Puppet Documentation

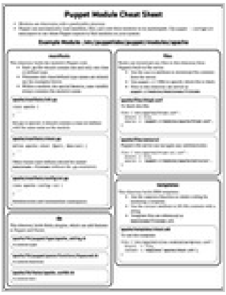
(Generated on July 01, 2013, from git revision 46784ac1656bd7b57fcfb51d0865ec7ff65533d9)

This is the documentation for Puppet, the industry-leading configuration management toolkit. Most of the content here applies equally to Puppet Enterprise and open source releases of Puppet.

Drive-Thru

Small documents for getting help fast.

Core Types Cheat Sheet



Puppet Module Cheat Sheet

- Core Types Cheat Sheet — A double-sided reference to the most common resource types. (HTML version)
- Module Cheat Sheet — A one-page reference to Puppet module layout, covering classes and defined types, files, templates, and plugins. (HTML version)
- Frequently Asked Questions
- Glossary

Learning Puppet

Learn to use Puppet! New users: start here.

- Introduction and Index

- Introduction
- Part one: Serverless Puppet
  - Resources and the RAL
  - Manifests
  - Ordering
  - Variables, Conditionals, Facts
  - Modules and Classes
  - Templates
  - Class Parameters
  - Defined Types

- Part two: Master/Agent Puppet
  - Preparing an Agent VM
  - Basic Agent/Master Puppet

Reference Shelf

Puppet 3 Reference Manual

A concise reference to Puppet 3’s usage and internals. Use the left sidebar of any reference manual page to navigate between pages.

- Overview
- Language
- Modules

Puppet 2.7 Reference Manual

A concise reference to Puppet 2.7’s usage and internals. Use the left sidebar of any reference manual page to navigate between pages.

- Table of Contents
- Language — A complete reference to the Puppet language.
- Modules

Miscellaneous References

- HTTP API — reference of API-accessible resources
- Puppet Language Guide — an older version of the Puppet reference manual’s language reference
- Puppet Manpages — detailed help for each Puppet application

Generated References

Complete and up-to-date references for Puppet’s resource types, functions, metaparameters, configuration options, indirection termini, and reports, served piping hot directly from the source□ code.

- Resource Types — all default types
- Functions — all built in functions
- Metaparameters — all type-independent resource attributes
- Configuration□— all configuration file settings□
- Report — all available report handlers

These references are automatically generated from the inline documentation in Puppet’s source code. References generated from each version of Puppet are archived here:

- Versioned References — inline reference docs from Puppet’s past and present

Puppet Guides

Learn about different areas of Puppet, fix problems, and design solutions.□

Components

Learn more about major working parts of the Puppet system.

- Puppet commands: master, agent, apply, resource, and more — components of the system

Installing and Configuring□

Get Puppet up and running at your site.

- An Introduction to Puppet
- Supported Platforms
- Installing Puppet — from packages, source, or gems
- Upgrading Puppet — general advice and suggestions for upgrading critical infrastructure
- Configuring Puppet□— use `puppet.conf` to configure Puppet's behavior□
- Setting Up Puppet — includes server setup & testing

Basic Features and Use

- Puppet Language Guide — all the language details
- Module Fundamentals — nearly all Puppet code should be in modules.
- Installing Modules from the Puppet Forge — save time by using pre-existing modules
- Techniques — common design patterns, tips, and tricks
- Troubleshooting — avoid common problems and confusions
- Parameterized Classes — use parameterized classes to write more effective, versatile, and□ encapsulated code
- Module Smoke Testing — write and run basic smoke tests for your modules
- Scope and Puppet — understand and banish dynamic lookup warnings with Puppet 2.7
- Puppet File Serving — serving files with Puppet□
- Style Guide — Puppet community conventions
- Best Practices — use Puppet effectively□

Puppet on Windows

Manage Windows nodes side by side with your *nix infrastructure, with Puppet 2.7 and higher (including Puppet Enterprise ≥ 2.5).

- Overview
- Installing Puppet on Windows
- Running Puppet on Windows
- Writing Manifests for Windows
- Troubleshooting Puppet on Windows
- Developers Only: Running Puppet from Source on Windows

Tuning and Scaling

Puppet's default configuration is meant for prototyping and designing a site. Once you're ready for□ production deployment, learn how to adjust Puppet for peak performance.

- Scaling Puppet — general tips & tricks
- Using Multiple Puppet Masters — a guide to deployments with multiple Puppet masters
- Scaling With Passenger — for Puppet 0.24.6 and later
- Scaling With Mongrel — for older versions of Puppet

Advanced Features

Go beyond basic manifests.

- Templating — template out config files using ERB
- Virtual Resources
- Exported Resources — share data between hosts
- Environments — separate dev, stage, & production
- Reporting — learn what your nodes are up to
- Getting Started With Cloud Provisioner — create and bootstrap new nodes with the experimental cloud provisioner extension
- Publishing Modules on the Puppet Forge — preparing your best modules to go public

Hacking and Extending

Build your own tools and workflows on top of Puppet.

USING THE PUPPET DATA LIBRARY

- Puppet Data Library: Overview — Puppet automatically gathers reams of data about your infrastructure. Learn where that data is, how to access it, and how to mine it for knowledge.
- Inventory Service — use Puppet's inventory of nodes at your site in your own custom applications

USING APIS AND INTERFACES

- HTTP Access Control — secure API access with `auth.conf`
- External Nodes — specify what your machines do using external data sources

USING RUBY PLUGINS

- Plugins In Modules — where to put plugins, how to sync to clients
- Writing Custom Facts
- Writing Custom Functions
- Writing Custom Types & Providers
- Complete Resource Example — more information on custom types & providers
- Provider Development — more about providers

DEVELOPING PUPPET

- Running Puppet from Source — preview the leading edge
- Development Life Cycle — learn how to contribute code
- Puppet Internals — understand how Puppet works internally

Other Resources

- Puppet Wiki & Bug Tracker
- Puppet Patterns (Recipes)

Tools

This guide covers the major tools that comprise Puppet.

Single binary

Starting with Puppet 2.6, Puppet uses a single `puppet` binary with multiple subcommands, in the style of Git. Each of the pre-2.6 commands corresponds directly to one of the new subcommands.

> Note: As of Puppet 3, the old standalone commands have been removed completely. Note also that `puppet` without any subcommand will no longer default to puppet apply.

Pre-2.6	Post-2.6
puppetmasterd	puppet master
puppetd	puppet agent
puppet	puppet apply
puppetca	puppet cert
ralsh	puppet resource
puppetrun	puppet kick
puppetqd	puppet queue
filebucket□	puppet filebucket□
puppetdoc	puppet doc
pi	puppet describe

This also results in a change in the puppet.conf configuration file. The sections, previously things□ like [puppetd], now should be renamed to match the new binary names. So [puppetd] becomes [agent]. You will be prompted to do this when you start Puppet. A log message will be generated for each section that needs to be renamed. This is merely a warning – existing configuration file will□ work unchanged.

Manpage documentation

Additional information about each tool is provided in the relevant manpage. You can consult the local version of each manpage, or view the web versions of the manuals.

puppet master (or puppetmasterd)

Puppet master is a central management daemon. In most installations, you'll have one puppet master server and each managed machine will run puppet agent. By default, puppet master operates a certificate authority, which can be managed using puppet cert.□

Puppet master serves compiled configurations, files, templates, and custom plugins to managed□ nodes.

The main configuration file for puppet master, puppet agent, and puppet apply is□ `/etc/puppet/puppet.conf`, which has sections for each application.

puppet agent (or puppetd)

Puppet agent runs on each managed node. By default, it will wake up every 30 minutes (configurable), check in with puppetmasterd, send puppetmasterd new information about the system (facts), and receive a ‘compiled catalog’ describing the desired system configuration. Puppet agent is then responsible for making the system match the compiled catalog. If `pluginsync` is enabled in a given node’s configuration, custom plugins stored on the Puppet Master server are transferred to it automatically.

The puppet master server determines what information a given managed node should see based on its unique identifier (“certname”); that node will not be able to see configurations intended for other machines.

puppet apply (or puppet)

When running Puppet locally (for instance, to test manifests, or in a non-networked disconnected case), puppet apply is run instead of puppet agent. It then uses local files, and does not try to contact the central server. Otherwise, it behaves the same as puppet agent.

puppet cert (or puppetca)

The puppet cert command is used to sign, list and examine certificates used by Puppet to secure the connection between the Puppet master and agents. The most common usage is to sign the certificates of Puppet agents awaiting authorisation:

```
> puppet cert --list
agent.example.com

> puppet cert --sign agent.example.com
```

You can also list all signed and unsigned certificates:

```
> puppet cert --all and --list
+ agent.example.com
agent2.example.com
```

Certificates with a + next to them are signed. All others are awaiting signature.

puppet doc (or puppetdoc)

Puppet doc generates documentation about Puppet and your manifests, which it can output in HTML, Markdown and RDoc.

puppet resource (or ralsh)

Puppet resource (also known as `ralsh`, for “Resource Abstraction Layer SHell”) uses Puppet’s resource abstraction layer to interactively view and manipulate your local system.

For example, to list information about the user ‘xyz’:

```
> puppet resource User "xyz"

user { 'xyz':
   home => '/home/xyz',
   shell => '/bin/bash',
   uid => '1000',
   comment => 'xyz,,,',
   gid => '1000',
   groups =>
['adm','dialout','cdrom','sudo','plugdev','lpadmin','admin','sambashare','libvirtd

   ensure => 'present'
}
```

It can also be used to make additions and removals, as well as to list resources found on a system:

```
> puppet resource User "bob" ensure=present group=admin

notice: /User[bob]/ensure: created
user { 'bob':
    shell => '/bin/sh',
    home => '/home/bob',
    uid => '1001',
    gid => '1001',
    ensure => 'present',
    password => '!'
}

> puppet resource User "bob" ensure=absent
...

> puppet resource  User
...
```

Puppet resource is most frequently used as a learning tool, but it can also be used to avoid memorizing differences in common commands when maintaining multiple platforms. (Note that puppet resource can be used the same way on OS X as on Linux, e.g.)

puppet inspect

Puppet inspect generates an inspection report and sends it to the puppet master. It cannot be run as a daemon.

Inspection reports differ from standard Puppet reports, as they do not record the actions taken by Puppet when applying a catalog; instead, they document the current state of all resource attributes which have been marked as auditable with the `audit` metaparameter. (The most recent cached catalog is used to determine which resource attributes are auditable.)

Inspection reports are handled identically to standard reports, and must be differentiated at parse time by your report tools; see the report format documentation for more details. Although a future version of Puppet Dashboard will support viewing of inspection reports, Puppet Labs does not currently ship any inspection report tools.

Puppet inspect was added in Puppet 2.6.5.

facter

Puppet agent nodes use a library (and associated front-end tool) called facter to provide information about the hardware and OS (version information, IP address, etc) to the puppet master server. These facts are exposed to Puppet manifests as global variables, which can be used in conditionals, string expressions, and templates. To see a list of the facts any node offers, simply open a shell session on that node and run `facter`. Facter is included with (and required by) all Puppet installations.

Introduction to Puppet

Why Puppet

As system administrators acquire more and more systems to manage, automation of mundane tasks is increasingly important. Rather than develop in-house scripts, it is desirable to share a system that everyone can use, and invest in tools that can be used regardless of one's employer. Certainly doing things manually doesn't scale.

Puppet has been developed to help the sysadmin community move to building and sharing mature tools that avoid the duplication of everyone solving the same problem. It does so in two ways:

- It provides a powerful framework to simplify the majority of the technical tasks that sysadmins need to perform
- The sysadmin work is written as code in Puppet's custom language which is shareable just like any other code.

This means that your work as a sysadmin can get done much faster, because you can have Puppet handle most or all of the details, and you can download code from other sysadmins to help you get done even faster. The majority of Puppet implementations use at least one or two modules developed by someone else, and there are already hundreds of modules developed and shared by the community.

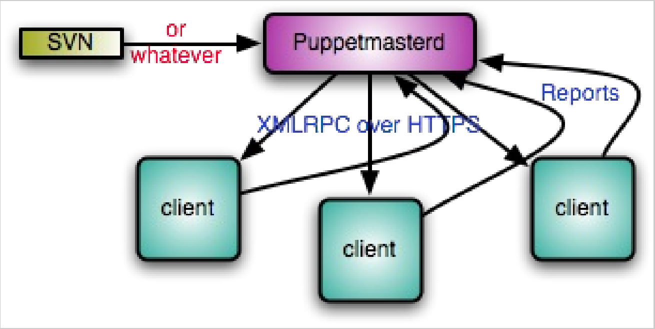
Learning Recommendations

We're glad you want to learn Puppet. You're free to browse around the documentation as you like, though we generally recommend trying out Puppet locally first (without the daemon and client/server setup), so you can understand the basic concepts. From there, move on to centrally managed server infrastructure. Ralsh is also a great way to get your feet wet exploring the Puppet model, after you have read some of the basic information — you can quickly see how the declarative model works for simple things like users, services, and file permissions.

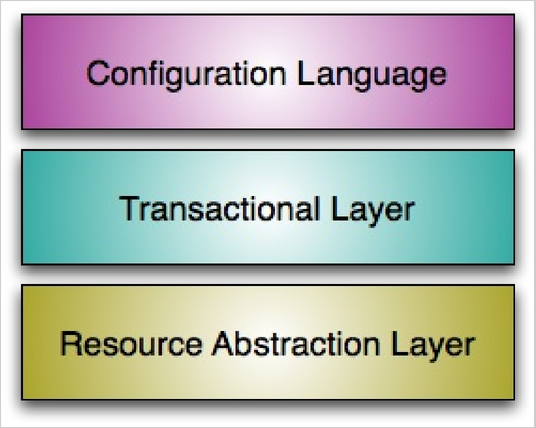
Once you've learned the basics, make sure you understand classes and modules, then move on to the advanced sections and read more about the features that are useful to you. Learning all at once is definitely not required. If you find something confusing, file a ticket or email us at faq@puppetlabs.com to let us know.

System Components

Puppet is typically (but not always) used in a client/server formation, with all of your clients talking to one or more central servers. Each client contacts the server periodically (every half hour, by default), downloads the latest configuration, and makes sure it is in sync with that configuration. Once done, the client can send a report back to the server indicating if anything needed to change. This diagram shows the data flow in a regular Puppet implementation:



Puppet's functionality is built as a stack of separate layers, each responsible for a fixed aspect of the system, with tight controls on how information passes between layers:



See also Configuring Puppet. For more information about components (puppetmasterd, puppetd, puppet, and so on), see the Tools section.

Features of the System

Idempotency

One big difference between Puppet and most other tools is that Puppet configurations are idempotent, meaning they can safely be run multiple times. Once you develop your configuration, your machines will apply the configuration often — by default, every 30 minutes — and Puppet will only make any changes to the system if the system state does not match the configured state.

If you tell the system to operate in no-op ("aka dry-run"), mode, using the `--noop` argument to one of the Puppet tools, puppet will guarantee that no work happens on your system. Similarly, if any changes do happen when running without that flag, puppet will ensure those changes are logged.

Because of this, you can use Puppet to manage a machine throughout its lifecycle — from initial installation, to ongoing upgrades, and finally to end-of-life, where you move services elsewhere. Unlike system install tools like Sun's Jumpstart or Red Hat's Kickstart, Puppet configurations can keep machines up to date for years, rather than just building them correctly only the first time and then neccessitating a rebuild. Puppet users usually do just enough with their host install tools to boostrap Puppet, then they use Puppet to do everything else.

Cross Platform

Puppet's Resource Abstraction Layer (RAL) allows you to focus on the parts of the system you care about, ignoring implementation details like command names, arguments, and file formats — your tools should treat all users the same, whether the user is stored in NetInfo or `/etc/passwd`. We call these system entities `resources`.

Ralsh, listed in the Tools section is a fun way to try out the RAL before you get too deep into Puppet language.

Model & Graph Based

RESOURCE TYPES

The concept of each resource (like service, file, user, group, etc) is modelled as a "type". Puppet decouples the definition from how that implementation is fulfilled on a particular operating system, for instance, a Linux user versus an OS X user can be talked about in the same way but are implemented differently inside of Puppet.

See the types reference for a list of managed types and information about how to use them.

PROVIDERS

Providers are the fulfillment of a resource. For instance, for the package type, both 'yum' and 'apt' are valid ways to manage packages. Sometimes more than one provider will be available on a particular platform, though each platform always has a default provider. There are currently 17 providers for the package type.

MODIFYING THE SYSTEM

Puppet resource providers are what are responsible for directly managing the bits on disk. You do not directly modify a system from Puppet language — you use the language to specify a resource, which then modifies the system. This way puppet language behaves exactly the same way in a centrally managed server setup as it does locally without a server. Rather than tacking a couple of lines onto the end of your `fstab`, you use the `mount` type to create a new resource that knows how to modify the `fstab`, or NetInfo, or wherever mount information is kept.

Resources have attributes called 'properties' which change the way a resource is managed. For instance, users have an attribute that specifies whether the home directory should be created.

'Metaparams' are another special kind of attribute, those exist on all resources. This include things like the log level for the resource, whether the resource should be in `noop` mode so it never modifies the system, and the relationships between resources.

RESOURCE RELATIONSHIPS

Puppet has a system of modelling relationships between resources — what resources should be evaluated before or after one another. They also are used to determine whether a resource needs to respond to changes in another resource (such as if a service needs to restart if the configuration file for the service has changed). This ordering reduces unneccessary commands, such as avoiding restarting a service if the configuration has not changed.

Because the system is graph based, it's actually possible to generate a diagram (from Puppet) of the relationships between all of your resources.

Learning The Language

Seeing a few examples in action will greatly help in learning the system.

For information about the Puppet language, see the excellent language guide

Puppet Open Source Supported Platforms

This page lists supported platforms for the open source version of Puppet. For Puppet Enterprise's supported platforms visit the PE system requirements page.

Please contact Puppet Labs if you are interested in a platform not on this list.

See Installing Puppet for more details about the packages available for your platform(s).

Puppet 2.6, 2.7, and 3 can run on the following platforms:

Linux

- Red Hat Enterprise Linux, version 4 and higher
- CentOS, version 4 and higher
- Scientific Linux, version 4 and higher
- Oracle Linux, version 4 and higher
- Debian, version 5 (Lenny) and higher
- Ubuntu, version 8.04 LTS and higher
- Fedora, version 15 and higher
- SUSE Linux Enterprise Server, version 11 and higher
- Gentoo Linux
- Mandriva Corporate Server 4
- ArchLinux

BSD

- FreeBSD 4.7 and later
- OpenBSD 4.1 and later

Other Unix

- Mac OS X, version 10.5 (Leopard) and higher (Puppet 2.7 and earlier also support 10.4)
- Oracle Solaris, version 10 and higher

- AIX, version 5.3 and higher
- HP-UX

Windows

- Windows Server 2003 and 2008 (Puppet version 2.7.6 and higher)
- Windows 7 (Puppet version 2.7.6 and higher)

Ruby Versions

Puppet requires an MRI Ruby interpreter. Certain versions of Ruby work better with Puppet than others, and some versions are not supported at all. Run `ruby --version` to check the version of Ruby on your system.

> Puppet Enterprise does not rely on the OS's Ruby version, as it maintains its own Ruby environment. You can install PE alongside any version of Ruby or on systems without Ruby installed.

> The Windows installers provided by Puppet Labs don't rely on the OS's Ruby version, and can be installed alongside any version of Ruby or on systems without Ruby installed.

Ruby version	Puppet 2.6	Puppet 2.7	Puppet 3.x
1.8.5*	Supported	Supported	No
1.8.7	Supported	Supported	Supported
1.9.3**	No	No	Supported
1.9.2	No	No	No
1.9.1	No	No	No
1.9.0	No	No	No
1.8.6	No	No	No
1.8.1	No	No	No

> * Note that although Ruby 1.8.5 is fully supported on Puppet 2.6 and 2.7, Ruby 1.8.7 generally gives better performance and memory use. To support the large installed base of RHEL5 systems which ship with Ruby 1.8.5, Puppet Labs packages a drop-in replacement Ruby 1.8.7 package. Read the 'Enterprise Linux and Derivatives' section of the Installing Puppet guide to learn how to install these packages.
>
> ** Ruby 1.9.3-p0 has bugs that cause a number of known issues with Puppet, and you should use a different release. To the best of our knowledge, these issues were fixed in the second public release of Ruby 1.9.3 (p125), and we are positive they are resolved in p392 (which ships with Fedora 18). Unfortunately, Ubuntu Precise ships with p0 for some reason, and there's not a lot we can do about it. If you're using Precise, we recommend using Puppet Enterprise or installing a third-party Ruby package.

Versions marked as “Supported” are recommended by Puppet Labs and are under extensive automated test coverage. Other versions are not recommended and we make no guarantees about their performance with Puppet.

Prerequisites

Puppet has a very small number of external dependencies:

Dependency	Puppet 2.x	Puppet 3.x
Facter	Required	Required
Hiera	Optional	Required
rgen		Optional

Rgen is only needed if you are using Puppet ≥ 3.2 with `parser = future` enabled. The official Puppet Labs packages will install it as a dependency.

All other prerequisite Ruby libraries should come with any standard Ruby 1.8.5+ install. Should your OS not come with the complete standard library (or you are using a custom Ruby build), these include:

- base64
- cgi
- digest/md5
- etc
- fileutils
- ipaddr
- openssl (>= 0.9.8o if using a 3.x Puppet master or newer)
- strscan
- syslog
- uri
- webrick
- webrick/https
- xmlrpc

Installing Puppet

Installing Puppet

This document covers open source releases of Puppet. See here for instructions on installing Puppet Enterprise.

Pre-Install

Check the following before you install Puppet.

OS/Ruby Version

- See the supported platforms guide.
- If your OS is older than the supported versions, you may still be able to run Puppet if you install an updated version of Ruby. See the list of supported Ruby versions.

Deployment Type

Decide on a deployment type before installing:

Agent/master

> Agent nodes pull their configurations from a puppet master server. Admins must manage node certificates, but will only have to maintain manifests and modules on the puppet master server(s), and can more easily take advantage of features like reporting and external data sources.
>
> You must decide in advance which server will be the master; install Puppet on it before installing on any agents. The master should be a dedicated machine with a fast processor, lots of RAM, and a fast disk.

Standalone

> Every node compiles its own configuration from manifests. Admins must regularly sync Puppet manifests and modules to every node.

Network

In an agent/master deployment, you must prepare your network for Puppet’s traffic.

- Firewalls: The puppet master server must allow incoming connections on port 8140, and agent nodes must be able to connect to the master on that port.
- Name resolution: Every node must have a unique hostname. Forward and reverse DNS must both be configured correctly. Instructions for configuring DNS are beyond the scope of this guide. If your site lacks DNS, you must write an `/etc/hosts` file on each node.

Note: The default master hostname is `puppet`. Your agent nodes will be ready sooner if this hostname resolves to your puppet master.

Installing Puppet

The best way to install Puppet varies by operating system. Use the links below to skip to your OS's instructions.

- Enterprise Linux (and Derivatives)
- Debian and Ubuntu
- Fedora
- Mac OS X
- Windows
- Installing from Gems (Not Recommended)
- Installing from a Tarball (Not Recommended)
- Running Directly from Source (Not Recommended)

Enterprise Linux (and Derivatives)

These instructions apply to Enterprise Linux (EL) variants, including but not limited to:

- Red Hat Enterprise Linux 5 and 6
- CentOS 5 and 6
- Scientific Linux 5 and 6□
- Ascendos 5 and 6

These distributions are also supported by Puppet Enterprise.

Users of out-of-production EL systems (i.e. RHEL 4) may need to compile their own copy of Ruby before installing, or use an older snapshot of EPEL.

1. CHOOSE A PACKAGE SOURCE

EL 5 and 6 releases can install Puppet from Puppet Labs' official repo, or from EPEL.

USING PUPPET LABS' PACKAGES

Puppet Labs provides an official package repo at yum.puppetlabs.com. It contains up-to-date packages, and can install Puppet and its prerequisites without requiring any other external repositories.

To use the Puppet Labs repo, follow the instructions here.

USING EPEL

The Extra Packages for Enterprise Linux (EPEL) repo includes Puppet and its prerequisites. These packages are usually older Puppet versions with security patches. As of April 2012, EPEL was shipping a Puppet version from the prior, maintenance-only release series.

To install Puppet from EPEL, follow EPEL's own instructions for enabling their repository on all of your target systems.

2. INSTALL THE PUPPET MASTER

Skip this step for a standalone deployment.

On your puppet master node, run `sudo yum install puppet-server`. This will install Puppet and an init script (`/etc/init.d/puppetmaster`) for running a test-quality puppet master server.

3. INSTALL PUPPET ON AGENT NODES

On your other nodes, run `sudo yum install puppet`. This will install Puppet and an init script (`/etc/init.d/puppet`) for running the puppet agent daemon.

For a standalone deployment, install this same package on all nodes.

4. CONFIGURE AND ENABLE

Continue reading here and follow any necessary post-install steps.

Debian and Ubuntu

These instructions apply to Debian, Ubuntu, and derived Linux distributions, including

- Debian 6 “Squeeze” (current stable release) (also supported by Puppet Enterprise)
- Debian “Wheezy” (current testing distribution)
- Debian “Sid” (current unstable distribution)
- Ubuntu 12.04 LTS “Precise Pangolin” (also supported by Puppet Enterprise)
- Ubuntu 10.04 LTS “Lucid Lynx” (also supported by Puppet Enterprise)
- Ubuntu 8.04 LTS “Hardy Heron”
- Ubuntu 12.10 “Quantal Quetzal”
- Ubuntu 11.10 “Oneiric Ocelot”

Users of out-of-production versions may have vendor packages of Puppet available, but cannot use the Puppet Labs packages.

1. CHOOSE A PACKAGE SOURCE

Debian and Ubuntu systems can install Puppet from Puppet Labs’ official repo, or from the OS vendor’s default repo.

USING PUPPET LABS’ PACKAGES

Puppet Labs provides an official package repo at apt.puppetlabs.com. It contains up-to-date packages, and can install Puppet and its prerequisites without requiring any other external repositories.

To use the Puppet Labs repo, follow the instructions here.

USING VENDOR PACKAGES

Debian and Ubuntu distributions include Puppet in their default package repos. No extra steps are necessary to enable it.

Older OS versions will have outdated Puppet versions, which are updated only with security patches. As of April 2012:

- Debian unstable’s Puppet was current.
- Debian testing’s Puppet was nearly current (one point release behind the current version).
- Debian stable’s Puppet was more than 18 months old, with additional security patches.
- The latest Ubuntu’s Puppet was nearly current (one point release behind).
- The prior (non-LTS) Ubuntu’s Puppet was nine months old, with additional security patches.
- The prior LTS Ubuntu’s Puppet was more than two years old, with additional security patches.

2. INSTALL THE PUPPET MASTER

Skip this step for a standalone deployment.

On your puppet master node, run `sudo apt-get install puppetmaster`. This will install Puppet, its prerequisites, and an init script (`/etc/init.d/puppetmaster`) for running a test-quality puppet master server.

If you are using vendor packages, a `puppetmaster-passenger` package may be available. If you install this package instead of `puppetmaster`, it will automatically configure a production-capacity web server for the Puppet master, using Passenger and Apache. In this configuration, do not use the puppetmaster init script; instead, control the puppet master by turning the Apache web server on and off or by disabling the puppet master vhost.

3. INSTALL PUPPET ON AGENT NODES

On your other nodes, run `sudo apt-get install puppet`. This will install Puppet and an init script (`/etc/init.d/puppet`) for running the puppet agent daemon.

For a standalone deployment, run `sudo apt-get install puppet-common` on all nodes instead. This will install Puppet without the agent init script.

4. CONFIGURE AND ENABLE

Continue reading here and follow any necessary post-install steps.

Fedora

These instructions apply to Fedora releases, including:

- Fedora 17
- Fedora 16

Users of out-of-production versions may have vendor packages of Puppet available, but cannot use the Puppet Labs packages.

1. CHOOSE A PACKAGE SOURCE

Fedora systems can install Puppet from Puppet Labs' official repo, or from the OS vendor's default repo.

USING PUPPET LABS' PACKAGES

Puppet Labs provides an official package repo at yum.puppetlabs.com. It contains up-to-date packages, and can install Puppet and its prerequisites without requiring any other external repositories.

To use the Puppet Labs repo, follow the instructions here.

USING VENDOR PACKAGES

Fedora includes Puppet in its default package repos. No extra steps are necessary to enable it.

These packages are usually older Puppet versions with security patches. As of April 2012, both current releases of Fedora had Puppet versions from the prior, maintenance-only release series.

2. INSTALL THE PUPPET MASTER

Skip this step for a standalone deployment.

On your puppet master node, run `sudo yum install puppet-server`. This will install Puppet and an init script (`/etc/init.d/puppetmaster`) for running a test-quality puppet master server.

3. INSTALL PUPPET ON AGENT NODES

On your other nodes, run `sudo yum install puppet`. This will install Puppet and an init script (`/etc/init.d/puppet`) for running the puppet agent daemon.

For a standalone deployment, install this same package on all nodes.

4. CONFIGURE AND ENABLE

Continue reading here and follow any necessary post-install steps.

Mac OS X

1. DOWNLOAD THE PACKAGE

OS X users should install Puppet with official Puppet Labs packages. Download them here. You will need:

- The most recent Facter package
- The most recent Hiera package
- The most recent Puppet package

2. INSTALL FACTER

Mount the Facter disk image, and run the installer package it contains.

3. INSTALL HIERA

Mount the Hiera disk image, and run the installer package it contains.

4. INSTALL PUPPET

Mount the Puppet disk image, and run the installer package it contains.

5. CONFIGURE AND ENABLE

The OS X packages are currently fairly minimal, and do not create launchd jobs, users, or default configuration or manifest files. You will have to:

- Manually create a `puppet` group, by running `sudo puppet resource group puppet ensure=present`.
- Manually create a `puppet` user, by running `sudo puppet resource user puppet ensure=present gid=puppet shell='/sbin/nologin'`.
- If you intend to run the puppet agent daemon regularly, or if you intend to automatically run puppet apply at a set interval, you must create and register your own launchd services. See the post-installation instructions for a model.

Continue reading here and follow any necessary post-install steps.

Windows

See the Windows installation instructions.

Installing from Gems (Not Recommended)

On *nix platforms without native packages available, you can install Puppet with Ruby’s `gem` package manager.

1. ENSURE PREREQUISITES ARE INSTALLED

Use your OS’s package tools to install both Ruby and RubyGems. In some cases, you may need to compile and install these yourself.

On Linux platforms, you should also ensure that the LSB tools are installed; at a minimum, we recommend installing `lsb_release`. See your OS’s documentation for details about its LSB tools.

2. INSTALL PUPPET

To install Puppet and Facter, run:

```
$ sudo gem install puppet
```

3. CONFIGURE AND ENABLE

Installing with gem requires some additional steps:

- Manually create a `puppet` group, by running `sudo puppet resource group puppet ensure=present`.
- Manually create a `puppet` user, by running `sudo puppet resource user puppet ensure=present gid=puppet shell='/sbin/nologin'`.
- Create and install init scripts for the puppet agent and/or puppet master services. See the `ext/` directory in the Puppet source for example init scripts (Red Hat, Debian, SUSE, systemd, FreeBSD, Gentoo, Solaris).
- Manually create an `/etc/puppet/puppet.conf` file.□
- Locate the Puppet source on disk, and manually copy the `auth.conf` file from the `/conf` directory to `/etc/puppet/auth.conf`.
- If you get the error `require: no such file to load` when trying to run Puppet, define the□ RUBYOPT environment variable as advised in the post-install instructions of the RubyGems User Guide.

Continue reading here and follow any necessary post-install steps.

Installing from a Tarball (Not Recommended)

This is almost never recommended, but may be necessary in some cases.

1. ENSURE PREREQUISITES ARE INSTALLED

Use your OS’s package tools to install Ruby. In some cases, you may need to compile and install it yourself.

On Linux platforms, you should also ensure that the LSB tools are installed; at a minimum, we recommend installing `lsb_release`. See your OS’s documentation for details about its LSB tools.

If you wish to use Puppet ≥ 3.2 with `parser = future` enabled, you should also install the `rgen` gem.

2. DOWNLOAD PUPPET AND FACTER

- Download Puppet here.
- Download Facter here.

3. INSTALL FACTER

Unarchive the Facter tarball, navigate to the resulting directory, and run:

```
$ sudo ruby install.rb
```

4. INSTALL PUPPET

Unarchive the Puppet tarball, navigate to the resulting directory, and run:

```
$ sudo ruby install.rb
```

5. CONFIGURE AND ENABLE

Installing from a tarball requires some additional steps:

- Manually create a `puppet` group, by running `sudo puppet resource group puppet ensure=present`.
- Manually create a `puppet` user, by running `sudo puppet resource user puppet ensure=present gid=puppet shell='/sbin/nologin'`.
- Create and install init scripts for the puppet agent and/or puppet master services. See the `ext/` directory in the Puppet source for example init scripts (Red Hat, Debian, SUSE, systemd, FreeBSD, Gentoo, Solaris).
- Manually create an `/etc/puppet/puppet.conf` file.□

Continue reading here and follow any necessary post-install steps.

Running Directly from Source (Not Recommended)

This is recommended only for developers and testers.

See Running Puppet from Source.

Post-Install

Perform the following tasks after you finish installing Puppet.□

Configure Puppet□

Puppet's main configuration file is found at `/etc/puppet/puppet.conf`. See Configuring Puppet□for more details.

Most users should specify the following settings:

ON AGENT NODES

Settings for agent nodes should go in the `[agent]` or `[main]` block of `puppet.conf`.

- `server`: The hostname of your puppet master server. Defaults to `puppet`.
- `report`: Most users should set this to `true`.
- `pluginsync`: Most users should set this to `true`.
- `certname`: The sitewide unique identifier for this node. Defaults to the node's fully qualified□ domain name, which is usually fine.□

ON PUPPET MASTERS

Settings for puppet master servers should go in the `[master]` or `[main]` block of `puppet.conf`.

> Note: puppet masters are usually also agent nodes; settings in `[main]` will be available to both services, and settings in the `[master]` and `[agent]` blocks will override the settings in `[main]`.

- `dns_alt_names`: A list of valid hostnames for the master, which will be embedded in its certificate. Defaults to the puppet master's `certname` and `puppet`, which is usually fine. If you are□ using a non-default setting, set it before starting the puppet master for the first time.□

ON STANDALONE NODES

Settings for standalone puppet nodes should go in the `[main]` block of `puppet.conf`.

Puppet's default settings are generally appropriate for standalone nodes. No additional configuration is necessary unless you intend to use centralized reporting or an external node classifier.□

Start and Enable the Puppet Services

Some packages do not automatically start the puppet services after installing the software. You may need to start them manually in order to use Puppet.

WITH INIT SCRIPTS

Most packages create init scripts called `puppet` and `puppetmaster`, which run the puppet agent and puppet master services.

You can start and permanently enable these services using Puppet:

```
$ sudo puppet resource service puppet ensure=running enable=true
$ sudo puppet resource service puppetmaster ensure=running enable=true
```

> Note: If you have configured puppet master to use a production web server, do not use the□ default init script; instead, start and stop the web server that is managing the puppet master service.

WITH CRON

Standalone deployments do not use services with init scripts; instead, they require a cron task to regularly run puppet apply on a main manifest (usually the same `/etc/puppet/manifests/site.pp` manifest that puppet master uses). You can create this cron job with Puppet:

```
$ sudo puppet resource cron puppet-apply ensure=present user=root minute=30
command='/usr/bin/puppet apply $(puppet --configprint manifest)'
```

In an agent/master deployment, you may wish to run puppet agent with cron rather than its init script; this can sometimes perform better and use less memory. You can create this cron job with Puppet:

```
$ sudo puppet resource cron puppet-agent ensure=present user=root minute=30
command='/usr/bin/puppet agent --onetime --no-daemonize --splay'
```

WITH LAUNCHD

Apple recommends you use launchd to manage the execution of services and daemons. You can define a launchd service with XML property lists (plists), and manage it with the `launchctl` command line utility. If you'd like to use launchd to manage execution of your puppet master or agent, download the following files and copy each into `/Library/LaunchDaemons/`:

- com.puppetlabs.puppetmaster.plist (to manage launch of a puppet master)
- com.puppetlabs.puppet.plist (to manage launch of a puppet agent)

Set the correct owner and permissions on the files. Both must be owned by the root user and both must be writable only by the root user:

```
$ sudo chown root:wheel /Library/LaunchDaemons/com.puppetlabs.puppet.plist
$ sudo chmod 644 /Library/LaunchDaemons/com.puppetlabs.puppet.plist
$ sudo chown root:wheel
/Library/LaunchDaemons/com.puppetlabs.puppetmaster.plist
$ sudo chmod 644 /Library/LaunchDaemons/com.puppetlabs.puppetmaster.plist
```

Make launchd aware of the new services:

```
$ sudo launchctl load -w /Library/LaunchDaemons/com.puppetlabs.puppet.plist
$ sudo launchctl load -w
/Library/LaunchDaemons/com.puppetlabs.puppetmaster.plist
```

Note that the files we provide here are responsible only for initial launch of a puppet master or puppet agent at system start. How frequently each conducts a run is determined by Puppet's configuration, not the plists.

See the OS X `launchctl` man page for more information on how to stop, start, and manage launchd jobs.

Sign Node Certificates

In an agent/master deployment, an admin must approve a certificate request for each agent node before that node can fetch configurations. Agent nodes will request certificates the first time they attempt to run.

- Periodically log into the puppet master server and run `sudo puppet cert list` to view outstanding requests.
- Run `sudo puppet cert sign <NAME>` to sign a request, or `sudo puppet cert sign --all` to sign all pending requests.

An agent node whose request has been signed on the master will run normally on its next attempt.

Change Puppet Master's Web Server

In an agent/master deployment, you must configure the puppet master to run under a scalable web server after you have done some reasonable testing. The default web server is simpler to configure and better for testing, but cannot support real-life workloads.

A replacement web server can be configured at any time, and does not affect the configuration of agent nodes.

Next

Now that you have installed and configured Puppet:

Learn to Use Puppet

If you have not used Puppet before, you should read the Learning Puppet series and experiment, either with the Learning Puppet VM or with your own machines. This series will introduce the concepts underpinning Puppet, and will guide you through the process of writing Puppet code, using modules, and classifying nodes.

Install Optional Software

You can extend and improve Puppet with other software:

- Puppet Dashboard is an open-source report analyzer, node classifier, and web GUI for Puppet.
- The stdlib module adds extra functions, an easier way to write custom facts, and more.
- For Puppet 2.6 and 2.7, the Hiera data lookup tool can help you separate your data from your Puppet manifests and write cleaner code.
- User-submitted modules that solve common problems are available at the Puppet Forge. Search here first before writing a new Puppet module from scratch; you can often find something that matches your need or can be quickly hacked to do so.

Upgrading Puppet

Since Puppet is likely managing your entire infrastructure, it should be upgraded with care. This page describes our recommendations for upgrading Puppet.

Upgrade Intentionally

If you are using `ensure => latest` on the Puppet package or running large-scale package upgrade commands, you might receive a Puppet upgrade you were not expecting, especially if you subscribe to the Puppet Labs package repos, which always contain the most recent version of Puppet. We highly recommend avoiding unintentional upgrades. Although we try our best not to break things, especially between minor releases, Puppet has a lot of surface area, and bugs can and do slip in.

We recommend doing one of the following:

- Maintain your own package repositories, test new Puppet releases in a dev environment, and only introduce known-good versions into your production repo. Many sysadmins consider this to be best practice for any mission-critical packages.
- Use Apt's pinning feature or Yum's versionlock plugin to lock Puppet to a specific version, and only upgrade when you have a roll-out plan in place.

Apt Pinning Example

You can pin package versions by adding special .pref files to your system's `/etc/apt/preferences.d/` directory:

```
# /etc/apt/preferences.d/00-puppet.pref
Package: puppet puppet-common
Pin: version 2.7*
Pin-Priority: 501
```

This pref file will lock puppet and puppet-common to the latest 2.7 release — they will be upgraded when new 2.7.x releases are added, but will not jump a major version. It will also downgrade a Puppet 3 to Puppet 2.7 if the pin-priority of the Puppet 3 is less than 501 (the default is 500). A separate file could be used to pin puppetmaster and puppetmaster-common, or they could be added to the package list.

Yum Versionlock Example

Unfortunately, Yum versionlock is less flexible than Apt pinning: it can't allow bugfix upgrades, and can only lock specific versions. For this reason, maintaining your own repo is a more attractive option for RPM systems.

```
$ sudo yum install yum-versionlock
$ sudo yum install puppet-2.7.19
$ sudo yum versionlock puppet
```

These commands will install the versionlock plugin and lock Puppet to version 2.7.19. When you want to upgrade, edit `/etc/yum/pluginconf.d/versionlock.list` and remove the Puppet lock, then run:

```
$ sudo yum install puppet-<desired version>
$ sudo yum versionlock puppet
```

Always Upgrade the Puppet Master First

Older agent nodes can get catalogs from a newer puppet master. The inverse is not always true.

Use More Care With Major Releases

Upgrading to a new major release presents more possibility for things to go wrong, and we recommend extra caution.

Additional Precautions

When upgrading to a new major release, we recommend the following:

- Avoid jumping over a whole major release. If you are on Puppet 2.6, you should upgrade to Puppet 2.7 before going to 3.x, unless you are prepared to spend a lot of time fixing your manifests without a net.
- Read the release notes, in particular any sections that refer to "backwards-incompatible changes." Follow any specific recommendations for the new version. (Backwards-incompatible changes for Puppet 3.0.)
- If you tend to just upgrade everything for bug fix releases, use a more conservative roll-out plan for major ones.

The definition of a "major release" has occasionally changed:

Versioning in Puppet 3 and Later

Starting with Puppet 3, there are three kinds of Puppet release:

- Bug fix releases increment the last segment of the version number. (E.g. 3.0.1.) They are intended to fix bugs without introducing new features or breaking backwards compatibility. These releases should be safe to upgrade to, but you should test them anyway.
- Minor releases increment the middle segment of the version number. (E.g. 3.1.0.) They may introduce new features, but shouldn't break backwards compatibility.
- Major releases increment the first segment of the version number. (E.g. 3.0.0.) They may intentionally break backwards compatibility with previous versions, in addition to adding features and fixing bugs.

Versioning in Puppet 2.x

In the 2.x series:

- Minor releases are not distinguished from bug fix releases. A release that increments the last segment of the version number (e.g. 2.7.18) may or may not add new features or break small areas of backwards compatibility, and you must check the release notes to find out.
- Major releases increment the second segment of the version number. (E.g. 2.7.0.) They may intentionally break backwards compatibility with previous versions, in addition to adding features and fixing bugs.

Roll Out In Stages

When upgrading, especially between major versions, we recommend rolling out the upgrade in stages. Use one of the following three options:

Option 1: Spin Up Temporary Puppet Master, or Cull a Master From Your Load Balancer Pool

The best approach is to spin up a temporary puppet master, then point a few test nodes at it.

- If you run a multi-master site and can pull a puppet master out of the load balancer pool for temporary test duty, do that. Upgrade Puppet on it, and follow steps 5–10 below.
- If you run a multi-master site and use Puppet to configure new puppet masters, you can also spin up a new node and use Puppet to configure it. Upgrade Puppet on it, and follow steps 5–10 below.
- Otherwise, follow steps 1–10 below.

1. Provision a new node and install Puppet on it.
2. Set its `server` setting to the existing puppet master, and use `puppet agent --test` to request a certificate; sign the cert.
3. Provision the new puppet master by checking out your latest modules, manifests, and data from version control. If you use an ENC and/or PuppetDB or storeconfigs, configure the master to talk to those services.
4. In a terminal window, run `puppet master --no-daemonize --verbose`. This will run a puppet master in the foreground so you can easily see log messages and warnings. Use care to limit concurrent checkins on your test nodes; this WEBrick puppet master cannot handle sustained load.
5. Choose a subset of your nodes to test with the new master, or spin up new nodes. Upgrade Puppet to the new version on them, and change their `server` setting to point to the temporary puppet master.
6. Trigger a `puppet agent --test` run on every test node, so you can see log messages in the foreground. Look for changes to their resources; if you see anything you didn't expect, investigate it. If something seems dangerous and you can't figure it out, you may want to post to the Puppet users list or ask other users in #puppet on Freenode.
7. Check the log messages in the terminal window or log file on your puppet master. Look for warnings and deprecation notices.
8. Check the actual configurations of your test nodes. Make sure everything is still working as expected.
9. Repeat steps 5–8 with more test nodes if you're still not sure.
0. Revert the `server` setting on all test nodes. Decommission the temporary puppet master. Upgrade your production puppet master(s) by stopping their web server, upgrading the puppet package, and restarting their web server. Upgrade all your production nodes. (Most packaging systems allow you to use Puppet to upgrade Puppet.)

Option 2: Run Two Instances of Puppet Master at Once

You can also run a second instance of puppet master on your production puppet master server, using the same modules, manifests, data, ENC, and SSL configuration.

> Note: This is generally reliable, but has a small chance of yielding inaccurate results. (This problem would require a major version to remove a given code path but not fail hard when attempting to access the code path; we are not currently aware of a situation that would cause that.)

1. Download a tarball of the Puppet source code for the new version. Unzip it somewhere other than your normal Ruby library directory. (`tar -xf puppet-<version>`)
2. Open a root shell, which should stay open for the duration of this test. (`sudo -i`)
3. Change directory into the source tarball. (`cd puppet-<version>`)
4. Add the lib directory to your shell's RUBYLIB. (`export RUBYLIB=$(pwd)/lib:$RUBYLIB`)
5. Run `puppet master --no-daemonize --verbose --port 8141`. This will run a puppet master on a different port in the foreground so you can easily see log messages and warnings. Use care to

limit concurrent checkins on your test nodes; this WEBrick puppet master cannot handle sustained load.

6. Choose a subset of your nodes to test with the new master, or spin up new nodes. Upgrade Puppet to the new version on them, and change their `port` setting to point to 8141.
7. Trigger a `puppet agent --test` run on every test node, so you can see log messages in the foreground. Look for changes to their resources; if you see anything you didn't expect, investigate it. If something seems dangerous and you can't figure it out, you may want to post to the Puppet users list or ask other users in #puppet on Freenode.
8. Check the log messages in the terminal window on your puppet master. Look for warnings and deprecation notices.
9. Check the actual configurations of your test nodes. Make sure everything is still working as expected.

0. Repeat steps 6–9 with more test nodes if you're still not sure.

1. Revert the `port` setting on all test nodes. Kill the temporary puppet master process, delete the temporary copy of the puppet source. Upgrade your production puppet master(s) by stopping their web server, upgrading the puppet package, and restarting their web server. Upgrade all of your production nodes. (Most packaging systems allow you to use Puppet to upgrade Puppet.)

Option 3: Upgrade Master and Roll Back if Needed

For minor and bug fix releases, you can often take a simpler path. This is not universally recommended, but many users do it and survive.

1. Disable puppet agent on all of your production nodes. This is best done with MCollective and the puppetd plugin, which can stop the agent on all nodes in a matter of seconds.
2. Upgrade your puppet master(s) to the new version of Puppet by stopping their web server, upgrading the puppet package, and restarting their web server.
3. Choose a subset of your nodes to test with the new master, or spin up new nodes. Upgrade Puppet to the new version on them.
4. Trigger a `puppet agent --test` run on every test node, so you can see log messages in the foreground. Look for changes to their resources; if you see anything you didn't expect, investigate it. If something seems dangerous and you can't figure it out, you may want to post to the Puppet users list or ask other users in #puppet on Freenode.
5. Check your puppet master's log files. Look for warnings and deprecation notices.
6. Check the actual configurations of your test nodes. Make sure everything is still working as expected.
7. Repeat steps 3–6 with more test nodes if you're still not sure.
8. Do one of the following:
    - Upgrade Puppet and reactivate puppet agent on all of your production nodes.
    - Downgrade Puppet to a known-good version on your Puppet master and any test nodes.

Setting Up Puppet

Once Puppet is installed, learn how to set it up for initial operation.

Open Firewall Ports On Server and Agent Node

In order for the puppet master server to centrally manage agent nodes, you may need to open port 8140 for incoming tcp connections on the puppet master. Consult your firewall documentation for more details.

Configuration Files

The main configuration file for Puppet is `/etc/puppet/puppet.conf`. A package based installation file will have created this file automatically. Unlisted settings have reasonable defaults. To see all the possible values, you may run:

```
$ puppet --genconfig
```

Configure DNS (Optional)

The puppet agent looks for a server named `puppet` by default. If you choose, you can set up a puppet DNS CNAME record to avoid having to specify your puppet master hostname in the configuration of each agent node.

If you have local DNS zone files, you can add a CNAME record pointing to the server machine in the appropriate zone file.

```
puppet   IN   CNAME  crabcake.picnic.edu.
```

See the book "DNS and Bind" by Cricket Liu et al if you need help with CNAME records. After adding the CNAME record, restart your name server. You can also add a host entry in the `/etc/hosts` file on both the server and agent nodes.

For the server:

```
127.0.0.1 localhost.localdomain localhost puppet
```

For the agent nodes:

```
192.168.1.67 crabcake.picnic.edu crabcake puppet
```

NOTE: If you can ping the server by the name `puppet` but Syslog (for example `/var/log/messages`) on the agent nodes still has entries stating the puppet agent cannot connect to the server, verify port 8140 is open on the server.

Puppet Language Setup

Create Your Site Manifest

Puppet is a declarative system, so it does not make much sense to speak of "executing" Puppet programs or scripts. Instead, we choose to use the word manifest to describe our Puppet code, and we speak of applying those manifests to the managed systems. Thus, a manifest is a text document written in the Puppet language and meant to describe and result in a desired configuration.

Puppet assumes that you will have one central manifest capable of configuring an entire site, which we call the site manifest. You could have multiple, separate site manifests if you wanted, though if doing this each of them would need their own puppet servers. Individual system differences can be separated out, node by node, in the site manifest.

Puppet will start with `/etc/puppet/manifests/site.pp` as the primary manifest, so create `/etc/puppet/manifests` and add your manifest, along with any files it includes, to that directory. It is highly recommended that you use some form of version control (git, svn, etc) to keep track of changes to manifests.

Example Manifest

The site manifest can do as little or as much as you want. A good starting point is a manifest that makes sure that your sudoers file has the appropriate permissions:

```
    # site.pp
    file { "/etc/sudoers":
        owner => root, group => root, mode => 440
    }
```

For more information on how to create the site manifest, see the Manifests chapter of the Learning Puppet tutorial.

Start the Central Daemon

Most sites should only need one puppet master server. Puppet Labs will be publishing a document describing best practices for scale-out and failover, though there are various ways to address handling in larger infrastructures. For now, we'll explain how to work with the one server, and others can be added as needed.

First, decide which machine will be the central server; this is where puppet master will be run.

The best way to start any daemon is using the local server's service management system, often in the form of init scripts.

If you're running on Red Hat, CentOS, Fedora, Debian, Ubuntu, or Solaris, the OS package already contains a suitable init script. If you don't have one, you can either create your own using an existing init script as an example, or simply run without one (though this is not advisable for production environments).

It is also neccessary to create the puppet user and group that the daemon will use. Either create these manually, or start the daemon with the `--mkusers` flag to create them.

```
# puppet master --mkusers
```

Starting the puppet daemon will automatically create all necessary certificates, directories, and files.

NOTE: To enable the daemon to also function as a file server, so that agent nodes can copy files from it, create a fileserver configuration file and restart puppet master.

Verifying Installation

To verify that your daemon is working as expected, pick a single agent node to use as a testbed. Once Puppet is installed on that machine, run the agent against the central server to verify that everything is working appropriately. You should start the agent in verbose mode the first time and with the `--waitforcert` flag enabled:

```
# puppet agent --server myserver.example.com --waitforcert 60 --test
```

Adding the –test flag causes the puppet agent to stay in the foreground; print extra output; only run once, then exit; and to exit immediately if the puppet master fails to compile the configuration catalog (by default, puppet agent will use a cached configuration if there is a problem with the remote manifests).

In running the agent, you should see the message:

```
info: Requesting certificate
warning: peer certificate won't be verified in this SSL session
notice: Did not receive certificate
```

INFO: This message will repeat every 60 seconds with the above command.

This is normal, since your server is not auto-signing certificates as a security precaution.

On your server, list the waiting certificates:

```
# puppet cert --list
```

You should see the name of the test agent node. Now go ahead and sign the certificate:

```
# puppet cert --sign mytestagent.example.com
```

Within 60 seconds, your test agent should receive its certificate from the server, receive its configuration, apply it locally, and exit normally.

