
↪o "-c config_file=/etc/postgresql/9.1/main/postgresql.conf"'
```

Ubuntu on 14.04 on some machines won't create default cluster

```
sudo pg_createcluster 9.3 main --start
```

More information

- http://www.postgresql.org/
- http://www.postgresql.org/docs/9.1/interactive/index.html
- http://momjian.us/main/writings/pgsql/hw_performance/
- https://gist.github.com/ibussieres/11262268 - upgrade instructions for ubuntu

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PowerDNS

Sample pillar:

PowerDNS server with MySQL backend

PowerDNS server with sqlite backend

Read more

RabbitMQ messaging system

RabbitMQ is a complete and highly reliable enterprise messaging system based on the emerging AMQP standard.

Sample pillars

Standalone Broker

RabbitMQ as AMQP broker with admin user and vhosts

```
rabbitmq:
  server:
    enabled: true
    bind:
      address: 0.0.0.0
      port: 5672
    secret_key: rabbit_master_cookie
    admin:
      name: adminuser
```

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```
      password: pwd
    plugins:
    - amqp_client
    - rabbitmq_management
    host:
      '/monitor':
        enabled: true
        user: 'monitor'
        password: 'password'
```

RabbitMQ as a Stomp broker

```
rabbitmq:
  server:
    enabled: true
    secret_key: rabbit_master_cookie
    bind:
      address: 0.0.0.0
      port: 5672
    host:
      '/monitor':
        enabled: true
        user: 'monitor'
        password: 'password'
    plugins:
    - rabbitmq_stomp
```

RabbitMQ cluster

RabbitMQ as base cluster node

```
rabbitmq:
  server:
    enabled: true
    bind:
      address: 0.0.0.0
      port: 5672
    secret_key: rabbit_master_cookie
    admin:
      name: adminuser
      password: pwd
  cluster:
    enabled: true
    role: master
    mode: disc
    members:
    - name: openstack1
      host: 10.10.10.212
    - name: openstack2
      host: 10.10.10.213
```

HA Queues definition

```
rabbitmq:
  server:
```

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```
    enabled: true
    ...
    host:
      '/monitor':
        enabled: true
        user: 'monitor'
        password: 'password'
        policies:
        - name: HA
          pattern: '^(?!amq\.).*'
          definition: '{"ha-mode": "all"}'
```

Enable TLS support

To enable support of TLS for rabbitmq-server you need to provide a path to cacert, server cert and private key :

```
rabbitmq:
   server:
     enabled: true
     ...
     ssl:
       enabled: True
       key_file: /etc/rabbitmq/ssl/key.pem
       cert_file: /etc/rabbitmq/ssl/cert.pem
       ca_file: /etc/rabbitmq/ssl/ca.pem
```

To manage content of these files you can either use the following options:

```
rabbitmq:
   server:
     enabled: true
     ...
     ssl:
       enabled: True

       key_file: /etc/rabbitmq/ssl/key.pem
       key: |
       -----BEGIN RSA PRIVATE KEY-----
                 ...
       -----END RSA PRIVATE KEY-------

       ca_file: /etc/rabbitmq/ssl/ca.pem
       cacert_chain: |
       -----BEGIN CERTIFICATE-----
                 ...
       -----END CERTIFICATE-------

       cert_file: /etc/rabbitmq/ssl/cert.pem
       cert: |
       -----BEGIN CERTIFICATE-----
                 ...
       -----END CERTIFICATE-------
```

Or you can use the *salt.minion.cert* salt state which creates all required files according to defined reclass model [1]. In this case you need just to enable ssl and nothing more:

```
rabbitmq:
   server:
     enabled: true
     ...
     ssl:
       enabled: True
```

–

Defaut port for TLS is **5671**:

```
rabbitmq:
  server:
    bind:
      ssl:
       port: 5671
```

1. https://github.com/Mirantis/reclass-system-salt-model/tree/master/salt/minion/cert/rabbitmq

Usage

Check cluster status, example shows running cluster with 3 nodes: ctl-1, ctl-2, ctl-3

```
> rabbitmqctl cluster_status

Cluster status of node 'rabbit@ctl-1' ...
[{nodes,[{disc,['rabbit@ctl-1','rabbit@ctl-2','rabbit@ctl-3']}]},
 {running_nodes,['rabbit@ctl-3','rabbit@ctl-2','rabbit@ctl-1']},
 {partitions,[]}]
...done.
```

Setup management user.

```
> rabbitmqctl add_vhost vhost
> rabbitmqctl add_user user alive
> rabbitmqctl set_permissions -p vhost user ".*" ".*" ".*"
> rabbitmqctl set_user_tags user management
```

EPD process is Erlang Port Mapper Daemon. It's a feature of the Erlang runtime that helps Erlang nodes to find each other. It's a pretty tiny thing and doesn't contain much state (other than "what Erlang nodes are running on this system?") so it's not a huge deal for it to still be running. Although it's running as user rabbitmq, it was started automatically by the Erlang VM when we started. We've considered adding "epmd -kill" to our shutdown script - but that would break any other Erlang apps running on the system; it's more "global" than RabbitMQ.

Read more

- http://www.rabbitmq.com/admin-guide.html
- https://github.com/saltstack/salt-contrib/blob/master/states/rabbitmq_plugins.py
- http://docs.saltstack.com/ref/states/all/salt.states.rabbitmq_user.html
- http://stackoverflow.com/questions/14699873/how-to-reset-user-for-rabbitmq-management
- http://www.rabbitmq.com/memory.html

Clustering

- http://www.rabbitmq.com/clustering.html#auto-config
- https://github.com/jesusaurus/hpcs-salt-state/tree/master/rabbitmq
- http://gigisayfan.blogspot.cz/2012/06/rabbit-mq-clustering-python-fabric.html
- http://docwiki.cisco.com/wiki/OpenStack_Havana_Release:_High-Availability_Manual_Deployment_Guide#RabbitMQ_Installation

Documentation and Bugs

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> http://salt-formulas.readthedocs.io/

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Redis formula

key value storage

Sample pillars

Redis localhost server

```
redis:
  server:
    enabled: true
    bind:
      address: 127.0.0.1
      port: 6379
      protocol: tcp
```

Redis world open

```
redis:
  server:
    enabled: true
    bind:
      address: 0.0.0.0
      port: 6379
      protocol: tcp
```

Redis modes

```
redis:
  server:
    enabled: true
    appendfsync: no | everysec | always
```

Redis cluster master

```
redis:
  cluster:
    enabled: True
    master:
      host: 192.168.1.100
      port: 6379
    mode: sentinel
    quorum: 2
    role: master
supervisor:
  server:
    service:
      redis_sentinel:
        name: sentinel
        type: redis
```

Redis cluster slave

```
redis:
  cluster:
    enabled: True
    master:
      host: 192.168.1.100
      port: 6379
    mode: sentinel
    quorum: 2
    role: slave
supervisor:
  server:
    service:
      redis_sentinel:
        name: sentinel
        type: redis
```

Command usage

Removes data from your connection's CURRENT database.

> > redis-cli FLUSHDB

Removes data from ALL databases.

> redis-cli FLUSHALL

More information

- http://redis.io/topics/admin
- http://redis.io/topics/quickstart
- http://redis.io/topics/persistence

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rsync Formula

rsync is an open source utility that provides fast incremental file transfer.

Sample Metadata

```
rsync:
  server:
    enabled: true
    bind:
      address: 0.0.0.0
    module:
      name:
        max_connections: 2
        path: /srv/rsync
        read_only: False
    timeout: 300
```

References

- http://rsync.samba.org/
- http://www.togaware.com/linux/survivor/Rsync_Server.html

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https://github.com/salt-formulas/salt-formula-rsync

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Supervisor Formula

Supervisor is a client/server system that allows its users to monitor and control a number of processes on UNIX-like operating systems.

It shares some of the same goals of programs like launchd, daemontools, and runit. Unlike some of these programs, it is not meant to be run as a substitute for init as "process id 1". Instead it is meant to be used to control processes related to a project or a customer, and is meant to start like any other program at boot time.

Sample Pillars

Robotice services

```
supervisor:
  server:
    enabled: true
    service:
      robotice_planner:
        name: planner
        type: robotice
      robotice_monitor:
        name: monitor
        type: robotice
```

OctoPrint services

```
supervisor:
  server:
    enabled: true
    service:
      octoprint_server:
        name: server
        type: octoprint
```

Sentry services

```
supervisor:
  server:
    enabled: true
    service:
      sentry_web:
        name: web
        type: sentry
      sentry_worker:
        name: worker
        type: sentry
```

More Information

- http://supervisord.org/

Documentation and Bugs

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http://salt-formulas.readthedocs.io/

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https://github.com/salt-formulas/salt-formula-supervisor/issues

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varnish

Varnish cache.

Sample pillars

Single varnish service

```
varnish:
  server:
    enabled: true
    version: 4.0
    lookup:
      varnish_leonardo_majklk:
        type: leonardo
        name: leonardo_majklk
        bind:
          port: 7000
          host: 0.0.0.0
        backend:
          gunicorn1:
            host: localhost
            port: 80
```

And Supervisor like this:: yaml

supervisor:

server:

service:

varnish_leonardo_majklk: name: leonardo_majklk type: varnish

Note: This formulas runs varnish processes under supervisor instead of init script.

Using nginx type:: yaml

nginx:

server:

site:

leonardo_majklk: enabled: true type: varnish name: varnish_leonardo_majklk host:

name: domain.com

Read more

- links

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https://github.com/salt-formulas/salt-formula-varnish/issues

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zookeeper

Service zookeeper description

Sample pillars

Single zookeeper service

```
zookeeper:
  server:
    enabled: true
    members:
    - host: ${_param:single_address}
      id: 1
```

Cluster zookeeper service

```
zookeeper:
  server:
    enabled: true
    members:
    - host: ${_param:cluster_node01_address}
      id: 1
    - host: ${_param:cluster_node02_address}
      id: 2
    - host: ${_param:cluster_node03_address}
      id: 3
```

Backup client with ssh/rsync remote host

```
  zookeeper:
    backup:
      client:
        enabled: true
        full_backups_to_keep: 3
        hours_before_full: 24
        target:
          host: cfg01

.. note:: full_backups_to_keep param states how many backup will be stored locally on␣
↪zookeeper client.
          More options to relocate local backups can be done using salt-formula-
↪backupninja.
```

Backup client with local backup only

```
  zookeeper:
    backup:
      client:
        enabled: true
        full_backups_to_keep: 3
        hours_before_full: 24

.. note:: full_backups_to_keep param states how many backup will be stored locally on␣
↪zookeeper client
```

Backup server rsync

```
zookeeper:
  backup:
    server:
      enabled: true
      hours_before_full: 24
      full_backups_to_keep: 5
      key:
        zookeeper_pub_key:
          enabled: true
          key: ssh_rsa
```

Client restore from local backup:

```
  zookeeper:
    backup:
      client:
        enabled: true
        full_backups_to_keep: 3
        hours_before_full: 24
        target:
          host: cfg01
        restore_latest: 1
        restore_from: local

.. note:: restore_latest param with a value of 1 means to restore db from the last␣
↪full backup. 2 would mean to restore second latest full backup.
```

Client restore from remote backup:

```
  zookeeper:
    backup:
      client:
        enabled: true
        full_backups_to_keep: 3
        hours_before_full: 24
        target:
          host: cfg01
        restore_latest: 1
        restore_from: remote

.. note:: restore_latest param with a value of 1 means to restore db from the last␣
↪full backup. 2 would mean to restore second latest full backup.
```

Read more

- links

Documentation and Bugs

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- Documentation Home
- Project Introduction
- Installation and Operations Manual
- Development Documentation

Home SaltStack-Formulas Project Introduction

Deployment Services

Deployment services for automated delivery pipelines.

Formula	Repository
gateone	https://github.com/salt-formulas/salt-formula-gateone
foreman	https://github.com/salt-formulas/salt-formula-foreman
isc-dhcp	https://github.com/salt-formulas/salt-formula-isc-dhcp
libvirt	https://github.com/salt-formulas/salt-formula-libvirt
maas	https://github.com/salt-formulas/salt-formula-maas
stackstorm	https://github.com/salt-formulas/salt-formula-stackstorm
tftpd-hpa	https://github.com/salt-formulas/salt-formula-tftpd-hpa
vagrant	https://github.com/salt-formulas/salt-formula-vagrant
virtualbox	https://github.com/salt-formulas/salt-formula-virtualbox

GateOne Formula

Gate One is an open source, web-based terminal emulator with a powerful plugin system. It comes bundled with a plugin that turns Gate One into an amazing SSH client but Gate One can actually be used to run any terminal application. You can even embed Gate One into other applications to provide an interface into serial consoles, virtual servers, or anything you like. It's a great supplement to any web-based administration interface.

Sample Pillars

```
gateone:
  server:
  enabled: true
  bind:
    address: '0.0.0.0'
    port: 8888
    protocol: 'tcp'
  auth:
    engine: pam
    realm: local
```

More Information

- http://liftoff.github.io/GateOne/
- https://github.com/liftoff/GateOne

Documentation and Bugs

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Foreman

Foreman is aimed to be a Single Address For All Machines Life Cycle Management.

- Foreman integrates with Puppet (and acts as web front end to it).
- Foreman takes care of provisioning until the point puppet is running, allowing Puppet to do what it does best.
- Foreman shows you Systems Inventory (based on Facter) and provides real time information about hosts status based on Puppet reports.
- Foreman creates everything you need when adding a new machine to your network,It's goal being automatically managing everything you would normally manage manually - this include DNS, DHCP, TFTP, Virtual Machines, PuppetCA, CMDB etc.

Sample pillar

Foreman server to use with apache

```
foreman:
  server:
    enabled: true
    domain: domain.com
    fqdn: foreman.domain.com
    database:
      engine: 'postgresql'
      host: '127.0.0.1'
      name: 'foreman'
      password: 'password'
      user: 'foreman'
    mail:
      host: mail.domain.com
      password: passwd
      user: robot@domain.com
      domain: domain.com
```

Foreman smart proxy

```
foreman:
  smart_proxy:
    enabled: true
```

Usage

Generated user:pasword is in database seed and printed to the output during db:seed process.

Read more

- http://theforeman.org/manuals/1.5/index.html#3.InstallingForeman
- http://projects.theforeman.org/projects/foreman/wiki/Upgrade_instructions
- http://mauricio.github.io/2014/02/09/foreman-and-environment-variables.html

Documentation and Bugs

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ISC DHCP formula

Sample pillars

ISC DHCP server with defined host and subnet (client must use the same key)

```
isc_dhcp:
  server:
    enabled: true
    omapi_port: 7911
    omapi_key: iFdQ0kvpUo+3gzXGJTpjk7/
↪dl9DI5SuDqMzasDUhBRGEg6VfNYUX+MAU14WoJJZDQbrvC4Pgsdfdsfdsfdsdf==
    authoritative: true
    interfaces:
    - name: eth0
    - name: eth1
    domain_name: domain.com
    name_servers:
    - ns1.domain.com
    host:
      node1:
        mac: 00:11:22:33:44:55:66
        address: 192.168.0.1
        hostname: domain.com
    subnet:
      testsubnet:
        range: 10.0.0.1 10.0.0.100
        netmask: 255.255.255.0
        network: 10.0.0.0
        pxeserver: 10.1.1.1
```

More information

- http://chschneider.eu/linux/server/tftpd-hpa.shtml

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https://github.com/salt-formulas/salt-formula-isc-dhcp/issues

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Libvirt

Sample pillars

simple libvirt server

```
libvirt:
  server:
    enabled: true
    unix_sock_group: libvirt
    virtualizations:
    - kvm
    network:
      default:
        ensure: absent
```

```
libvirt:
  server:
    enabled: true
    network:
      default:
        ensure: absent #present, running, stopped, absent
      mydefault:
        xml: |
          <network>
```

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```
          <name>mydefault</name>
          <bridge name="virbr0"/>
          <forward/>
          <ip address="192.168.122.1" netmask="255.255.255.0">
            <dhcp>
              <range start="192.168.122.2" end="192.168.122.254"/>
            </dhcp>
          </ip>
        </network>
    ovs-net:
      autostart: False
      xml: |
        <network>
          <name>ovs-net</name>
          <forward mode='bridge'/>
          <bridge name='ovsbr0'/>
          <virtualport type='openvswitch'>
            <parameters interfaceid='09b11c53-8b5c-4eeb-8f00-d84eaa0aaa4f'/>
          </virtualport>
        </network>
```

```
libvirt:
  server:
    enabled: true
    pool:
      virtimages:
        type: dir
        path: /var/lib/libvirt/images
        xml: |
          <pool type="dir">
            <name>virtimages</name>
              <target>
                <path>/var/lib/libvirt/images</path>
              </target>
          </pool>
      virtimages2:
        ensure: absent
        type: dir
        path: /var/lib/libvirt/images2
        xml: |
          <pool type="dir">
            <name>virtimages2</name>
              <target>
                <path>/var/lib/libvirt/images2</path>
              </target>
          </pool>
```

Read more

- https://github.com/bechtoldt/saltstack-libvirt-formula

Documentation and Bugs

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Metal as a Service

Service maas description

Sample pillars

Single maas service

```
maas:
  server:
    enabled: true
```

Single MAAS region service [single UI/API]

```
maas:
  salt_master_ip: 192.168.0.10
  region:
    upstream_proxy:
      address: 10.0.0.1
      port: 8080
      user: username      #OPTIONAL
      password: password  #OPTIONAL
    theme: mirantis
    bind:
      host: 192.168.0.10:5240
      port: 5240
    admin:
      username: exampleuser
      password: examplepassword
      email:  email@example.com
    database:
      engine: null
      host: localhost
      name: maasdb
```

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```
      password: qwqwqw
      username: maas
    enabled: true
    user: mirantis
    token: "89EgtWkX45ddjMYpuL:SqVjxFG87Dr6kVf4Wp:5WLfbUgmm9XQtJxm3V2LUUy7bpCmqmnk"
    fabrics:
      test-fabric1:
        description: "Test fabric"
      test-fabric2:
        description: "Test fabric2"
    subnets:
      subnet1:
        fabric: test-fabric1
        cidr: 2.2.3.0/24
        gateway_ip: 2.2.3.2
        iprange: # reserved range for DHCP\auto mapping
          start: 2.2.3.20
          end: 2.2.3.250
    dhcp_snippets:
      test-snippet:
        value: option bootfile-name "tftp://192.168.0.10/snippet";
        description: Test snippet
        enabled: true
        subnet: subnet1
    boot_resources:
      bootscript1:
        title: bootscript
        architecture: amd64/generic
        filetype: tgz
        content: /srv/salt/reclass/nodes/path_to_file
    package_repositories:
      Saltstack:
        url: http://repo.saltstack.com/apt/ubuntu/14.04/amd64/2016.3/
        distributions:
             - trusty
        components:
            - main
        arches: amd64
        key: "-----BEGIN PGP PUBLIC KEY BLOCK-----
             Version: GnuPG v2

             mQENBFOpvpgBCADkP656H41i8fpplEEB8IeLhugyC2rTEwwSclb8tQNYtUiGdna9
              ......
             fuBmScum8uQTrEF5+Um5zkwC7EXTdH1co/+/V/fpOtxIg4XO4kcugZefVm5ERfVS
             MA==
             =dtMN
             -----END PGP PUBLIC KEY BLOCK-----"
        enabled: true
    machines:
      machine1_new_schema:
        pxe_interface_mac: "11:22:33:44:55:66" # Node will be identified by those mac
        interfaces:
          nic01: # could be any, used for iterate only
            type: eth # NotImplemented
            name: eth0 # Override default nic name. Interface to rename will be
↪identified by mac
            mac: "11:22:33:44:55:66"
```

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```
          mode: "static"
          ip: "2.2.3.19"  # ip should be out of reserved subnet range, but still in␣
↪subnet range
          subnet: "subnet1"
          gateway: "2.2.3.2" # override default gateway from subnet
        nic02:
          type: eth # Not-implemented
          mac: "11:22:33:44:55:78"
          subnet: "subnet2"
          mode: "dhcp"
      power_parameters:
        power_type: ipmi
        power_address: '192.168.10.10'
        power_user: bmc_user
        power_password: bmc_password
        #Optional (for legacy HW)
        power_driver: LAN
      distro_series: xenial
      hwe_kernel: hwe-16.04
    machine1_old_schema:
      interface:
          mac: "11:22:33:44:55:88"  # Node will be identified by those mac
          mode: "static"
          ip: "2.2.3.15"
          subnet: "subnet1"
          gateway: "2.2.3.2"
      power_parameters:
        power_type: ipmi
        power_address: '192.168.10.10'
        power_user: bmc_user
        power_password: bmc_password
        #Optional (for legacy HW)
        power_driver: LAN
        # FIXME: that's should be moved into another,livirt example.
        # Used in case of power_type: virsh
        power_id: my_libvirt_vm_name
      distro_series: xenial
      hwe_kernel: hwe-16.04
  devices:
    machine1-ipmi:
      interface:
        ip_address: 192.168.10.10
        subnet: cidr:192.168.10.0/24
      mac: '66:55:44:33:22:11'
  commissioning_scripts:
    00-maas-05-simplify-network-interfaces: /etc/maas/files/commisioning_scripts/00-
↪maas-05-simplify-network-interfaces
  maas_config:
    domain: mydomain.local
    http_proxy: http://192.168.0.10:3142
    commissioning_distro_series: xenial
    default_distro_series: xenial
    default_osystem: 'ubuntu'
    default_storage_layout: lvm
    disk_erase_with_secure_erase: true
    dnssec_validation: 'no'
    enable_third_party_drivers: true
```

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```
      maas_name: cfg01
      network_discovery: 'enabled'
      active_discovery_interval: '600'
      ntp_external_only: true
      ntp_servers: 10.10.11.23 10.10.11.24
      upstream_dns: 192.168.12.13
      enable_http_proxy: true
      default_min_hwe_kernel: ''
     sshprefs:
      - 'ssh-rsa ASD.........dfsadf blah@blah'
```

Usage of local repos

```
maas:
  cluster:
    enabled: true
    region:
      port: 80
      host: localhost
    saltstack_repo_key: |
      -----BEGIN PGP PUBLIC KEY BLOCK-----
      Version: GnuPG v2

      mQENBFOpvpgBCADkP656H41i8fpplEEB8IeLhugyC2rTEwwSclb8tQNYtUiGdna9
      .....
      fuBmScum8uQTrEF5+Um5zkwC7EXTdH1co/+/V/fpOtxIg4XO4kcugZefVm5ERfVS
      MA==
      =dtMN
      -----END PGP PUBLIC KEY BLOCK-----
    saltstack_repo_xenial: "http://${_param:local_repo_url}/ubuntu-xenial stable salt"
    saltstack_repo_trusty: "http://${_param:local_repo_url}/ubuntu-trusty stable salt"
```

Single MAAS cluster service [multiple racks]

```
maas:
  cluster:
    enabled: true
    role: master/slave
```

```
maas:
  cluster:
    enabled: true
    role: master/slave
```

MAAS region service with backup data

Module function's example:

- Wait for status of selected machine's:

```
> cat maas/machines/wait_for_machines_ready.sls

...

wait_for_machines_ready:
```

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```
  module.run:
  - name: maas.wait_for_machine_status
  - kwargs:
        machines:
          - kvm01
          - kvm02
        timeout: 1200 # in seconds
        req_status: "Ready"
  - require:
    - cmd: maas_login_admin
  ...
```

If module run w/o any extra paremeters - *wait_for_machines_ready* will wait for defined in salt machines. In those case, will be usefull to skip some machines:

```
> cat maas/machines/wait_for_machines_deployed.sls

...

wait_for_machines_ready:
  module.run:
  - name: maas.wait_for_machine_status
  - kwargs:
        timeout: 1200 # in seconds
        req_status: "Deployed"
        ignore_machines:
           - kvm01 # in case it's broken or whatever
  - require:
    - cmd: maas_login_admin
  ...
```

List of available *req_status* defined in global variable:

```
STATUS_NAME_DICT = dict([
    (0, 'New'), (1, 'Commissioning'), (2, 'Failed commissioning'),
    (3, 'Missing'), (4, 'Ready'), (5, 'Reserved'), (10, 'Allocated'),
    (9, 'Deploying'), (6, 'Deployed'), (7, 'Retired'), (8, 'Broken'),
    (11, 'Failed deployment'), (12, 'Releasing'),
    (13, 'Releasing failed'), (14, 'Disk erasing'),
    (15, 'Failed disk erasing')])
```

Read more

- https://maas.io/

Documentation and Bugs

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http://salt-formulas.readthedocs.io/

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stackstorm

Service stackstorm description

Sample pillars

Single stackstorm service

```
stackstorm:
  server:
    enabled: true
    version: icehouse
```

Read more

- links

TFTPD HPA formula

A TFTP server is mainly required for booting operating systems or configurations over the network.

Sample pillars

TFTPD HPA server

```
tftpd_hpa:
  server:
    enabled: true
```

More information

- http://chschneider.eu/linux/server/tftpd-hpa.shtml

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> https://github.com/salt-formulas/salt-formula-tftpd-hpa/issues

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Vagrant formula

Vagrant provides easy to configure, reproducible, and portable work environments built on top of industry-standard technology and controlled by a single consistent workflow to help maximize the productivity and flexibility of you and your team.

To achieve its magic, Vagrant stands on the shoulders of giants. Machines are provisioned on top of VirtualBox, VMware, AWS, or any other provider. Then, industry-standard provisioning tools such as shell scripts, Chef, or Puppet, can be used to automatically install and configure software on the machine.

Sample pillars

Vagrant with VirtualBox cluster

```
vagrant:
  control:
    enabled: true
    cluster:
      clustername:
        provider: virtualbox
        domain: local.domain.com
        control:
          engine: salt
          host: salt.domain.com
          version: '2016.3'
        node:
          box1:
            status: suspended
            image: ubuntu1204
            memory: 512
```

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```
            cpus: 1
            networks:
            - type: hostonly
              address: 10.10.10.110
```

Vagrant with Windows plugin

```
vagrant:
  control:
    enabled: true
    plugin:
      vagrant-windows:
        version: 1.2.3
```

Vagrant with presseded images

```
vagrant:
  control:
    enabled: true
    image:
      ubuntu1204:
        source: http://files.vagrantup.com/precise64.box
```

Sample usage

Start and connect machine

```
cd /srv/vagrant/<cluster_name>
vagrant up <node_name>
vagrant ssh <node_name>
```

More information

- http://www.vagrantup.com/
- http://docs.vagrantup.com/v2/
- http://docs.vagrantup.com/v2/synced-folders/

Documentation and Bugs

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http://salt-formulas.readthedocs.io/

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https://github.com/salt-formulas/salt-formula-vagrant/issues

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VirtualBox

VirtualBox is a general-purpose full virtualizer for x86 hardware, targeted at server, desktop and embedded use.

Sample pillars

VirtualBox version 4.3

```
virtualbox:
  host:
    enabled: true
    version: 4.3
    extensions: false
```

VirtualBox version 5.0

```
virtualbox:
  host:
    enabled: true
    version: 5.0
```

Read more

- https://www.virtualbox.org/wiki/Technical_documentation
- http://ubuntuforums.org/showthread.php?t=1810768
- https://www.virtualbox.org/wiki/Linux_Downloads

Documentation and Bugs

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- Documentation Home
- Project Introduction
- Installation and Operations Manual
- Development Documentation

Home SaltStack-Formulas Project Introduction

Integration Services

Continuous integration services for automated integration and delivery pipelines.

Formula	Repository
aptly	https://github.com/salt-formulas/salt-formula-aptly
artifactory	https://github.com/salt-formulas/salt-formula-artifactory
gerrit	https://github.com/salt-formulas/salt-formula-gerrit
gitlab	https://github.com/salt-formulas/salt-formula-gitlab
gource	https://github.com/salt-formulas/salt-formula-gource
jenkins	https://github.com/salt-formulas/salt-formula-jenkins
owncloud	https://github.com/salt-formulas/salt-formula-owncloud
packer	https://github.com/salt-formulas/salt-formula-packer
roundcube	https://github.com/salt-formulas/salt-formula-roundcube

Aptly

Install and configure Aptly server and client.

Available states

- *aptly.server*
- *aptly.publisher*

aptly.server

Setup aptly server

aptly.publisher

Setup aptly publisher

Available metadata

- *metadata.aptly.server.single*
- *metadata.aptly.client.publisher*

metadata.aptly.server.single

Setup basic server

metadata.aptly.client.publisher

Setup aptly publisher client

Configuration parameters

Example reclass

Basic Aptly server with no repos or mirrors.

```
classes:
- service.aptly.server.single
parameters:
   aptly:
     server:
       enabled: true
       secure: true
       gpg_keypair_id: A76882D3
       gpg_passphrase:
       gpg_public_key: |
         -----BEGIN PGP PUBLIC KEY BLOCK-----
         Version: GnuPG v1
         ...
       gpg_private_key: |
         -----BEGIN PGP PRIVATE KEY BLOCK-----
         Version: GnuPG v1
         ...
```

Define s3 endpoint:

```
parameters:
  aptly:
    server:
      endpoint:
        mys3endpoint:
```

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```
        engine: s3
        awsAccessKeyID: xxxx
        awsSecretAccessKey: xxxx
        bucket: test
```

Example pillar

```
aptly:
  server:
    enabled: true
    repo:
      myrepo:
        distribution: trusty
        component: main
        architectures: amd64
        comment: "Custom components"
        sources: false
        publisher:
          component: mycomponent
          distributions:
            - nightly/trusty
```

Basic Aptly server mirrors

```
aptly:
  server:
    mirror:
      mirror_name:
        source: http://example.com/debian
        distribution: xenial
        components: main
        architectures: amd64
        gpgkeys: 460F3999
        filter: "!(Name (% *-dbg))"
        filter_with_deps: true
        publisher:
          component: example
          distributions:
            - xenial/repo/nightly
            - "s3:aptcdn:xenial/repo/nightly"
```

Proxy environment variables (optional) in cron job for mirroring script

```
aptly:
  server:
    enabled: true
    ...
    mirror_update:
      enabled: true
      http_proxy: "http://1.2.3.4:8000"
      https_proxy: "http://1.2.3.4:8000"
    ...
```

Read more

- http://www.aptly.info/doc/configuration/

Documentation and Bugs

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Artifactory

JFrog Artifactory is the only Universal Repository Manager supporting all major packaging formats, build tools and CI servers.

Sample pillars

Server

Single artifactory OSS edition from OS package

```
artifactory:
  server:
    enabled: true
    edition: oss
    version: 4
    source:
      engine: pkg
```

Single artifactory pro edition from OS package

```
artifactory:
  server:
    enabled: true
```

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```
    edition: pro
    version: 4
    source:
      engine: pkg
```

Single artifactory with PostgreSQL database

```
artifactory:
  server:
    database:
      engine: postgresql
      host: localhost
      port: 5432
      name: artifactory
      user: artifactory
      password: pass
```

Client

Basic client setup

```
artifactory:
  client:
    enabled: true
    server:
      host: 10.10.10.148
      port: 8081
      user: admin
      password: password
```

Artifactory repository definition

```
artifactory:
  client:
    enabled: true
  repo:
    local_artifactory_repo:
      name: local_artifactory_repo
      package_type: docker
      repo_type: local
    remote_artifactory_repo:
      name: remote_artifactory_repo
      package_type: generic
      repo_type: remote
      url: "http://totheremoterepo:80/"
```

Repository configuration

Sample pillar above shows basic repository configuration, but you can use any parameters described in https://www.jfrog.com/confluence/display/RTF/Repository+Configuration+JSON

This module does direct map from pillar parameters to repository JSON description with two aliases for compatibility:

- repo_type -> rclass

- package_type -> packageType

Read more

- https://www.jfrog.com/confluence/display/RTF/Debian+Repositories
- https://www.jfrog.com/confluence/display/RTF/PostgreSQL
- https://www.jfrog.com/confluence/display/RTF/Artifactory+REST+API#ArtifactoryRESTAPI-REPOSITORIES
- https://www.jfrog.com/confluence/display/RTF/Repository+Configuration+JSON

Documentation and Bugs

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Gerrit

Gerrit provides web based code review and repository management for the Git version control system.

Sample pillars

Simple gerrit service

```
gerrit:
  server:
    enabled: true
    source:
      engine: http
      address: https://gerrit-ci.gerritforge.com/job/Gerrit-stable-2.13/20/artifact/
↪buck-out/gen/gerrit.war
      hash: 2e17064b8742c4622815593ec496c571
```

Full service setup

```
  gerrit:
    server:
      canonical_web_url: http://10.10.10.148:8082/
      email_private_key: ""
      token_private_key: ""
      initial_user:
        full_name: John Doe
        email: 'mail@jdoe.com'
        username: jdoe
      plugin:
        download-commands:
          engine: gerrit
#         replication:
#           engine: gerrit
        reviewnotes:
          engine: gerrit
        singleusergroup:
          engine: gerrit
      ssh_rsa_key: |
        -----BEGIN RSA PRIVATE KEY-----
        MIIEowIBAAKCAQEAs0Y8mxS3dfs5zG8Du5vdBkfOCOng1IEUmFZIirJ8oBgJOd54
        QgmkDFB7oP9eTCgz9k/rix1uJWhhVCMBzrWzH5IODO+tyy/tK66pv2BWtVfTDhBA
        nShOLDNbSIBaV8E/NcrbnQN+b0alp4N7rQnavkOYl+JQncKjz1csmCodirscB9Oj
        rdo6NG9olv9IQd/tDQxEeDyQkoW50aCEWcq7o+QaTzgnlrL+XZEzhzjdcvA9m8go
        ...
        jvMXms60iD/A5OpG33LWHNNzQBP486SxG75LB+Xs5sp5j2/b7VF5LJLhpGiJv9Mk
        ydbuy8iuuvali2uF133kAlLqnrWfVTYQQI1OfW5glOv1L6kv94dU
        -----END RSA PRIVATE KEY-----
      ssh_rsa_key_pub: ssh-rsa␣
↪AAAAB3NzaC1yc2EAAAADAQABAAABAQCzRjybFLd1+znMbwO7m90GR84I6eDUgRSYVkiKsnygGAk53nhCCaQMUHug/
↪15MKDP2T+uLHW4laGFUIwHOtbMfkg4M763LL+0rrqm/
↪YFa1V9MOEECdKE4sM1tIgFpXwT81ytudA35vRqWng3utCdq+Q5iX41CdwqPPVyyYKh2KuxwH06Ot2jo0b2iW/
↪0hB3+0NDER4PJCShbnRoIRZyruj5BpPOCeWsv5dkTOHON1y8D2byCgNGdCBIRx7x9Qb4dKK2F01r0/
↪bfBGxELJzBdQ8XO14bQ7VOd3gTxrccTM4tVS7/uc/vtjiq7MKjnHGf/svbw9bTHAXbXcWXtOlRe51
      email: mail@domain.com
      auth:
        engine: HTTP
      source:
        engine: http
        address: https://gerrit-releases.storage.googleapis.com/gerrit-2.12.4.war
        hash: sha256=45786a920a929c6258de6461bcf03ddec8925577bd485905f102ceb6e5e1e47c
            receive_timeout: 5min
      sshd:
        threads: 64
        batch_threads: 16
        max_connections_per_user: 64
      database:
        engine: postgresql
        host: localhost
        port: 5432
        name: gerrit
        user: gerrit
        password: ${_param:postgresql_gerrit_password}
        pool_limit: 250
        pool_max_idle: 16
```

Gerrit change auto abandon

```
gerrit:
  server:
    change_cleanup:
      abandon_after: 3months
```

Gerrit client enforcing groups

```
gerrit:
  client:
    group:
      Admin001:
        description: admin 01
      Admin002:
        description: admin 02
```

Gerrit client enforcing users, install using pip

```
gerrit:
  client:
    source:
      engine: pip
    user:
      jdoe:
        fullname: John Doe
        email: "jdoe@domain.com"
        ssh_key: ssh-rsa
        http_password: password
        groups:
        - Admin001
```

Gerrit client enforcing projects

```
gerrit:
  client:
    enabled: True
    server:
      host: 10.10.10.148
      user: newt
      key: |
        -----BEGIN RSA PRIVATE KEY-----
        MIIEowIBAAKCAQEAs0Y8mxS3dfs5zG8Du5vdBkfOCOng1IEUmFZIirJ8oBgJOd54
        QgmkDFB7oP9eTCgz9k/rix1uJWhhVCMBzrWzH5IODO+tyy/tK66pv2BWtVfTDhBA
        ...
        l1UrxQKBgEklBTuEiDRibKGXQBwlAYvK2He09hWpqtpt9/DVel6s4A1bbTWDHyoP
        jvMXms60iD/A5OpG33LWHNNzQBP486SxG75LB+Xs5sp5j2/b7VF5LJLhpGiJv9Mk
        ydbuy8iuuvali2uF133kAlLqnrWfVTYQQI1OfW5glOv1L6kv94dU
        -----END RSA PRIVATE KEY-----
      email: "Project Creator <infra@lists.domain.com>"
    project:
      test_salt_project:
        enabled: true
```

Gerrit client enforcing project, full project example

```
gerrit:
  client:
    enabled: True
```

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```
    project:
      test_salt_project:
        enabled: true
        access:
          "refs/heads/*":
            actions:
            - name: abandon
              group: openstack-salt-core
            - name: create
              group: openstack-salt-release
            labels:
            - name: Code-Review
              group: openstack-salt-core
              score: -2..+2
            - name: Workflow
              group: openstack-salt-core
              score: -1..+1
          "refs/tags/*":
            actions:
            - name: pushSignedTag
              group: openstack-salt-release
        inherit_access: All-Projects
        require_change_id: true
        require_agreement: true
        merge_content: true
        action: "fast forward only"
```

```
gerrit:
  client:
    enabled: True
    group:
      groupname:
        enabled: true
        members:
        - username
    account:
      username:
        enabled: true
        full_name: hovno
        email: mail@newt.cz
        public_key: rsassh
        http_password: passwd
```

Sample project access

```
[access "refs/*"]
  read = group Administrators
  read = group Anonymous Users
[access "refs/for/refs/*"]
  push = group Registered Users
  pushMerge = group Registered Users
[access "refs/heads/*"]
  create = group Administrators
  create = group Project Owners
  forgeAuthor = group Registered Users
  forgeCommitter = group Administrators
```

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```
  forgeCommitter = group Project Owners
  push = group Administrators
  push = group Project Owners
  label-Code-Review = -2..+2 group Administrators
  label-Code-Review = -2..+2 group Project Owners
  label-Code-Review = -1..+1 group Registered Users
  label-Verified = -1..+1 group Non-Interactive Users
  submit = group Administrators
  submit = group Project Owners
  editTopicName = +force group Administrators
  editTopicName = +force group Project Owners
[access "refs/meta/config"]
  exclusiveGroupPermissions = read
  read = group Administrators
  read = group Project Owners
  push = group Administrators
  push = group Project Owners
  label-Code-Review = -2..+2 group Administrators
  label-Code-Review = -2..+2 group Project Owners
  submit = group Administrators
  submit = group Project Owners
[access "refs/tags/*"]
  pushTag = group Administrators
  pushTag = group Project Owners
  pushSignedTag = group Administrators
  pushSignedTag = group Project Owners
[label "Code-Review"]
  function = MaxWithBlock
  copyMinScore = true
  value = -2 This shall not be merged
  value = -1 I would prefer this is not merged as is
  value =  0 No score
  value = +1 Looks good to me, but someone else must approve
  value = +2 Looks good to me, approved
[label "Verified"]
  function = MaxWithBlock
  copyMinScore = true
  value = -1 Fails
  value =  0 No score
  value = +1 Verified
```

Read more

- https://www.gerritcodereview.com/
- https://gerrit-review.googlesource.com/Documentation/
- https://github.com/openstack-infra/puppet-gerrit/
- https://gerrit-ci.gerritforge.com/
- https://github.com/morucci/exzuul

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

http://salt-formulas.readthedocs.io/

In the unfortunate event that bugs are discovered, they should be reported to the appropriate issue tracker. Use Github issue tracker for specific salt formula:

https://github.com/salt-formulas/salt-formula-gerrit/issues

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#salt-formulas @ irc.freenode.net

Gitlab formula

Gitlab is a free git repository management application based on Ruby on Rails. It is distributed under the MIT License and its source code can be found on Github. It is a very active project with a monthly release cycle and ideal for businesses that want to keep their code private. Consider it as a self hosted Github but open source.

Sample metadata

Server role

Gitlab server with local MTA and PostgreSQL database

```
gitlab:
  server:
    enabled: true
    server_name: 'repo1.domain.com'
    source:
      engine: pkg
    database:
      engine: 'postgresql'
      host: 'locslhost'
      name: 'gitlab'
      password: 'LfTno5mYdZmRfoPV'
      user: 'gitlab'
    mail:
      engine: 'smtp'
      host: 'localhost'
      port: 25
      domain: 'domain.com'
      use_tls: false
      from: 'gitlab@domain.com'
      no_reply: 'no-reply@domain.com'
```

Gitlab server from custom source code repository

```
gitlab:
  server:
    enabled: true
    source:
      engine: git
      host: git://git.domain.com
    server_name: 'repo.domain.com'
```

Gitlab server with LDAP authentication

```
gitlab:
  server:
    enabled: true
    version: '6.2'
    server_name: 'repo1.domain.com'
    identity:
      engine: ldap
      host: lda.domain.com
      base: OU=ou,DC=domain,DC=com
      port: 389
      uid: sAMAccountName
      method: plain
      bind_dn: uid=ldap,ou=Users,dc=domain,dc=com
      password: pwd
```

Client role

Gitlab groups/namespaces

```
gitlab:
  client:
    enabled: true
    server:
      url: http:/repo.domain.com/
      token: fdsfdsfdsfdsfds
    group:
      hovno53:
        enabled: true
        description: some tex2
```

Gitlab repository enforcement with import url repository and deploy keys and hooks.

```
gitlab:
  client:
    enabled: true
    server:
      url: http:/repo.domain.com/
      token: fdsfdsfdsfdsfds
    repository:
      name-space/repo-name:
        enabled: true
        import_url: https://repo01.domain.com/namespace/repo.git
        description: Repo description
        deploy_key:
          keyname:
```

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```
          enabled: true
          key: public_part_of_ssh_key
      hook:
        hookname:
          enabled: true
          address: http://ci-tool/
```

More information

- https://github.com/gitlabhq/gitlabhq/blob/6-1-stable/doc/install/installation.md
- https://github.com/gitlabhq/gitlabhq/blob/master/doc/update/6.0-to-6.1.md
- https://github.com/gitlabhq/gitlabhq/tree/master/doc/update
- https://wiki.archlinux.org/index.php/gitlab
- https://github.com/gitlabhq/gitlabhq/issues/6687
- https://github.com/gitlabhq/gitlab-public-wiki/wiki/Trouble-Shooting-Guide

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Gource

OpenGL-based 3D visualisation tool for source control repositories. This formulas helps to generate video from multiple git reposiotires.

Sample pillars

Single gource service

```
gource:
client:
  enabled: true
  workspace: /media/majklk/9ECC42B6CC42890B
  video:
    leonardo:
      resolution: 1920x1080
      convert: true
      source:
        core:
          address: https://github.com/django-leonardo/django-leonardo.git
        package_index:
          address: https://github.com/leonardo-modules/leonardo-package-index.git
        blog:
          address: 'git@repo1.robotice.cz:leonardo-modules/leonardo-module-blog.git'
```

Read more

- links

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Jenkins formula

Jenkins CI is an open source automation server written in Java. Jenkins helps to automate the non-human part of software development process, with continuous integration and facilitating technical aspects of continuous delivery.

(*Source*: Wikipedia)

More information can be found at https://jenkins.io/

Setup jenkins client, works with Salt 2016.3+, supports pipeline workflow projects only now.

Dependencies

To install on Ubuntu, you will need to add the jenkins debian repository to the target server. You can do this with the salt-formula-linux formula , with the following pillar data:

```
linux:
  system:
    enabled: true
      repo:
      jenkins:
        enabled: true
        source: "deb http://pkg.jenkins.io/debian-stable binary/"
        key_url: "https://pkg.jenkins.io/debian/jenkins-ci.org.key"
```

This state will need to be applied *before* the jenkins state.

Using this formula

To use this formula, you must install the formula to your salt master as documented in saltstack formula docs

This formula is driven by pillar data, and can be used to install either a Jenkins Master or Client. See pillar data below for examples.