NOTE: By default, puppet agent runs with a waitforcert of five minutes; set the value to 0 to disable this wait-polling period entirely.

Scaling your Installation

For more about how to tune Puppet for large environments, see Scaling Puppet.

Configuring Puppet

Puppet’s behavior can be customized with a rather large collection of settings. Most of these can be safely ignored, but you’ll almost definitely have to modify some of them.

This document describes how Puppet’s configuration settings work, and describes all of Puppet’s auxiliary config files.□

Puppet’s Settings

Puppet is able to automatically generate a reference of all its config settings (`puppet doc --reference configuration`), and the documentation site includes archived references for every recent version of Puppet. You will generally want to consult the the most recent stable version’s reference.

When retrieving the value for a given setting, Puppet follows a simple lookup path, stopping at the first value it finds. In order, it will check:□

- Values specified on the command line□
- Values in environment blocks in `puppet.conf`
- Values in run mode blocks in `puppet.conf`
- Values in the main block of `puppet.conf`
- The default values

The settings you’ll have to interact with will vary a lot, depending on what you’re doing with Puppet. But at the least, you should get familiar with the following:

- `certname` — The locally unique name for this node. If you aren’t using DNS names to identify your nodes, you’ll need to set it yourself.
- `server` — The puppet master server to request configurations from. If your puppet master□ server isn’t reachable at the default hostname of `puppet`, you’ll need to set this yourself.
- `pluginsync` — Whether to use plugins from modules. Most users should set this to true on all agent nodes.
- `report` — Whether to send reports to the puppet master. Most users should set this to true on all agent nodes.
- `reports` — On the puppet master, which report handler(s) to use.
- `modulepath` — The search path for Puppet modules. Defaults to `/etc/puppet/modules:/usr/share/puppet/modules`.
- `environment` — On agent nodes, the environment to request configuration in.□
- `node_terminus` — How puppet master should get node definitions; if you use an ENC, you’ll□ need to set this to “exec” on the master (or on all nodes if running in a standalone arrangement).
- `external_nodes` — The script to run for node definitions (if `node_terminus` is set to “exec”).
- `confdir` — One of Puppet’s main working directories, which usually contains config files,□ manifests, modules, and certificates.□
- `vardir` — Puppet’s other main working directory, which usually contains cached data and configurations, reports, and file backups.□

`puppet.conf`

Puppet's main config file is `puppet.conf`, which is located in Puppet's `confdir`.

Finding puppet.conf

PERSONAL CONFDIRS

- When Puppet is not running as root (*nix) or not running with elevated privileges (Windows), it will read its config files from the `.puppet` directory in the current user's home directory.

*NIX SYSTEMS

- Puppet Enterprise's confdir is `/etc/puppetlabs/puppet`.
- Most open source Puppet distributions use `/etc/puppet` as Puppet's confdir.
- If you are unsure where the confdir is, run `sudo puppet agent --configprint confdir` to locate it.

WINDOWS SYSTEMS

On Windows, Puppet Enterprise and open source Puppet use the same confdir.

- On Windows 2003, Puppet's confdir is `%ALLUSERSPROFILE%\PuppetLabs\puppet\etc`. This is usually located on disk at `C:\Documents and Settings\All Users\Application Data\PuppetLabs\puppet\etc`.
- On Windows 7 and Windows 2008, Puppet's confdir is `%PROGRAMDATA%\PuppetLabs\puppet\etc`. This is usually located on disk at `C:\ProgramData\PuppetLabs\puppet\etc`.

> Note: On Windows systems, the puppet.conf file is allowed to use Windows-style CRLF line endings as well as *nix-style LF line endings.

File Format

`puppet.conf` uses an INI-like format, with `[config blocks]` containing indented groups of `setting = value` lines. Comment lines `# start with an octothorpe`; partial-line comments are not allowed.

You can interpolate the value of a setting by using its name as a `$variable`. (Note that `$environment` has special behavior: most of the Puppet applications will interpolate their own environment, but puppet master will use the environment of the agent node it is serving.)

If a setting has multiple values, they should be a comma-separated list. "Path"-type settings made up of multiple directories should use the system path separator (colon, on most Unices).

Finally, for settings that accept only a single file or directory, you can set the owner, group, and/or mode by putting their desired states in curly braces after the value.

Putting that all together:

```
# a block:
[main]
  # setting = value pairs:
  server = master.example.com
```

```
    certname = 005056c00008.localcloud.example.com

    # variable interpolation:
    rundir = $vardir/run
    modulepath = /etc/puppet/modules/$environment:/usr/share/puppet/modules
  [master]
    # a list:
    reports = store, http

    # a multi-directory modulepath:
    modulepath = /etc/puppet/modules:/usr/share/puppet/modules

    # setting owner and mode for a directory:
    vardir = /Volumes/zfs/vardir {owner = puppet, mode = 644}
```

Config Blocks

Settings in different config blocks take effect under varying conditions. Settings in a more specific block can override those in a less specific block, as per the lookup path described above.

THE `[MAIN]` BLOCK

The `[main]` config block is the least specific. Settings here are always effective, unless overridden by a more specific block.

`[AGENT]`, `[MASTER]`, AND `[USER]` BLOCKS

These three blocks correspond to Puppet's run modes. Settings in `[agent]` will only be used by puppet agent; settings in `[master]` will be used by puppet master and puppet cert; and settings in `[user]` will only be used by puppet apply. The faces subcommands introduced in Puppet 2.7 default to the `user` run mode, but their mode can be changed at run time with the `--mode` option. Note that not every setting makes sense for every run mode, but specifying a setting in a block where it is irrelevant has no observable effect.

NOTES ON PUPPET 0.25.5 AND OLDER

Prior to Puppet 2.6, blocks were assigned by application name rather than by run mode; e.g. `[puppetd]`, `[puppetmasterd]`, `[puppet]`, and `[puppetca]`. Although these names still work, their use is deprecated, and they interact poorly with the modern run mode blocks. If you have an older config file and are using Puppet 2.6 or later, you should consider changing `[puppetd]` to `[agent]`, `[puppet]` to `[user]`, and combining `[puppetmasterd]` and `[puppetca]` into `[master]`.

PER-ENVIRONMENT BLOCKS

Blocks named for environments are the most specific, and can override settings in the run mode blocks. Only a small number of settings (specifically: `modulepath, manifest, manifestdir,` and `templatedir`) can be set in a per-environment block; any other settings will be ignored and read from a run mode or main block.

Like with the `$environment` variable, puppet master treats environments differently from the other run modes: instead of using the block corresponding to its own `environment` setting, it will use the block corresponding to each agent node's environment. The puppet master's own environment setting is effectively inert.

You may not create environments named `main`, `master`, `agent`, or `user`, as these are already taken by the primary config blocks.

Command-Line Options

You can override any config setting at runtime by specifying it as a command-line option to almost any Puppet application. (Puppet doc is the main exception.)

Boolean settings are handled a little differently: use a bare option for a true value, and add a prefix of `no-` for false:

```
# Equivalent to listen = true:
$ puppet agent --listen
# Equivalent to listen = false:
$ puppet agent --no-listen
```

For non-boolean settings, just follow the option with the desired value:

```
$ puppet agent --certname magpie.example.com
# An equals sign is optional:
$ puppet agent --certname=magpie.example.com
```

Inspecting Settings

Puppet agent, apply, and master all accept the `--configprint <setting>` option, which makes them print their local value of the requested setting and exit. In Puppet 2.7, you can also use the `puppet config print <setting>` action, and view values in different run modes with the `--mode` flag. Either way, you can view all settings by passing `all` instead of a specific setting.

```
$ puppet master --configprint modulepath
# or:
$ puppet config print modulepath --mode master

/etc/puppet/modules:/usr/share/puppet/modules
```

Puppet agent, apply, and master also accept a `--genconfig` option, which behaves similarly to `--configprint all` but outputs a complete `puppet.conf` file, with descriptive comments for each setting, default values explicitly declared, and settings irrelevant to the requested run mode commented out. Having the documentation inline and the default values laid out explicitly can be helpful for setting up your config file, or it can be noisy and hard to work with; it comes down to personal taste.

You can also inspect settings for specific environments with the `--environment` option:

```
$ puppet agent --environment testing --configprint modulepath
/etc/puppet/testing/modules:/usr/share/puppet/modules
```

(As implied above, this doesn't work in the master run mode, since the master effectively has no environment.)

Other configuration files

In addition to the main configuration file, there are five special-purpose config files you might need to interact with: `auth.conf`, `fileserver.conf`, `tagmail.conf`, `autosign.conf`, and `device.conf`.

`auth.conf`

See the `auth.conf` documentation for more details about this file.

Access to Puppet's HTTP API is configured in `auth.conf`, the location of which is determined by the `rest_authconfig` setting. (Default: `/etc/puppet/auth.conf`.) It consists of a series of ACL stanzas, and behaves quite differently from `puppet.conf`.

```
# Example auth.conf:

path /
auth true
environment override
allow magpie.example.com

path /certificate_status
auth true
environment production
allow magpie.example.com

path /facts
method save
auth true
allow magpie.example.com

path /facts
auth true
method find, search
allow magpie.example.com, dashboard.example.com, finch.example.com
```

`puppetdb.conf`

The `puppetdb.conf` file contains the hostname and port of the PuppetDB server. It is only used if you are using PuppetDB and have connected your puppet master to it.

This file uses the same ini-like format as `puppet.conf`, but only uses a `[main]` block and only has two settings (`server` and `port`):

```
[main]
server = puppetdb.example.com
port = 8081
```

See the PuppetDB manual for more information.

`routes.yaml`

This file overrides configuration settings involving indirector termini, and allows termini to be set in greater detail than `puppet.conf` allows.

This file should be a YAML hash. Each top level key should be the name of a run mode (master, agent, user), and its value should be another hash. Each key of these second-level hashes should be the name of an indirection, and its value should be another hash. The only keys allowed in these third-level hashes are `terminus` and `cache`. The value of each of these keys should be the name of a valid terminus for the indirection.

Example:

```
---
master:
  facts:
    terminus: puppetdb
    cache: yaml
```

`autosign.conf`

The `autosign.conf` file (located at `/etc/puppet/autosign.conf` by default, and configurable with the `autosign` setting) is a list of certnames or certname globs (one per line) whose certificate requests will automatically be signed.

```
rebuilt.example.com
*.scratch.example.com
*.local
```

Note that certname globs do not function as normal globs: an asterisk can only represent one or more subdomains at the front of a certname that resembles a fully-qualified domain name. (That is, if your certnames don't look like FQDNs, you can't use `autosign.conf` to full effect.

As any host can provide any certname, autosigning should only be used with great care, and only in situations where you essentially trust any computer able to connect to the puppet master.

`device.conf`

Puppet device, added in Puppet 2.7, configures network hardware using a catalog downloaded from the puppet master; in order to function, it requires that the relevant devices be configured in `/etc/puppet/device.conf` (configurable with the `deviceconfig` setting).

`device.conf` is organized in INI-like blocks, with one block per device:

```
[device certname]
    type <type>
    url <url>
[router6.example.com]
    type cisco
    url ssh://admin:password@ef03c87a.local
```

`fileserver.conf`

By default, `fileserver.conf` isn't necessary, provided that you only need to serve files from modules. If you want to create additional fileserver mount points, you can do so in `/etc/puppet/fileserver.conf` (or whatever is set in the `fileserverconfig` setting).

`fileserver.conf` consists of a collection of mount-point stanzas, and looks like a hybrid of `puppet.conf` and `auth.conf`:

```
# Files in the /path/to/files directory will be served
# at puppet:///mount_point/.
[mount_point]
    path /path/to/files
    allow *.example.com
    deny *.wireless.example.com
```

See the file serving documentation for more details.

Note that certname globs do not function as normal globs: an asterisk can only represent one or more subdomains at the front of a certname that resembles a fully-qualified domain name. (That is, if your certnames don't look like FQDNs, you can't use `autosign.conf` to full effect.

`tagmail.conf`

Your puppet master server can send targeted emails to different admin users whenever certain resources are changed. This requires that you:

- Set `report = true` on your agent nodes
- Set `reports = tagmail` on the puppet master (the `reports` setting accepts a list, so you can enable any number of reports)
- Set the `reportfrom` email address and either the `smtpserver` or `sendmail` setting on the puppet master
- Create a `tagmail.conf` file at the location specified in the `tagmap` setting

More details are available at the tagmail report reference.

The `tagmail.conf` file (located at `/etc/puppet/tagmail.conf` by default, and configurable with the `tagmap` setting) is list of lines, each of which consists of:

- A comma-separated list of tags and !negated tags; valid tags include:
  - Explicit tags
  - Class names
  - "`all`"
  - Any valid Puppet log level (`debug`, `info`, `notice`, `warning`, `err`, `alert`, `emerg`, `crit`, or `verbose`)
- A colon
- A comma-separated list of email addresses

The list of tags on a line builds the set of resources whose messages will be included in the mailing; each additional tag adds to the set, and each !negated tag subtracts from the set.

So, for example:

```
all: log-archive@example.com
webserver, !mailserver: httpadmins@example.com
emerg, crit: james@example.com, zach@example.com, ben@example.com
```

This `tagmail.conf` file will mail any resource events tagged with `webserver` but not with `mailserver` to the httpadmins group; any emergency or critical events to to James, Zach, and Ben, and all events to the log-archive group.

Language Guide

Important Note

This page has been superseded by the Puppet 2.7 reference manual's language reference. We hope you find the new version more complete and easier to use! Find the new version here, and use the links in its left sidebar to navigate between pages. If you don't know which language feature you are looking for, use the visual language index.

The purpose of Puppet's language is to make it easy to specify the resources you need to manage on the machines you're managing.

This guide will show you how the language works, going through some basic concepts. Understanding the Puppet language is key, as it's the main driver of how you tell your Puppet managed machines what to do.

Ready To Dive In?

Puppet language is really relatively simple compared to many programming languages. As you are reading over this guide, it may also be helpful to look over various Puppet modules people have already written. Complete real world examples can serve as a great introduction to Puppet. See the Modules page for more information and some links to list of community developed Puppet content.

Language Feature by Release

Feature	0.24.x	0.25.x	2.6.x	2.7.x	3.x
Plusignment operator (+>)	X	X	X	X	X
Multiple Resource relationships	X	X	X	X	X
Class Inheritance Overrides	X	X	X	X	X
Appending to Variables (+=)	X	X	X	X	X

Class names starting with 0-9	X	X	X	X	X
Multi-line C-style comments	X	X	X	X	X
Node regular expressions		X	X	X	X
Expressions in Variables		X	X	X	X
RegExes in conditionals		X	X	X	X
Elsif in conditionals			X	X	X
Chaining Resources			X	X	X
Hashes			X	X	X
Parameterised Class			X	X	X
Run Stages			X	X	X
The “in” syntax			X	X	X
The “unless” syntax					X

Acceptable Characters in Names

Variable names can include alphanumeric characters and underscores, and are case-sensitive. Hyphens are not allowed; although some Puppet versions permit them, this is now considered a bug.

Class names, module names, and the names of defined and custom resource types should be restricted to lowercase alphanumeric characters and underscores, and should begin with a lowercase letter; that is, they should match the expression `[a-z][a-z0-9_]*`. Although some names that violate these restrictions currently work, using them is not recommended. Hyphens are very strongly discouraged, and in most versions of Puppet will cause variables inside the class to be unavailable elsewhere.

Class and defined resource type names can use `::` as a namespace separator, which is both semantically useful and a means of directing the behavior of the module autoloader. The final segment of a qualified variable name must obey the restrictions on variable names, and the preceding segments must obey the restrictions on class names.

Parameters used in parameterized classes and defined resource types can include alphanumeric characters and underscores, cannot begin with an underscore, and are case-sensitive. In practice, they should be treated as though they were under the same restrictions as class names in order to maximize future compatibility.

There is no practical restriction on resource names.

Any word that the syntax uses for special meaning is a reserved word, meaning you cannot use it for variable or type names. Words like `true`, `define`, `inherits`, and `class` are all reserved. If you ever need to use a reserved word as a value, be sure to quote it.

Resources

The fundamental unit of modelling in Puppet is a resource. Resources describe some aspect of a system; it might be a file, a service, a package, or perhaps even a custom resource that you have developed. We'll show later how resources can be aggregated together with "defines" and "classes", and even show how to organize things with "modules", but resources are what we should start with first.

Each resource has a type, a title, and a list of attributes — each resource in Puppet can support various attributes, though many of them will have reasonable defaults and you won't have to specify all of them.

You can find all of the supported resource types, their valid attributes, and documentation for all of it in the References.

Let's get started. Here's a simple example of a resource in Puppet, where we are describing the permissions and ownership of a file:

```
file { '/etc/passwd':
  owner => 'root',
  group => 'root',
  mode  => '0644',
}
```

Any machine on which this snippet is executed will use it to verify that the passwd file is configured as specified.

The field before the colon is the resource's title, which must be unique and can be used to refer to the resource in other parts of the Puppet configuration. Following the title are a series of attributes and their values.

Most resources have an attribute (often called simply `name`) whose value will default to the title if you don't specify it. (Internally, this is called the "namevar.") For the `file` type, the `path` will default to the title. A resource's namevar value almost always has to be unique. (The `exec` and `notify` types are the exceptions.)

For simple resources that don't vary much, leaving out the name or path and falling back to the title is sufficient. But for resources with long names, or in cases where filenames differ between operating systems, it makes more sense to choose a symbolic title:

```
file { 'sshdconfig':
  path => $operatingsystem ? {
    solaris => '/usr/local/etc/ssh/sshd_config',
    default => '/etc/ssh/sshd_config',
  },
  owner => 'root',
  group => 'root',
  mode  => '0644',
}
```

This makes it easy to refer to the file resource elsewhere in our configuration, since the title is always the same.

For instance, let’s add a service that depends on the file:

```
    service { 'sshd':
      subscribe => File['sshdconfig'],
    }
```

This will cause the `sshd` service to get restarted when the `sshdconfig` file changes. You’ll notice that when we reference a resource we capitalise the name of the resource, for example `File[sshdconfig]`. When you see an uppercase resource type, that’s always a reference. A lowercase version is a declaration. Since resources can only be declared once, repeating the same declaration twice will cause an error. This is an important feature of Puppet that makes sure your configuration is well modelled.

What happens if our resource depends on multiple resources? From Puppet version 0.24.6 you can specify multiple relationships like so:

```
    service { 'sshd':
      require => File['sshdconfig', 'sshconfig', 'authorized_keys']
    }
```

Metaparameters

In addition to the attributes specific to each Resource Type Puppet also has global attributes called metaparameters. Metaparameters are parameters that work with any resource type.

In the examples in the section above we used two metaparameters, `subscribe` and `require`, both of which build relationships between resources. You can see the full list of all metaparameters in the Metaparameter Reference, though we’ll point out additional ones we use as we continue the guide.

Resource Defaults

Sometimes you will need to specify a default parameter value for a set of resources; Puppet provides a syntax for doing this, using a capitalized resource specification that has no title. For instance, in the example below, we’ll set the default path for all execution of commmands:

```
    Exec { path => '/usr/bin:/bin:/usr/sbin:/sbin' }
    exec { 'echo this works': }
```

The first statement in this snippet provides a default value for `exec` resources; Exec resources require either fully qualified paths or a path in which to look for the executable. Individual resources can still override this path when needed, but this saves typing. This way you can specify a single default path for your entire configuration, and then override that value as necessary.

Defaults work with any resource type in Puppet.

Defaults are not global — they only affect the current scope and scopes below the current one. If you want a default setting to affect your entire configuration, your only choice currently is to specify them outside of any class. We’ll mention classes in the next section.

Resource Collections

Aggregation is a powerful concept in Puppet. There are two ways to combine multiple resources into one easier to use resource: Classes and defined resource types. Classes model fundamental aspects of nodes, they say “this node IS a webserver” or “this node is one of these”. In programming terminology classes are singletons — they only ever get evaluated once per node.

Defined resource types, on the other hand, can be reused many times on the same node. They essentially work as if you created your own Puppet type just by using the language. They are meant to be evaluated multiple times, with different inputs each time. This means you can pass variable values into the defines.

Both classes and defines are very useful and you should make use of them when building out your puppet infrastructure.

CLASSES

Classes are introduced with the `class` keyword, and their contents are wrapped in curly braces. The following simple example creates a simple class that manages two separate files:

```
class unix {
  file {
    '/etc/passwd':
      owner => 'root',
      group => 'root',
      mode  => '0644';
    '/etc/shadow':
      owner => 'root',
      group => 'root',
      mode  => '0440';
  }
}
```

You’ll notice we introduced some shorthand here. This is the same as saying:

```
class unix {
  file { '/etc/passwd':
    owner => 'root',
    group => 'root',
    mode  => '0644',
  }
  file { '/etc/shadow':
    owner => 'root',
    group => 'root',
    mode  => '0440',
  }
}
```

Classes also support a simple form of object inheritance. For those not acquainted with programming terms, this means that we can extend the functionality of the previous class without copy/pasting the entire class. Inheritance allows subclasses to override resource settings declared in parent classes. A class can only inherit from one other class, not more than one. In programming terms, this is called ‘single inheritance’.

```
    class freebsd inherits unix {
      File['/etc/passwd'] { group => 'wheel' }
      File['/etc/shadow'] { group => 'wheel' }
    }
```

If we needed to undo some logic specified in a parent class, we can use undef like so:

```
    class freebsd inherits unix {
      File['/etc/passwd'] { group => undef }
    }
```

In the above example, nodes which include the `unix` class will have the password file's group set to `root`, while nodes including `freebsd` would have the password file group ownership left unmodified.

In Puppet version 0.24.6 and higher, you can specify multiple overrides like so:

```
    class freebsd inherits unix {
      File['/etc/passwd', '/etc/shadow'] { group => 'wheel' }
    }
```

There are other ways to use inheritance. In Puppet 0.23.1 and higher, it's possible to add values to resource parameters using the '+>' ('plusignment') operator:

```
    class apache {
      service { 'apache': require => Package['httpd'] }
    }

    class apache-ssl inherits apache {
      # host certificate is required for SSL to function
      Service['apache'] { require +> File['apache.pem'] }
    }
```

The above example makes the service resource in the second class require all the packages in the first, as well as the `apache.pem` file.

To append multiple requires, use array brackets and commas:

```
    class apache {
      service { 'apache': require => Package['httpd'] }
    }

    class apache-ssl inherits apache {
      Service['apache'] { require +> [ File['apache.pem'],
File['/etc/httpd/conf/httpd.conf'] ] }
    }
```

The above would make the `require` parameter in the `apache-ssl` class equal to

```
    [Package['httpd'], File['apache.pem'], File['/etc/httpd/conf/httpd.conf']]
```

Like resources, you can also create relationships between classes with 'require', like so:

```
class apache {
  service { 'apache': require => Class['squid'] }
}
```

The above example uses the `require` metaparameter to make the `apache` class dependent on the `squid` class.

In Puppet version 0.24.6 and higher, you can specify multiple relationships like so:

```
class apache {
  service { 'apache':
    require => Class['squid', 'xml', 'jakarta'],
  }
}
```

The `require` metaparameter does not implicitly declare a class; this means it can be used multiple times and is compatible with parameterized classes, but you must make sure you actually declare the class you're requiring at some point.

Puppet also has a `require` function, which can be used inside class definitions and which does implicitly declare a class, in the same way that the `include` function does. This function doesn't play well with parameterized classes. The `require` function is largely unnecessary, as class-level dependencies can be managed in other ways.

PARAMETERISED CLASSES

In Puppet release 2.6.0 and later, classes are extended to allow the passing of parameters into classes.

To create a class with parameters you can now specify:

```
class apache($version) {
  ... class contents ...
}
```

Classes with parameters are not declared using the include function but with an alternate syntax similar to a resource declaration:

```
node webserver {
  class { 'apache': version => '1.3.13' }
}
```

You can also specify default parameter values in your class like so:

```
class apache($version = '1.3.13', $home = '/var/www') {
  ... class contents ...
}
```

RUN STAGES

Run stage were added in Puppet version 2.6.0, you now have the ability to specify any number of stages which provide another method to control the ordering of resource management in puppet. If you have a large number of resources in your catalog it may become tedious and cumbersome to explicitly manage every relationship between the resources where order is important. In this situation, run-stages provides you the ability to associate a class to a single stage. Puppet will guarantee stages run in a specific predictable order every catalog run.

In order to use run-stages, you must first declare additional stages beyond the already present main stage. You can then configure puppet to manage each stage in a specific order using the same resource relationship syntax, before, require, “->” and “<-“. The relationship of stages will then guarantee the ordering of classes associated with each stage.

By default there is only one stage named “main” and all classes are automatically associated with this stage. Unless explicitly stated, a class will be associated with the main stage. With only one stage the effect of run stages is the same as previous versions of puppet since resources within a stage are managed in arbitrary order unless they have explicit relationships declared.

In order to declare additional stage resources, follow the same consistent and simple declarative syntax of the puppet language:

```
stage { 'first': before => Stage['main'] }
stage { 'last': require => Stage['main'] }
```

All classes associated with the first stage are to be managed before the classes associated with the main stage. All classes associated with the last stage are to be managed after the classes associated with the main stage.

Once stages have been declared, a class may be associated with a stage other than main using the “stage” class parameter.

```
class {
  'apt-keys': stage => first;
  'sendmail': stage => main;
  'apache':   stage => last;
}
```

Associate all resources in the class apt-keys with the first run stage, all resources in the class sendmail with the main stage, and all resources in the apache class with the last stage.

This short declaration guarantees resources in the apt-keys class are managed before resources in the sendmail class, which in turn is managed before resources in the apache class.

Please note that stage is not a metaparameter. The run stage must be specified as a class parameter and as such classes must use the resource declaration syntax as shown rather than the “include” statement.

DEFINED RESOURCE TYPES

Defined resource types follow the same basic form as classes, but they are introduced with the `define` keyword (not `class`) and they support arguments but no inheritance. As mentioned previously, defined resource types take parameters and can be reused multiple times on the same system. Suppose we want to create a resource collection that creates source control repositories. We probably would want to create multiple repositories on the same system, so we would use a defined type, not a class. Here's an example:

```
define svn_repo($path) {
  exec { "/usr/bin/svnadmin create ${path}/${title}":
    unless => "/bin/test -d ${path}",
  }
}

svn_repo { 'puppet_repo': path => '/var/svn_puppet' }
svn_repo { 'other_repo':  path => '/var/svn_other' }
```

Note how parameters specified in the definition (`define svn_repo($path)`) must appear as resource attributes (`path => '/var/svn_puppet'`) whenever a resource of the new type is declared and are available as variables (`unless => "/bin/test -d ${path}"`) within the definition. Multiple variables (separated by commas) can be specified. Default values can also be specified for any parameter with `=`, and any parameter which has a default becomes non-mandatory when a resource of the new type is declared.

Defined types have a number of built-in variables available, including `$name` and `$title`, which are set to the title of the resource when it is declared. (The reasons for having two identical variables with this information are outside the scope of this document, and these two special variables cannot be used the same way in classes or other resources.) As of Puppet 2.6.5, the `$name` and `$title` variables can also be used as default values for parameters:

```
define svn_repo($path = "/var/${name}") {...}
```

Any metaparameters used when a defined resource is declared are also made available in the definition as variables:

```
define svn_repo($path) {
  exec { "create_repo_${name}":
    command => "/usr/bin/svnadmin create ${path}/${title}",
    unless  => "/bin/test -d ${path}",
  }
  if $require {
    Exec["create_repo_${name}"] {
      require +> $require,
    }
  }
}

svn_repo { 'puppet':
  path    => '/var/svn',
  require => Package['subversion'],
    }
```

The above is perhaps not a perfect example, as most likely we would know that subversion was always required for svn checkouts, but it illustrates how `require` and other metaparameters can be used in defined types.

Defined resource types can have namespace separators (`::`) in their names, just like classes. When making a resource reference (e.g. `File['/etc/motd']`) to an instance of a defined type, you must capitalize all segments of the type's name (e.g. `Apache::Vhost['wordpress']`).

CLASSES VS. DEFINED RESOURCE TYPES

Classes and defined types are created similarly, but they are used very differently.

Defined types are used to define reusable objects which will have multiple instances on a given host, so they cannot include any resources that will only have one instance. For instance, multiple uses of the same define cannot create the same file.

Classes, on the other hand, are guaranteed to be singletons — you can include them as many times as you want and you'll only ever get one copy of the resources.

Most often, services will be defined in a class, where the service's package, configuration files, and running service will all be gathered, because there will normally be one copy of each on a given host. (This idiom is sometimes referred to as "service-package-file").

Defined types would be used to manage resources like virtual hosts, of which you can have many, or to encode some simple information in a reusable wrapper to save typing.

MODULES

You can (and should!) combine collections of classes, defined types, and resources into modules. Modules are portable collections of configuration, for example a module might contain all the resources required to configure Postfix or Apache. You can find out more on the Modules Page

Chaining resources

As of puppet version 2.6.0, resources may be chained together to declare relationships between and among them.

You can now specify relationships directly as statements in addition to the before and require resource metaparameters of previous versions:

```
    File['/etc/ntp.conf'] -> Service['ntpd']
```

Manage the ntp configuration file before the ntpd service

You can specify a "notify" relationship by employing the tilde instead of the hyphen:

```
    File['/etc/ntp.conf'] ~> Service['ntpd']
```

This manages the ntp configuration file before the ntpd service and notifies the service of changes to the ntp configuration file.

You can also do relationship chaining, specifying multiple relationships on a single line:

```
Package['ntp'] -> File['/etc/ntp.conf'] -> Service['ntpd']
```

Here we first manage the ntp package, second manage the ntp configuration file, and third manage the ntpd service.

Note that while it’s confusing, you don’t have to have all of the arrows be the same direction:

```
File['/etc/ntp.conf'] -> Service['ntpd'] <- Package['ntp']
```

Here the ntpd service requires /etc/ntp.conf and the ntp package.

Please note, relationships declared in this manner are between adjacent resources. In this example, the ntp package and the ntp configuration file are not directly related to each other, and puppet may try to manage the configuration file before the package is even installed, which may not be the desired behavior.

Chaining in this manner can provide some succinctness at the cost of readability.

You can also specify relationships when resources are declared, in addition to the above resource reference examples:

```
package { 'ntp': } -> file { '/etc/ntp.conf': }
```

Here we manage the ntp package before the ntp configuration file.

But wait! There’s more! You can also specify a collection on either side of the relationship marker:

```
yumrepo { 'localyumrepo': .... }
package { 'ntp': provider => yum, ... }
Yumrepo <| |> -> Package <| provider == yum |>
```

This manages all yum repository resources before managing all package resources that explicitly specify the yum provider. (Note that it will not work for package resources that don’t specify a provider but end up using Yum — since this relationship is created during catalog compilation, it can only act on attributes visible to the parser, not properties that must be read from the target system.)

This, finally, provides easy many to many relationships in Puppet, but it also opens the door to massive dependency cycles. This last feature is a very powerful stick, and you can considerably hurt yourself with it. In particular, watch out when using virtual resources, as the collection operator realizes resources as a side-effect.

Nodes

Having knowledge of resources, classes, defines, and modules gets you to understanding of most of Puppet. Nodes are a very simple remaining step, which are how we map the what we define (“this is what a webserver looks like") to what machines are chosen to fulfill those instructions.

Node definitions look just like classes, including supporting inheritance, but they are special in that when a node (a managed computer running the Puppet client) connects to the Puppet master daemon, its name will be looked for in the list of defined nodes. The information found for the node will then be evaluated for that node, and then node will be sent that configuration.

Node names can be the short host name, or the fully qualified domain name (FQDN). Some names, especially fully qualified ones, need to be quoted, so it is a best practice to quote all of them. Here's an example:

```
node 'www.testing.com' {
  include common
  include apache, squid
}
```

The previous node definition creates a node called `www.testing.com` and includes the `common`, `apache` and `squid` classes.

You can also specify that multiple nodes receive an identical configuration by separating each with a comma:

```
node 'www.testing.com', 'www2.testing.com', 'www3.testing.com' {
  include common
  include apache, squid
}
```

The previous examples creates three identical nodes: `www.testing.com`, `www2.testing.com`, and `www3.testing.com`.

MATCHING NODES WITH REGULAR EXPRESSIONS

In Puppet 0.25.0 and later, nodes can also be matched by regular expressions, which is much more convenient than listing them individually, one-by-one:

```
node /^www\d+$/ {
  include common
}
```

The above would match any host called `www` and ending with one or more digits. Here's another example:

```
node /^(foo|bar)\.testing\.com$/ {
  include common
}
```

The above example would match either host `foo` or `bar` in the testing.com domain.

What happens if there are multiple regular expressions or node definitions set in the same file?

- If there is a node without a regular expression that matches the current client connecting, that will be used first.
- Otherwise the first matching regular expression wins.

NODE INHERITANCE

Nodes support a limited inheritance model. Like classes, nodes can only inherit from one other node:

```
node 'www2.testing.com' inherits 'www.testing.com' {
  include loadbalancer
}
```

In this node definition the `www2.testing.com` inherits any configuration specified for the `www.testing.com` node in addition to including the `loadbalancer` class. In other words, it does everything "www.testing.com" does, but also takes on some additional functionality.

DEFAULT NODES

If you create a node named `default`, the node configuration for default will be used if no other node matches are found.

EXTERNAL NODES

In some cases you may already have an external list of machines and what roles they perform. This may be in LDAP, version control, or a database. You may also need to pass some variables to those nodes (more on variables later).

In these cases, writing an External Nodes script can help, and that can take the place of your node definitions. See that section for more information.

Additional Language Features

We've already gone over features such as ordering and grouping, though there's still a few more things to learn.

Puppet is not a programming language, it is a way of describing your IT infrastructure as a model. This is usually quite sufficient to get the job done, and prevents you from having to write a lot of programming code.

Quoting

Most of the time, you don't have to quote strings in Puppet. Any alphanumeric string starting with a letter (hyphens are also allowed), can leave out the quotes, though it's a best practice to quote strings for any non-native value.

Variable Interpolation With Quotes

So far, we've mentioned variables in terms of defines. If you need to use those variables within a string, use double quotes, not single quotes. Single-quoted strings will not do any variable interpolation, double-quoted strings will. Variables in strings can also be bracketed with `{}` which makes them easier to use together, and also a bit cleaner to read:

```
    $value = "${one}${two}"
```

To put a quote character or `$` in a double-quoted string where it would normally have a special meaning, precede it with an escaping `\`. For an actual `\`, use `\\`.

In single-quoted strings only two escape sequences are supported, `\'` for single quote and `\\` for single backslash. Except for these two escape sequences, everything else between single quotes is treated literally.

We recommend using single quotes for all strings that do not require variable interpolation. Use double quotes for those strings that require variable interpolation. The Style Guide also discusses this with examples.

Capitalization

Capitalization of resources is used in three major ways:

- Referencing: when you want to reference an already declared resource, usually for dependency purposes, you have to capitalize the name of the resource, for example

```
    require => File['sshdconfig']
```

- Inheritance. When overwriting the resource settings of a parent class from a subclass, use the uppercase versions of the resource names. Using the lowercase versions will result in an error. See the inheritance section above for an example of this.
- Setting default attribute values: Resource Defaults. As mentioned previously, using a capitalized resource with no `title` works to set the defaults for that resource. Our previous example was setting the default path for command executions.

Note that when capitalizing a namespaced defined type, you have to capitalize all segments of the□ type's name, e.g. `Apache::Vhost['wordpress']`.

Arrays

As mentioned in the class and resource examples above, Puppet allows usage of arrays in various areas. Arrays defined in puppet look like this:□

```
    [ 'one', 'two', 'three' ]
```

You can access array entries by their index, for example:

```
    $foo = [ 'one', 'two', 'three' ]
    notice $foo[1]
```

Would return `two`.

Several type members, such as ‘alias’ in the ‘host’ definition accept arrays as their value. A host□ resource with multiple aliases would look like this:

```
host { 'one.example.com':
  ensure => present,
  alias  => [ 'satu', 'dua', 'tiga' ],
  ip     => '192.168.100.1',
}
```

This would add a host ‘one.example.com’ to the hosts list with the three aliases ‘satu’, ‘dua’, and ‘tiga’.

Or, for example, if you want a resource to require multiple other resources, the way to do this would be like this:

```
resource { 'baz':
  require  => [ Package['foo'], File['bar'] ],
}
```

Another example for array usage is to call a custom defined resource multiple times, like this:□

```
define php::pear() {
  package { "php-${name}": ensure => installed }
}

php::pear { ['ldap', 'mysql', 'ps', 'snmp', 'sqlite', 'tidy', 'xmlrpc']: }
```

Of course, this can be used for native types as well:

```
file { [ 'foo', 'bar', 'foobar' ]:
  owner => 'root',
  group => 'root',
  mode  => '0600',
}
```

Hashes

Since Puppet version 2.6.0, hashes have been supported in the language. These hashes are defined□ like Ruby hashes using the form:

```
{ key1 => val1, key2 => val2, ... }
```

The hash keys are strings, but hash values can be any possible RHS values allowed in the language like function calls, variables, etc.

It is possible to assign hashes to a variable like so:

```
$myhash = { key1 => 'myval', key2 => $b }
```

And to access hash members (recursively) from a variable containing a hash (this also works for arrays too):

```
$myhash = { key => { subkey => 'b' }}
notice($myhash[key][subkey])
```

You can also use a hash member as a resource title, as a default definition parameter, or potentially as the value of a resource parameter,

Variables

Puppet supports variables like most other languages you may be familiar with. Puppet variables are denoted with `$`:

```
$content = 'some content\n'

file { '/tmp/testing': content => $content }
```

Puppet language is a declarative language, which means that its scoping and assignment rules are somewhat different than a normal imperative language. The primary difference is that you cannot change the value of a variable within a single scope, because that would rely on order in the file to determine the value of the variable. Order does not matter in a declarative language. Doing so will result in an error:

```
$user = root
file { '/etc/passwd':
  owner => $user,
}
$user = bin
file { '/bin':
  owner   => $user,
  recurse => true,
}
```

Rather than reassigning variables, instead use the built in conditionals:

```
$group = $operatingsystem ? {
  solaris => 'sysadmin',
  default => 'wheel',
}
```

A variable may only be assigned once per scope. However you still can set the same variable in non-overlapping scopes. For example, to set top-level configuration values:

```
node a {
  $setting = 'this'
  include class_using_setting
}
node b {
  $setting = 'that'
  include class_using_setting
}
```

In the above example, nodes “a” and “b” have different scopes, so this is not reassignment of the same variable.

VARIABLE SCOPE

Scoping may initially seem like a foreign concept, though in reality it is pretty simple. A scope defines where a variable is valid. Unlike early programming languages like BASIC, variables are only valid and accessible in certain places in a program. Using the same variable name in different parts of the language do not refer to the same value.

Classes and nodes introduce new scopes. Puppet is currently dynamically scoped, which means that scope hierarchies are created based on where the code is evaluated instead of where the code is defined.

For example:

```
$test = 'top'
class myclass {
  exec { "/bin/echo ${test}": logoutput => true }
}

class other {
  $test = 'other'
  include myclass
}

include other
```

In this case, there’s a top-level scope, a new scope for `other`, and the a scope below that for `myclass`. When this code is evaluated, `$test` evaluates to `other`, not `top`.

QUALIFIED VARIABLES

Puppet supports qualification of variables inside a class. This allows you to use variables defined in other classes.

For example:

```
class myclass {
  $test = 'content'
}

class anotherclass {
  $other = $myclass::test
}
```

In this example, the value of the `$other` variable evaluates to `content`. Qualified variables are read-only — you cannot set a variable’s value from other class.

Variable qualification is dependent on the evaluation order of your classes. Class `myclass` must be evaluated before class `anotherclass` for variables to be set correctly.

FACTS AS VARIABLES

In addition to user-defined variables, the facts generated by Facter are also available as variables.□ This allows values that you would see by running `facter` on a client system within Puppet manifests and also within Puppet templates. To use a fact as a variable prefix the name of the fact with `$`. For example, the value of the `operatingsystem` and `puppetversion` facts would be available as the variables `$operatingsystem` and `$puppetversion`.

VARIABLE EXPRESSIONS

In Puppet 0.24.6 and later, arbitrary expressions can be assigned to variables, for example:

```
$inch_to_cm = 2.54
$rack_length_cm = 19 * $inch_to_cm
$gigabyte = 1024 * 1024 * 1024
$can_update = ($ram_gb * $gigabyte) > 1 << 24
```

See the Expression section later on this page for further details of the expressions that are now available.

APPENDING TO VARIABLES

In Puppet 0.24.6 and later, values can be appended to array variables:

```
$ssh_users = [ 'myself', 'someone' ]

class test {
  $ssh_users += ['someone_else']
}
```

Here the `$ssh_users` variable contains an array with the elements `myself` and `someone`. Using the variable append syntax, `+=`, we added another element, `someone_else` to the array.

Please note, variables cannot be modified in the same scope because of the declarative nature of□ Puppet. As a result, $ssh_users contains the element ‘someone_else’ only in the scope of class test and not outside scopes. Resources outside of this scope will “see” the original array containing only myself and someone.

Conditionals

At some point you’ll need to use a different value based on the value of a variable, or decide to not□ do something if a particular value is set.

Puppet currently supports two types of conditionals:

- The selector which can be used within resources and variable assignments to pick the correct value for an attribute, and
- statement conditionals which can be used more widely in your manifests to include additional classes, define distinct sets of resources within a class, or make other structural decisions.□

Case statements do not return a value. Selectors do. That is the primary difference between them□ and why you would use one and not the other.

SELECTORS

If you're familiar with programming terms, The selector syntax works like a multi-valued ternary operator, similar to C's `foo = bar ? 1 : 0` operator where `foo` will be set to `1` if `bar` evaluates to true and `0` if `bar` is false.

Selectors are useful to specify a resource attribute or assign a variable based on a fact or another variable. In addition to any number of specified values, selectors also allow you to specify a default□ if no value matches; if no default is supplied and a selector fails to match, it will result in a parse error.

Here's a simple example of selector use:

```
file { '/etc/config':
  owner => $operatingsystem ? {
    'sunos'   => 'adm',
    'redhat'  => 'bin',
    default   => undef,
  },
}
```

If the `$operatingsystem` fact (sent up from 'facter') returns `sunos` or `redhat` then the ownership of the file is set to `adm` or `bin` respectively. Any other result and the `owner` attribute will not be set, because it is listed as `undef`.

Remember to quote the comparators you're using in the selector as the lack of quotes can cause syntax errors.

Selectors can also be used in variable assignment:

```
$owner = $operatingsystem ? {
  'sunos'   => 'adm',
  'redhat'  => 'bin',
  default   => undef,
}
```

In Puppet 0.25.0 and later, selectors can also be used with regular expressions:

```
$owner = $operatingsystem ? {
  /(redhat|debian)/ => 'bin',
  default           => undef,
}
```

In this last example, if `$operatingsystem` value matches either redhat or debian, then `bin` will be the selected result, otherwise the owner will not be set (`undef`).

Like Perl and some other languages with regular expression support, captures in selector regular expressions automatically create some limited scope variables (`$0` to `$n`):

```
$system = $operatingsystem ? {
  /(redhat|debian)/ => "our system is $1",
  default           => "our system is unknown",
}
```

In this last example, `$1` will get replaced by the content of the capture (here either `redhat` or `debian`).

The variable `$0` will contain the whole match.

CASE STATEMENT

`Case` is the other form of Puppet's two conditional statements, which can be wrapped around any Puppet code to add decision-making logic to your manifests. Case statements, unlike selectors, do not return a value. Also unlike selectors, a failed match without a default specified will simply skip□ the case statement instead of throwing a parse error. A common use for the `case` statement is to apply different classes to a particular node based on its operating system:□

```
case $operatingsystem {
  'sunos':  { include solaris } # apply the solaris class
  'redhat': { include redhat  } # apply the redhat class
  default:  { include generic } # apply the generic class
}
```

Case statements can also specify multiple match conditions by separating each with a comma:

```
case $hostname {
  'jack','jill':      { include hill    } # apply the hill class
  'humpty','dumpty': { include wall    } # apply the wall class
  default:            { include generic } # apply the generic class
}
```

Here, if the `$hostname` fact returns either `jack` or `jill` the `hill` class would be included.

In Puppet 0.25.0 and later, the `case` statement also supports regular expressions:

```
case $hostname {
  /^j(ack|ill)$/: { include hill    } # apply the hill class
  /^[hd]umpty$/:  { include wall    } # apply the wall class
  default:        { include generic } # apply the generic class
}
```

In this last example, if `$hostname` matches either `jack` or `jill`, then the `hill` class will be included. But if `$hostname` matches either `humpty` or `dumpty`, then the `wall` class will be included.

As with selectors (see above), regular expressions captures are also available. These create limited scope variables `$0` to `$n`:

```
case $hostname {
  /^j(ack|ill)$/: { notice("Welcome $1!") }
  default:        { notice("Welcome stranger") }
}
```

In this last example, if `$host` is `jack` or `jill` then a notice message will be logged with `$1` replaced by either `ack` or `ill`. `$0` contains the whole match.

IF/ELSE STATEMENT

The `if/else` statement provides branching options based on the truth value of a variable:

```
    if $variable {
      file { '/some/file': ensure => present }
    } else {
      file { '/some/other/file': ensure => present }
    }
```

In Puppet 0.24.6 and later, the `if` statement can also branch based on the value of an expression:

```
    if $server == 'mongrel' {
      include mongrel
    } else {
      include nginx
    }
```

In the above example, if the value of the variable `$server` is equal to `mongrel`, Puppet will include the class `mongrel`, otherwise it will include the class `nginx`.

From version 2.6.0 and later an `elsif` construct was introduced into the language:

```
    if $server == 'mongrel' {
      include mongrel
    } elsif $server == 'nginx' {
      include nginx
    } else {
      include thin
    }
```

Arithmetic expressions are also possible, for example:

```
    if $ram > 1024 {
      $maxclient = 500
    }
```

In the previous example if the value of the variable `$ram` is greater than `1024`, Puppet will set the value of the `$maxclient` variable to `500`.

“If” statements also support the use of regular expressions and “in” expressions. More complex expressions can also be made by combining arbitrary expressions with the Boolean `and`, `or`, and `not` operators:

```
    if ( $processor_count > 2 ) and (( $ram >= 16 * $gigabyte ) or ( $disksize
> 1000 )) {
      include for_big_irons
    } else {
      include for_small_box
    }
```

UNLESS STATEMENT

The `unless` statement, which will be introduced in an upcoming (post-2.7) version of Puppet, is an optional replacement for the `if !` or “if not” syntax.

```
    unless $memorysize > 1024 {
       $maxclient = 500
    }
```

Virtual Resources

See Virtual Resources.

Virtual resources are available in Puppet 0.20.0 and later.

Virtual resources are resources that are not sent to the client unless `realized`.

The syntax for a virtual resource is:

```
    @user { 'luke': ensure => present }
```

The user luke is now defined virtually. To realize that definition, you can use a `collection`:

```
    User <| title == luke |>
```

This can be read as ‘the user whose title is luke’. This is equivalent to using the `realize` function:

```
    realize User['luke']
```

Realization could also use other criteria, such as realizing Users that match a certain group, or using a metaparameter like ‘tag’.

The motivation for this feature is somewhat complicated; please see the Virtual Resources page for more information.

Exported Resources

Exported resources are an extension of virtual resources used to allow different hosts managed by Puppet to influence each other’s Puppet configuration. This is described in detail on the Exported Resources page. As with virtual resources, new syntax was added to the language for this purpose.

The key syntactical difference between virtual and exported resources is that the special sigils (`@` and `<| |>`) are doubled (`@@` and `<<| |>>`) when referring to an exported resource.

Here is an example with exported resources that shares SSH keys between clients:

```
class ssh {
  @@sshkey { $hostname: type => dsa, key => $sshdsakey }
  Sshkey <<| |>>
}
```

In the above example, notice that fulfillment and exporting are used together, so that any node that□ gets the ‘sshkey’ class will have all the ssh keys of other hosts. This could be done differently so□ that the keys could be realized on different hosts.□

To actually work, the `storeconfig` parameter must be set to `true` in puppet.conf. This allows configurations from client to be stored on the central server.□

The details of this feature are somewhat complicated; see the Exported Resources page for more information.

Comments

Puppet supports two types of comments:

- Unix shell style comments; they can either be on their own line or at the end of a line.
- multi-line C-style comments (available in Puppet 0.24.7 and later)

Here is a shell style comment:

```
# this is a comment
```

You can see an example of a multi-line comment:

```
/*
this is a comment
*/
```

Expressions

Starting with version 0.24.6 the Puppet language supports arbitrary expressions in `if` statement boolean tests and in the right hand value of variable assignments.

Puppet expressions can be composed of:

- boolean expressions, which are combination of other expressions combined by boolean operators (`and`, `or` and `not`)
- comparison expressions, which consist of variables, numerical operands or other expressions combined with comparison operators (`==`, `!=`, `<`, `>`, `<=`, `>`, `>=`)
- arithmetic expressions, which consists of variables, numerical operands or other expressions combined with the following arithmetic operators: `+`, `-`, `/`, `*`, `<<`, `>>`
- in Puppet 0.25.0 and later, regular expression matches with the help of the regex match operator: `=~` and `!~`
- in Puppet 2.6.0 and later, `in` expressions, which test whether the right operand contains the left

operand.

Expressions can be enclosed in parenthesis, `()`, to group expressions and resolve operator ambiguity.

Operator precedence

The Puppet operator precedence conforms to the standard precedence in most systems, from highest to lowest:

```
! -> not
* / -> times and divide
- + -> minus, plus
<< >> -> left shift and right shift
== != -> equal, not equal
>= <= > < -> greater equal, less or equal, greater than, less than
and
or
```

Expression examples

COMPARISON EXPRESSIONS

Comparison expressions include tests for equality using the `==` expression:

```
    if $variable == 'foo' {
      include bar
    } else {
      include foobar
    }
```

Here if `$variable` has a value of `foo`, Puppet will then include the `bar` class, otherwise it will include the `foobar` class.

Here is another example shows the use of the `!=` (‘not equal’) comparison operator:

```
    if $variable != 'foo' {
      $othervariable = 'bar'
    } else {
      $othervariable = 'foobar'
    }
```

In our second example if `$variable` is not equal to a value of `foo`, Puppet will then set the value of the `$othervariable` variable to `bar`, otherwise it will set the `$othervariable` variable to `foobar`.

Note that comparison of strings is case-insensitive.

ARITHMETIC EXPRESSIONS

You can also perform a variety of arithmetic expressions, for example:

```
    $one = 1
    $one_thirty = 1.30
    $two = 2.034e-2

    $result = ((( $two + 2) / $one_thirty) + 4 * 5.45) - (6 << ($two + 4)) +
(0x800 + -9)
```

BOOLEAN EXPRESSIONS

Boolean expressions are also possible using `or`, `and` and `not`:

```
    $one = 1
    $two = 2
    $var = ( $one < $two ) and ( $one + 1 == $two )
```

The exclamation mark (`!`) can be used as a synonym for `not.`

REGULAR EXPRESSIONS

In Puppet 0.25.0 and later, Puppet supports regular expression matching using `=~` (match) and `!~` (not-match) for example:

```
    if $host =~ /^www(\d+)\./ {
      notice('Welcome web server #$1')
    }
```

Like case and selectors, the regex match operators create limited scope variables for each regex capture. In the previous example, `$1` will be replaced by the number following `www` in `$host`. Those variables are valid only for the statements inside the braces of the if clause.

“IN” EXPRESSIONS

From Puppet 2.6.0, Puppet supports an “in” syntax. This operator allows you to find if the left□ operand is in the right one. The left operand must be a string, but the right operand can be:

- a string
- an array
- a hash (the search is done on the keys)

This syntax can be used in any place where an expression is supported:

```
    $eatme = 'eat'
    if $eatme in ['ate', 'eat'] {
    ...
    }

    $value = 'beat generation'
    if 'eat' in $value {
      notice('on the road')
    }
```

Like other expressions, “in” expressions can be combined or negated with boolean operators:

```
    if ! ($eatme in ['ate', 'eat']) { ... }
```

Backus Naur Form

We’ve already covered the list of operators, though if you wish to see it, here’s the available operators in Backus Naur Form:

```
<exp> ::=  <exp> <arithop> <exp>
         | <exp> <boolop> <exp>
         | <exp> <compop> <exp>
         | <exp> <matchop> <regex>
         | ! <exp>
         | - <exp>
         | "(" <exp> ")"
         | <rightvalue>

<arithop> ::= "+" | "-" | "/" | "*" | "<<" | ">>"
<boolop>  ::= "and" | "or"
<compop>  ::= "==" | "!=" | ">" | ">=" | "<=" | "<"
<matchop>  ::= "=~" | "!~"

<rightvalue> ::= <variable> | <function-call> | <literals>
<literals> ::= <float> | <integer> | <hex-integer> | <octal-integer> | <quoted-
string>
<regex> ::= '/regex/'
```

Functions

Puppet supports many built in functions; see the Function Reference for details — see Custom Functions for information on how to create your own custom functions.