Sample pillars

Master role

Simple master with reverse proxy

```
nginx:
  server:
    site:
      jenkins:
        enabled: true
        type: nginx_proxy
        name: jenkins
        proxy:
          host: 127.0.0.1
          port: 8080
          protocol: http
        host:
          name: jenkins.example.com
          port: 80
jenkins:
  master:
    mode: EXCLUSIVE
    # Do not manage config.xml from Salt, use UI instead
    no_config: true
    slaves:
      - name: slave01
```

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```
        label: pbuilder
        executors: 2
      - name: slave02
        label: image_builder
        mode: EXCLUSIVE
        executors: 2
    views:
      - name: "Package builds"
        regex: "debian-build-.*"
      - name: "Contrail builds"
        regex: "contrail-build-.*"
      - name: "Aptly"
        regex: "aptly-.*"
    plugins:
    - name: slack
    - name: extended-choice-parameter
    - name: rebuild
    - name: test-stability
```

Jenkins master with experimental plugin source support

```
jenkins:
  master:
    enabled: true
    update_site_url: 'http://updates.jenkins-ci.org/experimental/update-center.json'
```

SMTP server settings

```
jenkins:
  master:
    email:
      engine: "smtp"
      host: "smtp.domain.com"
      user: "user@domain.cz"
      password: "smtp-password"
      port: 25
```

Script approvals from client

```
jenkins:
  client:
    approved_scripts:
      - method groovy.json.JsonSlurperClassic parseText java.lang.String
```

Script approvals

```
jenkins:
  master:
    approved_scripts:
    - method groovy.json.JsonSlurperClassic parseText java.lang.String
```

User enforcement

```
jenkins:
  master:
    user:
```

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```
      admin:
        api_token: xxxxxxxxxx
        password: admin_password
        email: admin@domain.com
      user01:
        api_token: xxxxxxxxxx
        password: user_password
        email: user01@domain.com
```

Agent (slave) role

```
jenkins:
  slave:
    master:
      host: jenkins.example.com
      port: 80
      protocol: http
    user:
      name: jenkins_slave
      password: dexiech6AepohthaiHook2iesh7ol5ook4Ov3leid3yek6daid2ooNg3Ee2oKeYo
    gpg:
      keypair_id: A76882D3
      public_key: |
        -----BEGIN PGP PUBLIC KEY BLOCK-----
        ...
      private_key: |
        -----BEGIN PGP PRIVATE KEY BLOCK-----
        ...
```

Client role

Simple client with workflow job definition

```
jenkins:
  client:
    master:
      host: jenkins.example.com
      port: 80
      protocol: http
    job:
      jobname:
        type: workflow
        param:
          bool_param:
            type: boolean
            description: true/false
            default: true
          string_param:
            type: string
            description: 1 liner
            default: default_string
          text_param:
            type: text
```

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```
            description: multi-liner
            default: default_text
      jobname_scm:
        type: workflow-scm
        concurrent: false
        scm:
          type: git
          url: https://github.com/jenkinsci/docker.git
          branch: master
          script: Jenkinsfile
          github:
            url: https://github.com/jenkinsci/docker
            name: "Jenkins Docker Image"
        trigger:
          timer:
            spec: "H H * * *"
          github:
          pollscm:
            spec: "H/15 * * * *"
          reverse:
            projects:
             - test1
             - test2
            state: SUCCESS
        param:
          bool_param:
            type: boolean
            description: true/false
            default: true
          string_param:
            type: string
            description: 1 liner
            default: default_string
          text_param:
            type: text
            description: multi-liner
            default: default_text
```

Inline Groovy scripts

```
jenkins:
  client:
    job:
      test_workflow_jenkins_simple:
        type: workflow
        display_name: Test jenkins simple workflow
        script:
          content: |
            node {
               stage 'Stage 1'
               echo 'Hello World 1'
               stage 'Stage 2'
               echo 'Hello World 2'
            }
      test_workflow_jenkins_input:
        type: workflow
        display_name: Test jenkins workflow inputs
```

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```
        script:
          content: |
            node {
               stage 'Enter string'
               input message: 'Enter job parameters', ok: 'OK', parameters: [
                 string(defaultValue: 'default', description: 'Enter a string.',␣
↪name: 'string'),
               ]
               stage 'Enter boolean'
               input message: 'Enter job parameters', ok: 'OK', parameters: [
                 booleanParam(defaultValue: false, description: 'Select boolean.',␣
↪name: 'Bool'),
               ]
               stage 'Enter text'
               input message: 'Enter job parameters', ok: 'OK', parameters: [
                 text(defaultValue: '', description: 'Enter multiline', name:
↪'Multiline')
               ]
            }
```

GIT controlled groovy scripts

```
jenkins:
  client:
    source:
      base:
       engine: git
        address: repo_url
        branch: branch
      domain:
       engine: git
        address: domain_url
        branch: branch
    job:
      test_workflow_jenkins_simple:
        type: workflow
        display_name: Test jenkins simple workflow
        param:
          bool_param:
            type: boolean
            description: true/false
            default: true
        script:
          repository: base
          file: workflows/test_workflow_jenkins_simple.groovy
      test_workflow_jenkins_input:
        type: workflow
        display_name: Test jenkins workflow inputs
        script:
          repository: domain
          file: workflows/test_workflow_jenkins_input.groovy
      test_workflow_jenkins_input_jenkinsfile:
        type: workflow
        display_name: Test jenkins workflow inputs (jenknisfile)
        script:
          repository: domain
          file: workflows/test_workflow_jenkins_input/Jenkinsfile
```

GIT controlled groovy script with shared libraries

```
jenkins:
  client:
    source:
      base:
       engine: git
        address: repo_url
        branch: branch
      domain:
       engine: git
        address: domain_url
        branch: branch
    job:
      test_workflow_jenkins_simple:
        type: workflow
        display_name: Test jenkins simple workflow
        param:
          bool_param:
            type: boolean
            description: true/false
            default: true
        script:
          repository: base
          file: workflows/test_workflow_jenkins_simple.groovy
        libs:
        - repository: base
          file: macros/cookiecutter.groovy
        - repository: base
          file: macros/git.groovy
```

Setting job max builds to keep (amount of last builds stored on Jenkins master)

```
jenkins:
  client:
    job:
      my-amazing-job:
        type: workflow
        discard:
          build:
            keep_num: 5
            keep_days: 5
          artifact:
            keep_num: 6
            keep_days: 6
```

Using job templates in similar way as in jjb. For now just 1 defined param is supported.

```
jenkins:
  client:
    job_template:
      test_workflow_template:
        name: test-{{formula}}-workflow
        template:
          type: workflow
          display_name: Test jenkins {{name}} workflow
          param:
            repo_param:
```

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```
              type: string
              default: repo/{{formula}}
          script:
            repository: base
            file: workflows/test_formula_workflow.groovy
        param:
          formula:
          - aodh
          - linux
          - openssh
```

Interpolating parameters for job templates.

```
_param:
  salt_formulas:
  - aodh
  - git
  - nova
  - xorg
jenkins:
  client:
    job_template:
      test_workflow_template:
        name: test-{{formula}}-workflow
        template:
          ...
        param:
          formula: ${_param:salt_formulas}
```

Or simply define multiple jobs and it's parameters to replace from template:

```
jenkins:
  client:
    job_template:
      test_workflow_template:
        name: test-{{name}}-{{myparam}}
        template:
          ...
        jobs:
          - name: firstjob
            myparam: dummy
          - name: secondjob
            myparam: dummyaswell
```

Purging undefined jobs from Jenkins

```
jenkins:
  client:
    purge_jobs: true
    job:
      my-amazing-job:
        type: workflow
```

Plugins management from client

```
jenkins:
  client:
```

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```
    plugin:
      swarm:
        restart: false
      hipchat:
        enabled: false
        restart: true
```

Adding plugin params to job

```
jenkins:
  client:
    job:
      my_plugin_parametrized_job:
        plugin_properties:
          throttleconcurrents:
            enabled: True
            max_concurrent_per_node: 3
            max_concurrent_total: 1
            throttle_option: category #one of project (default or category)
            categories:
              - my_throuttle_category
    plugin:
      swarm:
        restart: false
      hipchat:
        enabled: false
        restart: true
```

LDAP configuration (depends on LDAP plugin)

```
jenkins:
  client:
    security:
      ldap:
        server: 1.2.3.4
        root_dn: dc=foo,dc=com
        user_search_base: cn=users,cn=accounts
        manager_dn: ""
        manager_password: password
        user_search: ""
        group_search_base: ""
        inhibit_infer_root_dn: false
```

Matrix configuration (depends on auth-matrix plugin)

```
jenkins:
  client:
    security:
      matrix:
        # set true for use ProjectMatrixAuthStrategy instead of␣
↪GlobalMatrixAuthStrategy
        project_based: false
        permissions:
          Jenkins:
            # administrator access
            ADMINISTER:
              - admin
```

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```
            # read access (anonymous too)
            READ:
              - anonymous
              - user1
              - user2
            # agents permissions
            MasterComputer:
              BUILD:
                - user3
          # jobs permissions
          hudson:
            model:
              Item:
                BUILD:
                  - user4
```

Common matrix strategies

Views enforcing from client

```
jenkins:
  client:
    view:
     my-list-view:
       enabled: true
       type: ListView
       include_regex: ".*"
     my-view:
       # set false to disable
       enabled: true
       type: MyView
```

View specific params:

- include_regex for ListView and CategorizedJobsView
- categories for CategorizedJobsView

Categorized views

```
jenkins:
  client:
    view:
      my-categorized-view:
        enabled: true
        type: CategorizedJobsView
        include_regex: ".*"
        categories:
          - group_regex: "aptly-.*-nightly-testing"
            naming_rule: "Nightly -> Testing"
          - group_regex: "aptly-.*-nightly-production"
            naming_rule: "Nightly -> Production"
```

Credentials enforcing from client

```
jenkins:
  client:
    credential:
```

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```
      cred_first:
        username: admin
        password: password
      cred_second:
        username: salt
        password: password
      cred_with_key:
        username: admin
        key: SOMESSHKEY
```

Users enforcing from client

```
jenkins:
  client:
    user:
      admin:
        password: admin_password
        admin: true
      user01:
        password: user_password
```

Node enforcing from client using JNLP launcher

```
jenkins:
  client:
    node:
      node01:
        remote_home: /remote/home/path
        desc: node-description
        num_executors: 1
        node_mode: Normal
        ret_strategy: Always
        labels:
          - example
          - label
        launcher:
           type: jnlp
```

Node enforcing from client using SSH launcher

```
jenkins:
  client:
    node:
      node01:
        remote_home: /remote/home/path
        desc: node-description
        num_executors: 1
        node_mode: Normal
        ret_strategy: Always
        labels:
          - example
          - label
        launcher:
           type: ssh
           host: test-launcher
           port: 22
```

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```
          username: launcher-user
          password: launcher-pass
```

Configure Jenkins master

```
jenkins:
  client:
    node:
      master:
        num_executors: 1
        node_mode: Normal # or Exclusive
        labels:
          - example
          - label
```

Setting node labels

```
jenkins:
  client:
    label:
      node-name:
        lbl_text: label-offline
        append: false # set true for label append instead of replace
```

SMTP server settings from client

```
jenkins:
  client:
    smtp:
      host: "smtp.domain.com"
      username: "user@domain.cz"
      password: "smtp-password"
      port: 25
      ssl: false
      reply_to: reply_to@address.com
```

Jenkins admin user email enforcement from client

```
jenkins:
  client:
    smtp:
      admin_email: "My Jenkins <jenkins@myserver.com>"
```

Slack plugin configuration

```
jenkins:
  client:
    slack:
      team_domain: example.com
      token: slack-token
      room: slack-room
      token_credential_id: cred_id
      send_as: Some slack user
```

Pipeline global libraries setup

```yaml
jenkins:
  client:
    lib:
      my-pipeline-library:
        enabled: true
        url: https://path-to-my-library
        credential_id: github
        branch: master # optional, default master
        implicit: true # optional default true
```

Artifactory server enforcing

```
   jenkins:
     client:
       artifactory:
         my-artifactory-server:
           enabled: true
           url: https://path-to-my-library
           credential_id: github

Jenkins Global env properties enforcing

.. code-block:: yaml

    jenkins:
      client:
        globalenvprop:
          OFFLINE_DEPLOYMENT:
            enabled: true
            name: "OFFLINE_DEPLOYMENT" # optional, default using dict key
            value: "true"
```

Usage

Generate password hash:

```
echo -n "salt{plainpassword}" | openssl dgst -sha256
```

Place in the configuration `salt:hashpassword`.

External links

- https://wiki.jenkins-ci.org/display/JENKINS/Use+Jenkins

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> #salt-formulas @ irc.freenode.net

owncloud

Install and configure owncloud.

Available states

- *owncloud.server*

`owncloud.server`

Setup owncloud server

Available metadata

- *metadata.owncloud.server*

`metadata.owncloud.server`

Setup owncloud server

Requirements

- linux
- mysql (for mysql backend)
- apache

Optional

- memcached
- glusterfs (for clustered setup)

Configuration parameters

For complete list of parameters, please check `metadata/service/server.yml`

Example reclass

```
classes:
  - system.linux.system.single
  - service.memcached.server.local
  - service.apache.server.single
  - service.mysql.server.single
  - service.owncloud.server
params:
  salt_master_host: ${_param:reclass_config_master}
  mysql_admin_user: root
  mysql_admin_password: cloudlab
parameters:
  owncloud:
    server:
      version: 8.1.5.2
      # pwgen -A 12 | head -1
      instanceid: iy5opia6chae
      # pwgen 31 | head -1
      passwordsalt: Een7riefohSahchaigh9ohcho6xoaFe
      # pwgen -y 49 | head -1
      secret: |
        "guth9kee1fe9hoo\g6oowei6er9aigohK=ieM4uvojaicha4a"
      url: "http://owncloud.lxc.eru"
      trusted_domains:
        - owncloud.lxc.eru
      mail:
        domain: lxc.eru
      database:
        password: eikaithiuka2iex1ChieYaGeiguqu0iw
      cache:
        enabled: true
        servers:
          - address: localhost
      admin:
        username: admin
        password: cloudlab
      users:
        test:
          enabled: true
          group: Users
          password: test
          name: Test user
      appstore:
        experimental: true
```

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```
mysql:
  server:
    ssl:
      enabled: false
    database:
      owncloud:
        encoding: UTF8
        locale: cs_CZ
        users:
        - name: owncloud
          password: eikaithiuka2iex1ChieYaGeiguqu0iw
          host: localhost
          rights: all privileges
apache:
  server:
    site:
      owncloud:
        enabled: true
        type: owncloud
        name: owncloud
        host:
          Name: owncloud.lxc.eru
```

Read more

- https://doc.owncloud.org/
- http://sabre.io/dav/service-discovery/

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

http://salt-formulas.readthedocs.io/

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Packer

Packer is an open source tool for creating identical machine images for multiple platforms from a single source configuration. Packer is lightweight, runs on every major operating system, and is highly performant, creating machine images for multiple platforms in parallel.

Sample pillar

Basic linux distros

```
packer:
  build:
    system:
      ubuntu:
        source:
          engine: git
          address: https://github.com/boxcutter/ubuntu.git
          revision: master
        template:
          ubuntu1404-salt:
            file: ubuntu1404.json
            provisioner: salt
            builders:
            - vmware
            - virtualbox
          ubuntu1504-desktop-salt:
            file: ubuntu1504-desktop.json
            provisioner: salt
            builders:
            - vmware
            - virtualbox
```

Usage

Openstack image prepare guide

- Install cloud-init - add epel - package epel-centos 6, yum cloud-init
- Set network to DHCP
- /etc/udev.rules/70netrules - remove MAC address records

Read more

- http://www.packer.io/docs/installation.html
- http://www.packer.io/intro/getting-started/setup.html
- https://github.com/mitchellh/packer-ubuntu-12.04-docker
- https://github.com/boxcutter

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roundcube

Install and configure roundcube.

Available states

- *roundcube.server*

roundcube.server

Setup roundcube server

Available metadata

- *metadata.roundcube.server*

metadata.roundcube.server

Setup roundcube server

Requirements

- linux
- mysql (for mysql backend)
- dovecot

Configuration parameters

For complete list of parameters, please check `metadata/service/server.yml`

Example reclass

Server

```
classes:
  - service.roundcube.server
parameters:
 _param:
   postfix_origin: mail.eru
   mysql_roundcube_password: changeme
 roundcube:
   force_https: false
   mail:
     host: ${_param:postfix_origin}
 mysql:
   server:
     database:
       roundcube:
         encoding: UTF8
         locale: cs_CZ
         users:
         - name: roundcube
           password: ${_param:mysql_roundcube_password}
           host: 127.0.0.1
           rights: all privileges
 apache:
   server:
     site:
       roundcube:
         enabled: true
         type: static
         name: roundcube
         root: /usr/share/roundcube
         host:
           name: ${_param:postfix_origin}
           aliases:
             - ${linux:system:name}.${linux:system:domain}
             - ${linux:system:name}
```

Example pillar

Server

```
roundcube:
  server:
    mail:
      host: mail.cloudlab.cz
    session:
      # 24 random characters
      des_key: 'Ckhuv6VW6iUdbxpovKzhbepk'
      # 30 minutes
      lifetime: 30
    plugins:
      - archive
      - zipdownload
      - newmail_notifier
```

Read more

- https://roundcube.net/

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- Documentation Home
- Project Introduction
- Installation and Operations Manual
- Development Documentation

Home SaltStack-Formulas Project Introduction

Monitoring Services

Monitoring, metering and log collecting tools implementing complete monitoring stack.

Formula	Repository
collectd	https://github.com/salt-formulas/salt-formula-collectd
fluentd	https://github.com/salt-formulas/salt-formula-fluentd
grafana	https://github.com/salt-formulas/salt-formula-grafana
graphite	https://github.com/salt-formulas/salt-formula-graphite
heka	https://github.com/salt-formulas/salt-formula-heka
influxdb	https://github.com/salt-formulas/salt-formula-influxdb
kedb	https://github.com/salt-formulas/salt-formula-kedb
kibana	https://github.com/salt-formulas/salt-formula-kibana
nagios	https://github.com/salt-formulas/salt-formula-nagios
rsyslog	https://github.com/salt-formulas/salt-formula-rsyslog
sensu	https://github.com/salt-formulas/salt-formula-sensu
statsd	https://github.com/salt-formulas/salt-formula-statsd

Collectd formula

Collectd is a daemon which collects system performance statistics periodically and provides mechanisms to store the values in a variety of ways, for example in RRD files.

Sample pillars

Data writers

Send data over TCP to Graphite Carbon

```
collectd:
  client:
    enabled: true
    read_interval: 60
    backend:
      carbon_service:
        engine: carbon
        host: carbon1.comain.com
        port: 2003
```

Send data over AMQP

```
collectd:
  client:
    enabled: true
    read_interval: 60
    backend:
      amqp_broker:
        engine: amqp
        host: broker1.comain.com
        port: 5672
        user: monitor
```

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```
        password: amqp-pwd
        virtual_host: '/monitor'
```

Send data over HTTP

```
collectd:
  client:
    enabled: true
    read_interval: 60
    backend:
      http_service:
        engine: http
        host: service.comain.com
        port: 8123
```

Data collectors

Monitor network devices, defined in 'external' dictionary

```
external:
  network_device:
    MX80-01:
      community: test
      model: Juniper_MX80
      management:
        address: 10.0.0.254
        port: fxp01
        engine: snmp/ssh
      interface:
        xe-0/0/0:
          description: MEMBER-OF-LACP-TO-QFX
          type: 802.3ad
          subinterface:
            xe-0/0/0.0:
              description: MEMBER-OF-LACP-TO-QFX
collectd:
  client:
    enabled: true
    ...
```

Collecting the SNMP metrics

```
collectd:
  client:
    data:
      connected_devices:
        type: devices
        values:
        - IF-MIB::ifNumber.0
    host:
      ubiquity:
        address: 10.0.0.1
        community: public
        version: 2
```

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```
        data:
        - connected_devices
```

Collecting the cURL response times and codes

```
collectd:
  client:
    check:
      curl:
        service1:
          url: "https://service.domain.com:443/"
        service2:
          url: "https://service.domain.com:443/"
```

Collecting the ping response times

```
collectd:
  client:
    check:
      ping:
        host_label1:
          host: "172.10.31.14"
        host_label2:
          host: "172.10.31.12"
```

External links

- http://collectd.org/documentation.shtml
- http://www.canopsis.org/2013/02/collectd-graphite/
- http://collectd.org/documentation/manpages/collectd.conf.5.shtml#plugin_libvirt
- http://libvirt.org/uri.html#URI_qemu

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Fluentd Formula

Many web/mobile applications generate huge amount of event logs (c,f. login, logout, purchase, follow, etc). Analyzing these event logs can be quite valuable for improving services. However, collecting these logs easily and reliably is a challenging task.

Fluentd solves the problem by having: easy installation, small footprint, plugins reliable buffering, log forwarding, etc.

NOTE: WORK IN PROGRES NOTE: DESIGN OF THIS FORMULA IS NOT YET STABLE AND MAY CHANGE NOTE: FORMULA NOT COMPATIBLE WITH OLD VERSION

Sample Pillars

General pillar structure

```
fluentd:
  config:
    label:
      filename:
        input:
          input_name:
            params
        filter:
          filter_name:
            params
          filter_name2:
            params
        match:
          match_name:
            params
    input:
      filename:
        input_name:
          params
        input_name2:
          params
      filename2:
        input_name3:
          params
    filter:
      filename:
        filter_name:
          params
        filter_name2:
          params
      filename2:
        filter_name3:
          params
    match:
      filename:
```

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```
        match_name:
          params
```

Example pillar

```
fluentd:
  enabled: true
  config:
    label:
      monitoring:
        filter:
          parse_log:
            tag: 'docker.monitoring.{alertmanager,remote_storage_adapter,prometheus}.*
↪'
            type: parser
            reserve_data: true
            key_name: log
            parser:
              type: regexp
              format: >-
                /^time="(?<time>[^ ]*)" level=(?<severity>[a-zA-Z]*) msg="(?<message>.
↪+?)"/
              time_format: '%FT%TZ'
          remove_log_key:
            tag: 'docker.monitoring.{alertmanager,remote_storage_adapter,prometheus}.*
↪'
            type: record_transformer
            remove_keys: log
        match:
          docker_log:
            tag: 'docker.**'
            type: file
            path: /tmp/flow-docker.log
      grok_example:
        input:
          test_log:
            type: tail
            path: /var/log/test
            tag: test.test
            parser:
              type: grok
              custom_pattern_path: /etc/td-agent/config.d/global.grok
              rule:
                - pattern: >-
                    %{KEYSTONEACCESS}
      syslog:
        filter:
          add_severity:
            tag: 'syslog.*'
            type: record_transformer
            enable_ruby: true
            record:
              - name: severity
                value: 'record["pri"].to_i - (record["pri"].to_i / 8).floor * 8'
```

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```
          severity_to_string:
            tag: 'syslog.*'
            type: record_transformer
            enable_ruby: true
            record:
              - name: severity
                value: '{"debug"=>7,"info"=>6,"notice"=>5,"warning"=>4,"error"=>3,"critical"=>2,"alert"=>1,"emerg"=>0}.key(record["severity"])'
          severity_for_telegraf:
            tag: 'syslog.*.telegraf'
            type: parser
            reserve_data: true
            key_name: message
            parser:
              type: regexp
              format: >-
                /^(?<time>[^ ]*) (?<severity>[A-Z])! (?<message>.*)/
              time_format: '%FT%TZ'
          severity_for_telegraf_string:
            tag: 'syslog.*.telegraf'
            type: record_transformer
            enable_ruby: true
            record:
              - name: severity
                value: '{"debug"=>"D","info"=>"I","notice"=>"N","warning"=>"W","error"=>"E","critical"=>"C","alert"=>"A","emerg"=>"E"}.key(record["severity"])'
          prometheus_metric:
            tag: 'syslog.*.*'
            type: prometheus
            label:
              - name: ident
                type: variable
                value: ident
              - name: severity
                type: variable
                value: severity
            metric:
              - name: log_messages
                type: counter
                desc: The total number of log messages.
        match:
          rewrite_tag_key:
            tag: 'syslog.*'
            type: rewrite_tag_filter
            rule:
              - name: ident
                regexp: '^(.*)'
                result: '__TAG__.$1'
          syslog_log:
            tag: 'syslog.*.*'
            type: file
            path: /tmp/syslog
    input:
      syslog:
        syslog_log:
          type: tail
          label: syslog
```

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```
          path: /var/log/syslog
          tag: syslog.syslog
          parser:
            type: regexp
            format: >-
              '/^\<(?<pri>[0-9]+)\>(?<time>[^ ]*) (?<host>[^ ]*) (?<ident>[a-zA-Z0-9_
↪\/\.\-]*)(?:\[(?<pid>[0-9]+)\])?(?:[^\:]*\:)? *(?<message>.*)$/'
            time_format: '%FT%T.%L%:z'
        auth_log:
          type: tail
          label: syslog
          path: /var/log/auth.log
          tag: syslog.auth
          parser:
            type: regexp
            format: >-
              '/^\<(?<pri>[0-9]+)\>(?<time>[^ ]*) (?<host>[^ ]*) (?<ident>[a-zA-Z0-9_
↪\/\.\-]*)(?:\[(?<pid>[0-9]+)\])?(?:[^\:]*\:)? *(?<message>.*)$/'
            time_format: '%FT%T.%L%:z'
      prometheus:
        prometheus:
          type: prometheus
        prometheus_monitor:
          type: prometheus_monitor
        prometheus_output_monitor:
          type: prometheus_output_monitor
      forward:
        forward_listen:
          type: forward
          port: 24224
          bind: 0.0.0.0
    match:
      docker_monitoring:
        docker_monitoring:
          tag: 'docker.monitoring.{alertmanager,remote_storage_adapter,prometheus}.*'
          type: relabel
          label: monitoring
```

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Grafana

A beautiful, easy to use and feature rich Graphite dashboard replacement and graph editor.

Sample pillars

Server deployments

Server installed from system package and listening on 1.2.3.4:3000 (the default is 0.0.0.0:3000)

```
grafana:
  server:
    enabled: true
    bind:
      address: 1.2.3.4
      port: 3000
    admin:
      user: admin
      password: passwd
    database:
      engine: sqlite
```

Server installed with PostgreSQL database

```
grafana:
  server:
    enabled: true
    admin:
      user: admin
      password: passwd
    database:
      engine: postgresql
      host: localhost
      port: 5432
      name: grafana
      user: grafana
      password: passwd
```

Server installed with LDAP authentication and all authenticated users are administrators

```
grafana:
  server:
    enabled: true
    admin:
      user: admin
      password: passwd
```

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```
    auth:
      ldap:
        enabled: true
        host: '127.0.0.1'
        port: 389
        use_ssl: false
        bind_dn: "cn=admin,dc=grafana,dc=org"
        bind_password: "grafana"
        user_search_filter: "(cn=%s)"
        user_search_base_dns:
        - "dc=grafana,dc=org"
```

Server installed with LDAP and basic authentication

```
grafana:
  server:
    enabled: true
    admin:
      user: admin
      password: passwd
    auth:
      basic:
        enabled: true
      ldap:
        enabled: true
        host: '127.0.0.1'
        port: 389
        use_ssl: false
        bind_dn: "cn=admin,dc=grafana,dc=org"
        bind_password: "grafana"
        user_search_filter: "(cn=%s)"
        user_search_base_dns:
        - "dc=grafana,dc=org"
```

Server installed with LDAP for authentication and authorization

```
grafana:
  server:
    enabled: true
    admin:
      user: admin
      password: passwd
    auth:
      ldap:
        enabled: true
        host: '127.0.0.1'
        port: 389
        use_ssl: false
        bind_dn: "cn=admin,dc=grafana,dc=org"
        bind_password: "grafana"
        user_search_filter: "(cn=%s)"
        user_search_base_dns:
        - "dc=grafana,dc=org"
        group_search_filter: "(&(objectClass=posixGroup)(memberUid=%s))"
        group_search_base_dns:
        - "ou=groups,dc=grafana,dc=org"
        authorization:
```

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```
          enabled: true
          admin_group: "admins"
          editor_group: "editors"
          viewer_group: "viewers"
```

Server installed with default StackLight JSON dashboards. This will be replaced by the possibility for a service to provide its own dashboard using salt-mine.

```
grafana:
  server:
    enabled: true
    dashboards:
      enabled: true
      path: /var/lib/grafana/dashboards
```

Server with theme overrides

```
grafana:
  server:
    enabled: true
    theme:
      light:
        css_override:
          source: http://path.to.theme
          source_hash: sha256=xyz
          build: xyz
      dark:
        css_override:
          source: salt://path.to.theme
```

Server with two additionals plugins. It requires to have access to the Internet.

```
grafana:
  server:
    enabled: true
    plugins:
      grafana-piechart-panel:
        enabled: true
      grafana-example-app:
        enabled: true
```

Collector setup

Used to aggregate dashboards from monitoring node.

```
grafana:
  collector:
    enabled: true
```

Client setups

Client with token based auth

```
grafana:
  client:
    enabled: true
    server:
      protocol: https
      host: grafana.host
      port: 3000
      token: token
```

Client with base auth

```
grafana:
  client:
    enabled: true
    server:
      protocol: https
      host: grafana.host
      port: 3000
      user: admin
      password: password
```

Client enforcing graphite data source

```
grafana:
  client:
    enabled: true
    datasource:
      graphite:
        type: graphite
        host: mtr01.domain.com
        protocol: https
        port: 443
```

Client enforcing elasticsearch data source

```
grafana:
  client:
    enabled: true
    datasource:
      elasticsearch:
        type: elasticsearch
        host: log01.domain.com
        port: 80
        index: grafana-dash
```

Client defined and enforced dashboard

```
grafana:
  client:
    enabled: true
    server:
      host: grafana.host
      port: 3000
      token: token
    dashboard:
      system_metrics:
        title: "Generic system metrics"
```

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```
        style: dark
        editable: false
        row:
          top:
            title: "First row"
```

Client enforced dashboards defined in salt-mine

```
grafana:
  client:
    enabled: true
    remote_data:
      engine: salt_mine
    server:
      host: grafana.host
      port: 3000
      token: token
```

Usage

There's a difference between JSON dashboard representation and models we us. The lists used in JSON format [for rows, panels and target] were replaced by dictionaries. This form of serialization allows better merging and overrides of hierarchical data structures that dashboard models are.

The default format of Grafana dashboards with lists for rows, panels and targets.

```
system_metrics:
  title: graph
  editable: true
  hideControls: false
  rows:
  - title: Usage
    height: 250px
    panels:
    - title: Panel Title
      span: 6
      editable: false
      type: graph
      targets:
      - refId: A
        target: "support_prd.cfg01_iot_tcpcloud_eu.cpu.0.idle"
      datasource: graphite01
      renderer: flot
    showTitle: true
```

The modified version of Grafana dashboard format with dictionary declarations. Please note that dictionary keys are only for logical separation and are not displayed in generated dashboards.

```
system_metrics:
    system_metrics2:
      title: graph
      editable: true
      hideControls: false
      row:
        usage:
```

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```
          title: Usage
          height: 250px
          panel:
            usage-panel:
              title: Panel Title
              span: 6
              editable: false
              type: graph
              target:
                A:
                  refId: A
                  target: "support_prd.cfg01_iot_tcpcloud_eu.cpu.0.idle"
              datasource: graphite01
              renderer: flot
          showTitle: true
```

Read more

- http://grafana.org/
- http://docs.grafana.org/reference/export_import/

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Graphite

Graphite is an enterprise-scale monitoring tool that runs well on cheap hardware.

Sample pillars

Single Graphite web server

```
graphite:
  server:
    enabled: true
    debug: true
    timezone: 'Europe/Prague'
    cache:
      engine: 'memcached'
      host: '127.0.0.1'
      prefix: 'GRAPHITE'
    database:
      engine: 'postgresql'
      host: '127.0.0.1'
      name: 'graphite'
      password: 'password'
      user: 'graphite'
    mail:
      host: mail1.domain.com
      password: pwd
      user: username
```

Graphite web server cluster

```
graphite:
  server:
    enabled: true
    time_zone: 'Europe/Prague'
    database: ...
    mail: ...
    carbon_links:
    - host: 10.0.0.1
      port: 7002
    - host: 10.0.0.2
      port: 7002
    cache:
      engine: 'memcached'
      members:
      - host: 10.0.0.1
        port: 11211
      - host: 10.0.0.2
        port: 11211
```

Complete single Carbon collector

```
carbon:
  relay:
    enabled: true
    method: consistent-hashing
  aggregator:
    enabled: false
  cache:
    storage_schema:
      default:
        pattern: '.*'
```

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```
        retentions:
        - 60s:1d
        - 600s:90d
```

Clustered Carbon with AMQP and aggregation

```
carbon:
  relay:
    enabled: true
    method: rules
    message_queue:
      host: broker1.domain.com
      port: 5672
      user: monitor
      password: pwd
      virtual_host: '/monitor'
      exchange: 'metrics'
    destinations:
    - host: 10.0.0.1
      port: 2024
    - host: 10.0.0.2
      port: 2024
  aggregator:
    enabled: true
    destinations:
    - host: 10.0.0.1
      port: 2004
    - host: 10.0.0.2
      port: 2004
  cache:
    storage_schema:
      default:
        pattern: '.*'
        retentions:
        - 60s:1d
        - 600s:90d
```

Read more

s * http://graphite.readthedocs.org/en/latest/ * http://www.canopsis.org/2013/02/collectd-graphite/ * http://graphite.readthedocs.org/en/latest/install.html * http://stackoverflow.com/questions/19894708/cant-start-carbon-12-04-python-error-importerror-cannot-import-name-daem * http://www.kinvey.com/blog/108/graphite-on-ubuntu-1204-lts-8211-part-ii-gunicorn-nginx-and-supervisord * https://github.com/obfuscurity/graphite-scripts/blob/master/init.d/carbon-relay

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Heka Formula

Heka is an open source stream processing software system developed by Mozilla. Heka is a Swiss Army Knife type tool for data processing.

Sample pillars

Log collector service

```
heka:
  log_collector:
    automatic_starting: true
    elasticsearch_host: 172.16.10.253
    elasticsearch_port: 9200
    enabled: true
    metric_collector_host: 127.0.0.1
    metric_collector_port: 5567
    poolsize: 100
    max_message_size: 262144
```

Default values:

- `automatic_starting: true`
- `elastisearch_port: 9200`
- `enabled: false`
- `metric_collector_host: 127.0.0.1`
- `metric_collector_port: 5567`
- `poolsize: 100`
- `max_message_size: 262144`

Local Metric collector service

```
heka:
  metric_collector:
    aggregator_host: 172.16.20.253
    aggregator_port: 5565
    automatic_starting: true
```

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```
    enabled: true
    influxdb_database: lma
    influxdb_host: 172.16.10.101
    influxdb_password: lmapass
    influxdb_port: 8086
    influxdb_time_precision: ms
    influxdb_timeout: 500
    influxdb_username: lma
    nagios_host: 172.16.20.253
    nagios_host_dimension_key: nagios_host
    nagios_password: secret
    nagios_port: 5601
    nagios_username: nagiosadmin
    poolsize: 100
    max_message_size: 262144
```

Default values:

- `aggregator_port: 5565`
- `automatic_starting: true`
- `enabled: false`
- `influxdb_port: 8086`
- `influxdb_time_precision: ms`
- `influxdb_timeout: 5000`
- `nagios_port: 8001`
- `poolsize: 100`
- `max_message_size: 262144`

Remote Metric Collector service

```
heka:
  remote_collector:
    aggregator_host: 172.16.20.253
    aggregator_port: 5565
    amqp_exchange: nova
    amqp_host: 172.16.10.254
    amqp_password: workshop
    amqp_port: 5672
    amqp_user: openstack
    amqp_vhost: /openstack
    automatic_starting: false
    elasticsearch_host: 172.16.10.253
    elasticsearch_port: 9200
    enabled: true
    influxdb_database: lma
    influxdb_host: 172.16.10.101
    influxdb_password: lmapass
    influxdb_port: 8086
    influxdb_time_precision: ms
    influxdb_username: lma
    poolsize: 100
    max_message_size: 262144
```

Default values:

- `aggregator_port: 5565`
- `amqp_exchange: nova`
- `amqp_port: 5672`
- `amqp_vhost: ''`
- `automatic_starting: true`
- `elastisearch_port: 9200`
- `enabled: false`
- `influxdb_port: 8086`
- `influxdb_time_precision: ms`
- `influxdb_timeout: 5000`
- `poolsize: 100`
- `max_message_size: 262144`

Aggregator service

```
heka:
  aggregator:
    automatic_starting: false
    enabled: true
    influxdb_database: lma
    influxdb_host: 172.16.10.101
    influxdb_password: lmapass
    influxdb_port: 8086
    influxdb_time_precision: ms
    influxdb_username: lma
    nagios_default_host_alarm_clusters: 00-clusters
    nagios_host: 172.16.20.253
    nagios_host_dimension_key: nagios_host
    nagios_password: secret
    nagios_port: 5601
    nagios_username: nagiosadmin
    poolsize: 100
    max_message_size: 262144
```

Default values:

- `automatic_starting: true`
- `enabled: false`
- `influxdb_port: 8086`
- `influxdb_time_precision: ms`
- `influxdb_timeout: 5000`
- `nagios_port: 8001`
- `nagios_default_host_alarm_clusters: 00-clusters`
- `poolsize: 100`
- `max_message_size: 262144`

Ceilometer service

```
heka:
  ceilometer_collector:
    elasticsearch_host: 172.16.10.253
    elasticsearch_port: 9200
    enabled: true
    influxdb_database: lma
    influxdb_host: 172.16.10.101
    influxdb_password: lmapass
    influxdb_port: 8086
    influxdb_time_precision: ms
    influxdb_username: lma
    resource_decoding: false
    amqp_exchange: ceilometer
    amqp_host: 172.16.10.253
    amqp_port: 5672
    amqp_queue: metering.sample
    amqp_vhost: /openstack
```

Default values:

- `automatic_starting: true`
- `elastisearch_port: 9200`
- `enabled: false`
- `influxdb_port: 8086`
- `influxdb_time_precision: ms`
- `influxdb_timeout: 5000`
- `poolsize: 100`
- `amqp_exchange: ceilometer`
- `amqp_port: 5672`
- `amqp_queue: metering.sample`
- `amqp_vhost: /openstack`
- `resource_decoding: false`

Read more

- https://hekad.readthedocs.org/en/latest/index.html

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InfluxDB

InfluxData is based on the TICK stack, the first open source platform for managing IoT time-series data at scale.

Sample pillars

Single-node influxdb, enabled http frontend and admin web interface:

```
influxdb:
  server:
    enabled: true
    http:
      enabled: true
      bind:
        address: 0.0.0.0
        port: 8086
    admin:
      enabled: true
      bind:
        address: 0.0.0.0
        port: 8083
```

Single-node influxdb, SSL for http frontend:

```
influxdb:
  server:
    enabled: true
    http:
      bind:
        ssl:
          enabled: true
          key_file: /etc/influxdb/ssl/key.pem
          cert_file: /etc/influxdb/ssl/cert.pem
```

Single-node influxdb where you specify paths for data and metastore directories. Custom directories are created by this formula:

```
influxdb:
  server:
    enabled: true
    data:
      dir: '/opt/influxdb/data'
```

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```
      wal_dir: '/opt/influxdb/wal'
    meta:
      dir: '/opt/influxdb/meta'
```

InfluxDB server with customized parameters for the data service:

```
influxdb:
  server:
    enabled: true
    data:
      max_series_per_database: 20000000
      cache_max_memory_size: 524288000
      cache_snapshot_memory_size: 26214400
      cache_snapshot_write_cold_duration: "5m"
      compact_full_write_cold_duration: "2h"2h"
      max_values_per_tag: 5000
```

Single-node influxdb with an admin user:

```
influxdb:
  server:
    enabled: true
    http:
      enabled: true
      bind:
        address: 0.0.0.0
        port: 8086
    admin:
      enabled: true
      bind:
        address: 0.0.0.0
        port: 8083
      user:
        enabled: true
        name: root
        password: secret
```

Single-node influxdb with new users:

```
influxdb:
  server:
    user:
      user1:
        enabled: true
        admin: true
        name: username1
        password: keepsecret1
      user2:
        enabled: true
        admin: false
        name: username2
        password: keepsecret2
```

Single-node influxdb with new databases:

```
influxdb:
  server:
```

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```
    database:
      mydb1:
        enabled: true
        name: mydb1
      mydb2:
        enabled: true
        name: mydb2
```

Manage the retention policies for a database:

```
influxdb:
  server:
    database:
      mydb1:
        enabled: true
        name: mydb1
        retention_policy:
        - name: rp_db1
          duration: 30d
          replication: 1
          is_default: true
```

Where default values are:

- name = autogen
- duration = INF
- replication = 1
- is_default: false

Here is how to manage grants on database:

```
influxdb:
  server:
    grant:
      username1_mydb1:
        enabled: true
        user: username1
        database: mydb1
        privilege: all
      username2_mydb1:
        enabled: true
        user: username2
        database: mydb1
        privilege: read
      username2_mydb2:
        enabled: true
        user: username2
        database: mydb2
        privilege: write
```

InfluxDB relay:

```
influxdb:
  server:
    enabled: true
```

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```
    http:
      enabled: true
      output:
        idb01:
          location: http://idb01.local:8086/write
          timeout: 10
        idb02:
          location: http://idb02.local:8086/write
          timeout: 10
    udp:
      enabled: true
      output:
        idb01:
          location: idb01.local:9096
        idb02:
          location: idb02.local:9096
```

InfluxDB cluster:

```
influxdb:
  server:
    enabled: true
  meta:
    bind:
      address: 0.0.0.0
      port: 8088
      http_address: 0.0.0.0
      http_port: 8091
  cluster:
    members:
      - host: idb01.local
        port: 8091
      - host: idb02.local
        port: 8091
      - host: idb03.local
        port: 8091
```

Deploy influxdb apt repository (using linux formula):

```
linux:
  system:
    os: ubuntu
    dist: xenial
    repo:
      influxdb:
        enabled: true
        source: 'deb https://repos.influxdata.com/${linux:system:os} $
↪{linux:system:dist} stable'
        key_url: 'https://repos.influxdata.com/influxdb.key'
```

InfluxDB client for configuring databases, users and retention policies:

```
influxdb:
  client:
    enabled: true
    server:
      protocol: http
```

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```
      host: 127.0.0.1
      port: 8086
      user: admin
      password: foobar
    user:
      user1:
        enabled: true
        admin: true
        name: username1
    database:
      mydb1:
        enabled: true
        name: mydb1
        retention_policy:
        - name: rp_db1
          duration: 30d
          replication: 1
          is_default: true
    grant:
      username1_mydb1:
        enabled: true
        user: username1
        database: mydb1
        privilege: all
```

InfluxDB client state's that uses curl can be forced to retry query if curl call fails:

```
influxdb:
  client:
    enabled: true
    retry:
      count: 3
      delay: 3
```

Create an continuous queries:

```
influxdb:
  client:
    database:
      mydb1:
        continuous_query:
          cq_avg_bus_passengers: >-
            SELECT mean("passengers") INTO "transportation"."three_weeks"."average_
↪passengers" FROM "bus_data" GROUP BY time(1h)
```

Prunning data and data management:

Intended to use in scheduled jobs, executed to maintain data life cycle above retention policy. These states are executed by `query.sls` and you are expected to trigger `sls_id` individually.

```
influxdb:
  client:
    database:
      mydb1:
        query:
          drop_measurement_h2o: >-
            DROP MEASUREMENT h2o_quality
```

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```
          drop_shard_h2o: >-
            DROP SHARD h2o_quality
          drop_series_h2o_feet: >-
            DROP SERIES FROM "h2o_feet"
          drop_series_h2o_feet_loc_smonica: >-
            DROP SERIES FROM "h2o_feet" WHERE "location" = 'santa_monica'
          delete_h2o_quality_rt3: >-
            DELETE FROM "h2o_quality" WHERE "randtag" = '3'
          delete_h2o_quality: >-
            DELETE FROM "h2o_quality"
```

```
salt \* state.sls_id influxdb_query_delete_h2o_quality influxdb.query
```

InfluxDB relay with HTTP outputs:

```
influxdb:
  relay:
    enabled: true
    telemetry:
      enabled: true
      bind:
        address: 127.0.0.1
        port: 9196
    listen:
      http_backend:
        type: http
        bind:
          address: 127.0.0.1
          port: 9096
        output:
          server1:
            location: http://server1:8086/write
            timeout: 20s
            buffer_size_mb: 512
            max_batch_kb: 1024
            max_delay_interval: 30s
          server2:
            location: http://server2:8086/write
```

Read more

- https://influxdata.com/time-series-platform/influxdb/

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Known Error Database

Sample pillar

kedb:

server: enabled: true workers: 3 secret_key: secret_token bind:

address: 0.0.0.0 port: 9753 protocol: tcp

source: type: 'git' address: 'git@repo1.robotice.cz:django/django-kedb.git' rev: 'master'

cache: engine: 'memcached' host: '127.0.0.1' prefix: 'CACHE_KEDB'

database: engine: 'postgresql' host: '127.0.0.1' name: 'django_kedb' password: 'db-pwd' user: 'django_kedb'

mail: host: 'mail.domain.com' password: 'mail-pwd' user: 'mail-user'

logger_handler: engine: raven dsn: http://public:private@host/project

Read more

- http://docs.gunicorn.org/en/latest/configure.html

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Kibana

Kibana is an open source (Apache Licensed), browser based analytics and search interface to Logstash and other timestamped data sets stored in ElasticSearch. With those in place Kibana is a snap to setup and start using (seriously). Kibana strives to be easy to get started with, while also being flexible and powerful

Sample pillar

```
kibana:
  server:
    addrepo: true
    enabled: true
    bind:
      address: 0.0.0.0
      port: 5601
    database:
      engine: elasticsearch
      host: localhost
      port: 9200
```

Or without adding elasticsearch kibana repository, but with modified path to config file

```
kibana:
  server:
    configpath: /usr/share/kibana/config/kibana.yml
    enabled: true
    bind:
      address: 0.0.0.0
      port: 5601
    database:
      engine: elasticsearch
      host: localhost
      port: 9200
```

Client setup

Client with host and port (Kibana use Elasticsearch to store its data):

```
kibana:
  client:
    enabled: true
    server:
      host: elasticsearch.host
      port: 9200
```

Client where you download a Kibana object that is stored in the directory *files/*:

```
kibana:
  client:
    enabled: true
    server:
      host: elasticsearch.host
      port: 9200
    object:
      logs:
        enabled: true
        name: Logs
        template: kibana/files/objects/dashboard_logs.json
        type: 'dashboard'
```

Read more

- https://github.com/elasticsearch/kibana/blob/master/src/config.js

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nagios

Salt formula to set up and manage nagios

Available states

`nagios.server`

Set up Nagios server

Sample pillars

Single nagios service

```
nagios:
  server:
    enabled: true
```

All Nagios configurations can be configured

```
nagios:
  server:
    enabled: true
    accept_passive_service_checks: 1
    process_performance_data: 0
    check_service_freshness: 1
    check_host_freshness: 0
```

Nagios UI configrations with HTTP basic authentication (use “readonly” flag to specify readonly users)

```
nagios:
  server:
    enabled: true
    ui:
      enabled: true
      auth:
        basic:
          # this is the main admin, it cannot have a 'readonly' flag.
          username: nagiosadmin
          password: secret
          # 'users' section is optional, allows defining additional users.
          users:
            - username: nagios_admin_2
              password: secret2
            - username: nagios_user
              password: secret3
              readonly: true
```

Nagios UI configuration with LDAP authentication/authorization:

```
nagios:
  server:
    enabled: true
    ui:
      enabled: true
      auth:
        basic:
          username: nagiosadmin
          password: secret
        ldap:
          enabled: true
          # Url format is described here
          # http://httpd.apache.org/docs/2.0/mod/mod_auth_ldap.html#authldapurl
          url: ldaps://ldap.domain.ltd:<port>/cn=users,dc=domain,dc=local?uid?sub?
↪<filter>
          bind_dn: cn=admin,dc=domain,dc=local
          bind_password: secret
```

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```
        # Optionaly, restrict access to members of a group:
        ldap_group_dn: cn=admins,ou=groups,dc=domain,dc=local
        ldap_group_attribute: memberUid
```

Nagios objects can be defined in pillar:

```
nagios:
  server:
    enabled: true
    objects:
      contactgroups:
        group1:
          contactgroup_name: Operator
      contacts:
        contact1:
          alias: 'root_at_localhost'
          contact_name: Me
          contactgroups:
              - Operator
          email: 'root@localhost'
          host_notifications_enabled: 1
          host_notification_period: 24x7
          host_notification_options: 'd,r'
          host_notification_commands: notify-host-by-smtp
          service_notifications_enabled: 1
          service_notification_period: 24x7
          service_notification_options: 'w,u,c,r'
          service_notification_commands: notify-service-by-smtp
      commands:
        check_http_basic_auth:
          command_line: "check_http -4 -I '$ARG1$' -w 2 -c 3 -t 5 -p $ARG2$ -u '/' -e
↪'401 Unauthorized'"

      services:
        generic_service_tpl:
          register: 0
          contact_groups: Operator
          process_perf_data: 0
          max_check_attempts: 3
      hosts:
        generic_host_tpl:
          notifications_enabled: 1
          event_handler_enabled: 1
          flap_detection_enabled: 1
          failure_prediction_enabled: 1
          process_perf_data: 0
          retain_status_information: 1
          retain_nonstatus_information: 1
          max_check_attempts: 10
          notification_interval: 0
          notification_period: 24x7
          notification_options: d,u,r
          contact_groups: Operator
          register: 0
```

Also, **hostgroups**, **hosts** and **services** can be created dynamically using **mine**:

```
nagios:
  server:
    enabled: true
    dynamic:
      enabled: true
      grain_hostname: 'host'
      grain_interfaces: 'ip4_interfaces' # the default
      #hostname_suffix: .prod # optionally suffix hostnames
      hostgroups:
        - target: '*'
          name: All
          expr_from: glob
        - target: 'G@roles:nova.controller'
          expr_from: compound # the default
          name: Nova Controller
        - target: 'G@roles:nova.compute'
          name: Nova Compute
        - target: 'G@roles:keystone.server'
          name: Keystone server
        - target: 'G@roles:influxdb.server'
          name: InfluxDB server
        - target: 'G@roles:elasticsearch.server'
          name: Elasticsearchserver
      hosts:
        - target: 'G@services:openssh'
          contact_groups: Operator
          use: generic_host_tpl
          network: 10.0.0.0/8
      services:
        - target: 'G@roles:openssh.server'
          name: SSH
          use: generic_service_tpl
          check_command: check_ssh
        - target: 'G@roles:nagios.server'
          name: HTTP Nagios
          use: generic_service_tpl
          check_command: check_http_basic_auth!localhost!${nagios:server:ui:port}
```

Note about dynamic hosts IP addresses configuration:

There are 2 different ways to configure the Host IP adddresses, the preferred way is to define the **network** of the nodes to pickup the first IP address found belonging to this network.