Some functions can be used as a statement:

```
    notice('Something weird is going on')
```

(The notice function above is an example of a function that will log on the server)

Or without parentheses:

```
    notice 'Something weird is going on'
```

Some functions instead return a value:

```
    file { '/my/file': content => template('mytemplate.erb') }
```

All functions run on the Puppet master, so you only have access to the file system and resources on that host from your functions. The only exception to this is that the value of any Facter facts that have been sent to the master from your clients are also at your disposal. See the Tools Guide for more information about these components.

Importing Manifests

Puppet has an `import` keyword for importing other manifests. You should almost never use it, as almost every use case for it has been replaced by the module autoloader. In particular, you should never use any import statements inside a module, as the behavior of import within autoloaded manifests is undefined.

The `import` keyword does not insert Puppet code inline like a C preprocessor #include directive; instead, it adds all code in the requested file to the main scope. This means any code in these external manifests must be in a class, node statement, or defined type, or else it will be applied to all nodes:

```
    # site.pp
    node kestrel.example.com {
        # Wrong wrong wrong!
        import nodes/kestrel.pp
    }

    # kestrel.pp
    include ntp
    include apache2
    # These two classes are outside any node statement, and will always be
applied.
```

Files are only searched for within the same directory as the file doing the importing. Files can also be imported using globbing, as implemented by Ruby's `Dir.glob` method:

```
    import 'nodes/*.pp'
    import 'packages/[a-z]*.pp'
```

Instead of importing manifests, you should organize all class manifests into Modules. The one case where `import` is still useful is for maintaining a `nodes/` directory with one manifest per node and then placing an `import 'nodes/*.pp'` statement in `site.pp`. However, note that doing this can cause puppet master to not notice edits to your node definitions.

Handling Compilation Errors

Puppet does not use manifests directly, it compiles them down to a internal format that the clients can understand.

By default, when a manifest fails to compile, the previously compiled version of the Puppet manifest is used instead.

This behavior is governed by a setting in `puppet.conf` called `usecacheonfailure` and is set by default to `true`.

This may result in surprising behaviour if you are editing complex configurations.

Running the Puppet client with `--no-usecacheonfailure` or with `--test`, or setting `usecacheonfailure = false` in the configuration file, will disable this behaviour.

Module Fundamentals

Puppet Modules

Modules are self-contained bundles of code and data. You can write your own modules or you can download pre-built modules from Puppet Labs' online collection, the Puppet Forge.

Nearly all Puppet manifests belong in modules. The sole exception is the main `site.pp` manifest, which contains site-wide and node-specific code.

Every Puppet user should expect to write at least some of their own modules.

- Continue reading to learn how to write and use Puppet modules.
- See "Installing Modules" for how to install pre-built modules from the Puppet Forge.
- See "Publishing Modules" for how to publish your modules to the Puppet Forge.
- See "Using Plugins" for how to arrange plugins (like custom facts and custom resource types) in modules and sync them to agent nodes.

Using Modules

Modules are how Puppet finds the classes and types it can use — it automatically loads any class or defined type stored in its modules. Within a manifest or from an external node classifier (ENC), any of these classes or types can be declared by name:

```
# /etc/puppetlabs/puppet/site.pp

node default {
  include apache

  class {'ntp':
    enable => false;
  }

  apache::vhost {'personal_site':
    port    => 80,
    docroot => '/var/www/personal',
    options => 'Indexes MultiViews',
  }
}
```

Likewise, Puppet can automatically load plugins (like custom native resource types or custom facts) from modules; see "Using Plugins" for more details.

To make a module available to Puppet, place it in one of the directories in Puppet's modulepath.

The Modulepath

Note: The `modulepath` is a list of directories separated by the system path-separator character. On 'nix systems, this is the colon (:), while Windows uses the semi-colon (;). The most common default modulepaths are:

- `/etc/puppetlabs/puppet/modules:/opt/puppet/share/puppet/modules` (for Puppet

> Enterprise)
>
> - `/etc/puppet/modules:/usr/share/puppet/modules` (for open source Puppet)
>
> Use `puppet config print modulepath` to see your currently configured modulepath.□
>
> If you want both puppet master and puppet apply to have access to the modules, set the modulepath in puppet.conf to go to the `[main]` block. Modulepath is also one of the settings that can be different per environment.

You can easily install modules written by other users with the `puppet module` subcommand. See “Installing Modules” for details.

Module Layout

On disk, a module is simply a directory tree with a specific, predictable structure:□

- MODULE NAME
  - manifests
  - files□
  - templates
  - lib
  - tests
  - spec

Example

This example module, named “`my_module`,” shows the standard module layout in more detail:

- `my_module` — This outermost directory’s name matches the name of the module.
  - `manifests/` — Contains all of the manifests in the module.
    - `init.pp` — Contains a class definition. This class’s name must match the module’s name.
    - `other_class.pp` — Contains a class named `my_module::other_class`.
    - `my_defined_type.pp` — Contains a defined type named `my_module::my_defined_type`.
    - `implementation/` — This directory’s name affects the class names beneath it.□
      - `foo.pp` — Contains a class named `my_module::implementation::foo`.
      - `bar.pp` — Contains a class named `my_module::implementation::bar`.
  - `files/` — Contains static files, which managed nodes can download.□
    - `service.conf` — This file’s URL would be `puppet:///modules/my_module/service.conf`.
  - `lib/` — Contains plugins, like custom facts and custom resource types. See “Using Plugins” for more details.
  - `templates/` — Contains templates, which the module’s manifests can use. See “Templates” for more details.
    - `component.erb` — A manifest can render this template with

`template('my_module/component.erb')`.

- `tests/` — Contains examples showing how to declare the module’s classes and defined types.
  - `init.pp`
  - `other_class.pp` — Each class or type should have an example in the tests directory.
- `spec/` — Contains spec tests for any plugins in the lib directory.

Each of the module’s subdirectories has a specific function, as follows.

Manifests

Each manifest in a module’s `manifests` folder should contain one class or defined type. The file names of manifests map predictably to the names of the classes and defined types they contain.

`init.pp` is special and always contains a class with the same name as the module.

Every other manifest contains a class or defined type named as follows:

Name of module	::	Other directories:: (if any)	Name of file (no extension)
`my_module`	`::`		`other_class`
`my_module`	`::`	`implementation::`	`foo`

Thus:

- `my_module::other_class` would be in the file `my_module/manifests/other_class.pp`
- `my_module::implementation::foo` would be in the file `my_module/manifests/implementation/foo.pp`

The double colon that divides the sections of a class’s name is called the namespace separator.

Allowed Module Names

Module names should only contain lowercase letters, numbers, and underscores, and should begin with a lowercase letter; that is, they should match the expression `[a-z][a-z0-9_]*`. Note that these are the same restrictions that apply to class names, but with the added restriction that module names cannot contain the namespace separator (`::`) as modules cannot be nested.

Although some names that violate these restrictions currently work, using them is not recommended.

Certain module names are disallowed:

- main
- settings

Files

Files in a module’s `files` directory are automatically served to agent nodes. They can be downloaded by using puppet:/// URLs in the `source` attribute of a `file` resource.

Puppet URLs work transparently in both agent/master mode and standalone mode; in either case, they will retrieve the correct file from a module.

Puppet URLs are formatted as follows:

Protocol	3 slashes	“Modules”/	Name of module/	Name of file
`puppet:`	`///`	`modules/`	`my_module/`	`service.conf`

So `puppet:///modules/my_module/service.conf` would map to `my_module/files/service.conf`.

Templates

Any ERB template (see “Templates” for more details) can be rendered in a manifest with the `template` function. The output of the template is a simple string, which can be used as the content attribute of a `file` resource or as the value of a variable.

The template function can look up templates identified by shorthand:

Template function	(‘	Name of module/	Name of template	’)
`template`	`('`	`my_module/`	`component.erb`	`')`

So `template('my_module/component.erb')` would render the template `my_module/templates/component.erb`.

Writing Modules

To write a module, simply write classes and defined types and place them in properly named manifest files as described above.

- See here for more information on classes
- See here for more information on defined types

Best Practices

The classes, defined types, and plugins in a module should all be related, and the module should aim to be as self-contained as possible.

Manifests in one module should never reference files or templates stored in another module.

Be wary of having classes declare classes from other modules, as this makes modules harder to redistribute. When possible, it’s best to isolate “super-classes” that declare many other classes in a local “site” module.

Installing Modules

Installing Modules

This reference applies to Puppet 2.7.14 and later and Puppet Enterprise 2.5 and later. Earlier versions will not behave identically.

> The puppet module tool does not currently work on Windows.
>
> - Windows nodes which pull configurations from a Linux or Unix puppet master can use any Forge modules installed on the master. Continue reading to learn how to use the module tool on your puppet master.
> - On Windows nodes which compile their own catalogs, you can install a Forge module by downloading and extracting the module's release tarball, renaming the module directory to remove the user name prefix, and moving it into place in Puppet's modulepath.

The Puppet Forge is a repository of pre-existing modules, written and contributed by users. These modules solve a wide variety of problems so using them can save you time and effort.

The `puppet module` subcommand, which ships with Puppet, is a tool for finding and managing new modules from the Forge. Its interface is similar to several common package managers, and makes it easy to search for and install new modules from the command line.

- Continue reading to learn how to install and manage modules from the Puppet Forge.
- See "Module Fundamentals" to learn how to use and write Puppet modules.
- See "Publishing Modules" to learn how to contribute your own modules to the Forge, including information about the puppet module tool's `build` and `generate` actions.
- See "Using Plugins" for how to arrange plugins (like custom facts and custom resource types) in modules and sync them to agent nodes.

Using the Module Tool

The `puppet module` subcommand has several actions. The main actions used for managing modules are:

`install`

> Install a module from the Forge or a release archive.
>
> ```
> # puppet module install puppetlabs-apache --version 0.0.2
> ```

`list`

> List installed modules.
>
> ```
> # puppet module list
> ```

`search`

> Search the Forge for a module.
>
> ```
> # puppet module search apache
> ```

`uninstall`

> Uninstall a puppet module.
>
> ```
> # puppet module uninstall puppetlabs-apache
> ```

`upgrade`

> Upgrade a puppet module.
>
> ```
> # puppet module upgrade puppetlabs-apache --version 0.0.3
> ```

If you have used a command line package manager tool (like `gem`, `apt-get`, or `yum`) before, these actions will generally do what you expect. You can view a full description of each action with `puppet man module` or by viewing the man page here.

Installing Modules

The `puppet module install` action will install a module and all of its dependencies. By default, it will install into the first directory in Puppet's modulepath.□

- Use the `--version` option to specify a version. You can use an exact version or a requirement string like `>=1.0.3`.
- Use the `--force` option to forcibly re-install an existing module.
- Use the `--environment` option to install into a different environment.□
- Use the `--modulepath` option to manually specify which directory to install into. Note: To avoid duplicating modules installed as dependencies, you may need to specify the modulepath as a list of directories; see the documentation for setting the modulepath for details.
- Use the `--ignore-dependencies` option to skip installing any modules required by this module.

Installing From the Puppet Forge

To install a module from the Puppet Forge, simply identify the desired module by its full name. The full name of a Forge module is formatted as "username-modulename."

```
# puppet module install puppetlabs-apache
```

Installing From Another Module Repository

The module tool can install modules from other repositories that mimic the Forge's interface. To do this, change the `module_repository` setting in `puppet.conf` or specify a repository on the command line with the `--module_repository` option. The value of this setting should be the base URL of the repository; the default value, which uses the Forge, is `http://forge.puppetlabs.com`.

After setting the repository, follow the instructions above for installing from the Forge.

```
# puppet module install --module_repository http://dev-forge.example.com
puppetlabs-apache
```

Installing From a Release Tarball

At this time, the module subcommand cannot properly install from local tarball files. Follow issue #13542 for more details about the progress of this feature.

Finding Modules

Modules can be found by browsing the Forge's web interface or by using the module tool's `search` action. The search action accepts a single search term and returns a list of modules whose names, descriptions, or keywords match the search term.

```
$ puppet module search apache
Searching http://forge.puppetlabs.com ...
NAME                           DESCRIPTION            AUTHOR          KEYWORDS
puppetlabs-apache              This is a generic ...  @puppetlabs     apache
web
puppetlabs-passenger           Module to manage P...  @puppetlabs     apache
DavidSchmitt-apache            Manages apache, mo...  @DavidSchmitt   apache
jamtur01-httpauth              Puppet HTTP Authen...  @jamtur01       apache
jamtur01-apachemodules         Puppet Apache Modu...  @jamtur01       apache
adobe-hadoop                   Puppet module to d...  @adobe          apache
adobe-hbase                    Puppet module to d...  @adobe          apache
adobe-zookeeper                Puppet module to d...  @adobe          apache
adobe-highavailability         Puppet module to c...  @adobe          apache
mon
adobe-mon                      Puppet module to d...  @adobe          apache
mon
puppetmanaged-webserver        Apache webserver m...  @puppetmanaged  apache
ghoneycutt-apache              Manages apache ser...  @ghoneycutt     apache
web
ghoneycutt-sites               This module manage...  @ghoneycutt     apache
web
fliplap-apache_modules_sles11  Exactly the same a...  @fliplap
mstanislav-puppet_yum          Puppet 2.              @mstanislav     apache
mstanislav-apache_yum          Puppet 2.              @mstanislav     apache
jonhadfield-wordpress          Puppet module to s...  @jonhadfield    apache
php
saz-php                        Manage cli, apache...  @saz            apache
php
pmtacceptance-apache           This is a dummy ap...  @pmtacceptance  apache
php
pmtacceptance-php              This is a dummy ph...  @pmtacceptance  apache
php
```

Once you've identified the module you need, you can install it by name as described above.□

Managing Modules

Listing Installed Modules

Use the module tool's `list` action to see which modules you have installed (and which directory they're installed in).

- Use the `--tree` option to view the modules arranged by dependency instead of by location on disk.

Upgrading Modules

Use the module tool's `upgrade` action to upgrade an installed module to the latest version. The target module must be identified by its full name.□

- Use the `--version` option to specify a version.
- Use the `--ignore-dependencies` option to skip upgrading any modules required by this module.

Uninstalling Modules

Use the module tool's `uninstall` action to remove an installed module. The target module must be identified by its full name:□

```
# puppet module uninstall apache
Error: Could not uninstall module 'apache':
  Module 'apache' is not installed
      You may have meant `puppet module uninstall puppetlabs-apache`
# puppet module uninstall puppetlabs-apache
Removed /etc/puppet/modules/apache (v0.0.3)
```

By default, the tool won't uninstall a module which other modules depend on or whose files have□ been edited since it was installed.

- Use the `--force` option to uninstall even if the module is depended on or has been manually edited.

Publishing Modules on the Puppet Forge

The Puppet Forge is a repository of modules, written and contributed by users. This document describes how to publish your own modules to the Puppet Forge so that other users can install them.

- Continue reading to learn how to publish your modules to the Puppet Forge.
- See "Module Fundamentals" for how to write and use your own Puppet modules.
- See "Installing Modules" for how to install pre-built modules from the Puppet Forge.
- See "Using Plugins" for how to arrange plugins (like custom facts and custom resource types) in modules and sync them to agent nodes.

Overview

This guide assumes that you have already written a useful Puppet module. To publish your module, you will need to:

1. Create a Puppet Forge account, if you don’t already have one
2. Prepare your module
3. Write a Modulefile with the required metadata
4. Build an uploadable tarball of your module
5. Upload your module using the Puppet Forge’s web interface.

A Note on Module Names

Because many users have published their own versions of modules with common names (“mysql,” “bacula,” etc.), the Puppet Forge requires module names to have a username prefix. That is, if a user named “puppetlabs” maintained a “mysql” module, it would be known to the Puppet Forge as `puppetlabs-mysql`.

Be sure to use this long name in your module’s Modulefile. However, you do not have to rename the module’s directory, and can leave the module in your active modulepath — the build action will do the right thing as long as the Modulefile is correct.

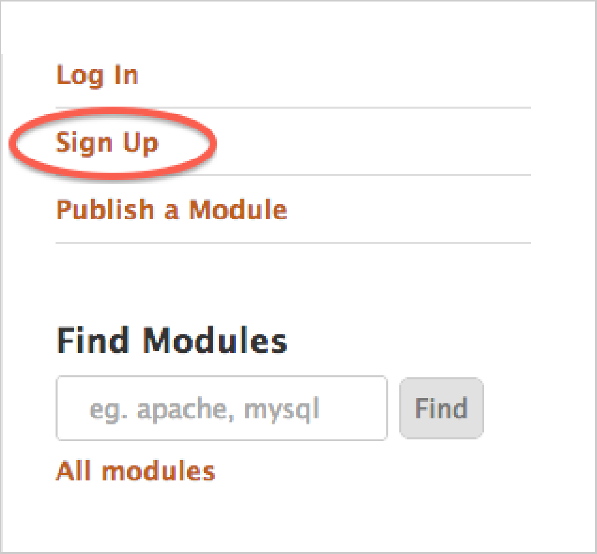
Another Note on Module Names

Although the Puppet Forge expects to receive modules named `username-module`, its web interface presents them as `username/module`. There isn’t a good reason for this, and we are working on reconciling the two; in the meantime, be sure to always use the `username-module` style in your metadata files and when issuing commands.

Create a Puppet Forge Account

Before you begin, you should create a user account on the Puppet Forge. You will need to know your username when preparing to publish any of your modules.

Start by navigating to the Puppet Forge website and clicking the “Sign Up” link in the sidebar:



Fill in your details. After you finish, you will be asked to verify your email address via a verification email. Once you have done so, you can publish modules to the Puppet Forge.

Prepare the Module

If you already have a Puppet module with the correct directory layout, you may continue to the next step.

Alternately, you can use the `puppet module generate` action to generate a template layout. This is mostly useful if you need an example Modulefile and README, and also includes a copy of the `spec_helper` tool for writing rspec-puppet tests. If you choose to do this, you will need to manually copy your module's files into the template.

To generate a template, run `puppet module generate <USERNAME>-<MODULE NAME>`. For example:

```
# puppet module generate examplecorp-mymodule
Generating module at /Users/fred/Development/examplecorp-mymodule
examplecorp-mymodule
examplecorp-mymodule/tests
examplecorp-mymodule/tests/init.pp
examplecorp-mymodule/spec
examplecorp-mymodule/spec/spec_helper.rb
examplecorp-mymodule/README
examplecorp-mymodule/Modulefile
examplecorp-mymodule/manifests
examplecorp-mymodule/manifests/init.pp
```

> Note: This action is of limited use when developing a module from scratch, as the module must be renamed to remove the username prefix before it can be used with Puppet.

Write a Modulefile

In your module's main directory, create a text file named `Modulefile`. If you generated a template, you'll already have an example Modulefile.

The Modulefile resembles a configuration or data file, but is actually a simple Ruby domain-specific language (DSL), which is executed when you build a tarball of the module. This means Ruby's normal rules of string quoting apply:

```
name 'examplecorp-mymodule'
version '0.0.1'
dependency 'puppetlabs/mysql', '1.2.3'
description "This is a full description
    of the module, and is being written as a multi-line string."
```

Modulefiles support the following pieces of metadata:

- `name` — REQUIRED. The full name of the module, including the username (e.g. "username-module" — see note above).
- `version` — REQUIRED. The current version of the module. This should be a semantic version.

- `summary` — REQUIRED. A one-line description of the module.
- `description` — REQUIRED. A more complete description of the module.
- `dependency` — A module that this module depends on. Unlike the other fields, the `dependency` method accepts up to three comma-separated arguments: a module name (with a slash between the user and name, not a hyphen), a version requirement, and a repository. A Modulefile may include multiple `dependency` lines. See “Dependencies in the Modulefile” below for more details.
- `project_page` — The module’s website.
- `license` — The license under which the module is made available.
- `author` — The module’s author. If not provided, this field will default to the username portion of the module’s `name` field.
- `source` — The module’s source. This field’s purpose is not specified.

Dependencies in the Modulefile

If you choose to rely on another Forge module, you can express this in the “dependency” field of your Modulefile:

```
dependency 'puppetlabs/stdlib', '>= 2.2.1'
```

> Warning: The full name in a dependency must use a slash between the username and module name. This is different from the name format used elsewhere in the Modulefile. This is a legacy architecture problem with the Puppet Forge, and we apologize for the inconvenience. Our eventual plan is to allow full names with hyphens everywhere while continuing to allow names with slashes, then (eventually, much later) phase out names with slashes.

A Modulefile may have several dependency fields.

The version requirement in a dependency isn’t limited to a single version; you can use several operators for version comparisons. The following operators are available:

- `1.2.3` — A specific version.
- `>1.2.3` — Greater than a specific version.
- `<1.2.3` — Less than a specific version.
- `>=1.2.3` — Greater than or equal to a specific version.
- `<=1.2.3` — Less than or equal to a specific version.
- `>=1.0.0 <2.0.0` — Range of versions; both conditions must be satisfied. (This example would match 1.0.1 but not 2.0.1)
- `1.x` — A semantic major version. (This example would match 1.0.1 but not 2.0.1, and is shorthand for `>=1.0.0 <2.0.0`.)
- `1.2.x` — A semantic major & minor version. (This example would match 1.2.3 but not 1.3.0, and is shorthand for `>=1.2.0 <1.3.0`.)

A Note on Semantic Versioning

When writing your Modulefile, you're setting a version for your own module and optionally expressing dependancies on others' module versions. We strongly recommend following the Semantic Versioning specification. Doing so allows others to rely on your modules without unexpected change.

Many other users already use semantic versioning, and you can take advantage of this in your modules' dependencies. For example, if you depend on puppetlabs/stdlib and want to allow updates while avoiding breaking changes, you could write the following line in your Modulefile (assuming a current stdlib version of 2.2.1):

```
dependency 'puppetlabs/stdlib', '2.x'
```

Build Your Module

Now that the content and Modulefile are ready, you can build a package of your module by running the following command:

```
puppet module build <MODULE DIRECTORY>
```

This will generate a `.tar.gz` package, which will be saved in the module's `pkg/` subdirectory.

For example:

```
# puppet module build /etc/puppetlabs/puppet/modules/mymodule
Building /etc/puppetlabs/puppet/modules/mymodule for release
/etc/puppetlabs/puppet/modules/mymodule/pkg/examplecorp-mymodule-0.0.1.tar.gz
```

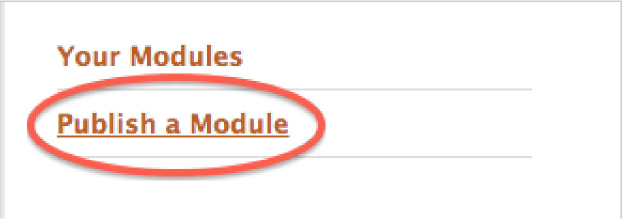
Upload to the Puppet Forge

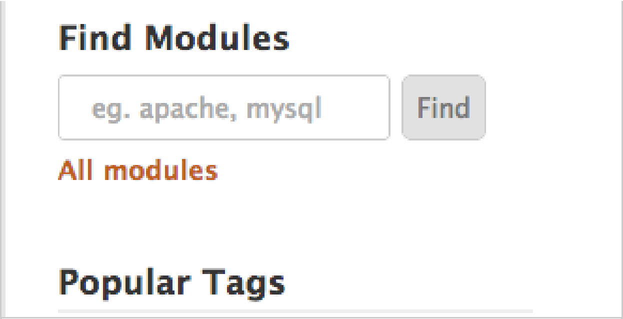
Now that you have a compiled `tar.gz` package, you can upload it to the Puppet Forge. There is currently no command line tool for publishing; you must use the Puppet Forge's web interface.

In your web browser, navigate to the Puppet Forge; log in if necessary.

Create a Module Page

If you have never published this module before, you must create a new page for it. Click on the "Publish a Module" link in the sidebar:



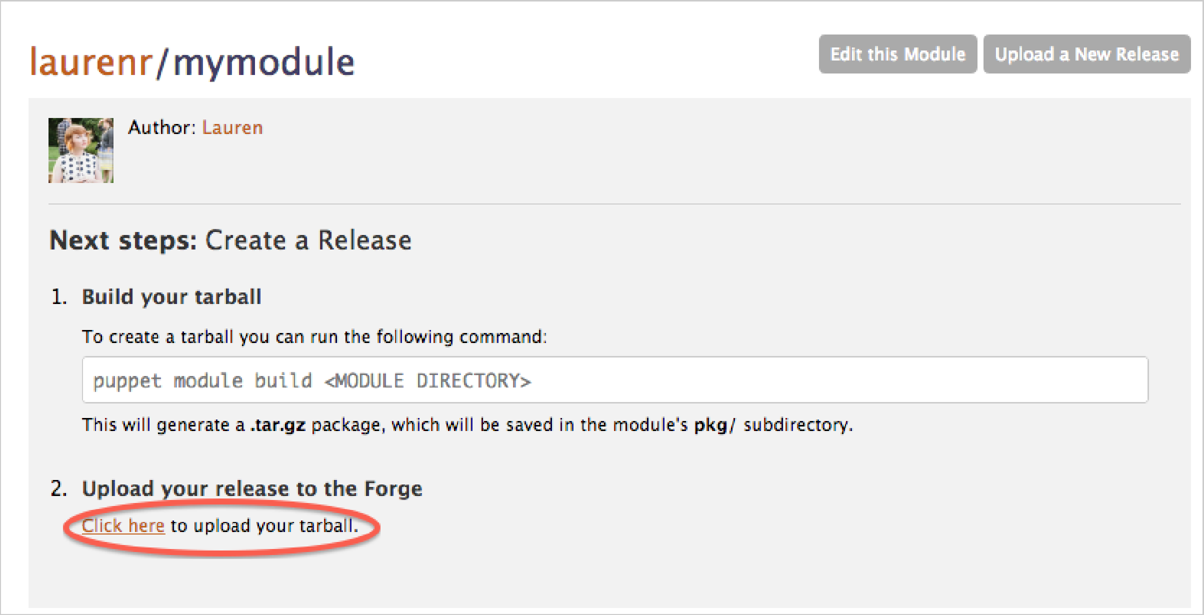


This will bring up a form for info about the new module. Only the “Module Name” field is required.□ Use the module’s short name, not the long `username-module` name.

Clicking the “Publish Module” button at the bottom of the form will automatically navigate to the new module page.

Create a Release

Navigate to the module’s page if you are not already there, and click the “Click here to upload your tarball” link:



Next steps: Create a Release

1. **Build your tarball**

   To create a tarball you can run the following command:

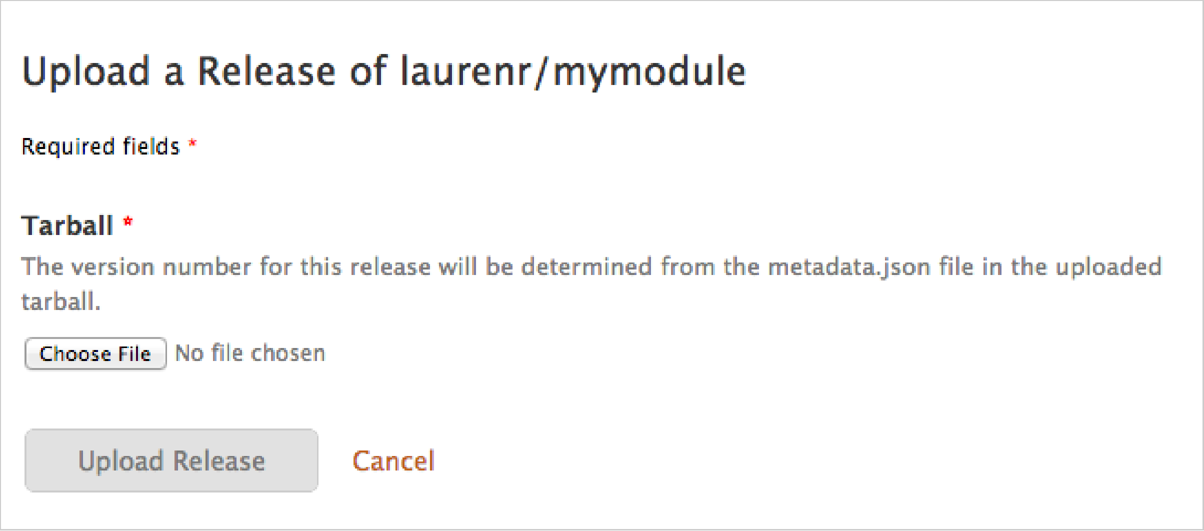
   ```
   puppet module build <MODULE DIRECTORY>
   ```

   This will generate a **.tar.gz** package, which will be saved in the module's **pkg/** subdirectory.

2. **Upload your release to the Forge**

   Click here to upload your tarball.

This will bring you to the upload form:



Upload a Release of laurenr/mymodule

Required fields *

Tarball *

The version number for this release will be determined from the metadata.json file in the uploaded tarball.

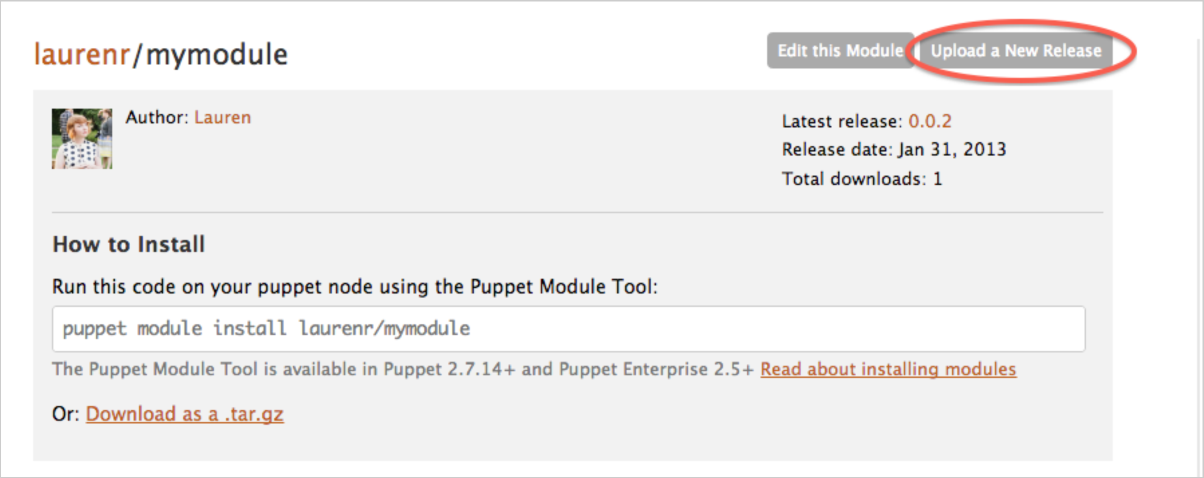
Click “Choose File” and use the file browser to locate and select the release tarball you created with the `puppet module build` action. Then click the “Upload Release” link.

Your module has now been published to the Puppet Forge. The Forge will pull your README, Changelog, and License files from your tarball to display on your module’s page. To confirm that it was published correctly, you can install it on a new system using the `puppet module install` action.

Release a New Version

To release a new version of an already published module, you will need to make any necessary edits to your module, and then increment the `version` field in the Modulefile (ensuring you use a valid semantic version).

When you are ready to publish your new version, navigate to the Puppet Forge and log in if necessary. Click the “Upload a New Release” link:



laurenr/mymodule

Author: Lauren

Latest release: 0.0.2
Release date: Jan 31, 2013
Total downloads: 1

How to Install

Run this code on your puppet node using the Puppet Module Tool:

```
puppet module install laurenr/mymodule
```

The Puppet Module Tool is available in Puppet 2.7.14+ and Puppet Enterprise 2.5+ Read about installing modules

Or: Download as a .tar.gz

This will bring you to the upload form as mentioned in Create a Release above, where you can select the new release tarball and upload the release.

Techniques

Here are some useful tips & tricks.

How Can I Manage Whole Directories of Files Without Explicitly Listing the Files?

The file type has a “recurse” attribute, which can be used to synchronize the contents of a target directory recursively with a chosen source. In the example below, the entire /etc/httpd/conf.d directory is synchronized recursively with the copy on the server:

```
file { "/etc/httpd/conf.d":
  source => "puppet://server/vol/mnt1/adm/httpd/conf.d",
  recurse => true,
}
```

You can also set `purge => true` to keep the directory clear of all files or directories not managed by Puppet.

How Do I Run a Command Whenever A File Changes?

The answer is to use an exec resource with refreshonly set to true, such as in this case of telling bind to reload its configuration when it changes:

```
file { "/etc/bind": source => "/dist/apps/bind" }

exec { "/usr/bin/ndc reload":
  subscribe => File["/etc/bind"],
  refreshonly => true
}
```

The exec has to subscribe to the file so it gets notified of changes.

How Can I Ensure a Group Exists Before Creating a User?

In the example given below, we'd like to create a user called tim who we want to put in the fearme group. By using the require attribute, we can create a dependency between the user tim and the group fearme. The result is that user tim will not be created until puppet is certain that the fearme group exists.

```
group { "fearme":
        ensure => present,
        gid => 1000
}
user { "tim":
        ensure => present,
        gid => "fearme",
        groups => ["adm", "staff", "root"],
        membership => minimum,
        shell => "/bin/bash",
        require => Group["fearme"]
}
```

Note that Puppet will set this relationship up for you automatically, so you should not normally need to do this.

How Can I Require Multiple Resources Simultaneously?

Give the `require` attribute an array as its value. In the example given below, we're again adding the user tim (just as we did earlier in this document), but in addition to requiring tim's primary group, fearme, we're also requiring another group, fearmenot. Any reasonable number of resources can be required in this way.

```
user { "tim":
        ensure => present,
        gid => "fearme",
        groups => ["adm", "staff", "root", "fearmenot"],
        membership => minimum,
        shell => "/bin/bash",
        require => [ Group["fearme"],
                            Group["fearmenot"]
                          ]
        }
```

Can I use complex comparisons in if statements and variables?

In Puppet version 0.24.6 onwards you can use complex expressions in if statements and variable assignments. You can see examples of how to do this in the language guide.

Can I output Facter facts in YAML?

Facter supports output of facts in YAML as well as to standard out. You need to run:

```
# facter --yaml
```

To get this output, which you can redirect to a file for further processing.

Can I check the syntax of my templates?

ERB files are easy to syntax check. For a file mytemplate.erb, run:

```
$ erb -x -T '-' -P mytemplate.erb | ruby -c
```

The trim option specified corresponds to what Puppet uses.

Troubleshooting

Answers to some common problems that may come up.

Basic workflow items are covered in the main section of the documentation. If you’re looking for how to do something unconventional, you may also wish to read Techniques.

General

Why hasn’t my new node configuration been noticed?

If you’re using separate node definition files and import them into site.pp (with an `import *.node`, for example) you’ll find that new files added won’t get noticed until you restart puppetmasterd. This is due to the fact globs aren’t evaluated on each run, but only when the ‘parent’ file is re-read.

To make sure your new file is actually read, simply ‘touch’ the site.pp (or importing file) and the glob will be re-evaluated.

Why don’t my certificates show as waiting to be signed on my server when I do a “`puppet cert --list`”?

puppet cert must be run with root privileges. If you are not root, then re-run the command with sudo:

```
sudo puppet cert --list
```

I keep getting “certificates were not trusted”. What’s wrong?

Firstly, if you’re re-installing a machine, you probably haven’t cleared the previous certificate for that machine. To correct the problem:

1. Run `sudo puppet cert --clean {node certname}` on the puppet master to clear the certificates.
2. Remove the entire SSL directory of the client machine (`sudo rm -r etc/puppet/ssl; rm -r /var/lib/puppet/ssl`).

Assuming that you’re not re-installing, by far the most common cause of SSL problems is that the clock on the client machine is set incorrectly, which confuses SSL because the “validFrom” date in the certificate is in the future.

You can figure the problem out by manually verifying the certificate with openssl:

```
sudo openssl verify -CAfile /etc/puppet/ssl/certs/ca.pem
/etc/puppet/ssl/certs/myhostname.domain.com.pem
```

This can also happen if you’ve followed the Using Mongrel pattern to alleviate file download problems. If your set-up is such that the host name differs from the name in the Puppet server certificate, or there is any other SSL certificate negotiation problem, the SSL handshake between client and server will fail. In this case, either alleviate the SSL handshake problems (debug using cURL), or revert to the original Webrick installation.

Agents are failing with a “hostname was not match with the server certificate” error; what’s wrong?

Agent nodes determine the validity of the master’s certificate based on hostname; if they’re contacting it using a hostname that wasn’t included when the certificate was signed, they’ll reject the certificate.

To fix this error, either:

- Modify your agent nodes’ settings to point to one of the master’s certified hostnames. (This may also require adjusting your site’s DNS.) To see the puppet master’s certified hostnames, run:

  ```
  $ sudo puppet master --configprint certname,certdnsnames
  ```

  …on the puppet master server.

- Re-generate the puppet master’s certificate:
  - Stop puppet master.
  - Delete the puppet master’s certificate, private key, and public key:

    ```
      $ sudo find $(puppet master --configprint ssldir) -name "$(puppet master
    --configprint certname).pem" -delete
    ```

  - Edit the `certname` and `certdnsnames` settings in the puppet master’s `/etc/puppet/puppet.conf` file to match the puppet master’s actual hostnames.
  - Start a non-daemonized WEBrick puppet master instance, and wait for it to generate and sign a new certificate:

    ```
      $ sudo puppet master --no-daemonize --verbose
    ```

    You should stop the temporary puppet master with ctrl-C after you see the “notice: Starting Puppet master version 2.6.9” message.
  - Restart the puppet master.

I’m getting IPv6 errors; what’s wrong?

This can happen if Ruby is not compiled with IPv6 support. The only known solution is to make sure you’re running a version of Ruby compiled with IPv6 support.

I’m getting tlsv1 alert unknown ca errors; what’s wrong?

This problem is caused by puppetmasterd not being able to read its ca certificate. This problem might occur up to 0.18.4 but has been fixed in 0.19.0. You can probably fix it for versions before 0.19.0 by changing the group ownership of the /etc/puppet/ssl directory to the puppet group, but puppetd may change the group back. Having puppetmasterd start as the root user should fix the problem permanently until you can upgrade.

Why does Puppet keep trying to start a running service?

The ideal way to check for a service is to use the hasstatus attribute, which calls the init script with its `status` command. This should report back to Puppet whether the service is running or stopped.

In some broken scripts, however, the status output will be correct (“Ok” or “not running”), but the exit code of the script will be incorrect. (Most commonly, the script will always blindly return 0.) Puppet only uses the exit code, and so may behave unpredictably in these cases.

There are two workarounds, and one fix. If you must deal with the script’s broken behavior as is, your resource can either use the “pattern” attribute to look for a particular name in the process table, or use the “status” attribute to specify a custom script that returns the proper exit code for the service’s status.

The longer-term fix is to rewrite the service’s init script to use the proper exit codes. When rewriting them, or submitting bug reports to vendors or upstream, be sure to reference the LSB Init Script Actions standard. This should carry more weight by pointing out an official, published standard they're failing to meet, rather than trying to explain how their bug is causing problems in Puppet.

Why is my external node configuration failing? I get no errors by running the script by hand.

Most of the time, if you get the following error when running you client

```
warning: Not using cache on failed catalog
err: Could not retrieve catalog; skipping run
```

it is because of some invalid YAML output from your external node script. Check yaml.org if you have doubts about validity.

Puppet Syntax Errors

Puppet generates syntax errors when manifests are incorrectly written. Sometimes these errors can be a little cryptic. Below is a list of common errors and their explanations that should help you trouble-shoot your manifests.

Syntax error at '}'; expected '}' at manifest.pp:nnn

This error can occur when:

```
service { "fred" }
```

This contrived example demonstrates one way to get the very confusing error of Puppet's parser expecting what it found. In this example, the colon (:) is missing after the service title. A variant looks like:

```
service { "fred"
    ensure => running
}
```

and the error would be Syntax error at 'ensure'; expected '}' .

You can also get the same error if you forget a comma. For instance, in this example the comma is missing at the end of line 3: service { "myservice": provider => "runit" path => "/path/to/daemons" }

Syntax error at ':'; expected ']' at manifest.pp:nnn

This error can occur when:

```
classname::define_name {
    "jdbc/automation":
        cpoolid     => "automationPool",
        require     => [ Classname::other_define_name["automationPool"] ],
}
```

The problem here is that Puppet requires that object references in the require lines to begin with a capital letter. However, since this is a reference to a class and a define, the define also needs to have a capital letter, so Classname::Other_define_name would be the correct syntax.

Syntax error at ‘.’; expected ‘}’ at manifest.pp:nnn

This error happens when you use unquoted comparators with dots in them, a’la:

```
class autofs {

  case $kernelversion {
    2.6.9:   { $autofs_packages = ["autofs", "autofs5"] }
    default: { $autofs_packages = ["autofs"] }
  }
}
```

That 2.6.9 needs to have double quotes around it, like so:

```
class autofs {

   case $kernelversion {
     "2.6.9":   { $autofs_packages = ["autofs", "autofs5"] }
     default: { $autofs_packages = ["autofs"] }
   }
 }
```

Could not match ‘_define_name’ at manifest.pp:nnn on node nodename

This error can occur using a manifest like:

```
case $ensure {
    "present": {
        _define_name {
            "$title":
                user        => $user,
        }
    }
}
```

This one is simple – you cannot begin a function name (define name) with an underscore.

Duplicate definition: Classname::Define_name[system] is already defined in file manifest.pp at line nnn; cannot redefine at manifest.pp:nnn on node nodename

This error can occur when using a manifest like:

```
Classname::define_name {
     "system":
         properties  => "Name=system";
     .....
     "system":
          properties  => "Name=system";
 }
```

The most confusing part of this error is that the line numbers are usually the same – this is the case when using the block format that Puppet supports for a resource definition. In this contrived example, the system entry has been defined twice, so one of them needs removing.

Syntax error at '=>'; expected ')'

This error results from incorrect syntax in a defined resource type:

```
define foo($param => 'value') { ... }
```

Default values for parameters are assigned, not defined, therefore a '=', not a '=>' operator is needed.

Syntax error at '«|'; expected '|»'

You may get this error when using a manifest like:

```
node a {
   @@foo_module::bar_exported_resource {
        .....
   }
}

node b {
   #where we collect things
   .....

   foo_module::bar_exported_resource <<| |>>
}
```

This confusing error is a result of improper (or rather lack of any) capitalization while collecting the exported resource — resource collectors use the capitalized form of the resource type. The manifest for the node b should actually be:

```
node b {
    #where we collect things
    .....

    Foo_module::Bar_exported_resource <<| |>>
}
```

err: Exported resource Blah[$some_title] cannot override local resource on node $nodename

While this is not a classic "syntax" error, it is a annoying error none-the-less. The actual error tells you that you have a local resource Blah[$some_title] that puppet refuses to overwrite with a collected resource of the same name. What most often happens, that the same resource is exported by two nodes. One of them is collected first and when trying to collect the second resource, this error happens as the first is already converted to a "local" resource.

Common Misconceptions

Node Inheritance and Variable Scope

It is generally assumed that the following will result in the /tmp/puppet-test.variable file containing the string ‘my_node’:

```
class test_class {
    file { "/tmp/puppet-test.variable":
       content => "$testname",
       ensure => present,
    }
}

node base_node {
    include test_class
}

node my_node inherits base_node {
    $testname = 'my_node'
}
```

Contrary to expectations, /tmp/puppet-test.variable is created with no contents. This is because the inherited test_class remains in the scope of base_node, where $testname is undefined.

Node inheritance is currently only really useful for inheriting static or self-contained classes, and is, as a result, of quite limited value.

A workaround is to define classes for your node types – essentially include classes rather than inheriting them. For example:

```
class test_class {
    file { "/tmp/puppet-test.variable":
       content => "$testname",
       ensure => present,
    }
}

class base_node_class {
    include test_class
}

node my_node {
    $testname = 'my_node'
    include base_node_class
}
```

/tmp/puppet-test.variable will now contain ‘my_node’ as desired.

Class Inheritance and Variable Scope

The following would also not work as generally expected:

```
class base_class {
    $myvar = 'bob'
    file {"/tmp/testvar":
         content => "$myvar",
         ensure => present,
    }
}

class child_class inherits base_class {
    $myvar = 'fred'
}
```

The /tmp/testvar file would be created with the content ‘bob’, as this is the value of $myvar where the type is defined.

A workaround would be to ‘include’ the base_class, rather than inheriting it, and also to strip the $myvar out of the included class itself (otherwise it will cause a variable scope conflict – $myvar would be set twice in the same child_class scope):

```
$myvar = 'bob'

class base_class {
    file {"/tmp/testvar":
         content => "$myvar",
         ensure => present,
    }
}

class child_class {
    $myvar = 'fred'
    include base_class
}
```

In some cases you can reset the content of the file resource so that the scope used for the content (e.g., template) is rebound. Example:

```
class base_class {
    $myvar = 'bob'
    file { "/tmp/testvar":
         content => template("john.erb"),
    }
}

class child_class inherits base_class {
    $myvar = 'fred'
    File["/tmp/testvar"] { content => template("john.erb") }
}
```

(john.erb contains a reference like <%= myvar %>.)

To avoid the duplication of the template filename, it is better to sidestep the problem altogether with a define:

```
class base_class {
    define testvar_file($myvar="bob") {
         file { $name:
             content => template("john.erb"),
         }
    }
    testvar_file { "/tmp/testvar": }
}

class child_class inherits base_class {
    Base_class::Testvar_file["/tmp/testvar"] { myvar => fred }
}
```

Whilst not directly solving the problem also useful are qualified variables that allow you to refer to variables from other classes. Qualified variables might provoke alternate methods of solving this issue. You can use qualified methods like:

```
class foo {
    $foovariable = "foobar"
}

class bar {
    $barvariable = $foo::foovariable
}
```

In this example the value of the of the $barvariable variable in the bar class will be set to foobar the value of the $foovariable variable which was set in the foo class.

Custom Type & Provider development

err: Could not retrieve catalog: Invalid parameter 'foo' for type 'bar'

When you are developing new custom types, you should restart both the puppetmasterd and the puppetd before running the configuration using the new custom type. The pluginsync feature will then synchronise the files and the new code will be loaded when both daemons are restarted.

Using Parameterized Classes

Use parameterized classes to write more effective, versatile, and encapsulated code.

Why, and Some History

Well-written and reusable classes often have to change their behavior based on where and how they're declared. However, due to the organic way the Puppet language grew, there was a long period where it didn't have a specific means to do this.

Most Puppet coders solved this by using dynamic variable lookup to pass parameters into classes. By making the class's effects pivot on a handful of variables not defined in the class, you could later set those variables at node scope or in another class, then declare the class and assign its parent scope; at that point, the class would go looking for the information it needed and react accordingly.

This approach did the job and solved some really important problems, but it had major drawbacks:

- It basically exploded all variables into the global namespace. Since classes had to look outside their own scope for parameters, parameters were effectively global. That meant you had to anticipate what every other module author was going to name their variables and try to guess something safe.

- Understanding how to declare a class was not exactly straightforward. There was no built-in way to tell what parameters a class needed to have set, so you were on your own for documenting it and following the rules to the letter. Optional parameters in particular could bite you at exactly the wrong time.
- It was just plain confusing. The rules for how a parent scope is assigned can fit on an index card, but they can interact in some extraordinarily hairy ways. (ibid.)

So to shorten a long story, Puppet 2.6 introduced a better and more direct way to pass parameters into a class.

Philosophy

A class that depends on dynamic scope for its parameters has to do its own research. Instead, you should supply it with a full dossier when you declare it. Start thinking in terms of passing information to the class, instead of in terms of setting variables and getting scope to act right.

Using Parameterized Classes

Writing a Parameterized Class

Parameterized classes are defined just like classical classes, but with a list of parameters (in parentheses) between the class name and the opening bracket:

```
class webserver( $vhost_dir, $packages ) {
  ...
}
```

The parameters you name can be used as normal local variables throughout the class definition. In fact, the first step in converting a class to use parameters is to just locate all the variables you're expecting to find in an outer scope and call them out as parameters — you won't have to change how they're used inside the class at all.

```
class webserver( $vhost_dir, $packages ) {
  package { $packages: ensure => present }

  file { 'vhost_dir':
    path   => $vhost_dir,
    ensure => directory,
    mode   => '0750',
    owner  => 'www-data',
    group  => 'root',
  }
}
```

You can also give default values for any parameter in the list:

```
class webserver( $vhost_dir = '/etc/httpd/conf.d', $packages = 'httpd' ) {
  ...
}
```

Any parameter with a default value can be safely omitted when declaring the class.

Declaring a Parameterized Class

This can be easy to forget when using the shorthand `include` function, but class instances are just resources. Since `include` wasn't designed for use with parameterized classes, you have to declare them like a normal resource: type, name, and attributes, in their normal order. The parameters you named when defining the class become the attributes you use when declaring it:□

```
class {'webserver':
  packages  => 'apache2',
  vhost_dir => '/etc/apache2/sites-enabled',
}
```

Or, if declaring with all default values:

```
class {'webserver': }
```

As of Puppet 2.6.5, parameterized classes can be declared by external node classifiers; see the ENC documentation for details.

Site Design and Composition With Parameterized Classes

Once your classes are converted to use parameters, there's some work remaining to make sure your classes can work well together.

A common pattern with standard classes is to `include` any other classes that the class requires. Since `include` ensures a class is declared without redeclaring it, this has been a convenient way to satisfy dependencies. This won't work well with parameterized classes, though, for the reasons we've mentioned above.

Instead, you should explicitly state your class's dependencies inside its definition using the□ relationship chaining syntax:

```
class webserver( $vhost_dir, $packages ) {
  ...
  # Make sure our ports are configured correctly:
  Class['iptables::webserver'] -> Class['webserver']
}
```

Instead of implicitly declaring the required class, this will make sure that compilation throws an error if it's absent. From one perspective, this is less convenient; from another, it's less magical and more knowable. For those who prefer implicit declaration, we're working on a safe way to implicitly declare parameterized classes, but the design work isn't finished at the time of this writing.□

Once you've stated your class's dependencies, you'll need to declare the required classes when composing your node or wrapper class:

```
class tacoma_webguide_application_server {
  class {'webserver':
    packages  => 'apache2',
    vhost_dir => '/etc/apache2/sites-enabled',
  }
  class {'iptables::webserver':}
}
```

The general rule of thumb here is that you should only be declaring other classes in your outermost node or class definitions.□

Further Reading

For more information on modern Puppet class and module design, see the Puppet Labs style guide.

Appendix: Smart Parameter Defaults

This design pattern can make for significantly cleaner code while enabling some really□ sophisticated behavior around default values.

```
# /etc/puppet/modules/webserver/manifests/params.pp

class webserver::params {
 $packages = $operatingsystem ? {
   /(?i-mx:ubuntu|debian)/        => 'apache2',
   /(?i-mx:centos|fedora|redhat)/ => 'httpd',
 }
 $vhost_dir = $operatingsystem ? {
   /(?i-mx:ubuntu|debian)/        => '/etc/apache2/sites-enabled',
   /(?i-mx:centos|fedora|redhat)/ => '/etc/httpd/conf.d',
 }
}

# /etc/puppet/modules/webserver/manifests/init.pp

class webserver(
 $packages  = $webserver::params::packages,
 $vhost_dir = $webserver::params::vhost_dir
) inherits webserver::params {

 package { $packages: ensure => present }

 file { 'vhost_dir':
   path   => $vhost_dir,
   ensure => directory,
   mode   => '0750',
   owner  => 'www-data',
   group  => 'root',
 }
}
```

To summarize what’s happening here: When a class inherits from another class, it implicitly declares the base class. Since the base class’s local scope already exists before the new class’s parameters get declared, those parameters can be set based on information in the base class.