```
nagios:
  server:
    enabled: true
    dynamic:
      enabled: true
      hosts:
        - target: '*'
          contact_groups: Operator
          network: 10.0.0.0/8
```

The alternative way is to define the **interface** list, to pickup the first IP address of the first interface found.

```
nagios:
  server:
    enabled: true
```

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```
    dynamic:
      enabled: true
      hosts:
        - target: '*'
          contact_groups: Operator
          interface:
          - eth0
          - ens0
```

If both properties are defined, the **network** option wins and the **interface** is ignored.

StackLight Alarms

StackLight alarms are configured dynamically using **mine** data which are exposed by the Heka formula, respectively `heka:metric_collector:alarm` and `heka:aggergator:alarm_cluster`.

To configure StackLight alarms per nodes (known as AFD):

```
nagios:
  server:
    enabled: true
  dynamic:
    enabled: true
    hosts:
      - target: 'G@services:openssh'
        contact_groups: Operator
        use: generic_host_tpl
        interface:
        - eth0
        - ens3
    stacklight_alarms:
      enabled: true
      service_template: generic_service_tpl # optional
```

To configure StackLight alarm clusters (known as GSE):

```
nagios:
  server:
    enabled: true
  dynamic:
    enabled: true
    stacklight_alarm_clusters:
      enabled: true
      service_template: generic_service_tpl # optional
      host_template: generic_host_tpl # optional
      dimension_key: nagios_host # optional
      default_host: clusters # optional
```

Nagios Notification Handlers

You can configure notification handlers. Currently supported handlers are SMTP, Slack, Salesforce, and Pagerduty.

```
nagios:
  server:
    enabled: true
    notification:
      slack:
        enabled: true
        webhook_url: https://hooks.slack.com/services/abcdef/12345
      pagerduty:
        enabled: true
        key: abcdef12345
      sfdc:
        enabled: true
        client_id: abcdef12345
        client_secret: abcdef12345
        username: abcdef
        password: abcdef
        auth_url: https://abcedf.my.salesforce.com
        environment: abcdef
        organization_id: abcdef
```

```
# SMTP without auth
nagios:
  server:
    enabled: true
    notification:
      smtp:
        auth: false
        url: smtp://127.0.0.1:25
        from: nagios@localhost
        # Notification email subject can be defined, must be one line
        # default subjects are:
        host_subject: >-
           ** $NOTIFICATIONTYPE$ Host Alert: $HOSTNAME$ is $HOSTSTATE$ **
        service_subject: >-
           ** $NOTIFICATIONTYPE$ Service Alert: $HOSTNAME$/$SERVICEDESC$ is
↪$SERVICESTATE$ **

# An example using a Gmail account as a SMTP relay
nagios:
  server:
    enabled: true
    notification:
      smtp:
        auth: login
        url: smtp://smtp.gmail.com:587
        from: <you>@gmail.com
        starttls: true
        username: foo
        password: secret
```

Each handler adds two commands, *notify-host-by-<HANDLER>*, and *notify-service-by-<HANDLER>*, that you can reference in a contact.

```
nagios:
  server:
    objects:
      contact:
```

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```
        sfdc:
          alias: sfdc
          contactgroups:
            - Operator
          email: root@localhost
          host_notification_commands: notify-host-by-sfdc
          host_notification_options: d,r
          host_notification_period: 24x7
          host_notifications_enabled: 1
          service_notification_commands: notify-service-by-sfdc
          service_notification_options: c,r
          service_notification_period: 24x7
          service_notifications_enabled: 1
```

By default in Stacklight, notifications are only enabled for *00-top-clusters* and individual host and SSH checks. If you want to enable notifications for all checks you can enable this value:

```
nagios:
  server:
    enabled: true
    notification:
      alarm_enabled_override: true
```

The notification interval defaults to zero, which will only send one notification when the alert triggers. You can override the interval if you want notifications to repeat. For example, to have them repeat every 30 minutes:

```
nagios:
  server:
    enabled: true
    objects:
      hosts:
        generic_host_tpl:
          notification_interval: 30
      services:
        generic_service_tpl:
          notification_interval: 30
```

Read more

- https://www.nagios.org

Platform support

This formula has been tested on Ubuntu Xenial **only**.

TODO

- Configure Apache using salt-formula-apache (using service metadata) or alternatively using Nginx.

Documentation and Bugs

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rsyslog

In computing, syslog is a widely used standard for message logging. It permits separation of the software that generates messages, the system that stores them, and the software that reports and analyzes them.

Sample pillars

Rsyslog service with default logging template

```
rsyslog:
  client:
    enabled: true
```

Rsyslog service with precise timestamps, severity, facility.

```
rsyslog:
  client:
    enabled: true
    format:
      name: TraditionalFormatWithPRI
      template: '"%syslogpriority% %syslogfacility% %timestamp:::date-rfc3339%
↪%HOSTNAME% %syslogtag%%msg:::sp-if-no-1st-sp%%msg:::drop-last-lf%\n"'
    output:
      file:
        -/var/log/syslog:
          filter: *.*;auth,authpriv.none
          owner: syslog
          group: adm
          createmode: 0640
          umask: 0022
```

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```
        /var/log/auth.log:
          filter: auth,authpriv.*
          owner: syslog
          group: adm
          createmode: 0640
          umask: 0022
        -/var/log/kern.log:
          filter: kern.*
          owner: syslog
          group: adm
          createmode: 0640
          umask: 0022
       -/var/log/mail.log:
          filter: mail.*
          owner: syslog
          group: adm
          createmode: 0640
          umask: 0022
        /var/log/mail.err:
          filter: mail.err
          owner: syslog
          group: adm
          createmode: 0640
          umask: 0022
        ":omusrmsg:*":
          filter: *.emerg
        "|/dev/xconsole":
          filter: "daemon.*;mail.*; news.err; *.=debug;*.=info;*.=notice;*.=warn":
       -/var/log/your-app.log:
          filter: "if $programname startswith 'your-app' then"
          owner: syslog
          group: adm
          createmode: 0640
          umask: 0022
          stop_processing: true
```

Rsyslog service with RainerScript (module, ruleset, template, input).

```
rsyslog:
  client:
    run_user: syslog
    run_group: adm
    enabled: true
    rainerscript:
      module:
        imfile: {}
      input:
        imfile:
          nginx:
            File: "/var/log/nginx/*.log"
            Tag: "nginx__"
            Severity: "notice"
            Facility: "local0"
            PersistStateInterval: "0"
            Ruleset: "myapp_logs"
          apache2:
            File: "/var/log/apache2/*.log"
```

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```
            Tag: "apache2__"
            Severity: "notice"
            Facility: "local0"
            Ruleset: "myapp_logs"
            PersistStateInterval: "0"
          rabbitmq:
            File: "/var/log/rabbitmq/*.log"
            Tag: "rabbitmq__"
            Severitet: "notice"
            Facility: "local0"
            PersistStateInterval: "0"
            Ruleset: "myapp_logs"
      template:
        ImfileFilePath:
          parameter:
            type: string
            string: "<%PRI%>%TIMESTAMP:::date-rfc3339% %HOSTNAME% %syslogtag:1:32%%$.
↪suffix%%msg:::sp-if-no-1st-sp%%msg%\n"
      ruleset:
        remote_logs:
          description: 'action(type="omfwd" Target="172.16.10.92" Port="10514"␣
↪Protocol="udp" Template="ImfileFilePath")'
        myapp_logs:
          description: 'set $.suffix=re_extract($!metadata!filename, "(.*)/([^/]*[^/.
↪log])", 0, 2, "all.log"); call remote_logs'
```

Custom templates

It is possible to define a specific syslog template per output file instead of using the default one.

```
rsyslog:
    output:
      file:
       /var/log/your-app.log:
          template: ""%syslogtag:1:32%%msg:::sp-if-no-1st-sp%%msg%\\n""
          filter: "if $programname startswith 'your-app' then"
```

Remote rsyslog server

It is possible to have rsyslog act as remote server, collecting, storing or forwarding logs. This functionality is provided via rsyslog input/output modules, rulesets and templates.

```
rsyslog:
  server:
    enabled: true
    module:
      imudp: {}
    template:
      RemoteFilePath:
        parameter:
          type: string
          string: /var/log/%HOSTNAME%/%programname%.log
    ruleset:
```

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```
      remote10514:
        description: action(type="omfile" dynaFile="RemoteFilePath")
    input:
      imudp:
        port: 10514
        ruleset: remote10514
```

Support metadata

If the *heka* support metadata is enabled, all output files are automatically parsed by the **log_collector** service. To skip the log_collector configuration, set the **skip_log_collector** to true.

```
rsyslog:
    output:
      file:
       /var/log/your-app.log:
          filter: "if $programname startswith 'your-app' then"
          skip_log_collector: true
```

Read more

http://www.rsyslog.com/ https://wiki.gentoo.org/wiki/Rsyslog https://github.com/saz/puppet-rsyslog

Documentation and Bugs

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Sensu

Sample pillars

Sensu Server with API

```
sensu:
  server:
    enabled: true
    keepalive_warning: 20
    keepalive_critical: 60
    mine_checks: true
    database:
      engine: redis
      host: localhost
      port: 6379
    message_queue:
      engine: rabbitmq
      host: rabbitmq
      port: 5672
      user: monitor
      password: pwd
      virtual_host: '/monitor'
    bind:
      address: 0.0.0.0
      port: 4567
    handler:
      default:
        enabled: true
        set:
        - mail
        - pipe
      stdout:
        enabled: true
      mail:
        mail_to: 'mail@domain.cz'
        host: smtp1.domain.cz
        port: 465
        user: 'mail@domain.cz'
        password: 'pwd'
        authentication: cram_md5
        encryption: ssl
        domain: 'domain.cz'
      pipe:
        enabled: true
        command: /usr/bin/tee /tmp/debug
```

Sensu Dashboard (now uchiwa)

```
sensu:
  dashboard:
    enabled: true
    bind:
      address: 0.0.0.0
      port: 8080
    admin:
      username: admin
```

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```
      password: pass
```

Sensu Client

```
sensu:
  client:
    enabled: true
    message_queue:
      engine: rabbitmq
      host: rabbitmq
      port: 5672
      user: monitor
      password: pwd
      virtual_host: '/monitor'
```

Sensu Client with check explicitly disabled

```
sensu:
  client:
    enabled: true
    message_queue:
      engine: rabbitmq
      host: rabbitmq
      port: 5672
      user: monitor
      password: pwd
      virtual_host: '/monitor'
    check:
      local_linux_storage_swap_usage:
        enabled: False
```

Sensu Client with subscriptions explicitly disabled

```
sensu:
  client:
    enabled: true
    message_queue:
      engine: rabbitmq
      host: rabbitmq
      port: 5672
      user: monitor
      password: pwd
      virtual_host: '/monitor'
    unsubscribe:
      - collectd.client
      - git.client
```

Sensu Client with community plugins

```
sensu:
  client:
    enabled: true
    plugin:
      sensu_community_plugins:
        enabled: true
      monitoring_for_openstack:
```

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```
        enabled: true
      ruby_gems:
        enabled: True
        name:
          bunny:
    message_queue:
      engine: rabbitmq
      host: rabbitmq
      port: 5672
      user: monitor
      password: pwd
      virtual_host: '/monitor'
```

Sensu SalesForce handler

```
sensu:
  server:
    enabled: true
    handler:
      default:
        enabled: true
        set:
        - sfdc
      stdout:
        enabled: true
      sfdc:
        enabled: true
        sfdc_client_id: "3MVG9Oe7T3Ol0ea4MKj"
        sfdc_client_secret: 11482216293059
        sfdc_username: test@test1.test
        sfdc_password: passTemp
        sfdc_auth_url: https://mysite--scloudqa.cs12.my.salesforce.com
        environment: a2XV0000001
        sfdc_organization_id: 00DV00000
        sfdc_http_proxy: 'http://10.10.10.10:8888'
        token_cache_file: "/path/to/cache/token"
```

Sensu Slack handler

```
sensu:
  server:
    enabled: true
    handler:
      default:
        enabled: true
        set:
        - slack
      stdout:
        enabled: true
      slack:
        enabled: True
        channel: '#channel_name'
        webhook_url: 'https://hooks.slack.com/services/kastan12T/B57X3SDQA/
↪fasfsaf0632hjkl3dsccLn9v'
        proxy_address: '10.10.10.10'
        proxy_port: '8888'
```

Read more

- http://docs.sensuapp.org/0.9/installing_sensu.html
- https://speakerdeck.com/joemiller/practical-examples-with-sensu-monitoring-framework
- https://github.com/fridim/nagios-plugin-check_galera_cluster
- http://www.reimann.sh/2011/06/30/nagios-check-pacemaker-failed-actions/
- http://sys4.de/en/blog/2014/01/23/montoring-pacemaker-nagios/
- https://raw.githubusercontent.com/sensu/sensu-community-plugins/master/plugins/openstack/neutron/neutron-agent-status.py
- https://github.com/sensu/sensu-community-plugins/blob/master/plugins/openstack/keystone/check_keystone-api.sh
- http://openstack.prov12n.com/monitoring-openstack-nagios-3/
- https://raw.githubusercontent.com/drewkerrigan/nagios-http-json/master/check_http_json.py
- https://github.com/opinkerfi/nagios-plugins/tree/master/check_ibm_bladecenter
- https://github.com/opinkerfi/nagios-plugins/tree/master/check_storwize
- https://github.com/ehazlett/sensu-py/
- https://github.com/Level-Up/Supervisord-Nagios-Plugin/blob/master/check_supv.py

Documentation and Bugs

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Statsd formula

Simple daemon for easy stats aggregation.

Sample pillars

Standalone Statsd server with Graphite/carbon backend

```
statsd:
  server:
    enabled: true
    bind:
      port: 8125
      address: 0.0.0.0
    backend:
      engine: carbon
      host: metrics1.domain.com
      port: 2003
```

Standalone Statsd server with Graphite/AMQP backend

```
statsd:
  server:
    enabled: true
    bind:
      port: 8125
      address: 0.0.0.0
    backend:
      engine: amqp
      host: metrics1.domain.com
      port: 5672
```

Standalone Statsd server with OpenTSDB backend

```
statsd:
  server:
    enabled: true
    bind:
      port: 8125
      address: 0.0.0.0
    backend:
      engine: amqp
      host: metrics1.domain.com
      port: 2003
```

More information

- https://github.com/etsy/statsd/
- https://github.com/mrtazz/statsd-amqp-backend
- https://github.com/danslimmon/statsd-opentsdb-backend

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- Documentation Home
- Project Introduction
- Installation and Operations Manual
- Development Documentation

Home SaltStack-Formulas Project Introduction

Container Services

Container services for automated container management.

Formula	Repository
calico	https://github.com/salt-formulas/salt-formula-calico
dekapod	https://github.com/salt-formulas/salt-formula-dekapod
docker	https://github.com/salt-formulas/salt-formula-docker
kubernetes	https://github.com/salt-formulas/salt-formula-kubernetes

Salt Formula Calico

Salt formula for calico deployment.

Documentation and Bugs

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http://salt-formulas.readthedocs.io/

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https://github.com/salt-formulas/salt-formula-calico/issues

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Decapod formula

Decapod is intendend to simplify deployment and lifecycle management of Ceph.

Sample pillars

Single decapod service

```
decapod:
  server:
    enabled: true
```

Read more

- http://decapod.readthedocs.io/en/latest/

Documentation and Bugs

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http://salt-formulas.readthedocs.io/

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https://github.com/salt-formulas/salt-formula-letsencrypt/issues

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Docker Formula

Docker is a platform for developers and sysadmins to develop, ship, and run applications. Docker lets you quickly assemble applications from components and eliminates the friction that can come when shipping code. Docker lets you get your code tested and deployed into production as fast as possible.

Sample Pillars

Docker Host

```
docker:
  host:
    enabled: true
    options:
      bip: 172.31.255.1/16
      insecure-registries:
        - 127.0.0.1
        - 10.0.0.1
      log-driver: json-file
      log-opts:
        max-size: 50m
```

Configure proxy for docker host

```
docker:
  host:
    proxy:
      enabled: true
      http: http://user:pass@proxy:3128
      https: http://user:pass@proxy:3128
      no_proxy:
        - localhost
        - 127.0.0.1
        - docker-registry
```

Docker Swarm

Role can be master, manager or worker. Where master is the first manager that will initialize the swarm.

Metadata for manager (first node):

```
docker:
  host:
    enabled: true
  swarm:
    role: manager
    advertise_addr: 192.168.1.5
    bind:
      address: 192.168.1.5
      port: 2377
```

Metadata for worker.

```
docker:
  host:
    enabled: true
  swarm:
    role: worker
    master:
      host: 192.168.1.5
      port: 2377
```

Token to join to master node is obtained from grains using salt.mine. In case of any `join_token undefined` issues, ensure you have `docker_swarm_` grains available.

Docker Client

Container

```
docker:
  client:
    container:
      jenkins:
        # Don't start automatically
        start: false
        restart: unless-stopped
        image: jenkins:2.7.1
        ports:
          - 8081:8080
          - 50000:50000
        environment:
          JAVA_OPTS: "-Dhudson.footerURL=https://www.example.com"
        volumes:
          - /srv/volumes/jenkins:/var/jenkins_home
```

Using Docker Compose

There are two states that provides this functionality:

- docker.client.stack
- docker.client.compose

Stack is new and works with Docker Swarm Mode. Compose is legacy and works only if node isn't member of Swarm. Metadata for both states are similar and differs only in implementation.

Stack

```
docker:
  client:
    stack:
      django_web:
        enabled: true
        update: true
        environment:
```

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```
          SOMEVAR: somevalue
        version: "3.1"
        service:
          db:
            image: postgres
          web:
            image: djangoapp
            volumes:
              - /srv/volumes/django:/srv/django
            ports:
              - 8000:8000
            depends_on:
              - db
```

Compose

There are three options how to install docker-compose:

- distribution package (default)
- using Pip
- using Docker container

Install docker-compose using Docker (default is distribution package)

```
docker:
  client:
    compose:
      source:
        engine: docker
        image: docker/compose:1.8.0
      django_web:
        # Run up action, any positional argument to docker-compose CLI
        # If not defined, only docker-compose.yml is generated
        status: up
        # Run image pull every time state is run triggering container
        # restart in case it's changed
        pull: true
        environment:
          SOMEVAR: somevalue
        service:
          db:
            image: postgres
          web:
            image: djangoapp
            volumes:
              - /srv/volumes/django:/srv/django
            ports:
              - 8000:8000
            depends_on:
              - db
```

Registry

```
docker:
  client:
    registry:
      target_registry: apt:5000
      image:
        - registry: docker
          name: compose:1.8.0
        - registry: tcpcloud
          name: jenkins:latest
        - registry: ""
          name: registry:2
          target_registry: myregistry
```

Service

To deploy service in Swarm mode, you can use `docker.client.service`:

```
parameters:
  docker:
    client:
      service:
        postgresql:
          environment:
            POSTGRES_USER: user
            POSTGRES_PASSWORD: password
            POSTGRES_DB: mydb
          restart:
            condition: on-failure
          image: "postgres:9.5"
          ports:
            - 5432:5432
          volume:
            data:
              type: bind
              source: /srv/volumes/postgresql/maas
              destination: /var/lib/postgresql/data
```

Docker Registry

```
docker:
  registry:
    log:
      level: debug
      formatter: json
    cache:
      engine: redis
      host: localhost
    storage:
      engine: filesystem
      root: /srv/docker/registry
    bind:
```

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```
      host: 0.0.0.0
      port: 5000
    hook:
      mail:
        levels:
          - panic
        # Options are rendered as yaml as is so use hook-specific options here
        options:
          smtp:
            addr: smtp.sendhost.com:25
            username: sendername
            password: password
            insecure: true
          from: name@sendhost.com
          to:
            - name@receivehost.com
```

Docker login to private registry

```
docker:
  host:
    enabled: true
    registry:
      first:
        address: private.docker.com
        user: username
        password: password
      second:
        address: private2.docker.com
        user: username2
        password: password2
```

Docker container service management

Enforce the service in container is started

```
contrail_control_started:
  dockerng_service.start:
    - container: f020d0d3efa8
    - service: contrail-control
```

or

```
contrail_control_started:
  dockerng_service.start:
    - container: contrail_controller
    - service: contrail-control
```

Enforce the service in container is stoped

```
contrail_control_stoped:
  dockerng_service.stop:
    - container: f020d0d3efa8
    - service: contrail-control
```

Enforce the service in container will be restarted

```
contrail_control_restart:
  dockerng_service.restart:
    - container: f020d0d3efa8
    - service: contrail-control
```

Enforce the service in container is enabled

```
contrail_control_enable:
  dockerng_service.enable:
    - container: f020d0d3efa8
    - service: contrail-control
```

Enforce the service in container is disabled

```
contrail_control_disable:
  dockerng_service.disable:
    - container: f020d0d3efa8
    - service: contrail-control
```

More Information

- https://docs.docker.com/installation/ubuntulinux/
- https://github.com/saltstack-formulas/docker-formula

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

> http://salt-formulas.readthedocs.io/

In the unfortunate event that bugs are discovered, they should be reported to the appropriate issue tracker. Use Github issue tracker for specific salt formula:

> https://github.com/salt-formulas/salt-formula-docker/issues

For feature requests, bug reports or blueprints affecting entire ecosystem, use Launchpad salt-formulas project:

> https://launchpad.net/salt-formulas

You can also join salt-formulas-users team and subscribe to mailing list:

> https://launchpad.net/~salt-formulas-users

Developers wishing to work on the salt-formulas projects should always base their work on master branch and submit pull request against specific formula.

> https://github.com/salt-formulas/salt-formula-docker

Any questions or feedback is always welcome so feel free to join our IRC channel:

> #salt-formulas @ irc.freenode.net

Kubernetes Formula

Kubernetes is an open-source system for automating deployment, scaling, and management of containerized applications. This formula deploys production ready Kubernetes and generate Kubernetes manifests as well.

You can download *kubectl* configuration and connect to your cluster. However, keep in mind *kubernetes_control_address* needs to be accessible from your computer:

```
mkdir -p ~/.kube
[ -f ~/.kube/config ] && cp -v ~/.kube/config ~/.kube/config-backup
ssh cfg01 "sudo ssh ctl01 /etc/kubernetes/kubeconfig.sh" > ~/.kube/config
kubectl get no
```

cfg01 is Salt master node and *ctl01* is one of Kubernetes masters

Sample Pillars

REQUIRED: Define image to use for hyperkube, CNIs and calicoctl image

```
parameters:
  kubernetes:
    common:
      hyperkube:
        image: gcr.io/google_containers/hyperkube:v1.6.5
    pool:
      network:
        calicoctl:
          image: calico/ctl
        cni:
          image: calico/cni
```

Enable helm-tiller addon

```
parameters:
  kubernetes:
    common:
      addons:
        helm:
          enabled: true
```

Enable calico-policy addon

```
parameters:
  kubernetes:
    common:
      addons:
        calico_policy:
          enabled: true
```

Enable virtlet addon

```
parameters:
  kubernetes:
    common:
      addons:
        virtlet:
          enabled: true
          namespace: kube-system
          image: mirantis/virtlet:v0.8.0
          hosts:
          - cmp01
          - cmp02
```

Enable netchecker addon

```
parameters:
  kubernetes:
    common:
      addons:
        netchecker:
          enabled: true
    master:
      namespace:
        netchecker:
          enabled: true
```

Enable Kubenetes Federation control plane

```
parameters:
  kubernetes:
    master:
      federation:
        enabled: True
        name: federation
        namespace: federation-system
        source: https://dl.k8s.io/v1.6.6/kubernetes-client-linux-amd64.tar.gz
        hash: 94b2c9cd29981a8e150c187193bab0d8c0b6e906260f837367feff99860a6376
        service_type: NodePort
        dns_provider: coredns
        childclusters:
          - secondcluster.mydomain
          - thirdcluster.mydomain
```

Enable external DNS addon with CoreDNS provider

```
parameters:
  kubernetes:
    common:
      addons:
        coredns:
          enabled: True
        externaldns:
          enabled: True
          domain: company.mydomain
          provider: coredns
```

Enable external DNS addon with Designate provider

```
parameters:
  kubernetes:
    common:
      addons:
        externaldns:
          enabled: True
          domain: company.mydomain
          provider: designate
          designate_os_options:
            OS_AUTH_URL: https://keystone_auth_endpoint:5000
            OS_PROJECT_DOMAIN_NAME: default
            OS_USER_DOMAIN_NAME: default
            OS_PROJECT_NAME: admin
```

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```
            OS_USERNAME: admin
            OS_PASSWORD: password
            OS_REGION_NAME: RegionOne
```

Enable external DNS addon with AWS provider

```
parameters:
  kubernetes:
    common:
      addons:
        externaldns:
          enabled: True
          domain: company.mydomain
          provider: aws
          aws_options:
            AWS_ACCESS_KEY_ID: XXXXXXXXXXXXXXXXXXXX
            AWS_SECRET_ACCESS_KEY: XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

Enable external DNS addon with Google CloudDNS provider

```
parameters:
  kubernetes:
    common:
      addons:
        externaldns:
          enabled: True
          domain: company.mydomain
          provider: google
          google_options:
            key: ''
            project: default-123
```

key should be exported from google console and processed as *cat key.json | tr -d 'n'*

Enable OpenStack cloud provider

```
parameters:
  kubernetes:
    common:
      cloudprovider:
        enabled: True
        provider: openstack
        params:
          auth_url: https://openstack.mydomain:5000/v3
          username: nova
          password: nova
          region: RegionOne
          tenant_id: 4bce4162d8744c599e350099cfa22a0a
          domain_name: default
          subnet_id: 72407854-aca6-4cf1-b873-e9affb09484b
          lb_version: v2
```

Configure service verbosity

```
parameters:
  kubernetes:
    master:
```

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```
      verbosity: 2
    pool:
      verbosity: 2
```

Set cluster name and domain

```
parameters:
  kubernetes:
    common:
      kubernetes_cluster_domain: mycluster.domain
      cluster_name : mycluster
```

Enable autoscaler for dns addon. Poll period can be skipped.

```
kubernetes:
    common:
      addons:
        dns:
          domain: cluster.local
          enabled: true
          replicas: 1
          server: 10.254.0.10
          autoscaler:
            enabled: true
            poll-period-seconds: 60
```

Pass aditional parameters to daemons:

```
parameters:
  kubernetes:
    master:
      apiserver:
        daemon_opts:
          storage-backend: pigeon
      controller_manager:
        daemon_opts:
          log-dir: /dev/nulL
    pool:
      kubelet:
        daemon_opts:
          max-pods: "6"
```

Containers on pool definitions in pool.service.local

```
parameters:
  kubernetes:
    pool:
      service:
        local:
          enabled: False
          service: libvirt
          cluster: openstack-compute
          namespace: default
          role: ${linux:system:name}
          type: LoadBalancer
          kind: Deployment
```

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```
        apiVersion: extensions/v1beta1
        replicas: 1
        host_pid: True
        nodeSelector:
        - key: openstack
          value: ${linux:system:name}
        hostNetwork: True
        container:
          libvirt-compute:
            privileged: True
            image: ${_param:docker_repository}/libvirt-compute
            tag: ${_param:openstack_container_tag}
```

Master definition

```
kubernetes:
    common:
      cluster_name: cluster
      addons:
        dns:
          domain: cluster.local
          enabled: true
          replicas: 1
          server: 10.254.0.10
    master:
      admin:
        password: password
        username: admin
      apiserver:
        address: 10.0.175.100
        secure_port: 443
        insecure_address: 127.0.0.1
        insecure_port: 8080
      ca: kubernetes
      enabled: true
      etcd:
        host: 127.0.0.1
        members:
        - host: 10.0.175.100
          name: node040
        name: node040
        token: ca939ec9c2a17b0786f6d411fe019e9b
      kubelet:
        allow_privileged: true
      network:
        engine: calico
        mtu: 1500
        hash: fb5e30ebe6154911a66ec3fb5f1195b2
        private_ip_range: 10.150.0.0/16
        version: v0.19.0
      service_addresses: 10.254.0.0/16
      storage:
        engine: glusterfs
        members:
        - host: 10.0.175.101
          port: 24007
        - host: 10.0.175.102
```

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```
          port: 24007
        - host: 10.0.175.103
          port: 24007
        port: 24007
      token:
        admin: DFvQ8GJ9JD4fKNfuyEddw3rjnFTkUKsv
        controller_manager: EreGh6AnWf8DxH8cYavB2zS029PUi7vx
        dns: RAFeVSE4UvsCz4gk3KYReuOI5jsZ1Xt3
        kube_proxy: DFvQ8GelB7afH3wClC9romaMPhquyyEe
        kubelet: 7bN5hJ9JD4fKjnFTkUKsvVNfuyEddw3r
        logging: MJkXKdbgqRmTHSa2ykTaOaMykgO6KcEf
        monitoring: hnsj0XqABgrSww7Nqo7UVTSZLJUt2XRd
        scheduler: HY1UUxEPpmjW4a1dDLGIANYQp1nZkLDk
      version: v1.2.4


kubernetes:
    pool:
      address: 0.0.0.0
      allow_privileged: true
      ca: kubernetes
      cluster_dns: 10.254.0.10
      cluster_domain: cluster.local
      enabled: true
      kubelet:
        allow_privileged: true
        config: /etc/kubernetes/manifests
        frequency: 5s
      master:
        apiserver:
          members:
          - host: 10.0.175.100
        etcd:
          members:
          - host: 10.0.175.100
        host: 10.0.175.100
      network:
        engine: calico
        mtu: 1500
        hash: fb5e30ebe6154911a66ec3fb5f1195b2
        version: v0.19.0
      token:
        kube_proxy: DFvQ8GelB7afH3wClC9romaMPhquyyEe
        kubelet: 7bN5hJ9JD4fKjnFTkUKsvVNfuyEddw3r
      version: v1.2.4
```

Enable basic, token and http authentication, disable ssl auth, create some static users:

```
kubernetes:
  master:
    auth:
      basic:
        enabled: true
        user:
          jdoe:
            password: dummy
            groups:
```

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```
            - system:admin
      http:
        enabled: true
        header:
          user: X-Remote-User
          group: X-Remote-Group
      ssl:
        enabled: false
      token:
        enabled: true
        user:
          jdoe:
            token: dummytoken
            groups:
              - system:admin
```

Kubernetes with OpenContrail network plugin

On Master:

```
kubernetes:
  common:
    addons:
      contrail_network_controller:
        enabled: true
        namespace: kube-system
        image: yashulyak/contrail-controller:latest
  master:
    network:
      engine: opencontrail
      default_domain: default-domain
      default_project: default-domain:default-project
      public_network: default-domain:default-project:Public
      public_ip_range: 185.22.97.128/26
      private_ip_range: 10.150.0.0/16
      service_cluster_ip_range: 10.254.0.0/16
      network_label: name
      service_label: uses
      cluster_service: kube-system/default
      config:
        api:
          host: 10.0.170.70
```

On pools:

```
kubernetes:
  pool:
    network:
      engine: opencontrail
```

Dashboard public IP must be configured when Contrail network is used:

```
kubernetes:
  common:
```

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```
    addons:
      public_ip: 1.1.1.1
```

Kubernetes control plane running in systemd

By default kube-apiserver, kube-scheduler, kube-controllermanager, kube-proxy, etcd running in docker containers through manifests. For stable production environment this should be run in systemd.

```
kubernetes:
  master:
    container: false

kubernetes:
  pool:
    container: false
```

Because k8s services run under kube user without root privileges, there is need to change secure port for apiserver.

```
kubernetes:
  master:
    apiserver:
      secure_port: 8081
```

Kubernetes with Flannel

On Master:

```
kubernetes:
  master:
    network:
      engine: flannel
# If you don't register master as node:
      etcd:
        members:
          - host: 10.0.175.101
            port: 4001
          - host: 10.0.175.102
            port: 4001
          - host: 10.0.175.103
            port: 4001
  common:
    network:
      engine: flannel
```

On pools:

```
kubernetes:
  pool:
    network:
      engine: flannel
      etcd:
        members:
          - host: 10.0.175.101
```

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```
            port: 4001
          - host: 10.0.175.102
            port: 4001
          - host: 10.0.175.103
            port: 4001
  common:
    network:
      engine: flannel
```

Kubernetes with Calico

On Master:

```
kubernetes:
  master:
    network:
      engine: calico
      mtu: 1500
# If you don't register master as node:
      etcd:
        members:
          - host: 10.0.175.101
            port: 4001
          - host: 10.0.175.102
            port: 4001
          - host: 10.0.175.103
            port: 4001
```

On pools:

```
kubernetes:
  pool:
    network:
      engine: calico
      mtu: 1500
      etcd:
        members:
          - host: 10.0.175.101
            port: 4001
          - host: 10.0.175.102
            port: 4001
          - host: 10.0.175.103
            port: 4001
```

Running with secured etcd:

```
kubernetes:
  pool:
    network:
      engine: calico
      mtu: 1500
      etcd:
        ssl:
          enabled: true
  master:
```

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```
    network:
      engine: calico
      etcd:
        ssl:
          enabled: true
```

Running with calico-policy controller:

```
kubernetes:
  pool:
    network:
      engine: calico
      mtu: 1500
      addons:
        calico_policy:
          enabled: true

  master:
    network:
      engine: calico
      mtu: 1500
      addons:
        calico_policy:
          enabled: true
```

Enable Prometheus metrics in Felix

```
kubernetes:
  pool:
    network:
      prometheus:
        enabled: true
  master:
    network:
      prometheus:
        enabled: true
```

Post deployment configuration

```
# set ETCD
export ETCD_AUTHORITY=10.0.111.201:4001

# Set NAT for pods subnet
calicoctl pool add 192.168.0.0/16 --nat-outgoing

# Status commands
calicoctl status
calicoctl node show
```

Kubernetes with GlusterFS for storage

```
kubernetes:
  master:
    ...
```

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```
    storage:
      engine: glusterfs
      port: 24007
      members:
      - host: 10.0.175.101
        port: 24007
      - host: 10.0.175.102
        port: 24007
      - host: 10.0.175.103
        port: 24007
     ...
```

Kubernetes Storage Class

AWS EBS storageclass integration. It also requires to create IAM policy and profiles for instances and tag all resources by KubernetesCluster in EC2.

```
kubernetes:
  common:
    addons:
      storageclass:
        aws_slow:
          enabled: True
          default: True
          provisioner: aws-ebs
          name: slow
          type: gp2
          iopspergb: "10"
          zones: xxx
        nfs_shared:
          name: elasti01
          enabled: True
          provisioner: nfs
          spec:
            name: elastic_data
            nfs:
              server: 10.0.0.1
              path: /exported_path
```

Kubernetes namespaces

Create namespace:

```
kubernetes:
  master:
    ...
    namespace:
      kube-system:
        enabled: True
      namespace2:
        enabled: True
      namespace3:
```

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```
        enabled: False
     ...
```

Kubernetes labels

Label node:

```
kubernetes:
  master:
    label:
      label01:
        value: value01
        node: node01
        enabled: true
        key: key01
      ...
```

Pull images from private registries

```
kubernetes:
  master:
    ...
    registry:
      secret:
        registry01:
          enabled: True
          key: (get from `cat /root/.docker/config.json | base64`)
          namespace: default
     ...
  control:
    ...
    service:
      service01:
      ...
      image_pull_secretes: registry01
      ...
```

Kubernetes Service Definitions in pillars

Following samples show how to generate kubernetes manifest as well and provide single tool for complete infrastructure management.

Deployment manifest

```
salt:
  control:
    enabled: True
    hostNetwork: True
    service:
```

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```
      memcached:
        privileged: True
        service: memcached
        role: server
        type: LoadBalancer
        replicas: 3
        kind: Deployment
        apiVersion: extensions/v1beta1
        ports:
        - port: 8774
          name: nova-api
        - port: 8775
          name: nova-metadata
        volume:
          volume_name:
            type: hostPath
            mount: /certs
            path: /etc/certs
        container:
          memcached:
            image: memcached
            tag:2
            ports:
            - port: 8774
              name: nova-api
            - port: 8775
              name: nova-metadata
            variables:
            - name: HTTP_TLS_CERTIFICATE:
              value: /certs/domain.crt
            - name: HTTP_TLS_KEY
              value: /certs/domain.key
            volumes:
            - name: /etc/certs
              type: hostPath
              mount: /certs
              path: /etc/certs
```

PetSet manifest

```
service:
  memcached:
    apiVersion: apps/v1alpha1
    kind: PetSet
    service_name: 'memcached'
    container:
      memcached:
    ...
```

Configmap

You are able to create configmaps using support layer between formulas. It works simple, eg. in nova formula there's file `meta/config.yml` which defines config files used by that service and roles.

Kubernetes formula is able to generate these files using custom pillar and grains structure. This way you are able to run docker images built by any way while still re-using your configuration management.

Example pillar:

```
kubernetes:
  control:
    config_type: default|kubernetes # Output is yaml k8s or default single files
    configmap:
      nova-control:
        grains:
          # Alternate grains as OS running in container may differ from
          # salt minion OS. Needed only if grains matters for config
          # generation.
          os_family: Debian
        pillar:
          # Generic pillar for nova controller
          nova:
            controller:
              enabled: true
              versionn: liberty
              ...
```

To tell which services supports config generation, you need to ensure pillar structure like this to determine support:

```
nova:
  _support:
    config:
      enabled: true
```

initContainers

Example pillar:

```
kubernetes:
  control:
  service:
    memcached:
      init_containers:
      - name: test-mysql
        image: busybox
        command:
        - sleep
        - 3600
        volumes:
        - name: config
          mount: /test
      - name: test-memcached
        image: busybox
        command:
        - sleep
        - 3600
        volumes:
        - name: config
          mount: /test
```

Affinity

podAffinity

Example pillar:

```
kubernetes:
  control:
  service:
    memcached:
      affinity:
        pod_affinity:
          name: podAffinity
          expression:
            label_selector:
              name: labelSelector
              selectors:
              - key: app
                value: memcached
          topology_key: kubernetes.io/hostname
```

podAntiAffinity

Example pillar:

```
kubernetes:
  control:
  service:
    memcached:
      affinity:
        anti_affinity:
          name: podAntiAffinity
          expression:
            label_selector:
              name: labelSelector
              selectors:
              - key: app
                value: opencontrail-control
          topology_key: kubernetes.io/hostname
```

nodeAffinity

Example pillar:

```
kubernetes:
  control:
  service:
    memcached:
      affinity:
        node_affinity:
          name: nodeAffinity
          expression:
            match_expressions:
```

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```
              name: matchExpressions
              selectors:
              - key: key
                operator: In
                values:
                - value1
                - value2
```

Volumes

hostPath

```
service:
  memcached:
    container:
      memcached:
        volumes:
          - name: volume1
            mountPath: /volume
            readOnly: True
    ...
    volume:
      volume1:
        name: /etc/certs
        type: hostPath
        path: /etc/certs
```

emptyDir

```
service:
  memcached:
    container:
      memcached:
        volumes:
          - name: volume1
            mountPath: /volume
            readOnly: True
    ...
    volume:
      volume1:
        name: /etc/certs
        type: emptyDir
```

configMap

```
service:
  memcached:
    container:
      memcached:
```

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```
        volumes:
          - name: volume1
            mountPath: /volume
            readOnly: True
    ...
    volume:
      volume1:
        type: config_map
        item:
          configMap1:
            key: config.conf
            path: config.conf
          configMap2:
            key: policy.json
            path: policy.json
```

To mount single configuration file instead of whole directory:

```
service:
  memcached:
    container:
      memcached:
        volumes:
          - name: volume1
            mountPath: /volume/config.conf
            sub_path: config.conf
```

Generating Jobs

Example pillar:

```
kubernetes:
  control:
    job:
      sleep:
        job: sleep
        restart_policy: Never
        container:
          sleep:
            image: busybox
            tag: latest
            command:
            - sleep
            - "3600"
```

Volumes and Variables can be used as the same way as during Deployment generation.

Custom params:

```
kubernetes:
  control:
    job:
      host_network: True
      host_pid: True
      container:
```

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```
        sleep:
          privileged: True
      node_selector:
        key: node
        value: one
      image_pull_secretes: password
```

Role-based access control

To enable RBAC, you need to set following option on your apiserver:

```
kubernetes:
  master:
    auth:
      mode: Node,RBAC
```

Then you can use `kubernetes.control.role` state to orchestrate role and rolebindings. Following example shows how to create brand new role and binding for service account:

```
control:
  role:
    etcd-operator:
      kind: ClusterRole
      rules:
        - apiGroups:
            - etcd.coreos.com
          resources:
            - clusters
          verbs:
            - "*"
        - apiGroups:
            - extensions
          resources:
            - thirdpartyresources
          verbs:
            - create
        - apiGroups:
            - storage.k8s.io
          resources:
            - storageclasses
          verbs:
            - create
        - apiGroups:
            - ""
          resources:
            - replicasets
          verbs:
            - "*"
      binding:
        etcd-operator:
          kind: ClusterRoleBinding
          namespace: test # <-- if no namespace, then it's clusterrolebinding
          subject:
            etcd-operator:
              kind: ServiceAccount
```

Simplest possible use-case, add user test edit permissions on it's test namespace:

```
kubernetes:
  control:
    role:
      edit:
        kind: ClusterRole
        # No rules defined, so only binding will be created assuming role
        # already exists
        binding:
          test:
            namespace: test
            subject:
              test:
                kind: User
```

More Information

- https://github.com/Juniper/kubernetes/blob

/opencontrail-integration/docs /getting-started-guides/opencontrail.md * https://github.com/kubernetes/kubernetes/tree/master/cluster/saltbase

Documentation and Bugs

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- Documentation Home
- Project Introduction
- Installation and Operations Manual
- Development Documentation

Home SaltStack-Formulas Project Introduction

OpenStack Services

All supported OpenStack cloud platform services.

Formula	Repository
aodh	https://github.com/salt-formulas/salt-formula-aodh
avinetworks	https://github.com/salt-formulas/salt-formula-avinetworks
billometer	https://github.com/salt-formulas/salt-formula-billometer
ceilometer	https://github.com/salt-formulas/salt-formula-ceilometer
cinder	https://github.com/salt-formulas/salt-formula-cinder
designate	https://github.com/salt-formulas/salt-formula-designate
glance	https://github.com/salt-formulas/salt-formula-glance
heat	https://github.com/salt-formulas/salt-formula-heat
horizon	https://github.com/salt-formulas/salt-formula-horizon
keystone	https://github.com/salt-formulas/salt-formula-keystone
magnum	https://github.com/salt-formulas/salt-formula-magnum
midonet	https://github.com/salt-formulas/salt-formula-midonet
murano	https://github.com/salt-formulas/salt-formula-murano
neutron	https://github.com/salt-formulas/salt-formula-neutron
nova	https://github.com/salt-formulas/salt-formula-nova
opencontrail	https://github.com/salt-formulas/salt-formula-opencontrail
openvstorage	https://github.com/salt-formulas/salt-formula-openvstorage
rally	https://github.com/salt-formulas/salt-formula-rally
sahara	https://github.com/salt-formulas/salt-formula-sahara
swift	https://github.com/salt-formulas/salt-formula-swift
tempest	https://github.com/salt-formulas/salt-formula-tempest

aodh

Aodh is an alarming service for OpenStack. It used to be a part of Ceilometer, but starting from Mitaka it is a separate project. Aodh supports several types of alarms like threshold, event, composite and gnocchi-specific. In cluster mode, coordination is enabled via tooz with Redis backend. MySQL is used as a data backend for alarms and alarm history.

Sample pillars

Cluster aodh service

```
aodh:
  server:
    enabled: true
    version: mitaka
    ttl: 86400
    cluster: true
  database:
    engine: "mysql+pymysql"
    host: 10.0.106.20
    port: 3306
    name: aodh
    user: aodh
    password: password
  bind:
```

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```
    host: 10.0.106.20
    port: 8042
  identity:
    engine: keystone
    host: 10.0.106.20
    port: 35357
    tenant: service
    user: aodh
    password: password
  message_queue:
    engine: rabbitmq
    port: 5672
    user: openstack
    password: password
    virtual_host: '/openstack'
  cache:
    members:
    - host: 10.10.10.10
        port: 11211
    - host: 10.10.10.11
        port: 11211
    - host: 10.10.10.12
        port: 11211
```

Enhanced logging with logging.conf

By default logging.conf is disabled.