This is functionally equivalent to doing the following:

```
# /etc/puppet/modules/webserver/manifests/init.pp

class webserver( $packages = 'UNSET', $vhost_dir = 'UNSET' ) {

 if $packages == 'UNSET' {
   $real_packages = $operatingsystem ? {
     /(?i-mx:ubuntu|debian)/        => 'apache2',
     /(?i-mx:centos|fedora|redhat)/ => 'httpd',
   }
 }
 else {
    $real_packages = $packages
 }

 if $vhost_dir == 'UNSET' {
   $real_vhost_dir = $operatingsystem ? {
     /(?i-mx:ubuntu|debian)/        => '/etc/apache2/sites-enabled',
     /(?i-mx:centos|fedora|redhat)/ => '/etc/httpd/conf.d',
   }
 }
 else {
    $real_vhost_dir = $vhost_dir
}

 package { $real_packages: ensure => present }

 file { 'vhost_dir':
   path   => $real_vhost_dir,
   ensure => directory,
   mode   => '0750',
   owner  => 'www-data',
   group  => 'root',
 }
}
```

… but it’s a significant readability win, especially if the amount of logic or the number of□ parameters gets any higher than what’s shown in the example.

Module Smoke Testing

Learn to write and run tests for each manifest in your Puppet module.

Doing some basic “Has it exploded?” testing on your Puppet modules is extremely easy, has obvious benefits during development, and can serve as a condensed form of documentation.□

Testing in Brief

The baseline for module testing used by Puppet Labs is that each manifest should have a corresponding test manifest that declares that class or defined type.□

Tests are then run by using `puppet apply --noop` (to check for compilation errors and view a log of events) or by fully applying the test in a virtual environment (to compare the resulting system state to the desired state).

Writing Tests

A well-formed Puppet module implements each of its classes or defined types in separate files in its□ `manifests` directory. Thus, ensuring each class or type has a test will result in the `tests` directory being a complete mirror image of the `manifests` directory.

A test for a class is just a manifest that declares the class. Often, this is going to be as simple as `include apache::ssl`. For parameterized classes, the test must declare the class with all of its required attributes set:

```
class {'ntp':
  servers => ['0.pool.ntp.org', '1.pool.ntp.org'],
}
```

Tests for defined resource types may increase test coverage by declaring multiple instances of the□ type, with varying values for their attributes:

```
dotfiles::user {'root':
  overwrite => false,
}
dotfiles::user {'nick':
  overwrite => append,
}
dotfiles::user {'guest':
  overwrite => true,
}
```

If a class (or type) depends on any other classes, the test will have to declare those as well:

```
# git/manifests/gitosis.pp
class git::gitosis {
  package {'gitosis':
    ensure => present,
  }
  Class['::git'] -> Class['git::gitosis']
}

# git/tests/gitosis.pp
class{'git':}
class{'git::gitosis':}
```

Running Tests

Run tests by applying the test manifests with puppet apply.

For basic smoke testing, you can apply the manifest with `--noop`. This will ensure that a catalog can be properly compiled from your code, and it'll show a log of the RAL events that would have been performed; depending on how simple the class is, these are often enough to ensure that it's doing what you expect.

For more advanced coverage, you can apply the manifest to a live system, preferably a VM. You can expand your coverage further by maintaining a stable of snapshotted environments in various states, to ensure that your classes do what's expected in all the situations where they're likely to be applied.

Automating all this is going to depend on your preferred tools and processes, and is thus left as an exercise for the reader.

Reading Tests

Since module tests declare their classes with all required attributes and with all prerequisites declared, they can serve as a form of drive-by documentation: if you're in a hurry, you can often figure out how to use a module (or just refresh your memory) by skimming through the tests□ directory.

This doesn't get anyone off the hook for writing real documentation, but it's a good reason to write□ tests even if your module is already working as expected.

Exploring Further

This form of testing is extremely basic, and still requires a human reader to determine whether the right RAL events are being generated or the right system configuration is being enforced. For more□ advanced testing, you may want to investigate cucumber-puppet or cucumber-nagios.

Scope and Puppet as of 2.7

Puppet 2.7 issues deprecation warnings for dynamic variable lookup. Find out why, and learn how to adapt your Puppet code for the future!

What's Changing?

Dynamic scope will be removed from the Puppet language in a future version. This will be a major and backwards-incompatible change. Currently, if an unqualified variable isn't defined in the local□ scope, Puppet looks it up along an unlimited chain of parent scopes, eventually ending at top scope. In the future, Puppet will only examine the local, inherited, node, and top scopes when resolving an unqualified variable; intervening scopes will be ignored. In effect, all variables will one□ of the following:

- Local
- Inherited from a base class
- Node-level
- Global

To ease the transition, Puppet 2.7 issues deprecation warnings whenever dynamic variable lookup occurs. You should strongly consider refactoring your code to eliminate these warnings.

An example of dynamic lookup

```
    include dynamic

    class dynamic {
      $var = "from dynamic"
      include included
    }

    class included {
      notify { $var: } # dynamic lookup will end up finding "from dynamic"
                       # this will change to being undefined
    }
```

Why?

Dynamic scope is confusing and dangerous, and often causes unexpected behavior. Although dynamic scoping allows many powerful features, even if you’re being good, it can step in to “help” at inopportune moments. Dynamic scope interacts really badly with class inheritance, and it makes the boundaries between classes a lot more porous than good programming practice demands. It turns out that dynamic scoping is not needed since there are already better methods for accomplishing everything dynamic scope currently allows.

Thus, it’s time to bid it a fond farewell.

Making the Switch

So you’ve installed Puppet 2.7 and are ready to start going after those deprecation warnings. What do you do?

Qualify Your Variables!

Whenever you need to refer to a variable in another class, give the variable an explicit namespace: instead of simply referring to `$packagelist`, use `$git::core::packagelist`. This is a win in readability — any casual observer can tell exactly where the variable is being set, without having to model your code in their head — and it saves you from accidentally getting the value of some completely unrelated `$packagelist` variable. For complete clarity and consistency you will probably want to do this even when it isn’t absolutely neccessary.

```
    include parent::child

    class parent {
      $var = "from parent"
    }

    class parent::child inherits parent {
      $local_var = "from parent::child"
      notify { $parent::var: }  # will be "from parent".
      notify { $var: }          # will be "from parent", as well. Avoid using
this form.
      notify { $local_var: }    # will be "from parent::child". The unqualified
form is fine here.
    }
```

When referring to a variable in another class that is not a parent of the current class, then you will always need to fully qualify the variable name.

```
class other {
  $var = "from other"
}

class example {
  include other
  notify { $other::var: } # will be "from other"
}
```

If you're referring explicitly to a top-scope variable, use the empty namespace (e.g. `$::packagelist`) for extra clarity.

```
$var = "from topscope"
node default {
  $var = "from node"
  include lookup_example
}

class lookup_example {
  notify { $var: }   # will be "from node"
  notify { $::var: } # will be "from topscope"
}
```

Declare Resource Defaults Per-File!

Although resource defaults are not being changed, they will still be affected by dynamic scope; for□ consistency and clarity you'll want to follow these rules for them, as well.

Using your resource defaults without dynamic scope means one thing: you'll have to repeat yourself in each file that the defaults apply to.□

But this is not a bad thing! Resource defaults are usually just code compression, used to make a single file of Puppet code more concise. By making sure your defaults are always on the same page□ as the resources they apply to, you'll make your code more legible and predictable.

In cases where you need site-wide resource defaults, you can still set them at top scope in your primary site manifest. If you need the resource defaults in a class to change depending on where the class is being declared, you need parameterized classes.

All told, it's more likely that defaults have been traveling through scopes without your knowledge, and following these guidelines will just make them act like you thought they were acting.

Use Parameterized Classes!

If you need a class to dynamically change its behavior depending on where and how you declare it, it should be rewritten as a parameterized class; see our guide to using parameterized classes for more details.

Appendix: How Scope Works in Puppet ≤ 2.7.x

(Note that nodes defined in the Puppet DSL function identically to classes.)□

- Classes, nodes, and instances of defined types introduce new scopes.□
- When you declare a variable in a scope, it is local to that scope.
- Every scope has one and only one “parent scope.”
  - If it’s a class that inherits from a base class, its parent scope is the base class.
  - Otherwise, its parent scope is the FIRST scope where that class was declared. (If you are declaring classes in multiple places with `include`, this can be unpredictable. Furthermore, declaring a derived class will implicitly declare the base class in that same scope.)
- If you try to resolve a variable that doesn’t exist in the current local scope, lookup proceeds through the chain of parent scopes — its parent, the parent’s parent, and so on, stopping at the first place it finds that variable.□

These rules seem simple enough, so an example is in order:

```
# manifests/site.pp
$nodetype = "base"

node "base" {
    include postfix
    ...snip...

}

node "www01", "www02", ... , "www10" inherits "base" {
     $nodetype = "wwwnode"
     include postfix::custom

}

# modules/postfix/manifests/init.pp
# (Template stored in modules/postfix/templates/main.cf.erb)
class postfix {
     package {"postfix": ensure => installed}
     file {"/etc/postfix/main.cf":
          content => template("postfix/main.cf.erb")
     }

}

# modules/postfix/manifests/custom.pp
class postfix::custom inherits postfix {
     File ["/etc/postfix/main.cf"] {
          content => undef,
          source => [ "puppet:///files/$hostname/main.cf",
                      "puppet:///files/$nodetype/main.cf" ]
     }

}
```

When nodes www01 through www10 connect to the puppet master, `$nodetype` will always be set to “base” and main.cf will always be served from files/base/. This is because `postfix::custom`’s chain of parent scopes is `postfix::custom < postfix < base < top-scope`; the combination of inheritance and dynamic scope causes lookup of the `$nodetype` variable to bypass `node 01-10` entirely.

Thanks to Ben Beuchler for contributing this example.

The Puppet File Server

This guide covers the use of Puppet's file serving capability.

The `puppet master` service includes a file server for transferring static files. If a `file` resource declaration contains a `puppet:` URI in its `source` attribute, nodes will retrieve that file from the master's file server:

```
# copy a remote file to /etc/sudoers
file { "/etc/sudoers":
    mode => 440,
    owner => root,
    group => root,
    source => "puppet:///modules/module_name/sudoers"
}
```

All puppet file server URIs are structured as follows:

```
puppet://{server hostname (optional)}/{mount point}/{remainder of path}
```

If a server hostname is omitted (i.e. `puppet:///{mount point}/{path}`; note the triple-slash), the URI will resolve to whichever server the evaluating node considers to be its master. As this makes manifest code more portable and reusable, hostnames should be omitted whenever possible.

The remainder of the `puppet:` URI maps to the server's filesystem in one of two ways, depending on whether the files are provided by a module or exposed through a custom mount point.

Serving Module Files

As the vast majority of file serving should be done through modules, the Puppet file server provides a special and semi-magical mount point called `modules`, which is available by default. If a URI's mount point is `modules`, Puppet will:

- Interpret the next segment of the path as the name of a module…[1]
- … locate that module in the server's `modulepath` (as described here under "Module Lookup")…
- … and resolve the remainder of the path starting in that module's `files/` directory.

That is to say, if a module named `test_module` is installed in the central server's `/etc/puppet/modules` directory, the following puppet: URI…

```
puppet:///modules/test_module/testfile.txt
```

…will resolve to the following absolute path:

```
/etc/puppet/modules/test_module/files/testfile.txt
```

If `test_module` were installed in `/usr/share/puppet/modules`, the same URI would instead resolve to:

```
/usr/share/puppet/modules/test_module/files/testfile.txt
```

Although no additional configuration is required to use the `modules` mount point, some access controls can be specified in the file server configuration by adding a `[modules]` configuration block; see Security.

Serving Files From Custom Mount Points

Puppet can also serve files from arbitrary mount points specified in the server's file server configuration (see below). When serving files from a custom mount point, Puppet does not perform the additional URI abstraction used in the `modules` mount, and will resolve the path following the mount name as a simple directory structure.

File Server Configuration

The default location for the file server's configuration data is /etc/puppet/fileserver.conf; this can be changed by passing the `--fsconfig` flag to `puppet master`.

The format of the fileserver.conf file is almost exactly like that of rsync, and roughly resembles an INI file:

```
[mount_point]
    path /path/to/files
    allow *.example.com
    deny *.wireless.example.com
```

The following options can currently be specified for a given mount point:

- The `path` to the mount's location on the disk
- Any number of `allow` directives
- Any number of `deny` directives

`path` is the only required option, but since the default security configuration is to deny all access, a mount point with no `allow` directives would not be available to any nodes.

The path can contain any or all of %h, %H, and %d, which are dynamically replaced by the client's hostname, its fully qualified domain name and its domain name, respectively. All are taken from the client's SSL certificate (so be careful if you've got hostname/certname mismatches). This is useful in creating modules where files for each client are kept completely separately, e.g. for private ssh host keys. For example, with the configuration

```
[private]
    path /data/private/%h
    allow *
```

the request for file /private/file.txt from client client1.example.com will look for a file /data/private/client1/file.txt, while the same request from client2.example.com will try to retrieve the file /data/private/client2/file.txt on the fileserver.

Currently paths cannot contain trailing slashes or an error will result. Also take care that in puppet.conf you are not specifying directory locations that have trailing slashes.

Security

Securing the Puppet file server consists of allowing and denying access (at varying levels of specificity) per mount point. Groups of nodes can be identified for permission or denial in three ways: by IP address, by name, or by a single global wildcard (`*`). Custom mount points default to denying all access.

In addition to custom mount points, there are two special mount points which can be managed with `fileserver.conf`: `modules` and `plugins`. Neither of these mount points should have a `path` option specified. The behavior of the `modules` mount point is described above under Serving Files From Custom Mount Points. The `plugins` mount is not a true mount point, but is rather a hook to allow `fileserver.conf` to specify which nodes are permitted to sync plugins from the Puppet Master. Both of these mount points exist by default, and both default to allowing all access; if any `allow` or `deny` directives are set for one of these special mounts, its security settings will behave like those of a normal mount (i.e., it will default to denying all access). Note that these are the only mount points for which `deny *` is not redundant.

If nodes are not connecting to the Puppet file server directly, e.g. using a reverse proxy and Mongrel (see Using Mongrel), then the file server will see all the connections as coming from the proxy server's IP address rather than that of the Puppet Agent node. In this case, it is best to restrict access based on hostname. Additionally, the machine(s) acting as reverse proxy (usually 127.0.0.0/8) will need to be allowed to access the applicable mount points.

Priority

More specific `deny` and `allow` statements take precedence over less specific statements; that is, an `allow` statement for `node.example.com` would let it connect despite a `deny` statement for `*.example.com`. At a given level of specificity, `deny` statements take precedence over `allow` statements.

Unpredictable behavior can result from mixing IP address directives with hostname and domain name directives, so try to avoid doing that. (Currently, if node.example.com's IP address is 192.168.1.80 and `fileserver.conf` contains `allow 192.168.1.80` and `deny node.example.com`, the IP-based `allow` directive will actually take precedence. This behavior may be changed in the future and should not be relied upon.)

Host Names

Host names can be specified using either a complete hostname, or specifying an entire domain using the `*` wildcard:

```
[export]
    path /export
    allow host.domain1.com
    allow *.domain2.com
    deny badhost.domain2.com
```

IP Addresses

Note: Puppet 3.0.0 broke IP address filtering in fileserver.conf, and it is currently broken in all 3.0.x versions of Puppet. This is issue #16686.

If you rely on IP address filtering for custom file server mount points, you can implement it in Puppet 3 by simplifying fileserver.conf and adding a new rule to auth.conf:

Original 2.x fileserver.conf:

```
[files]
  path /etc/puppet/files
  allow *.example.com
  allow 192.168.100.0/24
```

Workaround:

```
# fileserver.conf
[files]
  path /etc/puppet/files
  allow *

# auth.conf
path ~ ^/file_(metadata|content)/files/
auth yes
allow /^(.+\.)?example.com$/
allow_ip 192.168.100.0/24
```

In short, fileserver.conf must allow all access, but only authorized nodes will be allowed to reach fileserver.conf. The `file_metadata/<mount point>` and `file_content/<mount point>` endpoints control file access in auth.conf.

IP addresses can be specified similarly to host names, using either complete IP addresses or wildcarded addresses. You can also use CIDR-style notation:

```
[export]
```

```
    path /export
    allow 127.0.0.1
    allow 192.168.0.*
    allow 192.168.1.0/24
```

Global allow

Specifying a single wildcard will let any node access a mount point:

```
[export]
    path /export
    allow *
```

Note that the default behavior for custom mount points is equivalent to `deny *`.

[1] Older versions of Puppet generated individual mount points for each installed module; to reduce namespace conflicts, these were changed to subdirectories of the catch-all `modules` mount point in version 0.25.0.↩

Style Guide

Style Guide Metadata

Version 1.1.2

1. Terminology

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, ”MAY”, and “OPTIONAL” in this document are to be interpreted as described in RFC 2119.

2. Puppet Version

This style guide is largely specific to Puppet versions 2.6.x; some of its recommendations are based on some language features that became available in version 2.6.0 and later.

3. Why a Style Guide?

Puppet Labs develops modules for customers and the community, and these modules should represent the best known practice for module design and style. Since these modules are developed by many people across the organisation, a central reference was needed to ensure a consistent pattern, design, and style.

4. General Philosophies

No style manual can cover every possible circumstance. When a judgement call becomes necessary, keep in mind the following general ideas:

1. Readability matters. If you have to choose between two equally effective alternatives, pick the more readable one. This is, of course, subjective, but if you can read your own code three

months from now, that’s a great start.

2. Inheritance should be avoided. In general, inheritance leads to code that is harder to read. Most use cases for inheritance can be replaced by exposing class parameters that can be used to configure resource attributes. See the Class Inheritance section for more details.
3. Modules must work with an ENC without requiring one. An internal survey yielded near consensus that an ENC should not be required. At the same time, every module we write should work well with an ENC.
4. Classes should generally not declare other classes. Declare classes as close to node scope as possible. Classes which require other classes should not directly declare them and should instead allow the system to fail if they are not declared by some other means. (Although the include function allows multiple declarations of classes, it can result in non-deterministic scoping issues due to the way parent scopes are assigned. We might revisit this philosophy in the future if class multi-declarations can be made deterministic, but for now, be conservative with declarations.)

5. Module Metadata

Every module must have Metadata defined in the Modulefile data file and outputted as the metadata.json file. The following Metadata should be provided for all modules:

```
name 'myuser-mymodule'
version '0.0.1'
author 'Author of the module - for shared modules this is Puppet Labs'
summary 'One line description of the module'
description 'Longer description of the module including an example'
license 'The license the module is release under - generally GPLv2 or Apache'
project_page 'The URL where the module source is located'
dependency 'otheruser/othermodule', '>= 1.2.3'
```

A more complete guide to the Modulefile format can be found in the puppet-module-tool README.

5.1. Style Versioning

This style guide will be versioned, which will allow modules to comply with a specific version of the style guide.

A future version of the puppet-module tool may permit the relevant style guide version to be embedded as metadata in the Modulefile, and the metadata in turn may be used for automated linting.

6. Spacing, Indentation, & Whitespace

Module manifests complying with this style guide:

- Must use two-space soft tabs
- Must not use literal tab characters
- Must not contain trailing white space
- Should not exceed an 80 character line width
- Should align fat comma arrows (`=>`) within blocks of attributes

7. Comments

Although the Puppet language allows multiple comment types, we prefer hash/octothorpe comments (`# This is a comment`) because they're generally the most visible to text editors and other code lexers.

1. Should use `# ...` for comments
2. Should not use `// ...` or `/* ... */` for comments

8. Quoting

All strings that do not contain variables should be enclosed in single quotes. Double quotes should be used when variable interpolation is required. Double quotes may also be used to make a string more readable when it contains single quotes. Quoting is optional when the string is an alphanumeric bare word and is not a resource title.

All variables should be enclosed in braces when interpolated in a string. For example:

Good:

```
    "/etc/${file}.conf"
    "${::operatingsystem} is not supported by ${module_name}"
```

Bad:

```
    "/etc/$file.conf"
    "$::operatingsystem is not supported by $module_name"
```

Variables standing by themselves should not be quoted. For example:

Good:

```
    mode => $my_mode
```

Bad:

```
    mode => "$my_mode"
    mode => "${my_mode}"
```

9. Resources

9.1. Resource Names

All resource titles should be quoted. (Puppet supports unquoted resource titles if they do not contain spaces or hyphens, but you should avoid them in the interest of consistent look-and-feel.)

Good:

```
    package { 'openssh': ensure => present }
```

Bad:

```
package { openssh: ensure => present }
```

9.2. Arrow Alignment

All of the fat comma arrows (`=>`) in a resource's attribute/value list should be aligned. The arrows should be placed one space ahead of the longest attribute name.

Good:

```
exec { 'blah':
  path => '/usr/bin',
  cwd  => '/tmp',
}

exec { 'test':
  subscribe   => File['/etc/test'],
  refreshonly => true,
}
```

Bad:

```
exec { 'blah':
  path  => '/usr/bin',
  cwd   => '/tmp',
}

exec { 'test':
  subscribe => File['/etc/test'],
  refreshonly => true,
}
```

9.3. Attribute Ordering

If a resource declaration includes an `ensure` attribute, it should be the first attribute specified.□

Good:

```
file { '/tmp/readme.txt':
  ensure => file,
  owner  => '0',
  group  => '0',
  mode   => '0644',
}
```

(This recommendation is solely in the interest of readability, as Puppet ignores attribute order when syncing resources.)

9.4. Compression

Within a given manifest, resources should be grouped by logical relationship to each other, rather than by resource type. Use of the semicolon syntax to declare multiple resources within a set of curly braces is not recommended, except in the rare cases where it would improve readability.

Good:

```
file { '/tmp/a':
  content => 'a',
}

exec { 'change contents of a':
  command => 'sed -i.bak s/a/A/g /tmp/a',
}

file { '/tmp/b':
  content => 'b',
}

exec { 'change contents of b':
  command => 'sed -i.bak s/b/B/g /tmp/b',
}
```

Bad:

```
file {
  "/tmp/a":
    content => "a";
  "/tmp/b":
    content => "b";
}

exec {
  "change contents of a":
    command => "sed -i.bak s/b/B/g /tmp/a";
  "change contents of b":
    command => "sed -i.bak s/b/B/g /tmp/b";
}
```

9.5. Symbolic Links

In the interest of clarity, symbolic links should be declared by using an ensure value of `ensure => link` and explicitly specifying a value for the `target` attribute. Using a path to the target as the ensure value is not recommended.

Good:

```
file { '/var/log/syslog':
  ensure => link,
  target => '/var/log/messages',
}
```

Bad:

```
file { '/var/log/syslog':
  ensure => '/var/log/messages',
}
```

9.6. File Modes

File modes should be represented as 4 digits rather than 3.

In addition, file modes should be specified as single-quoted strings instead of bare word numbers.

Good:

```
file { '/var/log/syslog':
  ensure => present,
  mode   => '0644',
}
```

Bad:

```
file { '/var/log/syslog':
  ensure => present,
  mode   => 644,
}
```

9.7. Resource Defaults

Resource defaults should be used in a very controlled manner, and should only be declared at the edges of your manifest ecosystem. Specifically, they may be declared:

- At top scope in site.pp
- In a class which is guaranteed to never declare another class and never be inherited by another class.

This is due to the way resource defaults propagate through dynamic scope, which can have unpredictable effects far away from where the default was declared.

Good:

```
# /etc/puppetlabs/puppet/manifests/site.pp:
File {
  mode  => '0644',
  owner => 'root',
  group => 'root',
}
```

Bad:

```
# /etc/puppetlabs/puppet/modules/ssh/manifests/init.pp
File {
  mode  => '0600',
  owner => 'nobody',
  group => 'nogroup',
}

class {'ssh::client':
  ensure => present,
}
```

10. Conditionals

10.1. Keep Resource Declarations Simple

You should not intermingle conditionals with resource declarations. When using conditionals for data assignment, you should separate conditional code from the resource declarations.

Good:

```
$file_mode = $::operatingsystem ? {
  debian => '0007',
  redhat => '0776',
  fedora => '0007',
}

file { '/tmp/readme.txt':
   content => "Hello World\n",
   mode    => $file_mode,
}
```

Bad:

```
file { '/tmp/readme.txt':
  mode => $::operatingsystem ? {
    debian => '0777',
    redhat => '0776',
    fedora => '0007',
  }
}
```

10.2. Defaults for Case Statements and Selectors

Case statements should have default cases. Additionally, the default case should fail the catalog compilation when the resulting behavior cannot be predicted on the majority of platforms the module will be used on. If you want the default case to be “do nothing,” include it as an explicit `default: {}` for clarity’s sake.

For selectors, default selections should only be omitted if you explicitly want catalog compilation to fail when no value matches.

The following example follows the recommended style:

```
case $::operatingsystem {
  centos: {
    $version = '1.2.3'
  }
  solaris: {
    $version = '3.2.1'
  }
  default: {
    fail("Module ${module_name} is not supported on ${::operatingsystem}")
  }
}
```

11. Classes

11.1. Separate Files

All classes and resource type definitions must be in separate files in the `manifests` directory of their module. For example:

```
# /etc/puppetlabs/puppet/modules/apache/manifests

# init.pp
  class apache { }
# ssl.pp
  class apache::ssl { }
# virtual_host.pp
  define apache::virtual_host () { }
```

This is functionally identical to declaring all classes and defines in init.pp, but highlights the□ structure of the module and makes everything more legible.

11.2. Internal Organization of a Class

Classes should be organised with a consistent structure and style. In the below list there is an implicit statement of “should be at this relative location” for each of these items. The word “may” should be interpreted as “If there are any X’s they should be here”.

1. Should define the class and parameters□
2. Should validate any class parameters and fail catalog compilation if any parameters are invalid
3. Should default any validated parameters to the most general case
4. May declare local variables
5. May declare relationships to other classes `Class['apache'] -> Class['local_yum']`
6. May override resources
7. May declare resource defaults
8. May declare resources; resources of defined and custom types should go before those of core□ types
9. May declare resource relationships inside of conditionals

The following example follows the recommended style:

```
class myservice($ensure='running') {

  if $ensure in [ running, stopped ] {
    $ensure_real = $ensure
  } else {
    fail('ensure parameter must be running or stopped')
  }

  case $::operatingsystem {
    centos: {
      $package_list = 'openssh-server'
    }
    solaris: {
      $package_list = [ SUNWsshr, SUNWsshu ]
    }
    default: {
      fail("Module ${module_name} does not support ${::operatingsystem}")
    }
  }

  $variable = 'something'

  Package { ensure => present, }

  File { owner => '0', group => '0', mode => '0644' }

  package { $package_list: }

  file { "/tmp/${variable}":
    ensure => present,
  }

  service { 'myservice':
    ensure    => $ensure_real,
    hasstatus => true,
  }
}
```

11.3. Relationship Declarations

Relationship declarations with the chaining syntax should only be used in the “left to right” direction.

Good:

```
Package['httpd'] -> Service['httpd']
```

Bad:

```
Service['httpd'] <- Package['httpd']
```

When possible, you should prefer metaparameters to relationship declarations. One example where metaparameters aren’t desirable is when subclassing would be necessary to override behavior; in this situation, relationship declarations inside of conditionals should be used.

11.4. Classes and Defined Resource Types Within Classes□

Classes and defined resource types must not be defined within other classes.□

Bad:

```
class apache {
  class ssl { ... }
}
```

Also bad:

```
class apache {
  define config() { ... }
}
```

11.5. Class Inheritance

Inheritance may be used within a module, but must not be used across module namespaces. Cross-module dependencies should be satisfied in a more portable way that doesn't violate the concept of□ modularity, such as with include statements or relationship declarations.

Good:

```
class ssh { ... }

class ssh::client inherits ssh { ... }

class ssh::server inherits ssh { ... }

class ssh::server::solaris inherits ssh::server { ... }
```

Bad:

```
class ssh inherits server { ... }

class ssh::client inherits workstation { ... }

class wordpress inherits apache { ... }
```

Inheritance in general should be avoided when alternatives are viable. For example, instead of using inheritance to override relationships in an existing class when stopping a service, consider using a single class with an ensure parameter and conditional relationship declarations:

```
class bluetooth($ensure=present, $autoupgrade=false) {
   # Validate class parameter inputs. (Fail early and fail hard)

   if ! ($ensure in [ "present", "absent" ]) {
     fail("bluetooth ensure parameter must be absent or present")
   }

   if ! ($autoupgrade in [ true, false ]) {
     fail("bluetooth autoupgrade parameter must be true or false")
   }

   # Set local variables based on the desired state

   if $ensure == "present" {
     $service_enable = true
     $service_ensure = running
     if $autoupgrade == true {
       $package_ensure = latest
     } else {
       $package_ensure = present
     }
   } else {
     $service_enable = false
     $service_ensure = stopped
     $package_ensure = absent
   }

   # Declare resources without any relationships in this section

   package { [ "bluez-libs", "bluez-utils"]:
     ensure => $package_ensure,
   }

   service { hidd:
     enable         => $service_enable,
     ensure         => $service_ensure,
     status         => "source /etc/init.d/functions; status hidd",
     hasstatus      => true,
     hasrestart     => true,
  }

  # Finally, declare relations based on desired behavior

  if $ensure == "present" {
    Package["bluez-libs"]  -> Package["bluez-utils"]
    Package["bluez-libs"]  ~> Service[hidd]
    Package["bluez-utils"] ~> Service[hidd]
  } else {
    Service["hidd"]        -> Package["bluez-utils"]
    Package["bluez-utils"] -> Package["bluez-libs"]
  }
}
```

(This example makes several assumptions and is based on an example provided in the Puppet Master training for managing bluetooth.)

In summary:

- Class inheritance is only useful for overriding resource attributes; any other use case is better accomplished with other methods.
- If you just need to override relationship metaparameters, you should use a single class with conditional relationship declarations instead of inheritance.
- In many cases, even other attributes (e.g. ensure and enable) may have their behavior changed with variables and conditional logic instead of inheritance.

11.6. Namespacing Variables

When using top-scope variables, including facts, Puppet modules should explicitly specify the empty namespace to prevent accidental scoping issues.

Good:

```
$::operatingsystem
```

Bad:

```
$operatingsystem
```

11.7. Variable format

When defining variables you should only use letters, numbers and underscores. You should□ specifically not make use of dashes.□

Good:

```
$foo_bar123
```

Bad:

```
$foo-bar123
```

11.8. Display Order of Class Parameters

In parameterized class and defined resource type declarations, parameters that are required should□ be listed before optional parameters (i.e. parameters with defaults).

Good:

```
class ntp (
  $servers,
  $options   = "iburst",
  $multicast = false
) {}
```

Bad:

```
class ntp (
  $options   = "iburst",
  $servers,
  $multicast = false
) {}
```

11.9 Class parameter defaults

When writing a module that accepts class parameters sane defaults SHOULD be provided for optional parameters to allow the end user the option of not explicitly specifying the parameter when declaring the class.

For example:

```
class ntp(
  $server = 'UNSET'
) {

  include ntp::params
```

```
      $server_real = $server ? {
        'UNSET' => $::ntp::params::server,
        default => $server,
      }

      notify { 'ntp':
        message => "server=[$server_real]",
      }

    }
```

The reason this class is declared in this manner is to be fully compatible with all Puppet 2.6.x versions. The following alternative method SHOULD NOT be used because it is not compatible with Puppet 2.6.2 and earlier.

```
class ntp(
  $server = $ntp::params::server
) inherits ntp::params {

    notify { 'ntp':
      message => "server=[$server]",
    }

}
```

Other SHOULD recommendations:

- SHOULD use the _real suffix to indicate a scope local variable for maintainability over time.□
- SHOULD use fully qualified namespace variables when pulling the value from the module params□ class to avoid namespace collisions.
- SHOULD declare the params class so the end user does not have to for the module to function properly.

This recommended pattern may be relaxed when Puppet 2.7 is more widely adopted and module compatibility with as many versions of 2.6.x is no longer a primary concern.

This diff illustrates the changes between these two commonly used patterns and how to switch□ from one to the other.

```
    diff --git a/manifests/init.pp b/manifests/init.pp
    index c16c3a0..7923ccb 100644
    --- a/manifests/init.pp
    +++ b/manifests/init.pp
    @@ -12,9 +12,14 @@
     #
     class paramstest (
       $mandatory,
    -  $param = $paramstest::params::param
    -) inherits paramstest::params {
    +  $param = 'UNSET'
    +) {
    +  include paramstest::params
    +  $param\_real = $param ? {
    +    'UNSET' => $::paramstest::params::param,
    +    default => $param,
    +  }
       notify { 'TEST':
    -    message => " param=[$param] mandatory=[$mandatory]",
    +    message => " param=[$param\_real] mandatory=[$mandatory]",
       }
     }
```

12. Tests

All manifests should have a corresponding test manifest in the module’s `tests` directory.

```
modulepath/apache/manifests/{init,ssl}.pp
modulepath/apache/tests/{init,ssl}.pp
```

The test manifest should provide a clear example of how to declare the class or defined resource□ type. In addition, the test manifest should also declare any classes required by the corresponding class to ensure `puppet apply` works in a limited, stand alone manner.

13. Puppet Doc

Classes and defined resource types should be documented inline using RDoc markup. These inline documentation comments are important because online documentation can then be easily generated using the puppet doc command.

For classes:

```
    # == Class: example_class
    #
    # Full description of class example_class here.
    #
    # === Parameters
    #
    # Document parameters here.
    #
    # [*ntp_servers*]
    #   Explanation of what this parameter affects and what it defaults to.
    #   e.g. "Specify one or more upstream ntp servers as an array."
    #
    # === Variables
    #
    # Here you should define a list of variables that this module would
require.
    #
    # [*enc_ntp_servers*]
    #   Explanation of how this variable affects the funtion of this class and
if it
    #   has a default. e.g. "The parameter enc_ntp_servers must be set by the
    #   External Node Classifier as a comma separated list of hostnames."
(Note,
    #   global variables should not be used in preference to class parameters
as of
    #   Puppet 2.6.)
    #
    # === Examples
    #
    #  class { 'example_class':
    #    ntp_servers => [ 'pool.ntp.org', 'ntp.local.company.com' ]
    #  }
    #
    # === Authors
    #
    # Author Name <author@example.com>
    #
    # === Copyright
    #
    # Copyright 2011 Your name here, unless otherwise noted.
    #
    class example_class {

    }
```

For defined resources:□

```
    # == Define: example_resource
    #
    # Full description of defined resource type example_resource here.
    #
    # === Parameters
    #
    # Document parameters here
    #
    # [*namevar*]
    #   If there is a parameter that defaults to the value of the title string
    #   when not explicitly set, you must always say so.  This parameter can be
    #   referred to as a "namevar," since it's functionally equivalent to the
    #   namevar of a core resource type.
    #
    # [*basedir*]
    #   Description of this variable.  For example, "This parameter sets the
    #   base directory for this resource type.  It should not contain a
trailing
    #   slash."
    #
    # === Examples
    #
    # Provide some examples on how to use this type:
    #
    #   example_class::example_resource { 'namevar':
    #     basedir => '/tmp/src',
    #   }
    #
    # === Authors
    #
    # Author Name <author@example.com>
    #
    # === Copyright
    #
    # Copyright 2011 Your name here, unless otherwise noted.
    #
    define example_class::example_resource($basedir) {

    }
```

This will allow documentation to be automatically extracted with the puppet doc tool.

Best Practices

This guide includes some tips to getting the most out of Puppet. It is derived from the best practices section of the Wiki and other sources. It is intended to cover high-level best practices and may not extend into lower level details.

Use Modules When Possible

Puppet modules are something everyone should use. If you have an application you are managing, add a module for it, so that you can keep the manifests, plugins (if any), source files, and templates together.

Keep Your Puppet Content In Version Control

Keep your Puppet manifests in version control. You can pick your favorite systems — popular choices include git and svn.

Naming Conventions

Node names should match the hostnames of the nodes.

When naming classes, a class that disables ssh should be inherited from the ssh class and be named “ssh::disabled”

Style

For recommendations on syntax and formatting, follow the Style Guide

Classes Vs Defined Types

Classes are not to be thought of in the ‘object oriented’ meaning of a class. This means a machine belongs to a particular class of machine.

For instance, a generic webserver would be a class. You would include that class as part of any node that needed to be built as a generic webserver. That class would drop in whatever packages, etc, it needed to do.

Defined types on the other hand (created with ‘define’) can have many instances on a machine, and can encapsulate classes and other resources. They can be created using user supplied variables. For instance, to manage iptables, a defined type may wrap each rule in the iptables file, and the iptables configuration could be built out of fragments generated by those defined types.

Usage of classes and defined types, in addition to the built-in managed types, is very helpful towards having a managable Puppet infrastructure.

Work In Progress

This document is a stub. You can help Puppet by submitting contributions to it.

Puppet on Windows

This documentation applies to Puppet versions ≥ 2.7.6 and Puppet Enterprise ≥ 2.5. Earlier versions may behave differently.

Puppet runs on Microsoft Windows® and can manage Windows systems alongside *nix systems. These pages explain how to install and run Puppet on Windows, and describe how it differs from Puppet on *nix.

Installing

Puppet Labs provides pre-built, standalone .msi packages for installing Puppet on Windows.

Downloads

- For Puppet Enterprise
- For open source Puppet

Supported Platforms

Puppet runs on the following versions of Windows :

- Windows Server 2003 and 2003 R2
- Windows Server 2008 and 2008 R2
- Windows 7

More

For full details, see Installing Puppet on Windows.

Running

Puppet Subcommands and Services

Windows nodes can run the following Puppet subcommands:

- Puppet agent, to fetch configurations from a puppet master and apply them
  - The agent functions as a standard Windows service, and agent runs can also be triggered manually.
  - Windows nodes can connect to any *nix puppet master server running Puppet 2.7.6 or higher.
- Puppet apply, to apply configurations from local manifest files
- Puppet resource, to directly manipulate system resources
- Puppet inspect, to send audit reports for compliance purposes

Because the installer doesn't alter the system's PATH variable, you must choose Start Command Prompt with Puppet from the Start menu to run Puppet commands manually.

Windows nodes can't act as puppet masters or certificate authorities, and most of the ancillary Puppet subcommands aren't supported on Windows.

Puppet's Environment on Windows

- Puppet runs as a 32-bit process.
- Puppet has to run with elevated privileges; on systems with UAC, it will request explicit elevation even when running as a member of the local Administrators group.
- Puppet's configuration and data are stored in `%ALLUSERSPROFILE%\Application Data\PuppetLabs` on Windows 2003, and in `%PROGRAMDATA%\PuppetLabs` on Windows 7 and 2008.

More

For full details, see Running Puppet on Windows.

Writing Manifests for Windows

Resource Types

Some *nix resource types aren't supported on Windows, and there are some Windows-only resource types.

The following resource types can be managed on Windows:

- file
- user
- group
- scheduled_task (Windows-only)
- package
- service
- exec
- host

More

For full details, see Writing Manifests for Windows.

Troubleshooting

The most common points of failure on Windows systems aren't the same as those on *nix. For full details, see Troubleshooting Puppet on Windows.

For Developers and Testers

To test pre-release features, or to hack and improve Puppet on Windows, you can run Puppet from source. This requires a fairly specific version of Ruby and several important gems. For full details, see Running Puppet from Source on Windows.

Installing Puppet on Windows

This documentation applies to Puppet versions ≥ 2.7.6 and Puppet Enterprise ≥ 2.5. Earlier versions may behave differently.

Before Installing

Downloads

Download the Puppet installer for Windows here:

- Puppet Enterprise Windows installer
- Standard Windows installer

If you are using Puppet Enterprise, use the PE-specific installer; otherwise, use the standard installer.

Supported Platforms

Puppet runs on the following versions of Windows:

- Windows Server 2003 and 2003 R2
- Windows Server 2008 and 2008 R2
- Windows Server 2012
- Windows Vista
- Windows 7 and 8

The Puppet installer bundles all of Puppet’s prerequisites. There are no additional software requirements.

Puppet Master Requirements

Windows nodes cannot serve as puppet master servers.

- If your Windows nodes will be fetching configurations from a puppet master, you will need a *nix server to run as puppet master at your site.
- If your Windows nodes will be compiling and applying configurations locally with puppet apply, you should disable the puppet agent service on them after installing Puppet. See Running Puppet on Windows for details on how to stop the service.

> Version note for PE users: Your puppet master should be running PE 2.5 or later. On PE 2.0, the `pe_mcollective` and `pe_accounts` modules cause run failures on Windows nodes. If you wish to run Windows agents but have a PE 2.0 puppet master, you can do one of the following:
>
> - Upgrade your master to PE 2.5 or later
> - Remove those modules from the console’s default group
> - Manually hack those modules to be inert on Windows.

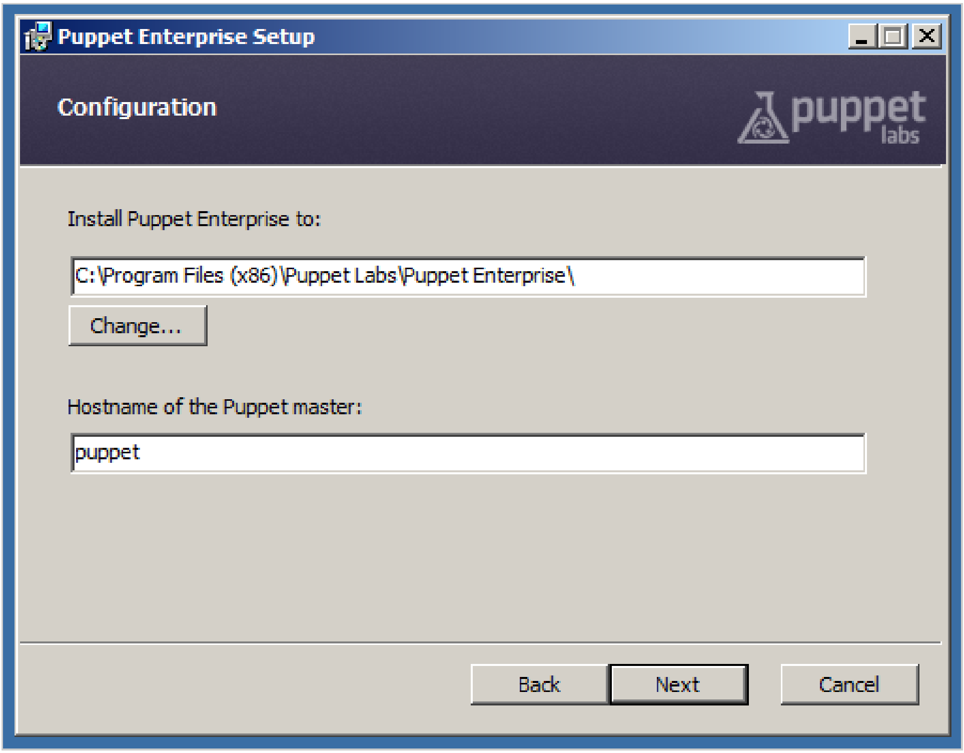
Installing Puppet

To install Puppet, simply download and run the installer, which is a standard Windows .msi package and will run as a graphical wizard.

The installer must be run with elevated privileges. Installing Puppet does not require a system reboot.

The only information you need to specify during installation is the hostname of your puppet master server: (If you are using puppet apply for node configuration instead of a puppet master, you can just enter some dummy text here.)

Note that you can download and install Puppet Enterprise on up to ten nodes at no charge. No licence key is needed to run PE on up to ten nodes.



Puppet Enterprise Setup

Configuration

Install Puppet Enterprise to:

C:\Program Files (x86)\Puppet Labs\Puppet Enterprise\

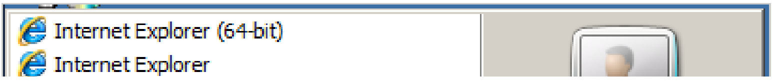
Hostname of the Puppet master:

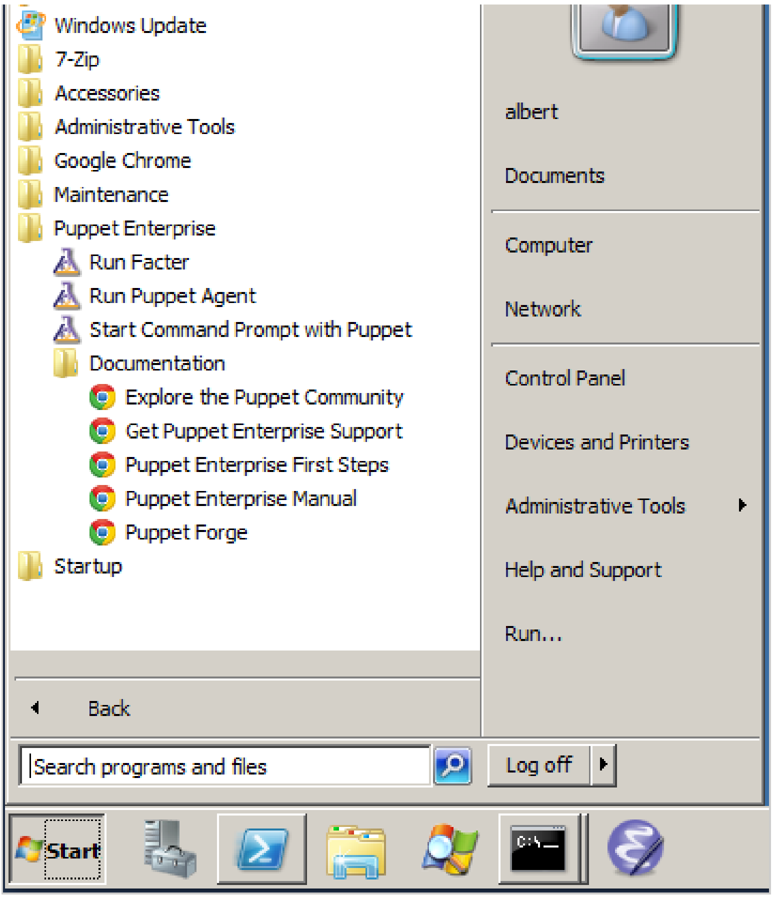
puppet

After Installation

Once the installer finishes:

- Puppet agent will be running as a Windows service, and will fetch and apply configurations every 30 minutes. You can now assign classes to the node on your puppet master or console server. Puppet agent can be started and stopped with the Service Control Manager or the `sc.exe` utility; see Running Puppet on Windows for more details.
- The Start menu will contain a Puppet folder, with shortcuts for running puppet agent manually, for running Facter, and for opening a command prompt for use with the Puppet tools. See Running Puppet on Windows for more details. The Start menu folder also contains documentation links.





Automated Installation

For automated deployments, Puppet can be installed unattended on the command line as follows:

```
msiexec /qn /i puppet.msi
```

You can also specify `/l*v install.txt` to log the progress of the installation to a file.

The following public MSI properties can also be specified:

MSI Property	Puppet Setting	Default Value
`INSTALLDIR`	n/a	Version-dependent, see below
`PUPPET_MASTER_SERVER`	`server`	`puppet`
`PUPPET_CA_SERVER`	`ca_server`	Value of `PUPPET_MASTER_SERVER`
`PUPPET_AGENT_CERTNAME`	`certname`	Value of `facter fdqn` (must be lowercase)

For example:

```
msiexec /qn /i puppet.msi PUPPET_MASTER_SERVER=puppet.acme.com
```

Upgrading

Puppet can be upgraded by installing a new version of the MSI package. No extra steps are required, and the installer will handle stopping and re-starting the puppet agent service.

When upgrading, the installer will not replace any settings in the main puppet.conf configuration file, but it can add previously unspecified settings if they are provided on the command line.

Uninstalling

Puppet can be uninstalled through Windows' standard "Add or Remove Programs" interface, or from the command line.

To uninstall from the command line, you must have the original MSI file or know the ProductCode of the installed MSI:

```
msiexec /qn /x [puppet.msi|product-code]
```

Uninstalling will remove Puppet's program directory, the puppet agent service, and all related registry keys. It will leave the data directory intact, including any SSL keys. To completely remove Puppet from the system, the data directory can be manually deleted.

Installation Details

What Gets Installed

In order to provide a self-contained installation, the Puppet installer includes all of Puppet's dependencies, including Ruby, Gems, and Facter. (Puppet redistributes the 32-bit Ruby application from rubyinstaller.org).

These prerequisites are used only for Puppet and do not interfere with other local copies of Ruby.

Program Directory

Unless overridden during installation, Puppet and its dependencies are installed into the standard Program Files directory for 32-bit applications.

For Puppet Enterprise, the default installation path is:

OS type	Default Install Path
32-bit	`C:\Program Files\Puppet Labs\Puppet Enterprise`
64-bit	`C:\Program Files (x86)\Puppet Labs\Puppet Enterprise`

For open source Puppet, the default installation path is:

OS type	Default Install Path
32-bit	`C:\Program Files\Puppet Labs\Puppet`
64-bit	`C:\Program Files (x86)\Puppet Labs\Puppet`

The program files directory can be located using the `PROGRAMFILES` environment variable on 32-bit versions of Windows or the `PROGRAMFILES(X86)` variable on 64-bit versions.

Puppet's program directory contains the following subdirectories:

Directory	Description
bin	scripts for running Puppet and Facter
facter	Facter source
misc	resources
puppet	Puppet source
service	code to run puppet agent as a service
sys	Ruby and other tools

Data Directory

Puppet stores its settings (`puppet.conf`), manifests, and generated data (like logs and catalogs) in its data directory. Puppet's data directory contains two subdirectories:

- `etc` (the `$confdir`) contains configuration files, manifests, certificates, and other important files□
- `var` (the `$vardir`) contains generated data and logs

When run with elevated privileges, the data directory is located in `COMMON_APPDATA\PuppetLabs\puppet`; see below for more about the `COMMON_APPDATA` folder. When run without elevated privileges, the data directory will be a `.puppet` directory in the current user's home folder. Puppet on Windows should usually be run with elevated privileges.

THE `COMMON_APPDATA` FOLDER

Windows' `COMMON_APPDATA` folder contains non-roaming application data for all users. Its location varies by Windows version:

OS Version	Path	Default
7, 2008	`%PROGRAMDATA%`	`C:\ProgramData`
2003	`%ALLUSERSPROFILE%\Application Data`	`C:\Documents and Settings\All Users\Application Data`

Since the CommonAppData directory is a system folder, it is hidden by default. See http://support.microsoft.com/kb/812003 for steps to show system and hidden files and folders.□

More

For more details about using Puppet on Windows, see:

- Running Puppet on Windows
- Writing Manifests for Windows

Running Puppet on Windows

This documentation applies to Puppet versions ≥ 2.7.6 and Puppet Enterprise ≥ 2.5. Earlier versions may behave differently.□

If you only plan to run puppet agent on its normal schedule, no further action is necessary — after installing Puppet on Windows, the puppet agent service will run every 30 minutes.

Continue reading for information about running Puppet tasks manually, configuring Puppet, and the context in which Puppet runs on Windows.

Running Puppet Tasks

Finding the Puppet Tools

The Puppet installer creates a “Puppet Enterprise” or “Puppet” folder in the Start menu. Any Start menu items referenced below can be found in this folder.

Fetching Configurations from a Puppet Master

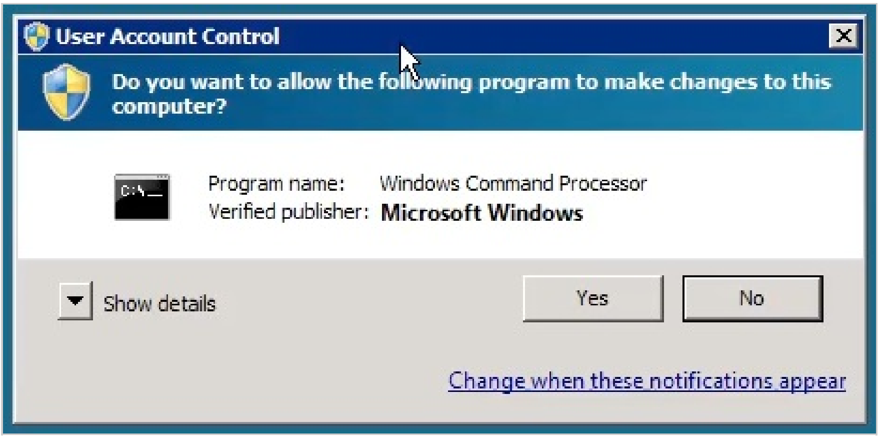
After installation, Puppet on Windows will regularly fetch configurations from a puppet master with no further configuration needed. Every 30 minutes, the puppet agent service will contact the puppet master that was specified during installation, and will fetch and apply a configuration.

> Note: just like with any *nix Puppet node, you must sign the node’s certificate request on the puppet master before it can fetch configurations. Use `puppet cert list` to view outstanding certificate requests, and `puppet cert sign <NAME>` to approve them.

MANUALLY TRIGGERING A PUPPET AGENT RUN

You can trigger a puppet agent run at any time with the “Run Puppet Agent” Start menu item. This will show the status of the run in a command prompt window.

Triggering an agent run requires elevated privileges, and must be performed as an administrator. On Windows 7 or 2008, using this Start menu item will automatically ask for User Account Control confirmation:



User Account Control

Do you want to allow the following program to make changes to this computer?