That is possible to enable per-binary logging.conf with new variables:

- openstack_log_appender - set it to true to enable log_config_append for all OpenStack services;
- openstack_fluentd_handler_enabled - set to true to enable FluentHandler for all Openstack services.

Only WatchedFileHandler and FluentHandler are available.

Also it is possible to configure this with pillar:

```
aodh:
  server:
    logging:
      log_appender: true
      log_handlers:
        watchedfile:
          enabled: true
        fluentd:
          enabled: true
```

Development and testing

Development and test workflow with Test Kitchen and kitchen-salt provisioner plugin.

Test Kitchen is a test harness tool to execute your configured code on one or more platforms in isolation. There is a `.kitchen.yml` in main directory that defines *platforms* to be tested and *suites* to execute on them.

Kitchen CI can spin instances locally or remote, based on used *driver*. For local development `.kitchen.yml` defines a vagrant or docker driver.

To use backend drivers or implement your CI follow the section **'INTEGRATION.rst#Continuous Integration'__**.

The Busser *Verifier* is used to setup and run tests implementated in *<repo>/test/integration*. It installs the particular driver to tested instance (Serverspec, InSpec, Shell, Bats, . . .) prior the verification is executed.

Usage:

```
# list instances and status
kitchen list

# manually execute integration tests
kitchen [test || [create|converge|verify|exec|login|destroy|...]] [instance] -t tests/
↪integration

# use with provided Makefile (ie: within CI pipeline)
make kitchen
```

Read more

- https://docs.openstack.org/cli-reference/aodh.html
- https://docs.openstack.org/developer/aodh/

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> https://github.com/salt-formulas/salt-formula-aodh

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Avinetworks formula

Sample pillars

Salt formula to setup Avi Networks LBaaS

```
avinetworks:
  server:
    enabled: true
    identity: cloud1
    image_location: http://...
    disk_format: qcow2
    public_network: INET1
    saltmaster_ip: 10.0.0.90

avinetworks:
  client:
    enabled: true
```

External links

- https://kb.avinetworks.com/installing-avi-vantage-for-openstack-2/

Documentation and Bugs

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http://salt-formulas.readthedocs.io/

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https://github.com/salt-formulas/salt-formula-avinetworks/issues

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https://github.com/salt-formulas/salt-formula-avinetworks

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Billometer

Sample pillar

```
billometer:
  server:
    enabled: true
    workers: 3
    secret_key: secret_token
    sync_time: 600
```

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```
    collect_time: 1800
    metric:
      in:
        engine: graphite
        host: 10.10.10.180
        port: 80
      out:
        engine: statsd
        host: 10.10.10.180
        prefix: foo
        port: 81
    bind:
      address: 0.0.0.0
      port: 9753
      protocol: tcp
    source:
      type: 'git'
      address: 'git@repo1.robotice.cz:python-apps/billometer.git'
      rev: 'master'
    cache:
      engine: 'memcached'
      host: '127.0.0.1'
      prefix: 'CACHE_DJANGO_ENC'
    database:
      engine: 'postgresql'
      host: '127.0.0.1'
      name: 'django_billometer'
      password: 'db-pwd'
      user: 'django_billometer'
    identity:
      engine: 'keystone'
      region: 'regionOne'
      token: 'token'
      host: '127.0.0.1'
      port: 5000
      api_version: 2
    mail:
      host: 'mail.domain.com'
      password: 'mail-pwd'
      user: 'mail-user'
    logging:
      engine: sentry
      dsn: pub@sec:dsn.cz/12
```

Extra Resources

```
billometer:
  server:
    enabled: true
    workers: 3
    secret_key: secret_token
    sync_time: 600
    collect_time: 1800
    extra_resource:
```

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```
      network.rx:
        label: Network RX
        resource: network.rx
        price_rate: 0.0002
        threshold: 150000
      7k2_SAS
        price_rate: 0.008205
        resource: cinder.volume
        name: 7k2_SAS
        label: 7k2 SA
      10k_SAS
        price_rate: 0.027383
        resource: cinder.volume
        label: 10k2 SAS
        name: 10k_SAS
      15k_SAS
        price_rate: 0.034232
        resource: cinder.volume
        label: 15k2 SAS
        name: 15k_SAS
      EasyTier
        price_rate: 0.041082
        resource: cinder.volume
        label: Easy Tier
        name:'EasyTier
```

Read more

- http://docs.gunicorn.org/en/latest/configure.html

Documentation and Bugs

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Ceilometer Formula

The ceilometer project aims to deliver a unique point of contact for billing systems to acquire all of the measurements they need to establish customer billing, across all current OpenStack components with work underway to support future OpenStack components. This formula provides different backends for Ceilometer data: MongoDB, InfluxDB. Also, Graphite and direct (to Elasticsearch) publishers are available. If InfluxDB is used as a backend, heka is configured to consume messages from RabbitMQ and write in to InfluxDB, i.e. ceilometer collector service is not used in this configuration.

Sample Pillars

Ceilometer API/controller node

```
ceilometer:
  server:
    enabled: true
    version: mitaka
    cluster: true
    secret: pwd
    bind:
      host: 127.0.0.1
      port: 8777
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
      tenant: service
      user: ceilometer
      password: pwd
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: pwd
      virtual_host: '/openstack'
```

Enable CORS parameters

```
ceilometer:
  server:
    cors:
      allowed_origin: https:localhost.local,http:localhost.local
      expose_headers: X-Auth-Token,X-Openstack-Request-Id,X-Subject-Token
      allow_methods: GET,PUT,POST,DELETE,PATCH
      allow_headers: X-Auth-Token,X-Openstack-Request-Id,X-Subject-Token
      allow_credentials: True
      max_age: 86400
```

Configuration of policy.json file

```
ceilometer:
  server:
    ....
    policy:
      segregation: 'rule:context_is_admin'
      # Add key without value to remove line from policy.json
      'telemetry:get_resource':
```

Databases configuration

MongoDB example:

```
ceilometer:
  server:
    database:
      engine: mongodb
      members:
      - host: 10.0.106.10
        port: 27017
      - host: 10.0.106.20
        port: 27017
      - host: 10.0.106.30
        port: 27017
      name: ceilometer
      user: ceilometer
      password: password
```

InfluxDB/Elasticsearch example:

```
ceilometer:
  server:
    database:
      influxdb:
        host: 10.0.106.10
        port: 8086
        user: ceilometer
        password: password
        database: ceilometer
      elasticsearch:
        enabled: true
        host: 10.0.106.10
        port: 9200
```

Client-side RabbitMQ HA setup

```
ceilometer:
  server:
    ....
```

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```
    message_queue:
      engine: rabbitmq
      members:
      - host: 10.0.106.10
      - host: 10.0.106.20
      - host: 10.0.106.30
      user: openstack
      password: pwd
      virtual_host: '/openstack'
   ....
```

Ceilometer Graphite publisher

```
ceilometer:
  server:
    enabled: true
    publisher:
      graphite:
        enabled: true
        host: 10.0.0.1
        port: 2003
```

Ceilometer compute agent

```
ceilometer:
  agent:
    enabled: true
    version: mitaka
    secret: pwd
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
      tenant: service
      user: ceilometer
      password: pwd
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: pwd
      virtual_host: '/openstack'
      rabbit_ha_queues: true
```

Ceilometer instance discovery method

```
ceilometer:
  agent:
    ...
    discovery_method: naive
```

Keystone auth caching

```
ceilometer:
  server:
    cache:
      members:
        - host: 10.10.10.10
          port: 11211
        - host: 10.10.10.11
          port: 11211
        - host: 10.10.10.12
          port: 11211
  agent:
    cache:
      members:
        - host: 10.10.10.10
          port: 11211
        - host: 10.10.10.11
          port: 11211
        - host: 10.10.10.12
          port: 11211
```

Enhanced logging with logging.conf

By default logging.conf is disabled.

That is possible to enable per-binary logging.conf with new variables:

- openstack_log_appender - set it to true to enable log_config_append for all OpenStack services;
- openstack_fluentd_handler_enabled - set to true to enable FluentHandler for all Openstack services.
- openstack_ossyslog_handler_enabled - set to true to enable OSSysLogHandler for all Openstack services.

Only WatchedFileHandler, OSSysLogHandler and FluentHandler are available.

Also it is possible to configure this with pillar:

```
ceilometer:
  server:
    logging:
      log_appender: true
      log_handlers:
        watchedfile:
          enabled: true
        fluentd:
          enabled: true
        ossyslog:
          enabled: true

  agent:
    logging:
      log_appender: true
      log_handlers:
        watchedfile:
          enabled: true
        fluentd:
```

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```
    enabled: true
  ossyslog:
    enabled: true
```

More Information

- https://wiki.openstack.org/wiki/Ceilometer
- http://docs.openstack.org/developer/ceilometer/install/manual.html
- http://docs.openstack.org/developer/ceilometer/
- https://fedoraproject.org/wiki/QA:Testcase_OpenStack_ceilometer_install
- https://github.com/spilgames/ceilometer_graphite_publisher
- http://engineering.spilgames.com/using-ceilometer-graphite/

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Openstack Cinder Block Storage

Cinder provides an infrastructure for managing volumes in OpenStack. It was originally a Nova component called nova-volume, but has become an independent project since the Folsom release.

Sample pillars

New structure divides cinder-api,cinder-scheduler to role controller and cinder-volume to role volume.

```
cinder:
  controller:
    enabled: true
    version: juno
    cinder_uid: 304
    cinder_gid: 304
    nas_secure_file_permissions: false
    nas_secure_file_operations: false
    cinder_internal_tenant_user_id: f46924c112a14c80ab0a24a613d95eef
    cinder_internal_tenant_project_id: b7455b8974bb4064ad247c8f375eae6c
    default_volume_type: 7k2SaS
    enable_force_upload: true
    availability_zone_fallback: True
    database:
      engine: mysql
      host: 127.0.0.1
      port: 3306
      name: cinder
      user: cinder
      password: pwd
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
      tenant: service
      user: cinder
      password: pwd
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    backend:
      7k2_SAS:
        engine: storwize
        type_name: slow-disks
        host: 192.168.0.1
        port: 22
        user: username
        password: pass
        connection: FC/iSCSI
        multihost: true
        multipath: true
        pool: SAS7K2
    audit:
      enabled: false
    osapi_max_limit: 500
    barbican:
      enabled: true

cinder:
  volume:
    enabled: true
    version: juno
    cinder_uid: 304
```

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```
    cinder_gid: 304
    nas_secure_file_permissions: false
    nas_secure_file_operations: false
    cinder_internal_tenant_user_id: f46924c112a14c80ab0a24a613d95eef
    cinder_internal_tenant_project_id: b7455b8974bb4064ad247c8f375eae6c
    default_volume_type: 7k2SaS
    nable_force_upload: true
    database:
      engine: mysql
      host: 127.0.0.1
      port: 3306
      name: cinder
      user: cinder
      password: pwd
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
      tenant: service
      user: cinder
      password: pwd
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    backend:
      7k2_SAS:
        engine: storwize
        type_name: 7k2 SAS disk
        host: 192.168.0.1
        port: 22
        user: username
        password: pass
        connection: FC/iSCSI
        multihost: true
        multipath: true
        pool: SAS7K2
    audit:
      enabled: false
    barbican:
      enabled: true
```

Enable CORS parameters

```
cinder:
  controller:
    cors:
      allowed_origin: https:localhost.local,http:localhost.local
      expose_headers: X-Auth-Token,X-Openstack-Request-Id,X-Subject-Token
      allow_methods: GET,PUT,POST,DELETE,PATCH
      allow_headers: X-Auth-Token,X-Openstack-Request-Id,X-Subject-Token
      allow_credentials: True
      max_age: 86400
```

Client-side RabbitMQ HA setup for controller

```
cinder:
  controller:
    ....
    message_queue:
      engine: rabbitmq
      members:
        - host: 10.0.16.1
        - host: 10.0.16.2
        - host: 10.0.16.3
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    ....
```

Client-side RabbitMQ HA setup for volume component

```
cinder:
  volume:
    ....
    message_queue:
      engine: rabbitmq
      members:
        - host: 10.0.16.1
        - host: 10.0.16.2
        - host: 10.0.16.3
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    ....
```

Configuring TLS communications

Note: by default system wide installed CA certs are used, so `cacert_file` param is optional, as well as `cacert`.

- **RabbitMQ TLS**

```
cinder:
  controller, volume:
     message_queue:
       port: 5671
       ssl:
         enabled: True
         (optional) cacert: cert body if the cacert_file does not exists
         (optional) cacert_file: /etc/openstack/rabbitmq-ca.pem
         (optional) version: TLSv1_2
```

- **MySQL TLS**

```
cinder:
  controller:
     database:
       ssl:
         enabled: True
         (optional) cacert: cert body if the cacert_file does not exists
         (optional) cacert_file: /etc/openstack/mysql-ca.pem
```

- **Openstack HTTPS API**

```
cinder:
 controller, volume:
     identity:
        protocol: https
        (optional) cacert_file: /etc/openstack/proxy.pem
     glance:
        protocol: https
        (optional) cacert_file: /etc/openstack/proxy.pem
```

Cinder setup with zeroing deleted volumes

```
cinder:
  controller:
    enabled: true
    wipe_method: zero
    ...
```

Cinder setup with shreding deleted volumes

```
cinder:
  controller:
    enabled: true
    wipe_method: shred
    ...
```

Configuration of policy.json file

```
cinder:
  controller:
    ....
    policy:
      'volume:delete': 'rule:admin_or_owner'
      # Add key without value to remove line from policy.json
      'volume:extend':
```

Default Cinder setup with iSCSI target

```
cinder:
  controller:
    enabled: true
    version: mitaka
    default_volume_type: lvmdriver-1
    database:
      engine: mysql
      host: 127.0.0.1
      port: 3306
      name: cinder
      user: cinder
      password: pwd
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
      tenant: service
      user: cinder
      password: pwd
```

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```
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    backend:
      lvmdriver-1:
        engine: lvm
        type_name: lvmdriver-1
        volume_group: cinder-volume
```

Cinder setup for IBM Storwize

```
cinder:
  volume:
    enabled: true
    backend:
      7k2_SAS:
        engine: storwize
        type_name: 7k2 SAS disk
        host: 192.168.0.1
        port: 22
        user: username
        password: pass
        connection: FC/iSCSI
        multihost: true
        multipath: true
        pool: SAS7K2
      10k_SAS:
        engine: storwize
        type_name: 10k SAS disk
        host: 192.168.0.1
        port: 22
        user: username
        password: pass
        connection: FC/iSCSI
        multihost: true
        multipath: true
        pool: SAS10K
      15k_SAS:
        engine: storwize
        type_name: 15k SAS
        host: 192.168.0.1
        port: 22
        user: username
        password: pass
        connection: FC/iSCSI
        multihost: true
        multipath: true
        pool: SAS15K
```

Cinder setup with NFS

```
cinder:
  controller:
```

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```
    enabled: true
    default_volume_type: nfs-driver
    backend:
      nfs-driver:
        engine: nfs
        type_name: nfs-driver
        volume_group: cinder-volume
        path: /var/lib/cinder/nfs
        devices:
        - 172.16.10.110:/var/nfs/cinder
        options: rw,sync
```

Cinder setup with NetApp

```
cinder:
  controller:
    backend:
      netapp:
        engine: netapp
        type_name: netapp
        user: openstack
        vserver: vm1
        server_hostname: 172.18.2.3
        password: password
        storage_protocol: nfs
        transport_type: https
        lun_space_reservation: enabled
        use_multipath_for_image_xfer: True
        nas_secure_file_operations: false
        nas_secure_file_permissions: false
        devices:
          - 172.18.1.2:/vol_1
          - 172.18.1.2:/vol_2
          - 172.18.1.2:/vol_3
          - 172.18.1.2:/vol_4
linux:
  system:
    package:
      nfs-common:
        version: latest
```

Cinder setup with Hitachi VPS

```
cinder:
  controller:
    enabled: true
    backend:
      hus100_backend:
        type_name: HUS100
        backend: hus100_backend
        engine: hitachi_vsp
        connection: FC
```

Cinder setup with Hitachi VPS with defined ldev range

```
cinder:
  controller:
```

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```
    enabled: true
    backend:
      hus100_backend:
        type_name: HUS100
        backend: hus100_backend
        engine: hitachi_vsp
        connection: FC
        ldev_range: 0-1000
```

Cinder setup with CEPH

```
cinder:
  controller:
    enabled: true
    backend:
      ceph_backend:
        type_name: standard-iops
        backend: ceph_backend
        pool: volumes
        engine: ceph
        user: cinder
        secret_uuid: da74ccb7-aa59-1721-a172-0006b1aa4e3e
        client_cinder_key: AQDOavlU6BsSJhAAnpFR906mvdgdfRqLHwu0Uw==
        report_discard_supported: True
```

http://ceph.com/docs/master/rbd/rbd-openstack/

Cinder setup with HP3par

```
cinder:
  controller:
    enabled: true
    backend:
      hp3par_backend:
        type_name: hp3par
        backend: hp3par_backend
        user: hp3paruser
        password: something
        url: http://10.10.10.10/api/v1
        cpg: OpenStackCPG
        host: 10.10.10.10
        login: hp3paradmin
        sanpassword: something
        debug: True
        snapcpg: OpenStackSNAPCPG
```

Cinder setup with Fujitsu Eternus

```
cinder:
  volume:
    enabled: true
    backend:
      10kThinPro:
        type_name: 10kThinPro
        engine: fujitsu
        pool: 10kThinPro
        host: 192.168.0.1
```

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```
        port: 5988
        user: username
        password: pass
        connection: FC/iSCSI
        name: 10kThinPro
      10k_SAS:
        type_name: 10k_SAS
        pool: SAS10K
        engine: fujitsu
        host: 192.168.0.1
        port: 5988
        user: username
        password: pass
        connection: FC/iSCSI
        name: 10k_SAS
```

Cinder setup with IBM GPFS filesystem

```
cinder:
  volume:
    enabled: true
    backend:
      GPFS-GOLD:
        type_name: GPFS-GOLD
        engine: gpfs
        mount_point: '/mnt/gpfs-openstack/cinder/gold'
      GPFS-SILVER:
        type_name: GPFS-SILVER
        engine: gpfs
        mount_point: '/mnt/gpfs-openstack/cinder/silver'
```

Cinder setup with HP LeftHand

```
cinder:
  volume:
    enabled: true
    backend:
      HP-LeftHand:
        type_name: normal-storage
        engine: hp_lefthand
        api_url: 'https://10.10.10.10:8081/lhos'
        username: user
        password: password
        clustername: cluster1
        iscsi_chap_enabled: false
```

Extra parameters for HP LeftHand

```
cinder type-key normal-storage set hplh:data_pl=r-10-2 hplh:provisioning=full
```

Cinder setup with Solidfire

```
cinder:
  volume:
    enabled: true
    backend:
```

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```
      solidfire:
        type_name: normal-storage
        engine: solidfire
        san_ip: 10.10.10.10
        san_login: user
        san_password: password
        clustername: cluster1
        sf_emulate_512: false
```

Cinder setup with Block Device driver

```
cinder:
  volume:
    enabled: true
    backend:
      bdd:
        engine: bdd
        enabled: true
        type_name: bdd
        devices:
          - sdb
          - sdc
          - sdd
```

Enable cinder-backup service for ceph

```
cinder:
  controller:
    enabled: true
    version: mitaka
    backup:
      engine: ceph
      ceph_conf: "/etc/ceph/ceph.conf"
      ceph_pool: backup
      ceph_stripe_count: 0
      ceph_stripe_unit: 0
      ceph_user: cinder
      ceph_chunk_size: 134217728
      restore_discard_excess_bytes: false
  volume:
    enabled: true
    version: mitaka
    backup:
      engine: ceph
      ceph_conf: "/etc/ceph/ceph.conf"
      ceph_pool: backup
      ceph_stripe_count: 0
      ceph_stripe_unit: 0
      ceph_user: cinder
      ceph_chunk_size: 134217728
      restore_discard_excess_bytes: false
```

Enable auditing filter, ie: CADF

```
cinder:
  controller:
    audit:
```

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```
      enabled: true
  ....
      filter_factory: 'keystonemiddleware.audit:filter_factory'
      map_file: '/etc/pycadf/cinder_api_audit_map.conf'
  ....
  volume:
    audit:
      enabled: true
  ....
      filter_factory: 'keystonemiddleware.audit:filter_factory'
      map_file: '/etc/pycadf/cinder_api_audit_map.conf'
```

Cinder setup with custom availability zones:

```
cinder:
  controller:
    default_availability_zone: my-default-zone
    storage_availability_zone: my-custom-zone-name
cinder:
  volume:
    default_availability_zone: my-default-zone
    storage_availability_zone: my-custom-zone-name
```

Cinder setup with custom non-admin volume query filters:

```
cinder:
  controller:
    query_volume_filters:
      - name
      - status
      - metadata
      - availability_zone
      - bootable
```

public_endpoint and osapi_volume_base_url parameters: "public_endpoint" is used for configuring versions endpoint, "osapi_volume_base_URL" is used to present Cinder URL to users. They are useful when running Cinder under load balancer in SSL.

```
cinder:
  controller:
    public_endpoint_address: https://${_param:cluster_domain}:8776
```

The default availability zone is used when a volume has been created, without specifying a zone in the create request. (this zone must exist in your configuration obviously) The storage availability zone is the actual zone where the node belongs to. Make sure to specify this per node. Check the documentation of OpenStack for more information

Client role

```
cinder:
  client:
    enabled: true
    identity:
      host: 127.0.0.1
      port: 35357
      project: service
      user: cinder
```

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```
      password: pwd
      protocol: http
      endpoint_type: internalURL
      region_name: RegionOne
    backend:
      ceph:
        type_name: standard-iops
        engine: ceph
        key:
          conn_speed: fibre-10G
```

Enable Barbican integration

```
cinder:
  controller:
    barbican:
      enabled: true
```

Enhanced logging with logging.conf

By default logging.conf is disabled.

That is possible to enable per-binary logging.conf with new variables:

- openstack_log_appender - set it to true to enable log_config_append for all OpenStack services;
- openstack_fluentd_handler_enabled - set to true to enable FluentHandler for all Openstack services.
- openstack_ossyslog_handler_enabled - set to true to enable OSSysLogHandler for all Openstack services.

Only WatchedFileHandler, OSSysLogHandler and FluentHandler are available.

Also it is possible to configure this with pillar:

```
cinder:
  controller:
    logging:
      log_appender: true
      log_handlers:
        watchedfile:
          enabled: true
        fluentd:
          enabled: true
        ossyslog:
          enabled: true

  volume:
    logging:
      log_appender: true
      log_handlers:
        watchedfile:
          enabled: true
        fluentd:
          enabled: true
        ossyslog:
          enabled: true
```

Documentation and Bugs

To learn how to deploy OpenStack Salt, consult the documentation available online at:

https://wiki.openstack.org/wiki/OpenStackSalt

In the unfortunate event that bugs are discovered, they should be reported to the appropriate bug tracker. If you obtained the software from a 3rd party operating system vendor, it is often wise to use their own bug tracker for reporting problems. In all other cases use the master OpenStack bug tracker, available at:

> http://bugs.launchpad.net/openstack-salt

Developers wishing to work on the OpenStack Salt project should always base their work on the latest formulas code, available from the master GIT repository at:

> https://git.openstack.org/cgit/openstack/salt-formula-cinder

Developers should also join the discussion on the IRC list, at:

> https://wiki.openstack.org/wiki/Meetings/openstack-salt

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

> http://salt-formulas.readthedocs.io/

In the unfortunate event that bugs are discovered, they should be reported to the appropriate issue tracker. Use Github issue tracker for specific salt formula:

> https://github.com/salt-formulas/salt-formula-cinder/issues

For feature requests, bug reports or blueprints affecting entire ecosystem, use Launchpad salt-formulas project:

> https://launchpad.net/salt-formulas

You can also join salt-formulas-users team and subscribe to mailing list:

> https://launchpad.net/~salt-formulas-users

Developers wishing to work on the salt-formulas projects should always base their work on master branch and submit pull request against specific formula.

> https://github.com/salt-formulas/salt-formula-cinder

Any questions or feedback is always welcome so feel free to join our IRC channel:

> #salt-formulas @ irc.freenode.net

Designate formula

Designate provides DNSaaS services for OpenStack.

Sample pillars

For Designate with BIND9 local backend:

```
designate:
  server:
    enabled: true
    region: RegionOne
    domain_id: 5186883b-91fb-4891-bd49-e6769234a8fc
    version: ocata
    backend:
      bind9:
        rndc_key: 4pc+X4PDqb2q+5o72dISm72LM1Ds9X2EYZjqg+nmsS7FhdTwzFFY8l/
↪iEDmHxnyjkA33EQC8H+z0fLLBunoitw==
        rndc_algorithm: hmac-sha512
    bind:
      api:
        address: 127.0.0.1
    database:
      engine: mysql
      host: 127.0.0.1
      port: 3306
      name:
        main_database: designate
        pool_manager: designate_pool_manager
      user: designate
      password: passw0rd
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
      tenant: service
      user: designate
      password: passw0rd
    message_queue:
      engine: rabbitmq
      members:
      - host: 127.0.0.1
      user: openstack
      password: password
      virtual_host: '/openstack'
    pools:
      default:
        description: 'default pool'
        attributes:
          service_tier: GOLD
        ns_records:
          - hostname: 'ns1.example.org.'
            priority: 10
        nameservers:
          - host: 127.0.0.1
            port: 53
        targets:
          default_target:
            type: bind9
            description: 'default target'
            masters:
              - host: 127.0.0.1
                port: 5354
            options:
              host: 127.0.0.1
```

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```
              port: 53
              rndc_host: 127.0.0.1
              rndc_port: 953
              rndc_key_file: /etc/designate/rndc.key
```

Note: *domain_id* parameter is UUID of DNS zone managed by designate-sink service. This zone will be populated by A records for fixed and floating ip addresses of spawned VMs. After designate is deployed and zone is created, this parameter should be updated accordingly to UUID of newly created zone. Then designate state should be reapplied.

Pools pillar for BIND9 master and multiple slaves setup:

```
pools:
  default:
    description: 'default pool'
    attributes:
      service_tier: GOLD
    ns_records:
      - hostname: 'ns1.example.org.'
        priority: 10
    nameservers:
      - host: 192.168.0.1
        port: 53
      - host: 192.168.0.2
        port: 53
      - host: 192.168.0.3
        port: 53
    targets:
      default_target:
        type: bind9
        description: 'default target'
        masters:
          - host: 192.168.0.4
            port: 5354
        options:
          host: 192.168.0.4
          port: 53
          rndc_host: 192.168.0.4
          rndc_port: 953
          rndc_key_file: /etc/designate/rndc.key
```

Usage

Create server

```
designate server-create --name ns.example.com.
```

Create domain

```
designate domain-create --name example.com. --email mail@example.com
```

Create record

```
designate record-create example.com. --name test.example.com. --type A --data 10.2.14.
↪15
```

Test it

```
dig @127.0.0.1 test.example.com.
```

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

http://salt-formulas.readthedocs.io/

In the unfortunate event that bugs are discovered, they should be reported to the appropriate issue tracker. Use Github issue tracker for specific salt formula:

https://github.com/salt-formulas/salt-formula-letsencrypt/issues

For feature requests, bug reports or blueprints affecting entire ecosystem, use Launchpad salt-formulas project:

https://launchpad.net/salt-formulas

You can also join salt-formulas-users team and subscribe to mailing list:

https://launchpad.net/~salt-formulas-users

Developers wishing to work on the salt-formulas projects should always base their work on master branch and submit pull request against specific formula.

https://github.com/salt-formulas/salt-formula-letsencrypt

Any questions or feedback is always welcome so feel free to join our IRC channel:

#salt-formulas @ irc.freenode.net

Glance formula

The Glance project provides services for discovering, registering, and retrieving virtual machine images. Glance has a RESTful API that allows querying of VM image metadata as well as retrieval of the actual image.

Sample pillars

```
glance:
  server:
    enabled: true
    version: juno
    workers: 8
    glance_uid: 302
    glance_gid: 302
    policy:
      publicize_image:
        - "role:admin"
        - "role:image_manager"
    database:
      engine: mysql
      host: 127.0.0.1
```

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```
      port: 3306
      name: glance
      user: glance
      password: pwd
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
      tenant: service
      user: glance
      password: pwd
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    storage:
      engine: file
    images:
    - name: "CirrOS 0.3.1"
      format: qcow2
      file: cirros-0.3.1-x86_64-disk.img
      source: http://cdn.download.cirros-cloud.net/0.3.1/cirros-0.3.1-x86_64-disk.img
      public: true
    audit:
      enabled: false
    api_limit_max: 100
    limit_param_default: 50
    barbican:
      enabled: true
```

The pagination is controlled by the *api_limit_max* and *limit_param_default* parameters as shown above:

- *api_limit_max* defines the maximum number of records that the server will return.
- *limit_param_default* is the default *limit* parameter that applies if the request didn't defined it explicitly.

Configuration of policy.json file

```
glance:
  server:
    ....
    policy:
      publicize_image: "role:admin"
      # Add key without value to remove line from policy.json
      add_member:
```

Keystone and cinder region

```
glance:
  server:
    enabled: true
    version: kilo
    ...
    identity:
      engine: keystone
```

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```
      host: 127.0.0.1
      region: RegionTwo
    ...
```

Ceph integration glance

```
glance:
  server:
    enabled: true
    version: juno
    storage:
      engine: rbd,http
      user: glance
      pool: images
      chunk_size: 8
      client_glance_key: AQDOavlU6BsSJhAAnpFR906mvdgdfRqLHwu0Uw==
```

RabbitMQ HA setup

```
glance:
  server:
    ....
    message_queue:
      engine: rabbitmq
      members:
        - host: 10.0.16.1
        - host: 10.0.16.2
        - host: 10.0.16.3
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    ....
```

Quota Options

```
glance:
  server:
    ....
    quota:
      image_member: -1
      image_property: 256
      image_tag: 256
      image_location: 15
      user_storage: 0
    ....
```

Configuring TLS communications

Note: by default system wide installed CA certs are used, so `cacert_file` param is optional, as well as `cacert`.

- **RabbitMQ TLS**

```
glance:
  server:
     message_queue:
```

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```
      port: 5671
      ssl:
        enabled: True
        (optional) cacert: cert body if the cacert_file does not exists
        (optional) cacert_file: /etc/openstack/rabbitmq-ca.pem
        (optional) version: TLSv1_2
```

- **MySQL TLS**

```
glance:
  server:
     database:
       ssl:
         enabled: True
         (optional) cacert: cert body if the cacert_file does not exists
         (optional) cacert_file: /etc/openstack/mysql-ca.pem
```

- **Openstack HTTPS API**

Set the `https` as protocol at `glance:server` sections:

```
glance:
  server:
     identity:
        protocol: https
        (optional) cacert_file: /etc/openstack/proxy.pem
     registry:
        protocol: https
        (optional) cacert_file: /etc/openstack/proxy.pem
     storage:
        engine: cinder, swift
        cinder:
           protocol: https
          (optional) cacert_file: /etc/openstack/proxy.pem
        swift:
           store:
               (optional) cafile: /etc/openstack/proxy.pem
```

Enable Glance Image Cache:

```
glance:
  server:
    image_cache:
      enabled: true
      enable_management: true
      directory: /var/lib/glance/image-cache/
      max_size: 21474836480
  ....
```

Enable auditing filter (CADF):

```
glance:
  server:
    audit:
      enabled: true
  ....
      filter_factory: 'keystonemiddleware.audit:filter_factory'
```

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```
      map_file: '/etc/pycadf/glance_api_audit_map.conf'
  ....
```

Swift integration glance

```
glance:
  server:
    enabled: true
    version: mitaka
    storage:
      engine: swift,http
      swift:
        store:
          auth:
            address: http://keystone.example.com:5000/v2.0
            version: 2
          endpoint_type: publicURL
          container: glance
          create_container_on_put: true
          retry_get_count: 5
          user: 2ec7966596504f59acc3a76b3b9d9291:glance-user
          key: someRandomPassword
```

Another way, which also supports multiple swift backends, can be configured like this:

```
glance:
  server:
    enabled: true
    version: mitaka
    storage:
      engine: swift,http
      swift:
        store:
          endpoint_type: publicURL
          container: glance
          create_container_on_put: true
          retry_get_count: 5
          references:
            my_objectstore_reference_1:
              auth:
                address: http://keystone.example.com:5000/v2.0
                version: 2
              user: 2ec7966596504f59acc3a76b3b9d9291:glance-user
              key: someRandomPassword
```

Enable CORS parameters

```
glance:
  server:
    cors:
      allowed_origin: https:localhost.local,http:localhost.local
      expose_headers: X-Auth-Token,X-Openstack-Request-Id,X-Subject-Token
      allow_methods: GET,PUT,POST,DELETE,PATCH
      allow_headers: X-Auth-Token,X-Openstack-Request-Id,X-Subject-Token
      allow_credentials: True
      max_age: 86400
```

Enable Viewing Multiple Locations

If you want to expose all locations available (for example when you have multiple backends configured), then you can configure this like so:

```
glance:
  server:
    show_multiple_locations: True
    location_strategy: store_type
    store_type_preference: rbd,swift,file
```

Please note: the show_multiple_locations option is deprecated since Newton and is planned to be handled by policy files _only_ starting with the Pike release.

This feature is convenient in a scenario when you have swift and rbd configured and want to benefit from rbd enhancements.

Barbican integration glance

```
glance:
  server:
      barbican:
        enabled: true
```

Client role

Glance images

```
glance:
  client:
    enabled: true
    server:
      profile_admin:
        image:
          cirros-test:
            visibility: public
            protected: false
            location: http://download.cirros-cloud.net/0.3.4/cirros-0.3.4-i386-disk.
↪img
```

Enhanced logging with logging.conf

By default logging.conf is disabled.

That is possible to enable per-binary logging.conf with new variables:

- openstack_log_appender - set it to true to enable log_config_append for all OpenStack services;
- openstack_fluentd_handler_enabled - set to true to enable FluentHandler for all Openstack services.
- openstack_ossyslog_handler_enabled - set to true to enable OSSysLogHandler for all Openstack services.

Only WatchedFileHandler, OSSysLogHandler and FluentHandler are available.

Also it is possible to configure this with pillar:

```
glance:
  server:
    logging:
      log_appender: true
      log_handlers:
        watchedfile:
          enabled: true
        fluentd:
          enabled: true
        ossyslog:
          enabled: true
```

Usage

Import new public image

```
glance image-create --name 'Windows 7 x86_64' --is-public true --container-format␣
↪bare --disk-format qcow2  < ./win7.qcow2
```

Change new image's disk properties

```
glance image-update "Windows 7 x86_64" --property hw_disk_bus=ide
```

Change new image's NIC properties

```
glance image-update "Windows 7 x86_64" --property hw_vif_model=rtl8139
```

External links

- http://ceph.com/docs/master/rbd/rbd-openstack/

Documentation and Bugs

To learn how to deploy OpenStack Salt, consult the documentation available online at:

https://wiki.openstack.org/wiki/OpenStackSalt

In the unfortunate event that bugs are discovered, they should be reported to the appropriate bug tracker. If you obtained the software from a 3rd party operating system vendor, it is often wise to use their own bug tracker for reporting problems. In all other cases use the master OpenStack bug tracker, available at:

http://bugs.launchpad.net/openstack-salt

Developers wishing to work on the OpenStack Salt project should always base their work on the latest formulas code, available from the master GIT repository at:

https://git.openstack.org/cgit/openstack/salt-formula-glance

Developers should also join the discussion on the IRC list, at:

https://wiki.openstack.org/wiki/Meetings/openstack-salt

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

http://salt-formulas.readthedocs.io/

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https://github.com/salt-formulas/salt-formula-glance/issues

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https://launchpad.net/salt-formulas

You can also join salt-formulas-users team and subscribe to mailing list:

https://launchpad.net/~salt-formulas-users

Developers wishing to work on the salt-formulas projects should always base their work on master branch and submit pull request against specific formula.

https://github.com/salt-formulas/salt-formula-glance

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#salt-formulas @ irc.freenode.net

Heat Formula

Heat is the main project in the OpenStack Orchestration program. It implements an orchestration engine to launch multiple composite cloud applications based on templates in the form of text files that can be treated like code. A native Heat template format is evolving, but Heat also endeavours to provide compatibility with the AWS CloudFormation template format, so that many existing CloudFormation templates can be launched on OpenStack. Heat provides both an OpenStack-native ReST API and a CloudFormation-compatible Query API.

Sample Pillars

Single Heat services on the controller node

```
heat:
  server:
    enabled: true
    version: icehouse
    region: RegionOne
    bind:
      metadata:
        address: 10.0.106.10
        port: 8000
        protocol: http
      waitcondition:
        address: 10.0.106.10
        port: 8000
        protocol: http
      watch:
        address: 10.0.106.10
        port: 8003
        protocol: http
```

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```
    cloudwatch:
      host: 10.0.106.20
    api:
      host: 10.0.106.20
    api_cfn:
      host: 10.0.106.20
    database:
      engine: mysql
      host: 10.0.106.20
      port: 3306
      name: heat
      user: heat
      password: password
    identity:
      engine: keystone
      host: 10.0.106.20
      port: 35357
      tenant: service
      user: heat
      password: password
      endpoint_type_default: internalURL
      endpoint_type_heat: publicURL
    message_queue:
      engine: rabbitmq
      host: 10.0.106.20
      port: 5672
      user: openstack
      password: password
      virtual_host: '/openstack'
      ha_queues: True
    max_stacks_per_tenant: 150
    max_nested_stack_depth: 10
```

Define server clients keystone parameter

```
heat:
  server:
    clients:
      keystone:
        protocol: https
        host: 10.0.106.10
        port: 5000
        insecure: false
```

Enable CORS parameters

```
heat:
  server:
    cors:
      allowed_origin: https:localhost.local,http:localhost.local
      expose_headers: X-Auth-Token,X-Openstack-Request-Id,X-Subject-Token
      allow_methods: GET,PUT,POST,DELETE,PATCH
      allow_headers: X-Auth-Token,X-Openstack-Request-Id,X-Subject-Token
      allow_credentials: True
      max_age: 86400
```

Heat client with specified git templates

```
heat:
  client:
    enabled: true
    template:
      admin:
        domain: default
        source:
          engine: git
          address: git@repo.domain.com/admin-templates.git
          revision: master
      default:
        domain: default
        source:
          engine: git
          address: git@repo.domain.com/default-templates.git
          revision: master
```

Ceilometer notification

```
heat:
  server:
    enabled: true
    version: icehouse
    notification: true
```

Configuration of policy.json file

```
heat:
  server:
    ....
    policy:
      deny_stack_user: 'not role:heat_stack_user'
      'cloudformation:ValidateTemplate': 'rule:deny_stack_user'
      # Add key without value to remove line from policy.json
      'cloudformation:DescribeStackResource':
```

Client-side RabbitMQ HA setup

```
heat:
  server:
    ....
    message_queue:
      engine: rabbitmq
      members:
        - host: 10.0.16.1
        - host: 10.0.16.2
        - host: 10.0.16.3
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    ....
```

Configuring TLS communications

Note: by default system wide installed CA certs are used, so `cacert_file` param is optional, as well as `cacert`.

- **RabbitMQ TLS**

```
heat:
  server:
     message_queue:
       port: 5671
       ssl:
         enabled: True
         (optional) cacert: cert body if the cacert_file does not exists
         (optional) cacert_file: /etc/openstack/rabbitmq-ca.pem
         (optional) version: TLSv1_2
```

- **MySQL TLS**

```
heat:
  server:
     database:
       ssl:
         enabled: True
         (optional) cacert: cert body if the cacert_file does not exists
         (optional) cacert_file: /etc/openstack/mysql-ca.pem
```

- **Openstack HTTPS API**

```
heat:
 server:
     identity:
        protocol: https
        (optional) cacert_file: /etc/openstack/proxy.pem
     clients:
        keystone:
          protocol: https
          (optional) cacert_file: /etc/openstack/proxy.pem
```

Enhanced logging with logging.conf

By default logging.conf is disabled.

That is possible to enable per-binary logging.conf with new variables:

- openstack_log_appender - set it to true to enable log_config_append for all OpenStack services;
- openstack_fluentd_handler_enabled - set to true to enable FluentHandler for all Openstack services.
- openstack_ossyslog_handler_enabled - set to true to enable OSSysLogHandler for all Openstack services.

Only WatchedFileHandler, OSSysLogHandler and FluentHandler are available.

Also it is possible to configure this with pillar:

```
heat:
  server:
    logging:
      log_appender: true
      log_handlers:
        watchedfile:
          enabled: true
        fluentd:
```

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```
        enabled: true
      ossyslog:
        enabled: true
```

Documentation and Bugs

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https://github.com/salt-formulas/salt-formula-heat/issues

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You can also join salt-formulas-users team and subscribe to mailing list:

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Developers wishing to work on the salt-formulas projects should always base their work on master branch and submit pull request against specific formula.

https://github.com/salt-formulas/salt-formula-heat

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#salt-formulas @ irc.freenode.net

Horizon Formula

Horizon is the canonical implementation of OpenStack's Dashboard, which provides a web based user interface to OpenStack services including Nova, Swift, Keystone, etc.

Sample Pillars

Simplest horizon setup

```
horizon:
  server:
    enabled: true
    secret_key: secret
    host:
      name: cloud.lab.cz
    cache:
      engine: 'memcached'
      host: '127.0.0.1'
      port: 11211
      prefix: 'CACHE_HORIZON'
    api_versions:
      identity: 2
    identity:
      engine: 'keystone'
```

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```
      host: '127.0.0.1'
      port: 5000
    mail:
      host: '127.0.0.1'
```

Multidomain setup for horizon

```
horizon:
  server:
    enabled: true
    default_domain: MYDOMAIN
    multidomain: True
```

Simple branded horizon

```
horizon:
  server:
    enabled: true
    branding: 'OpenStack Company Dashboard'
    default_dashboard: 'admin'
    help_url: 'http://doc.domain.com'
```

Horizon with policy files metadata. With source mine you can obtain real time policy file state from targeted node (OpenStack control node), provided you have policy file published to specified grain key. Source file will obtain static policy definition from formula files directory.

```
horizon:
  server:
    enabled: true
    policy:
      identity:
        source: mine
        host: ctl01.my-domain.local
        name: keystone_policy.json
        grain_name: keystone_policy
        enabled: true
      compute:
        source: file
        name: nova_policy.json
        enabled: true
      network:
        source: file
        name: neutron_policy.json
        enabled: true
      image:
        source: file
        name: glance_policy.json
        enabled: true
      volume:
        source: file
        name: cinder_policy.json
        enabled: true
      telemetry:
        source: file
        name: ceilometer_policy.json
        enabled: true
```

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```
      orchestration:
        source: file
        name: heat_policy.json
        enabled: true
```

Horizon with enabled SSL security (when SSL is realised by proxy)

```
horizon:
  server:
    enabled: True
    secure: True
```

Horizon package setup with SSL

```
horizon:
  server:
    enabled: true
    secret_key: MEGASECRET
    version: juno
    ssl:
      enabled: true
      authority: CA_Authority
    host:
      name: cloud.lab.cz
    cache:
      engine: 'memcached'
      host: '127.0.0.1'
      port: 11211
      prefix: 'CACHE_HORIZON'
    api_versions:
      identity: 2
    identity:
      engine: 'keystone'
      host: '127.0.0.1'
      port: 5000
    mail:
      host: '127.0.0.1'
```

Horizon with custom SESSION_ENGINE (default is "signed_cookies", valid options are: "signed_cookies", "cache", "file") and SESSION_TIMEOUT

```
horizon:
  server:
    enabled: True
    secure: True
    session:
      engine: 'cache'
      timeout: 43200
```

Multi-regional horizon setup

```
horizon:
  server:
    enabled: true
    version: juno
    secret_key: MEGASECRET
```

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```
    cache:
      engine: 'memcached'
      host: '127.0.0.1'
      port: 11211
      prefix: 'CACHE_HORIZON'
    api_versions:
      identity: 2
    identity:
      engine: 'keystone'
      host: '127.0.0.1'
      port: 5000
    mail:
      host: '127.0.0.1'
    regions:
    - name: cluster1
      address: http://cluster1.example.com:5000/v2.0
    - name: cluster2
      address: http://cluster2.example.com:5000/v2.0
```

Horizon setup with sensu plugin

```
horizon:
  server:
    enabled: true
    version: juno
    sensu_api:
      host: localhost
      port: 4567
    plugin:
      monitoring:
        app: horizon_monitoring
        source:
          type: git
          address: git@repo1.robotice.cz:django/horizon-monitoring.git
          rev: develop
```

Sensu multi API

```
horizon:
  server:
    enabled: true
    version: juno
    sensu_api:
      dc1:
        host: localhost
        port: 4567
      dc2:
        host: anotherhost
        port: 4567
```

Horizon setup with jenkins plugin

```
horizon:
  server:
    enabled: true
    version: juno
    jenkins_api:
```

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```
      url: https://localhost:8080
      user: admin
      password: pwd
    plugin:
      jenkins:
        app: horizon_jenkins
        source:
          type: pkg
```

Horizon setup with billometer plugin

```
horizon:
  server:
    enabled: true
    version: juno
    billometer_api:
      host: localhost
      port: 9753
      api_version: 1
    plugin:
      billing:
        app: horizon_billing
        source:
          type: git
          address: git@repo1.robotice.cz:django/horizon-billing.git
          rev: develop
```

Horizon setup with contrail plugin

```
horizon:
  server:
    enabled: true
    version: icehouse
    plugin:
      contrail:
        app: contrail_openstack_dashboard
        override: true
        source:
          type: git
          address: git@repo1.robotice.cz:django/horizon-contrail.git
          rev: develop
```

Horizon setup with sentry log handler

```
horizon:
  server:
    enabled: true
    version: juno
    ...
    logging:
      engine: raven
      dsn: http://pub:private@sentry1.test.cz/2
```

Multisite with Git source

Simple Horizon setup from git repository

```
horizon:
  server:
    enabled: true
    app:
      default:
        secret_key: MEGASECRET
        source:
          engine: git
          address: https://github.com/openstack/horizon.git
          rev: stable/havana
        cache:
          engine: 'memcached'
          host: '127.0.0.1'
          port: 11211
          prefix: 'CACHE_DEFAULT'
        api_versions:
          identity: 2
        identity:
          engine: 'keystone'
          host: '127.0.0.1'
          port: 5000
        mail:
          host: '127.0.0.1'
```

Themed multisite setup

```
horizon:
  server:
    enabled: true
    app:
      openstack1c:
        secret_key: MEGASECRET1
        source:
          engine: git
          address: https://github.com/openstack/horizon.git
          rev: stable/havana
        plugin:
          contrail:
            app: contrail_openstack_dashboard
            override: true
            source:
              type: git
              address: git@repo1.robotice.cz:django/horizon-contrail.git
              rev: develop
          theme:
            app: site1_theme
            source:
              type: git
              address: git@repo1.domain.com:django/horizon-site1-theme.git
        cache:
          engine: 'memcached'
          host: '127.0.0.1'
          port: 11211
          prefix: 'CACHE_SITE1'
        api_versions:
          identity: 2
        identity:
```

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```
          engine: 'keystone'
          host: '127.0.0.1'
          port: 5000
        mail:
          host: '127.0.0.1'
      openstack2:
        secret_key: MEGASECRET2
        source:
          engine: git
          address: https://repo1.domain.com/openstack/horizon.git
          rev: stable/icehouse
        plugin:
          contrail:
            app: contrail_openstack_dashboard
            override: true
            source:
              type: git
              address: git@repo1.domain.com:django/horizon-contrail.git
              rev: develop
          monitoring:
            app: horizon_monitoring
            source:
              type: git
              address: git@domain.com:django/horizon-monitoring.git
              rev: develop
          theme:
            app: bootswatch_theme
            source:
              type: git
              address: git@repo1.robotice.cz:django/horizon-bootswatch-theme.git
              rev: develop
        cache:
          engine: 'memcached'
          host: '127.0.0.1'
          port: 11211
          prefix: 'CACHE_SITE2'
        api_versions:
          identity: 3
        identity:
          engine: 'keystone'
          host: '127.0.0.1'
          port: 5000
        mail:
          host: '127.0.0.1'
```

API versions override

```
horizon:
  server:
    enabled: true
    app:
      openstack_api_overrride:
        secret_key: MEGASECRET1
        api_versions:
          identity: 3
          volume: 2
        source:
```

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```
        engine: git
        address: https://github.com/openstack/horizon.git
        rev: stable/havana
```

Control dashboard behaviour

```
horizon:
  server:
    enabled: true
    app:
      openstack_dashboard_overrride:
        secret_key: password
        dashboards:
          settings:
            enabled: true
          project:
            enabled: false
            order: 10
          admin:
            enabled: false
            order: 20
        source:
          engine: git
          address: https://github.com/openstack/horizon.git
          rev: stable/juno
```

Enable WebSSO feature

```
horizon:
  server:
    enabled: true
    websso:
      login_url: "WEBROOT + 'auth/login/'"
      logout_url: "WEBROOT + 'auth/logout/'"
      websso_choices:
        - saml2
        - oidc
```

More Information

- https://github.com/openstack/horizon
- http://dijks.wordpress.com/2012/07/06/how-to-change-screen-resolution-of-novnc-client-in-openstack-essex-dashboard-nova-ho

Documentation and Bugs

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OpenStack Keystone

Keystone provides authentication, authorization and service discovery mechanisms via HTTP primarily for use by projects in the OpenStack family. It is most commonly deployed as an HTTP interface to existing identity systems, such as LDAP.

From Kilo release Keystone v3 endpoint has definition without version in url

```
+----------------------------------+-----------+--------------------------+-----------
↪--------------+--------------------------+--------------------------------+
|                id                |   region  |        publicurl         |      ␣
↪internalurl        |          adminurl          |           service_id           |
+----------------------------------+-----------+--------------------------+-----------
↪--------------+--------------------------+--------------------------------+
| 91663a8db11c487c9253c8c456863494 | RegionOne | http://10.0.150.37:5000/ | http://10.
↪0.150.37:5000/ | http://10.0.150.37:35357/ | 0fd2dba3153d45a1ba7f709cfc2d69c9 |
+----------------------------------+-----------+--------------------------+-----------
↪--------------+--------------------------+--------------------------------+
```

Sample pillars

Caution: When you use localhost as your database host (keystone:server: atabase:host), sqlalchemy will try to connect to /var/run/mysql/ mysqld.sock, may cause issues if you located your mysql socket elsewhere

Full stacked keystone

```
keystone:
  server:
    enabled: true
    version: juno
    service_token: 'service_tokeen'
    service_tenant: service
    service_password: 'servicepwd'
    admin_tenant: admin
    admin_name: admin
    admin_password: 'adminpwd'
    admin_email: stackmaster@domain.com
    roles:
      - admin
      - Member
```

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```
      - image_manager
    bind:
      address: 0.0.0.0
      private_address: 127.0.0.1
      private_port: 35357
      public_address: 127.0.0.1
      public_port: 5000
    api_version: 2.0
    region: RegionOne
    database:
      engine: mysql
      host: '127.0.0.1'
      name: 'keystone'
      password: 'LfTno5mYdZmRfoPV'
      user: 'keystone'
```

Keystone public HTTPS API

```
keystone:
  server:
    enabled: true
    version: juno
    ...
    services:
    - name: nova
      type: compute
      description: OpenStack Compute Service
      user:
        name: nova
        password: password
      bind:
        public_address: cloud.domain.com
        public_protocol: https
        public_port: 8774
        internal_address: 10.0.0.20
        internal_port: 8774
        admin_address: 10.0.0.20
        admin_port: 8774
```

Keystone with custom policies. Keys with specified rules are created or set to this value if they already exists. Keys with no value (like our "existing_rule") are deleted from the policy file.

```
keystone:
  server:
    enabled: true
    policy:
      new_rule: "rule:admin_required"
      existing_rule:
```

Keystone memcached storage for tokens

```
keystone:
  server:
    enabled: true
    version: juno
    ...
```

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```
    token_store: cache
    cache:
      engine: memcached
      host: 127.0.0.1
      port: 11211
    services:
    ...
```

Keystone clustered memcached storage for tokens

```
keystone:
  server:
    enabled: true
    version: juno
    ...
    token_store: cache
    cache:
      engine: memcached
      members:
      - host: 192.160.0.1
        port: 11211
      - host: 192.160.0.2
        port: 11211
    services:
    ...
```

Keystone client

```
keystone:
  client:
    enabled: true
    server:
      host: 10.0.0.2
      public_port: 5000
      private_port: 35357
      service_token: 'token'
      admin_tenant: admin
      admin_name: admin
      admin_password: 'passwd'
```

Keystone cluster

```
keystone:
  control:
    enabled: true
    provider:
      os15_token:
        host: 10.0.0.2
        port: 35357
        token: token
      os15_tcp_core_stg:
        host: 10.0.0.5
        port: 5000
        tenant: admin
        name: admin
        password: password
```

Keystone fernet tokens for OpenStack Kilo release

```
keystone:
  server:
    ...
    tokens:
      engine: fernet
      max_active_keys: 3
    ...
```

Keystone auth methods

```
keystone:
  server:
    ...
    auth_methods:
    - external
    - password
    - token
    - oauth1
    ...
```

Keystone domain with LDAP backend, using SQL for role/project assignment

```
keystone:
  server:
    domain:
      external:
        description: "Testing domain"
        backend: ldap
        assignment:
          backend: sql
        ldap:
          url: "ldaps://idm.domain.com"
          suffix: "dc=cloud,dc=domain,dc=com"
          # Will bind as uid=keystone,cn=users,cn=accounts,dc=cloud,dc=domain,dc=com
          uid: keystone
          password: password
```

Using LDAP backend for default domain

```
keystone:
  server:
    backend: ldap
    assignment:
      backend: sql
    ldap:
      url: "ldaps://idm.domain.com"
      suffix: "dc=cloud,dc=domain,dc=com"
      # Will bind as uid=keystone,cn=users,cn=accounts,dc=cloud,dc=domain,dc=com
      uid: keystone
      password: password
```

Using LDAP backend for default domain with “user_enabled” field emulation

```
keystone:
  server:
    backend: ldap
```

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```
    assignment:
      backend: sql
    ldap:
      url: "ldap://idm.domain.com"
      suffix: "ou=Openstack Service Users,o=domain.com"
      bind_user: keystone
      password: password
      # Define LDAP "group" object class and "membership" attribute
      group_objectclass: groupOfUniqueNames
      group_member_attribute: uniqueMember
      # User will receive "enabled" attribute basing on membership in "os-user-enabled
↪" group
      user_enabled_emulation: True
      user_enabled_emulation_dn: "cn=os-user-enabled,ou=Openstack,o=domain.com"
      user_enabled_emulation_use_group_config: True
```

Simple service endpoint definition (defaults to RegionOne)

```
keystone:
  server:
    service:
      ceilometer:
        type: metering
        description: OpenStack Telemetry Service
        user:
          name: ceilometer
          password: password
        bind:
          ...
```

Region-aware service endpoints definition

```
keystone:
  server:
    service:
      ceilometer_region01:
        service: ceilometer
        type: metering
        region: region01
        description: OpenStack Telemetry Service
        user:
          name: ceilometer
          password: password
        bind:
          ...
      ceilometer_region02:
        service: ceilometer
        type: metering
        region: region02
        description: OpenStack Telemetry Service
        bind:
          ...
```

Enable ceilometer notifications

```
keystone:
  server:
```

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```
    notification: true
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: password
      virtual_host: '/openstack'
      ha_queues: true
```

Client-side RabbitMQ HA setup

```
keystone:
  server:
    ....
    message_queue:
      engine: rabbitmq
      members:
        - host: 10.0.16.1
        - host: 10.0.16.2
        - host: 10.0.16.3
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    ....
```

Client-side RabbitMQ TLS configuration:

By default system-wide CA certs are used. Nothing should be specified except *ssl.enabled*.

```
keystone:
  server:
    ....
    message_queue:
      ssl:
        enabled: True
```

Use *cacert_file* option to specify the CA-cert file path explicitly:

```
keystone:
  server:
    ....
    message_queue:
      ssl:
        enabled: True
        cacert_file: /etc/ssl/rabbitmq-ca.pem
```

To manage content of the *cacert_file* use the *cacert* option:

```
keystone:
  server:
    ....
```

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```
    message_queue:
      ssl:
        enabled: True
        cacert: |

        -----BEGIN CERTIFICATE-----
                  ...
        -----END CERTIFICATE-------

        cacert_file: /etc/openstack/rabbitmq-ca.pem
```

Notice:

- The *message_queue.port* is set to **5671** (AMQPS) by default if *ssl.enabled=True*.
- Use *message_queue.ssl.version* if you need to specify protocol version. By default is TLSv1 for python < 2.7.9 and TLSv1_2 for version above.

Enable CADF audit notification

```
keystone:
  server:
    notification: true
    notification_format: cadf
```

Run keystone under Apache

```
keystone:
  server:
    service_name: apache2
apache:
  server:
    enabled: true
    default_mpm: event
    site:
      keystone:
        enabled: true
        type: keystone
        name: wsgi
        host:
          name: ${linux:network:fqdn}
    modules:
      - wsgi
```

Enable SAML2 Federated keystone

```
keystone:
  server:
    auth_methods:
    - password
    - token
    - saml2
    federation:
      saml2:
        protocol: saml2
        remote_id_attribute: Shib-Identity-Provider
        shib_url_scheme: https
```

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```
        shib_compat_valid_user: 'on'
      federation_driver: keystone.contrib.federation.backends.sql.Federation
      federated_domain_name: Federated
      trusted_dashboard:
        - https://${_param:cluster_public_host}/horizon/auth/websso/
apache:
  server:
    pkgs:
      - apache2
      - libapache2-mod-shib2
    modules:
      - wsgi
      - shib2
```

Enable OIDC Federated keystone

```
keystone:
  server:
    auth_methods:
    - password
    - token
    - oidc
    federation:
    oidc:
        protocol: oidc
        remote_id_attribute: HTTP_OIDC_ISS
        remote_id_attribute_value: https://accounts.google.com
        oidc_claim_prefix: "OIDC-"
        oidc_response_type: id_token
        oidc_scope: "openid email profile"
        oidc_provider_metadata_url: https://accounts.google.com/.well-known/openid-
↪configuration
        oidc_client_id: <openid_client_id>
        oidc_client_secret: <openid_client_secret>
        oidc_crypto_passphrase: openstack
        oidc_redirect_uri: https://key.example.com:5000/v3/auth/OS-FEDERATION/websso/
↪oidc/redirect
        oidc_oauth_introspection_endpoint: https://www.googleapis.com/oauth2/v1/
↪tokeninfo
        oidc_oauth_introspection_token_param_name: access_token
        oidc_oauth_remote_user_claim: user_id
        oidc_ssl_validate_server: 'off'
    federated_domain_name: Federated
    federation_driver: keystone.contrib.federation.backends.sql.Federation
    trusted_dashboard:
      - https://${_param:cluster_public_host}/auth/websso/
apache:
  server:
    pkgs:
      - apache2
      - libapache2-mod-auth-openidc
    modules:
      - wsgi
      - auth_openidc
```

Notes: Ubuntu Trusty repository doesn't contain libapache2-mod-auth-openidc package. Additonal repository should be added to source list.

Use a custom identity driver with custom options

```
keystone:
  server:
    backend: k2k
    k2k:
      auth_url: 'https://keystone.example.com/v2.0'
      read_user: 'example_user'
      read_pass: 'password'
      read_tenant_id: 'admin'
      identity_driver: 'sql'
      id_prefix: 'k2k:'
      domain: 'default'
      caching: true
      cache_time: 600
```

Enable CORS parameters

```
keystone:
  server:
    cors:
      allowed_origin: https:localhost.local,http:localhost.local
      expose_headers: X-Auth-Token,X-Openstack-Request-Id,X-Subject-Token
      allow_methods: GET,PUT,POST,DELETE,PATCH
      allow_headers: X-Auth-Token,X-Openstack-Request-Id,X-Subject-Token
      allow_credentials: True
      max_age: 86400
```

Keystone client

Service endpoints enforcement with service token

```
keystone:
  client:
    enabled: true
    server:
      keystone01:
        admin:
          host: 10.0.0.2
          port: 35357
          token: 'service_token'
        service:
          nova:
            type: compute
            description: OpenStack Compute Service
            endpoints:
            - region: region01
              public_address: 172.16.10.1
              public_port: 8773
              public_path: '/v2'
              internal_address: 172.16.10.1
              internal_port: 8773
              internal_path: '/v2'
              admin_address: 172.16.10.1
              admin_port: 8773
              admin_path: '/v2'
```

Project, users, roles enforcement with admin user

```
keystone:
  client:
    enabled: true
    server:
      keystone01:
        admin:
          host: 10.0.0.2
          port: 5000
          project: admin
          user: admin
          password: 'passwd'
          region_name: RegionOne
          protocol: https
        roles:
        - admin
        - member
        project:
          tenant01:
            description: "test env"
            quota:
              instances: 100
              cores: 24
              ram: 151200
              floating_ips: 50
              fixed_ips: -1
              metadata_items: 128
              injected_files: 5
              injected_file_content_bytes: 10240
              injected_file_path_bytes: 255
              key_pairs: 100
              security_groups: 20
              security_group_rules: 40
              server_groups: 20
              server_group_members: 20
            user:
              user01:
                email: jdoe@domain.com
                is_admin: true
                password: some
              user02:
                email: jdoe2@domain.com
                password: some
                roles:
                - custom-roles
```

Multiple servers example

```
keystone:
  client:
    enabled: true
    server:
      keystone01:
        admin:
          host: 10.0.0.2
          port: 5000
          project: 'admin'
```

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```
          user: admin
          password: 'workshop'
          region_name: RegionOne
          protocol: https
      keystone02:
        admin:
          host: 10.0.0.3
          port: 5000
          project: 'admin'
          user: admin
          password: 'workshop'
          region_name: RegionOne
```

Tenant quotas

```
keystone:
  client:
    enabled: true
    server:
      keystone01:
        admin:
          host: 10.0.0.2
          port: 5000
          project: admin
          user: admin
          password: 'passwd'
          region_name: RegionOne
          protocol: https
        roles:
        - admin
        - member
        project:
          tenant01:
            description: "test env"
            quota:
              instances: 100
              cores: 24
              ram: 151200
              floating_ips: 50
              fixed_ips: -1
              metadata_items: 128
              injected_files: 5
              injected_file_content_bytes: 10240
              injected_file_path_bytes: 255
              key_pairs: 100
              security_groups: 20
              security_group_rules: 40
              server_groups: 20
              server_group_members: 20
```

Extra config params in keystone.conf (since Mitaka release)

```
keystone:
  server:
    ....
    extra_config:
      ini_section1:
```

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```
        param1: value
        param2: value
      ini_section2:
        param1: value
        param2: value
    ....
```

Configuration of policy.json file

```
keystone:
  server:
    ....
    policy:
      admin_or_token_subject: 'rule:admin_required or rule:token_subject'
```

Setting up default admin project name and domain

```
keystone:
  server:
    ....
    admin_project:
      name: "admin"
      domain: "default"
```

Enhanced logging with logging.conf

By default logging.conf is disabled.

That is possible to enable per-binary logging.conf with new variables:

- openstack_log_appender - set it to true to enable log_config_append for all OpenStack services;
- openstack_fluentd_handler_enabled - set to true to enable FluentHandler for all Openstack services.
- openstack_ossyslog_handler_enabled - set to true to enable OSSysLogHandler for all Openstack services.

Only WatchedFileHandler, OSSysLogHandler and FluentHandler are available.

Also it is possible to configure this with pillar:

```
keystone:
  server:
    logging:
      log_appender: true
      log_handlers:
        watchedfile:
          enabled: true
        fluentd:
          enabled: true
        ossyslog:
          enabled: true
```

Usage

Apply state *keystone.client.service* first and then *keystone.client* state.

Documentation and Bugs

To learn how to deploy OpenStack Salt, consult the documentation available online at:

https://wiki.openstack.org/wiki/OpenStackSalt

In the unfortunate event that bugs are discovered, they should be reported to the appropriate bug tracker. If you obtained the software from a 3rd party operating system vendor, it is often wise to use their own bug tracker for reporting problems. In all other cases use the master OpenStack bug tracker, available at:

http://bugs.launchpad.net/openstack-salt

Developers wishing to work on the OpenStack Salt project should always base their work on the latest formulas code, available from the master GIT repository at:

https://git.openstack.org/cgit/openstack/salt-formula-keystone

Developers should also join the discussion on the IRC list, at:

https://wiki.openstack.org/wiki/Meetings/openstack-salt

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

http://salt-formulas.readthedocs.io/

In the unfortunate event that bugs are discovered, they should be reported to the appropriate issue tracker. Use Github issue tracker for specific salt formula:

https://github.com/salt-formulas/salt-formula-keystone/issues

For feature requests, bug reports or blueprints affecting entire ecosystem, use Launchpad salt-formulas project:

https://launchpad.net/salt-formulas

You can also join salt-formulas-users team and subscribe to mailing list:

https://launchpad.net/~salt-formulas-users

Developers wishing to work on the salt-formulas projects should always base their work on master branch and submit pull request against specific formula.

https://github.com/salt-formulas/salt-formula-keystone

Any questions or feedback is always welcome so feel free to join our IRC channel:

#salt-formulas @ irc.freenode.net

magnum

Service magnum description

Sample pillars

Single magnum service

```
magnum:
  server:
    enabled: true
    version: kilo
```

Read more

- links

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

http://salt-formulas.readthedocs.io/

In the unfortunate event that bugs are discovered, they should be reported to the appropriate issue tracker. Use Github issue tracker for specific salt formula:

https://github.com/salt-formulas/salt-formula-magnum/issues

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#salt-formulas @ irc.freenode.net

Midonet

MidoNet is an advanced Software Defined Networking (SDN) solution, which provides network virtualization for public and private cloud environments.

Sample pillars

Cluster Control

```
midonet:
  control:
    version: v5.0
    enterprise:
      enabled: true
    enabled: true
    host: 127.0.0.1
    nova:
```

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```
      control:
        host: 127.0.0.1
    database:
      members:
      - host: 127.0.0.1
        port: 9160
      - host: 127.0.0.1
        port: 9160
      - host: 127.0.0.1
        port: 9160
    zookeeper:
      members:
      - host: 127.0.0.1
      - host: 127.0.0.1
      - host: 127.0.0.1
    identity:
      user: midonet
      password: passwd
      host: 127.0.0.1
      admin:
        token: tokenpass
        password: passwd
```

Analytics

```
midonet:
  analytics:
    version: v5.0
    enterprise:
      enabled: true
    enabled: true
    host: 127.0.0.1
```

Gateway

```
  midonet:
gateway:
      version: v5.0
      enterprise:
        enabled: true
      enabled: true
      zookeeper:
        members:
        - host: 127.0.0.1
        - host: 127.0.0.1
        - host: 127.0.0.1
      template: medium
```

Compute

```
  midonet:
compute:
      version: v5.0
      enterprise:
        enabled: true
      enabled: true
      zookeeper:
        members:
        - host: 127.0.0.1
        - host: 127.0.0.1
        - host: 127.0.0.1
      template: medium
```

Web

```
midonet:
  web:
    version: v5.0
    enabled: true
    api:
      host: 127.0.0.1
    analytics:
      host: 127.0.0.1
```

Read More

- http://www.midokura.com/midonet/

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

http://salt-formulas.readthedocs.io/

In the unfortunate event that bugs are discovered, they should be reported to the appropriate issue tracker. Use Github issue tracker for specific salt formula:

https://github.com/salt-formulas/salt-formula-midonet/issues

For feature requests, bug reports or blueprints affecting entire ecosystem, use Launchpad salt-formulas project:

https://launchpad.net/salt-formulas

You can also join salt-formulas-users team and subscribe to mailing list:

https://launchpad.net/~salt-formulas-users

Developers wishing to work on the salt-formulas projects should always base their work on master branch and submit pull request against specific formula.

https://github.com/salt-formulas/salt-formula-midonet

Any questions or feedback is always welcome so feel free to join our IRC channel:

#salt-formulas @ irc.freenode.net

Murano formula

Murano Project introduces an application catalog, which allows application developers and cloud administrators to publish various cloud-ready applications in a browsable categorised catalog, which may be used by the cloud users (including the inexperienced ones) to pick-up the needed applications and services and composes the reliable environments out of them in a "push-the-button" manner.

Sample pillars

Single murano services on the controller node

```
murano:
  server:
    enabled: true
    version: liberty
    insecure: false
    database:
      engine: mysql
      host: 10.10.20.20
      port: 3306
      name: murano
      user: murano
      password: password
    identity:
      engine: keystone
      host: 10.10.20.20
      port: 35357
      tenant: service
      user: murano
      password: password
    message_queue:
      engine: rabbitmq
      members:
      - host: 192.168.1.13
      - host: 192.168.1.14
      - host: 192.168.1.15
      user: openstack
      password: supersecret
      virtual_host: '/openstack'
    murano_agent_queue:
      engine: rabbitmq
      port: 5672
      host: 192.168.1.10
      user: openstack
      password: supersecretcatalogpassword
```

External links

- https://wiki.openstack.org/wiki/Murano/ProjectOverview
- http://murano.readthedocs.org/en/latest/install/
- https://github.com/stackforge/murano

- https://github.com/stackforge/murano-apps

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

> http://salt-formulas.readthedocs.io/

In the unfortunate event that bugs are discovered, they should be reported to the appropriate issue tracker. Use Github issue tracker for specific salt formula:

> https://github.com/salt-formulas/salt-formula-murano/issues

For feature requests, bug reports or blueprints affecting entire ecosystem, use Launchpad salt-formulas project:

> https://launchpad.net/salt-formulas

You can also join salt-formulas-users team and subscribe to mailing list:

> https://launchpad.net/~salt-formulas-users

Developers wishing to work on the salt-formulas projects should always base their work on master branch and submit pull request against specific formula.

> https://github.com/salt-formulas/salt-formula-murano

Any questions or feedback is always welcome so feel free to join our IRC channel:

> #salt-formulas @ irc.freenode.net

OpenContrail Formula

Contrail Controller is an open, standards-based software solution that delivers network virtualization and service automation for federated cloud networks. It provides self-service provisioning, improves network troubleshooting and diagnostics, and enables service chaining for dynamic application environments across enterprise virtual private cloud (VPC), managed Infrastructure as a Service (IaaS), and Networks Functions Virtualization (NFV) use cases.

Package source

Formula support OpenContrail as well as Juniper Contrail package repository in the backend.

Differences withing the configuration and state run are controlled by `opencontrail.common.vendor: [opencontrail|juniper]` pillar attribute.

Default value is set to `opencontrail`.

Juniper releases tested with this formula:

- 3.0.2.x

To use Juniper Contrail repository as a source of packages override pillar as in this example:

```
opencontrail:
  common:
    vendor: juniper
```

Sample Pillars

Controller nodes

There are several scenarios for OpenContrail control plane.

All-in-one single

Config, control, analytics, database, web – altogether on one node.

```
opencontrail:
  common:
    version: 2.2
    source:
      engine: pkg
      address: http://mirror.robotice.cz/contrail-havana/
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
      token: token
      password: password
    network:
      engine: neutron
      host: 127.0.0.1
      port: 9696
  config:
    version: 2.2
    enabled: true
    network:
      engine: neutron
      host: 127.0.0.1
      port: 9696
    discovery:
      host: 127.0.0.1
    analytics:
      host: 127.0.0.1
    bind:
      address: 127.0.0.1
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
    database:
      members:
      - host: 127.0.0.1
        port: 9160
    cache:
      members:
      - host: 127.0.0.1
        port: 11211
    identity:
      engine: keystone
      version: '2.0'
      region: RegionOne
```

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```
      host: 127.0.0.1
      port: 35357
      user: admin
      password: password
      token: token
      tenant: admin
    members:
    - host: 127.0.0.1
      id: 1
    rootlogger: "INFO, CONSOLE"
  control:
    version: 2.2
    enabled: true
    bind:
      address: 127.0.0.1
    discovery:
      host: 127.0.0.1
    master:
      host: 127.0.0.1
    members:
    - host: 127.0.0.1
      id: 1
  collector:
    version: 2.2
    enabled: true
    bind:
      address: 127.0.0.1
    master:
      host: 127.0.0.1
    discovery:
      host: 127.0.0.1
    data_ttl: 2
    database:
      members:
      - host: 127.0.0.1
        port: 9160
  database:
    version: 2.2
    cassandra:
      version: 2
    enabled: true
    minimum_disk: 10
    name: 'Contrail'
    original_token: 0
    compaction_throughput_mb_per_sec: 16
    concurrent_compactors: 1
    data_dirs:
    - /var/lib/cassandra
    id: 1
    discovery:
      host: 127.0.0.1
    bind:
      host: 127.0.0.1
      port: 9042
      rpc_port: 9160
    members:
    - host: 127.0.0.1
```

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```
      id: 1
  web:
    version: 2.2
    enabled: True
    bind:
      address: 127.0.0.1
    analytics:
      host: 127.0.0.1
    master:
      host: 127.0.0.1
    cache:
      engine: redis
      host: 127.0.0.1
      port: 6379
    members:
    - host: 127.0.0.1
      id: 1
    identity:
      engine: keystone
      version: '2.0'
      host: 127.0.0.1
      port: 35357
      user: admin
      password: password
      token: token
      tenant: admin
```

All-in-one cluster

Config, control, analytics, database, web – altogether, clustered on multiple nodes.

```
opencontrail:
  common:
    version: 2.2
    source:
      engine: pkg
      address: http://mirror.robotice.cz/contrail-havana/
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
      token: token
      password: password
    network:
      engine: neutron
      host: 127.0.0.1
      port: 9696
  config:
    version: 2.2
    enabled: true
    network:
      engine: neutron
      host: 127.0.0.1
      port: 9696
    discovery:
```

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```
      host: 127.0.0.1
    analytics:
      host: 127.0.0.1
    bind:
      address: 127.0.0.1
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
    database:
      members:
      - host: 127.0.0.1
        port: 9160
      - host: 127.0.0.1
        port: 9160
      - host: 127.0.0.1
        port: 9160
    cache:
      members:
      - host: 127.0.0.1
        port: 11211
      - host: 127.0.0.1
        port: 11211
      - host: 127.0.0.1
        port: 11211
    identity:
      engine: keystone
      version: '2.0'
      region: RegionOne
      host: 127.0.0.1
      port: 35357
      user: admin
      password: password
      token: token
      tenant: admin
    members:
    - host: 127.0.0.1
      id: 1
    - host: 127.0.0.1
      id: 2
    - host: 127.0.0.1
      id: 3
  control:
    version: 2.2
    enabled: true
    bind:
      address: 127.0.0.1
    discovery:
      host: 127.0.0.1
    master:
      host: 127.0.0.1
    members:
    - host: 127.0.0.1
      id: 1
    - host: 127.0.0.1
      id: 2
    - host: 127.0.0.1
```

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```
    id: 3
  collector:
    version: 2.2
    enabled: true
    bind:
      address: 127.0.0.1
    master:
      host: 127.0.0.1
    discovery:
      host: 127.0.0.1
    data_ttl: 1
    database:
      members:
      - host: 127.0.0.1
        port: 9160
      - host: 127.0.0.1
        port: 9160
      - host: 127.0.0.1
        port: 9160
  database:
    version: 2.2
    cassandra:
      version: 2
    enabled: true
    name: 'Contrail'
    minimum_disk: 10
    original_token: 0
    data_dirs:
    - /var/lib/cassandra
    id: 1
    discovery:
      host: 127.0.0.1
    bind:
      host: 127.0.0.1
      port: 9042
      rpc_port: 9160
    members:
    - host: 127.0.0.1
      id: 1
    - host: 127.0.0.1
      id: 2
    - host: 127.0.0.1
      id: 3
  web:
    version: 2.2
    enabled: True
    bind:
      address: 127.0.0.1
    master:
      host: 127.0.0.1
    analytics:
      host: 127.0.0.1
    cache:
      engine: redis
      host: 127.0.0.1
      port: 6379
    members:
```

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```
    - host: 127.0.0.1
      id: 1
    - host: 127.0.0.1
      id: 2
    - host: 127.0.0.1
      id: 3
    identity:
      engine: keystone
      version: '2.0'
      host: 127.0.0.1
      port: 35357
      user: admin
      password: password
      token: token
      tenant: admin
```

Separated analytics from control and config

Config, control, database, web.

```
opencontrail:
  common:
    version: 2.2
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
      token: token
      password: password
    network:
      engine: neutron
      host: 127.0.0.1
      port: 9696
  config:
    version: 2.2
    enabled: true
    network:
      engine: neutron
      host: 127.0.0.1
      port: 9696
    discovery:
      host: 127.0.0.1
    analytics:
      host: 127.0.0.1
    bind:
      address: 127.0.0.1
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
    database:
      members:
      - host: 127.0.0.1
        port: 9160
      - host: 127.0.0.1
```

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```
        port: 9160
      - host: 127.0.0.1
        port: 9160
    cache:
      members:
      - host: 127.0.0.1
        port: 11211
      - host: 127.0.0.1
        port: 11211
      - host: 127.0.0.1
        port: 11211
    identity:
      engine: keystone
      version: '2.0'
      region: RegionOne
      host: 127.0.0.1
      port: 35357
      user: admin
      password: password
      token: token
      tenant: admin
    members:
    - host: 127.0.0.1
      id: 1
    - host: 127.0.0.1
      id: 2
    - host: 127.0.0.1
      id: 3
  control:
    version: 2.2
    enabled: true
    bind:
      address: 127.0.0.1
    discovery:
      host: 127.0.0.1
    master:
      host: 127.0.0.1
    members:
    - host: 127.0.0.1
      id: 1
    - host: 127.0.0.1
      id: 2
    - host: 127.0.0.1
      id: 3
  database:
    version: 127.0.0.1
    cassandra:
      version: 2
    enabled: true
    name: 'Contrail'
    minimum_disk: 10
    original_token: 0
    data_dirs:
    - /var/lib/cassandra
    id: 1
    discovery:
      host: 127.0.0.1
```

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```
    bind:
      host: 127.0.0.1
      port: 9042
      rpc_port: 9160
    members:
    - host: 127.0.0.1
      id: 1
    - host: 127.0.0.1
      id: 2
    - host: 127.0.0.1
      id: 3
  web:
    version: 2.2
    enabled: True
    bind:
      address: 127.0.0.1
    analytics:
      host: 127.0.0.1
    master:
      host: 127.0.0.1
    cache:
      engine: redis
      host: 127.0.0.1
      port: 6379
    members:
    - host: 127.0.0.1
      id: 1
    - host: 127.0.0.1
      id: 2
    - host: 127.0.0.1
      id: 3
    identity:
      engine: keystone
      version: '2.0'
      host: 127.0.0.1
      port: 35357
      user: admin
      password: password
      token: token
      tenant: admin
```

Analytic nodes

Analytics and database on an analytic node(s)

```
opencontrail:
  common:
    version: 2.2
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
      token: token
      password: password
    network:
      engine: neutron
      host: 127.0.0.1
```

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```
      port: 9696
  collector:
    version: 2.2
    enabled: true
    bind:
      address: 127.0.0.1
    master:
      host: 127.0.0.1
    discovery:
      host: 127.0.0.1
    data_ttl: 1
    database:
      members:
      - host: 127.0.0.1
        port: 9160
      - host: 127.0.0.1
        port: 9160
      - host: 127.0.0.1
        port: 9160
  database:
    version: 2.2
    cassandra:
      version: 2
    enabled: true
    name: 'Contrail'
    minimum_disk: 10
    original_token: 0
    data_dirs:
    - /var/lib/cassandra
    id: 1
    discovery:
      host: 127.0.0.1
    bind:
      host: 127.0.0.1
      port: 9042
      rpc_port: 9160
    members:
    - host: 127.0.0.1
      id: 1
    - host: 127.0.0.1
      id: 2
    - host: 127.0.0.1
      id: 3
```

Compute nodes

Vrouter configuration on a compute node(s)

```
opencontrail:
  common:
    version: 2.2
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
```

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```
      token: token
      password: password
    network:
      engine: neutron
      host: 127.0.0.1
      port: 9696
  compute:
    version: 2.2
    enabled: True
    hostname: node-12.domain.tld
    discovery:
      host: 127.0.0.1
    interface:
      address: 127.0.0.1
      dev: eth0
      gateway: 127.0.0.1
      mask: /24
      dns: 127.0.0.1
      mtu: 9000
```

Compute nodes with gateway_mode

Gateway mode: can be server/ vcpe (default is none)

```
opencontrail:
  compute:
    gateway_mode: server
```

TSN nodes

Configure TSN nodes

```
opencontrail:
  compute:
    enabled: true
    tor:
      enabled: true
      bind:
        port: 8086
      agent:
        tor01:
          id: 0
          port: 6632
          host: 127.0.0.1
          address: 127.0.0.1
```

Set up metadata secret for the Vrouter

In order to get cloud-init within the instance to properly fetch instance metadata, metadata_proxy_secret in the Vrouter agent config should match the value in nova.conf. The administrator should define it in the pillar:

```
opencontrail:
  compute:
    metadata:
      secret: opencontrail
```

Add auth info for Barbican on compute nodes

```
opencontrail:
  compute:
    lbaas:
      enabled: true
      secret_manager:
        engine: barbican
        identity:
          user: admin
          password: "supersecretpassword123"
          tenant: admin
```

Keystone v3

To enable support for keystone v3 in opencontrail, there must be defined version for config and web role.

```
opencontrail:
  config:
    version: 2.2
    enabled: true
    ...
    identity:
      engine: keystone
      version: '3'
    ...

opencontrail:
  web:
    version: 2.2
    enabled: true
    ...
    identity:
      engine: keystone
      version: '3'
    ...
```

Without Keystone

```
opencontrail:
  ...
  common:
    ...
    identity:
      engine: none
      token: none
```

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```
      password: none
    ...
  config:
    ...
    identity:
      engine: none
      password: none
      token: none
    ...
  web:
    ...
    identity:
      engine: none
      password: none
      token: none
    ...
```

Kubernetes support

Kubernetes vrouter nodes

Vrouter configuration on a kubernetes node(s)

```
opencontrail:
  ...
  compute:
    engine: kubernetes
  ...
```

vRouter with separated control plane

Separate XMPP traffic from dataplane interface.

```
opencontrail:
  compute:
    bind:
      address: 172.16.0.50
  ...
```

Override RPF default in Contrail API

From MCP1.1 with OpenContrail >= 3.1.1 you can override RPF default for newly created virtual networks. This can be useful for usecases like running Calico and K8S in overlay. The *override_rpf_default_by* has valid values *disable*, *enable*. If not defined, the configuration fallbacks to Contrail default - currently *enable*.

```
opencontrail:
  ...
  config:
    override_rpf_default_by: 'disable'
  ...
```

Cassandra GC logging

From Contrail version 3 you can set a way you want to handle Cassandra GC logs. The behavior is controlled by *cassandra_gc_logging*. Valid values are 'rotation' (default), 'legacy' and false.

- 'rotation' is supported by JDK 6u34 7u2 or later and handles rotation of log

files automatically. - 'legacy' is a way to support older JDKs and you will need to handle logs by other means. This can be handled for example by using - *service.opencontrail.database.cassandra_log_cleanup* in your reclass model. - false will disable the cassandra gc logging

```
opencontrail:
  ...
  database:
    cassandra_gc_logging: false
  ...
```

Disable Contrail API authentication

Contrail version must >= 3.0. It is useful especially for Keystone v3.

```
opencontrail:
  ...
  config:
    multi_tenancy: false
  ...
```

Enable RBAC

```
opencontrail:
  ...
  config:
    aaa_mode: rbac
    cloud_admin_role: admin
    global_read_only_role: member
  ...
```

Switch from on demand to periodic keystone sync

This can be useful when you want to sync projects from OpenStack to Contrail automatically. The period of sync is 60s.

```
opencontrail:
  ...
  config:
    identity:
      sync_on_demand: false
  ...
```

Cassandra listen interface

```
database:
  ....
  bind:
    interface: eth0
    port: 9042
    rpc_port: 9160
  ....
```

OpenContrail WebUI version >= 3.1.1

For OpenContrail version >= 3.1.1 and Cassandra >= 2.1 we should override WebUI's cassandra port from 9160 to 9042.

For appropriate node at class level:

```
opencontrail:
  ....
  web:
    database:
      port: 9042
  ....
```

RabbitMQ HA hosts

```
opencontrail:
  config:
    message_queue:
      engine: rabbitmq
      members:
        - host: 10.0.16.1
        - host: 10.0.16.2
        - host: 10.0.16.3
      port: 5672
```

```
database:
  ....
  bind:
    interface: eth0
    port: 9042
    rpc_port: 9160
  ....
```

DPDK vRouter

```
opencontrail:
  compute:
    dpdk:
      enabled: true
      taskset: "0x0000003C00003C"
```

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```
      socket_mem: "1024,1024"
    interface:
      mac_address: 90:e2:ba:7c:22:e1
      pci: 0000:81:00.1
  ...
```

Increase number of alarm-gen workers

Port prefix will increment used ports by workers starting with 5901.

```
collector:
  alarm_gen:
    workers: 1
    port_prefix: 59
```

Contrail client

Basic parameters with identity and host configs

```
opencontrail:
  client:
    identity:
      user: admin
      project: admin
      password: adminpass
      host: keystone_host
    config:
      host: contrail_api_host
      port: contrail_api_ort
```

Enforcing virtual routers

```
opencontrail:
  client:
    ...
    virtual_router:
      cmp01:
        ip_address: 172.16.0.11
        dpdk_enabled: True
      cmp02:
        ip_address: 172.16.0.12
        dpdk_enabled: True
```

Enforcing global system config

```
opencontrail:
  client:
    ...
    global_system_config:
      name: default-global-system-config
      asn: 64512
      grp:
        enable: true
```

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```
        restart_time: 60
        end_of_rib_timeout: 30
        bgp_helper_enable: false
        xmpp_helper_enable: false
        long_lived_restart_time: 300
```

Enforcing global vrouter config

```
opencontrail:
  client:
    ...
    global_vrouter_config:
      name: default-global-vrouter-config
      parent_type: global-system-config
      encap_priority: "MPLSoUDP,MPLSoGRE"
      vxlan_vn_id_mode: automatic
      fq_names:
        - 'default-global-system-config'
        - 'default-global-vrouter-config'
```

Enforcing control nodes

```
opencontrail:
  client:
    ...
    bgp_router:
      ntw01:
        type: control-node
        ip_address: 172.16.0.11
      nwt02:
        type: control-node
        ip_address: 172.16.0.12
      nwt03:
        type: control-node
        ip_address: 172.16.0.13
```

Enforcing edge BGP routers

```
opencontrail:
  client:
    ...
    bgp_router:
      mx01:
        type: router
        ip_address: 172.16.0.21
        asn: 64512
      mx02:
        type: router
        ip_address: 172.16.0.22
        asn: 64512
        key_type: md5
        key: password
```

Enforcing config nodes

```
opencontrail:
  client:
```

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```
    ...
    config_node:
      ctl01:
        ip_address: 172.16.0.21
      ctl02:
        ip_address: 172.16.0.22
```

Enforcing database nodes

```
opencontrail:
  client:
    ...
    database_node:
      ntw01:
        ip_address: 172.16.0.21
      ntw02:
        ip_address: 172.16.0.22
```

Enforcing analytics nodes

```
opencontrail:
  client:
    ...
    analytics_node:
      nal01:
        ip_address: 172.16.0.31
      nal02:
        ip_address: 172.16.0.32
```

Enforcing Link Local Services

```
opencontrail:
  client:
    ...
    linklocal_service:
       # example with dns name address (only one permited)
       meta1:
         lls_ip: 10.0.0.23
         lls_port: 80
         ipf_addresses: "meta.example.com"
         ipf_port: 80
       # example with multiple ip addresses
       meta2:
         lls_ip: 10.0.0.23
         lls_port: 80
         ipf_addresses:
         - 10.10.10.10
         - 10.20.20.20
         - 10.30.30.30
         ipf_port: 80
       # example with one ip address
       meta3:
         lls_ip: 10.0.0.23
         lls_port: 80
         ipf_addresses:
         - 10.10.10.10
         ipf_port: 80
```

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```
        # example with name override
        lls_meta4:
          name: meta4
          lls_ip: 10.0.0.23
          lls_port: 80
          ipf_addresses:
          - 10.10.10.10
          ipf_port: 80
```

Configuring OpenStack default quotasx

Enforcing physical routers h .. code-block:: yaml

opencontrail:

client: ... physical_router:

router1: name: router1 dataplane_ip: 1.2.3.4 management_ip: 1.2.3.4 vendor_name: ovs product_name: ovs agents:

- tsn0-0
- tsn0

Enforcing physical/logical interfaces for routers

```
opencontrail
  client:
  ...
  physical_router:
    router1:
      ...
      interface:
        port1:
          name: port1
          logical_interface:
            port1_l:
              name: 'port1.0'
              vlan_tag: 0
              interface_type: L2
              virtual_machine_interface:
                port1_port:
                  name: port1_port
                  ip_address: 192.168.90.107
                  mac_address: '2e:92:a8:af:c2:21'
                  security_group: 'default'
                  virtual_network: 'virtual-network'
```

Enforcing virtual networks

```
opencontrail:
  client:
    virtual_networks:
      net01:
        name: 'network01'
        ip_address: '172.16.111.0'
        ip_prefix: 24
        asn: 64512
        route_target: 10000
```

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```
        external: True
        allow_transit: False
        forwarding_mode: 'l2_l3'
        rpf: 'disable'
        mirror_destination: False
        domain: 'default-domain'
        project: 'admin'
        ipam_domain: 'default-domain'
        ipam_project: 'default-project'
        ipam_name: 'default-network-ipam'
      net02:
        name: 'network02'
      net03:
        name: 'network03'
```

Enforcing floating ip pool setings.

Virtual network with flag external needs to be created before managing the floating ip pool. Param vn_name is the name of the external network.

```
opencontrail:
  client:
    floating_ip_pools:
      pool1:
        vn_name: external-network
        vn_project: admin
        vn_domain: default-domain
        owner_access: 7
        global_access: 0
        list_of_projects:
          - [tenant1, 7]
          - [tenant2, 7]
          - [tenant3, 7]
      pool2:
        vn_name: floating-ips
        vn_project: admin
        vn_domain: default-domain
        owner_access: 7
        global_access: 0
        list_of_projects:
          - [tenant3, 7]
```

If you want to remove all shares from the ip floating pool, define only empty list in list of projects, like this:

```
opencontrail:
  client:
    floating_ip_pools:
      pool1:
        vn_name: external-network
        vn_project: admin
        vn_domain: default-domain
        owner_access: 7
        global_access: 0
        list_of_projects: []
```

Contrail DNS custom forwarders

By default Contrail uses the /etc/resolv.conf file to determine the upstream DNS servers. This can have some side-affects, like resolving internal DNS entries on you public instances.

In order to overrule this default set, you can configure nameservers using pillar data. The formula is then responsible for configuring and generating a alternate resolv.conf file.

Note: this has been patched recently in the Contrail distribution of Mirantis: https://github.com/Mirantis/contrail-controller/commit/ed9a25ccbcfebd7d079a93aecc5a1a7bf1265ea4 https://github.com/Mirantis/contrail-controller/commit/94c844cf2e9bcfcd48587aec03d10b869e737ade

To change forwarders for the default-dns option (which is handled by compute nodes):

```
compute:
  ....
  dns:
    forwarders:
    - 8.8.8.8
    - 8.8.4.4
  ....
```

To change forwarders for vDNS zones (handled by control nodes):

```
control:
  ....
  dns:
    forwarders:
    - 8.8.8.8
    - 8.8.4.4
  ....
```

Usage

Basic installation

Add control BGP

```
python /etc/contrail/provision_control.py --api_server_ip 192.168.1.11 --api_server_
↪port 8082 --host_name network1.contrail.domain.com --host_ip 192.168.1.11 --router_
↪asn 64512
```

Install compute node

```
yum install contrail-vrouter contrail-openstack-vrouter

salt-call state.sls nova,opencontrail
```

Add virtual router

```
python /etc/contrail/provision_vrouter.py --host_name hostnode1.intra.domain.com --
↪host_ip 10.0.100.101 --api_server_ip 10.0.100.30 --oper add --admin_user admin --
↪admin_password cloudlab --admin_tenant_name admin

/etc/sysconfig/network-scripts/ifcfg-bond0 -- comment GATEWAY,NETMASK,IPADDR
```

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```
reboot
```

Debugging

Display vhost XMPP connection status

You should see the correct controller_ip and state should be established.