Program name: Windows Command Processor
Verified publisher: Microsoft Windows

CONFIGURING THE AGENT SERVICE

By default, the puppet agent service starts automatically at boot, runs every 30 minutes, and contacts the puppet master specified during installation.

> Note: When puppet is running as a daemonized Windows service, the `listen = true` configuration directive or command line argument does not apply. Consequently, it is not

possible to use the deprecated puppet kick run mode. Instead, consider using Marionette Collective.

- To start, stop, or disable the service, use the Service Control Manager, which can be launched by choosing “Run…” from the Start menu and typing `Services.msc`.
- You can also use the `sc.exe` command to manage the puppet agent service. To prevent the service from starting on boot:

  ```
  C:\>sc config puppet start= demand
  [SC] ChangeServiceConfig SUCCESS
  ```

  To restart the service:

  ```
  C:\>sc stop puppet && sc start puppet
  ```

  To change the arguments used when triggering a puppet agent run (this example changes the level of detail that gets written to Puppet’s logs):

  ```
  C:\>sc start puppet --test --debug
  ```

- To change how often the agent runs, change the `runinterval` setting in puppet.conf.
- To change which puppet master the agent contacts, change the `server` setting in puppet.conf.

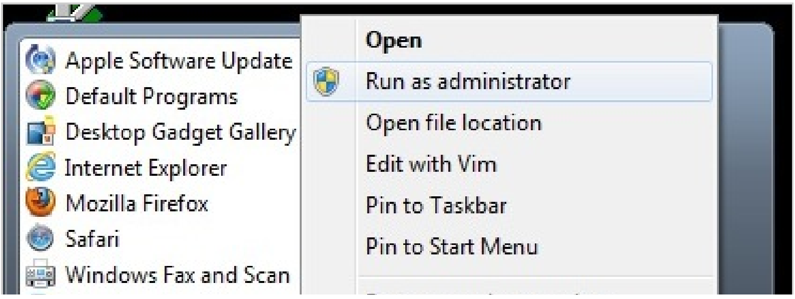
Note: You must restart the puppet agent service after making any changes to Puppet’s config file. Restart the service using the Services control panel item.

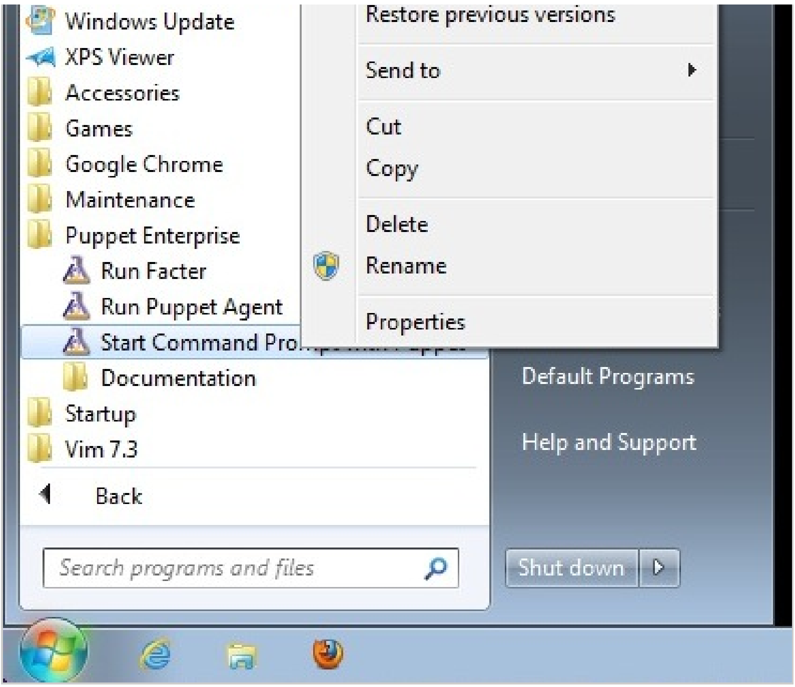
Running Other Puppet Tasks

To perform any task other than triggering an agent run, use the “Start Command Prompt with Puppet” Start menu item. This shortcut starts a command prompt window with its environment pre-set to enable the Puppet tools.

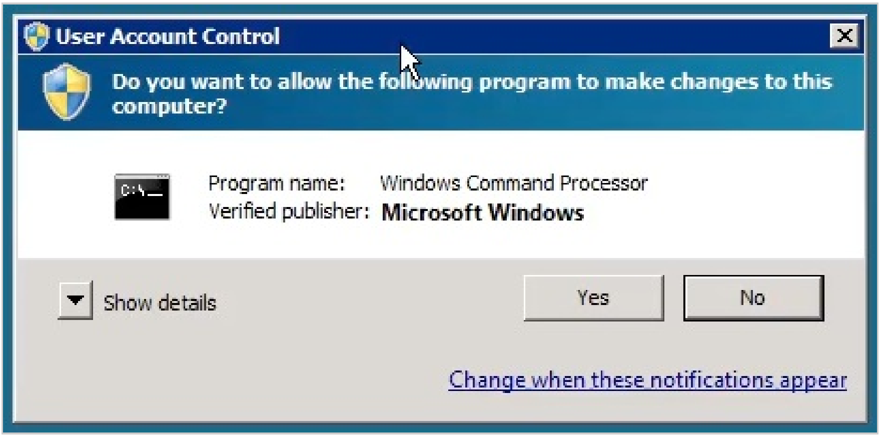
For nearly all purposes, you must start this command window with elevated privileges:

- On Windows 2003, make sure you are logged in as an administrator before starting the Puppet command prompt.
- On Windows 7 or 2008, you must right-click the start menu item and choose “Run as administrator:”





This will ask for UAC confirmation:



User Account Control

Do you want to allow the following program to make changes to this computer?

Program name: Windows Command Processor
Verified publisher: **Microsoft Windows**

Applying Manifests Locally

The `puppet apply` subcommand accepts a puppet manifest file, and immediately compiles and applies a configuration from it:

```
C:\> puppet apply my_manifest.pp
```

This allows you to manage nodes with Puppet without a central puppet master server, by having every node manage its own configuration.

To use `puppet apply`, you must first use the "Start Command Prompt with Puppet" item in the Start menu. This will open a command prompt window in which `puppet apply` commands can be issued. Remember to start this command prompt with elevated privileges.

To use `puppet apply` effectively, you should distribute your Puppet modules to each agent node and copy them into the `modulepath`. This allows the small manifests written for `puppet apply` to easily assign pre-existing classes to the node.

> Note: The default `modulepath` on Windows is `<data directory>\etc\modules`.

> Note: When using a multi-directory modulepath, remember to separate the directories with `;`, rather than `:`.

To learn more about using modules, see Module Fundamentals or Learning Puppet.

Interactively Modifying Puppet Resources

The `puppet resource` subcommand can interactively view and modify a system's state using Puppet's resource types. (For example, it can be used as an alternate interface for creating or modifying user accounts.)

To run `puppet resource`, you must use the "Start Command Prompt with Puppet" item in the Start menu. This will open a command prompt window in which `puppet resource` commands can be issued. Remember to start this command prompt with elevated privileges.

The standard format of a `puppet resource` command is:

```
C:\> puppet resource <TYPE> <NAME> <ATTRIBUTE=VALUE> <ATTRIBUTE=VALUE>
```

Specifying `attribute=value` pairs will modify the resource, leaving them off will print the resource's current state. Leaving out the resource name will list every resource of the specified type.

- The resources `puppet resource` can use are the same as those available for Windows manifests. See Writing Manifests for Windows for more details.
- See the `puppet resource` man page for more details about the puppet resource subcommand.

Running Facter

When writing manifests for Windows nodes, it can be helpful to see a test system's actual fact data. Use the "Run Facter" Start menu item to do this.

Configuring Puppet

Puppet's main `puppet.conf` configuration file can be found at `<data directory>\etc\puppet.conf`.

- See Configuring Puppet for more details about Puppet's main config file. (Puppet's secondary config files are not used on Windows.)
- See the configuration reference for a complete list of `puppet.conf` settings.
- In a command window opened with the "Start Command Prompt with Puppet" Start menu item, you can use `puppet --configprint <SETTING>` to see the current value of any setting.

> Note: You must restart the puppet agent service after making any changes to Puppet's config file. Restart the service using the Services control panel item.

Important Windows Concepts for Unix Admins

Windows differs from *nix systems in many ways, several of which affect how Puppet works.

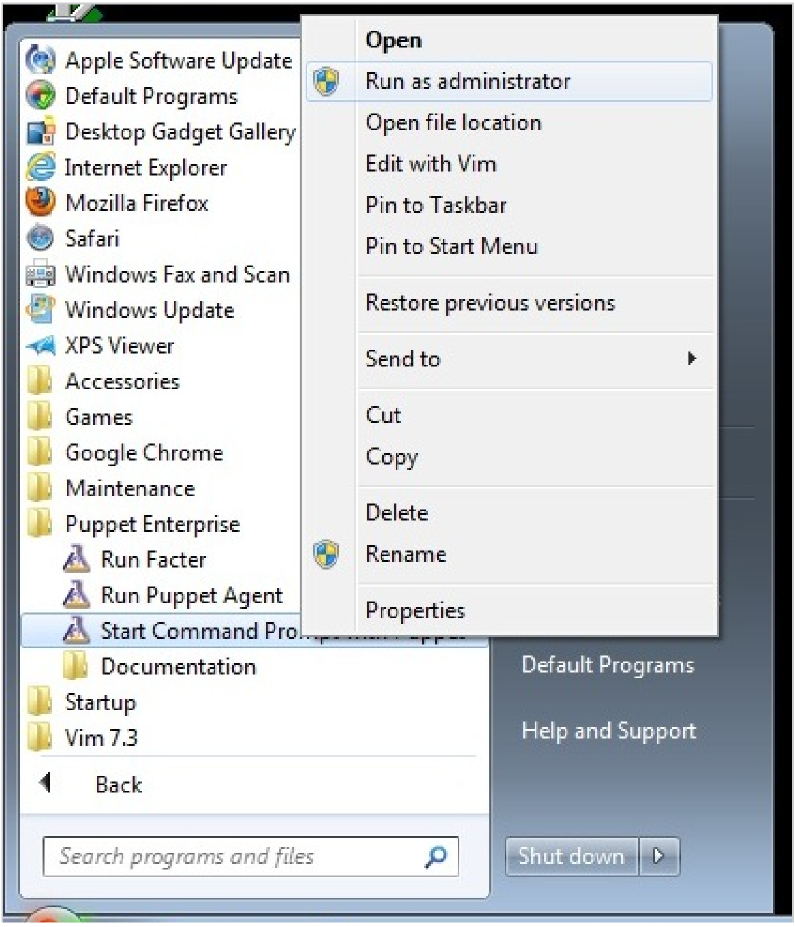
Security Context

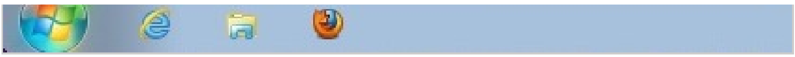
On Unix, puppet is either running as root or not. On Windows, this maps to running with elevated privileges or not.

Puppet agent typically runs as a service under the LocalSystem account, and thus always has elevated privileges. When running puppet from the command line or from a script or scheduled task, you should be aware of User Account Control (UAC) restrictions that may cause Puppet to run without elevated privileges.

If Puppet is accidentally run in a non-elevated security context, it will use a different data directory (specifically, the `.puppet` directory in the current user's home directory) and will try to request a second SSL certificate. Since the puppet master does not allow duplicate certificates, running puppet agent in a non-elevated security context will usually cause it to fail.

- On systems without UAC (i.e. Windows 2003), users in the local Administrators group will typically run all commands with elevated privileges.
- On systems with UAC (i.e. Windows 7 and 2008), you must explicitly elevate privileges, even when running as a member of the local Administrators group. Puppet's "Run Puppet Agent" Start menu item automatically requests privilege elevation when run, but the "Start Command Prompt with Puppet" item must be manually started with elevated privileges by right-clicking it and choosing "Run as administrator."





File System Redirection in 64-bit Windows Versions

The Puppet agent process runs as a 32-bit process. When run on 64-bit versions of Windows, there are some issues to be aware of.

- The File System Redirector will silently redirect all file system access to `%windir%\system32` to `%windir%\SysWOW64` instead. This can be an issue when trying to manage files in the system directory, e.g., IIS configuration files. In order to prevent redirection, you can use the `sysnative` alias, e.g. `C:\Windows\sysnative\inetsrv\config\application Host.config`.

> Note: 64-bit Windows Server 2003 requires hotfix KB942589 to use the sysnative alias.

- The Registry Redirector performs a similar function with certain registry keys .

Writing Manifests for Windows

This documentation applies to Puppet ≥ 2.7.6 and Puppet Enterprise ≥ 2.5. Earlier versions may behave differently.

Just as on *nix systems, Puppet manages resources on Windows using manifests written in the Puppet language. There are several major differences to be aware of when writing manifests that manage Windows resources:

- Windows primarily uses the backslash as its directory separator character, and Ruby handles it differently in different circumstances. You should learn when to use and when to avoid backslashes.
- Most classes written for *nix systems will not work on Windows nodes; if you are managing a mixed environment, you should use conditionals and Windows-specific facts to govern the behavior of your classes.
- Puppet generally does the right thing with Windows line endings.
- Puppet supports a slightly different set of resource types on Windows.

File Paths on Windows

Windows file paths must be written in different ways at different times, due to various tools' conflicting rules for backslash use.

- Windows file system APIs accept both the backslash (`\`) and forwardslash (`/`) to separate directory and file components in a path.
- Some Windows programs only accept backslashes in file paths.
- *nix shells and many programming languages — including the Puppet language — use the backslash as an escape character.

As a result, any system that interacts with *nix and Windows systems as equal peers will unavoidably have complicated behavior around backslashes.

The following guidelines will help you use backslashes safely in Windows file paths with Puppet.

Forward Slashes vs. Backslashes

In many cases, you can use forward slashes instead of backslashes when specifying file paths.

Forward slashes MUST be used:

- In template paths passed to the `template` function. For example:

  ```
  file {'C:/warning.txt':
    ensure  => present,
    content => template('my_module/warning.erb'),
  }
  ```

- In Puppet URLs in a `file` resource’s `source` attribute.
- When part of the `modulepath` configuration option, e.g. `puppet apply --modulepath="Z:/path/to/my/modules" "Z:/path/to/my/site.pp"` (This restriction applies only to versions of Puppet prior to 3.0.)

Forward slashes SHOULD be used in:

- The title or `path` attribute of a `file` resource
- The `source` attribute of a `package` resource
- Local paths in a `file` resource’s `source` attribute
- The `command` of an `exec` resource, unless the executable requires backslashes, e.g. cmd.exe

Forward slashes MUST NOT be used in:

- The `command` of a `scheduled_task` resource.
- The `install_options` of a `package` resource.

THE RULE

If Puppet itself is interpreting the file path, forward slashes are okay. If the file path is being passed directly to a Windows program, forward slashes may not be okay.

Using Backslashes in Double-Quoted Strings

Puppet supports two kinds of string quoting. Strings surrounded by double quotes (`"`) allow variable interpretation and many escape sequences (including the common `\n` for a newline), so care must be taken to prevent backslashes from being mistaken for escape sequences.

When using backslashes in a double-quoted string, you must always use two backslashes for each literal backslash. There are no exceptions and no special cases.

Using Backslashes in Single-Quoted Strings

Strings surrounded by single quotes (`'`) do not allow variable interpretation, and the only escape sequences permitted are `\'` (a literal single quote) and `\\` (a literal backslash).

Lone backslashes can usually be used in single-quoted strings. However:

- When a backslash occurs at the very end of a single-quoted string, a double backslash must be used instead of a single backslash. For example: `path => 'C:\Program Files(x86)\\'`
- When a literal double backslash is intended, a quadruple backslash must be used.

THE RULE

In single-quoted strings:

- A double backslash always means a literal backslash.
- A single backslash usually means a literal backslash, unless it is followed by a single quote or another backslash.

Notable Windows Facts

Windows nodes with a default install of Puppet will return the following notable facts, which can be useful when writing manifests:

Identifying Facts

The following facts can help you determine whether a given machine is running Windows:

- `kernel => windows`
- `operatingsystem => windows`
- `osfamily => windows`

Windows-Specific Facts

The following facts are either Windows-only, or have different values on Windows than on *nix:

- `env_windows_installdir` — This fact will contain the directory in which Puppet was installed.
- `id` — This fact will be `<DOMAIN>\<USER NAME>`. You can use the user name to determine whether Puppet is running as a service or was triggered manually.

Line Endings in Windows Text Files

Windows uses CRLF line endings instead of *nix's LF line endings.

- If the contents of a file are specified with the `content` attribute, Puppet will write the content in "binary" mode. To create files with CRLF line endings, the `\r\n` escape sequence should be specified as part of the content.
- If a file is being downloaded to a Windows node with the `source` attribute, Puppet will transfer the file in "binary" mode, leaving the original newlines untouched.
- Non-`file` resource types that make partial edits to a system file (most notably the `host` type, which manages the `%windir%\system32\drivers\etc\hosts` file) manage their files in text mode, and will automatically translate between Windows and *nix line endings.

  > Note: When writing your own resource types, you can get this behavior by using the `flat` filetype.

Resource Types

Puppet can manage the following resource types on Windows nodes:

`file`

```
    file { 'c:/mysql/my.ini':
      ensure => 'file',
      mode => '0660',
      owner => 'mysql',
      group => 'Administrators',
      source => 'N:/software/mysql/my.ini',
    }
```

Puppet can manage files and directories, including owner, group, permissions, and content. Symbolic links are not supported.

- If an `owner` or `group` are specified for a file, you must also specify a `mode`. Failing to do so can render a file inaccessible to Puppet. See here for more details.
- Windows NTFS filesystems are case-preserving, but case-insensitive; Puppet is case-sensitive. Thus, you should be consistent in the case you use when referring to a file resource in multiple places in a manifest.
- In order to manage files that it does not own, Puppet must be running as a member of the local Administrators group (on Windows 2003) or with elevated privileges (Windows 7 and 2008). This gives Puppet the `SE_RESTORE_NAME` and `SE_BACKUP_NAME` privileges it requires to manage file permissions.
- Permissions modes are set as though they were *nix-like octal modes; Puppet translates these to the equivalent access controls on Windows.
  - The read, write, and execute permissions translate to the `FILE_GENERIC_READ`, `FILE_GENERIC_WRITE`, and `FILE_GENERIC_EXECUTE` access rights.
  - The owner of a file/directory always has the `FULL_CONTROL` access right.
  - The `Everyone` SID is used to represent users other than the owner and group.
- Puppet cannot set permission modes where the group has higher permissions than the owner, or other users have higher permissions than the owner or group. (That is, 0640 and 0755 are supported, but 0460 is not.) Directories on Windows can have the sticky bit, which makes it so users can only delete files if they own the containing directory.
- On Windows, the owner of a file can be a group (e.g. `owner => 'Administrators'`) and the group of a file can be a user (e.g. `group => 'Administrator'`). The owner and group can even be the same, but as that can cause problems when the mode gives different permissions to the owner and group (like `0750`), this is not recommended.
- The source of a file can be a puppet URL, a local path, or a path to a file on a mapped drive.
- When downloading a file from a puppet master with a `puppet:///` URI, Puppet will set the permissions mode to match that of the remote file. Be sure to set the proper mode on any remote files.

`user`

Puppet can create, edit, and delete local users. Puppet does not support managing domain user accounts, but can add (and remove) domain user accounts to local groups.

- The `comment`, `home`, and `password` attributes can be managed, as well as groups to which the user belongs.
- Passwords can only be specified in cleartext. Windows does not provide an API for setting the password hash.
- The user SID is available as a read-only parameter. Attempting to set the parameter will fail
- User names are case-sensitive in Puppet manifests, but insensitive on Windows. Make sure to consistently use the same case in manifests.

SECURITY IDENTIFIERS (SID)

On Windows, user and group account names can take multiple forms, e.g. `Administrators`, `<host>\Administrators`, `BUILTIN\Administrators`, `S-1-5-32-544`. When comparing two account names, puppet always first transforms account names into their canonical SID form and compares the SIDs instead.

`group`

Puppet can create, edit, and delete local groups, and can manage a group's members. Puppet does not support managing domain group accounts, but a local group can include both local and domain users as members.

- The group SID is available as a read-only parameter. Attempting to set the parameter will fail.
- Group names are case-sensitive in puppet manifests, but insensitive on Windows. Make sure to consistently use the same case in manifests.
- Nested groups are not supported. (Group members must be users, not other groups.)

`scheduled_task`

```
scheduled_task { 'Daily task':
  ensure    => present,
  enabled   => true,
  command   => 'C:\path\to\command.exe',
  arguments => '/flags /to /pass',
  trigger   => {
    schedule   => daily,
    every      => 2,            # Defaults to 1
    start_date => '2011-08-31', # Defaults to 'today'
    start_time => '08:00',      # Must be specified
  }
}
```

Puppet can create, edit, and delete scheduled tasks. It can manage the task name, the enabled/disabled status, the command, any arguments, the working directory, the user and password, and triggers. For more information, see the reference documentation for the `scheduled_task` type. This is a Windows-only resource type.

- Puppet does not support "every X minutes" type triggers.

`package`

```
package { 'mysql':
  ensure          => installed,
  provider        => 'msi', # deprecated in Puppet 3.0
  source          => 'N:/packages/mysql-5.5.16-winx64.msi',
  install_options => { 'INSTALLDIR' => 'C:\mysql-5.5' },
}
```

Puppet can install and remove MSI packages, including specifying package-specific install options, e.g. install directory.

IDENTIFYING PACKAGES

The `title` or name of the package must match the value of the `DisplayName` property in the registry, which is also the value displayed in Add/Remove Programs. Alternately, when a package name is not unique across versions (e.g. VMWare Tools, or where there are 32- and 64-bit versions with the same name), we provide the ability to specify the package's PackageCode as the package name. This is a GUID that's unique across all MSI builds. For instance:

```
package { '{XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX}':
  ensure => installed,
  source => 'the.msi',
  provider => windows
}
```

To find the PackageCode from an MSI, you can use Orca, or you can get to it programmatically with Ruby:

```
require 'win32ole'
installer = WIN32OLE.new('WindowsInstaller.Installer')
db = installer.OpenDatabase(path, 0) # where 'path' is the path to the MSI
puts db.SummaryInformation.Property(9)
```

ADDITIONAL NOTES ON WINDOWS PACKAGES

- The source parameter is required, and must refer to a local .msi file, a file from a mapped drive, or a UNC path. You can distribute packages as `file` resources. Puppet URLs are not currently supported for the `package` type's `source` attribute.
- The `install_options` attribute is package-specific; refer to the documentation for the package you are trying to install.
  - Any file path arguments within the `install_options` attribute (such as `INSTALLDIR`) should use backslashes, not forward slashes.
- As of Puppet 3.0, `windows` is the default provider parameter for all Windows packages. Using `msi` will result in a deprecation warning.

`service`

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

Puppet can start, stop, enable, disable, list, query and configure services. It does not support configuring service dependencies, account to run as, or desktop interaction.

- Use the short service name (e.g. `wuauserv`) in Puppet, not the display name (e.g. `Automatic Updates`).
- Setting the `enable` attribute to `true` will assign a service the “Automatic” startup type; setting `enable` to `manual` will assign the “Manual” startup type.

`exec`

Puppet can execute binaries (exe, com, bat, etc.), and can log the child process output and exit status.

- If an extension for the `command` is not specified (for example, `ruby` instead of `ruby.exe`), Puppet will use the `PATHEXT` environment variable to resolve the appropriate binary. `PATHEXT` is a Windows-specific variable that lists the valid file extensions for executables.
- Puppet does not support a shell provider for Windows, so if you want to execute shell built-ins (e.g. `echo`), you must provide a complete `cmd.exe` invocation as the command. (For example, `command => 'cmd.exe /c echo "foo"'`.)
- When executing Powershell scripts, you must specify the `remotesigned` execution policy as part of the `powershell.exe` invocation:

```
      exec { 'test':
        command => 'C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe -
executionpolicy remotesigned -file C:\test.ps1',
      }
```

`host`

Puppet can manage entries in the hosts file in the same way that is supported on Unix platforms.

Troubleshooting Puppet on Windows

Tips

Process Explorer

We recommend installing Process Explorer and configuring it to replace Task Manager. This will make debugging significantly easier.

Logging

As of Puppet 2.7.x, messages from the `puppetd` log file are available via the Windows Event Viewer (choose “Windows Logs” > “Application”). To enable debugging, stop the puppet service and restart it as:

```
c:\>sc stop puppet && sc start puppet --debug --trace
```

Puppet's windows service component also writes to the `windows.log` within the same `log` directory and can be used to debug issues with the service.

Common Issues

Installation

The Puppet MSI package will not overwrite an existing entry in the puppet.conf file. As a result, if you uninstall the package, then reinstall the package using a different puppet master hostname, Puppet won't actually apply the new value if the previous value still exists in `<data directory>\etc\puppet.conf`.

In general, we've taken the approach of preserving configuration data on the system when doing an upgrade, uninstall or reinstall.

To fully clean out a system make sure to delete the `<data directory>`.

Similarly, the MSI will not overwrite the custom facts written to the `PuppetLabs\facter\facts.d` directory.

Unattended installation

Puppet may fail to install when trying to perform an unattended install from the command line, e.g.

```
msiexec /qn /i puppet.msi
```

To get troubleshooting data, specify an installation log, e.g. /l*v install.txt. Look in the log for entries like the following:

```
MSI (s) (7C:D0) [17:24:15:870]: Rejecting product '{D07C45E2-A53E-4D7B-844F-
F8F608AFF7C8}': Non-assigned apps are disabled for non-admin users.
MSI (s) (7C:D0) [17:24:15:870]: Note: 1: 1708
MSI (s) (7C:D0) [17:24:15:870]: Product: Puppet -- Installation failed.
MSI (s) (7C:D0) [17:24:15:870]: Windows Installer installed the product.
Product Name: Puppet. Product Version: 2.7.12. Product Language: 1033.
Manufacturer: Puppet Labs. Installation success or error status: 1625.
MSI (s) (7C:D0) [17:24:15:870]: MainEngineThread is returning 1625
MSI (s) (7C:08) [17:24:15:870]: No System Restore sequence number for this
installation.
Info 1625.This installation is forbidden by system policy. Contact your system
administrator.
```

If you see entries like this you know you don't have sufficient privileges to install puppet. Make sure to launch `cmd.exe` with the `Run as Administrator` option selected, and try again.

File Paths

Path Separator

Make sure to use a semi-colon (;) as the path separator on Windows, e.g., `modulepath=path1;path2`

File Separator

In most resource attributes, the Puppet language accepts either forward- or backslashes as the file□ separator. However, some attributes absolutely require forward slashes, and some attributes absolutely require backslashes. See the relevant section of Writing Manifests for Windows for more information.

Backslashes

When backslashes are double-quoted(“), they must be escaped. When single-quoted (‘), they may be escaped. For example, these are valid file resources:□

```
file { 'c:\path\to\file.txt': }
file { 'c:\\path\\to\\file.txt': }
file { "c:\\path\\to\\file.txt": }
```

But this is an invalid path, because \p, \t, \f will be interpreted as escape sequences:

```
file { "c:\path\to\file.txt": }
```

UNC Paths

UNC paths are not currently supported. However, the path can be mapped as a network drive and accessed that way.

Case-insensitivity

Several resources are case-insensitive on Windows (file, user, group). When establishing□ dependencies among resources, make sure to specify the case consistently. Otherwise, puppet may not be able to resolve dependencies correctly. For example, applying the following manifest will fail, because puppet does not recognize that FOOBAR and foobar are the same user:

```
file { 'c:\foo\bar':
  ensure => directory,
  owner => 'FOOBAR'
}
user { 'foobar':
  ensure => present
}
...
err: /Stage[main]//File[c:\foo\bar]: Could not evaluate: Could not find user
FOOBAR
```

Diffs□

Puppet does not show diffs on Windows (e.g., `puppet agent --show_diff`) unless a third-party diff□

utility has been installed (e.g., msys, gnudiff, cygwin, etc) and the `diff` property has been set appropriately.

Resource Errors and Quirks

File

If the owner and/or group are specified in a file resource on Windows, the mode must also be specified. So this is okay:

```
file { 'c:/path/to/file.bat':
  ensure => present,
  owner => 'Administrator',
  group => 'Administrators',
  mode => 0770
}
```

But this is not:

```
file { 'c:/path/to/file.bat':
  ensure => present,
  owner => 'Administrator',
  group => 'Adminstrators',
}
```

The latter case will remove any permissions the Administrators group previously had to the file, resulting in the effective permissions of 0700. And since puppet runs as a service under the "SYSTEM" account, not "Administrator," Puppet itself will not be able to manage the file the next time it runs!

To get out of this state, have Puppet execute the following (with an exec resource) to reset the file permissions:

```
takeown /f c:/path/to/file.bat && icacls c:/path/to/file.bat /reset
```

Exec

When declaring a Windows exec resource, the path to the resource typically depends on the %WINDIR% environment variable. Since this may vary from system to system, you can use the `path` fact in the exec resource:

```
exec { 'cmd.exe /c echo hello world':
  path => $::path
}
```

Shell Builtins

Puppet does not currently support a shell provider on Windows, so executing shell builtins directly will fail:

```
exec { 'echo foo':
  path => 'c:\windows\system32;c:\windows'
}
...
err: /Stage[main]//Exec[echo foo]/returns: change from notrun to 0 failed:
Could not find command 'echo'
```

Instead, wrap the builtin in `cmd.exe`:

```
exec { 'cmd.exe /c echo foo':
  path => 'c:\windows\system32;c:\windows'
}
```

Or, better still, use the tip from above:

```
exec { 'cmd.exe /c echo foo':
  path => $::path
}
```

Powershell

By default, powershell enforces a restricted execution policy which prevents the execution of scripts. Consequently, make sure to specify the appropriate execution policy in the powershell command:

```
exec { 'test':
  command => 'powershell.exe -executionpolicy remotesigned -file C:\test.ps1',
  path => $::path
}
```

Package

The source of an MSI package must be a file on either a local filesystem or on a network mapped□ drive. It does not support URI-based sources, though you can achieve a similar result by defining a□ file whose source is the puppet master and then defining a package whose source is the local file.□

Service

Windows services support a short name and a display name. Make sure to use the short name in puppet manifests. For example use `wuauserv`, not `Automatic Updates`. You can use `sc query` to get a list of services and their various names.

Error Messages

- “`Service 'Puppet Agent' (puppet) failed to start. Verify that you have sufficient privileges to start system services.`”

  This can occur when installing puppet on a UAC system from a non-elevated account. Although the installer displays the UAC prompt to install puppet, it does not elevate when trying to start the service. Make sure to run from an elevated `cmd.exe` process when installing the MSI.

- "`Cannot run on Microsoft Windows without the sys-admin, win32-process, win32-dir, win32-service and win32-taskscheduler gems.`"

  Puppet requires the indicated Windows-specific gems, which can be installed using `gem install <gem>`

- "`err: /Stage[main]//Scheduled_task[task_system]: Could not evaluate: The operation completed successfully.`"

  This error can occur when using version < 0.2.1 of the win32-taskscheduler gem. Run `gem update win32-taskscheduler`

- "`err: /Stage[main]//Exec[C:/tmp/foo.exe]/returns: change from notrun to 0 failed: CreateProcess() failed: Access is denied.`"

  This error can occur when requesting an executable from a remote puppet master that cannot be executed. For a file to be executable on Windows, set the user/group executable bits accordingly on the puppet master (or alternatively, specify the mode of the file as it should exist on the Windows host):

  ```
  file { "C:/tmp/foo.exe":
    source => "puppet:///modules/foo/foo.exe",
  }

  exec { 'C:/tmp/foo.exe':
    logoutput => true
  }
  ```

- "`err: getaddrinfo: The storage control blocks were destroyed.`"

  This error can occur when the agent cannot resolve a DNS name into an IP address (for example the `server`, `ca_server`, etc properties). To verify that there is a DNS issue, check that you can run `nslookup <dns>`. If this fails, there is a problem with the DNS settings on the Windows agent (for example, the primary dns suffix is not set). See http://technet.microsoft.com/en-us/library/cc959322.aspx

- "`err: /Stage[main]//Group[mygroup]/members: change from to Administrators failed: Add OLE error code:8007056B in <Unknown> <No Description> HRESULT error code:0x80020009 Exception occurred.`"

  This error will occur when attempting to add a group as a member of another local group, i.e. nesting groups. Although Active Directory supports nested groups for certain types of domain group accounts, Windows does not support nesting of local group accounts. As a result, you must only specify user accounts as members of a group.

- "`err: /Stage[main]//Package[7zip]/ensure: change from absent to present failed: Execution of 'msiexec.exe /qn /norestart /i "c:\\7z920.exe"' returned 1620: T h i s i n s t a l l a t i o n p a c k a g e c o u l d n o t b e o p e n e d . C o n t a c` `t the application vendor to verify that this is a valid Windows Installer package.`”

This error can occur when attempting to install a non-MSI package. Puppet only supports MSI packages. To install non-MSI packages, use an exec resource with an `onlyif` parameter.

- “`err: Could not request certificate: The certificate retrieved from the master does not match the agent's private key.`”

  This error is usually a sign that the master has already issued a certificate to the agent. This can occur if the agent’s SSL directory is deleted after it has retrieved a certificate from the master, or when running the agent in two different security contexts. For example, running puppet agent as a service and then trying to run `puppet agent` from the command line with non-elevated security. Specifically, this would happen if you’ve selected `Start Command Prompt with Puppet` but did not elevate privileges using `Run as Administrator`.

- “`err: Could not evaluate: Could not retrieve information from environment production source(s) puppet://puppet.domain.com/plugins.`”

  This error will be generated when a Windows agent does a pluginsync from the Puppet master server, when the latter does not contain any plugins. Note that pluginsync is enabled by default on Windows. This is a known bug in 2.7.x, see https://projects.puppetlabs.com/issues/2244.

- “`err: Could not send report: SSL_connect returned=1 errno=0 state=SSLv3 read server certificate B: certificate verify failed. This is often because the time is out of sync on the server or client.`”

  Windows agents that are part of an Active Directory domain should automatically have their time synchronized with AD. For agents that are not part of an AD domain, you may need to enable and add the Windows time service manually:

  ```
  w32tm /register
  net start w32time
  w32tm /config /manualpeerlist:<ntpserver> /syncfromflags:manual /update
  w32tm /resync
  ```

- “`err: You cannot service a running 64-bit operating system with a 32-bit version of DISM. Please use the version of DISM that corresponds to your computer's architecture.`”

  As described in the Installation Guide, 64-bit versions of windows will redirect all file system access from `%windir%\system32` to `%windir%\SysWOW64` instead. When attempting to configure Windows roles and features using `dism.exe`, make sure to use the 64-bit version. This can be done by executing `c:\windows\sysnative\dism.exe`, which will prevent file system redirection. See https://projects.puppetlabs.com/issues/12980

- “Error: Could not parse for environment production: Syntax error at ‘=’; expected ‘}’”

  This error will usually occur if `puppet apply -e` is used from the command line and the supplied command is surrounded with single quotes (‘), which will cause `cmd.exe` to interpret any `=>` in the command as a redirect. To solve this surround the command with double quotes (“) instead. See https://projects.puppetlabs.com/issues/20528.

Running Puppet From Source on Windows

This documentation applies to Puppet versions ≥ 2.7.6 and Puppet Enterprise ≥ 2.5. Earlier versions may behave differently.□

> Note: Nearly all users should install Puppet from Puppet Labs’ installer packages, which are provided free of charge. See here for download links and more information. The following procedures are only for advanced users involved in Puppet’s development.

Prerequisites

Platforms

Puppet Enterprise supports Windows 7, Server 2008, 2008 R2, Server 2003, and 2003 R2.

Ruby

Only Ruby version 1.8.7 is currently supported. It is available from rubyinstaller.org

Puppet does not require Cygwin, Powershell, or any other non-standard shells; it can be run from Windows’ default `cmd.exe` terminal.

Required Gems

Puppet on Windows requires the following gems be installed:

- sys-admin
- win32-process
- win32-dir
- win32-service (>=0.7.1)
- win32-taskscheduler (>= 0.2.1)

To install them all in two commands:

```
C:\>gem install sys-admin win32-process win32-dir win32-taskscheduler --no-rdoc
--no-ri
C:\>gem install win32-service --platform=mswin32 --no-rdoc --no-ri
```

(Since win32-service includes native code, you should install it with the `--platform=mswin32` option. Otherwise, `gem` will need to compile the extensions at install time, which has additional dependencies and can be time-consuming.)

Installation

Obtain zip files of the latest Puppet and Facter source code by clicking the "Downloads" button on their GitHub pages or by checking out a copy of their repositories.

- Puppet
- Facter

Then, unzip each archive into a temporary directory and run their `install.rb` scripts. You do not need to modify your `RUBYLIB` or `PATH` environment variables prior to running the install scripts.

```
C:\>ruby install.rb
```

Note: When installed from source, Puppet does not install itself as an NT service. Use the standard installer packages if you want to run Puppet as a service.

Note: The location of Puppet's data directory varies depending on the Windows version. See this explanation from the installer documentation to find the data directory on your version.

Note: When installed from source, Puppet does not change the system's `PATH` or `RUBYLIB` variables, nor does it provide Start menu shortcuts for opening a terminal with these variables set. You will need to set them yourself before running Puppet.

User Account Control

In general, puppet must be running in an account that is a member of the local Administrators group in order to make changes to the system, (e.g., change file ownership, modify `/etc/hosts`, etc.). On systems where User Account Control (UAC) is enabled, such as Windows 7 and 2008, Puppet must be running with explicitly elevated privileges. It will not ask for elevation automatically; you must specifically start your `cmd.exe` terminal window with elevated privileges on these platforms. See this blog post (unaffiliated with Puppet Labs) for more information about UAC.

Development Tools and Tasks

Gems

If you're developing Puppet, you'll need to install the rspec, rake, and mocha gems in order to run the tests.

```
gem install rspec rake mocha --no-rdoc --no-ri
```

Git

In addtion, you will likely need the current version of MSYS GIT. You will also want to set the following in your git config so that you don't create unnecessary mode bit changes when editing files on Windows:

```
git config core.filemode false
```

Source

The source code for Puppet and Facter is available in Puppet Labs' repositories on GitHub:

- Puppet
- Facter

Testing

Nearly all of the rspec tests are known to work on Windows, with a few exceptions (e.g. due to the lack of a mount provider on Windows). To run the rspec tests on Windows, execute the following command:

```
C:\>rspec --tag ~fails_on_windows spec
```

Scaling Puppet

Tune Puppet for maximum performance in large environments.

Are you using the default webserver?

WEBrick, the default web server used to enable Puppet's web services connectivity, is essentially a reference implementation, and becomes unreliable beyond about ten managed nodes. In any sort of production environment serving many nodes, you should switch to a more efficient web server implementation such as Passenger or Mongrel. Passenger is the currently recommended implementation, on older systems use Mongrel.

Delayed check in

Puppet's default configuration asks that each node check-in every 30 minutes. An option called 'splay' can add a random configurable lag to this check-in time, to further balance out check-in frequency. Alternatively, do not run puppetd as a daemon. Add a cronjob for `puppet agent` with `--onetime`, thus allowing for setting different intervals on different nodes.

Triggered selective updates

Similar to the delayed check-in and cron strategies, it's possible to trigger node updates on demand. Managed nodes can be configured to not check-in automatically, but rather to check-in only when requested. `puppetrun` (in the 'ext' directory of the Puppet checkout) may be used to selectively update hosts. Alternatively, do not run the daemon, instead use a tool like mcollective to launch `puppet agent` with the `--onetime` option.

No central host

Using a central server offers numerous advantages, particularly in the area of security and enhanced control. In environments that do not need these features, it is possible to use rsync, git, or some other means to transfer Puppet manifests and data to each individual node, and then run `puppet apply` locally (usually via cron). This approach scales essentially infinitely, and full usage of Puppet and facter is still possible.

Minimize recursive file serving

Puppet's recursive file serving works well for small directories, but it isn't as efficient as rsync or NFS, and using it for larger directories can take a performance toll on both the client and server.

Using Multiple Puppet Masters

To scale beyond a certain size, or for geographic distribution or disaster recovery, a deployment may warrant having more than one puppet master server. This document outlines options for deployments with multiple masters.

> Note: As of this writing, this document does not cover:
>
> - How to expand Puppet Enterprise's orchestration or live management features
> - How to use multiple PE console or Puppet Dashboard servers

In brief:

1. Determine the method you will use to distribute the agent load among the available masters
2. Centralize all certificate authority functions
3. Bring up additional puppet master servers
4. Centralize reporting, inventory service, and storeconfigs (if necessary)
5. Keep manifests and modules in sync across your puppet masters
6. Implement agent load distribution

Distributing Agent Load

First things first; the rest of your configuration will depend on how you're planning on distributing the agent load. You have several options available. Determine what your deployment will look like now, but implement this as the last step, only after you have the infrastructure in place to support it.

Option 1: Statically Designate Servers on Agent Nodes

Manually or with Puppet, change the `server` setting in each agent node's `puppet.conf` file such that the nodes are divided more or less evenly among the available masters.

This option is labor-intensive and will gradually fall out of balance, but it will work without additional infrastructure.

Option 2: Use Round-Robin DNS

Leave all of your agent nodes pointed at the same puppet master hostname, then configure your site's DNS to arbitrarily route all requests directed at that hostname to the pool of available masters.

For instance, if all of your agent nodes are configured with `server = puppet.example.com`, you'll configure a DNS name such as:

```
# IP address of master 1:
puppet.example.com. IN A 192.0.2.50
# IP address of master 2:
puppet.example.com. IN A 198.51.100.215
```

For this option, you'll need to configure your masters with `dns_alt_names` before their certificate request is made — see below.

Option 3: Use a Load Balancer

You can also use a hardware load balancer or a load balancing proxy webserver to redirect requests more intelligently. Depending on how it's configured for SSL (either raw TCP proxying, or acting as its own SSL endpoint), you'll need to use a combination of the other procedures in this document.

Configuring a load balancer is beyond the scope of this document.

Option 4: DNS `SRV` Records

This option is new in Puppet 3.0, and will only work if your entire Puppet infrastructure is on 3.0 or newer.

> Note: Designating Puppet services with SRV records is an experimental feature. It is currently being used in production at several large sites, but there are still some issues with the implementation to be wary of. Specifically: it makes a large number of DNS requests, request timeouts are completely under the DNS server's control and agents cannot bail early, the way it divides services does not map perfectly to the pre-existing `server`/`ca_server`/etc. settings, and SRV records don't interact well with static servers set in the config file (i.e. static settings can't be used for failover, it's one or the other). Please keep these potential pitfalls in mind when configuring your DNS!

You can use DNS `SRV` records to assign a pool of puppet masters for agents to communicate with. This requires a DNS service capable of `SRV` records — all major DNS software including Windows Server's DNS and BIND are compatible.

Each of your puppet nodes will be configured with a `srv_domain` instead of a `server` in their `puppet.conf`:

```
[main]
  use_srv_records = true
  srv_domain = example.com
```

..then they will look up a `SRV` record at `_x-puppet._tcp.example.com` when they need to talk to a puppet master.

```
# Equal-weight load balancing between master-a and master-b:
_x-puppet._tcp.example.com. IN SRV 0 5 8140 master-a.example.com.
_x-puppet._tcp.example.com. IN SRV 0 5 8140 master-b.example.com.
```

Advanced configurations are also possible. For instance, if all devices in site A are configured with a□ `srv_domain` of `site-a.example.com` and all nodes in site B are configured to `site-b.example.com`, you can configure them to prefer a master in the local site, but fail over to the remote site:□

```
# Site A has two masters - master-1 is beefier, give it 75% of the load:
_x-puppet._tcp.site-a.example.com. IN SRV 0 75 8140 master-1.site-
a.example.com.
_x-puppet._tcp.site-a.example.com. IN SRV 0 25 8140 master-2.site-
a.example.com.
_x-puppet._tcp.site-a.example.com. IN SRV 1 5 8140 master.site-b.example.com.

# For site B, prefer the local master unless it's down, then fail back to site
A
_x-puppet._tcp.site-b.example.com. IN SRV 0 5 8140 master.site-b.example.com.
_x-puppet._tcp.site-b.example.com. IN SRV 1 75 8140 master-1.site-
a.example.com.
_x-puppet._tcp.site-b.example.com. IN SRV 1 25 8140 master-2.site-
a.example.com.
```

Centralize the Certificate Authority□

The additional puppet masters at a site should only share the burden of compiling and serving catalogs; any certificate authority functions should be delegated to a single server. Choose one server to act as the CA, and ensure that it is reachable at a unique hostname other than (or in addition to) `puppet`.

There are two main options for centralizing the CA:

Option 1: Direct agent nodes to the CA Master

METHOD A: INDIVIDUAL AGENT CONFIGURATION

On every agent node, you must set the `ca_server` setting in `puppet.conf` (in the `[main]` configuration block) to the hostname of the server acting as the certificate authority.□

- If you have a large number of existing nodes, it is easiest to do this by managing `puppet.conf` with a Puppet module and a template.
- Be sure to pre-set this setting when provisioning new nodes — they will be unable to successfully complete their initial agent run if they're not communicating with the correct `ca_server`.

METHOD B: DNS `SRV` RECORDS

If you are utilizing `SRV` records for agents, then you can use the `_x-puppet-ca._tcp.$srv_domain` DNS name to configure clients to point to a single specific CA server, while the `_x-puppet._tcp.$srv_domain` DNS name will be handling the majority of their requests to masters and can be a set of puppet masters without CA capabilities.

Option 2: Proxy Certificate Traffic

Alternately, if your nodes don't have direct connectivity to your CA master, you aren't using `SRV` records, or you do not wish to change every node's `puppet.conf`, you can configure the web server on the puppet masters other than your CA master to proxy all certificate-related traffic to the designated CA master.

> This method only works if your puppet master servers are using a web server that provides a method for proxying requests, like Apache with Passenger.

All certificate related URLs begin with `/<NAME OF PUPPET ENVIRONMENT>/certificate`; simply catch and proxy these requests using whatever capabilities your web server offers.

EXAMPLE: APACHE CONFIGURATION WITH `MOD_PROXY`

In the scope of your puppet master vhost, add the following configuration:

```
SSLProxyEngine On
# Proxy all requests that start with things like /production/certificate
to the CA
ProxyPassMatch ^/([^/]+/certificate.*)$
https://puppetca.example.com:8140/$1
```

This change must be made to the Apache configuration on every puppet master server other than the one serving as the CA. No changes need to be made to agent nodes' configurations.

Additionally, the CA master must allow the nodes to download the certificate revocation list via the proxy, without authentication — certificate requests and retrieval of signed certificates are allowed by default, but not CRLs. Add the following to the CA master's `auth.conf`:

```
path /certificate_revocation_list
auth any
method find
allow *
```

Create New Puppet Master Servers

Install Puppet

To add a new puppet master server to your deployment, begin by installing and configuring Puppet as per normal.

- Installing Puppet (open source versions)
- Installing Puppet Enterprise

Like with any puppet master, you'll need to use a production-grade web server rather than the default WEBrick server. We generally assume that you know how to do this if you're already at the point where you need multiple masters, but see Scaling with Passenger for one way to do it.

Before Running `puppet agent` or `puppet master`

- In `puppet.conf`, do the following:
  - Set `ca` to `false` in the `[master]` config block.
  - If you're using the individual agent configuration method of CA centralization:

    Set `ca_server` to the hostname of your CA server in the `[main]` config block.
  - If an `ssldir` is configured, make sure it's configured in the `[main]` block only.

> If you're using the DNS round robin method of agent load balancing, or a load balancer in TCP proxying mode, your non-CA masters will need certificates with DNS Subject Alternative Names:
>
> - Configure `dns_alt_names` in the `[main]` block of `puppet.conf`.
>
>   It should be configured to cover every DNS name that might be used by a node to access this master.
>
>   ```
>   dns_alt_names = puppet,puppet.example.com,puppet.site-a.example.com
>   ```
>
> - If the agent or master has been run and already created a certificate, blow it away by running `sudo rm -rf $(puppet master --configprint ssldir)`. If a cert has been requested from the master, you'll also need to delete it there to re-issue a new one with the alt names: `puppet cert clean master-2.example.com`.

- Request a new certificate by running `puppet agent --test --waitforcert 10`.
- Log into the CA server and run `puppet cert sign master-2.example.com`.

  (You'll need to add `--allow-dns-alt-names` to the command if `dns_alt_names` were in the certificate request.)

Centralize Reports, Inventory Service, and Catalog Searching (storeconfigs)

If you are using Puppet Dashboard or another HTTP report processor, you should point all of your puppet masters at the same shared Dashboard server; otherwise, you won't be able to see all of your nodes' reports.

If you are using the inventory service or exported resources, it's complex and impractical to use any of the older (activerecord) backends in a multi-master environment. You should definitely switch to PuppetDB, and point all of your puppet masters at a shared PuppetDB instance. A reasonably robust PuppetDB server can handle many puppet masters and many thousands of agent nodes.

See the PuppetDB manual for instructions on setting up PuppetDB. You will need to deploy a PuppetDB server, then configure each puppet master to use it.

Keep Manifests and Modules in Sync Across Your Puppet Masters

You will need to find some way to ensure that all of your puppet masters have identical copies of your manifests, Puppet modules, and external node classifier data. Some options are:

- Use a version control system such as Git, Mercurial, or Subversion to manage and sync your manifests, modules, and other data.
- Run an out-of-band rsync task via cron.
- Configure puppet agent on each master node to point to a designated model puppet master, then use Puppet itself to distribute the modules.

Implement Load Distribution

Now that your other masters are ready, you can implement the agent load balancing mechanism that you selected above.

Passenger

Using Passenger instead of WEBrick for web services offers numerous performance advantages. This guide shows how to set it up in an Apache web server.

Why Passenger

Traditionally, the puppetmaster would embed a WEBrick Web Server to serve the Puppet clients. This may work well for testing and small deployments, but it's recommended to use a more scalable server for production environments.

What is Passenger?

Passenger (AKA mod_rails or mod_rack) is the Apache 2.x module which lets you run Rails or Rack applications inside a general purpose web server, like Apache httpd or nginx.

Passenger is the recommended deployment method for modern versions of puppet masters, but you may run into compatibility issues with Puppet versions older than 0.24.6 and Passenger versions older than 2.2.5.

Apache and Passenger Installation

Make sure `puppet master` has been run at least once (or `puppet agent`, if this master is not the CA), so that all required SSL certificates are in place.

Install Apache 2

Debian/Ubuntu:

```
$ sudo apt-get install apache2 ruby1.8-dev rubygems
$ sudo a2enmod ssl
$ sudo a2enmod headers
```

RHEL/CentOS (needs the Puppet Labs repository enabled, or the EPEL repository):

```
$ sudo yum install httpd httpd-devel mod_ssl ruby-devel rubygems gcc
```

Install Rack/Passenger

```
$ sudo gem install rack passenger
$ sudo passenger-install-apache2-module
```

Apache Configuration

To configure Apache to run the puppet master application, you must:

- Install the puppet master Rack application, by creating a directory for it and copying the `config.ru` file from the Puppet source.
- Create a virtual host config file for the puppet master application, and install/enable it.

Install the Puppet Master Rack Application

Your copy of Puppet includes a `config.ru` file, which tells Rack how to spawn puppet master processes. Create a directory for it, then copy the `ext/rack/files/config.ru` file from the Puppet source code into that directory:

```
$ sudo mkdir -p /usr/share/puppet/rack/puppetmasterd
$ sudo mkdir /usr/share/puppet/rack/puppetmasterd/public
/usr/share/puppet/rack/puppetmasterd/tmp
$ sudo cp /usr/share/puppet/ext/rack/files/config.ru
/usr/share/puppet/rack/puppetmasterd/
$ sudo chown puppet /usr/share/puppet/rack/puppetmasterd/config.ru
```

Note: The `chown` step is important — the owner of this file is the user the puppet master process will run under. This should usually be `puppet`, but may be different in your deployment.

Create and Enable the Puppet Master Vhost

See "Example Vhost Configuration" below for the contents of this vhost file. Note that the vhost's `DocumentRoot` directive refers to the Rack application directory you created above.