> http://<compute-node>:8085/Snh_AgentXmppConnectionStatusReq?

Display vrouter interface status

When vrf_name = —ERROR— then something goes wrong

> http://<compute-node>:8085/Snh_ItfReq?name=

Display IF MAP table

Look for neighbours, if VM has 2, it's ok

> http://<control-node>:8083/Snh_IFMapTableShowReq?table_name=

Trace XMPP requests

> http://<compute-node>:8085/Snh_SandeshTraceRequest?x=XmppMessageTrace

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

> http://salt-formulas.readthedocs.io/

In the unfortunate event that bugs are discovered, they should be reported to the appropriate issue tracker. Use Github issue tracker for specific salt formula:

> https://github.com/salt-formulas/salt-formula-opencontrail/issues

For feature requests, bug reports or blueprints affecting entire ecosystem, use Launchpad salt-formulas project:

> https://launchpad.net/salt-formulas

You can also join salt-formulas-users team and subscribe to mailing list:

> https://launchpad.net/~salt-formulas-users

Developers wishing to work on the salt-formulas projects should always base their work on master branch and submit pull request against specific formula.

> https://github.com/salt-formulas/salt-formula-opencontrail

Any questions or feedback is always welcome so feel free to join our IRC channel:

> #salt-formulas @ irc.freenode.net

Neutron Formula

Neutron is an OpenStack project to provide "networking as a service" between interface devices (e.g., vNICs) managed by other Openstack services (e.g., nova).

Starting in the Folsom release, Neutron is a core and supported part of the OpenStack platform (for Essex, we were an "incubated" project, which means use is suggested only for those who really know what they're doing with Neutron).

Sample Pillars

Neutron Server on the controller node

```
neutron:
  server:
    enabled: true
    version: mitaka
    allow_pagination: true
    pagination_max_limit: 100
    api_workers: 2
    rpc_workers: 2
    rpc_state_report_workers: 2
    bind:
      address: 172.20.0.1
      port: 9696
    database:
      engine: mysql
      host: 127.0.0.1
      port: 3306
      name: neutron
      user: neutron
      password: pwd
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
      user: neutron
      password: pwd
      tenant: service
      endpoint_type: internal
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    metadata:
      host: 127.0.0.1
      port: 8775
      password: pass
      workers: 2
    audit:
      enabled: false
```

Note: The pagination is useful to retrieve a large bunch of resources, because a single request may fail (timeout). This is enabled with both parameters *allow_pagination* and *pagination_max_limit* as shown above.

Configuration of policy.json file

```
neutron:
  server:
    ....
```

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```
    policy:
      create_subnet: 'rule:admin_or_network_owner'
      'get_network:queue_id': 'rule:admin_only'
      # Add key without value to remove line from policy.json
      'create_network:shared':
```

Neutron LBaaSv2 enablement

```
neutron:
  server:
    lbaas:
      enabled: true
      providers:
        octavia:
          engine: octavia
          driver_path: 'neutron_lbaas.drivers.octavia.driver.OctaviaDriver'
          base_url: 'http://127.0.0.1:9876'
        avi_adc:
          engine: avinetworks
          driver_path: 'avi_lbaasv2.avi_driver.AviDriver'
          controller_address: 10.182.129.239
          controller_user: admin
          controller_password: Cloudlab2016
          controller_cloud_name: Default-Cloud
        avi_adc2:
          engine: avinetworks
          ...
```

Note: If the Contrail backend is set, Opencontrail loadbalancer would be enabled automatically. In this case lbaas should disabled in pillar:

```
neutron:
  server:
    lbaas:
      enabled: false
```

Neutron FWaaSv1 enablement

```
neutron:
  fwaas:
    enabled: true
    version: ocata
    api_version: v1
```

Enable CORS parameters

```
neutron:
  server:
    cors:
      allowed_origin: https:localhost.local,http:localhost.local
```

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```
    expose_headers: X-Auth-Token,X-Openstack-Request-Id,X-Subject-Token
    allow_methods: GET,PUT,POST,DELETE,PATCH
    allow_headers: X-Auth-Token,X-Openstack-Request-Id,X-Subject-Token
    allow_credentials: True
    max_age: 86400
```

Neutron VXLAN tenant networks with Network nodes

With DVR for East-West and Network node for North-South.

This use case describes a model utilising VxLAN overlay with DVR. The DVR routers will only be utilized for traffic that is router within the cloud infrastructure and that remains encapsulated. External traffic will be routed to via the network nodes.

The intention is that each tenant will require at least two (2) vrouters one to be utilised

Neutron Server

```
neutron:
  server:
    version: mitaka
    path_mtu: 1500
    bind:
      address: 172.20.0.1
      port: 9696
    database:
      engine: mysql
      host: 127.0.0.1
      port: 3306
      name: neutron
      user: neutron
      password: pwd
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
      user: neutron
      password: pwd
      tenant: service
      endpoint_type: internal
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    global_physnet_mtu: 9000
    l3_ha: False # Which type of router will be created by default
    dvr: True # disabled for non DVR use case
    backend:
      engine: ml2
      tenant_network_types: "flat,vxlan"
      external_mtu: 9000
      mechanism:
```

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```
        ovs:
          driver: openvswitch
```

Network Node

```
neutron:
  gateway:
    enabled: True
    version: mitaka
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    local_ip: 192.168.20.20 # br-mesh ip address
    dvr: True # disabled for non DVR use case
    agent_mode: dvr_snat
    metadata:
      host: 127.0.0.1
      password: pass
    backend:
      engine: ml2
      tenant_network_types: "flat,vxlan"
      mechanism:
        ovs:
          driver: openvswitch
```

Compute Node

```
neutron:
  compute:
    enabled: True
    version: mitaka
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    local_ip: 192.168.20.20 # br-mesh ip address
    dvr: True # disabled for non DVR use case
    agent_mode: dvr
    external_access: false # Compute node with DVR for east-west only, Network Node␣
↪has True as default
    metadata:
      host: 127.0.0.1
      password: pass
    backend:
      engine: ml2
      tenant_network_types: "flat,vxlan"
      mechanism:
        ovs:
          driver: openvswitch
    audit:
```

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```
      enabled: false
```

Disable physnet1 bridge

By default we have external access turned on, so among any physnets in your reclass there would be additional one: physnet1, which is mapped to br-floating

If you need internal nets only without this bridge, remove br-floating and configurations mappings. Disable mappings for this bridge on neutron-servers:

```
neutron:
  server:
    external_access: false
```

gateways:

```
neutron:
  gateway:
    external_access: false
```

compute nodes:

```
neutron:
  compute:
    external_access: false
```

Add additional bridge mappings for OVS bridges

By default we have external access turned on, so among any physnets in your reclass there would be additional one: physnet1, which is mapped to br-floating

If you need to add extra non-default bridge mappings they can be defined separately for both gateways and compute nodes:

gateways:

```
neutron:
  gateway:
    bridge_mappings:
      physnet4: br-floating-internet
```

compute nodes:

```
neutron:
  compute:
    bridge_mappings:
      physnet4: br-floating-internet
```

Specify different mtu values for different physnets

Neutron Server

```
neutron:
  server:
    version: mitaka
    backend:
      external_mtu: 1500
      tenant_net_mtu: 9000
      ironic_net_mtu: 9000
```

Neutron VXLAN tenant networks with Network Nodes (non DVR)

This section describes a network solution that utilises VxLAN overlay networks without DVR with all routers being managed on the network nodes.

Neutron Server

```
neutron:
  server:
    version: mitaka
    bind:
      address: 172.20.0.1
      port: 9696
    database:
      engine: mysql
      host: 127.0.0.1
      port: 3306
      name: neutron
      user: neutron
      password: pwd
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
      user: neutron
      password: pwd
      tenant: service
      endpoint_type: internal
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    global_physnet_mtu: 9000
    l3_ha: True
    dvr: False
    backend:
      engine: ml2
      tenant_network_types= "flat,vxlan"
      external_mtu: 9000
      mechanism:
        ovs:
          driver: openvswitch
```

Network Node

```
neutron:
  gateway:
    enabled: True
    version: mitaka
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    local_ip: 192.168.20.20 # br-mesh ip address
    dvr: False
    agent_mode: legacy
    availability_zone: az1
    metadata:
      host: 127.0.0.1
      password: pass
    backend:
      engine: ml2
      tenant_network_types: "flat,vxlan"
      mechanism:
        ovs:
          driver: openvswitch
```

Compute Node

```
neutron:
  compute:
    enabled: True
    version: mitaka
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    local_ip: 192.168.20.20 # br-mesh ip address
    external_access: False
    dvr: False
    backend:
      engine: ml2
      tenant_network_types: "flat,vxlan"
      mechanism:
        ovs:
          driver: openvswitch
```

Neutron VXLAN tenant networks with Network Nodes with DVR

With DVR for East-West and North-South, DVR everywhere, Network node for SNAT.

This section describes a network solution that utilises VxLAN overlay networks with DVR with North-South and East-West. Network Node is used only for SNAT.

Neutron Server

```
neutron:
  server:
    version: mitaka
    bind:
      address: 172.20.0.1
      port: 9696
    database:
      engine: mysql
      host: 127.0.0.1
      port: 3306
      name: neutron
      user: neutron
      password: pwd
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
      user: neutron
      password: pwd
      tenant: service
      endpoint_type: internal
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    global_physnet_mtu: 9000
    l3_ha: False
    dvr: True
    backend:
      engine: ml2
      tenant_network_types= "flat,vxlan"
      external_mtu: 9000
      mechanism:
        ovs:
          driver: openvswitch
```

Network Node

```
neutron:
  gateway:
    enabled: True
    version: mitaka
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    local_ip: 192.168.20.20 # br-mesh ip address
    dvr: True
    agent_mode: dvr_snat
    availability_zone: az1
    metadata:
```

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```
      host: 127.0.0.1
      password: pass
    backend:
      engine: ml2
      tenant_network_types: "flat,vxlan"
      mechanism:
        ovs:
          driver: openvswitch
```

Compute Node

```
neutron:
  compute:
    enabled: True
    version: mitaka
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    local_ip: 192.168.20.20 # br-mesh ip address
    dvr: True
    external_access: True
    agent_mode: dvr
    availability_zone: az1
    metadata:
      host: 127.0.0.1
      password: pass
    backend:
      engine: ml2
      tenant_network_types: "flat,vxlan"
      mechanism:
        ovs:
          driver: openvswitch
```

Sample Linux network configuration for DVR

```
linux:
  network:
    bridge: openvswitch
    interface:
      eth1:
        enabled: true
        type: eth
        mtu: 9000
        proto: manual
      eth2:
        enabled: true
        type: eth
        mtu: 9000
        proto: manual
      eth3:
        enabled: true
        type: eth
        mtu: 9000
```

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```
      proto: manual
    br-int:
      enabled: true
      mtu: 9000
      type: ovs_bridge
    br-floating:
      enabled: true
      mtu: 9000
      type: ovs_bridge
    float-to-ex:
      enabled: true
      type: ovs_port
      mtu: 65000
      bridge: br-floating
    br-mgmt:
      enabled: true
      type: bridge
      mtu: 9000
      address: ${_param:single_address}
      netmask: 255.255.255.0
      use_interfaces:
      - eth1
    br-mesh:
      enabled: true
      type: bridge
      mtu: 9000
      address: ${_param:tenant_address}
      netmask: 255.255.255.0
      use_interfaces:
      - eth2
    br-ex:
      enabled: true
      type: bridge
      mtu: 9000
      address: ${_param:external_address}
      netmask: 255.255.255.0
      use_interfaces:
      - eth3
      use_ovs_ports:
      - float-to-ex
```

Additonal VXLAN tenant network settings

The default multicast group of 224.0.0.1 only multicasts to a single subnet. Allow overriding it to allow larger underlay network topologies.

Neutron Server

```
neutron:
  server:
    vxlan:
      group: 239.0.0.0/8
      vni_ranges: "2:65535"
```

Neutron VLAN tenant networks with Network Nodes

VLAN tenant provider

Neutron Server only

```
neutron:
  server:
    version: mitaka
    ...
    global_physnet_mtu: 9000
    l3_ha: False
    dvr: True
    backend:
      engine: ml2
      tenant_network_types: "flat,vlan" # Can be mixed flat,vlan,vxlan
      tenant_vlan_range: "1000:2000"
      external_vlan_range: "100:200" # Does not have to be defined.
      external_mtu: 9000
      mechanism:
        ovs:
          driver: openvswitch
```

Compute node

```
neutron:
  compute:
    version: mitaka
    ...
    dvr: True
    agent_mode: dvr
    external_access: False
    backend:
      engine: ml2
      tenant_network_types: "flat,vlan" # Can be mixed flat,vlan,vxlan
      mechanism:
        ovs:
          driver: openvswitch
```

Advanced Neutron Features (DPDK, SR-IOV)

Neutron OVS DPDK

Enable datapath netdev for neutron openvswitch agent

```
neutron:
  server:
    version: mitaka
    ...
    dpdk: True
    ...

neutron:
  compute:
    version: mitaka
    dpdk: True
```

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```
    vhost_socket_dir: /var/run/openvswitch
    backend:
      engine: ml2
      ...
      mechanism:
        ovs:
          driver: openvswitch
```

Neutron OVS SR-IOV

```
neutron:
  server:
    version: mitaka
    backend:
      engine: ml2
      ...
      mechanism:
        ovs:
          driver: openvswitch
        sriov:
          driver: sriovnicswitch

neutron:
  compute:
    version: mitaka
    ...
    backend:
      engine: ml2
      tenant_network_types: "flat,vlan" # Can be mixed flat,vlan,vxlan
      sriov:
        nic_one:
          devname: eth1
          physical_network: physnet3
      mechanism:
        ovs:
          driver: openvswitch
```

Neutron with VLAN-aware-VMs

```
neutron:
  server:
    vlan_aware_vms: true
  ....
  compute:
    vlan_aware_vms: true
  ....
  gateway:
    vlan_aware_vms: true
```

Neutron with OVN

Control node:

```
neutron:
  server:
    backend:
      engine: ovn
      mechanism:
        ovn:
          driver: ovn
      tenant_network_types: "geneve,flat"
    ovn_ctl_opts:
      db-nb-create-insecure-remote: 'yes'
      db-sb-create-insecure-remote: 'yes'
```

Compute node:

```
neutron:
  compute:
    local_ip: 10.2.0.105
    controller_vip: 10.1.0.101
    external_access: false
    backend:
      engine: ovn
```

Neutron Server

Neutron Server with OpenContrail

```
neutron:
  server:
    backend:
      engine: contrail
      host: contrail_discovery_host
      port: 8082
      user: admin
      password: password
      tenant: admin
      token: token
```

Neutron Server with Midonet

```
neutron:
  server:
    backend:
      engine: midonet
      host: midonet_api_host
      port: 8181
      user: admin
      password: password
```

Neutron Keystone region

```
neutron:
  server:
    enabled: true
    version: kilo
    ...
```

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```
    identity:
      region: RegionTwo
    ...
    compute:
      region: RegionTwo
    ...
```

Client-side RabbitMQ HA setup

```
neutron:
  server:
    ....
    message_queue:
      engine: rabbitmq
      members:
        - host: 10.0.16.1
        - host: 10.0.16.2
        - host: 10.0.16.3
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    ....
```

Configuring TLS communications

Note: by default system wide installed CA certs are used, so `cacert_file` param is optional, as well as `cacert`.

- **RabbitMQ TLS**

```
neutron:
  server, gateway, compute:
     message_queue:
       port: 5671
       ssl:
         enabled: True
         (optional) cacert: cert body if the cacert_file does not exists
         (optional) cacert_file: /etc/openstack/rabbitmq-ca.pem
         (optional) version: TLSv1_2
```

- **MySQL TLS**

```
neutron:
  server:
     database:
       ssl:
         enabled: True
         (optional) cacert: cert body if the cacert_file does not exists
         (optional) cacert_file: /etc/openstack/mysql-ca.pem
```

- **Openstack HTTPS API**

```
neutron:
  server:
     identity:
        protocol: https
        (optional) cacert_file: /etc/openstack/proxy.pem
```

Enable auditing filter, ie: CADF

```
neutron:
  server:
    audit:
      enabled: true
  ....
      filter_factory: 'keystonemiddleware.audit:filter_factory'
      map_file: '/etc/pycadf/neutron_api_audit_map.conf'
  ....
  compute:
    audit:
      enabled: true
  ....
      filter_factory: 'keystonemiddleware.audit:filter_factory'
      map_file: '/etc/pycadf/neutron_api_audit_map.conf'
  ....
```

Neutron with security groups disabled

```
neutron:
  server:
    security_groups_enabled: False
  ....
  compute:
    security_groups_enabled: False
  ....
  gateway:
    security_groups_enabled: False
```

Neutron Client

Neutron networks

```
neutron:
  client:
    enabled: true
    server:
      identity:
        endpoint_type: internalURL
        network:
          inet1:
            tenant: demo
            shared: False
            admin_state_up: True
            router_external: True
            provider_physical_network: inet
            provider_network_type: flat
            provider_segmentation_id: 2
            subnet:
              inet1-subnet1:
                cidr: 192.168.90.0/24
                enable_dhcp: False
          inet2:
            tenant: admin
            shared: False
```

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```
            router_external: True
            provider_network_type: "vlan"
            subnet:
              inet2-subnet1:
                cidr: 192.168.92.0/24
                enable_dhcp: False
              inet2-subnet2:
                cidr: 192.168.94.0/24
                enable_dhcp: True
      identity1:
        network:
          ...
```

Neutron routers

```
neutron:
  client:
    enabled: true
    server:
      identity:
        endpoint_type: internalURL
        router:
          inet1-router:
            tenant: demo
            admin_state_up: True
            gateway_network: inet
            interfaces:
              - inet1-subnet1
              - inet1-subnet2
      identity1:
        router:
          ...

TODO: implement adding new interfaces to a router while updating it
```

Neutron security groups

```
neutron:
  client:
    enabled: true
    server:
      identity:
        endpoint_type: internalURL
        security_group:
          security_group1:
            tenant: demo
            description: security group 1
            rules:
              - direction: ingress
                ethertype: IPv4
                protocol: TCP
                port_range_min: 1
                port_range_max: 65535
                remote_ip_prefix: 0.0.0.0/0
              - direction: ingress
                ethertype: IPv4
                protocol: UDP
```

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```
                port_range_min: 1
                port_range_max: 65535
                remote_ip_prefix: 0.0.0.0/0
              - direction: ingress
                protocol: ICMP
                remote_ip_prefix: 0.0.0.0/0
      identity1:
        security_group:
          ...

TODO: implement updating existing security rules (now it adds new rule if trying to␣
↪update existing one)
```

Floating IP addresses

```
neutron:
  client:
    enabled: true
    server:
      identity:
        endpoint_type: internalURL
        floating_ip:
          prx01-instance:
            server: prx01.mk22-lab-basic.local
            subnet: private-subnet1
            network: public-net1
            tenant: demo
          gtw01-instance:
            ...
```

Note: The network must have flag router:external set to True. Instance port in the stated subnet will be associated with the dynamically generated floating IP.

Enable Neutron extensions (QoS, DNS, etc.)

```
neutron:
  server:
    backend:
      extension:
        dns:
          enabled: True
          host: 127.0.0.1
          port: 9001
          protocol: http
          ....
        qos
          enabled: True
```

Neutron with Designate

```
neutron:
  server:
    backend:
      extension:
        dns:
          enabled: True
          host: 127.0.0.1
          port: 9001
          protocol: http
```

Enhanced logging with logging.conf

By default logging.conf is disabled.

That is possible to enable per-binary logging.conf with new variables:

- openstack_log_appender - set it to true to enable log_config_append for all OpenStack services;
- openstack_fluentd_handler_enabled - set to true to enable FluentHandler for all Openstack services.
- openstack_ossyslog_handler_enabled - set to true to enable OSSysLogHandler for all Openstack services.

Only WatchedFileHandler, OSSysLogHandler and FluentHandler are available.

Also it is possible to configure this with pillar:

```
neutron:
  server:
    logging:
      log_appender: true
      log_handlers:
        watchedfile:
          enabled: true
        fluentd:
          enabled: true
        ossyslog:
          enabled: true
  ....
  compute:
    logging:
      log_appender: true
      log_handlers:
        watchedfile:
          enabled: true
        fluentd:
          enabled: true
        ossyslog:
          enabled: true
  ....
  gateway:
    logging:
      log_appender: true
      log_handlers:
        watchedfile:
          enabled: true
```

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```
        fluentd:
          enabled: true
        ossyslog:
          enabled: true
```

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

http://salt-formulas.readthedocs.io/

In the unfortunate event that bugs are discovered, they should be reported to the appropriate issue tracker. Use Github issue tracker for specific salt formula:

https://github.com/salt-formulas/salt-formula-neutron/issues

For feature requests, bug reports or blueprints affecting entire ecosystem, use Launchpad salt-formulas project:

https://launchpad.net/salt-formulas

You can also join salt-formulas-users team and subscribe to mailing list:

https://launchpad.net/~salt-formulas-users

Developers wishing to work on the salt-formulas projects should always base their work on master branch and submit pull request against specific formula.

https://github.com/salt-formulas/salt-formula-neutron

Any questions or feedback is always welcome so feel free to join our IRC channel:

#salt-formulas @ irc.freenode.net

Nova Formula

OpenStack Nova provides a cloud computing fabric controller, supporting a wide variety of virtualization technologies, including KVM, Xen, LXC, VMware, and more. In addition to its native API, it includes compatibility with the commonly encountered Amazon EC2 and S3 APIs.

Sample Pillars

Controller nodes

Nova services on the controller node

```
nova:
  controller:
    version: juno
    enabled: true
    security_group: true
    cpu_allocation_ratio: 8.0
    ram_allocation_ratio: 1.0
    disk_allocation_ratio: 1.0
    cross_az_attach: false
    workers: 8
```

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```
    report_interval: 60
    bind:
      public_address: 10.0.0.122
      public_name: openstack.domain.com
      novncproxy_port: 6080
    database:
      engine: mysql
      host: 127.0.0.1
      port: 3306
      name: nova
      user: nova
      password: pwd
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
      user: nova
      password: pwd
      tenant: service
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    network:
      engine: neutron
      host: 127.0.0.1
      port: 9696
      extension_sync_interval: 600
      identity:
        engine: keystone
        host: 127.0.0.1
        port: 35357
        user: neutron
        password: pwd
        tenant: service
    metadata:
      password: password
    audit:
      enabled: false
    osapi_max_limit: 500
    barbican:
      enabled: true
```

Nova services from custom package repository

```
nova:
  controller:
    version: juno
    source:
      engine: pkg
      address: http://...
  ....
```

Client-side RabbitMQ HA setup

```
nova:
  controller:
    ....
    message_queue:
      engine: rabbitmq
      members:
        - host: 10.0.16.1
        - host: 10.0.16.2
        - host: 10.0.16.3
      user: openstack
      password: pwd
      virtual_host: '/openstack'
   ....
```

Enable auditing filter, ie: CADF

```
nova:
  controller:
    audit:
      enabled: true
  ....
      filter_factory: 'keystonemiddleware.audit:filter_factory'
      map_file: '/etc/pycadf/nova_api_audit_map.conf'
  ....
```

Enable CORS parameters

```
nova:
  controller:
    cors:
      allowed_origin: https:localhost.local,http:localhost.local
      expose_headers: X-Auth-Token,X-Openstack-Request-Id,X-Subject-Token
      allow_methods: GET,PUT,POST,DELETE,PATCH
      allow_headers: X-Auth-Token,X-Openstack-Request-Id,X-Subject-Token
      allow_credentials: True
      max_age: 86400
```

Configuration of policy.json file

```
nova:
  controller:
    ....
    policy:
      context_is_admin: 'role:admin or role:administrator'
      'compute:create': 'rule:admin_or_owner'
      # Add key without value to remove line from policy.json
      'compute:create:attach_network':
```

Enable Barbican integration

```
nova:
  controller:
    ....
    barbican:
      enabled: true
```

Configuring TLS communications

Note: by default system wide installed CA certs are used, so `cacert_file` param is optional, as well as `cacert`.

- **RabbitMQ TLS**

```
nova:
  compute:
     message_queue:
       port: 5671
       ssl:
         enabled: True
         (optional) cacert: cert body if the cacert_file does not exists
         (optional) cacert_file: /etc/openstack/rabbitmq-ca.pem
         (optional) version: TLSv1_2
```

- **MySQL TLS**

```
nova:
  controller:
     database:
       ssl:
         enabled: True
         (optional) cacert: cert body if the cacert_file does not exists
         (optional) cacert_file: /etc/openstack/mysql-ca.pem
```

- **Openstack HTTPS API**

Set the `https` as protocol at `nova:compute` and `nova:controller` sections :

```
nova:
  controller :
     identity:
        protocol: https
        (optional) cacert_file: /etc/openstack/proxy.pem
     network:
        protocol: https
        (optional) cacert_file: /etc/openstack/proxy.pem
     glance:
        protocol: https
        (optional) cacert_file: /etc/openstack/proxy.pem
```

```
nova:
  compute:
     identity:
        protocol: https
        (optional) cacert_file: /etc/openstack/proxy.pem
     network:
        protocol: https
        (optional) cacert_file: /etc/openstack/proxy.pem
     image:
        protocol: https
        (optional) cacert_file: /etc/openstack/proxy.pem
     ironic:
        protocol: https
        (optional) cacert_file: /etc/openstack/proxy.pem
```

Note: the barbican, cinder and placement url endpoints are discovering using service catalog.

Compute nodes

Nova controller services on compute node

```
nova:
  compute:
    version: juno
    enabled: true
    virtualization: kvm
    cross_az_attach: false
    disk_cachemodes: network=writeback,block=none
    availability_zone: availability_zone_01
    aggregates:
    - hosts_with_fc
    - hosts_with_ssd
    security_group: true
    resume_guests_state_on_host_boot: False
    my_ip: 10.1.0.16
    bind:
      vnc_address: 172.20.0.100
      vnc_port: 6080
      vnc_name: openstack.domain.com
      vnc_protocol: http
    database:
      engine: mysql
      host: 127.0.0.1
      port: 3306
      name: nova
      user: nova
      password: pwd
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
      user: nova
      password: pwd
      tenant: service
    message_queue:
      engine: rabbitmq
      host: 127.0.0.1
      port: 5672
      user: openstack
      password: pwd
      virtual_host: '/openstack'
    image:
      engine: glance
      host: 127.0.0.1
      port: 9292
    network:
      engine: neutron
      host: 127.0.0.1
      port: 9696
      identity:
        engine: keystone
        host: 127.0.0.1
        port: 35357
        user: neutron
```

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```
        password: pwd
        tenant: service
    qemu:
      max_files: 4096
      max_processes: 4096
    host: node-12.domain.tld
```

Group and user to be used for QEMU processes run by the system instance

```
nova:
  compute:
    enabled: true
    ...
    qemu:
      user: nova
      group: cinder
      dynamic_ownership: 1
```

Group membership for user nova (upgrade related)

```
nova:
  compute:
    enabled: true
    ...
    user:
      groups:
      - libvirt
```

Nova services on compute node with OpenContrail

```
nova:
  compute:
    enabled: true
    ...
    networking: contrail
```

Nova services on compute node with memcached caching

```
nova:
  compute:
    enabled: true
    ...
    cache:
      engine: memcached
      members:
      - host: 127.0.0.1
        port: 11211
      - host: 127.0.0.1
        port: 11211
```

Client-side RabbitMQ HA setup

```
nova:
  compute:
    ....
    message_queue:
```

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```
      engine: rabbitmq
      members:
        - host: 10.0.16.1
        - host: 10.0.16.2
        - host: 10.0.16.3
      user: openstack
      password: pwd
      virtual_host: '/openstack'
   ....
```

Nova with ephemeral configured with Ceph

```
nova:
  compute:
    enabled: true
    ...
    ceph:
      ephemeral: yes
      rbd_pool: nova
      rbd_user: nova
      secret_uuid: 03006edd-d957-40a3-ac4c-26cd254b3731
  ....
```

Nova with ephemeral configured with LVM

```
nova:
  compute:
    enabled: true
    ...
    lvm:
      ephemeral: yes
      images_volume_group: nova_vg

linux:
  storage:
    lvm:
      nova_vg:
        name: nova_vg
        devices:
          - /dev/sdf
          - /dev/sdd
          - /dev/sdg
          - /dev/sde
          - /dev/sdc
          - /dev/sdj
          - /dev/sdh
```

Enable Barbican integration

```
nova:
  compute:
    ....
    barbican:
      enabled: true
```

Nova metadata custom bindings

```
nova:
  controller:
    enabled: true
    ...
    metadata:
      bind:
        address: 1.2.3.4
        port: 8776
```

Client role

Nova configured with NFS

```
nova:
  compute:
    instances_path: /mnt/nova/instances

linux:
  storage:
    enabled: true
    mount:
      nfs_nova:
        enabled: true
        path: ${nova:compute:instances_path}
        device: 172.31.35.145:/data
        file_system: nfs
        opts: rw,vers=3
```

Nova flavors

```
nova:
  client:
    enabled: true
    server:
      identity:
        flavor:
          flavor1:
            flavor_id: 10
            ram: 4096
            disk: 10
            vcpus: 1
          flavor2:
            flavor_id: auto
            ram: 4096
            disk: 20
            vcpus: 2
      identity1:
        flavor:
          ...
```

Availability zones

```
nova:
  client:
    enabled: true
```

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```
    server:
      identity:
        availability_zones:
        - availability_zone_01
        - availability_zone_02
```

Aggregates

```
nova:
  client:
    enabled: true
    server:
      identity:
        aggregates:
        - aggregate1
        - aggregate2
```

Upgrade levels

```
nova:
  controller:
    upgrade_levels:
      compute: juno

nova:
  compute:
    upgrade_levels:
      compute: juno
```

SR-IOV

Add PciPassthroughFilter into scheduler filters and NICs on specific compute nodes.

```
nova:
  controller:
    sriov: true
    scheduler_default_filters: "DifferentHostFilter,SameHostFilter,RetryFilter,
↪AvailabilityZoneFilter,RamFilter,CoreFilter,DiskFilter,ComputeFilter,
↪ComputeCapabilitiesFilter,ImagePropertiesFilter,ServerGroupAntiAffinityFilter,
↪ServerGroupAffinityFilter,PciPassthroughFilter"

nova:
  compute:
    sriov:
      nic_one:
        devname: eth1
        physical_network: physnet1
```

CPU pinning & Hugepages

CPU pinning of virtual machine instances to dedicated physical CPU cores. Hugepages mount point for libvirt.

```
nova:
  controller:
    scheduler_default_filters: "DifferentHostFilter,SameHostFilter,RetryFilter,
↪AvailabilityZoneFilter,RamFilter,CoreFilter,DiskFilter,ComputeFilter,
↪ComputeCapabilitiesFilter,ImagePropertiesFilter,ServerGroupAntiAffinityFilter,
↪ServerGroupAffinityFilter,NUMATopologyFilter,AggregateInstanceExtraSpecsFilter"

nova:
  compute:
    vcpu_pin_set: 2,3,4,5
    hugepages:
      mount_points:
      - path: /mnt/hugepages_1GB
      - path: /mnt/hugepages_2MB
```

Custom Scheduler filters

If you have a custom filter, that needs to be included in the scheduler, then you can include it like so:

```
nova:
  controller:
    scheduler_custom_filters:
    - my_custom_driver.nova.scheduler.filters.my_custom_filter.MyCustomFilter

    # Then add your custom filter on the end (make sure to include all other ones␣
↪that you need as well)
    scheduler_default_filters: "DifferentHostFilter,SameHostFilter,RetryFilter,
↪AvailabilityZoneFilter,RamFilter,CoreFilter,DiskFilter,ComputeFilter,
↪ComputeCapabilitiesFilter,ImagePropertiesFilter,ServerGroupAntiAffinityFilter,
↪ServerGroupAffinityFilter,PciPassthroughFilter,MyCustomFilter"
```

Hardware Trip/Unmap Support

To enable TRIM support for ephemeral images (thru nova managed images), libvirt has this option.

```
nova:
  compute:
    libvirt:
      hw_disk_discard: unmap
```

In order to actually utilize this feature, the following metadata must be set on the image as well, so the SCSI unmap is supported.

```
glance image-update --property hw_scsi_model=virtio-scsi <image>
glance image-update --property hw_disk_bus=scsi <image>
```

Scheduler Host Manager

Specify a custom host manager.

libvirt CPU mode

Allow setting the model of CPU that is exposed to a VM. This allows better support live migration between hypervisors with different hardware, among other things. Defaults to host-passthrough.

```
nova:
  controller:
    scheduler_host_manager: ironic_host_manager

  compute:
    cpu_mode: host-model
```

Nova compute workarounds

Live snapshotting is disabled by default in nova. To enable this, it needs a manual switch.

From manual:

```
# When using libvirt 1.2.2 live snapshots fail intermittently under load
# (likely related to concurrent libvirt/qemu operations). This config
# option provides a mechanism to disable live snapshot, in favor of cold
# snapshot, while this is resolved. Cold snapshot causes an instance
# outage while the guest is going through the snapshotting process.
#
# For more information, refer to the bug report:
#
#   https://bugs.launchpad.net/nova/+bug/1334398
```

Configurable pillar data:

```
nova:
  compute:
    workaround:
      disable_libvirt_livesnapshot: False
```

Config drive options

See example below on how to configure the options for the config drive.

```
nova:
  compute:
    config_drive:
      forced: True  # Default: True
      cdrom: True  # Default: False
      format: iso9660  # Default: vfat
      inject_password: False  # Default: False
```

Number of concurrent live migrates

Default is to have no concurrent live migrations (so 1 live-migration at a time).

Excerpt from config options page (https://docs.openstack.org/ocata/config-reference/compute/config-options.html):

Maximum number of live migrations to run concurrently. This limit is enforced to avoid outbound live migrations overwhelming the host/network and causing failures. It is not recommended that you change this unless you are very sure that doing so is safe and stable in your environment.

Possible values:

- 0 : treated as unlimited.
- Negative value defaults to 0.
- Any positive integer representing maximum number of live migrations to run concurrently.

To configure this option:

```
nova:
  compute:
    max_concurrent_live_migrations: 1  # (1 is the default)
```

Enhanced logging with logging.conf

By default logging.conf is disabled.

That is possible to enable per-binary logging.conf with new variables:

- openstack_log_appender - set it to true to enable log_config_append for all OpenStack services;
- openstack_fluentd_handler_enabled - set to true to enable FluentHandler for all Openstack services.
- openstack_ossyslog_handler_enabled - set to true to enable OSSysLogHandler for all Openstack services.

Only WatchedFileHandler, OSSysLogHandler and FluentHandler are available.

Also it is possible to configure this with pillar:

```
nova:
  controller:
      logging:
        log_appender: true
        log_handlers:
          watchedfile:
            enabled: true
          fluentd:
            enabled: true
          ossyslog:
            enabled: true

  compute:
      logging:
        log_appender: true
        log_handlers:
          watchedfile:
            enabled: true
          fluentd:
            enabled: true
          ossyslog:
            enabled: true
```

Documentation and Bugs

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> http://salt-formulas.readthedocs.io/

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Rally

Rally is a Benchmark-as-a-Service project for OpenStack.

Sample pillars

```
rally:
  benchmark:
    enabled: true
    source:
      engine: git
      address: git://github.com/stackforge/rally.git
      revision: master
    database:
      engine: mysql
      host: 10.10.20.20
      port: 3306
      name: rally
      user: rally
      password: password
    provider:
      example_cloud:
        auth:
          auth_url: http://example.net:5000/v2.0/
          username: admin
          password: myadminpass
          tenant_name: demo
          endpoint_type: internal
        tests:
```

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```
        - nova_volumes
        - neutron_networks
```

Rally client with specified git scenarios

```
rally:
  client:
    enabled: true
    source:
      engine: git
      address: git@repo.domain.com/heat-templates.git
      revision: master
```

Read more

- https://rally.readthedocs.org/en/latest/install.html
- https://www.mirantis.com/blog/rally-openstack-tempest-testing-made-simpler/
- https://wiki.openstack.org/wiki/Rally
- https://wiki.openstack.org/wiki/Rally/HowTo
- https://launchpad.net/rally
- https://github.com/stackforge/rally
- https://trello.com/b/DoD8aeZy/rally

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Sahara formula

The Sahara project provides a simple means to provision a data-intensive application cluster (Hadoop or Spark) on top of OpenStack.

Sample pillars

```
sahara:
  server:
    enabled: true
    version: kilo
    bind:
      host: 0.0.0.0
      port: 8386
    database:
      engine: mysql
      host: 127.0.0.1
      port: 3306
      name: sahara
      user: sahara
      password: password
    identity:
      engine: keystone
      protocol: http
      host: 127.0.0.1
      port: 35357
      tenant: sahara
      user: sahara
      password: password
    message_queue:
      engine: rabbitmq
      port: 5672
      members:
      - host: 192.168.1.13
      - host: 192.168.1.14
      - host: 192.168.1.15
      user: openstack
      password: supersecret
      virtual_host: '/openstack'
```

Usage

Get Vanilla glance images

- http://sahara-files.mirantis.com/sahara-icehouse-vanilla-1.2.1-ubuntu-13.10.qcow2
- http://sahara-files.mirantis.com/sahara-juno-vanilla-1.2.1-ubuntu-14.04.qcow2
- http://sahara-files.mirantis.com/sahara-juno-vanilla-2.4.1-ubuntu-14.04.qcow2
- http://sahara-files.mirantis.com/sahara-juno-vanilla-1.2.1-centos-6.5.qcow2

Register image in sahara

```
sahara image-register --image-id $IMAGE_ID --username ubuntu

sahara image-add-tag --image-id $IMAGE_ID --tag vanilla
sahara image-add-tag --image-id $IMAGE_ID --tag 1.2.1
```

Make sure that image is registered correctly

```
sahara image-list
```

External links

- http://docs.openstack.org/developer/sahara/userdoc/vanilla_plugin.html
- http://docs.openstack.org/developer/sahara/devref/quickstart.html
- http://docs.openstack.org/developer/sahara/horizon/installation.guide.html

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Swift Formula

Swift is a highly available, distributed, eventually consistent object/blob store. Organizations can use Swift to store lots of data efficiently, safely, and cheaply.

Sample Metadata

Swift proxy

```
swift:
  common:
    cache:
      engine: memcached
      members:
      - host: 127.0.0.1
        port: 11211
      - host: 127.0.0.1
        port: 11211
    enabled: true
    version: kilo
    swift_hash_path_suffix: hash
    swift_hash_path_prefix: hash
  proxy:
    version: kilo
    enabled: true
    bind:
      address: 0.0.0.0
      port: 8080
    identity:
      engine: keystone
      host: 127.0.0.1
      port: 35357
      user: swift
      password: pwd
      tenant: service
```

Swift storage

```
swift:
  common:
    cache:
      engine: memcached
      members:
      - host: 127.0.0.1
        port: 11211
      - host: 127.0.0.1
        port: 11211
    version: kilo
    enabled: true
    swift_hash_path_suffix: hash
    swift_hash_path_prefix: hash
  object:
    enabled: true
    version: kilo
    bind:
      address: 0.0.0.0
      port: 6000
  container:
    enabled: true
```

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```
    version: kilo
    allow_versions: true
    bind:
      address: 0.0.0.0
      port: 6001
  account:
    enabled: true
    version: kilo
    bind:
      address: 0.0.0.0
      port: 6002
```

To enable object versioning feature

```
swift:
  ....
  container:
    ....
    allow_versions: true
    ....
```

Ring builder

```
parameters:
  swift:
    ring_builder:
      enabled: true
      rings:
        - name: default
          partition_power: 9
          replicas: 3
          hours: 1
          region: 1
          devices:
            - address: ${_param:storage_node01_address}
              device: vdb
            - address: ${_param:storage_node02_address}
              device: vdc
            - address: ${_param:storage_node03_address}
              device: vdd
        - partition_power: 9
          replicas: 2
          hours: 1
          region: 1
          devices:
            - address: ${_param:storage_node01_address}
              device: vdb
            - address: ${_param:storage_node02_address}
              device: vdc
```

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Tempest Formula

This is a set of integration tests to be run against a live OpenStack cluster. Tempest has batteries of tests for OpenStack API validation, Scenarios, and other specific tests useful in validating an OpenStack deployment.

Sample Pillars

```
tempest:
  test:
    enabled: true
    source:
      engine: git
      address: git://github.com/openstack/tempest.git
      revision: master
    suite:
      identity:
        disable_ssl_certificate_validation: true
        auth_version: v3
        uri_v3:
        region: RegionOne
      identity-feature-enabled:
        trust: true
        api_v2: false
        api_v3: true
```

More Information

- http://docs.openstack.org/developer/tempest/overview.html
- http://www.slideshare.net/masayukiigawa/tempest-scenariotests-20140512?related=1
- https://github.com/stackforge/puppet-tempest

- Documentation Home
- Project Introduction
- Installation and Operations Manual
- Development Documentation

Home SaltStack-Formulas Project Introduction

Programming Languages

Support programming languages, libraries, environments.

Formula	Repository
java	https://github.com/salt-formulas/salt-formula-java
nodejs	https://github.com/salt-formulas/salt-formula-nodejs
php	https://github.com/salt-formulas/salt-formula-php
python	https://github.com/salt-formulas/salt-formula-python
ruby	https://github.com/salt-formulas/salt-formula-ruby

Java

Programming language environment.

Sample pillars

OpenJDK 8 environment with development libs

```
java:
  environment:
    enabled: true
    version: '8'
    platform: openjdk
    development: true
```

Oracle JAVA JDK 8

```
java:
  environment:
    enabled: true
    version: '8'
    platform: oracle-java
    development: true
```

Oracle JAVA JDK 9

```
java:
  environment:
    enabled: true
    version: '9'
    release: '0.1'
    build: '11'
```

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```
    platform: oracle-java
    development: true
```

Read more

- http://openjdk.java.net/install/
- http://www.wikihow.com/Install-Oracle-Java-on-Ubuntu-Linux
- https://github.com/saltstack-formulas/sun-java-formula
- https://www.digitalocean.com/community/articles/how-to-install-java-on-ubuntu-with-apt-get
- https://github.com/saltstack-formulas/sun-java-formula
- https://github.com/saltstack-formulas/java-formula

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NodeJS

Event-driven I/O server-side JavaScript environment based on V8. Includes API documentation, change-log, examples and announcements.

Sample pillars

Simplest environment

```
nodejs:
  environment:
    enabled: true
```

Pillar for development

```
nodejs:
  environment:
    enabled: true
    development: true
```

Read more

- http://nodejs.org/

Documentation and Bugs

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http://salt-formulas.readthedocs.io/

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https://github.com/salt-formulas/salt-formula-nodejs/issues

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PHP Formula

PHP is a widely-used general-purpose scripting language that is especially suited for Web development and can be embedded into HTML.