Debian/Ubuntu:

See Apache Configuration below for contents of puppetmaster file

```
$ sudo cp puppetmaster /etc/apache2/sites-available/
$ sudo a2ensite puppetmaster
```

RHEL/CentOS:

See Apache Configuration below for contents of puppetmaster.conf file

```
$ sudo cp puppetmaster.conf /etc/httpd/conf.d/
```

EXAMPLE VHOST CONFIGURATION

This Apache Virtual Host configures the puppet master on the default puppetmaster port (8140). You can also see a similar file at `ext/rack/files/apache2.conf` in the Puppet source.

```
# You'll need to adjust the paths in the Passenger config depending on which OS
# you're using, as well as the installed version of Passenger.

# Debian/Ubuntu:
#LoadModule passenger_module /var/lib/gems/1.8/gems/passenger-
3.0.x/ext/apache2/mod_passenger.so
#PassengerRoot /var/lib/gems/1.8/gems/passenger-3.0.x
#PassengerRuby /usr/bin/ruby1.8

# RHEL/CentOS:
#LoadModule passenger_module /usr/lib/ruby/gems/1.8/gems/passenger-
3.0.x/ext/apache2/mod_passenger.so
#PassengerRoot /usr/lib/ruby/gems/1.8/gems/passenger-3.0.x
#PassengerRuby /usr/bin/ruby

# And the passenger performance tuning settings:
PassengerHighPerformance On
PassengerUseGlobalQueue On
# Set this to about 1.5 times the number of CPU cores in your master:
PassengerMaxPoolSize 12
# Recycle master processes after they service 1000 requests
PassengerMaxRequests 1000
# Stop processes if they sit idle for 10 minutes
PassengerPoolIdleTime 600

Listen 8140
<VirtualHost *:8140>
    SSLEngine On

    # Only allow high security cryptography. Alter if needed for compatibility.
    SSLProtocol             All -SSLv2
    SSLCipherSuite          HIGH:!ADH:RC4+RSA:-MEDIUM:-LOW:-EXP
    SSLCertificateFile      /var/lib/puppet/ssl/certs/puppet-
server.example.com.pem
    SSLCertificateKeyFile   /var/lib/puppet/ssl/private_keys/puppet-
server.example.pem
    SSLCertificateChainFile /var/lib/puppet/ssl/ca/ca_crt.pem
    SSLCACertificateFile    /var/lib/puppet/ssl/ca/ca_crt.pem
    SSLCARevocationFile     /var/lib/puppet/ssl/ca/ca_crl.pem
    SSLVerifyClient         optional
    SSLVerifyDepth          1
    SSLOptions              +StdEnvVars +ExportCertData

    # These request headers are used to pass the client certificate
    # authentication information on to the puppet master process
    RequestHeader set X-SSL-Subject %{SSL_CLIENT_S_DN}e
    RequestHeader set X-Client-DN %{SSL_CLIENT_S_DN}e
    RequestHeader set X-Client-Verify %{SSL_CLIENT_VERIFY}e

    RackAutoDetect On
    DocumentRoot /usr/share/puppet/rack/puppetmasterd/public/
    <Directory /usr/share/puppet/rack/puppetmasterd/>
        Options None
        AllowOverride None
        Order Allow,Deny
        Allow from All
    </Directory>
</VirtualHost>
```

If this puppet master is not the certificate authority, you will need to use different paths to the CA certificate and CRL:

```
SSLCertificateChainFile /var/lib/puppet/ssl/certs/ca.pem
SSLCACertificateFile    /var/lib/puppet/ssl/certs/ca.pem
SSLCARevocationFile     /var/lib/puppet/ssl/crl.pem
```

For additional details about enabling and configuring Passenger, see the Passenger install guide.

Start or Restart the Apache service

Ensure that any WEBrick puppet master process is stopped before starting the Apache service; only one can be bound to TCP port 8140.

Debian/Ubuntu:

```
$ sudo /etc/init.d/apache2 restart
```

RHEL/CentOS:

```
$ sudo /etc/init.d/httpd restart
```

If all works well, you'll want to make sure the WEBrick service no longer starts on boot:

Debian/Ubuntu:

```
$ sudo update-rc.d -f puppetmaster remove
```

RHEL/CentOS:

```
$ sudo chkconfig puppetmaster off
$ sudo chkconfig httpd on
```

Using Mongrel

Puppet daemons default to using WEBrick for http serving, but puppetmasterd can be used with Mongrel instead for performance benefits.

The mongrel documentation is currently maintained our our Wiki until it can be migrated over. Please see the OS specific setup documents on the Wiki for further information.

Using Puppet Templates

Learn how to template out configuration files with Puppet, filling in variables with the managed node's facts.

Puppet supports templates written in the ERB templating language, which is part of the Ruby standard library.

Templates can be used to specify the contents of files.

For a full introduction to using templates with Puppet, see the templates chapter of Learning Puppet.

Evaluating Templates

Templates are evaluated via a simple function:

```
    $value = template("my_module/mytemplate.erb")
```

Template files should be stored in the `templates` directory of a Puppet module, which allows the `template` function to locate them with the simplified path format shown above. For example, the file referenced by `template("my_module/mytemplate.erb")` would be found on disk at `/etc/puppet/modules/my_module/templates/mytemplate.erb` (assuming the common `modulepath` of `/etc/puppet/modules`).

(If a file cannot be located within any module, the `template` function will fall back to searching relative to the paths in Puppet's `templatedir`. However, using this setting is no longer recommended.)

Templates are always evaluated by the parser, not by the client. This means that if you are using a puppet master server, then the templates only need to be on the server, and you never need to download them to the client. The client sees no difference between using a template and specifying all of the text of the file as a string.

ERB Template Syntax

ERB is part of the Ruby standard library. Full information about its syntax and evaluation is available in the Ruby documentation. An abbreviated version is presented below.

ERB is Plain Text With Embedded Ruby

ERB templates may contain any kind of text; in the context of Puppet, this is usually some sort of config file. (Outside the context of Puppet, it is usually HTML.)

Literal text in an ERB file becomes literal text in the processed output. Ruby instructions and expressions can be embedded in tags; these will be interpreted to help create the processed output.

Tags

The tags available in an ERB file depend on the way the ERB processor is configured. Puppet always uses the same configuration for its templates (see “trim mode” below), which makes the following tags available:

- `<%= Ruby expression %>` — This tag will be replaced with the value of the expression it contains.
- `<% Ruby code %>` — This tag will execute the code it contains, but will not be replaced by a value. Useful for conditional or looping logic, setting variables, and manipulating data before printing it.
- `<%# comment %>` — Anything in this tag will be suppressed in the final output.
- `<%%` or `%%>` — A literal <% or %>, respectively.
- `<%-` — Same as `<%`, but suppresses any leading whitespace in the final output. Useful when indenting blocks of code for readability.
- `-%>` — Same as `%>`, but suppresses the subsequent line break in the final output. Useful with many lines of non-printing code in a row, which would otherwise appear as a long stretch of blank lines.

Trim Mode

Puppet uses ERB’s undocumented `"-"` (explicit line trim) mode, which allows tags to suppress leading whitespace and trailing line breaks as described above, and disallows the `% line of code` shortcut. Although it unfortunately doesn’t appear in the ERB docs, you can read its effect in the Ruby source code starting in the `initialize` method of the `ERB::Compiler::TrimScanner` class.

Using Templates

Here is an example for generating the Apache configuration for Trac sites:

```
    # /etc/puppet/modules/trac/manifests/tracsite.pp
    define trac::tracsite($cgidir, $tracdir) {
      file { "trac-${name}":
        path    => "/etc/apache2/trac/${name}.conf",
        owner   => 'root',
        group   => 'root',
        mode    => '0644',
        require => File[apacheconf],
        content => template('trac/tracsite.erb'),
        notify  => Service[apache2]
      }

      file { "tracsym-${name}":
        ensure => symlink,
        path   => "${cgidir}/${name.cgi}",
        target => '/usr/share/trac/cgi-bin/trac.cgi'
      }
    }
```

And then here’s the template:

```
    <%# /etc/puppet/modules/trac/templates/tracsite.erb %>
    <Location "/cgi-bin/ <%= @name %>.cgi">
        SetEnv TRAC_ENV "/export/svn/trac/<%= @name %>"
    </Location>

    <%# You need something like this to authenticate users: %>
    <Location "/cgi-bin/<%= @name %>.cgi/login">
        AuthType Basic
        AuthName "Trac"
        AuthUserFile /etc/apache2/auth/svn
        Require valid-user
    </Location>
```

This puts each Trac configuration into a separate file, and then we just tell Apache to load all of these files:

```
# /etc/httpd/httpd.conf
Include /etc/apache2/trac/[^.#]*
```

Note that the `template` function simply returns a string, which can be used as a value anywhere — the most common use is to fill file contents, but templates can also provide values for variables:

```
$myvariable = template('my_module/myvariable.erb')
```

Referencing Variables

Puppet passes all of the currently set variables (including facts) to templates when they are evaluated. There are several ways to access these variables:

- All of the variables visible in the current scope are available as Ruby instance variables — that is, `@fqdn, @memoryfree, @operatingsystem`, etc. This style of reference works identically to using short (local) variable names in a Puppet manifest: `@fqdn` is exactly equivalent to `$fqdn`.

- Historically, all of the variables visible in the current scope were also available as Ruby methods — that is, `fqdn, memoryfree, operatingsystem`, etc., without the prepended `@` sign. This style of reference caused problems when variable names collided with Ruby method names; its use emits deprecation warnings as of Puppet 3 and will be removed in Puppet 4. Please update any existing code which uses it and start any new code out with the `@fqdn` instance-variable syntax.
- Puppet passes an object named `scope` to the template. This contains all of the currently set variables, as well as some other data (including functions), and provides some methods for accessing them. You can use the scope object's `lookupvar` method to find any variable, in any scope. See "Out-of-Scope Variables" below for more details.

Note that Puppet's variable lookup rules changed for Puppet 3.0.

Out-of-Scope Variables

You can access variables in other scopes with the `scope.lookupvar` method:

```
<%= scope.lookupvar('apache::user') %>
```

This can also be used to ensure that you are getting the top-scope value of a variable that may have been overridden in a local scope:

```
<%= scope.lookupvar('::domain') %>
```

Puppet 3 introduces an easier syntax: you can use the square bracket operator (`[]`) on the scope object as though it were a hash.

```
<%= scope['::domain'] %>
```

Testing for Undefined variables

Instance variables are not created for variables whose values are undefined, so you can easily test for undefined variables with `if @variable`:

```
<% if @myvar %>
myvar has <%= @myvar %> value
<% end %>
```

Older templates often used the `has_variable?("myvar")` helper function, but this could yield odd results when variables were explicitly set to `undef`, and should usually be avoided.

If you need to test for a variable outside the current scope, you should copy it to a local variable in the manifest before evaluating the template:

```
# manifest:
$in_var = $outside_scope::outside_var
```

```
# template:
<% if @in_var %>
outside_var has <%= @in_var %> value
<% end %>
```

Getting a List of All Variables

If you use the scope object's `to_hash` method, you can get a hash of every variable that is defined in the current scope. This hash uses the local name (`osfamily`) of each variable, rather than the qualified name (`::osfamily`).

This snippet will print all of the variable names defined in the current scope:

```
<% scope.to_hash.keys.each do |k| -%>
<%= k %>
<% end -%>
```

Combining Templates

The template function can concatenate several templates together as follows:

```
 template('my_module/template1.erb','my_module/template2.erb')
```

This would be rendered as a single string with the content of both templates, in order.

Iteration

Puppet's templates also support array iteration. If the variable you are accessing is an array, you can iterate over it in a loop. Given Puppet manifest code like this:

```
$values = [val1, val2, otherval]
```

You could have a template like this:

```
<% @values.each do |val| -%>
Some stuff with <%= val %>
<% end -%>
```

This would produce:

```
Some stuff with val1
Some stuff with val2
Some stuff with otherval
```

Note that normally, ERB template lines that just have code on them would get translated into blank lines. This is because ERB generates newlines by default. To prevent this, we use the closing tag `-%>` instead of `%>`.

As we mentioned, erb is a Ruby system, but you don’t need to know Ruby well to use ERB. Internally, Puppet’s values get translated to real Ruby values, including true and false, so you can be pretty confident that variables will behave as you might expect.□

Conditionals

The ERB templating supports conditionals. The following construct is a quick and easy way to conditionally put content into a file:□

```
<% if broadcast != "NONE" %>        broadcast <%= broadcast %> <% end %>
```

Access to Tags and Declared Classes

> Note: The lists of tags and declared classes are parse-order dependent — they are only safe to use if you know exactly when in the compilation process the template will be evaluated. Using these variables is not recommended.

In version 0.24.6 and later, Puppet passes the following extra variables to a template:

- `classes` — an array of all of the classes that have been declared so far
- `tags` — an array of all of the tags applied to the current container
- `all_tags` — an array of all of the tags in use anywhere in the catalog

You can iterate over these variables or access their members.

This snippet will print all the classes that have been declared so far:

```
<% classes.each do |klass| -%>
The class <%= klass %> is defined
<% end -%>
```

This snippet will print all the tags applied to the current container:

```
<% tags.each do |tag| -%>
The tag <%= tag %> is part of the current scope
<% end -%>
```

This snippet will print all of the tags in use so far:

```
<% all_tags.each do |tag| -%>
The tag <%= tag %> is defined
<% end -%>
```

Using Functions Within Templates

Puppet functions can be used inside templates, but their use is slightly different from their use in□

manifests:

- All functions are methods on the `scope` object.
- You must prepend “`function_`” to the beginning of the function name.
- The arguments of the function must be provided as an array, even if there is only one argument. (This is mandatory in Puppet 3. Prior to Puppet 3, some functions would succeed when passed a string and some would fail.)

For example, to include one template inside another:

```
<%= scope.function_template(["my_module/template2.erb"]) %>
```

To log a warning using Puppet’s own logging system, so that it will appear in reports:

```
<%= scope.function_warning(["Template was missing some data; this config file
may be malformed."]) %>
```

Syntax Checking

ERB files are easy to syntax check. For a file mytemplate.erb, run

```
erb -P -x -T '-' mytemplate.erb | ruby -c
```

Virtual Resource Design Patterns

Referencing an entity from more than one place.

About Virtual Resources

By default, any resource you describe in a client’s Puppet config will get sent to the client and be managed by that client. However, resources can be specified in a way that marks them as virtual, meaning that they will not be sent to the client by default. You mark a resource as virtual by prefixing @ to the resource specification; for instance, the following code defines a virtual user:

```
@user { luke: ensure => present }
```

If you include this code (or something similar) in your configuration then the user will never get sent to your clients without some extra effort.

How This Is Useful

Puppet enforces configuration normalization, meaning that a given resource can only be specified in one part of your configuration. You can’t configure user johnny in both the solaris and freebsd classes.

For most cases, this is fine, because most resources are distinctly related to a single Puppet class — they belong in the webserver class, mailserver class, or whatever. Some resources can not be cleanly tied to a specific class, though; multiple otherwise-unrelated classes might need a specific resource. For instance, if you have a user who is both a database administrator and a Unix sysadmin, you want the user installed on all machines that have either database administrators or Unix administrators.

You can't specify the user in the dba class nor in the sysadmin class, because that would not get the user installed for all cases that matter.

In these cases, you can specify the user as a virtual resource, and then mark the user as real in both classes. Thus, the user is still specified in only one part of your configuration, but multiple parts of your configuration verify that the user will be installed on the client.

The important point here is that you can take a virtual resource and mark it non-virtual as many times as you want in a configuration; it's only the specification itself that must be normalized to one specific part of your configuration.

How to Realize Resources

There are two ways to mark a virtual resource so that it gets sent to the agent: You can use a special syntax called a collection, or you can use the realize function.

Collections provide a simple syntax (sometimes referred to as the "spaceship" operator) for marking virtual objects as real, such that they should be sent to the agent. Collections require the type of resource you are collecting and zero or more attribute comparisons to specifically select resources. For instance, to find our mythical user, we would use:

```
User <| title == luke |>
```

As promised, we've got the user type (capitalized, because we're performing a type-level operation), and we're looking for the user whose title is luke. "Title" is special here — it is the value before the colon when you specify the user. This is somewhat of an inconsistency in Puppet, because this value is often referred to as the name, but many types have a name parameter and they could have both a title and a name.

If no comparisons are specified, all virtual resources of that type will be marked real.

This attribute querying syntax is currently very simple. The only comparisons available are equality and non-equality (using the == and != operators, respectively), and you can join these comparisons using or and and. You can also parenthesize these statements, as you might expect. So, a more complicated collection might look like:

```
User <| (groups == dba or groups == sysadmin) or title == luke |>
```

Realizing Resources

Puppet provides a simple form of syntactic sugar for marking resource non-virtual by title, the realize function:

```
realize User[luke]
realize(User[johnny], User[billy])
```

The function follows the same syntax as other functions in the language, except that only resource references are valid values.

Virtual Define-Based Resources□

Since version 0.23, define-based resources may also be made virtual. For example:□

```
define msg($arg) {
  notify { "$name: $arg": }
}
@msg { test1: arg => arg1 }
@msg { test2: arg => arg2 }
```

With the above definitions, neither of the msg resources will be applied to a node unless it realizes□ them, e.g.:

```
realize( Msg[test1], Msg[test2] )
```

Remember that when referencing an instance of a namespaced defined type, or when specifying□ such a defined type for the collection syntax, you have to capitalize all segments of the type's name□ (e.g. `Apache::Vhost['wordpress']` or `Apache::Vhost <| |>`).

Keep in mind that resources inside virtualized define-based resources must have unique names.□ The following example will fail, complaining that `File[foo]` is defined twice:□

```
    define basket($arg) {
            file{'foo':
                    ensure  => present,
                    content => "$arg",
                    }
            }
    @basket { 'fruit': arg => 'apple' }
    @basket { 'berry': arg => 'watermelon' }

    realize( Basket[fruit], Basket[berry] )
```

Here's a working example:

```
    define basket($arg) {
        file{"$name":
            ensure  => present,
            content => "$arg",
            }
        }
    @basket { 'fruit': arg => 'apple' }
    @basket { 'berry': arg => 'watermelon' }

    realize( Basket[fruit], Basket[berry] )
```

Note that the working example will result in two File resources, named `fruit` and `berry`.

Exported Resource Design Patterns

Exporting and collecting resources is an extension of Virtual Resources . Puppet provides an experimental superset of virtual resources, using a similar syntax. In addition to these resources being virtual, they're also "exported" to other hosts on your network.

About Exported Resources

While virtual resources can only be collected by the host that specified them, exported resources can be collected by any host. You must set the storeconfigs setting to true to enable this functionality (you can see information about stored configuration on the Using Stored Configuration wiki page, and Puppet will automatically create a database for storing configurations (using Ruby on Rails).

```
[master]
storeconfigs = true
```

This allows one host to configure another host; for instance, a host could configure its services using Puppet, and then could export Nagios configurations to monitor those services.

The key syntactical difference between virtual and exported resources is that the special sigils (`@` and `<| |>`) are doubled (`@@` and `<<| |>>`) when referring to an exported resource.

Here is an example with exported resources:

```
class ssh {
    @@sshkey { $hostname: type => dsa, key => $sshdsakey }
    Sshkey <<| |>>
}
```

As promised, we use two @ sigils here, and the angle brackets are doubled in the collection.

The above code would have every host export its SSH public key, and then collect every host's key and install it in the ssh_known_hosts file (which is what the sshkey type does); this would include the host doing the exporting.

It's important to mention here that you will only get exported resources from hosts whose configurations have been compiled. If hostB exports a resource but hostB has never connected to the server, then no host will get that exported resource. The act of compiling a given host's configuration puts the resources into the database, and only resources in the database are available for collection.

Let’s look at another example, this time using a File resource:

```
node a {
    @@file { "/tmp/foo": content => "fjskfjs\n", tag => "foofile", }
}
node b {
    File <<| tag == 'foofile' |>>
}
```

This will create /tmp/foo on node b. Note that the tag is not required, it just allows you to control which resources you want to import.

Exported Resources with Nagios

Puppet includes native types for managing Nagios configuration files. These types become very powerful when you export and collect them. For example, you could create a class for something like Apache that adds a service definition on your Nagios host, automatically monitoring the web server:

```
class nagios-target {
   @@nagios_host { $fqdn:
        ensure => present,
        alias => $hostname,
        address => $ipaddress,
        use => "generic-host",
   }
   @@nagios_service { "check_ping_${hostname}":
        check_command => "check_ping!100.0,20%!500.0,60%",
        use => "generic-service",
        host_name => "$fqdn",
        notification_period => "24x7",
        service_description => "${hostname}_check_ping"
   }
}
class nagios-monitor {
    package { [ nagios, nagios-plugins ]: ensure => installed, }
    service { nagios:
        ensure => running,
        enable => true,
        #subscribe => File[$nagios_cfgdir],
        require => Package[nagios],
    }
    # collect resources and populate /etc/nagios/nagios_*.cfg
    Nagios_host <<||>>
    Nagios_service <<||>>
}
```

Exported Resources Override

Beginning in version 0.25, some new syntax has been introduced that allows creation of collections of any resources, not just virtual ones, based on filter conditions, and override of attributes in the created collection. This feature is not constrained to the override in inherited context, as is the case in the usual resource override.

Ordinary resource collections can now be defined by filter conditions, in the same way as collections of virtual or exported resources. For example:

```
file {
    "/tmp/testing": content => "whatever"
}

File<| |> {
    mode => 0600
}
```

The filter condition goes in the middle of the `<| |>` sigils. In the above example the condition is empty, so all file resources (not just virtual ones) are selected, and all file resources will have their modes overridden to 0600.

In the past this syntax only collected virtual resources. It now collects all matching resources, virtual or no, and allows you to override attributes in any of the collection so defined.

As another example, one can write:

```
file { "/tmp/a": content => "a" }
file { "/tmp/b": content => "b" }

File <| title != "/tmp/b" |> {
    require => File["/tmp/b"]
}
```

This means that every File resource requires /tmp/b, except /tmp/b itself. Moreover, it is now possible to define resource overriding without respecting the override on inheritance rule:

```
class a {
    file {
        "/tmp/testing": content => "whatever"
    }
}

class b {
    include a
    File<| |> {
        mode => 0600
    }
}
include b
```

Environments

Manage your module releases by dividing your site into environments.

Slice and Dice

Puppet lets you slice your site up into an arbitrary number of "environments" and serve a different set of modules to each one. This is usually used to manage releases of Puppet modules by testing them against scratch nodes before rolling them out completely, but it introduces a lot of other possibilities, like separating a DMZ environment, splitting coding duties among multiple sysadmins, or dividing the site by hardware type.

What an Environment Is

Every agent node is configured to have an environment, which is simply a short label specified in puppet.conf's `environment` setting. Whenever that node makes a request, the puppet master gets informed of its environment. (If you don't specify an environment, the agent has the default "production" environment.)

The puppet master can then use that environment several ways:

- If the master's `puppet.conf` file has a `[config block]` for this agent's environment, those settings will override the master's normal settings when serving that agent.
- If the values of any settings in `puppet.conf` reference the `$environment` variable (like `modulepath = $confdir/environments/$environment/modules:$confdir/modules`, for example), the agent's environment will be interpolated into them.
- Depending on how `auth.conf` is configured, different requests might be allowed or denied.
- The agent's environment will also be accessible in Puppet manifests as the top-scope `$environment` variable.

In short: environments let the master tweak its own configuration on the fly, and offer a way to completely swap out the set of available modules for certain nodes.

Naming Environments

Environment names should only contain alphanumeric characters and underscores, and are case-sensitive.

There are four forbidden environment names:

- `main`
- `master`
- `agent`
- `user`

These names are already taken by the primary config blocks. If you are using Git branches for your environment names, this may mean you'll need to rename the master branch to something like `production` or `stable`.

Caveats

Before you start, be aware that environments have some limitations, most of which are known bugs or vagaries of implementation rather than design choices.

- Puppet will only read the `modulepath`, `manifest`, `manifestdir`, and `templatedir` settings from environment config blocks; other settings in any of these blocks will be ignored in favor of settings in the `[master]` or `[main]` blocks. (Issue 7497)
- File serving only works well with environments if you're only serving files from modules; if you've set up custom mount points in `fileserver.conf`, they won't work in your custom environments. (Though hopefully you're only serving files from modules anyway.)
- Prior to Puppet 3, environments set by external node classifiers were not authoritative. If you are using Puppet 2.7 or earlier, you must set the environment in the agent node's config file.
- Serving custom types and providers from an environment-specific modulepath sometimes fails. (Issue 4409)

Configuring Environments on the Puppet Master

In `puppet.conf`

As mentioned above, `puppet.conf` lets you use `$environment` as a variable and create config blocks for environments.

```
# /etc/puppet/puppet.conf
[master]
  modulepath = $confdir/environments/$environment/modules:$confdir/modules
  manifest = $confdir/manifests/unknown_environment.pp
[production]
  manifest = $confdir/manifests/site.pp
[dev]
  manifest = $confdir/manifests/site.pp
```

In the `[master]` block, this example dynamically sets the modulepath so Puppet will check a per-environment folder for a module before serving it from the main set. Note that this won't complain about missing directories, so you can create the per-environment folders lazily as you need them.

The example also redirects requests for a non-existent environment to a different site manifest, which will log an error and fail compilation; this can keep typos or forgetfulness from silently causing odd configurations.

In `auth.conf`

```
path /
auth true
environment appdev
allow localhost, customapp.example.com
```

If you specify an environment in an `auth.conf` ACL, it will only apply to requests in that environment. This can be useful for developing new applications that integrate with Puppet; the example above will leave normal requests functioning normally, but allow an app server to access everything via the HTTP API.

In Manifests

The `$environment` variable should only rarely be necessary, but it's there if you need it.

Configuring Environments for Agent Nodes

In an ENC

Your external node classifier can set an environment for a node by setting a value for the `environment` key. In Puppet 3 and later, the environment set by the ENC will override the environment from the agent node's config file. If no environment is provided by the ENC, the value from the node's config file will be used.

> Note: In Puppet 2.7 and earlier, ENC-set environments are not authoritative, and using them results in nodes using a mixture of two environments — the ENC environment wins during compilation, and the agent environment wins during file downloads. If you need to centrally control your nodes environments, you should upgrade to Puppet 3 as soon as is practical.
>
> As a temporary workaround, you can manage nodes' puppet.conf files with a template and set the environment based on the ENC's value; this will allow nodes to use a consistent environment on their second (and subsequent) Puppet runs.

> Note: If your puppet master is running Puppet 3 but was once running Puppet 2.6, its auth.conf file may be missing a rule required for ENC environments. Ensure that the following rule exists somewhere near the top of your auth.conf file:
>
> ```
> # allow nodes to retrieve their own node definition
> path ~ ^/node/([^/]+)$
> method find
> allow $1
> ```
>
> Puppet masters which have only run 2.7 and later should already have this rule in their auth.conf files.

On the Agent Node

To set an environment agent-side, just specify the `environment` setting in either the `[agent]` or `[main]` block of `puppet.conf`.

```
[agent]
  environment = dev
```

Note that in Puppet 3 and later, this value will only be used if the ENC does not override it.

As with any config setting, you can also temporarily set it with a command line option:

```
# puppet agent --environment dev
```

Compatibility Notes

Environments were introduced in Puppet 0.24.0.

Reporting

How to learn more about the activity of your nodes.

Reports and Reporting

Puppet clients can be configured to send reports at the end of every configuration run. These□ reports include all of the log messages generated during the configuration run and metrics related□ to what happened on that run.

Logs

The bulk of the report is every log message generated during the transaction. This is a simple way to send almost all client logs to the Puppet server; you can use the log report to send all of these client logs to syslog on the server.

Metrics

The rest of the report contains some basic metrics describing what happened in the transaction. There are three types of metrics in each report, and each type of metric has one or more values:

- Time: Keeps track of how long things took.
    - Total: Total time for the configuration run□
    - File:
    - Exec:
    - User:
    - Group:
    - Config Retrieval□How long the configuration took to retrieve□
    - Service:
    - Package:

- Resources: Keeps track of the following stats:
    - Total: The total number of resources being managed
    - Skipped: How many resources were skipped, because of either tagging or scheduling restrictions
    - Scheduled: How many resources met any scheduling restrictions
    - Out of Sync: How many resources were out of sync
    - Applied: How many resources were attempted to be fixed□
    - Failed: How many resources were not successfully fixed□
    - Restarted: How many resources were restarted because their dependencies changed

    - Failed Restarts: How many resources could not be restarted

- Changes: The total number of changes in the transaction.

Setting Up Reporting

By default, the agent does not send reports, and the master is only configured to store reports, which just dumps reports as YAML in the `reportdir`.

Make Agent Nodes Send Reports

Set the `report` setting in the `puppet.conf` file to true in order to turn on reporting on agent nodes.

```
#
#  /etc/puppet/puppet.conf
#
[agent]
    report = true
```

With this setting enabled, the agent will then send the report to the puppet master server at the end of every transaction.

Agents default to sending reports to the same server they get their configurations from, but you can change that by setting `reportserver`, so if you have load-balanced Puppet servers you can keep all of your reports consolidated on a single machine. (This is unimportant if the puppet masters are using report processors like `http` or `puppetdb`, which just hand off reports to an external system.)

Make Masters Process Reports

By default, the puppet master server stores incoming YAML reports to disk in the `reportdir`. There are other report types available that can process each report as it arrives; you can use Puppet's built-in report processors, write custom report processor plugins, or write an out-of-band report analyzer task that consumes the stored YAML reports on your own schedule.

USING BUILT-IN REPORTS

- A list of the available built-in report processors

Select the report processors to use with the `reports` setting in the puppet master's `puppet.conf` file. This setting should be a comma-separated list of report processors to use; if there is more than one, Puppet will run all of them.

The most useful one is usually the `http` processor, which sends reports to an arbitrary URL. Puppet Dashboard uses this, and it's easy enough to write a web service that consumes reports.

The PuppetDB terminus plugins also include a `puppetdb` report processor.

WRITING CUSTOM REPORTS

You can easily write your own report processor in place of any of the built-in reports. Put the report into the puppet master's `lib/puppet/reports` directory to make it available.

Documentation of the report plugin API is forthcoming; however, you can use the built-in reports as a guide, or use and/or hack one of these simple custom reports:

- Report failed runs to an IRC channel
- Report failed runs and logs to PagerDuty
- Report failed runs to Jabber/XMPP
- Report failed runs to Twitter
- Report failed runs and logs to Campfire□
- Report failed runs to Twilio
- Report failed runs to Boxcar
- Report failed runs to HipChat
- Send metrics to a Ganglia server via gmetric
- Report failed runs to Growl

These example reports were posted to the Puppet users group by a Puppet Labs employee, and are linked here for educational purposes.

When writing a report processor, you will need to handle a Puppet::Transaction::Report object provided by Puppet. See Report Formats below.

USING EXTERNAL REPORT PROCESSORS

Alternately, you can use the default `store` report and write an external report processor that reads in and analyzes the saved YAML files. This is ideal for analyzing large amounts of reports on□ demand, and allows the report processor to be written in any common scripting language.

Report Formats

Puppet creates reports as Puppet::Transaction::Report objects, which have changed format several times over the course of Puppet's history. We have report format references for the following Puppet versions:

- Puppet 3.x (report format 3)
- Puppet 2.7.x (report formats 3 and 2)
- Puppet 2.6.x (report formats 2 and 1)
- Puppet 0.25.5 (report format 0)

The report format applies to both the Ruby object handed to a report processor and the YAML object written to disk by the default `store` processor.

Getting Started With Puppet Cloud Provisioner

Learn how to install and start using Cloud Provisioner, Puppet's extension for node bootstrapping.

Overview

Puppet Cloud Provisioner is a Puppet extension that adds new actions for creating and puppetizing new machines in Amazon’s EC2.

Cloud Provisioner gives you an easy command line interface to the following tasks:

- Create a new Amazon EC2 instance
- Install Puppet on a remote machine of your choice
- Remotely sign a node’s certificate□
- Do all of the above with a single `puppet node_aws bootstrap` invocation

Prerequisites

Puppet Cloud Provisioner has several requirements beyond those of Puppet.

Software

Cloud Provisioner can only be used with Puppet 2.7.2 or greater.

Cloud Provisioner requires Fog, a Ruby cloud services library. You’ll need to ensure that Fog is installed on the machine running Cloud Provisioner:

```
# gem install fog -v 0.7.2
```

Depending on your operating system and Ruby environment, you may need to manually install some of Fog’s dependencies.

Cloud Provisier also requires the GUID library for generating unique identifiers.□

```
# gem install guid
```

Services

Currently, Amazon EC2 is the only supported cloud platform for creating new machine instances; you’ll need a pre-existing Amazon EC2 account to use this feature.

Installing

Puppet Cloud Provisioner should be installed with the puppet module subcommand, which is included in Puppet 2.7.14 and later.

```
$ sudo puppet module install puppetlabs-cloud_provisioner
```

The command will tell you where it is installing the module; take note:

```
admin@magpie$ puppet module install puppetlabs-cloud_provisioner
Preparing to install into /etc/puppet/modules ...
Downloading from https://forge.puppetlabs.com ...
```

```
Installing -- do not interrupt ...
/etc/puppet/modules
└── puppetlabs-cloud_provisioner (v1.0.5)
```

After installing it, you must add the `lib` directory of the module to your `$RUBYLIB`. Add the following to your `.profile` file (replacing `/etc/puppet/modules` with the directory from the install command, if necessary), then run `source ~/.profile` to re-load it in the current shell:

```
export RUBYLIB=/etc/puppet/modules/cloud_provisioner/lib:$RUBYLIB
```

You can verify that it is installed and usable by running:

```
# puppet help node_aws
```

If you are installing the Cloud Provisioner on an older version of Puppet, you will have to do so manually or with the add-on `puppet-module` gem.

Configuration□

Fog

For Cloud Provisioner to work, Fog needs to be configured with your AWS access key ID and secret□ access key. Create a `~/.fog` file as follows:□

```
:default:
  :aws_access_key_id:     XXXXXXXXXXXXXXXXXXXXX
  :aws_secret_access_key: Xx+xxXX+XxxXXXXXXxxXxxXXXXXxxxXXxXXXxxxxXX
```

You may obtain your AWS Access key id and secret access key using the following information:

```
To view your AWS Secret access key, go to http://aws.amazon.com and click on
Account > Security Credentials. From their, under the "Access Credentials"
section of the page, click on the "Access Keys" tab to view your Access Keys.
To see your Secret Access Key, just click on the "Show" link under "Secret
Access Key".

From here, you can create new access keys or delete old ones. Just click on
"Create a new Access Key" and confirm that you'd like to generate a new pair.
This will generate both access and secret access keys. But, keep in mind that
your account is only able to have two sets of keys at any given time. If you
already have two sets created, you will not see the option to create a new set
until one has been made inactive and then deleted.
```

Information from AWS Discussion Forums

To test whether Fog is working, execute the following command:

```
$ ruby -rubygems -e 'require "fog"' -e 'puts Fog::Compute.new(:provider =>
"AWS").servers.length >= 0'
```

This should return “true”

If you do not have the ~/.fog configuration file correct, you may receive an error such as the following:

```
fog-0.9.0/lib/fog/core/service.rb:155
in `validate_options': Missing required arguments: aws_access_key_id,
aws_secret_access_key (ArgumentError)
        from /Users/jeff/.rvm/gems/ruby-1.8.7-p334@puppet/gems/fog-
0.9.0/lib/fog/core/service.rb:53:in `new'
        from /Users/jeff/.rvm/gems/ruby-1.8.7-p334@puppet/gems/fog-
0.9.0/lib/fog/compute.rb:13:in `new'
        from -e:2
```

In this case, please verify your `aws_access_key_id` and `aws_secret_access_key` are properly set in the ~/.fog file.

EC2

Your EC2 account will need to have at least one Amazon-managed SSH keypair, and a security group that allows outbound traffic on port 8140 and SSH traffic from the machine running the Cloud Provisioner actions.

Your puppet master server will also have to be reachable from your newly created instances.

script chosen. Testing has only currently been done on Ubuntu 11.04 (Natty) and CentOS 5.4.

Provisioning

In order to use the `install` action, any newly provisioned instances will need to have their root user enabled, or will need a user account configured to `sudo` as root without a password.

puppet master

If you want to automatically sign certificates with the Cloud Provisioner, you'll have to allow the computer running the Cloud Provisioner actions to access the puppet master's `certificate_status` REST endpoint. This can be configured in the master's auth.conf file:

```
path /certificate_status
method save
auth yes
allow {certname}
```

If you're running the Cloud Provisioner actions on a machine other than your puppet master, you'll have to ensure it can communicate with the puppet master over port 8140.

Certificates and Keys

You'll also have to make sure the control node has a certificate signed by the puppet master's CA. If the control node is already known to the puppet master (e.g. it is or was a puppet agent node), you'll be able to use the existing certificate, but we recommend generating a per-user certificate for a more explicit and readable security policy. On the control node, run:

```
puppet certificate generate {certname} --ca-location remote
```

Then sign the certificate as usual on the master (`puppet cert sign {certname}`). On the control node again, run:

```
puppet certificate find ca --ca-location remote
puppet certificate find {certname} --ca-location remote
```

This should let you operate under the new certname when you run puppet commands with the `--certname {certname}` option.

The control node will also need a private key to allow SSH access to the new machine; for EC2 nodes, this is the private key from the keypair used to create the instance. If you are working with non-EC2 nodes, please note that the `install` action does not currently support keys with passphrases.

Usage

Puppet Cloud Provisioner provides seven new actions on the `node` face:

- `create`: Creates a new EC2 machine instance.
- `install`: Install's Puppet on an arbitrary machine, including non-cloud hardware.
- `init`: Perform the `install` and `classify` actions, and automatically sign the new agent node's certificate.□
- `bootstrap`: Create a new EC2 machine instance and perform the `init` action on it.
- `terminate`: Tear down an EC2 machine instance.
- `list`: List running instances in the specified zone.□
- `fingerprint`: Make a best effort to securely obtain the SSH host key fingerprint.□

puppet node_aws create

Argument(s): none.

Options:

- `--image, -i` — The name of the AMI to use when creating the instance. Required.
- `--keyname` — The name of the Amazon-managed SSH keypair to use for accessing the instance. Required.
- `--group, -g, --security-group` — The security group(s) to apply to the instance. Can be a single group or a path-separator (colon, on *nix systems) separated list of groups.
- `--region` — The geographic region of the instance. Defaults to us-east-1.
- `--type` — Type of instance to be launched.

Example:

```
$ puppet node_aws create --image ami-XxXXxXXX --keyname puppetlabs.admin --type
```

```
m1.small / Creates a new EC2 machine instance and returns its DNS name. If the
process fails, Puppet will automatically clean up after itself and tear down
the instance.
```

puppet node_aws install

Argument(s): the hostname of the system to install Puppet on.

Options:

- `--login, -l, --username` — The user to log in as. Required.
- `--keyfile` — The SSH private key file to use. This key cannot require a passphrase. Required.
- `--install-script` — The install script that should be used to install Puppet. Currently supported options are: gems (default), puppet-enterprise, and puppet-enterprise-s3
- `--installer-payload, --puppet` — The location of the Puppet Enterprise universal tarball. (Used with puppet-enterprise install script)
- `--installer-answers` — The location of an answers file to use with the PE installer. (Used with puppet-enterprise and puppet-enterprise-s3 install scripts).
- `--puppet-version` — The version of puppet to install with the gems install script.
- `--facter-version` — The version of facter to install with the gems install script.
- `--pe-version` — The version of PE to install with the puppet-enterprise script (e.g. `1.1`). Defaults to `1.1`.

Example:

```
puppet node_aws install ec2-XXX-XXX-XXX-XX.compute-1.amazonaws.com \
--login root --keyfile ~/.ssh/puppetlabs-ec2_rsa \
--install-script gems --puppet-version 2.6.9
```

Installs Puppet on an arbitrary system and returns the new agent node's certname.

Interactive installation of PE is not supported, so you'll need an answers file. See the PE manual for complete documentation of the answers file format. A reasonable default has been supplied in Cloud Provisioner's `ext` directory.

This action is not restricted to cloud machine instances, and will install Puppet on any machine accessible by SSH.

puppet node_aws init

Argument(s): the hostname of the system to install Puppet on.

Options: See "install"

Example:

```
puppet node_aws init ec2-XXX-XXX-XXX-XX.compute-1.amazonaws.com \
--login root --keyfile ~/.ssh/puppetlabs-ec2_rsa \
--certname cloud_admin
```

Install Puppet on an arbitrary system (see “install”) and automatically sign its certificate request (using the `certificate` face’s `sign` action).

puppet node_aws bootstrap

Argument(s): none.

Options: See “create” and “install”

Example:

```
puppet node_aws bootstrap --image ami-XxXXxXXX --keyname \
puppetlabs.admin --login root --keyfile ~/.ssh/puppetlabs-ec2_rsa \
--certname cloud_admin
```

Create a new EC2 machine instance and pass the new node’s hostname to the `init` action.

puppet node_aws terminate

Argument(s): the hostname of the machine instance to tear down.

Options:

- `--region` — The geographic region of the instance. Defaults to us-east-1.

Example:

```
puppet node_aws terminate ec2-XXX-XXX-XXX-XX.compute-1.amazonaws.com
```

Tear down an EC2 machine instance.

puppet node_aws list

Argument(s): None

Options:

- `--region` — The geographic region of the instance. Defaults to us-east-1.

Example:

```
puppet node_aws list --region us-west-1
```

List the Amazon EC2 instances in the specified region and report on their status (pending, running, shutting down, or terminated). This is not limited to instances created by Cloud Provisioner.

Publishing Modules on the Puppet Forge

The Puppet Forge is a repository of modules, written and contributed by users. This document describes how to publish your own modules to the Puppet Forge so that other users can install them.

- Continue reading to learn how to publish your modules to the Puppet Forge.
- See “Module Fundamentals” for how to write and use your own Puppet modules.
- See “Installing Modules” for how to install pre-built modules from the Puppet Forge.
- See “Using Plugins” for how to arrange plugins (like custom facts and custom resource types) in modules and sync them to agent nodes.

Overview

This guide assumes that you have already written a useful Puppet module. To publish your module, you will need to:

1. Create a Puppet Forge account, if you don’t already have one
2. Prepare your module
3. Write a Modulefile with the required metadata
4. Build an uploadable tarball of your module
5. Upload your module using the Puppet Forge’s web interface.

A Note on Module Names

Because many users have published their own versions of modules with common names (“mysql,” “bacula,” etc.), the Puppet Forge requires module names to have a username prefix. That is, if a user named “puppetlabs” maintained a “mysql” module, it would be known to the Puppet Forge as `puppetlabs-mysql`.

Be sure to use this long name in your module’s Modulefile. However, you do not have to rename the module’s directory, and can leave the module in your active modulepath — the build action will do the right thing as long as the Modulefile is correct.

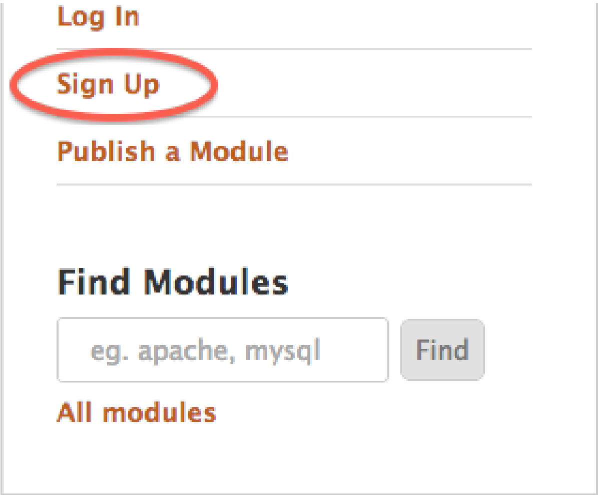
Another Note on Module Names

Although the Puppet Forge expects to receive modules named `username-module`, its web interface presents them as `username/module`. There isn’t a good reason for this, and we are working on reconciling the two; in the meantime, be sure to always use the `username-module` style in your metadata files and when issuing commands.

Create a Puppet Forge Account

Before you begin, you should create a user account on the Puppet Forge. You will need to know your username when preparing to publish any of your modules.

Start by navigating to the Puppet Forge website and clicking the “Sign Up” link in the sidebar:



Fill in your details. After you finish, you will be asked to verify your email address via a verification email. Once you have done so, you can publish modules to the Puppet Forge.

Prepare the Module

If you already have a Puppet module with the correct directory layout, you may continue to the next step.

Alternately, you can use the `puppet module generate` action to generate a template layout. This is mostly useful if you need an example Modulefile and README, and also includes a copy of the `spec_helper` tool for writing rspec-puppet tests. If you choose to do this, you will need to manually copy your module's files into the template.

To generate a template, run `puppet module generate <USERNAME>-<MODULE NAME>`. For example:

```
# puppet module generate examplecorp-mymodule
Generating module at /Users/fred/Development/examplecorp-mymodule
examplecorp-mymodule
examplecorp-mymodule/tests
examplecorp-mymodule/tests/init.pp
examplecorp-mymodule/spec
examplecorp-mymodule/spec/spec_helper.rb
examplecorp-mymodule/README
examplecorp-mymodule/Modulefile
examplecorp-mymodule/manifests
examplecorp-mymodule/manifests/init.pp
```

> Note: This action is of limited use when developing a module from scratch, as the module must be renamed to remove the username prefix before it can be used with Puppet.

Write a Modulefile

In your module's main directory, create a text file named `Modulefile`. If you generated a template, you'll already have an example Modulefile.

The Modulefile resembles a configuration or data file, but is actually a simple Ruby domain-specific language (DSL), which is executed when you build a tarball of the module. This means Ruby's normal rules of string quoting apply:

```
name 'examplecorp-mymodule'
version '0.0.1'
dependency 'puppetlabs/mysql', '1.2.3'
description "This is a full description
    of the module, and is being written as a multi-line string."
```

Modulefiles support the following pieces of metadata:

- `name` — REQUIRED. The full name of the module, including the username (e.g. "username-module" — see note above).
- `version` — REQUIRED. The current version of the module. This should be a semantic version.
- `summary` — REQUIRED. A one-line description of the module.
- `description` — REQUIRED. A more complete description of the module.
- `dependency` — A module that this module depends on. Unlike the other fields, the `dependency` method accepts up to three comma-separated arguments: a module name (with a slash between the user and name, not a hyphen), a version requirement, and a repository. A Modulefile may include multiple `dependency` lines. See "Dependencies in the Modulefile" below for more details.
- `project_page` — The module's website.
- `license` — The license under which the module is made available.
- `author` — The module's author. If not provided, this field will default to the username portion of the module's `name` field.
- `source` — The module's source. This field's purpose is not specified.

Dependencies in the Modulefile

If you choose to rely on another Forge module, you can express this in the "dependency" field of your Modulefile:

```
dependency 'puppetlabs/stdlib', '>= 2.2.1'
```

> Warning: The full name in a dependency must use a slash between the username and module name. This is different from the name format used elsewhere in the Modulefile. This is a legacy architecture problem with the Puppet Forge, and we apologize for the inconvenience. Our eventual plan is to allow full names with hyphens everywhere while continuing to allow names with slashes, then (eventually, much later) phase out names with slashes.

A Modulefile may have several dependency fields.

The version requirement in a dependency isn't limited to a single version; you can use several operators for version comparisons. The following operators are available:

- `1.2.3` — A specific version.

- `>1.2.3` — Greater than a specific version.
- `<1.2.3` — Less than a specific version.
- `>=1.2.3` — Greater than or equal to a specific version.
- `<=1.2.3` — Less than or equal to a specific version.
- `>=1.0.0 <2.0.0` — Range of versions; both conditions must be satisfied. (This example would match 1.0.1 but not 2.0.1)
- `1.x` — A semantic major version. (This example would match 1.0.1 but not 2.0.1, and is shorthand for `>=1.0.0 <2.0.0`.)
- `1.2.x` — A semantic major & minor version. (This example would match 1.2.3 but not 1.3.0, and is shorthand for `>=1.2.0 <1.3.0`.)

A Note on Semantic Versioning

When writing your Modulefile, you're setting a version for your own module and optionally expressing dependancies on others' module versions. We strongly recommend following the Semantic Versioning specification. Doing so allows others to rely on your modules without unexpected change.

Many other users already use semantic versioning, and you can take advantage of this in your modules' dependencies. For example, if you depend on puppetlabs/stdlib and want to allow updates while avoiding breaking changes, you could write the following line in your Modulefile (assuming a current stdlib version of 2.2.1):

```
dependency 'puppetlabs/stdlib', '2.x'
```

Build Your Module

Now that the content and Modulefile are ready, you can build a package of your module by running the following command:

```
puppet module build <MODULE DIRECTORY>
```

This will generate a `.tar.gz` package, which will be saved in the module's `pkg/` subdirectory.

For example:

```
# puppet module build /etc/puppetlabs/puppet/modules/mymodule
Building /etc/puppetlabs/puppet/modules/mymodule for release
/etc/puppetlabs/puppet/modules/mymodule/pkg/examplecorp-mymodule-0.0.1.tar.gz
```

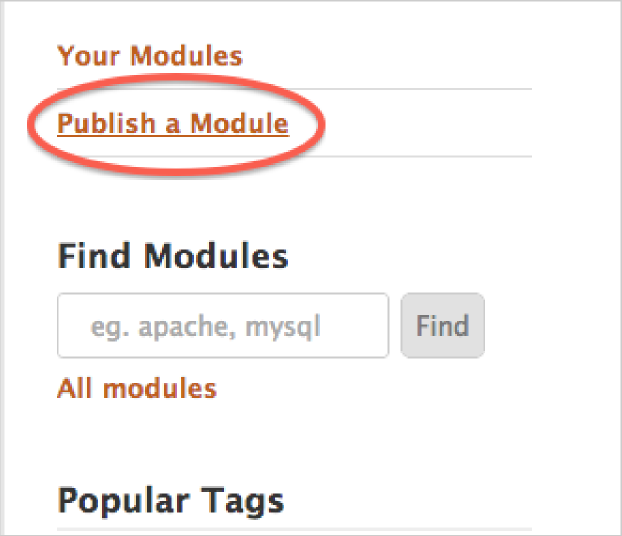
Upload to the Puppet Forge

Now that you have a compiled `tar.gz` package, you can upload it to the Puppet Forge. There is currently no command line tool for publishing; you must use the Puppet Forge's web interface.

In your web browser, navigate to the Puppet Forge; log in if necessary.

Create a Module Page

If you have never published this module before, you must create a new page for it. Click on the "Publish a Module" link in the sidebar:

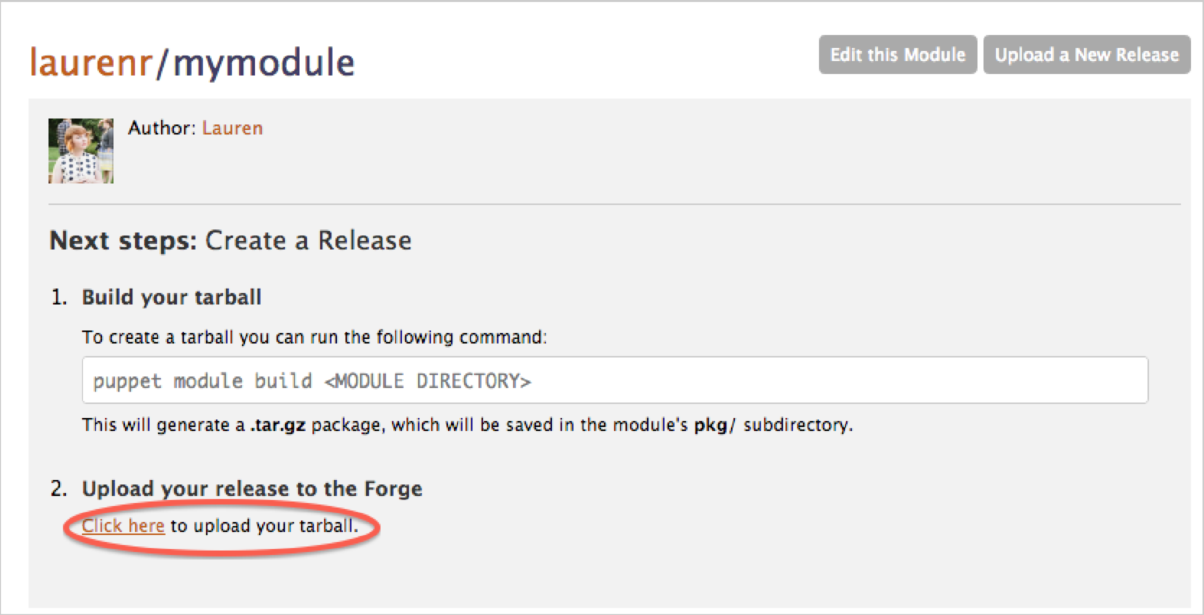


This will bring up a form for info about the new module. Only the "Module Name" field is required.□ Use the module's short name, not the long `username-module` name.