Sample Pillars

```
php:
  environment:
    enabled: true
    cache:
```

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```
    engine: 'apc'
    shm_size: 128
    max_file_size: '10M'
```

More Information

- http://www.php.net/manual/en/

Python formula

Python is a widely used general-purpose, high-level programming language. Its design philosophy emphasizes code readability, and its syntax allows programmers to express concepts in fewer lines of code than would be possible in languages such as C++ or Java. The language provides constructs intended to enable clear programs on both a small and large scale.

Python supports multiple programming paradigms, including object-oriented, imperative and functional programming or procedural styles. It features a dynamic type system and automatic memory management and has a large and comprehensive standard library.

Available metadata

service.environment.environment: Basic Python environment

service.environment.development: Python development environment

python.environment.django: Python Django environment

Sample pillars

Simple Python environment

```
python:
  environment:
    enabled: true
```

Development Python environment

```
python:
  environment:
    enabled: true
    module:
      development: true
```

Python django environment

```
python:
  environment:
    enabled: true
    module:
      django: true
```

Using offline mirrors

```
python:
  environment:
    enabled: true
    user:
      root:
        pypi_user: user
        pypi_password: password
        pypi_mirror:
          protocol: http
          host: pypi.local
          port: 8084
          upstream_fallback: true
          user: user
          password: password
```

Read more

- https://www.python.org/

Documentation and Bugs

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Ruby programming language

Ruby is a dynamic, open source programming language with a focus on simplicity and productivity. It has an elegant syntax that is natural to read and easy to write.

Pillars

Ruby version 1.8

```
ruby:
  enabled: true
  version: '1.8'
  development: true
```

Ruby version 1.9

```
ruby:
  enabled: true
  version: '1.9'
  development: true
```

Ruby version 2.1

```
ruby:
  enabled: true
  version: '2.1'
  development: true
```

Example gem deployment of Sensu plugin

```
environment:
  managed: False
  gem:
    sensu-plugins-elasticsearch:
      version: 0.4.3
      user: sensu
      executable: /opt/sensu/embedded/bin/gem
```

Read more

- https://www.ruby-lang.org/en/

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> https://github.com/salt-formulas/salt-formula-ruby

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#salt-formulas @ irc.freenode.net

- Documentation Home
- Project Introduction
- Installation and Operations Manual
- Development Documentation

Home SaltStack-Formulas Project Introduction

Web Applications

Automated management of web-based applications.

Formula	Repository
flower	https://github.com/salt-formulas/salt-formula-flower
jupyter	https://github.com/salt-formulas/salt-formula-jupyter
leonardo	https://github.com/salt-formulas/salt-formula-leonardo
mayan	https://github.com/salt-formulas/salt-formula-mayan
moodle	https://github.com/salt-formulas/salt-formula-moodle
openode	https://github.com/salt-formulas/salt-formula-openode
redmine	https://github.com/salt-formulas/salt-formula-redmine
sentry	https://github.com/salt-formulas/salt-formula-sentry
suitecrm	https://github.com/salt-formulas/salt-formula-suitecrm
taiga	https://github.com/salt-formulas/salt-formula-taiga
wordpress	https://github.com/salt-formulas/salt-formula-wordpress

Flower Formula

Flower is a web based tool for monitoring and administrating Celery clusters.

Sample Pillars

Flower single broker

```
flower:
  server:
    enabled: true
    bind:
      port: 5555
      address: 0.0.0.0
    broker:
      engine: redis
      host: localhost
      port: 6379
      number: 0
```

Flower with multiple brokers

```
flower:
  server:
    enabled: true
    message_queue:
      location_hklab01:
        bind:
          port: 5555
          address: 0.0.0.0
        broker:
          engine: rabbitmq
          host: localhost
          port: 5672
          virtual_host: /test
          user: test
          password: test
```

Flower with redis broker

```
flower:
  server:
    enabled: true
    bind:
      port: 5555
      address: 0.0.0.0
    broker:
      engine: redis
      host: localhost
      port: 6379
      number: 0
```

More Information

- https://github.com/mher/flower

Jupyter notebook server

Open source, interactive data science and scientific computing across over 40 programming languages.

Sample pillars

Single jupyter server

```
jupyter:
  server:
    enabled: true
    bind:
      address: 0.0.0.0
      port: 8888
    notebook_source:
      engine: git
      address: gitrepo
      revision: master
      requirements: true
```

Read more

- http://jupyter.org/
- http://jupyter-notebook.readthedocs.org/en/latest/config.html

Documentation and Bugs

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https://github.com/salt-formulas/salt-formula-jupyter/issues

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Django-Leonardo formula

Python/django based CMS.

Sample metadata

```
leonardo:
  server:
    enabled: true
    app:
      example_app:
        enabled: true
        workers: 3
        # disable strict host check on nginx proxy at app node
        dev: true
        bind:
          address: 0.0.0.0 # ${linux:network:fqdn}
          port: 9754
          protocol: tcp
        source:
          type: 'git'
          address: 'git@repo1.robotice.cz:python-apps/leonardo.git'
          rev: 'master'
```

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```
        secret_key: 'y5m^_^ak6+5(f.m^_^ak6+5(f.m^_^ak6+5(f.'
        database:
          engine: 'postgresql'
          host: '127.0.0.1'
          name: 'leonardo'
          password: 'db-pwd'
          user: 'leonardo'
        mail:
          host: 'mail.domain.com'
          password: 'mail-pwd'
          user: 'mail-user'
        plugin:
          eshop: {}
          static: {}
          sentry: {}
          my_site:
            site: true
          blog:
            source:
              engine: 'git'
              address: 'git+https://github.com/django-leonardo/leonardo-module-blog.
↪git#egg=leonardo_module_blog'
```

Site Name

Without setting formula produce somethink like this `Example app` from your site name `site_name`

```
leonardo:
  server:
    app:
      example_app:
        site_name: My awesome site
```

Site Language

```
leonardo:
  server:
    app:
      example_app:
        languages:
          en:
            default: true
          cs: {}
          de: {}
```

LDAP auth support

```
leonardo:
  server:
    app:
```

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```
      myapp:
        ldap:
          url: "ldaps://idm.example.com"
          binddn: "uid=apache,cn=users,cn=accounts,dc=example,dc=com"
          password: "secretpassword"
          basedn: "dc=example,dc=com"
          require_group: myapp-users
          flags_mapping:
            is_active: myapp-users
            is_staff: myapp-admins
            is_superuser: myapp-admins
```

This settings needs leonardo-auth-ldap installed.

Site Admins & Managers

```
leonardo:
  server:
    app:
      example_app:
        admins:
          mail@majklk.cz:
            name: majklk
          mail@newt.cz: {}
        managers:
          mail@majklk.cz:
            name: majklk
          mail@newt.cz:
            name: newt
```

Cache

without setting cache we get default localhost memcache with per site prefix

```
leonardo:
  server:
    enabled: true
    app:
      example_app:
        cache:
          engine: 'memcached'
          host: '192.168.1.1'
          prefix: 'CACHE_EXAMPLEAPP'
```

Workers

Leonardo uses Celery workers for long running backgrounds jobs which runs under supervisor.

Redis

```
leonardo:
  server:
    enabled: true
    app:
      example_app:
        worker: true
        broker:
          engine: redis
          host: 127.0.0.1
          port: 6379
          number: 0
```

AMQP

```
leonardo:
  server:
    enabled: true
    app:
      example_app:
        worker: true
        broker:
          engine: amqp
          host: 127.0.0.1
          port: 5672
          password: password
          user: example_app
          virtual_host: /
```

Sentry Exception Handling

```
leonardo:
  server:
    app:
      example_app:
        ...
        logging:
          engine: raven
          dsn: http://pub:private@sentry1.test.cz/2
```

Backup and Initial Data

```
leonardo:
  server:
    enabled: true
    app:
      example_app:
        backup: true
        initial_data:
          engine: backupninja
          source: backup.com
          host: web01.webapp.prd.dio.backup.com
          name: example_app
```

for reinit data do this:

```
rm /root/postgresql/flags/leonardo_example_app-restored
su postgres
psql
drop database leonardo_example_app;
salt-call state.sls postgresql,leonardo
```

Gitversions

```
leonardo:
  server:
    enabled: true
    app:
      example_app:
        backup: true
        initial_data:
          engine: gitversions
          source: git@repo1.robotice.cz:majklk/backup-test.git
```

You also need django-gitversions installed.

Development Mode

```
leonardo:
  server:
    enabled: true
    app:
      example_app:
        development: true
```

Init your site

experimental feature for advanced users, which provides easy way to start your site without site repository ready yet

```
leonardo:
  server:
    enabled: true
    app:
      example_app:
        init: true
```

This parameter says, run `makemigrations` command before other management commands.

note: In default state `makemigrations` generates migrations into main leonardo module(repository).

Whatever

Sometimes you need propagate plugin specifig config into your site, for this purpose we have simple but elegant solution for do this

```
leonardo:
  server:
    enabled: true
```

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```
    app:
      example_app:
        plugin:
          eshop:
            config:
              order: true
```

will be

```
ESHOP_CONFIG = {'order': True}
```

Note: App.config will be rendered as python object in `EXAMPLE_APP_CONFIG = {'app_config': True}`

More information

- https://launchpad.net/~tcpcloud
- https://github.com/django-leonardo/django-leonardo
- https://github.com/leonardo-modules/leonardo-auth-ldap

Documentation and Bugs

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> http://salt-formulas.readthedocs.io/

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Mayan Formula

Automated OCR of documents, automatic categorization, flexible metadata, extensive access control, Mayan EDMS has all this to offers and many more features to help you tame your documents.

Sample pillars

```
mayan:
  server:
    enabled: true
    workers: 3
    bind:
      address: 0.0.0.0
      port: 9753
    source:
      type: git
        address: git@github.com:mayan-edms/mayan-edms.git
        rev: master
    database:
      engine: 'postgresql'
      host: 'localhost'
      port: 5672
      name: 'mayan'
      password: 'pass'
      user: 'mayan'
  api:
    enabled: true
    hmac_key: d2d00896183011e28eb950e5493b99d90
    uri_id: 1sadfasfg468h7j9g7j9h78gk6g54fg6f
    bind:
      port: 33333
      host: 0.0.0.0
```

Sample pillar with specific folder for documents

```
mayan:
  server:
    enabled: true
    workers: 3
    storage_location: "/share"
    bind:
      address: 0.0.0.0
      port: 9753
    source:
      type: git
        address: git@github.com:mayan-edms/mayan-edms.git
        rev: master
    database:
      engine: 'postgresql'
      host: 'localhost'
      port: 5672
      name: 'mayan'
      password: 'pass'
      user: 'mayan'
  api:
    enabled: true
    hmac_key: d2d00896183011e28eb950e5493b99d90
    uri_id: 1sadfasfg468h7j9g7j9h78gk6g54fg6f
    bind:
      port: 33333
      host: 0.0.0.0
```

More Information

- http://www.mayan-edms.com/
- http://openode.readthedocs.org/
- https://github.com/openode/mayan_pyro_api
- http://mayan.readthedocs.org/en/latest/intro/installation.html
- https://openode.readthedocs.org/en/latest/install_mayan_server.html

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https://github.com/salt-formulas/salt-formula-mayan/issues

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https://github.com/salt-formulas/salt-formula-mayan

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Moodle Formula

Moodle is a Course Management System (CMS), also known as a Learning Management System (LMS) or a Virtual Learning Environment (VLE). It is a Free web application that educators can use to create effective online learning sites.

Sample Pillars

```
moodle:
  enabled: true
  apps:
  - enabled: true
    name: 'uni'
    prefix: 'uni_' # max 5 chars
    version: '2.5'
    database:
      engine: 'postgresql'
      host: '127.0.0.1'
```

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```
      name: 'moodle_uni'
      password: 'pwd'
      user: 'moodle_uni'
    cache:
      engine: 'memcached'
      host: '127.0.0.1'
    themes:
    - name: uni
      source:
        type: git
        address: git@repo.git.cz:domain/repo.git
        branch: master
```

More Information

- https://moodle.org/plugins/view.php?plugin=cachestore_apc
- http://midact.com/content/moodle-how-enable-memcached
- http://docs.moodle.org/dev/The_Moodle_Universal_Cache_%28MUC%29
- http://docs.moodle.org/24/en/Cron

OPENODE

OPENode is open source web application for communities seeking answers for diverse problems in commercial, public or voluntary sectors. Based on flexible communication in nodes it helps to find solutions effectively and build smarter knowledgebase. It enables users to:

Ask questions and write answers Discuss specific topics in linear forums Group topics by tags Index and search documents & images using OCR technology Set public or private nodes and user rights.

Example pillar

```
openode:
  server:
    enabled: true
    workers: 3
    bind:
      address: 0.0.0.0
      port: 9753
    source:
      type: git
        address: https://github.com/openode/openode.git
        rev: master
    database:
      engine: 'postgresql'
      host: 'localhost'
      port: 5672
      name: 'openode'
      password: 'pass'
      user: 'openode'
  mayan:
```

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```
    hmac_key: qweeAopi
    uri_id: asdsda
    port: 33333
    host: mayan.domain.com
```

Read More

- http://openode.net/
- http://openode.readthedocs.org/

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Redmine Formula

Redmine is a flexible project management web application. Written using the Ruby on Rails framework, it is cross-platform and cross-database.

Sample pillars

```
redmine:
  server:
    enabled: true
    version: '2.3'
    apps:
    - name: majklk
      database:
        engine: postgresql
```

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```
        host: 127.0.0.1
        name: db_name
        password: pass
        user: user_name
      mail:
        host: host-mail
        password: pass
        user: email
        domain: domain
```

More Information

- http://www.redmine.org/
- http://www.redmine.org/projects/redmine/wiki/RedmineInstall

Sentry formula

Sentry is a realtime event logging and aggregation platform. At its core it specializes in monitoring errors and extracting all the information needed to do a proper post-mortem without any of the hassle of the standard user feedback loop.

It's important to note that Sentry should not be thought of as a log stream, but as an event aggregator. It fits somewhere in-between a simple metrics solution (such as Graphite) and a full-on log stream aggregator (like Logstash).

Sample pillars

Standalone server

```
python:
  environment:
    enabled: true
    module:
      development: true
sentry:
  server:
    enabled: true
    workers: 3
    secret_key: rfui34bt34bierbrebsbfhvbfdsv
    bind:
      name: sentry.domain.com
      address: 0.0.0.0
      port: 8080
    cache:
      engine: 'redis'
      host: '127.0.0.1'
    database:
      engine: 'postgresql'
      host: '127.0.0.1'
      name: 'sentry'
      password: 'pwd'
      user: 'sentry'
```

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```
    mail:
      host: domain.com
      password: pass
      user: robot@domain.com
```

Server behind proxy

```
python:
  environment:
    enabled: true
    module:
      development: true
sentry:
  server:
    enabled: true
    workers: 3
    secret_key: rfui34bt34bierbrebsbfhvbfdsv
    url: http://another.domain.cz
    bind:
      name: sentry.domain.com
      address: 0.0.0.0
      port: 8080
    cache:
      engine: 'redis'
      host: '127.0.0.1'
    database:
      engine: 'postgresql'
      host: '127.0.0.1'
      name: 'sentry'
      password: 'pwd'
      user: 'sentry'
    mail:
      host: domain.com
      password: pass
      user: robot@domain.com
```

More information

- https://github.com/getsentry/sentry
- https://docs.sentry.io/server/installation/

Documentation and Bugs

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> http://salt-formulas.readthedocs.io/

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> https://github.com/salt-formulas/salt-formula-sentry/issues

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SuiteCRM

SuiteCRM is SugarCRM, Supercharged! SuiteCRM is a fork of the popular open source SugarCRM Community Edition. This release features a host of additional open source modules, along with the standard features and functionality found within SugarCRM CE.

Sample pillars

Simple server with 1 app

suitecrm:

server: enabled: true app:

devel1: enabled: true version: '7.1.3' database:

engine: 'postgresql' host: '127.0.0.1' name: 'suitecrm_devel' password: 'password' user: 'suitecrm_devel'

Read more

- https://suitecrm.com/
- https://suitecrm.com/index.php?option=com_wrapper&view=wrapper&Itemid=1383 installation guide

Documentation and Bugs

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https://github.com/salt-formulas/salt-formula-suitecrm/issues

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https://github.com/salt-formulas/salt-formula-suitecrm

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#salt-formulas @ irc.freenode.net

Taiga

Project management web application with scrum in mind! Built on top of Django and AngularJ.

Sample pillars

Simple taiga server

```
taiga:
  server:
    enabled: true
    server_name: 'taiga.domain.com'
    mail_from: 'taiga@domain.com'
    secret_key: 'y5m^_^ak6+5(f.m^_^ak6+5(f.m^_^ak6+5(f.'
    cache:
      engine: 'memcached'
      host: '127.0.0.1'
      prefix: 'CACHE_TAIGA'
    database:
      engine: 'postgresql'
      host: '127.0.0.1'
      name: 'taiga'
      password: 'password'
      user: 'taiga'
    mail:
      host: localhost
      port: 25
      encryption: none
```

Simple taiga server with TLS mail and authentication

```
taiga:
  server:
    ...
    mail:
      host: localhost
      port: 465
      user: taiga
      password: password
      encryption: tls
```

Simple taiga server with SSL mail

```
taiga:
  server:
    ...
    mail:
      host: localhost
      port: 995
      user: taiga
```

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```
      password: password
      encryption: ssl
```

Install ldap authentication plugin:

```
taiga:
  server:
    plugin:
      taiga_contrib_ldap_auth:
        enabled: true
        source:
          engine: pip
          name: taiga-contrib-ldap-auth
        parameters:
          backend:
            ldap_server: "ldaps://idm.example.com/"
            ldap_port: 636
            bind_bind_dn: uid=taiga,cn=users,cn=accounts,dc=tcpcloud,dc=eu
            bind_bind_password: password
            ldap_search_base: "cn=users,cn=accounts,dc=tcpcloud,dc=eu"
            ldap_search_property: uid
            ldap_email_property: mail
            ldap_full_name_property: displayName
          frontend:
            loginFormType: ldap
```

Read more

- https://github.com/taigaio
- http://taigaio.github.io/taiga-doc/dist/setup-production.html

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

http://salt-formulas.readthedocs.io/

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https://github.com/salt-formulas/salt-formula-taiga/issues

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https://github.com/salt-formulas/salt-formula-taiga

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Wordpress formula

WordPress is web software you can use to create a beautiful website or blog.

Sample metadata

Simple site

```
wordpress:
  server:
    app:
      app_name:
        enabled: true
        version: '4.0'
        url: example.com
        title: TCPisekWeb
        admin_user: admin
        admin_password: password
        admin_email: nikicresl@gmail.com
        core_update: false
        theme_update: false
        plugin:
          bbpress:
            engine: http
            version: latest
          git_plugin:
            engine: git
            address: git@git.domain.com:git-repo
            revision: master
        database:
          engine: mysql
          host: 127.0.0.1
          name: w_site
          password: password
          user: w_tcpisek
          prefix: tcpisek
```

Read more

- http://codex.wordpress.org/Installing_WordPress
- http://www.severalnines.com/blog/scaling-wordpress-and-mysql-multiple-servers-performance

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https://github.com/salt-formulas/salt-formula-wordpress/issues

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IoT Services

Support for Internet of Things services.

Formula	Repository
ffmpeg	https://github.com/salt-formulas/salt-formula-ffmpeg
kodi	https://github.com/salt-formulas/salt-formula-kodi
home-assistant	https://github.com/salt-formulas/salt-formula-home-assistant
octoprint	https://github.com/salt-formulas/salt-formula-octoprint

ffmpeg formula

A complete, cross-platform solution to record, convert and stream audio and video.

Sample pillars

```
ffmpeg:
  server:
    enabled: true
    input:
      video0:
        source: /dev/video0
        bind:
          host: 192.168.2.1
          port: 8888
        video_format: mjpeg
```

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```
        width: 640
        height: 480
        format: mpeg
        codec: avi
```

note: type in your browser http://192.168.2.1:8888/video0.mjpeg

Read more

- https://www.ffmpeg.org/

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

http://salt-formulas.readthedocs.io/

In the unfortunate event that bugs are discovered, they should be reported to the appropriate issue tracker. Use Github issue tracker for specific salt formula:

https://github.com/salt-formulas/salt-formula-ffmpeg/issues

For feature requests, bug reports or blueprints affecting entire ecosystem, use Launchpad salt-formulas project:

https://launchpad.net/salt-formulas

You can also join salt-formulas-users team and subscribe to mailing list:

https://launchpad.net/~salt-formulas-users

Developers wishing to work on the salt-formulas projects should always base their work on master branch and submit pull request against specific formula.

https://github.com/salt-formulas/salt-formula-ffmpeg

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#salt-formulas @ irc.freenode.net

KODI formula

Kodi (formerly known as XBMC) is a software media center for playing videos, music, pictures, games, and more.

Sample pillars

```
kodi:
  server:
    enabled: True
```

Usage

plugin repositories

wget https://dmd-xbmc.googlecode.com/files/repository.dmd-xbmcv2.googlecode.com.zip

wget http://kodi-czsk.github.io/repository/repo/repository.kodi-czsk/repository.kodi-czsk-1.0.0.zip

tvheadend

curl http://apt.tvheadend.org/repo.gpg.key | sudo apt-key add - apt-add-repository -r http://apt.tvheadend.org/stable apt-add-repository http://apt.tvheadend.org/unstable apt-get update

apt-get update apt-get install tvheadend apt-get install kodi-pvr-tvheadend-hts v4l-conf v4l-utils dvb-tools w-scan

install tvb-t device firmware if necessary tvheadend ui - http://localhost:9981/

Read more

- https://code.google.com/p/dmd-xbmc/
- http://kodi-czsk.github.io/repository/
- https://tvheadend.org/projects/tvheadend/wiki/AptRepository
- https://kodi.tv/

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

> http://salt-formulas.readthedocs.io/

In the unfortunate event that bugs are discovered, they should be reported to the appropriate issue tracker. Use Github issue tracker for specific salt formula:

> https://github.com/salt-formulas/salt-formula-kodi/issues

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> https://launchpad.net/salt-formulas

You can also join salt-formulas-users team and subscribe to mailing list:

> https://launchpad.net/~salt-formulas-users

Developers wishing to work on the salt-formulas projects should always base their work on master branch and submit pull request against specific formula.

> https://github.com/salt-formulas/salt-formula-kodi

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Home Assistant Formula

Home Assistant is an open-source home automation platform running on Python 3. Track and control all devices at home and automate control.

Sample Metadata

Single homeassistant service

```
home_assistant:
  server:
    enabled: true
    bind:
      address: 0.0.0.0
      port: 8123
```

home-assistant service wit git based configuration

```
home_assistant:
  server:
    enabled: true
    bind:
      address: 0.0.0.0
      port: 8123
    config:
      engine: git
      address: '${_param:home_assistant_config_repository}'
      branch: ${_param:home_assistant_config_revision}
```

References

- https://home-assistant.io/getting-started/

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

> http://salt-formulas.readthedocs.io/

In the unfortunate event that bugs are discovered, they should be reported to the appropriate issue tracker. Use Github issue tracker for specific salt formula:

> https://github.com/salt-formulas/salt-formula-home-assistant/issues

For feature requests, bug reports or blueprints affecting entire ecosystem, use Launchpad salt-formulas project:

> https://launchpad.net/salt-formulas

You can also join salt-formulas-users team and subscribe to mailing list:

> https://launchpad.net/~salt-formulas-users

Developers wishing to work on the salt-formulas projects should always base their work on master branch and submit pull request against specific formula.

> https://github.com/salt-formulas/salt-formula-home-assistant

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Octoprint formula

The web interface for your 3D printer.

Sample pillars

Single printer [deprecated]

```
octoprint:
  server:
    enabled: true
    source:
      engine: git
      address 'https://github.com/foosel/OctoPrint.git'
      rev: "master"
    printer:
      engine: serial
      webcam: true
    webcam:
      host: localhost
      port: 1234
```

Multi printers setup

```
octoprint:
  server:
    enabled: true
    source:
      engine: git
      address 'https://github.com/foosel/OctoPrint.git'
      rev: "master"
    printer:
      printer01:
        bind:
          address: 0.0.0.0
          port: 5001
        device:
          bus: serial
          port: /dev/ACM01
          model: prusa-mk2
        camera:
          protocol: mjpg
          url: localhost
          port: 1234
      printer02:
        device:
          bus: serial
          port: /dev/ACM02
          model: prusa-clone
        bind:
          address: 0.0.0.0
          port: 5002
```

More Information

- http://octoprint.org/
- https://github.com/foosel/OctoPrint

Documentation and Bugs

To learn how to install and update salt-formulas, consult the documentation available online at:

http://salt-formulas.readthedocs.io/

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https://github.com/salt-formulas/salt-formula-octoprint/issues

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2.2 Development Documentation

In this section, you will find documentation relevant to developing SaltStack formulas. How to change existing formula, how to create a new formula.

2.2.1 Extending

Chapter 1. Extending

Home SaltStack-Formulas Development Documentation

Creating New Formula with Cookiecutter

This guide shows how to use cookiecutter template to create new Salt formula.

Installation

Install in blank virtualenv.

```
pip install cookiecutter

cd cookiecutter
```

Usage

```
cookiecutter salt-formula
```

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Sync Multiple Repository with Myrepos

Installation

```
apt-get install myrepos
```

To add `gerrit` remote automatically, set your username:

```
git config --global gitreview.username johndoe
```

To avoid using `--trust-all` option, add this .mrconfig into trusts file:

```
echo $PWD/.mrconfig >> ~/.mrtrust
```

Clone Repositories

Simply run `checkout` tool without parameters or with formula names, eg.:

```
./checkout
./checkout nova freeipa salt
```

Or with some parallelism:

```
mr --trust-all --force -j 4 checkout
```

Update Repositories

Pull with rebase in each repo or only one

```
mr --trust-all update
mr --trust-all -d tcpcloud update
mr --trust-all -d tcpcloud/apache update
```

More Information

- https://wiki.debian.org/Teams/Ruby/Packaging
- https://myrepos.branchable.com/

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Formula Authoring Guidelines

Salt formulas encapsulate specific services. This document contains guidelines to salt formula creation and maintenance.

Formula Directory Structure

Formulas follow the same directory structure as Salt official conventions and best practices described in the SaltStack documentation.

Every formula should have the following directory layout:

```
service-formula
|-- _grains/
|   `-- service.yml
|-- _modules/
|   `-- service.yml
|-- _states/
|   `-- service.yml
|-- service/
|   `-- files/
|       |-- service.conf
|       `-- service-systemd
|   `-- meta/
|       |-- sphinx.yml
|       `-- colletd.yml
|   |-- map.jinja
|   |-- init.sls
|   |-- _common.sls
|   |-- role1.sls
|   `-- role2/
|       |-- init.sls
|       |-- service.sls
|       `-- more.sls
|-- debian/
|   ├── changelog
|   ├── compat
|   ├── control
|   ├── copyright
|   ├── docs
|   ├── install
|   ├── rules
|   └── source
|       └── format
|-- metadata/
|   `-- service/
|       |-- role1/
|       |   |-- deployment1.yml
|       |   `-- deployment2.yml
|       `-- role2/
|           `-- deployment3.yml
|-- CHANGELOG.rst
|-- LICENSE
|-- pillar.example
|-- README.rst
`-- VERSION
```

Content of the formula directories in more detail.

_grains/ Optional grain modules

_modules/ Optional execution modules

_states/ Optional state modules

service/ Salt state files

service/meta/ Support metadata definitions

debian/ APT Package metadata

metadata/ Reclass metadata

Salt state files

Salt state files are located in `service` directory.

`service/map.jinja`

Map file helps to clean the differences among operating systems and provides default values so there's no need to provide default value in state files.

Following snippet uses YAML to serialize the data and is the recommended way to write `map.jinja` file as YAML can be easily extended in place.

```
{%- load_yaml as role1_defaults %}
Debian:
  pkgs:
  - python-psycopg2
  dir:
    base: /srv/service/venv
    home: /var/lib/service
RedHat:
  pkgs:
  - python-psycopg2
  dir:
    base: /srv/service/venv
    home: /var/lib/service
    workspace: /srv/service/workspace
{%- endload %}

{%- set role1 = salt['grains.filter_by'](role1_defaults, merge=salt['pillar.get'](
↪'service:role1')) %}
```

Following snippet uses JSON to serialize the data and was favored in past.

```
{% set api = salt['grains.filter_by']({
    'Debian': {
        'pkgs': ['salt-api'],
        'service': 'salt-api',
    },
    'RedHat': {
        'pkgs': ['salt-api'],
        'service': 'salt-api',
    },
}, merge=salt['pillar.get']('salt:api')) %}
```

Following snippet sets different common role parameters according to `service:role:source:engine` pillar variable of given service role.

```
{%- set source_engine = salt['pillar.get']('service:role:source:engine') %}

{%- load_yaml as base_defaults %}
{%- if source_engine == 'git' %}
Debian:
  pkgs:
  - python-psycopg2
  dir:
    base: /srv/service/venv
    home: /var/lib/service
    workspace: /srv/service/workspace
{%- else %}
Debian:
  pkgs:
  - helpdesk
  dir:
    base: /usr/lib/service
{%- endif %}
{%- endload %}
```

`service/init.sls`

Conditional include of individual service roles. Basically this is essential piece that makes the usage of formulas truly model-driven. You have catalog of services and this determines according to present metadata what roles get started.

Using `service/init.sls` file allows the service catalog to be role independent.

```
include:
{% if pillar.service.role1 is defined %}
- service.role1
{% endif %}
{% if pillar.service.role2 is defined %}
- service.role2
{% endif %}
```

You can use one file as `role1.sls` for simple roles. For more complex roles handling many resources, use individual directories as `role2`.

```
service-formula/
`-- service/
    |-- role1.sls
    `-- role2/
        |-- init.sls
        |-- service.sls
        |-- resource1.sls
        `-- resource2.sls
```

Then you can verify the full service catalog on node by following command:

```
root@web01:~# salt-call state.show_top
[INFO    ] Loading fresh modules for state activity
local:
    ----------
    base:
        - linux
        - openssh
```

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```
        - ntp
        - salt
        - backupninja
        - git
        - sphinx
        - python
        - nginx
        - nodejs
        - postgresql
        - rabbitmq
        - redis
        - ruby
```

Service metadata are stored also as `services` grain.

```
root@web01:~# salt-call grains.item services
local:
    ----------
    services:
        - linux
        - openssh
        - ntp
        - salt
        - backupninja
        - git
        - sphinx
        - python
        - nginx
        - nodejs
        - postgresql
        - rabbitmq
        - redis
        - ruby
```

And each service roles metadata is stored as detailed `roles` grain.

```
root@web01:~# salt-call grains.item roles
local:
    ----------
    roles:
        - git.client
        - postgresql.server
        - nodejs.environment
        - ntp.client
        - linux.storage
        - linux.system
        - linux.network
        - redis.server
        - rabbitmq.server
        - python.environment
        - backupninja.client
        - nginx.server
        - openssh.client
        - openssh.server
        - salt.minion
        - sphinx.server
```

Note: It is recommended to run `state.sls salt` prior the `state.highstate` command as grains may not be generated properly and some configuration parameters may not be set at all.

service/role1.sls

Actual salt state resources that enforce service existence. Common production and recommended pattern is to install packages, setup configuration files and ensure the service is up and running.

```
{%- from "redis/map.jinja" import server with context %}
{%- if server.enabled %}

redis_packages:
  pkg.installed:
  - names: {{ server.pkgs }}

{{ server.dir.conf }}/redis.conf:
  file.managed:
  - source: salt://redis/files/redis.conf
  - template: jinja
  - user: root
  - group: root
  - mode: 644
  - require:
    - pkg: redis_packages

redis_service:
  service.running:
  - enable: true
  - name: {{ server.service }}
  - watch:
    - file: {{ server.dir.conf }}/redis.conf

{%- endif %}
```

For development purposes other installation than s

Note: The role for `role.enabled` condition is to restrict the give service role from execution with default parametes, the single error is thrown instead. You can optionaly add `else` statement to disable or completely remove given service role.

service/role2/init.sls

This approach is used with more complex roles, it is similar to `service/init.sls`, but uses conditions to further limit the inclusion of unnecessary files.

For example Linux network role includes conditionally hosts and interfaces.

```
{%- from "linux/map.jinja" import network with context %}
include:
- linux.network.hostname
{%- if network.host|length > 0 %}
```

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```
- linux.network.host
{%- endif %}
{%- if network.interface|length > 0 %}
- linux.network.interface
{%- endif %}
- linux.network.proxy
```

Coding styles for state files

Good styling practices for writing salt state declarations.

Line length above 80 characters

As a 'standard code width limit' and for historical reasons - IBM punch card had exactly 80 columns.

Single line declaration

Avoid extending your code by adding single-line declarations. It makes your code much cleaner and easier to parse / grep while searching for those declarations.

The bad example:

```
python:
  pkg:
    - installed
```

The correct example:

```
python:
  pkg.installed
```

No newline at the end of the file

Each line should be terminated in a newline character, including the last one. Some programs have problems processing the last line of a file if it isn't newline terminated.

Trailing whitespace characters

Trailing whitespaces take more spaces than necessary, any regexp based searches won't return lines as a result due to trailing whitespace(s).

Reclass metadata files

Each of these files serve as default metadata set for given deployment. Each service role can have several deployments. For example rabbitmq server role has following deployments:

- metadata/rabbitmq/server/local.yml
- metadata/rabbitmq/server/single.yml

- metadata/rabbitmq/server/cluster.yml

metadata/service/role1/local.yml

```
applications:
- rabbitmq
parameters:
  _param:
    rabbitmq_admin_user: admin
  rabbitmq:
    server:
      enabled: true
      secret_key: ${_param:rabbitmq_secret_key}
      bind:
        address: 127.0.0.1
        port: 5672
      plugins:
      - amqp_client
      - rabbitmq_management
      admin:
        name: ${_param:rabbitmq_admin_user}
        password: ${_param:rabbitmq_admin_password}
```

metadata/service/role1/single.yml

```
applications:
- rabbitmq
parameters:
  _param:
    rabbitmq_admin_user: admin
  rabbitmq:
    server:
      enabled: true
      secret_key: ${_param:rabbitmq_secret_key}
      bind:
        address: 0.0.0.0
        port: 5672
      plugins:
      - amqp_client
      - rabbitmq_management
      admin:
        name: ${_param:rabbitmq_admin_user}
        password: ${_param:rabbitmq_admin_password}
```

metadata/service/role1/cluster.yml

```
applications:
- rabbitmq
parameters:
  rabbitmq:
    server:
      enabled: true
```

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```
      secret_key: ${_param:rabbitmq_secret_key}
      bind:
        address: ${_param:cluster_local_address}
        port: 5672
      plugins:
      - amqp_client
      - rabbitmq_management
      admin:
        name: admin
        password: ${_param:rabbitmq_admin_password}
      host:
        '/openstack':
          enabled: true
          user: openstack
          password: ${_param:rabbitmq_openstack_password}
          policies:
          - name: HA
            pattern: '^(?!amq\.).*'
            definition: '{"ha-mode": "all"}'
    cluster:
      enabled: true
      name: openstack
      role: ${_param:rabbitmq_cluster_role}
      master: ${_param:cluster_node01_hostname}
      mode: disc
      members:
      - name: ${_param:cluster_node01_hostname}
        host: ${_param:cluster_node01_address}
      - name: ${_param:cluster_node02_hostname}
        host: ${_param:cluster_node02_address}
      - name: ${_param:cluster_node03_hostname}
        host: ${_param:cluster_node03_address}
```

Parameters like `${_param:rabbitmq_secret_key}` are interpolation of common parameter passed from higher system or cluster levels.

Debian packaging

Use of debian packaging is preferable way for deploying production salt masters and it's formulas. Take basic structure of `debian` directory from some existing formula and modify to suit your formula.

Description of most important files follows.

debian/changelog

```
salt-formula-salt (0.1) trusty; urgency=medium

  * Initial release

 -- Ales Komarek <ales.komarek@tcpcloud.eu>  Thu, 13 Aug 2015 23:23:41 +0200
```

debian/copyright

Licensing informations of the package.

```
Format: http://www.debian.org/doc/packaging-manuals/copyright-format/1.0/
Upstream-Name: salt-formula-salt
Upstream-Contact: Ales Komarek <ales.komarek@tcpcloud.eu>
Source: https://github.com/tcpcloud/salt-formula-salt

Files: *
Copyright: 2014-2015 tcp cloud a.s.
License: Apache-2.0
  Copyright (C) 2014-2015 tcp cloud a.s.
  .
  Licensed under the Apache License, Version 2.0 (the "License");
  you may not use this file except in compliance with the License.
  .
  On a Debian system you can find a copy of this license in
  /usr/share/common-licenses/Apache-2.0.
```

debian/docs

Files listed here will be available in `/usr/share/doc`. Don't put COPYRIGHT or LICENSE files here as they are handled in a different way.

```
README.rst
CHANGELOG.rst
VERSION
```

debian/install

Defines what is going to be installed in which location.

```
salt/*                  /usr/share/salt-formulas/env/salt/
metadata/service/*      /usr/share/salt-formulas/reclass/service/salt/
```

debian/control

This file keeps metadata of source and binary package.

```
Source: salt-formula-salt
Maintainer: tcpcloud Packaging Team <pkg-team@tcpcloud.eu>
Section: admin
Priority: optional
Build-Depends: debhelper (>= 9)
Standards-Version: 3.9.6
Homepage: http://www.tcpcloud.eu
Vcs-Browser: https://github.com/tcpcloud/salt-formula-salt
Vcs-Git: https://github.com/tcpcloud/salt-formula-salt.git

Package: salt-formula-salt
Architecture: all
```

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```
Depends: ${misc:Depends}, salt-master, reclass
Description: Salt salt formula
 Install and configure Salt masters and minions.
```

Supplemental files

Files that are required to complete information about given formula.

README.rst

A sample skeleton of the README.rst file:

```
=======
service
=======

Install and configure the Specific service.

.. note::

    See the full `Salt Formulas installation and usage instructions
    <http://docs.saltstack.com/en/latest/topics/development/conventions/formulas.html>
↪`_.

Available states
================

.. contents::
    :local:

``service``
-----------

Install the ``service`` package and enable the service.

``service.role1``
-----------------

Setup individual role.


Available metadata
==================

.. contents::
    :local:

``metadata.service.role.single``
--------------------------------

Setup from system packages.
```

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```
``metadata.service.role.development`
--------------------------------------

Setup from git repository.


Configuration parameters
========================

.. contents::
    :local:

``service_secret_key``
------------------------------

``rabbitmq_service_password``
-------------------------------------

``postgresql_service_password``
---------------------------------------

If development is setup.

``service_source_revision``
---------------------------

If development is setup.

Example reclass
===============

Production setup

.. code-block:: yaml

    service-single:
      name: service-single
      domain: dev.domain.com
      classes:
      - system.service.server.single
      params:
        rabbitmq_admin_password: cwerfwefzdcdsf
        rabbitmq_secret_key: fsdfwfdsfdsf
        rabbitmq_service_password: fdsf24fsdfsdacadf
        keystone_service_password: fdasfdsafdasfdasfda
        postgresql_service_password: dfdasfdafdsa
        nginx_site_service_host: ${linux:network:fqdn}
        service_secret_key: fda32r

Development setup

.. code-block:: yaml

    service-single:
      name: service-single
      domain: dev.domain.com
      classes:
```

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```
      - system.service.server.development
      params:
        rabbitmq_admin_password: cwerfwefzdcdsf
        rabbitmq_secret_key: fsdfwfdsfdsf
        rabbitmq_service_password: fdsf24fsdfsdacadf
        keystone_service_password: fdasfdsafdasfdasfda
        postgresql_service_password: dfdasfdafdsa
        nginx_site_service_host: ${linux:network:fqdn}
        service_secret_key: fda32r
        service_source_repository: git@git.tcpcloud.eu:python-apps/service.git
        service_source_revision: feature/243


Example pillar
==============

Install from specific branch of Git

.. code-block:: yaml

   service:
     server:
       source:
         engine: 'git'
         address: 'git@git.tcpcloud.eu:python-apps/service.git'
         revision: 'feature/214'

To enable debug logging for both Django and Gunicorn and raise
number of Gunicorn workers

.. code-block:: yaml

   service:
     server:
       log_level: 'debug'
       workers: 8

To change where Django listens

.. code-block:: yaml

   service:
     server:
       bind:
         address: 'not-localhost'
         port: 9755

Read more
=========

* http://doc.tcpcloud.eu/
```

LICENSE

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```
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distributed under the License is distributed on an "AS IS" BASIS,
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
See the License for the specific language governing permissions and
limitations under the License.
```

VERSION

Latest version number, git repository tag, package version as well.

```
0.0.2
```

CHANGELOG.rst

The `CHANGELOG.rst` file should detail the individual versions, their release date and a set of bullet points for each version highlighting the overall changes in a given version of the formula.

A sample skeleton of the *CHANGELOG.rst* file:

`CHANGELOG.rst`:

```
service formula
===============

0.0.2 (2014-01-01)

- Re-organized formula file layout
- Fixed filename used for upstart logger template
- Allow for pillar message to have default if none specified

0.0.1 (2013-01-01)

- Initial formula setup
```

Versioning

Formula are versioned according to Semantic Versioning, http://semver.org/.

Note: Given a version number MAJOR.MINOR.PATCH, increment the:

1. MAJOR version when you make incompatible API changes,
2. MINOR version when you add functionality in a backwards-compatible manner, and
3. PATCH version when you make backwards-compatible bug fixes.

Additional labels for pre-release and build metadata are available as extensions to the MAJOR.MINOR.PATCH format.

Formula versions are tracked using Git tags as well as the `VERSION` file in the formula repository. The `VERSION` file should contain the currently released version of the particular formula.

Formula unit testing

A smoke-test for invalid Jinja, invalid YAML, or an invalid Salt state structure can be performed by with the `state.show_sls` function:

```
salt '*' state.show_sls service-name
```

Salt Formulas can then be tested by running each `.sls` file via `state.sls` and checking the output for the success or failure of each state in the Formula. This should be done for each supported platform.

```
salt '*' state.sls sls-file-name test
```

More information

- http://docs.saltstack.com/en/latest/topics/best_practices.html
- http://docs.saltstack.com/en/latest/topics/development/conventions/formulas.html
- http://docs.saltstack.com/en/latest/topics/development/conventions/style.html

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Contributor Guidelines

Bugs

Bugs should be filed on Bug Launchpad for SaltStack-formulas.

When submitting a bug, or working on a bug, please ensure the following criteria are met:

- The description clearly states or describes the original problem or root cause of the problem.
- Include historical information on how the problem was identified.
- Any relevant logs are included.
- If the issue is a bug that needs fixing in a branch other than master, please note the associated branch within the launchpad issue.
- The provided information should be totally self-contained. External access to web services/sites should not be needed.
- Steps to reproduce the problem if possible.

Tags

If it's a bug that needs fixing in a branch in addition to master, add a '<release>-backport-potential' tag (e.g. `kilo-backport-potential`). There are predefined tags that will auto-complete.

Status

Please leave the **status** of an issue alone until someone confirms it or a member of the bugs team triages it. While waiting for the issue to be confirmed or triaged the status should remain as **New**.

Importance

Should only be touched if it is a Blocker/Gating issue. If it is, please set to **High**, and only use **Critical** if you have found a bug that can take down whole infrastructures. Once the importance has been changed the status should be changed to *Triaged* by someone other than the bug creator.

Triaging Bugs

Reported bugs need prioritization, confirmation, and shouldn't go stale. If you care about OpenStack stability but aren't wanting to actively develop the roles and playbooks used within the "salt-formulas" project consider contributing in the area of bug triage, which helps immensely. The whole process is described in the upstream Bug Triage Documentation.

Submitting Code

- Write good commit messages. We follow the OpenStack "Git Commit Good Practice" guide. if you have any questions regarding how to write good commit messages please review the upstream OpenStack documentation.

- Changes to the project should be submitted for review via the Gerrit tool, following the workflow documented here.
- Pull requests submitted through GitHub will be ignored and closed without regard.
- All feature additions/deletions should be accompanied by a blueprint/spec. ie: adding additional active agents to neutron, developing a new service role, etc...
- Before creating blueprint/spec an associated issue should be raised on launchpad. This issue will be triaged and a determination will be made on how large the change is and whether or not the change warrants a blueprint/spec. Both features and bug fixes may require the creation of a blueprint/spec. This requirement will be voted on by core reviewers and will be based on the size and impact of the change.
- All blueprints/specs should be voted on and approved by core reviewers before any associated code will be merged. For more information on blueprints/specs please review the upstream OpenStack Blueprint documentation. At the time the blueprint/spec is voted on a determination will be made whether or not the work will be backported to any of the "released" branches.
- Patches should be focused on solving one problem at a time. If the review is overly complex or generally large the initial commit will receive a "**-2**" and the contributor will be asked to split the patch up across multiple reviews. In the case of complex feature additions the design and implementation of the feature should be done in such a way that it can be submitted in multiple patches using dependencies. Using dependent changes should always aim to result in a working build throughout the dependency chain. Documentation is available for advanced gerrit usage too.
- All patch sets should adhere to the Salt Style Guide listed here as well as adhere to the Salt best practices when possible.
- All changes should be clearly listed in the commit message, with an associated bug id/blueprint along with any extra information where applicable.
- Refactoring work should never include additional "rider" features. Features that may pertain to something that was re-factored should be raised as an issue and submitted in prior or subsequent patches.

Backporting

- Backporting is defined as the act of reproducing a change from another branch. Unclean/squashed/modified cherry-picks and complete reimplementations are OK.
- Backporting is often done by using the same code (via cherry picking), but this is not always the case. This method is preferred when the cherry-pick provides a complete solution for the targeted problem.
- When cherry-picking a commit from one branch to another the commit message should be amended with any files that may have been in conflict while performing the cherry-pick operation. Additionally, cherry-pick commit messages should contain the original commit *SHA* near the bottom of the new commit message. This can be done with `cherry-pick -x`. Here's more information on Submitting a change to a branch for review.
- Every backport commit must still only solve one problem, as per the guidelines in *Submitting Code*.
- If a backport is a squashed set of cherry-picked commits, the original SHAs should be referenced in the commit message and the reason for squashing the commits should be clearly explained.
- When a cherry-pick is modified in any way, the changes made and the reasons for them must be explicitly expressed in the commit message.
- Refactoring work must not be backported to a "released" branch.

Style Guide

When creating tasks and other roles for use in Salt please create then using the YAML dictionary format.

Example YAML dictionary format:

```
- name: The name of the tasks
  module_name:
    thing1: "some-stuff"
    thing2: "some-other-stuff"
  tags:
    - some-tag
    - some-other-tag
```

Example what **NOT** to do:

```
- name: The name of the tasks
  module_name: thing1="some-stuff" thing2="some-other-stuff"
  tags: some-tag
```

```
- name: The name of the tasks
  module_name: >
    thing1="some-stuff"
    thing2="some-other-stuff"
  tags: some-tag
```

Usage of the “>” and “|” operators should be limited to Salt conditionals and command modules such as the Salt `shell` or `command`.

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2.2.2 Testing

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Testing Coding Style

Formulas are pre-written Salt States. They are as open-ended as Salt States themselves and can be used for tasks such as installing a package, configuring, and starting a service, setting up users or permissions, and many other common tasks. They have certain rules that needs to be adhered.

Using Double Quotes with no Variables

In general - it's a bad idea. All the strings which does not contain dynamic content (variables) should use single quote instead of double.

Line Length Above 80 Characters

As a 'standard code width limit' and for historical reasons - [IBM punch card](http://en.wikipedia.org/wiki/Punched_card) had exactly 80 columns.

Single Line Declarations

Avoid extending your code by adding single-line declarations. It makes your code much cleaner and easier to parse / grep while searching for those declarations.

No Newline at the End of the File

Each line should be terminated in a newline character, including the last one. Some programs have problems processing the last line of a file if it isn't newline terminated. [Stackoverflow thread](http://stackoverflow.com/questions/729692/why-should-files-end- with-a-newline)

Trailing Whitespace Characters

Trailing whitespaces take more spaces than necessary, any regexp based searches won't return lines as a result due to trailing whitespace(s).

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Testing Metadata

Pillars are tree-like structures of data defined on the Salt Master and passed through to the minions. They allow confidential, targeted data to be securely sent only to the relevant minion. Pillar is therefore one of the most important systems when using Salt.

Testing Scenarios

Testing plan tests each formula with the example pillars covering all possible deployment setups:

The first test run covers `state.show_sls` call to ensure that it parses properly with debug output.

The second test covers `state.sls` to run the state definition, and run `state.sls` again, capturing output, asserting that `^Not Run:` is not present in the output, because if it is then it means that a state cannot detect by itself whether it has to be run or not and thus is not idempotent.

File *metadata.yml*

```
name: "service"
version: "0.2"
source: "https://github.com/tcpcloud/salt-formula-service"
```

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Testing Salt Formulas

Each formula contains *Makefile* with at least *test* target. Under `tests` directory are located resources for test execution.

Test target executes *"smoke test"* implemented by tests/run_tests.sh capable to fetch dependencies in python virtual environment by executing *salt-call state.show_sls* with provided `tests/pillar` data.

The purpose of the smoke test is to find syntax, typo issues and verify example pillar data against the formula.

Initial content of `tests` folder contains test pillars and a run_tests.sh as generated by cookiecutter.