Clicking the "Publish Module" button at the bottom of the form will automatically navigate to the new module page.

Create a Release

Navigate to the module's page if you are not already there, and click the "Click here to upload your tarball" link:



Author: Lauren

Next steps: Create a Release

1. **Build your tarball**

   To create a tarball you can run the following command:

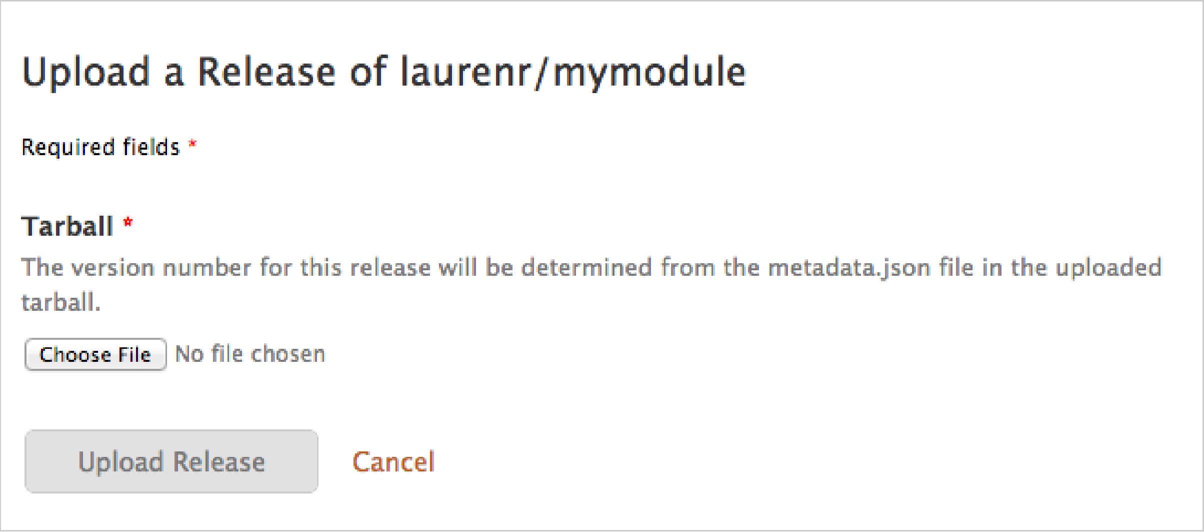
   ```
   puppet module build <MODULE DIRECTORY>
   ```

   This will generate a **.tar.gz** package, which will be saved in the module's **pkg/** subdirectory.

2. **Upload your release to the Forge**

   Click here to upload your tarball.

This will bring you to the upload form:


Upload a Release of laurenr/mymodule

Required fields *

Tarball *

The version number for this release will be determined from the metadata.json file in the uploaded tarball.

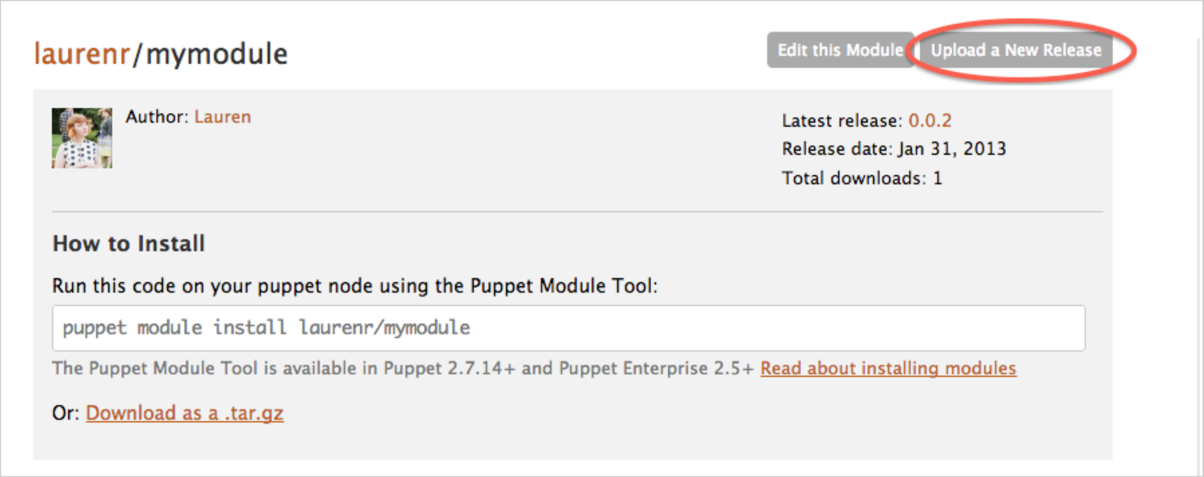
Click “Choose File” and use the file browser to locate and select the release tarball you created with the `puppet module build` action. Then click the “Upload Release” link.

Your module has now been published to the Puppet Forge. The Forge will pull your README, Changelog, and License files from your tarball to display on your module’s page. To confirm that it was published correctly, you can install it on a new system using the `puppet module install` action.

Release a New Version

To release a new version of an already published module, you will need to make any necessary edits to your module, and then increment the `version` field in the Modulefile (ensuring you use a valid semantic version).

When you are ready to publish your new version, navigate to the Puppet Forge and log in if necessary. Click the “Upload a New Release” link:


laurenr/mymodule

Author: Lauren

Latest release: 0.0.2
Release date: Jan 31, 2013
Total downloads: 1

How to Install

Run this code on your puppet node using the Puppet Module Tool:

```
puppet module install laurenr/mymodule
```

The Puppet Module Tool is available in Puppet 2.7.14+ and Puppet Enterprise 2.5+ Read about installing modules

Or: Download as a .tar.gz

This will bring you to the upload form as mentioned in Create a Release above, where you can select the new release tarball and upload the release.

Puppet Data Library

The Puppet Data Library (PDL) consists of two elements:

- The large amount of data Puppet automatically collects about your infrastructure.
- The formats and APIs Puppet uses to expose that data.

Sysadmins can access information from the PDL with their choice of tools, including familiar scripting languages like Ruby, Perl, and Python. Use this data to build custom reports, add to existing data sets, or automate repetitive tasks.

Right now, the Puppet Data Library consists of three different data services:□

Puppet Inventory Service

The Puppet Inventory Service provides a detailed inventory of the hardware and software on nodes managed by Puppet.

- Using a simple RESTful API, you can query the inventory service for a node’s MAC address, operating system version, DNS configuration, etc. The query results are returned as JSON.□
- Inventory information consists of the facts reported by each node when it requests configurations. By installing custom facts on your puppet master server, you can extend the inventory service to contain any kind of data that can possibly be extracted from your nodes.

> EXAMPLE: Using the Puppet Inventory Service, a customer automated the validation and reporting of their servers’ warranty status. Their automation used the Puppet Inventory Service to query all servers in the data center on a regular basis and retrieve their serial numbers. These serial numbers are then checked against the server hardware vendor’s warranty database using the vendor’s public API to determine the warranty status for each.

Learn more about the Puppet Inventory Service here.

Puppet Run Report Service

The Puppet Run Report Service provides push access to the reports that every node submits after each Puppet run. By writing a custom report processor, you can divert these reports to any custom service, which can use them to determine whether a Puppet run was successful, or dig deeply into the specific changes for each and every resource under management for every node.□

You can also write out-of-band report processors that consume the YAML files written to disk by□ the puppet master’s default report handler.

Learn more about the Puppet Run Report Service here.

Puppet Resource Dependency Graph

The Puppet Resource Dependency Graph provides a complete, mathematical graph of the dependencies between resources under management by Puppet. These graphs, which are stored in .dot format, can be used with any commercial or open source visualization tool to uncover hidden linkages and help understand how your resources interconnect to provide working services.

> EXAMPLE: Using the Puppet Resource Dependency Graph and Gephi, a visualization tool, a customer identified unknown dependencies within a complicated set of configuration modules. They used this knowledge to re-write parts of the modules to get better performance.

Learn more about the Puppet Resource Dependency Graph here

Inventory Service

Starting with Puppet 2.6.7, puppet master servers offer API access to the facts reported by every node. You can use this API to get complete info about any node, and to search for nodes whose facts meet certain criteria.

- Puppet Dashboard and Puppet Enterprise's console use the inventory service to provide a search function and display each node's complete facts on the node's page. (PE does this by default. See here for instructions on activating Dashboard's inventory support.)
- Your own custom applications can access any node's facts via the inventory service.

What It Is

The inventory is a collection of node facts. The inventory service is a retrieval, storage, and search API exposed to the network by the puppet master. The inventory service backend (AKA the `facts_terminus`) is what the puppet master uses to store the inventory and do some of the heavy lifting of the inventory service.

The puppet master updates the inventory when agent nodes report their facts, which happens every time puppet agent requests a catalog. Optionally, additional puppet masters can use the HTTP API to send facts from their agents to the central inventory.

Other tools, including Puppet Dashboard, can query the inventory via the puppet master's HTTP API. An API call can return:

- Complete facts for a single node

or

- A list of nodes whose facts meet some search condition

Information in the inventory is never automatically expired, but it is timestamped.

Using the Inventory Service

The inventory service is plain vanilla HTTP: Submit HTTP requests, get back structured fact or host data.

To read from the inventory, submit secured HTTP requests to the puppet master's `facts` and `facts_search` HTTP endpoints in the appropriate environment. Your API client will have to have an SSL certificate signed by the puppet master's CA.

Full documentation of these endpoints can be found here, but a summary follows:

- To retrieve the facts for testnode.example.com, send a GET request to https://puppet:8140/production/facts/testnode.example.com.
- To retrieve a list of all Ubuntu nodes with two or more processors, send a GET request to https://puppet:8140/production/facts_search/search?facts.processorcount.ge=2&facts.operatingsystem=Ubuntu.

In both cases, be sure to specify an `Accept: pson` or `Accept: yaml` header.

Directly Accessing the Inventory Service Backend

If you are using the PuppetDB inventory backend, you also have the option of using its public API instead of the inventory service API. See the following PuppetDB pages for more info:

- The node query API
- The facts query API
- The fact-names query API

Setting Up the Inventory Service

Configuring the Inventory Backend

There are two inventory service backends available: PuppetDB and `inventory_active_record`.

- If you are using Puppet 2.7.12 or later, use PuppetDB. It is faster, easier to configure and maintain, and also provides resource stashing to enable exported resources. Follow the installation and configuration instructions in the PuppetDB manual, and connect every puppet master to your PuppetDB server:
  - Install PuppetDB
  - Connect a puppet master to PuppetDB
- If you are using an older version of Puppet, you can use the `inventory_active_record` backend and connect your other puppet masters to the designated inventory master. See the appendix below to enable this backend.
  - You can upgrade to PuppetDB at a later date after upgrading Puppet; since a node’s facts are replaced every time it checks in, PuppetDB should have the same data as your old inventory in a matter of hours.

Configuring Access

By default, the inventory service is not accessible! This is a reasonable default. Because the inventory service exposes sensitive information about your infrastructure over the network, you’ll need to carefully control access with the `rest_authconfig` (a.k.a. `auth.conf`) file.

For prototyping your inventory application on a scratch puppet master, you can just permit all access to the `facts` endpoint:

```
path /facts
auth any
method find, search
allow *
```

(Note that this will allow access to both `facts` and `facts_search`, since the path is read as a prefix.)

For production deployment, you'll need to allow find and search access for each application that uses the inventory and deny access to all other machines. (Since agent nodes submit their facts as part of their request to the `catalog` resource, they don't require access to the `facts` or `facts_search` resources.) One such possible ACL set would be:

```
path /facts
auth yes
method find, search
allow dashboard.example.com, custominventoryapp.example.com
```

Configuring Certificates

To connect your application securely, you'll need a certificate signed by your site's puppet CA. There are two main ways to get this:

- On the puppet master:
  - Run `puppet cert --generate {certname for application}`.
  - Then, retrieve the private key (`{ssldir}/certs/{certname}.pem`) and the signed certificate (`{ssldir}/private_keys/{certname}.pem`) and move them to your application server.
- Manually:
  - Generate an RSA private key: `openssl genrsa -out {certname}.key 1024`.
  - Generate a certificate signing request (CSR): `openssl req -new -key {certname}.key -subj "/CN={certname}" -out request.csr`.
  - Submit the CSR to the puppet master for signing: `curl -k -X PUT -H "Content-Type: text/plain" --data-binary @request.csr https://puppet:8140/production/certificate_request/new`.
  - Sign the certificate on the puppet master: `puppet cert --sign {certname}`.
  - Retrieve the certificate: `curl -k -H "Accept: s" -o {certname}.pem https://puppet:8140/production/certificate/{certname}`

For one-off applications, generating it on the master is obviously easier, but if you're building a tool for distribution elsewhere, your users will appreciate it if you script the manual method and emulate the way puppet agent gets a cert.

Protect your application's private key appropriately, since it's the gateway to your inventory data.

In the event of a security breach, the application's certificate is revokable the same way any puppet agent certificate would be.

Testing the Inventory Service

On a machine that you've authorized to access the facts and facts_search resources, you can test the API using `curl`, as described in the HTTP API docs. To retrieve facts for a node:

```
curl -k -H "Accept: yaml" https://puppet:8140/production/facts/{node certname}
```

To insert facts for a fictional node into the inventory:

```
curl -k -X PUT -H 'Content-Type: text/yaml' --data-binary
@/var/lib/puppet/yaml/facts/hostname.yaml
https://puppet:8140/production/facts/{node certname}
```

To find out which nodes at your site are Intel Macs:

```
curl -k -H "Accept: pson" https://puppet:8140/production/facts_search/search?
facts.hardwaremodel=i386&facts.kernel=Darwin
```

Appendix: Enabling the `inventory_active_record` Backend

The `inventory_active_record` backend works on older puppet masters, all the way back to Puppet 2.6.7. It has reasonable speed, but is generally inferior to PuppetDB, on account of being slightly slower and more difficult to configure.

Unlike PuppetDB, this backend splits your puppet masters into two groups, which must be configured differently:

- The designated inventory puppet master must be configured to access a database. (If you site only has one puppet master, this is it.)
- Every other puppet master must be configured to access the designated inventory puppet master.

Configuring the Inventory Puppet Master

STEP 1: CREATE A DATABASE AND USER

The inventory puppet master will need access to both a database and a user account with all privileges on that database; setting that up is outside the scope of this document. The database server can be remote or on the local host.

Since database access is mediated by the common ActiveRecord library, you can, in theory, use any local or remote database supported by Rails. In practice, MySQL on the same server as the puppet master is the best-documented approach. See the documentation for the legacy ActiveRecord storeconfigs backend for more details about setting up and configuring a database with Puppet.

Do not use sqlite except as a proof of concept. It is slow and unreliable.

STEP 2: INSTALL THE APPROPRIATE RUBY DATABASE ADAPTER

The copy of Ruby in use by puppet master will need to be able to communicate with your chosen type of database server. This will always entail ensuring that Rails is installed, and will likely require installing a specific Ruby library to interface with the database (e.g. the `libmysql-ruby` package on Debian and Ubuntu or the `mysql` gem on other operating systems). As above, see the old

ActiveRecord storeconfigs docs for more help.

STEP 3: EDIT PUPPET.CONF

Set the following settings in your inventory master’s puppet.conf:

```
[master]
    facts_terminus = inventory_active_record
    dblocation = {sqlite file path (sqlite only)}
    dbadapter = {sqlite3|mysql|postgresql|oracle_enhanced}
    dbname = {database name (all but sqlite)}
    dbuser = {database user (all but sqlite)}
    dbpassword = {database password (all but sqlite)}
    dbserver = {database server (MySQL and PostgreSQL only)}
    dbsocket = {database socket file (MySQL only; optional)}
```

Note that some of these are only necessary for certain databases. As above, see the old ActiveRecord storeconfigs docs for more help.

STEP 4: EDIT AUTH.CONF (MULTIPLE MASTERS ONLY)

Since your other puppet masters will be sending node facts to the designated inventory master, you will need to give each of them `save` access to the `facts` HTTP endpoint.

```
path /facts
auth yes
method save
allow puppetmaster1.example.com, puppetmaster2.example.com,
puppetmaster3.example.com
```

Configuring Other Puppet Masters

Edit puppet.conf on every other puppet master to contain the following:

```
[master]
    facts_terminus = inventory_service
    inventory_server = {designated inventory master; defaults to "puppet"}
    inventory_port = 8140
```

HTTP Access Control

Learn how to configure access to Puppet’s HTTP API using the `rest_authconfig` file, a.k.a. `auth.conf`. This document is currently being checked for accuracy. If you note any errors, please email them to faq@puppetlabs.com.

HTTP

Puppet master and puppet agent communicate with each other over a pseudo-RESTful HTTP network API. By default, the usage of this API is limited to the standard types of master/agent communications. However, it can be exposed to other processes and used to build advanced tools on top of Puppet's existing infrastructure and functionality. (HTTP API calls are formatted as `https://{server}:{port}/{environment}/{resource}/{key}`.)

As you might guess, this can be turned into a security hazard, so access to the HTTP API is strictly controlled by a special configuration file.

auth.conf

The official name of the file controlling HTTP API access, taken from the configuration option that sets its location, is `rest_authconfig`, but it's more frequently known by its default filename of `auth.conf`. If you don't set a different location for it, Puppet will look for the file at `$confdir/auth.conf`.

You cannot configure different environments to use multiple `rest_authconfig` files.

File Format

The auth.conf file consists of a series of ACLs (Access Control Lists); ACLs should be separated by double newlines. Lines starting with `#` are interpreted as comments.

```
# This is a comment
path /facts
method find, search
auth yes
allow custominventory.site.net, devworkstation.site.net

# A more complicated rule
path ~ ^/file_(metadata|content)/user_files/
auth yes
allow /^(.+\.)?example.com$/
allow_ip 192.168.100.0/24

# An exception allowing one authenticated workstation to access any endpoint
path /
auth yes
allow devworkstation.site.net
```

Due to a known bug, trailing whitespace is not permitted after any line in auth.conf in versions prior to 2.7.3.

ACL format

Each auth.conf ACL is formatted as follows:

```
path [~] {/path/to/resource|regex}
[environment {list of environments}]
[method {list of methods}]
[auth[enthicated] {yes|no|on|off|any}]
[allow {hostname|certname|*}]
```

Lists of values are comma-separated, with an optional space after the comma.

Path

An ACL's `path` is interpreted as either a regular expression (with tilde) or a path prefix (no tilde). The root of the path in an ACL is AFTER the environment in an HTTP API call URL; that is, only put the `/{resource}/{key}` portion of the URL in the path. ACLs without a resource path are not permitted.

Environment

The `environment` directive can contain a single environment or a list. If environment isn't explicitly specified, it will default to all environments.

Method

Available methods are `find`, `search`, `save`, and `destroy`; you can specify one method or a list of them. If method isn't explicitly specified, it will default to all methods.

Auth

Whether the ACL matches authenticated requests.

- `auth yes` (or `on`) means this ACL will only match requests authenticated with an agent certificate.
- `auth any` means this ACL will match both authenticated and unauthenticated requests.
- `auth no` (or `off`) means this ACL will only match requests that are not authenticated with an agent certificate. Authenticated requests (like from puppet agent) will skip this ACL.

Most communications between puppet agent and the puppet master are authenticated, so you will usually be using `auth yes`.

The value of `auth` must be one of the above options; it cannot be a list. If auth isn't explicitly specified, it will default to `yes`.

`allow`

The node or nodes allowed to access this type of request. Can be a hostname, a certificate common name, a list of hostnames/certnames, or `*` (which matches all nodes). If the path for this ACL was a regular expression, `allow` directives may include backreferences to captured groups (e.g. `$1`).

An ACL may include multiple `allow` directives, which has the same effect as a single `allow` directive with a list.

Behavior in 0.25.x through 2.7.0: No fine-grained globbing of hostnames/certnames is available in allow directives; you must specify exact host/certnames, or a single asterisk that matches everything.

Behavior in 2.7.1 and later: Hostnames/certnames can also be specified by regular expression. Unlike with path directives, you don't need to use a tilde; just use the slash-quoting used in languages like Perl and Ruby (e.g. `allow /^[\w-]+.example.com$/`). Regular expression allow directives can include backreferences to regex paths with the standard `$1, $2` etc. variables.

Any nodes which aren’t specifically allowed to access the resource will be denied.□

`allow_ip`

> Note: The `allow_ip` directive was added in Puppet 3.0.0. Previous versions of Puppet cannot allow nodes by IP address.

An IP address or range of IP addresses allowed to access this type of request. Can be:

- A single IP address
- A glob representing a group of IP addresses (e.g. `192.168.100.*`)
- CIDR notation representing a group of IP addresses (e.g. `192.168.100.0/24`)

Any nodes which aren’t specifically allowed to access the resource will be denied.□

Deny

A `deny` directive is syntactically permitted, but has no effect.□

Matching ACLs to Requests

Puppet composes a full list of ACLs by combining auth.conf with a list of default ACLs. When a request is received, ACLs are tested in their order of appearance, and matching will stop at the first□ ACL that matches the request.

An ACL matches a request only if its path, environment, method, and authentication all match that of the request. These four elements are equal peers in determining the match.

Matching Paths

If an ACL’s `path` does not start with a tilde and a space, it matches the beginning of the resource path; an ACL with the line:

```
path /file
```

…will match both `/file_metadata` and `/file_content` resources.

Regular expression paths don’t have to match from the beginning of the resource path, but it’s good practice to use positional anchors.

```
path ~ ^/catalog/([^/]+)$
method find
allow $1
```

Captured groups from a regex path are available in the allow directive. The ACL above will allow nodes to retrieve their own catalog but prevent them from accessing other catalogs.

Determining Whether a Request is Allowed

Once an ACL has been determined to match an incoming request, Puppet consults the `allow` directive(s). If the request was unauthenticated, reverse DNS is used to determine the requesting node's hostname; the request is allowed if that hostname is allowed. If the request was authenticated, the certificate common name is read from the SSL certificate, and the hostname is ignored; the request is allowed if that certname is allowed.

Consequences of ACL Matching Behavior

Since ACLs are matched in linear order, auth.conf has to be manually arranged with the most specific paths at the top and the least specific paths at the bottom, lest the whole search get short-circuited and the (usually restrictive) fallback rule be applied to every request. Furthermore, since the default ACLs required for normal Puppet functionality are appended to the ACLs read from auth.conf, you must manually interleave copies of the default ACLs into your auth.conf if you are specifying any ACLs that are less specific than any of the default ACLs.

Default ACLs

Puppet appends a list of default ACLs to the ACLs read from auth.conf. However, if any custom ACLs have a path identical to that of a default ACL, that default ACL will be omitted when composing the full list of ACLs. Note that this is not the same criteria for determining whether the two ACLs match the same requests, as only the paths are compared:

```
# A custom ACL
path /file
auth no
allow magpie.example.com

# This default ACL will not be appended to the rules
path /file
allow *
```

These two ACLs match completely disjoint sets of requests (unauthenticated for the custom one, authenticated for the default one), but since the mechanism that appends default ACLs is not examining the authentication/methods/environments of the ACLs, it considers the one to override the other, even though they're effectively unrelated. Puppet agent will break if you only declare the custom ACL, will work if you manually declare the default ACL, and will work if you only declare the custom one but change its path to `/fil`. When in doubt, manually re-declare all default ACLs in your auth.conf file.

The following is a list of the default ACLs used by Puppet:

```
# Allow authenticated nodes to retrieve their own catalogs:

path ~ ^/catalog/([^/]+)$
method find
allow $1

# allow nodes to retrieve their own node definition

path ~ ^/node/([^/]+)$
```

```
method find
allow $1

# Allow authenticated nodes to access any file services --- in practice, this
results in fileserver.conf being consulted:

path /file
allow *

# Allow authenticated nodes to access the certificate revocation list:

path /certificate_revocation_list/ca
method find
allow *

# Allow authenticated nodes to send reports:

path /report
method save
allow *

# Allow unauthenticated access to certificates:

path /certificate/ca
auth no
method find
allow *

path /certificate/
auth no
method find
allow *

# Allow unauthenticated nodes to submit certificate signing requests:

path /certificate_request
auth no
method find, save
allow *

# Deny all other requests:

path /
auth any
```

An example auth.conf file containing these rules is provided in the Puppet source, in conf/auth.conf.

Danger Mode

If you want to test the HTTP API for application prototyping without worrying about specifying your final set of ACLs ahead of time, you can set a completely permissive auth.conf:

```
path /
auth any
allow *
```

Note Make sure any testing configurations using this pattern do not make it to production systems.

authconfig / namespaceauth.conf

Older versions of Puppet communicated over an XMLRPC interface instead of the current HTTP interface, and access to these APIs was governed by a file known as `authconfig` (after the configuration option listing its location) or `namespaceauth.conf` (after its default filename). This legacy file will not be fully documented, but an example namespaceauth.conf file can be found in the puppet source at conf/namespaceauth.conf.

puppet agent and the HTTP API

If started with the `listen = true` configuration option, puppet agent will accept incoming HTTP API requests. This is most frequently used to trigger puppet runs with the `run` endpoint. Several caveats apply:

- A known bug in the 2.6.x releases of Puppet prevents puppet agent from being started with the `listen = true` option unless namespaceauth.conf is present, even though the file is never consulted. The workaround is to create an empty file: `# touch $(puppet agent --configprint authconfig)`
- Puppet agent uses the same default ACLs as puppet master, which allow access to several useless endpoints while denying access to any agent-specific ones. For best results, you should short-circuit the defaults by denying access to `/` at the end of your auth.conf file.

External Node Classifiers

An external node classifier is an arbitrary script or application which can tell Puppet which classes a node should have. It can replace or work in concert with the `node` definitions in the main site manifest (`site.pp`).

Depending on the external data sources you use in your infrastructure, building an external node classifier can be a valuable way to extend Puppet.

What Is an ENC?

An external node classifier is an executable that can be called by puppet master; it doesn't have to be written in Ruby. Its only argument is the name of the node to be classified, and it returns a YAML document describing the node.

Inside the ENC, you can reference any data source you want, including some of Puppet's own data sources, but from Puppet's perspective, it just puts in a node name and gets back a hash of information.

ENCs can co-exist with standard node definitions in `site.pp`, and the classes declared in each source are effectively merged.

How Merging Works

Every node always gets a node object (which may be empty or may contain classes, parameters, and an environment) from the configured `node_terminus`. (This setting takes effect where the catalog is compiled; on the puppet master server when using an agent/master arrangement, and on the node itself when using puppet apply. The default node terminus is `plain`, which returns an empty node object; the `exec` terminus calls an ENC script to determine what should go in the node object.) Every node may also get a node definition from the site manifest (usually called site.pp).

When compiling a node's catalog, Puppet will include all of the following:

- Any classes specified in the node object it received from the node terminus
- Any classes or resources which are in the site manifest but outside any node definitions
- Any classes or resources in the most specific node definition in site.pp that matches the current node (if site.pp contains any node definitions)
    - Note 1: If site.pp contains at least one node definition, it must have a node definition that matches the current node; compilation will fail if a match can't be found.
    - Note 2: If the node name resembles a dot-separated fully qualified domain name, Puppet will make multiple attempts to match a node definition, removing the right-most part of the name each time. Thus, Puppet would first try `agent1.example.com`, then `agent1.example`, then `agent1`. This behavior isn't mimicked when calling an ENC, which is invoked only once with the agent's full node name.
    - Note 3: If no matching node definition can be found with the node's name, Puppet will try one last time with a node name of `default`; most users include a `node default {}` statement in their site.pp file. This behavior isn't mimicked when calling an ENC.

Considerations and Differences from Node Definitions

- The YAML returned by an ENC isn't an exact equivalent of a node definition in `site.pp` — it can't declare individual resources, declare relationships, or do conditional logic. The only things an ENC can do are declare classes, assign top-scope variables, and set an environment. This means an ENC is most effective if you've done a good job of separating your configurations out into classes and modules.
- In Puppet 3 and later, ENCs can set an environment for a node, overriding whatever environment the node requested. However, previous versions of Puppet use ENC-set and node-set environments inconsistently, with the ENC's used during catalog compilation and the node's used when downloading files. The workaround for Puppet 2.7 and earlier is to use Puppet to manage `puppet.conf` on the agent and set the environment for the next run based on what the ENC thinks it should be.
- Even if you aren't using node definitions, you can still use site.pp to do things like set global resource defaults.
- Unlike regular node definitions, where a node may match a less specific definition if an exactly matching one isn't found (depending on the puppet master's `strict_hostname_checking` setting), an ENC is called only once, with the node's full name.

Connecting an ENC

To tell puppet master to use an ENC, you need to set two configuration options: `node_terminus` has to be set to “exec”, and `external_nodes` should have the path to the executable.

```
[master]
  node_terminus = exec
  external_nodes = /usr/local/bin/puppet_node_classifier
```

ENC Output Format

There have been three versions of the ENC output format.

Puppet 2.6.5 and Higher

ENCs must return either a YAML hash or nothing. This hash may contain `classes`, `parameters`, and `environment` keys, and must contain at least either `classes` or `parameters`. ENCs should exit with an exit code of 0 when functioning normally, and may exit with a non-zero exit code if you wish puppet master to behave as though the requested node was not found.

If an ENC returns nothing or exits with a non-zero exit code, the catalog compilation will fail with a “could not find node” error, and the node will be unable to retrieve configurations.

CLASSES

If present, the value of `classes` must be either an array of class names or a hash whose keys are class names. That is, the following are equivalent:

```
classes:
  - common
  - puppet
  - dns
  - ntp

classes:
  common:
  puppet:
  dns:
  ntp:
```

Parameterized classes cannot be used with the array syntax. When using the hash key syntax, the value for a parameterized class should be a hash of the class’s attributes and values. Each value may be a string, number, array, or hash. String values should be quoted, as unquoted strings like “on” may be interpreted as booleans. Non-parameterized classes may have empty values.

```
classes:
    common:
    puppet:
    ntp:
        ntpserver: 0.pool.ntp.org
    aptsetup:
        additional_apt_repos:
            - deb localrepo.example.com/ubuntu lucid production
            - deb localrepo.example.com/ubuntu lucid vendor
```

PARAMETERS

If present, the value of the `parameters` key must be a hash of valid variable names and associated values; these will be exposed to the compiler as top scope variables. Each value may be a string, number, array, or hash.

```
parameters:
    ntp_servers:
        - 0.pool.ntp.org
        - ntp.example.com
    mail_server: mail.example.com
    iburst: true
```

ENVIRONMENT

If present, the value of `environment` must be a string representing the desired environment for this node. In Puppet 3 and later, this will become the only environment used by the node in its requests for catalogs and files. In Puppet 2.7 and earlier, ENC-set environments are not reliable, as noted above.

```
environment: production
```

COMPLETE EXAMPLE

```
---
classes:
    common:
    puppet:
    ntp:
        ntpserver: 0.pool.ntp.org
    aptsetup:
        additional_apt_repos:
            - deb localrepo.example.com/ubuntu lucid production
            - deb localrepo.example.com/ubuntu lucid vendor
parameters:
    ntp_servers:
        - 0.pool.ntp.org
        - ntp.example.com
    mail_server: mail.example.com
    iburst: true
environment: production
```

Puppet 0.23.0 through 2.6.4

As above, with the following exception:

CLASSES

If present, the value of `classes` must be an array of class names. Parameterized classes cannot be used with an ENC.

Puppet 0.22.4 and Lower

ENCs must return two lines of text, separated by a newline (LF). The first line must be the name of a parent node defined in the main site manifest. The second line must be a space-separated list of classes. ENCs must exit with exit code 0; Puppet's behavior when faced with a non-zero ENC exit code is undefined.

COMPLETE EXAMPLE

```
basenode
common puppet dns ntp
```

Tricks, Notes, and Further Reading

- Although only the node name is directly passed to an ENC, it can make decisions based on other facts about the node by querying the inventory service HTTP API or using the puppet facts subcommand shipped with Puppet 2.7.
- Puppet's "exec" `node_terminus` is just one way for Puppet to build node objects, and it's optimized for flexibility and for the simplicity of its API. There are situations where it can make more sense to design a native node terminus instead of an ENC, one example being the "ldap" node terminus that ships with Puppet. See the LDAP nodes documentation on the wiki for more info.

Plugins in Modules

Learn how to distribute custom facts and types from the server to managed clients automatically.

Details

This page describes the deployment of custom facts and types for use by the client via modules.

Custom types and facts are stored in modules. These custom types and facts are then gathered together and distributed via a file mount on your Puppet master called plugins.

This technique can also be used to bundle functions for use by the server when the manifest is being compiled. Doing so is a two step process which is described further on in this document.

To enable module distribution you need to make changes on both the Puppet master and the clients.

Note: Plugins in modules is supported in 0.24.x onwards and modifies the pluginsync model supported in releases prior to 0.24.x. It is NOT supported in earlier releases of Puppet but may be present as a patch in some older Debian Puppet packages. The older 0.24.x configuration for plugins in modules is documented at the end of this page.

Module structure for 0.25.x and later

In Puppet version 0.25.x and later, plugins are stored in the `lib` directory of a module, using an internal directory structure that mirrors that of the Puppet code:

```
{modulepath}
└── {module}
    └── lib
        |── augeas
        |   └── lenses
        ├── facter
        └── puppet
            ├── parser
            |   └── functions
            ├── provider
            |   ├── exec
            |   ├── package
            |   └── etc... (any resource type)
            └── type
```

As the directory tree suggests, custom facts should go in `lib/facter/`, custom types should go in `lib/puppet/type/`, custom providers should go in `lib/puppet/provider/{type}/`, and custom functions should go in `lib/puppet/parser/functions/`.

For example:

A custom user provider:

```
{modulepath}/{module}/lib/puppet/provider/user/custom_user.rb
```

A custom package provider:

```
{modulepath}/{module}/lib/puppet/provider/package/custom_pkg.rb
```

A custom type for bare Git repositories:

```
{modulepath}/{module}/lib/puppet/type/gitrepo.rb
```

A custom fact for the root of all home directories (that is, `/home` on Linux, `/Users` on Mac OS X, etc.):

```
{modulepath}/{module}/lib/facter/homeroot.rb
```

A custom Augeas lens:

```
{modulepath}/{module}/lib/augeas/lenses/custom.aug
```

Note: Support for syncing Augeas lenses was added in Puppet 2.7.18.

And so on.

Most types and facts should be stored in which ever module they are related to; for example, a Bind fact might be distributed in your Bind module. If you wish to centrally deploy types and facts you could create a separate module just for this purpose, for example one called `custom`. This module needs to be a valid module (with the correct directory structure and an `init.pp` file).

So, if we are using our custom module and our modulepath is /etc/puppet/modules then types and facts would be stored in the following directories:

```
/etc/puppet/modules/custom/lib/puppet/type
/etc/puppet/modules/custom/lib/puppet/provider
/etc/puppet/modules/custom/lib/puppet/parser/functions
/etc/puppet/modules/custom/lib/facter
```

Note: 0.25.x versions of Puppet have a known bug whereby plugins are instead loaded from the deprecated `plugins` directories of modules when applying a manifest locally with the `puppet` command, even though puppetmasterd will correctly serve the contents of `lib/` directories to agent nodes. This bug is fixed in Puppet 2.6.

Enabling Pluginsync

After setting up the directory structure, we then need to turn on pluginsync in our puppet.conf configuration file on both the master and the clients:

```
[main]
pluginsync = true
```

Note on Usage for Server Custom Functions

Functions are executed on the server while compiling the manifest. A module defined in the manifest can include functions in the plugins directory. The custom function will need to be placed in the proper location within the manifest first:

```
{modulepath}/{module}/lib/puppet/parser/functions
```

Note that this location is not within the puppetmaster’s $libdir path. Placing the custom function within the module plugins directory will not result in the puppetmasterd loading the new custom function. The puppet client can be used to help deploy the custom function by copying it from modulepath/module/lib/puppet/parser/functions to the proper $libdir location. To do so run the puppet client on the server. When the client runs it will download the custom function from the module’s lib directory and deposit it within the correct location in $libdir. The next invocation of the Puppet master by a client will autoload the custom function.

As always custom functions are loaded once by the Puppet master. Simply replacing a custom function with a new version will not cause Puppet master to automatically reload the function. You must restart the Puppet master.

Legacy 0.24.x and Plugins in Modules

For older Puppet release the `lib` directory was called `plugins`.

So for types you would place them in:

```
{modulepath}/{module}/plugins/puppet/type
```

For providers you place them in:

```
{modulepath}/{module}/plugins/puppet/provider
```

Similarly, Facter facts belong in the facter subdirectory of the library directory:

```
{modulepath}/{module}/plugins/facter
```

If we are using our custom module and our modulepath is /etc/puppet/modules then types and facts would be stored in the following directories:

```
/etc/puppet/modules/custom/plugins/puppet/type
/etc/puppet/modules/custom/plugins/puppet/provider
/etc/puppet/modules/custom/plugins/facter
```

Enabling pluginsync for 0.24.x versions

For 0.24.x versions you may need to specify some additional options:

```
[main]
pluginsync=true
factsync=true
factpath = $vardir/lib/facter
```

Custom Facts

Extend facter by writing your own custom facts to provide information to Puppet.

Ruby Facts

Adding Custom Facts to Facter

Sometimes you need to be able to write conditional expressions based on site-specific data that just isn’t available via Facter (or use a variable in a template that isn’t there). A solution can be achieved by adding a new fact to Facter. These additional facts can then be distributed to Puppet clients and are available for use in manifests.

The Concept

You can add new facts by writing a snippet of Ruby code on the Puppet master. We then use Plugins In Modules to distribute our facts to the client.

An Example

Let’s say we need to get the output of uname -i to single out a specific type of workstation. To do□ these we create a fact. We start by giving the fact a name, in this case, `hardware_platform`, and create our new fact in a file, `hardware_platform.rb`, on the Puppet master server:

```
# hardware_platform.rb

Facter.add("hardware_platform") do
  setcode do
    Facter::Util::Resolution.exec('/bin/uname -i')
  end
end
```

Note: Prior to Facter 1.5.8, values returned by `Facter::Util::Resolution.exec` often had trailing newlines. If your custom fact will also be used by older versions of Facter, you may need to call `chomp` on these values. (In the example above, this would look like `Facter::Util::Resolution.exec('/bin/uname -i').chomp`.)

We then use the instructions in Plugins In Modules page to copy our new fact to a module and distribute it. During your next Puppet run the value of our new fact will be available to use in your manifests.

The best place to get ideas about how to write your own custom facts is to look at the existing Facter fact code. You will find lots of examples of how to interpret different types of system data□ and return useful facts.

Using other facts

You can write a fact which uses other facts by accessing Facter.value(“somefact”) or simply Facter.somefact. The former will return nil for unknown facts, the latter will raise an exception. An example:

```
Facter.add("osfamily") do
  setcode do
    distid = Facter.value('lsbdistid')
    case distid
    when /RedHatEnterprise|CentOS|Fedora/
      "redhat"
    when "ubuntu"
      "debian"
    else
      distid
    end
  end
```

```
end
```

Loading Custom Facts

Facter offers a few methods of loading facts:□

- $LOAD_PATH, or the ruby library load path
- The environment variable ‘FACTERLIB’
- Facts distributed using pluginsync

You can use these methods of loading facts do to things like test files locally before distributing□ them, or have a specific set of facts available on certain machines.□

Facter will search all directories in the ruby $LOAD_PATH variable for subdirectories named ‘facter’, and will load all ruby files in those directories. If you had some directory in your $LOAD_PATH like□ ~/lib/ruby, set up like this:

```
{~/lib/ruby}
└── facter
    ├── rackspace.rb
    ├── system_load.rb
    └── users.rb
```

Facter would try to load ‘facter/system_load.rb’, ‘facter/users.rb’, and ‘facter/rackspace.rb’.

Facter also will check the environment variable `FACTERLIB` for a colon delimited set of directories, and will try to load all ruby files in those directories. This allows you to do something like this:□

```
$ ls my_facts
system_load.rb
$ ls my_other_facts
users.rb
$ export FACTERLIB="./my_facts:./my_other_facts"
$ facter system_load users
system_load => 0.25
users => thomas,pat
```

Facter can also easily load fact files distributed using pluginsync. Running `facter -p` will load all the facts that have been distributed via pluginsync, so if you’re using a lot of custom facts inside puppet, you can easily use these facts with standalone facter.

Custom facts can be distributed to clients using the Plugins In Modules method.

Configuring Facts□

Facts have a few properties that you can use to customize how facts are evaluated.

Confining Facts□

One of the more commonly used properties is the `confine` statement, which restricts the fact to only run on systems that matches another given fact.

An example of the confine statement would be something like the following:□

```
Facter.add(:powerstates) do
  confine :kernel => "Linux"
  setcode do
    Facter::Util::Resolution.exec('cat /sys/power/states')
  end
end
```

This fact uses sysfs on linux to get a list of the power states that are available on the given system. Since this is only available on Linux systems, we use the confine statement to ensure that this fact□ isn't needlessly run on systems that don't support this type of enumeration.

Fact precedence

Another property of facts is the `weight` property. Facts with a higher weight are run earlier, which allows you to either override or provide fallbacks to existing facts, or ensure that facts are evaluated in a specific order. By default, the weight of a fact is the number of confines for that fact,□ so that more specific facts are evaluated first.□

```
# Check to see if this server has been marked as a postgres server
Facter.add(:role) do
  has_weight 100
  setcode do
    if File.exist? "/etc/postgres_server"
      "postgres_server"
    end
  end
end

# Guess if this is a server by the presence of the pg_create binary
Facter.add(:role) do
  has_weight 50
  setcode do
    if File.exist? "/usr/sbin/pg_create"
      "postgres_server"
    end
  end
end

# If this server doesn't look like a server, it must be a desktop
Facter.add(:role) do
  setcode do
    "desktop"
  end
end
```

Timing out

If you have facts that are unreliable and may not finish running, you can use the `timeout` property. If a fact is defined with a timeout and the evaluation of the setcode block exceeds the timeout,□ Facter will halt the resolution of that fact and move on.

```
# Sleep
Facter.add(:sleep, :timeout => 10) do
  setcode do
      sleep 999999
  end
end
```

Viewing Fact Values

[puppetdb]: If your puppet master(s) are configured to use [PuppetDB][] and/or the inventory service, you can view and search all of the facts for any node, including custom facts. See the PuppetDB or inventory service docs for more info.

Legacy Fact Distribution

For Puppet versions prior to 0.24.0:

On older versions of Puppet, prior to 0.24.0, a different method called factsync was used for custom fact distribution. Puppet would look for custom facts on puppet://$server/facts by default and you needed to run puppetd with `--factsync` option (or add `factsync = true` to puppetd.conf). This would enable the syncing of these files to the local file system and loading them within puppetd.

Facts were synced to a local directory ($vardir/facts, by default) before facter was run, so they would be available the first time. If $factsource was unset, the `--factsync` option is equivalent to:

```
file { $factdir: source => "puppet://puppet/facts", recurse => true }
```

After the facts were downloaded, they were loaded (or reloaded) into memory.

Some additional options were available to configure this legacy method:

The following command line or config file options are available (default options shown):

- factpath ($vardir/facts): Where Puppet should look for facts. Multiple directories should be colon-separated, like normal PATH variables. By default, this is set to the same value as factdest, but you can have multiple fact locations (e.g., you could have one or more on NFS).
- factdest ($vardir/facts): Where Puppet should store facts that it pulls down from the central server.
- factsource (puppet://$server/facts): From where to retrieve facts. The standard Puppet file type is used for retrieval, so anything that is a valid file source can be used here.
- factsync (false): Whether facts should be synced with the central server.
- factsignore (.svn CVS): What files to ignore when pulling down facts.

Remember the approach described above for `factsync` is now deprecated and replaced by the plugin approach described in the Plugins In Modules page.

External Facts

External facts are available only in Facter 1.7 and later.

What are external facts?

External facts provide a way to use arbitrary executables or scripts as facts, or set facts statically with structured data. If you’ve ever wanted to write a custom fact in Perl, C, or a one-line text file, this is how.

Fact Locations

On Unix/Linux:

```
/etc/facter/facts.d/ # Puppet Open Source
/etc/puppetlab/facter/facts.d/ # Puppet Enterprise
```

On Windows 2003:

```
C:\Documents and Settings\All Users\Application Data\Puppetlabs\facter\facts.d\
```

On Windows 2008:

```
C:\ProgramData\Puppetlabs\facter\facts.d\
```

Executable facts — Unix

Executable facts on Unix work by dropping an executable file into the standard external fact path above.

You must ensure that the script has its execute bit set:

```
chmod +x /etc/facter/facts.d/my_fact_script.rb
```

For Facter to parse the output, the script must return key/value pairs on STDOUT in the format:

```
key1=value1
key2=value2
key3=value3
```

Using this format, a single script can return multiple facts.

Executable facts — Windows

Executable facts on Windows work by dropping an executable file into the external fact path for your version of Windows. Unlike with Unix, the external facts interface expects Windows scripts to end with a known extension. At the moment the following extensions are supported:

- `.com` and `exe`: binary executables
- `.bat`: batch scripts
- `.ps1`: PowerShell scripts

As with Unix facts, each script must return key/value pairs on STDOUT in the format:

```
key1=value1
key2=value2
key3=value3
```

Using this format, a single script can return multiple facts in one return.

ENABLING POWERSHELL SCRIPTS

For PowerShell scripts (scripts with a ps1 extension) to work, you need to make sure you have the correct execution policy set.

See this Microsoft TechNet article for more detail about the impact of changing execution policy. We recommend understanding any security implications before making a global change to execution policy.

The simplest and safest mechanism we have found is to change the execution policy so that only remotely downloaded scripts need to be signed. You can set this policy with:

```
Set-ExecutionPolicy RemoteSigned -Scope LocalMachine
```

Here is a sample PowerShell script which outputs facts using the required format:

```
Write-Host "key1=val1"
Write-Host "key2=val2"
Write-Host "key3=val3"
```

You should be able to save and execute this PowerShell script on the command line after changing the execution policy.

Structured Data Facts

Facter can parse structured data files stored in the external facts directory and set facts based on their contents.

Structured data files must use one of the supported data types and must have the correct file extension. At the moment, Facter supports the following extensions and data types:

- `.yaml`: YAML data, in the following format:

  ```
  ---
  key1: val1
  key2: val2
  key3: val3
  ```

- `.json`: JSON data, in the following format:

  ```
  {
      "key1": "val1",
      "key2": "val2",
  ```

```
        "key3": "val3"
    }
```

- `.txt`: Key value pairs, in the following format:

```
    key1=value1
    key2=value2
    key3=value3
```

As with executable facts, structured data files can set multiple facts at once.

Troubleshooting

If your external fact is not appearing in Facter’s output, running Facter in debug mode should give you a meaningful reason and tell you which file is causing the problem:

```
# facter --debug
```

An example would be in cases where a fact returns invalid characters. Let say you used a hyphen instead of an equals sign in your script `test.sh`:

```
#!/bin/bash

echo "key1-value1"
```

Running `facter --debug` should yield a useful error message:

```
...
Fact file /etc/facter/facter.d/sample.txt was parsed but returned an empty data
set
...
```

If you are interested in finding out where any bottlenecks are, you can run Facter in timing mode and it will reflect how long it takes to parse your external facts:

```
facter --timing
```

The output should look similar to the timing for Ruby facts, but will name external facts with their full paths. For example:

```
$ facter --timing
kernel: 14.81ms
/usr/lib/facter/ext/abc.sh: 48.72ms
/usr/lib/facter/ext/foo.sh: 32.69ms
/usr/lib/facter/ext/full.json: 104.71ms
/usr/lib/facter/ext/sample.txt: 0.65ms
....
```

EXTERNAL FACTS AND STDLIB

If you find that an external fact does not match what you have configured in your `facter.d` directory, make sure you have not defined the same fact using the external facts capabilities found in the stdlib module.

Drawbacks

While external facts provide a mostly-equal way to create variables for Puppet, they have a few drawbacks:

- An external fact cannot internally reference another fact. However, due to parse order, you can reference an external fact from a Ruby fact.
- External executable facts are forked instead of executed within the same process.
- Although we plan to allow distribution of external facts through Puppet's pluginsync capability, this is not yet supported.

Custom Functions

Extend the Puppet interpreter by writing your own custom functions.

Writing your own functions

The Puppet language and interpreter is very extensible. One of the places you can extend Puppet is in creating new functions to be executed on the puppet master at the time that the manifest is compiled. To give you an idea of what you can do with these functions, the built-in template and include functions are implemented in exactly the same way as the functions you're learning to write here.

Custom functions are written in Ruby, so you'll need a working understanding of the language before you begin.

Gotchas

There are a few things that can trip you up when you're writing your functions:

- Your function will be executed on the server. This means that any files or other resources you reference must be available on the server, and you can't do anything that requires direct access to the client machine.
- There are actually two completely different types of functions available — rvalues (which return a value) and statements (which do not). If you are writing an rvalue function, you must pass `:type => :rvalue` when creating the function; see the examples below.
- The name of the file containing your function must be the same as the name of function; otherwise it won't get automatically loaded.
- To use a fact about a client, use `lookupvar('{fact name}')` instead of `Facter['{fact name}'].value`. If the fact does not exist, `lookupvar` returns `:undefined`. See examples below.

Where to put your functions

Functions are implemented in individual .rb files (whose filenames must match the names of their respective functions), and should be distributed in modules. Put custom functions in the lib/puppet/parser/functions subdirectory of your module; see Plugins in Modules for additional details (including compatibility with versions of Puppet prior to 0.25.0).

If you are using a version of Puppet prior to 0.24.0, or have some other compelling reason to not use plugins in modules, functions can also be loaded from .rb files in the following locations:

- `$libdir/puppet/parser/functions`
- `puppet/parser/functions` sub-directories in your Ruby `$LOAD_PATH`

First Function — small steps

New functions are defined by executing the `newfunction` method inside the `Puppet::Parser::Functions` module. You pass the name of the function as a symbol to `newfunction`, and the code to be run as a block. So a trivial function to write a string to a file in /tmp might look like this:

```
module Puppet::Parser::Functions
  newfunction(:write_line_to_file) do |args|
    filename = args[0]
    str = args[1]
    File.open(filename, 'a') {|fd| fd.puts str }
  end
end
```

To use this function, it's as simple as using it in your manifest:

```
write_line_to_file('/tmp/some_file', "Hello world!")
```

(Note that this is not a useful function by any stretch of the imagination.)

The arguments to the function are passed into the block via the `args` argument to the block. This is simply an array of all of the arguments given in the manifest when the function is called. There's no real parameter validation, so you'll need to do that yourself.

This simple `write_line_to_file` function is an example of a statement function. It performs an action, and does not return a value. The other type of function is an rvalue function, which you must use in a context which requires a value, such as an `if` statement, a `case` statement, or a variable or attribute assignment. You could implement a `rand` function like this:

```
module Puppet::Parser::Functions
  newfunction(:rand, :type => :rvalue) do |args|
    rand(vals.empty? ? 0 : args[0])
  end
end
```

This function works identically to the Ruby built-in rand function. Randomising things isn't quite as useful as you might think, though. The first use for a `rand` function that springs to mind is probably to vary the minute of a cron job. For instance, to stop all your machines from running a job at the same time, you might do something like:

```
cron { run_some_job_at_a_random_time:
  command => "/usr/local/sbin/some_job",
  minute => rand(60)
}
```

But the problem here is quite simple: every time the Puppet client runs, the rand function gets re-evaluated, and your cron job moves around. The moral: just because a function seems like a good idea, don't be so quick to assume that it'll be the answer to all your problems.

Using Facts and Variables

Which raises the question: what should you do if you want to splay your cron jobs on different machines? The trick is to tie the minute value to something that's invariant in time, but different across machines. Perhaps the MD5 hash of the hostname, modulo 60, or maybe the IP address of the host converted to an integer, modulo 60. Neither guarantees uniqueness, but you can't really expect that with a range of no more than 60 anyway.

But given that functions are run on the puppet master, how do you get at the hostname or IP address of the agent node? The answer is that facts returned by facter can be used in our functions.

Example 1

```
require 'ipaddr'

module Puppet::Parser::Functions
  newfunction(:minute_from_address, :type => :rvalue) do |args|
    IPAddr.new(lookupvar('ipaddress')).to_i % 60
  end
end
```

Example 2

```
require 'md5'

module Puppet::Parser::Functions
  newfunction(:hour_from_fqdn, :type => :rvalue) do |args|
    MD5.new(lookupvar('fqdn')).to_s.hex % 24
  end
end
```

Example 3

```
module Puppet::Parser::Functions
  newfunction(:has_fact, :type => :rvalue) do |arg|
    lookupvar(arg[0]) != :undefined
  end
end
```

Basically, to get a fact’s or variable’s value, you just call `lookupvar('{fact name}')`.