```
tests
├── pillar
│   └── client_single.sls
│   └── server_single.sls
└── run_tests.sh
```

Create or update pillars in `tests/pillar/\*.sls` with test data.

Generate Test Structures in Formula

There is and salt-formulas cookiecutter template. to generate initial repository structure for new formula.

For existing formulas there is an convenient script capable to generate initial structures from available content. For more details follow the README in the above linked repository. To simply generate test structures according specification stated in this document simply run `kitchen-init.sh`.

tl;dr:

```
curl -skL "https://raw.githubusercontent.com/salt-formulas/salt-formulas/master/
↪cookiecutter/salt-formula/kitchen-init.sh" | bash -s --
```

Formula Testing with Test Kitchen

Test Kitchen with forked kitchen-salt provisioner plugin may be used for local development as well as CI scenario.

Test Kitchen is a test harness tool to execute your configured code on one or more platforms in isolation. There is a `.kitchen.yml` in main directory that defines *platforms* to be tested and *suites* to execute on them.

Kitchen CI can spin instances locally or remote, based on used *driver*. For example `.kitchen.yml` may define a docker or vagrant driver.

For more, explore it's rich ecosystem of supported drivers/provisioners/verifiers/. . .

Using Test Kitchen

A listing of scenarios to be executed:

```
$ kitchen list

Instance                    Driver   Provisioner  Verifier  Transport  Last Action

client-single-ubuntu-1404   Docker   SaltSolo     Inspec    Ssh        <Not Created>
client-single-ubuntu-1604   Docker   SaltSolo     Inspec    Ssh        <Not Created>
client-single-centos-71     Docker   SaltSolo     Inspec    Ssh        <Not Created>
```

The Busser *Verifier* is used to setup and run tests implementated in *<repo>/test/integration*. It installs the particular driver to tested instance (Serverspec, InSpec, Shell, Bats, . . .) prior the verification is executed.

Example workflow:

```
# list instances and status
kitchen list

# manually execute integration tests
kitchen [test || [create|converge|verify|exec|login|destroy|...]] [instance] -t tests/
↪integration

# use with provided Makefile (ie: within CI pipeline)
make kitchen
```

How it Works

Kitchen spin an instances in Docker, Vagrant, OpenStack environment, etc. based on configured driver. Instance is configured as salt minion, where the configuration is defined by `.kitchen.yml` and `tests/pillar/*.sls`

Override your specific needs with `.kitchen.<backend|local>.yml` that you may load as: `KITCHEN_LOCAL_YAML=.kitchen.<driver>.yml kitchen <action> <suite>`.

Example: `KITCHEN_LOCAL_YAML=.kitchen.local kitchen verify server-ubuntu-1404 -t tests/integration`.

Test Kitchen then allows you execute several action to perform your testing under configured conditions:

1. *create*, provision an test instance (VM, container)
2. *converge*, run a provisioner (shell script, kitchen-salt)
3. *verify*, run a verification (inspec, other may be added)
4. *destroy*

Verifying Deployment

There is couple of verifier plugins that are shipped with Test Kitchen. They allow to run simple bash scripts and checking it's exit codes to run specific purpose based frameworks.

The Busser *Verifier* goes with test-kitchen by default. It is used to setup and run tests implemented in `<repo>/test/integration`. It guess and installs the particular driver to tested instance. By default InSpec is expected.

You may avoid to install busser framework if you configure specific verifier in `.kitchen.yml`:

```
verifier:
        name: inspec
```

For default Inspec *Verifier* implement your scripts directly in `<repo>/test/integration/<suite>` directory with `_spec.rb` suffix.

If you would to write another verification scripts than InSpec store them in `<repo>/tests/integration/<suite>/<verifier>`. `Busser <https://github.com/test-kitchen/busser>` is a test setup and execution framework under test kitchen.

Implement integration tests under `<repo>/tests/integration/<suite>/<verifier>` directory with `_spec.<verifier suffix>` filename suffix.

InSpec

InSpec is native validation framework for Test Kitchen and as such don't require usage of `<verifier>` folder. Thus the tests may by stored directly under `<repo>/tests/integration/<suite>`

Additional resources.

- https://inspec.io
- https://github.com/chef/inspec
- https://github.com/chef/kitchen-inspec

Example verification scripts under *tests/integration* folder of the formula:

```
tests
├── integration
│   ├── default
│   │   └── default_testcase_spec.rb  # Written in InSpec
│   ├── backupmx
│   │   └── serverspec                # <Verifier framework>
│   │       └── backupmx_spec.rb      # Written in ServerSpec
│   ├── helpers
│   │   └── serverspec
│   │       └── spec_helper.rb
│   ├── relay
│   │   └── serverspec
│   │       └── relay_spec.rb
│   └── server
│       └── serverspec
│           ├── aliases_spec.rb
│           └── server_spec.rb
├── pillar
│   ├── backupmx.sls
│   ├── relay.sls
│   └── server.sls
└── run_tests.sh
```

Requirements

Use latest stable `kitchen-salt <https://github.com/saltstack/kitchen-salt>` and kitchen-test.

TL;DR

First you have to install ruby package manager gem.

Install required gems:

```
# Ruby side:
gem install <gem name from the list below>
```

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```
# Isolated w/Bundler
gem install bundler

cat > Gemfile <<EOF
            source 'https://rubygems.org'

            gem 'rake'
            gem 'test-kitchen'
            gem 'kitchen-docker'
            gem 'kitchen-inspec'
            gem 'inspec'
            gem 'kitchen-salt', :git => 'https://github.com/salt-formulas/kitchen-
↪salt.git'
      EOF

bundle install [--path $PWD/.vendor/bundle]

# use with preffix 'bundle kitchen':
# bundle exec kitchen list
```

Create aliases:

```
cat > ~/.${SHELL}rc <<EOF
            alias bk='nocorrect bundle exec kitchen'
            alias kl='nocorrect bundle exec kitchen list'
EOF
```

See http://kitchen.ci/ for more details.

Install procedure

One may be satisfied installing ruby and gems system-wide right from OS package manager.

If you are an ruby/chef developer you will probably want to use *ChefDK <https://downloads.chef.io/chefdk>*.

For advanced users or the sake of complex environments you may use rbenv for user side ruby installation.

- https://github.com/rbenv/rbenv
- http://kitchen.ci/docs/getting-started/installing

An example steps to install user side ruby and prerequisites:

```
# Use package manager to install rbenv and ruby-build
sudo apt-get install rbenv ruby-build

# list all available versions:
rbenv install -l

# install a Ruby version of your choice or pick latest
rbenv install $(rbenv install -l|grep -E '^[ ]*[0-9]\.[0-9]+'|tail -1)

# activate
rbenv local 2.4.0

# it's usually a good idea to update rubygems first
rbenv exec gem update --system
```

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```
# install test kitchen
rbenv exec gem install bundler
rbenv exec gem install test-kitchen
```

Continue with the optional `Gemfile` in the formula main directory to fetch fine tuned dependencies. If you use Gemfile and Bundler for local dependencies prepend all command with `rbenv exec bundler exec` and possibly set an alias in your ~/.bashrc, etc.

```
cat >> ~/.${SHELL}rc <<-EOF
              alias rk="rbenv exec kitchen"
              alias bk="rbenv exec bundler exec kitchen"
EOF
```

With such alias set, you should be able to execute `rbenv exec bundler exec make kitchen` and see test results.

Sample Configurations

For advanced configs have a look at `.kitchen*.yml` examples in *cookiecutter template <https://github.com/salt-formulas/salt-formulas/tree/master/cookiecutter/salt-formula/%7B%7Bcookiecutter.service_name%7D%7D>_*.

.kitchen.yml

```
---
driver:
  name: docker
  hostname: opencontrail
  use_sudo: true

provisioner:
  name: salt_solo
  salt_install: bootstrap
  salt_bootstrap_url: https://bootstrap.saltstack.com
  salt_version: latest
  require_chef: false
  log_level: error
  formula: opencontrail
  grains:
    noservices: True
  dependencies:
    - name: linux
      repo: git
      source: https://github.com/salt-formulas/salt-formula-linux
  state_top:
    base:
      "*":
        - linux
        - opencontrail
  pillars:
    top.sls:
      base:
        "*":
          - linux_repo_openstack
          - linux_repo_cassandra
          - linux_repo_opencontrail
```

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```
          - linux_repo_mos
          - linux
          - opencontrail
          - opencontrail_juniper
    linux.sls:
      linux:
        system:
          enabled: true
          name: opencontrail
    opencontrail_juniper.sls: {}
  pillars-from-files:
    linux_repo_mos.sls: tests/pillar/repo_mos8.sls
    linux_repo_cassandra.sls: tests/pillar/repo_cassandra.sls
    linux_repo_openstack.sls: tests/pillar/repo_openstack.sls
    linux_repo_opencontrail.sls: tests/pillar/repo_opencontrail.sls

verifier:
  name: inspec
  sudo: true

platforms:
  - name: <%= ENV['PLATFORM'] || 'ubuntu-xenial' %>
    driver_config:
      image: <%= ENV['PLATFORM'] || 'trevorj/salty-whales:xenial' %>
      platform: ubuntu

suites:

  - name: <%= ENV['SUITE'] || 'single' %>
    provisioner:
      pillars-from-files:
        opencontrail.sls: tests/pillar/<%= ENV['SUITE'] || 'single' %>.sls

  - name: cluster
    provisioner:
      pillars-from-files:
        opencontrail.sls: tests/pillar/cluster.sls

  - name: analytics
    provisioner:
      pillars-from-files:
        opencontrail.sls: tests/pillar/analytics.sls

  - name: control
    provisioner:
      pillars-from-files:
        opencontrail.sls: tests/pillar/control.sls

  - name: vendor-juniper
    provisioner:
      vendor_repo:
        - type: apt
          url: http://aptly.local/contrail
          key_url: http://aptly.local/public.gpg
          components: main
          distribution: trusty
      pillars-from-files:
```

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```
        opencontrail.sls: tests/pillar/control.sls
      pillars:
        opencontrail_juniper.sls:
          opencontrail:
            common:
              vendor: juniper


# vim: ft=yaml sw=2 ts=2 sts=2 tw=125
```

Continous Integration with Travis

Salt-formulas uses Travis CI to run smoke and integration tests. To generate `.travis.yml` follow *Generate test structures in formula*.

Sample Configurations

.travis.yml

```
sudo: required
services:
  - docker

# PREREQUISITES
install:
  - pip install PyYAML
  - pip install virtualenv
  - |
    test -e Gemfile || cat <<EOF > Gemfile
    source 'https://rubygems.org'
    gem 'rake'
    gem 'test-kitchen'
    gem 'kitchen-docker'
    gem 'kitchen-inspec'
    gem 'inspec'
    gem 'kitchen-salt', :git => 'https://github.com/salt-formulas/kitchen-salt.git
  - bundle install

# BUILD MATRIX
env:
  - PLATFORM=trevorj/salty-whales:trusty
  - PLATFORM=trevorj/salty-whales:xenial
  - PLATFORM=trevorj/salty-whales:xenial-2016.3

# SMOKE TEST
before_script:
  - set -o pipefail
  - make test | tail

# KITCHEN TEST
script:
  - bundle exec kitchen test -t tests/integration

# vim: ft=yaml sw=2 ts=2 sts=2 tw=125
```

Common Practices

noservices

At some rare cases execution of given state in the formula is not possible or required. For these cases set grain `noservices: True` and wrap corresponding code as in the example below:

```
{%- if not grains.get('noservices', False) %}
mysql_database_{{ database_name }}:
  mysql_database.present:
  - name: {{ database_name }}
  - character_set: {{ database.get('encoding', 'utf8') }}
  - connection_user: {{ connection.user }}
  - connection_pass: {{ connection.password }}
  - connection_charset: {{ connection.charset }}
{%- endif %}
```

As the mysql database might not be available in the given test environment (travis/docker, etc..).

In `.kitchen.yml` we set grain `noservices: True` by default.

```
grains:
  noservices: True
```

** formula dependencies **

Formula dependencies might be specified in `<formula repo>/metadata.yml`

```
name: "galera"
version: "1.0"
source: "https://github.com/salt-formulas/salt-formula-galera"
dependencies:
- name: mysql
  source: "https://github.com/salt-formulas/salt-formula-mysql"
```

While using test-kitchen formula dependencies must be specified in `.kitchen.yml` as well. Dependencies may be installed from git, spm or even apt repository.

```
provisioner::
  dependencies:
    - name: mysql
      repo: git
      source: https://github.com/salt-formulas/salt-formula-mysql.git
    - name: linux
      repo: git
      source: https://github.com/salt-formulas/salt-formula-linux.git
```

For convenience kitchen-salt will read `metadata.yml` of these dependencies and install their dependencies in case you omit them in `.kitchen.yml`.

** build matrix **

To simplify local CI we ship `.kitchen.yml` with limited number of platforms. (ie: latest ubuntu as a falback option if no `ENV` variable `PLATFORM` is specified)

However this is later extended on Travis CI while using `ENV` variables in build matrix.

`.travis.yml` snippet:

```
# BUILD MATRIX
env:
  - PLATFORM=trevorj/salty-whales:trusty
  - PLATFORM=trevorj/salty-whales:xenial
```

`.kitchen.yml` snippet:

```
platforms:
  - name: <%= ENV['PLATFORM'] || 'ubuntu-xenial' %>
    driver_config:
      image: <%= ENV['PLATFORM'] || 'trevorj/salty-whales:xenial' %>
      platform: ubuntu
```

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Testing Salt models

In order to test your model you may use kitchen-salt again.

To validate model use:

Kitchen-salt to validate mode

With the below approach you may validate or even deploy your model in any platform the *kitchen-test* support.

Expected repository structure:

```
  tree -L 3
.
├── classes
│   │
│   ├── service
│   │
│   ├── system
│   │
│   ├── cluster
│   │   ├── k8s-aio-calico
│   │   ├── k8s-aio-contrail
│   │   ├── k8s-ha-calico
│   │   ├── k8s-ha-calico-cloudprovider
│   │   ├── k8s-ha-calico-syndic
```

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```
│   │   ├── k8s-ha-contrail
│   │   ├── os-aio-contrail
│   │   ├── os-aio-ovs
│   │   ├── os-ha-contrail
│   │   ├── os-ha-contrail-40
│   │   ├── os-ha-contrail-ironic
│   │   ├── os-ha-ovs
│   │   ├── os-ha-ovs-ceph
│   │
│
├── Makefile
├── README.rst

├── verify.sh
```

Place this `kitchen.yml` and `verify.sh` to to your model repo.

Example `kitchen.yml`:

```
---
driver:
  name: docker
  use_sudo: false
  volume:
    - <%= ENV['PWD'] %>:/tmp/kitchen

provisioner:
  name: shell
  script: verify.sh

platforms:
  <% `find classes/cluster -maxdepth 1 -mindepth 1 -type d | tr '_' '-' |sort -u`.
↪split().each do |cluster| %>
  <% cluster=cluster.split('/')[2] %>
  - name: <%= cluster %>
    driver_config:
      #image: ubuntu:16.04
      image: tcpcloud/salt-models-testing # With preinstalled dependencies (faster)
      platform: ubuntu
      hostname: cfg01.<%= cluster %>.local
      provision_command:
        - apt-get update
        - apt-get install -y git curl python-pip
        - pip install --upgrade pip
        - git clone https://github.com/salt-formulas/salt-formulas-scripts /srv/salt/
↪scripts
        - cd /srv/salt/scripts; git pull -r; cd -
        # NOTE: Configure ENV options as needed, example:
        - echo "
            export BOOTSTRAP=1;\n
            export CLUSTER_NAME=<%= cluster %>;\n
            export FORMULAS_SOURCE=pkg;\n
            export RECLASS_VERSION=master;\n
            export RECLASS_IGNORE_CLASS_NOTFOUND=True;\n
            export RECLASS_IGNORE_CLASS_REGEXP='service.*';\n
            export EXTRA_FORMULAS="";\n
          " > /kitchen.env
```

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```
          #export RECLASS_SOURCE_PATH=/usr/lib/python2.7/site-packages/reclass;\n
          #export PYTHONPATH=$RECLASS_SOURCE_PATH:$PYTHONPATH;\n
  <% end %>

suites:
  - name: cluster
```

Example `verify.sh`:

```
#!/bin/bash

#export HOSTNAME=${`hostname -s`}
#export DOMAIN=${`hostname -d`}
cd /srv/salt/scripts; git pull -r || true; source bootstrap.sh || exit 1

# BOOTSTRAP
if [[ $BOOTSTRAP =~ ^(True|true|1|yes)$ ]]; then
  # workarounds for kitchen
  test ! -e /tmp/kitchen  || (mkdir -p /srv/salt/reclass; rsync -avh /tmp/kitchen/ /
↪srv/salt/reclass)
  cd /srv/salt/reclass
  # clone latest system-level if missing
  if [[ -e .gitmodules ]] && [[ ! -e classes/system/linux ]]; then
    git submodule update --init --recursive --remote || true
  fi
  source_local_envs
  /srv/salt/scripts/bootstrap.sh &&\
  if [[ -e /tmp/kitchen ]]; then sed -i '/BOOTSTRAP=/d' /kitchen.env; fi
fi

# VERIFY
export RECLASS_IGNORE_CLASS_NOTFOUND=False
cd /srv/salt/reclass &&\
if [[ -z "$1" ]] ; then
  verify_salt_master &&\
  verify_salt_minions
else
  verify_salt_minion "$1"
fi
```

Usage:

```
kitchen list

Instance                                  Driver  Provisioner  Verifier  Transport ␣
↪Last Action    Last Error
-------------------------------------------------------------------------------------
↪-----------------------
cluster-k8s-aio-calico                    Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-k8s-aio-contrail                  Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-k8s-ha-calico                     Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-k8s-ha-calico-cloudprovider       Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-k8s-ha-calico-syndic              Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
```

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```
cluster-k8s-ha-contrail                   Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-os-aio-contrail                   Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-os-aio-ovs                        Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-os-ha-contrail                    Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-os-ha-contrail-40                 Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-os-ha-contrail-ironic             Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-os-ha-ovs                         Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
cluster-os-ha-ovs-ceph                    Docker  Shell        Busser    Ssh
↪<Not Created>  <None>
...
```

Once all require requirements are set, use `tests/runtests.py` to run all of the tests included in Salt's test suite. For more information, see –help.

Running the Tests

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2.2.3 Maintenance

Chapter 3. Maintenance

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Formula Versioning

- *Creating New Release*

Current versioning system is date based same as Saltstack versioning using format `YYYY-MM-R` (year-month-revision) where revision is minor release that increments of 1 starting at 0.

Creating New Release

Releasing is currently not automatic and is up to maintainer of individual formula.

To automate the tasks needed to make a new release, there are unified targets in `Makefile` that should be present in each formula repository.

See `make help` for more information, there are `release-major` and `release-minor` targets. First one will create new major release by current date. Second will raise revision of current major release.

Example use and output:

```
$ make release-minor
Current version is 2017.2, new version is 2017.2.1
echo "2017.2.1" > VERSION
sed -i 's,version: .*,version: "2017.2.1",g' metadata.yml
[ ! -f debian/changelog ] || dch -v 2017.2.1 -m --force-distribution -D `dpkg-
↪parsechangelog -S Distribution` "New version"
make genchangelog-2017.2.1
make[1]: Entering directory '/home/filip/src/salt-formulas/formulas/letsencrypt'
(echo "=========\nChangelog\n=========\n"; \
(echo 2017.2.1;git tag) | sort -r | grep -E '^[0-9\.]+' | while read i; do \
    cur=$i; \
    test $i = 2017.2.1 && i=HEAD; \
    prev=`(echo 2017.2.1;git tag)|sort|grep -E '^[0-9\.]+'|grep -B1 "$cur\$"|head -1`;
↪ \
    echo "Version $cur\n=============================\n"; \
    git log --pretty=short --invert-grep --grep="Merge pull request" --decorate $prev.
↪.$i; \
    echo; \
done) > CHANGELOG.rst
make[1]: Leaving directory '/home/filip/src/salt-formulas/formulas/letsencrypt'
(git add -u; git commit -m "Version 2017.2.1")
[master 4859e22] Version 2017.2.1
 4 files changed, 81 insertions(+), 13 deletions(-)
 rewrite CHANGELOG.rst (98%)
git tag -s -m 2017.2.1 2017.2.1

$ git show
  ...
$ git push origin master
$ git push origin --tags
```

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Formula Packaging

This section describes process of building distribution packages for various distributions.

Debian

Debian packaging ecosystems is very diversed, there's many ways how to build and maintain a package.

We have decided to use `git-buildpackage` (aka `gbp`) and support two source formats depending on formula needs: `3.0 (native)` and `3.0 (quilt)`

Native Packages

Native source format is for applications made especially for Debian, it doesn't distinquish upstream vs. debian distribution. As it's the easiest format available, it's currently used by most of the formulas. The only requirement is to have `debian` directory in formula's git repository and building the package is as simple as:

```
dpkg-buildpackage -uc -us
```

or building source package and using cowbuilder:

```
dpkg-buildpackage -S -nc -uc -us
sudo cowbuilder --build "../salt-formula-somthin_*.dsc"
```

Disadvantages of using native format is that it's not possible to maintain stable versions and therefore maintain formula package in Debian distribution.

Quilt Packages

Quilt format adds more complexity as it distinquish upstream vs. debian distribution.

Upstream is original unmodified source code, originating from Git repository, Pypy, or some source tarball provided by upsteram, etc. Such distribution doesn't care about debian packaging and doesn't ship `debian` directory.

Debian consists of actual `debian` directory with everything needed similar to `native` format but as an additional it supports quilt patches. This feature allows package maintainer to maintain patches to specific upstream version separately (eg. to backport new features, fixes, etc.). In this way it's possible to maintain stable versions of software even if it's no longer supported upstream.

This format doesn't solve way how debian packaging is done, whether it's tracked in a Git repository, SVN, etc. Then `git-buildpackage` comes into play.

With `gbp` it's possible to have separate branch for packaging (eg. `debian/unstable`) and upstream (usually `master`) and this is what we are using to maintain packages for some formulas.

Example branches in such formula can be following:

- `master`
  - formulas itself
- debian/unstable
  - packaging for Debian, uploaded into `unstable`
  - if it's needed to patch formula in particular stable release (eg. `stretch`), according branch can be created, eg. `debian/stretch`
- `debian/trusty`
  - packaging for specific Ubuntu version
  - uploaded on Launchpad into `~salt-formulas/ppa`
- `debian/xenial`
  - packaging for specific Ubuntu version
  - uploaded on Launchpad into `~salt-formulas/ppa`

This mechanism also utilizes Git tags to mark specific release, eg. `debian/1.0-1`.

To build package, checkout into debian branch and run:

```
gbp buildpackage --git-ignore-new --git-ignore-branch -S -uc -us
```

More Information

Debian packaging is complex topic so it's good to check some external resources as well:

- http://honk.sigxcpu.org/projects/git-buildpackage/manual-html/gbp.html

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2.3 Installation and Operations Manual

2.3.1 Installation

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Configuration Node Setup

Configuring the Operating System

The configuration files will be installed to `/etc/salt` and are named after the respective components, `/etc/salt/master`, and `/etc/salt/minion`.

By default the Salt master listens on ports 4505 and 4506 on all interfaces (0.0.0.0). To bind Salt to a specific IP, redefine the "interface" directive in the master configuration file, typically `/etc/salt/master`, as follows:

```
- #interface: 0.0.0.0
+ interface: 10.0.0.1
```

After updating the configuration file, restart the Salt master. for more details about other configurable options. Make sure that mentioned ports are open by your network firewall.

Open salt master config

```
vim /etc/salt/master.d/master.conf
```

And set the content to the following, enabling dev environment and reclass metadata source.

```
file_roots:
  base:
  - /srv/salt/env/dev
  - /srv/salt/env/base

pillar_opts: False

reclass: &reclass
  storage_type: yaml_fs
  inventory_base_uri: /srv/salt/reclass

ext_pillar:
  - reclass: *reclass

master_tops:
  reclass: *reclass
```

And set the content to the following to setup reclass as salt-master metadata source.

```
vim /etc/reclass/reclass-config.yml
```

```
storage_type: yaml_fs
pretty_print: True
output: yaml
inventory_base_uri: /srv/salt/reclass
```

Configure the master service

```
# Ubuntu
service salt-master restart
# Redhat
systemctl enable salt-master.service
systemctl start salt-master
```

See the master configuration reference for more details about other configurable options.

Setting up package repository

Use `curl` to install your distribution's stable packages. Examine the downloaded file `install_salt.sh` to ensure that it contains what you expect (bash script). You need to perform this step even for salt-master instalation as it adds official saltstack package management PPA repository.

```
apt-get install vim curl git-core
curl -L https://bootstrap.saltstack.com -o install_salt.sh
sudo sh install_salt.sh
```

Install the Salt master from the apt repository with the apt-get command after you installed salt-minion.

```
sudo apt-get install salt-minion salt-master reclass
```

Note: Instalation is tested on Ubuntu Linux 14.04/16.04, but should work on any distribution with python 2.7 installed.

You should keep Salt components at current stable version.

Configuring Secure Shell (SSH) keys

Generate SSH key file for accessing your reclass metadata and development formulas.

```
mkdir /root/.ssh
ssh-keygen -b 4096 -t rsa -f /root/.ssh/id_rsa -q -N ""
chmod 400 /root/.ssh/id_rsa
```

Create SaltStack environment file root, we will use `dev` environment.

```
mkdir /srv/salt/env/dev -p
```

Get the reclass metadata definition from the git server.

```
git clone git@github.com:tcpcloud/workshop-salt-model.git /srv/salt/reclass
```

Get the core formulas from git repository server needed to setup the rest.

```
git clone git@github.com:tcpcloud/salt-formula-linux.git /srv/salt/env/dev/linux -b␣
↪develop
git clone git@github.com:tcpcloud/salt-formula-salt.git /srv/salt/env/dev/salt -b␣
↪develop
git clone git@github.com:tcpcloud/salt-formula-openssh.git /srv/salt/env/dev/openssh -
↪b develop
git clone git@github.com:tcpcloud/salt-formula-git.git /srv/salt/env/dev/git -b␣
↪develop
```

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Target Nodes Installation

On most distributions, you can set up a Salt Minion with the Salt Bootstrap .

Note: In every two-step example, you would be well-served to examine the downloaded file and examine it to ensure that it does what you expect.

Using `curl` to install latest git:

```
curl -L https://bootstrap.saltstack.com -o install_salt.sh
sudo sh install_salt.sh git develop
```

Using `wget` to install your distribution's stable packages:

```
wget -O install_salt.sh https://bootstrap.saltstack.com
sudo sh install_salt.sh
```

Install a specific version from git using `wget`:

```
wget -O install_salt.sh https://bootstrap.saltstack.com
sudo sh install_salt.sh -P git v2015.5
```

On the above example we added *-P* which will allow PIP packages to be installed if required but it's no a necessary flag for git based bootstraps.

Basic minion Configuration

Salt configuration is very simple. The only requirement for setting up a minion is to set the location of the master in the minion configuration file.

The configuration files will be installed to `/etc/salt` and are named after the respective components, `/etc/salt/master`, and `/etc/salt/minion`.

Setting `Salt Master host`

Although there are many Salt Minion configuration options, configuring a Salt Minion is very simple. By default a Salt Minion will try to connect to the DNS name "salt"; if the Minion is able to resolve that name correctly, no configuration is needed.

If the DNS name "salt" does not resolve to point to the correct location of the Master, redefine the "master" directive in the minion configuration file, typically `/etc/salt/minion`, as follows:

```
- #master: salt
+ master: 10.0.0.1
```

Setting `Salt minion ID`

Then explicitly declare the ID for this minion to use. Since Salt uses detached IDs it is possible to run multiple minions on the same machine but with different IDs.

```
id: foo.bar.com
```

After updating the configuration files, restart the Salt minion.

```
# Ubuntu
service salt-minion restart

# Redhat
systemctl enable salt-minion.service
systemctl start salt-minion
```

See the minion configuration reference for more details about other configurable options.

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Install Infrastructure Services

- *Support infrastructure deployment*

First execute basic states on all nodes to ensure Salt minion, system and OpenSSH are set up.

```
salt '*' state.sls linux,salt,openssh,ntp
```

Support infrastructure deployment

Metering node is deployed by running highstate:

```
salt 'mtr*' state.highstate
```

On monitoring node, git needs to be setup first:

```
salt 'mon*' state.sls git
salt 'mon*' state.highstate
```

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Validate Configuration Node

Now it's time to validate your configuration infrastrucuture.

Check validity of reclass data for entire infrastructure:

```
reclass-salt --top
```

It will return service catalog of entire infrastructure.

Get reclass data for specific node:

```
reclass-salt --pillar ctl01.workshop.cloudlab.cz
```

Verify that all salt minions are accepted at master:

```
root@cfg01:~# salt-key
Accepted Keys:
cfg01.workshop.cloudlab.cz
mtr01.workshop.cloudlab.cz
Denied Keys:
Unaccepted Keys:
Rejected Keys:
```

Verify that all Salt minions are responding:

```
root@cfg01:~# salt '*workshop.cloudlab.cz' test.ping
cfg01.workshop.cloudlab.cz:
    True
mtr01.workshop.cloudlab.cz:
    True
web01.workshop.cloudlab.cz:
    True
cmp02.workshop.cloudlab.cz:
    True
```

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```
cmp01.workshop.cloudlab.cz:
    True
mon01.workshop.cloudlab.cz:
    True
ctl02.workshop.cloudlab.cz:
    True
ctl01.workshop.cloudlab.cz:
    True
ctl03.workshop.cloudlab.cz:
    True
```

Get IP addresses of minions:

```
root@cfg01:~# salt "*.workshop.cloudlab.cz" grains.get ipv4"
```

Show top states (installed services) for all nodes in the infrastructure.

```
root@cfg01:~# salt '*' state.show_top
[INFO    ] Loading fresh modules for state activity
nodeXXX:
    ----------
    base:
        - git
        - linux
        - ntp
        - salt
        - collectd
        - openssh
        - reclass
```

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2.3.2 Configuration

Chapter 2. Configuration

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Initial Environment Configuration

Linux system setup

Basic linux box

```
linux:
  system:
    enabled: true
    name: 'node1'
    domain: 'domain.com'
    cluster: 'system'
    environment: prod
    timezone: 'Europe/Prague'
    utc: true
```

Linux with defined users (optionaly with password)

```
linux:
  system:
    ...
    user:
      jdoe:
        name: 'jdoe'
        enabled: true
        sudo: true
        shell: /bin/bash
        full_name: 'Jonh Doe'
        home: '/home/jdoe'
        email: 'jonh@doe.com'
      jsmith:
        name: 'jsmith'
        enabled: true
        full_name: 'Password'
        home: '/home/jsmith'
        password: userpassword
```

Linux package installation

Install latest version

```
linux:
  system:
    ...
    package:
      package-name:
        version: latest
```

Linux package with specified version and repository

```
linux:
  system:
    ...
    package:
      package-name:
        version: 2132.323
        repo: 'custom-repo'
        hold: true
```

Linux package with specified version and repository - disable GPG check

```
linux:
  system:
    ...
    package:
      package-name:
        version: 2132.323
        repo: 'custom-repo'
        verify: false
```

Linux cron job

```
linux:
  system:
    ...
    job:
      cmd1:
        command: '/cmd/to/run'
        enabled: true
        user: 'root'
        hour: 2
        minute: 0
```

Linux security limits

Limit sensu user maximum memory usage to 1GB

```
linux:
  system:
    ...
    limit:
      sensu:
        enabled: true
        domain: sensu
        limits:
          - type: hard
            item: as
            value: 1000000
```

Enable autologin on tty1

```
linux:
  system:
    console:
      tty1:
        autologin: root
```

Linux Kernel setup

Install always up to date LTS kernel and headers from Ubuntu trusty

```
linux:
  system:
    kernel:
      type: generic
      lts: trusty
      headers: true
```

Install specific kernel version and ensure all other kernel packages are not present. Also install extra modules and headers for this kernel

```
linux:
  system:
    kernel:
      type: generic
      extra: true
      headers: true
      version: 4.2.0-22
```

Linux repositories setup

RedHat based Linux with additional OpenStack repo

```
linux:
  system:
    ...
    repo:
      rdo-icehouse:
        enabled: true
        source: 'https://repos.fedorapeople.org/repos/openstack/openstack-kilo/el7/'
        pgpcheck: 0
```

Ensure system repository to use czech Debian mirror (default: true) Also pin it's packages with priority 900

```
linux:
  system:
    repo:
      debian:
        default: true
        source: "deb http://ftp.cz.debian.org/debian/ jessie main contrib non-free"
        # Import signing key from URL if needed
        key_url: "http://dummy.com/public.gpg"
        pin:
          - pin: 'origin "ftp.cz.debian.org"'
            priority: 900
            package: '*'
```

rc.local example

```
linux:
  system:
    rc:
      local: |
        #!/bin/sh -e
        #
        # rc.local
        #
        # This script is executed at the end of each multiuser runlevel.
        # Make sure that the script will "exit 0" on success or any other
        # value on error.
        #
        # In order to enable or disable this script just change the execution
        # bits.
        #
        # By default this script does nothing.
        exit 0
```

Linux prompt setup

Setting prompt is implemented by creating /etc/profile.d/prompt.sh. Every user can have different prompt

```
linux:
  system:
    prompt:
      root: \\n\\[\\033[0;37m\\]\\D{%y/%m/%d %H:%M:%S} $(hostname -
↪f)\\[\\e[0m\\]\\n\\[\\e[1;31m\\][\\u@\\h:\\w]\\[\\e[0m\\]
      default: \\n\\D{%y/%m/%d %H:%M:%S} $(hostname -f)\\n[\\u@\\h:\\w]
```

Linux network setup

Linux interface/route setup

Linux with default static network interfaces, default gateway interface and DNS servers

```
linux:
  network:
    enabled: true
    interface:
      eth0:
        enabled: true
        type: eth
        address: 192.168.0.102
        netmask: 255.255.255.0
        gateway: 192.168.0.1
        name_servers:
        - 8.8.8.8
        - 8.8.4.4
        mtu: 1500
```

Linux with bonded interfaces and disabled NetworkManager

```
linux:
  network:
    enabled: true
    interface:
      eth0:
        type: eth
        ...
      eth1:
        type: eth
        ...
      bond0:
        enabled: true
        type: bond
        address: 192.168.0.102
        netmask: 255.255.255.0
        mtu: 1500
        use_in:
        - interface: ${linux:interface:eth0}
        - interface: ${linux:interface:eth0}
    network_manager:
      disable: true
```

Linux with vlan interface_params

```
linux:
  network:
    enabled: true
    interface:
      vlan69:
        type: vlan
        use_interfaces:
        - interface: ${linux:interface:bond0}
```

Linux networks with routes defined

```
linux:
  network:
    enabled: true
    gateway: 10.0.0.1
    default_interface: eth0
    interface:
      eth0:
        type: eth
        route:
          default:
            address: 192.168.0.123
            netmask: 255.255.255.0
            gateway: 192.168.0.1
```

Linux network bridges

Native linux bridges

```
linux:
  network:
    interface:
      eth1:
        enabled: true
        type: eth
        proto: manual
        up_cmds:
        - ip address add 0/0 dev $IFACE
        - ip link set $IFACE up
        down_cmds:
        - ip link set $IFACE down
      br-ex:
        enabled: true
        type: bridge
        address: ${linux:network:host:public_local:address}
        netmask: 255.255.255.0
        use_interfaces:
        - eth1
```

OpenVSwitch bridges

```
linux:
  network:
    bridge: openvswitch
```

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```
    interface:
      eth1:
        enabled: true
        type: eth
        proto: manual
        up_cmds:
        - ip address add 0/0 dev $IFACE
        - ip link set $IFACE up
        down_cmds:
        - ip link set $IFACE down
      br-ex:
        enabled: true
        type: bridge
        address: ${linux:network:host:public_local:address}
        netmask: 255.255.255.0
        use_interfaces:
        - eth1
```

Other network related configuration

Linux with network manager

```
linux:
  network:
    enabled: true
    network_manager: true
```

/etc/hosts configuration

```
linux:
  network:
    ...
    host:
      node1:
        address: 192.168.10.200
        names:
        - node2.domain.com
        - service2.domain.com
      node2:
        address: 192.168.10.201
        names:
        - node2.domain.com
        - service2.domain.com
```

/etc/resolv.conf configuration

```
linux:
  network:
    resolv:
      dns:
        - 8.8.4.4
        - 8.8.8.8
      domain: my.example.com
      search:
```

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```
        - my.example.com
        - example.com
```

Linux storage setup

Linux with mounted Samba

```
linux:
  storage:
    enabled: true
    mount:
      samba1:
      - path: /media/myuser/public/
      - device: //192.168.0.1/storage
      - file_system: cifs
      - options: guest,uid=myuser,iocharset=utf8,file_mode=0777,dir_mode=0777,noperm
```

Linux with file swap

```
linux:
  storage:
    enabled: true
    swap:
      file:
        enabled: true
        engine: file
        device: /swapfile
        size: 1024
```

LVM group vg1 with one device and data volume mounted into /mnt/data

```
linux:
  storage:
    mount:
      data:
        device: /dev/vg1/data
        file_system: ext4
        path: /mnt/data
    lvm:
      vg1:
        enabled: true
        devices:
          - /dev/sdb
        volume:
          data:
            size: 40G
            mount: ${linux:storage:mount:data}
```

OpenSSH client

OpenSSH client with shared private key

```
openssh:
  client:
    enabled: true
    user:
      root:
        enabled: true
        private_key: ${private_keys:vaio.newt.cz}
        user: ${linux:system:user:root}
```

OpenSSH client with individual private key and known host

```
openssh:
  client:
    enabled: true
    user:
      root:
        enabled: true
        user: ${linux:system:user:root}
        known_hosts:
        - name: repo.domain.com
          type: rsa
          fingerprint: dd:fa:e8:68:b1:ea:ea:a0:63:f1:5a:55:48:e1:7e:37
```

OpenSSH server

OpenSSH server with configuration parameters

```
openssh:
  server:
    enabled: true
    permit_root_login: true
    public_key_auth: true
    password_auth: true
    host_auth: true
    banner: Welcome to server!
```

OpenSSH server with auth keys for users

```
openssh:
  server:
    enabled: true
    ...
    user:
      user1:
        enabled: true
        user: ${linux:system:user:user1}
        public_keys:
        - ${public_keys:user1}
      root:
        enabled: true
        user: ${linux:system:user:root}
        public_keys:
        - ${public_keys:user1}
```

OpenSSH server for use with FreeIPA

```
openssh:
  server:
    enabled: true
    public_key_auth: true
    authorized_keys_command:
      command: /usr/bin/sss_ssh_authorizedkeys
      user: nobody
```

Salt minion configuration

Simple Salt minion

```
salt:
  minion:
    enabled: true
    master:
      host: master.domain.com
```

Multi-master Salt minion

```
salt:
  minion:
    enabled: true
    masters:
    -  host: master1.domain.com
    -  host: master2.domain.com
```

Salt minion with salt mine options

```
salt:
  minion:
    enabled: true
    master:
      host: master.domain.com
    mine:
      interval: 60
      module:
        grains.items: []
        network.interfaces: []
```

Salt minion with graphing dependencies

```
salt:
  minion:
    enabled: true
    graph_states: true
    master:
```

NTP client

```
ntp:
  client:
    enabled: true
```

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```
    strata:
    - ntp.cesnet.cz
    - ntp.nic.cz
```

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2.3.3 Monitoring

Chapter 3. Monitoring

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Monitoring, Metering and Logging

The overall health of the systems is measured continuously. The metering system collects metrics from the systems and store them in time-series database for furher evaluation and analysys. The log collecting system collects logs from all systems, transforms them to unified form and stores them for analysis. The monitoring system checks for functionality of separate systems and raises events in case of threshold breach. The monitoring systems may query log and time-series databases for accident patterns and raise an event if anomaly is detected.

The difference between monitoring and metering systems

Monitoring is generally used to check for functionality on the overall system and to figure out if the hardware for the overall installation and usage needs to be scaled up. With monitoring, we also do not care that much if we have lost some samples in between. Metering is required for information gathering on usage as a base for resource utilisation. Many monitoring checks are simple meter checks with threshold definitions.

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Event Monitoring

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Monitoring Service (Sensu)

Sensu is often described as the "monitoring router". Essentially, Sensu takes the results of "check" scripts run across many systems, and if certain conditions are met, passes their information to one or more "handlers". Checks are used, for example, to determine if a service like Apache is up or down. Checks can also be used to collect data, such as MySQL query statistics or Rails application metrics. Handlers take actions, using result information, such as sending an email, messaging a chat room, or adding a data point to a graph. There are several types of handlers, but the most common and most powerful is "pipe", a script that receives data via standard input. Check and handler scripts can be written in any language, and the community repository continues to grow!

Sensu properties:

- Written in Ruby, using EventMachine
- Great test coverage with continuous integration via Travis CI
- Can use existing Nagios plugins
- Configuration all in JSON
- Has a message-oriented architecture, using RabbitMQ and JSON payloads
- Packages are "omnibus", for consistency, isolation, and low-friction deployment

Sensu embraces modern infrastructure design, works elegantly with configuration management tools, and is built for the cloud.

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Collecting Telemetry Data

Gathering metrics and other values. There are three basic types of meters that are stored in the time-series database.

Cumulative

Increasing over time (network or disk usage counters)

Gauge

Discrete items (number of connected users) and fluctuating values (system load)

Delta

Values changing over time (bandwidth)

Collectd/Graphite

Collectd gathers statistics about the system it is running on and stores this information. Those statistics can then be used to find current performance bottlenecks (i.e. performance analysis) and predict future system load (i.e. capacity planning). It's written in C for performance and portability, allowing it to run on systems without scripting language or cron daemon, such as embedded systems. At the same time it includes optimizations and features to handle hundreds of thousands of data sets. It comes with over 90 plugins which range from standard cases to very specialized and advanced topics. It provides powerful networking features and is extensible in numerous ways

Graphite is an enterprise-scale monitoring tool that runs well on cheap hardware. It was originally designed and written by Chris Davis at Orbitz in 2006 as side project that ultimately grew to be a foundational monitoring tool. In 2008, Orbitz allowed Graphite to be released under the open source Apache 2.0 license. Since then Chris has continued to work on Graphite and has deployed it at other companies including Sears, where it serves as a pillar of the e-commerce monitoring system. Today many large companies use it.

What Graphite does not do is collect data for you, however there are some tools out there that know how to send data to graphite. Even though it often requires a little code, sending data to Graphite is very simple.

Graphite consists of 3 software components:

- carbon - a Twisted daemon that listens for time-series data
- whisper - a simple database library for storing time-series data (similar in design to RRD)
- graphite - A Django webapp that renders graphs on-demand using Cairo

Graphite Metrics Functions

The metrics can be adjusted by applying functions on them within the Graphite composer. Aside the ability to store time-series data Graphite has a lot of additional functions that can be used to alter time-series data to more appropriate form, if we want to get the delta from the cumulative metrics or ad vice versa.

integral(seriesList)

This will show the sum over time, sort of like a continuous addition function. Useful for finding totals or trends in metrics that are collected per minute.

Example:

```
&target=integral(company.sales.perMinute)
```

This would start at zero on the left side of the graph, adding the sales each minute, and show the total sales for the time period selected at the right side, (time now, or the time specified by '&until=').

derivative(seriesList)

This is the opposite of the integral function. This is useful for taking a running total metric and calculating the delta between subsequent data points.

This function does not normalize for periods of time, as a true derivative would. Instead see the perSecond() function to calculate a rate of change over time.

Example:

```
&target=derivative(company.server.application01.ifconfig.TXPackets)
```

sumSeries(*seriesLists)

Short form: sum()

This will add metrics together and return the sum at each datapoint. (See integral for a sum over time)

Example:

```
&target=sum(company.server.application*.requestsHandled)
```

This would show the sum of all requests handled per minute (provided requestsHandled are collected once a minute). If metrics with different retention rates are combined, the coarsest metric is graphed, and the sum of the other metrics is averaged for the metrics with finer retention rates.

Read more about functions at http://graphite.readthedocs.org/en/latest/functions.html#module-graphite.render.functions

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Collecting Log Events

Our logging stack currently contains following services:

- Heka - log collection, streaming and processing
- Rabbitmq - amqp message broker
- Elasticsearch - indexed log storage

- Kibana - UI for log analysis

Heka

Heka is an open source stream processing software system developed by Mozilla. Heka is a "Swiss Army Knife" type tool for data processing, useful for a wide variety of different tasks, such as:

- Loading and parsing log files from a file system.
- Accepting statsd type metrics data for aggregation and forwarding to upstream time series data stores such as graphite or InfluxDB.
- Launching external processes to gather operational data from the local system.
- Performing real time analysis, graphing, and anomaly detection on any data flowing through the Heka pipeline.
- Shipping data from one location to another via the use of an external transport (such as AMQP) or directly (via TCP).
- Delivering processed data to one or more persistent data stores.

ElasticSearch

Elasticsearch is a search server based on Lucene.It provides a distributed, multitenant-capable full-text search engine with an HTTP web interface and schema-free JSON documents.

Kibana Dashboard

Kibana is an open source data visualization plugin for Elasticsearch. It provides visualization capabilities on top of the content indexed on an Elasticsearch cluster. Users can create bar, line and scatter plots, or pie charts and maps on top of large volumes of data.

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2.3.4 Use cases

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Use Case: Kubernetes

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Use Case: Openstack

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