Calling Functions from Functions

Functions can be accessed from other functions by calling `Puppet::Parser::Functions.autoloader.loadall` at the beginning of your new function, then prepending `function_` to the name of the function you are trying to call. Alternatively, you can load a specific function by calling `Puppet::Parser::Functions.function('myfunc1')`

Also keep in mind that when calling a puppet function from the puppet DSL, arguments are all passed in as an anonymous array. This is not the case when calling the function from within Ruby. To work around this, you must create the anonymous array yourself by putting the arguments (even if there is only one argument) inside square brackets like this:

```
[ arg1, arg1, arg3 ]
```

Example

```
module Puppet::Parser::Functions
  newfunction(:myfunc2, :type => :rvalue) do |args|
    Puppet::Parser::Functions.autoloader.loadall
    function_myfunc1( [ arg1, arg2, ... ] )
  end
end
```

Handling Errors

To throw a parse/compile error in your function, in a similar manner to the `fail()` function:

```
raise Puppet::ParseError, "my error"
```

Troubleshooting Functions

If you’re experiencing problems with your functions loading, there’s a couple of things you can do to see what might be causing the issue:

1 – Make sure your function is parsing correctly, by running:

```
ruby -rpuppet my_funct.rb
```

This should return nothing if the function is parsing correctly, otherwise you’ll get an exception which should help troubleshoot the problem.

2 – Check that the function is available to Puppet:

```
irb
```

```
> require 'puppet'
> require '/path/to/puppet/functions/my_funct.rb'
> Puppet::Parser::Functions.function(:my_funct)
=> "function_my_funct"
```

Substitute `:my_funct` with the name of your function, and it should return something similar to "`function_my_funct`" if the function is seen by Puppet. Otherwise it will just return false, indicating that you still have a problem (and you'll more than likely get a "Unknown Function" error on your clients).

Referencing Custom Functions In Templates

To call a custom function within a Puppet Template, you can do:

```
<%= scope.function_namegoeshere(["one","two"]) %>
```

Replace "namegoeshere" with the function name, and even if there is only one argument, still include the array brackets.

Notes on Backward Compatibility

Accessing Files With Older Versions of Puppet

In Puppet 2.6.0 and later, functions can access files with the expectation that it will just work. In□ versions prior to 2.6.0, functions that accessed files had to explicitly warn the parser to recompile□ the configuration if the files they relied on changed.□

If you find yourself needing to write custom functions for older versions of Puppet, the relevant□ instructions are preserved below.

ACCESSING FILES IN PUPPET 0.23.2 THROUGH 0.24.9

Until Puppet 0.25.0, safe file access was achieved by adding `self.interp.newfile($filename)` to the function. E.g., to accept a file name and return the last line of that file:□

```
    module Puppet::Parser::Functions
      newfunction(:file_last_line, :type => :rvalue) do |args|
        self.interp.newfile(args[0])
        lines = IO.readlines(args[0])
        lines[lines.length - 1]
      end
    end
```

ACCESSING FILES IN PUPPET 0.25.X

In release 0.25.0, the necessary code changed to:

```
    parser = Puppet::Parser::Parser.new(environment)
    parser.watch_file($filename)
```

This new code was used identically to the older code:

```
    module Puppet::Parser::Functions
      newfunction(:file_last_line, :type => :rvalue) do |args|
        parser = Puppet::Parser::Parser.new(environment)
        parser.watch_file($filename)
        lines = IO.readlines(args[0])
        lines[lines.length - 1]
      end
    end
```

Custom Types

Learn how to create your own custom types & providers in Puppet

Organizational Principles

When making a new Puppet type, you will create two things: The resource type itself, which we normally just call a 'type', and the provider(s) for that type. While Puppet does not require Ruby experience to use, extending Puppet with new Puppet types and providers does require some knowledge of the Ruby programming language, as is the case with new functions and facts. If you're new to Ruby, what is going on should still be somewhat evident from the examples below, and it is easy to learn.

The resource types provide the model for what you can do; they define what parameters are present, handle input validation, and they determine what features a provider can (or should) provide.

The providers implement support for that type by translating calls in the resource type to operations on the system. As mentioned in our Introduction and language guide, an example would be that "yum" and "apt" are both different providers that fulfill the "package" type.

Deploying Code

Once you have your code, you will need to have it both on the server and also distributed to clients.

The best place to put this content is within Puppet's configured `libdir`. The libdir is special because you can use the `pluginsync` system to copy all of your plugins from the fileserver to all of your clients (and separate Puppetmasters, if they exist)). To enable pluginsync, set `pluginsync=true` in puppet.conf and, if necessary, set the `pluginsource` setting. The contents of pluginsource will be copied directly into `libdir`, so make sure you make a puppet/type directory in your `pluginsource`, too.

In Puppet 0.24 and later, the "old" `pluginsync` function has been deprecated and you should see the Plugins In Modules page for details of distributing custom types and facts via modules.

The internals of how types are created have changed over Puppet's lifetime, and this document will focus on best practices, skipping over all the things you can but probably shouldn't do.

Resource Types

When defining the resource type, focus on what the resource can do, not how it does it (that is the job for providers!).

The first thing you have to figure out is what `properties` the resource has. Properties are the changeable bits, like a file's owner or a user's UID.

After adding properties, Then you need to add any other necessary `parameters`, which can affect how the resource behaves but do not directly manage the resource itself. Parameters handle things like whether to recurse when managing files or where to look for service init scripts.

Resource types also support special parameters, called `MetaParameters`, that are supported by all resource types, but you can safely ignore these since they are already defined and you won't normally add more. You may remember that things like `require` are metaparameters.

Types are created by calling the `newtype` method on `Puppet::Type`, with the name of the type as the only required argument. You can optionally specify a parent class; otherwise, `Puppet::Type` is used as the parent class. You must also provide a block of code used to define the type:

You may wish to read up on "Ruby blocks" to understand more about the syntax. Blocks are a very powerful feature of Ruby and are not surfaced in most programming languages.

```
Puppet::Type.newtype(:database) do
    @doc = "Create a new database."
    ... the code ...
end
```

The above code should be stored in puppet/type/database.rb (within the `libpath`), because of the name of the type we're creating ("database").

A normal type will define multiple properties and possibly some parameters. Once these are defined, as long as the type is put into lib/puppet/type anywhere in Ruby's search path, Puppet will autoload the type when you reference it in the Puppet language.

We have already mentioned Puppet provides a `libdir` setting where you can copy the files outside the Ruby search path. See also Plugins In Modules

All types should also provide inline documentation in the @doc class instance variable. The text format is in Restructured Text.

Properties

Here's where we define how the resource really works. In most cases, it's the properties that interact with your resource's providers. If you define a property named owner, then when you are retrieving the state of your resource, then the owner property will call the owner method on the provider. In turn, when you are setting the state (because the resource is out of sync), then the owner property will call the owner= method to set the state on disk.

There's one common exception to this: The ensure property is special because it's used to create and destroy resources. You can set this property up on your resource type just by calling the ensurable method in your type definition:

```
Puppet::Type.newtype(:database) do
    ensurable
    ...
end
```

This property uses three methods on the provider: create, destroy, and exists?. The last method, somewhat obviously, is a boolean to determine if the resource current exists. If a resource's ensure property is out of sync, then no other properties will be checked or modified.

You can modify how ensure behaves, such as by adding other valid values and determining what methods get called as a result; see existing types like package for examples.

The rest of the properties are defined a lot like you define the types, with the newproperty method, which should be called on the type:

```
Puppet::Type.newtype(:database) do
    ensurable
    newproperty(:owner) do
        desc "The owner of the database."
        ...
    end
end
```

Note the call to desc; this sets the documentation string for this property, and for Puppet types that get distributed with Puppet, it is extracted as part of the Type reference.

When Puppet was first developed, there would normally be a lot of code in this property definition. Now, however, you normally only define valid values or set up validation and munging. If you specify valid values, then Puppet will only accept those values, and it will automatically handle accepting either strings or symbols. In most cases, you only define allowed values for ensure, but it works for other properties, too:

```
newproperty(:enable) do
    newvalue(:true)
    newvalue(:false)
end
```

You can attach code to the value definitions (this code would be called instead of the property= method), but it's normally unnecessary.

For most properties, though, it is sufficient to set up validation:

```
newproperty(:owner) do
    validate do |value|
        unless value =~ /^\w+/
            raise ArgumentError, "%s is not a valid user name" % value
        end
    end
    end
```

Note that the order in which you define your properties can be important: Puppet keeps track of the definition order, and it always checks and fixes properties in the order they are defined.

CUSTOMIZING BEHAVIOUR

By default, if a property is assigned multiple values in an array:

- It is considered in sync if any of those values matches the current value.
- If none of those values match, the first one will be used when syncing the property.

If, instead, the property should only be in sync if all values match the current value (e.g., a list of times in a cron job), you can declare this:

```
    newproperty(:minute, :array_matching => :all) do # :array_matching defaults to :first
        ...
    end
```

You can also customize how information about your property gets logged. You can create an `is_to_s` method to change how the current values are described, `should_to_s` to change how the desired values are logged, and `change_to_s` to change the overall log message for changes. See current types for examples.

HANDLING PROPERTY VALUES

Handling values set on properties is currently somewhat confusing, and will hopefully be fixed in the future. When a resource is created with a list of desired values, those values are stored in each property in its @should instance variable. You can retrieve those values directly by calling should on your resource (although note that when `:array_matching` is set to `:first` you get the first value in the array, otherwise you get the whole array):

```
    myval = should(:color)
```

When you're not sure (or don't care) whether you're dealing with a property or parameter, it's best to use value:

```
    myvalue = value(:color)
```

Parameters

Parameters are defined essentially exactly the same as properties; the only difference between them is that parameters never result in methods being called on providers.

Like ensure, one parameter you will always want to define is the one used for naming the resource. This is nearly always called name:

```
    newparam(:name) do
        desc "The name of the database."
    end
```

You can name your naming parameter something else, but you must declare it as the namevar:

```
    newparam(:path, :namevar => true) do
        ...
    end
```

In this case, path and name are both accepted by Puppet, and it treats them equivalently.

If your parameter has a fixed list of valid values, you can declare them all at once:

```
    newparam(:color) do
        newvalues(:red, :green, :blue, :purple)
    end
```

You can specify regexes in addition to literal values; matches against regexes always happen after equality comparisons against literal values, and those matches are not converted to symbols. For instance, given the following definition:

```
    newparam(:color) do
        desc "Your color, and stuff."

        newvalues(:blue, :red, /.+/)
    end
```

If you provide blue as the value, then your parameter will get set to :blue, but if you provide green, then it will get set to “green”.

VALIDATION AND MUNGING

If your parameter does not have a defined list of values, or you need to convert the values in some way, you can use the validate and munge hooks:

```
    newparam(:color) do
        desc "Your color, and stuff."

        newvalues(:blue, :red, /.+/)

        validate do |value|
            if value == "green"
                raise ArgumentError,
                    "Everyone knows green databases don't have enough RAM"
            else
                super
            end
        end

        munge do |value|
            case value
            when :mauve, :violet # are these colors really any different?
                :purple
            else
                super
        end
    end
end
```

The default validate method looks for values defined using newvalues and if there are any values defined it accepts only those values (this is exactly how allowed values are validated). The default munge method converts any values that are specifically allowed into symbols. If you override either of these methods, note that you lose this value handling and symbol conversion, which you'll have to call super for.

Values are always validated before they're munged.

Lastly, validation and munging only* happen when a value is assigned. They have no role to play at all during use of a given value, only during assignment.

BOOLEAN PARAMETERS

Boolean parameters are common. To avoid repetition, some utilities are available:

```
require 'puppet/parameter/boolean'
# ...
newparam(:force, :boolean => true, :parent => Puppet::Parameter::Boolean)
```

There are two parts here. The `:parent => Puppet::Parameter::Boolean` part configures the parameter to accept lots of names for true and false, to make things easy for your users. The `:boolean => true` creates a boolean method on the type class to return the value of the parameter. In this example, the method would be named `force?`.

Automatic Relationships

Your type can specify automatic relationships it can have with resources. You use the autorequire hook, which requires a resource type as an argument, and your code should return a list of resource names that your resource could be related to:

```
autorequire(:file) do
  ["/tmp", "/dev"]
end
```

Note that this won't throw an error if resources with those names do not exist; the purpose of this hook is to make sure that if any required resources are being managed, they get applied before the requiring resource.

Providers

Look at the Provider Development page for intimate detail; this document will only cover how the resource types and providers need to interact. Because the properties call getter and setter methods on the providers, except in the case of ensure, the providers must define getters and setters for each property.

Provider Features

A recent development in Puppet (around 0.22.3) is the ability to declare what features providers can have. The type declares the features and what's required to make them work, and then the providers can either be tested for whether they suffice or they can declare that they have the features. Additionally, individual properties and parameters in the type can declare that they require one or more specific features, and Puppet will throw an error if those parameters are used with providers missing those features:

```
    newtype(:coloring) do
        feature :paint, "The ability to paint.", :methods => [:paint]
        feature :draw, "The ability to draw."

        newparam(:color, :required_features => %w{paint}) do
            ...
        end
    end
```

The first argument to the feature method is the name of the feature, the second argument is its description, and after that is a hash of options that help Puppet determine whether the feature is available. The only option currently supported is specifying one or more methods that must be defined on the provider. If no methods are specified, then the provider needs to specifically declare that it has that feature:

```
    Puppet::Type.type(:coloring).provide(:drawer) do
        has_feature :draw
    end
```

The provider can specify multiple available features at once with has_features.

When you define features on your type, Puppet automatically defines a bunch of class methods on the provider:

- feature?: Passed a feature name, will return true if the feature is available or false otherwise.
- features: Returns a list of all supported features on the provider.
- satisfies?: Passed a list of feature, will return true if they are all available, false otherwise.

Additionally, each feature gets a separate boolean method, so the above example would result in a paint? method on the provider.

Complete Resource Example

This document walks through the definition of a very simple resource type and one provider. We'll build the resource up slowly, and the provider along with it. See Custom Types and Provider Development for more information on the individual classes. As with creating Custom Facts and Custom Functions, these examples involve Ruby programming.

Resource Creation

Nearly every resource needs to be able to be created and destroyed, and resources have to have names, so we'll start with those two features. Puppet's property support has a helper method called `ensurable` that handles modeling creation and destruction; it creates an `ensure` property and adds `absent` and `present` values for it, which in turn require three methods on the provider, `create`, `destroy`, and `exists?`. Here's the first start to the resource. We're going to create one called 'file'□ — this is an example of how we'd create a resource for something Puppet already has. You can see how this would be extensible to handle one of your own ideas:

```
Puppet::Type.newtype(:file) do
    @doc = "Manage a file (the simple version)."

    ensurable

    newparam(:name) do
        desc "The full path to the file."
    end
end
```

Here we have provided the resource type name (it's `file`), a simple documentation string (which should be in Restructured Text format), a parameter for the name of the file, and we've used the□ ensurable method to say that our file is both createable and destroyable.□

To see how we would use this on the provider side, let's look at a simple provider:

```
Puppet::Type.type(:file).provide(:posix) do
    desc "Normal Unix-like POSIX support for file management."

    def create
        File.open(@resource[:name], "w") { |f| f.puts "" } # Create an empty
file
    end

    def destroy
        File.unlink(@resource[:name])
    end

    def exists?
        File.exists?(@resource[:name])
    end
end
```

Here you can see that the providers use a different way of specifying their documentation, which is□ not something that has been unified in Puppet yet.□

In addition to the docs and the provider name, we provide the three methods that the `ensure` property requires. You can see that in this case we're just using Ruby's built-in File abilities to create an empty file, remove the file, or test whether the file exists.□

Let's enhance our resource somewhat by adding the ability to manage the file mode. Here's the code we need to add to the resource:

```
newproperty(:mode) do
```

```
    desc "Manage the file's mode."

    defaultto "640"
end
```

Notice that we’re specifying a default value, and that it is a string instead of an integer (file modes are in octal, and most of us are used to specifying integers in decimal). You can pass a block to defaultto instead of a value, if you don’t have a simple value. (For more about blocks, see the Ruby language documentation).

Here’s the code we need to add to the provider to understand modes:

```
def create
    File.open(@resource[:name], "w") { |f| f.puts "" } # Create an empty file
    # Make sure the mode is correct
    should_mode = @resource.should(:mode)
    unless self.mode == should_mode
        self.mode = should_mode
    end
end

# Return the mode as an octal string, not as an integer.
def mode
    if File.exists?(@resource[:name])
        "%o" % (File.stat(@resource[:name]).mode & 007777)
    else
        :absent
    end
end

# Set the file mode, converting from a string to an integer.
def mode=(value)
    File.chmod(Integer("0" + value), @resource[:name])
end
```

Note that the getter method returns the value, it doesn’t attempt to modify the resource itself. Also, when the setter gets passed the value it is supposed to set; it doesn’t attempt to figure out the appropriate value to use. This should always be true of how providers are implemented.

Also notice that the `ensure` property, when created by the `ensurable` method, behaves differently because it uses methods for creation and destruction of the file, whereas normal properties use getter and setter methods. When a resource is being created, Puppet expects the `create` method (or, actually, any changes done within ensure) to make any other necessary changes. This is because most often resources are created already configured correctly, so it doesn’t make sense for Puppet to test it manually (e.g., useradd support is set up to add all specified properties when useradd is run, so usermod doesn’t need to be run afterward).

You can see how the `absent` and `present` values are defined by looking in the property.rb file; here’s the most important snippet:

```
newvalue(:present) do
    if @resource.provider and @resource.provider.respond_to?(:create)
        @resource.provider.create
    else
        @resource.create
    end
    nil # return nil so the event is autogenerated
end

newvalue(:absent) do
    if @resource.provider and @resource.provider.respond_to?(:destroy)
        @resource.provider.destroy
    else
        @resource.destroy
    end
    nil # return nil so the event is autogenerated
end
```

There are a lot of other options in creating properties, parameters, and providers, but this should provide a decent starting point.

See Also

- Provider Development
- Creating Custom Types

Provider Development

Information about writing providers to provide implementation for types.

About

The core of Puppet's cross-platform support is via Resource Providers, which are essentially back-ends that implement support for a specific implementation of a given resource type. For instance, there are more than 20 package providers, including providers for package formats like dpkg and rpm along with high-level package managers like apt and yum. A provider's main job is to wrap client-side tools, usually by just calling out to those tools with the right information.

Not all resource types have or need providers, but any resource type concerned about portability will likely need them.

We will use the apt and dpkg package providers as examples throughout this document, and the examples used are current as of 0.23.0.

Declaration

Providers are always associated with a single resource type, so they are created by calling the provide class method on that resource type. When declarating a provider, you can specify a parent class — for instance, all package providers have a common parent class:

```
Puppet::Type.type(:package).provide :dpkg, :parent => Puppet::Provider::Package
do
    desc "..."
    ...
end
```

Note the call desc there; it sets the documentation for this provider, and should include everything necessary for someone to use this provider.

Providers can also specify another provider (from the same resource type) as their parent:

```
Puppet::Type.type(:package).provide :apt, :parent => :dpkg, :source => :dpkg do
    ...
end
```

Note that we're also specifying that this provider uses the dpkg source; this tells Puppet to deduplicate packages from dpkg and apt, so the same package does not show up in an instance list from each provider type. Puppet defaults to creating a new source for each provider type, so you have to specify when a provider subclass shares a source with its parent class.

Suitability

The first question to ask about a new provider is where it will be functional, which Puppet describes as suitable. Unsuitable providers cannot be used to do any work, although as of Puppet 2.7.8 the suitability test is late-binding, meaning that you can have a resource in your configuration that makes a provider suitable. If you start puppetd or puppet in debug mode, you'll see the results of failed provider suitability tests for the resource types you're using.

Puppet providers include some helpful class-level methods you can use to both document and declare how to determine whether a given provider is suitable. The primary method is commands, which actually does two things for you: It declares that this provider requires the named binary, and it sets up class and instance methods with the name provided that call the specified binary. The binary can be fully qualified, in which case that specific path is required, or it can be unqualified, in which case Puppet will find the binary in the shell path and use that. If the binary cannot be found, then the provider is considered unsuitable. For example, here is the header for the dpkg provider (as of 0.23.0):

```
commands :dpkg => "/usr/bin/dpkg"
commands :dpkg_deb => "/usr/bin/dpkg-deb"
commands :dpkgquery => "/usr/bin/dpkg-query"
```

In addition to looking for binaries, Puppet can compare Facter facts, test for the existence of a file, check for a "feature" such as a library, or test whether a given value is true or false. For file existence, truth, or false, just call the confine class method with exists, true, or false as the name of the test and your test as the value:

```
confine :exists => "/etc/debian_release"
confine :true => /^10\.[0-4]/.match(product_version)
confine :false => (Puppet[:ldapuser] == "")
```

To test Facter values, just use the name of the fact:

```
confine :operatingsystem => [:debian, :solaris]
confine :puppetversion => "0.23.0"
```

Note that case doesn't matter in the tests, nor does it matter whether the values are strings or symbols. It also doesn't matter whether you specify an array or a single value — Puppet does an OR on the list of values.

To test a feature, as defined in `lib/puppet/feature/*.rb`, just supply the name of the feature. This is preferable to using a `confine :true` statement that calls `Puppet.features` because the expression is only evaluated once. As of 2.7.20, Puppet will enable the provider if the feature becomes available during a run (i.e. a package is installed).

```
confine :feature => :posix
confine :feature => :rrd
```

Default Providers

Providers are generally meant to be hidden from the users, allowing them to focus on resource specification rather than implementation details. Toward this end, Puppet does what it can to choose an appropriate default provider for each resource type.

This is generally done by a single provider declaring that it is the default for a given set of facts, using the defaultfor class method. For instance, this is the apt provider's declaration:

```
defaultfor :operatingsystem => :debian
```

The same fact matching functionality is used, so again case does not matter.

Provider/Resource API

Providers never do anything on their own; all of their action is triggered through an associated resource (or, in special cases, from the transaction). Because of this, resource types are essentially free to define their own provider interface if necessary, and providers were initially developed without a clear resource/provider API (mostly because it wasn't clear whether such an API was necessary or what it would look like). At this point, however, there is a default interface between the resource type and the provider.

This interface consists entirely of getter and setter methods. When the resource is retrieving its current state, it iterates across all of its properties and calls the getter method on the provider for that property. For instance, when a user resource is having its state retrieved and its uid and shell properties are being managed, then the resource will call uid and shell on the provider to figure out what the current state of each of those properties is. This method call is in the retrieve method in Puppet::Property.

When a resource is being modified, it calls the equivalent setter method for each property on the provider. Again using our user example, if the uid was in sync but the shell was not, then the resource would call shell=(value) with the new shell value.

The transaction is responsible for storing these returned values and deciding which value to actually send, and it does its work through a PropertyChange instance. It calls sync on each of the properties, which in turn just call the setter by default.

You can override that interface as necessary for your resource type, but in the hopefully-near future this API will become more solidified.

Note that all providers must define an instances class method that returns a list of provider instances, one for each existing instance of that provider. For instance, the dpkg provider should return a provider instance for every package in the dpkg database.

Provider Methods

By default, you have to define all of your getter and setter methods. For simple cases, this is sufficient — you just implement the code that does the work for that property.

However, because things are rarely so simple, Puppet attempts to help in a few ways.

Prefetching

First, Puppet transactions will prefetch provider information by calling prefetch on each used provider type. This calls the instances method in turn, which returns a list of provider instances with the current resource state already retrieved and stored in a @property_hash instance variable. The prefetch method then tries to find any matching resources, and assigns the retrieved providers to found resources. This way you can get information on all of the resources you're managing in just a few method calls, instead of having to call all of the getter methods for every property being managed. Note that it also means that providers are often getting replaced, so you cannot maintain state in a provider.

Resource Methods

For providers that directly modify the system when a setter method is called, there's no substitute for defining them manually. But for resources that get flushed to disk in one step, such as the ParsedFile providers, there is a mk_resource_methods class method that creates a getter and setter for each property on the resource. These methods just retrieve and set the appropriate value in the @property_hash variable.

Flushing

Many providers model files or parts of files, so it makes sense to save all of the writes up and do them in one run. Providers in need of this functionality can define a flush instance method to do this. The transaction will call this method after all values are synced (which means that the provider should have them all in its @property_hash variable) but before refresh is called on the resource (if appropriate).

Running Puppet From Source

Puppet should usually be installed from reliable packages, such as those provided by Puppet Labs or your operating system vendor. If you plan to run Puppet in anything resembling a normal fashion, you should leave this page and see Installing Puppet.

However, if you are developing Puppet, helping to resolve a bug, or testing a new feature, you may need to run pre-release versions of Puppet. The most flexible way to do this, if you are not being provided with pre-release packages, is to run Puppet directly from source.

> To run Puppet from source on Windows, see the equivalent page in the Puppet for Windows documentation.

> Note: When running Puppet from source, you should never use the `install.rb` script included in the source. The point of running from source is to be able to switch versions of Puppet with a single command, and the `install.rb` script removes that capability by copying the source to several directories across your system.

Prerequisites

- Puppet requires Ruby.
  - Ruby 1.8.5 may work, but you should make an effort to use Ruby 1.8.7 or 1.9.2. See the open source Puppet system requirements for more details.
- Puppet requires Facter, a Ruby library. This guide will also describe how to install Facter from source, but you can skip those steps and instead install Facter from your operating system's packages or with `sudo gem install facter`.
- To access every version of the Puppet source code, including the current pre-release status of every development branch, you will need Git.
- If you want to run Puppet's tests, you will need rake, rspec, and mocha.
- If you wish to use Puppet ≥ 3.2 with `parser = future` enabled, you should also install the `rgen` gem.

Get and Install the Source

Use Git to clone the public code repositories for Puppet and Facter. The examples below assume a base directory of `/usr/src`; if you are installing the source elsewhere, substitute the correct locations when running commands.

```
$ sudo mkdir -p /usr/src
$ cd /usr/src
$ sudo git clone git://github.com/puppetlabs/facter
$ sudo git clone git://github.com/puppetlabs/puppet
```

Select a Branch or Release

By default, the instructions above will leave you running the `master` branch, which contains code for the next unreleased major version of Puppet. This may or may not be what you want.

Most development on existing series of releases happens on branches with names like `2.7.x`. Explore the repository on GitHub to find the branch you want, then run:□

```
$ cd /usr/src/puppet
$ sudo git checkout origin/<BRANCH NAME>
```

…to switch to it. You can also check out:

- Released versions, by version number:

  ```
  $ sudo git checkout 2.7.12
  ```

- Specific commits anywhere on any branch:□

  ```
  $ sudo git checkout 2d51b64
  ```

Teaching the complete use of Git is beyond the scope of this guide.

Tell Ruby How to Find Puppet and Facter

For Puppet to be functional, Ruby needs to have Puppet and Facter in its load path. Add the following to your `/etc/profile` file:□

```
export RUBYLIB=/usr/src/puppet/lib:/usr/src/facter/lib:$RUBYLIB
```

This will make Puppet and Facter available when run from login shells; if you plan to run Puppet as a daemon from source, you must set `RUBYLIB` appropriately in your init scripts.

Add the Binaries to the Path

Add the following to your `/etc/profile` file:□

```
export PATH=/usr/src/puppet/bin:/usr/src/puppet/sbin:/usr/src/facter/bin:$PATH
```

This will make the Puppet and Facter binaries runnable from login shells.

At this point, you can run `source /etc/profile` or log out and back in again; after doing so, you will be able to run Puppet commands.

Configure Puppet□

On systems that have never had Puppet installed, you should do the following:

Copy auth.conf Into Place

Puppet master uses the `auth.conf` file to control which systems can access which resources. The□

source includes an example file that exposes the default rules; starting with this file makes it easier to tweak the rules if necessary.

```
$ sudo cp /usr/src/puppet/conf/auth.conf /etc/puppet/auth.conf
```

Create a puppet.conf File

```
$ sudo touch /etc/puppet/puppet.conf
```

The `puppet.conf` file contains Puppet's settings. See Configuring Puppet for more details.

You will likely want to set the following settings:

- In the `[agent]` block:
  - `certname`
  - `server`
  - `pluginsync`
  - `report`
  - `environment`
- In the `[master]` block:
  - `certname`
  - `dns_alt_names`
  - `reports`
  - `node_terminus`
  - `external_nodes`

Create the Puppet User and Group

Puppet requires a user and group. By default, these are `puppet` and `puppet`, but they can be changed in `puppet.conf` with the `user` and `group` settings.

Create this user and group using your operating system's normal tools, or run the following:

```
$ sudo puppet resource user puppet ensure=present
$ sudo puppet resource group puppet ensure=present
```

If you skip this step, puppet master may not start correctly, and Puppet may have problems when creating some of its run data directories.

Run Puppet

You can now interactively run the main puppet agent, puppet master, and puppet apply commands, as well as any of the additional commands used to manage Puppet.

For testing purposes, you will usually want to run puppet master with the `--verbose` and `--no-daemonize` options and run puppet agent with the `--test` option. For day-to-day use, you should create an init script for puppet agent (see the examples in the source's `conf/` directory) and use a Rack server like Passenger or Unicorn to run puppet master.

> Note: You should never attempt to run Puppet or Facter binaries while your current working directory is in `/usr/src`. This is because Ruby automatically adds the current directory to the load path, which can cause the projects' spec tests to accidentally be loaded as libraries. Facter in particular will usually fail when this is done.

Periodically Update the Source or Switch Versions

If you are running from source, it is likely because you need to stay up to date with activity on a specific development branch. To update your installation to the current point on your chosen branch, you should periodically run:

```
$ cd /usr/src/puppet
$ sudo git fetch origin
$ sudo git checkout origin/<BRANCH NAME>
```

Be sure to stop any Puppet processes before doing this.

You can also switch versions or branches of Puppet at any time by running `sudo git checkout <VERSION OR BRANCH>`.

Development Lifecycle

Contributing to Puppet Labs Projects (Puppet, Dashboard, Facter and more)

So you want to contribute to a Puppet Labs project? Awesome!

We would like to make contributing as easy as possible since your contributions are greatly appreciated.

That said, there are a few guidelines that make reviewing and applying contributions easier. We hope that the information below will answer any questions you might have about helping out with the Puppet Labs projects.

If you have any questions about contributing to a Puppet Labs project that aren't answered here, the Getting Help page has a list of additional resources for finding those answers.

Steps

Check the `CONTRIBUTING.md` in the root of the project tree:

- Puppet
- Facter
- Puppet Dashboard

These should all be the same, but there may be some project specific notes in each. If the project you wish to contribute to does not have a `CONTRIBUTING.md`, then you should follow the one from the Puppet repository.

Puppet Internals - How It Works

The goal of this document is to describe how a manifest you write in Puppet gets converted to work being done on the system. This process is relatively complex, but you seldom need to know many of the details; this document only exists for those who are pushing the boundaries of what Puppet can do or who don't understand why they are seeing a particular error. It can also help those who are hoping to extend Puppet beyond its current abilities.

High Level

When looked at coarsely, Puppet has three main phases of execution - compiling, instantiation, and configuration.

Compiling

Here is where we convert from a text-based manifest into a node-specific specification. Any code not meant for the host in question is ignored, and any code that is meant for that host is fully interpolated, meaning that variables are expanded and all of the results are literal strings.

The only connection between the compiling phase and the library of Puppet resource types is that all resulting resource specifications are verified that the referenced type is valid and that all specified attributes are valid for that type. There is no value validation at this point.

In a networked setup, this phase happens entirely on the server. The output of this phase is a collection of very simplistic resources that closely resemble basic hashes.

Instantiation

This phase converts the simple hashes and arrays into Puppet library objects. Because this phase requires so much information about the client in order to work correctly (e.g., what type of packaging is used, what type of services, etc.), this phase happens entirely on the client.

The conversion from the simpler format into literal Puppet objects allows those objects to do greater validation on the inputs, and this is where most of the input validation takes place. If you specified a valid attribute but an invalid value, this is where you will find it out, meaning that you will find it out when the config is instantiated on the client, not (unfortunately) on the server.

The output of this phase is the machine’s entire configuration in memory and in a form capable of modifying the local system.

Configuration

This is where Puppet actually modifies the system. Each of resource instance compares its specified state to the state on the machine and make any modifications that are necessary. If the machine exactly matches the specified configuration, then no work is done.

The output of this phase is a correctly configured machine, in one pass.

Lower Level

These three high level phases can each be broken down into more steps.

Compile Phase 1: Parsing

Inputs: Manifests written in the Puppet language

Outputs: Parse trees (instances of AST objects)

Entry: Puppet::Parser::Parser#parse

At this point, all Puppet manifests start out as text documents, and it’s the parser’s job to understand those documents. The parser (defined in parser/grammar.ra and parser/lexer.rb) does very little work – it converts from text to a format that maps directly back to the text, building parse trees that are essentially equivalent to the text itself. The only validation that takes place here is syntactic.

This phase takes place immediately for all uses of Puppet. Whether you are using nodes or no nodes, whether you are using the standalone puppet interpreter or the client/server system, parsing happens as soon as Puppet starts.

Compile Phase 2: Interpreting

Inputs: Parse trees (instances of AST objects) and client information (collection of facts output by Facter)

Outputs: Trees of TransObject and TransBucket instances (from transportable.rb)

Entry: Puppet::Parser::AST#evaluate

Exit: Puppet::Parser::Scope#to_trans

Most configurations will rely on client information to make decisions. When the Puppet client starts, it loads the Facter library, collects all of the facts that it can, and passes those facts to the interpreter. When you use Puppet over a network, these facts are passed over the network to the server and the server uses them to compile the client’s configuration.

This step of passing information to the server enables the server to make decisions about the client based on things like operating system and hardware architecture, and it also enables the server to insert information about the client into the configuration, information like IP address and MAC address.

The interpreter combines the parse trees and the client information into a tree of simple transportable objects which maps roughly to the configuration as defined in the manifests – it is still a tree, but it is a tree of classes and the resources contained in those classes.

NODES VS. NO NODES

When you use Puppet, you have the option of using node resources or not. If you do not use node resources, then the entire configuration is interpreted every time a client connects, from the top of the parse tree down. In this case, you must have some kind of explicit selection mechanism for specifying which code goes with which node.

If you do use nodes, though, the interpreter precompiles everything except the node-specific code. When a node connects, the interpreter looks for the code associated with that node name (retrieved from the Facter facts) and compiles just that bit on demand.

Configuration Transport

Inputs: Transportable objects

Outputs: Transportable objects

Entry: Puppet::Network::Server::Master#getconfig

Exit: Puppet::Network::Client::Master#getconfig

If you are using the stand-alone puppet executable, there is no configuration transport because the client and server are in the same process. If you are using the networked puppetd client and puppetmasterd server, though, the configuration must be sent to the client once it is entirely compiled.

Puppet currently converts the Transportable objects to YAML, which it then CGI-escapes and sends over the wire using XMLRPC over HTTPS. The client receives the configuration, unescapes it, caches it to disk in case the server is not available on the next run, and then uses YAML to convert it back to normal Ruby Transportable objects.

Instantiation Phase

Inputs: Transportable objects

Outputs: Puppet::Type instances

Entry: Puppet::Network::Client::Master#run

Exit: Puppet::Transaction#initialize

To create Puppet library objects (all of which are instances of Puppet::Type subclasses), to_trans is called on the top-level transportable object. All container objects get converted to Puppet::Type::Component instances, and all normal objects get converted into the appropriate Puppet resource type instance.

This is where all input validation takes place and often where values get converted into more usable forms. For instance, filesystems always return user IDs, not user names, so Puppet objects convert them appropriately. (Incidentally, sometimes Puppet is creating the user that it's chowning a file to, so whenever possible it ignores validation errors until the last minute).

Once all of the resources are built in a graph-like tree of components and resources, this tree is converted to a GRATR graph. The graph is then passed to a new transaction instance.

Configuration Phase

Inputs: GRATR graph

Outputs: Transaction report

Entry: Puppet::Transaction#evaluate

Exit: Puppet::Transaction#generate_report

This is the phase in which all of the work is done, tightly controlled by a transaction.

RESOURCE GENERATION

Some resources manage other resource instances, such as recursive file operations. During this phase, any statically generatable resources are generated. These generated resources are then added to the resource graphs.

RELATIONSHIPS

The next stage of the configuration process builds a graph to model resource dependencies. One of the goals of the Puppet language is to make file order matter as little as possible; this means that a Puppet resource needs to be able to require other resources listed later in the manifest, which means that the required resource will be instantiated after the requiring resource. This dependency graph is then merged with the original resource graph to build a complete graph of all resources and all of their relationships.

EVALUATION

The transaction does a topological sort on the final relationship graph and iterates over the resulting list, evaluating each resource in turn. Each out-of-sync property on each resource results in a Puppet::StateChange object, which the transaction uses to tightly control what happens to the resource and when, and also to guarantee that logs are provided.

REPORTING

As the transaction progresses, it collects logs and metrics on what it does. At the end of evaluation, it turns this information into a report, which it sends to the server (if requested).

Conclusion

That’s the entire flow of how a Puppet manifest becomes a complete configuration. There is more to the Puppet system, such as FileBuckets, but those are more support staff rather than the main attraction.

Puppet Application Manpages

View documentation for each of the Puppet executables.

puppet agent Manual Page

NAME

`puppet-agent` -- The puppet agent daemon

SYNOPSIS

Retrieves the client configuration from the puppet master and applies it to the local host.

This service may be run as a daemon, run periodically using cron (or something similar), or run interactively for testing purposes.

USAGE

puppet agent [--certname name] [-D|--daemonize|--no-daemonize] [-d|--debug] [--detailed-exitcodes] [--digest digest] [--disable [message]] [--enable] [--fingerprint] [-h|--help] [-l|--logdest syslog|file|console] [--no-client] [--noop] [-o|--onetime] [--serve handler] [-t|--test] [-v|--verbose] [-V|--version] [-w|--waitforcert seconds]

DESCRIPTION

This is the main puppet client. Its job is to retrieve the local machine's configuration from a remote server and apply it. In order to successfully communicate with the remote server, the client must have a certificate signed by a certificate authority that the server trusts; the recommended method for this, at the moment, is to run a certificate authority as part of the puppet server (which is the default). The client will connect and request a signed certificate, and will continue connecting until it receives one.

Once the client has a signed certificate, it will retrieve its configuration and apply it.

USAGE NOTES

'puppet agent' does its best to find a compromise between interactive use and daemon use. Run with no arguments and no configuration, it will go into the background, attempt to get a signed certificate, and retrieve and apply its configuration every 30 minutes.

Some flags are meant specifically for interactive use -- in particular, 'test', 'tags' or 'fingerprint' are useful. 'test' enables verbose logging, causes the daemon to stay in the foreground, exits if the server's configuration is invalid (this happens if, for instance, you've left a syntax error on the server), and exits after running the configuration once (rather than hanging around as a long-running process).

'tags' allows you to specify what portions of a configuration you want to apply. Puppet elements are tagged with all of the class or definition names that contain them, and you can use the 'tags' flag to specify one of these names, causing only configuration elements contained within that class or definition to be applied. This is very useful when you are testing new configurations -- for instance, if you are just starting to manage 'ntpd', you would put all of the new elements into an 'ntpd' class, and call puppet with '--tags ntpd', which would only apply that small portion of the configuration during your testing, rather than applying the whole thing.

'fingerprint' is a one-time flag. In this mode 'puppet agent' will run once and display on the console (and in the log) the current certificate (or certificate request) fingerprint. Providing the '--digest' option allows to use a different digest algorithm to generate the fingerprint. The main use is to verify that before signing a certificate request on the master, the certificate request the master received is the same as the one the client sent (to prevent against man-in-the-middle attacks when signing certificates).

OPTIONS

Note that any configuration parameter that's valid in the configuration file is also a valid long argument. For example, 'server' is a valid configuration parameter, so you can specify '--server servername' as an argument.

See the configuration file documentation at http://docs.puppetlabs.com/references/stable/configuration.html for the full list of acceptable parameters. A commented list of all configuration options can also be generated by running puppet agent with '--genconfig'.

--certname

> Set the certname (unique ID) of the client. The master reads this unique identifying string, which is usually set to the node's fully-qualified domain name, to determine which configurations the node will receive. Use this option to debug setup problems or implement unusual node identification schemes.

--daemonize

> Send the process into the background. This is the default.

--no-daemonize

> Do not send the process into the background.

--debug

> Enable full debugging.

--detailed-exitcodes

> Provide transaction information via exit codes. If this is enabled, an exit code of '2' means there were changes, an exit code of '4' means there were failures during the transaction, and an exit code of '6' means there were both changes and failures.

--digest

> Change the certificate fingerprinting digest algorithm. The default is MD5. Valid values depends on the version of OpenSSL installed, but should always at least contain MD5, MD2, SHA1 and SHA256.

--disable

> Disable working on the local system. This puts a lock file in place, causing 'puppet agent' not to work on the system until the lock file is removed. This is useful if you are testing a configuration and do not want the central configuration to override the local state until everything is tested and committed.
>
> Disable can also take an optional message that will be reported by the 'puppet agent' at the next disabled run.
>
> 'puppet agent' uses the same lock file while it is running, so no more than one 'puppet agent' process is working at a time.
>
> 'puppet agent' exits after executing this.

--enable

> Enable working on the local system. This removes any lock file, causing 'puppet agent' to start managing the local system again (although it will continue to use its normal scheduling, so it might not start for another half hour).
>
> 'puppet agent' exits after executing this.

--fingerprint

> Display the current certificate or certificate signing request fingerprint and then exit. Use the '--digest' option to change the digest algorithm used.

--help

> Print this help message

--logdest

> Where to send messages. Choose between syslog, the console, and a log file. Defaults to sending messages to syslog, or the console if debugging or verbosity is enabled.

--no-client

> Do not create a config client. This will cause the daemon to run without ever checking for its configuration automatically, and only makes sense when puppet agent is being run with listen = true in puppet.conf or was started with the `--listen` option.

--noop

> Use 'noop' mode where the daemon runs in a no-op or dry-run mode. This is useful for seeing what changes Puppet will make without actually executing the changes.

--onetime

> Run the configuration once. Runs a single (normally daemonized) Puppet run. Useful for interactively running puppet agent when used in conjunction with the --no-daemonize option.

--serve

> Start another type of server. By default, 'puppet agent' will start a service handler that allows authenticated and authorized remote nodes to trigger the configuration to be pulled down and applied. You can specify any handler here that does not require configuration, e.g., filebucket, ca, or resource. The handlers are in 'lib/puppet/network/handler', and the names must match exactly, both in the call to 'serve' and in 'namespaceauth.conf'.

--test

> Enable the most common options used for testing. These are 'onetime', 'verbose', 'ignorecache', 'no-daemonize', 'no-usecacheonfailure', 'detailed-exit-codes', 'no-splay', and 'show_diff'.

--verbose

> Turn on verbose reporting.

--version

> Print the puppet version number and exit.

--waitforcert

> This option only matters for daemons that do not yet have certificates and it is enabled by default, with a value of 120 (seconds). This causes 'puppet agent' to connect to the server every 2 minutes and ask it to sign a certificate request. This is useful for the initial setup of a puppet client. You can turn off waiting for certificates by specifying a time of 0.

EXAMPLE

```
$ puppet agent --server puppet.domain.com
```

DIAGNOSTICS

Puppet agent accepts the following signals:

SIGHUP

> Restart the puppet agent daemon.

SIGINT and SIGTERM

> Shut down the puppet agent daemon.

SIGUSR1

> Immediately retrieve and apply configurations from the puppet master.

AUTHOR

Luke Kanies

COPYRIGHT

puppet apply Manual Page

NAME

`puppet-apply` – Apply Puppet manifests locally

SYNOPSIS

Applies a standalone Puppet manifest to the local system.

USAGE

puppet apply [-h|--help] [-V|--version] [-d|--debug] [-v|--verbose] [-e|--execute] [--detailed-exitcodes] [-l|--logdest file] [--apply catalog] [--catalog catalog] file

DESCRIPTION

This is the standalone puppet execution tool; use it to apply individual manifests.

When provided with a modulepath, via command line or config file, puppet apply can effectively mimic the catalog that would be served by puppet master with access to the same modules, although there are some subtle differences. When combined with scheduling and an automated system for pushing manifests, this can be used to implement a serverless Puppet site.

Most users should use 'puppet agent' and 'puppet master' for site-wide manifests.

OPTIONS

Note that any configuration parameter that's valid in the configuration file is also a valid long argument. For example, 'modulepath' is a valid configuration parameter, so you can specify '--tags class,tag' as an argument.

See the configuration file documentation at http://docs.puppetlabs.com/references/stable/configuration.html for the full list of acceptable parameters. A commented list of all configuration options can also be generated by running puppet with '--genconfig'.

--debug

> Enable full debugging.

--detailed-exitcodes

> Provide transaction information via exit codes. If this is enabled, an exit code of '2' means there were changes, an exit code of '4' means there were failures during the transaction, and an exit code of '6' means there were both changes and failures.

--help

> Print this help message

--loadclasses

> Load any stored classes. 'puppet agent' caches configured classes (usually at /etc/puppet/classes.txt), and setting this option causes all of those classes to be set in your puppet manifest.

--logdest

> Where to send messages. Choose between syslog, the console, and a log file. Defaults to sending messages to the console.

--execute

> Execute a specific piece of Puppet code

--verbose

> Print extra information.

--apply

> Apply a JSON catalog (such as one generated with 'puppet master --compile'). You can either specify a JSON file or pipe in JSON from standard input. Deprecated, please use --catalog instead.

--catalog

> Apply a JSON catalog (such as one generated with 'puppet master --compile'). You can either specify a JSON file or pipe in JSON from standard input.

EXAMPLE

```
$ puppet apply -l /tmp/manifest.log manifest.pp
$ puppet apply --modulepath=/root/dev/modules -e "include ntpd::server"
$ puppet apply --catalog catalog.json
```

AUTHOR

Luke Kanies

COPYRIGHT

puppet cert Manual Page

NAME

`puppet-cert` – Manage certificates and requests

SYNOPSIS

Standalone certificate authority. Capable of generating certificates, but mostly used for signing certificate requests from puppet clients.

USAGE

puppet cert action [-h|--help] [-V|--version] [-d|--debug] [-v|--verbose] [--digest digest] [host]

DESCRIPTION

Because the puppet master service defaults to not signing client certificate requests, this script is available for signing outstanding requests. It can be used to list outstanding requests and then either sign them individually or sign all of them.

ACTIONS

Every action except 'list' and 'generate' requires a hostname to act on, unless the '--all' option is set.

clean

> Revoke a host's certificate (if applicable) and remove all files related to that host from puppet cert's storage. This is useful when rebuilding hosts, since new certificate signing requests will only be honored if puppet cert does not have a copy of a signed certificate for that host. If '--all' is specified then all host certificates, both signed and unsigned, will be removed.

fingerprint

> Print the DIGEST (defaults to md5) fingerprint of a host's certificate.

generate

> Generate a certificate for a named client. A certificate/keypair will be generated for each client named on the command line.

list

> List outstanding certificate requests. If '--all' is specified, signed certificates are also listed, prefixed by '+', and revoked or invalid certificates are prefixed by '-' (the verification outcome is printed in parenthesis).

print

> Print the full-text version of a host's certificate.

revoke

> Revoke the certificate of a client. The certificate can be specified either by its serial number (given as a decimal number or a hexadecimal number prefixed by '0x') or by its hostname. The certificate is revoked by adding it to the Certificate Revocation List given by the 'cacrl' configuration option. Note that the puppet master needs to be restarted after revoking certificates.

sign

> Sign an outstanding certificate request.

verify

> Verify the named certificate against the local CA certificate.

OPTIONS

Note that any configuration parameter that's valid in the configuration file is also a valid long argument. For example, 'ssldir' is a valid configuration parameter, so you can specify '--ssldir directory' as an argument.

See the configuration file documentation at http://docs.puppetlabs.com/references/stable/configuration.html for the full list of acceptable parameters. A commented list of all configuration options can also be generated by running puppet cert with '--genconfig'.

--all

> Operate on all items. Currently only makes sense with the 'sign', 'clean', 'list', and 'fingerprint' actions.

--digest

> Set the digest for fingerprinting (defaults to md5). Valid values depends on your openssl and openssl ruby extension version, but should contain at least md5, sha1, md2, sha256.

--debug

> Enable full debugging.

--help

> Print this help message

--verbose

> Enable verbosity.

--version

> Print the puppet version number and exit.

EXAMPLE

```
$ puppet cert list
culain.madstop.com
$ puppet cert sign culain.madstop.com
```

AUTHOR

Luke Kanies

COPYRIGHT

Copyright (c) 2011 Puppet Labs, LLC Licensed under the Apache 2.0 License

puppet describe Manual Page

NAME

`puppet-describe` – Display help about resource types

SYNOPSIS

Prints help about Puppet resource types, providers, and metaparameters.

USAGE

puppet describe [-h|--help] [-s|--short] [-p|--providers] [-l|--list] [-m|--meta]

OPTIONS

--help

> Print this help text

--providers

> Describe providers in detail for each type

--list

> List all types

--meta

> List all metaparameters

--short

> List only parameters without detail

EXAMPLE

```
$ puppet describe --list
$ puppet describe file --providers
$ puppet describe user -s -m
```

AUTHOR

David Lutterkort

COPYRIGHT

Copyright (c) 2011 Puppet Labs, LLC Licensed under the Apache 2.0 License

puppet device Manual Page

NAME

`puppet-device` – Manage remote network devices

SYNOPSIS

Retrieves all configurations from the puppet master and apply them to the remote devices□ configured in /etc/puppet/device.conf.□

Currently must be run out periodically, using cron or something similar.

USAGE

puppet device [-d|--debug] [--detailed-exitcodes] [-V|--version]

```
            [-h|--help] [-l|--logdest syslog|<file>|console]
            [-v|--verbose] [-w|--waitforcert <seconds>]
```

DESCRIPTION

Once the client has a signed certificate for a given remote device, it will retrieve its configuration□ and apply it.

USAGE NOTES

One need a /etc/puppet/device.conf file with the following content:

[remote.device.fqdn] type type url url

where: * type: the current device type (the only value at this time is cisco) * url: an url allowing to connect to the device

Supported url must conforms to: scheme://user:password@hostname/?query

with: * scheme: either ssh or telnet * user: username, can be omitted depending on the switch/router configuration * password: the connection password * query: this is device specific. Cisco devices supports an enable parameter whose value would be the enable password.

OPTIONS

Note that any configuration parameter that's valid in the configuration file is also a valid long argument. For example, 'server' is a valid configuration parameter, so you can specify '--server servername' as an argument.

--debug

> Enable full debugging.

--detailed-exitcodes

> Provide transaction information via exit codes. If this is enabled, an exit code of '2' means there were changes, an exit code of '4' means there were failures during the transaction, and an exit code of '6' means there were both changes and failures.

--help

> Print this help message

--logdest

> Where to send messages. Choose between syslog, the console, and a log file. Defaults to sending messages to syslog, or the console if debugging or verbosity is enabled.

--verbose

> Turn on verbose reporting.

--waitforcert

> This option only matters for daemons that do not yet have certificates and it is enabled by default, with a value of 120 (seconds). This causes +puppet agent+ to connect to the server every 2 minutes and ask it to sign a certificate request. This is useful for the initial setup of a puppet client. You can turn off waiting for certificates by specifying a time of 0.

EXAMPLE

```
$ puppet device --server puppet.domain.com
```

AUTHOR

Brice Figureau

COPYRIGHT

Copyright (c) 2011 Puppet Labs, LLC Licensed under the Apache 2.0 License

puppet doc Manual Page

NAME

`puppet-doc` – Generate Puppet documentation and references

SYNOPSIS

Generates a reference for all Puppet types. Largely meant for internal Puppet Labs use.

USAGE

puppet doc [-a|--all] [-h|--help] [-o|--outputdir rdoc-outputdir] [-m|--mode text|pdf|rdoc] [-r|--reference reference-name] [--charset charset] [manifest-file]

DESCRIPTION

If mode is not 'rdoc', then this command generates a Markdown document describing all installed Puppet types or all allowable arguments to puppet executables. It is largely meant for internal use and is used to generate the reference document available on the Puppet Labs web site.

In 'rdoc' mode, this command generates an html RDoc hierarchy describing the manifests that are in 'manifestdir' and 'modulepath' configuration directives. The generated documentation directory is doc by default but can be changed with the 'outputdir' option.

If the command is run with the name of a manifest file as an argument, puppet doc will output a single manifest's documentation on stdout.

OPTIONS

--all

> Output the docs for all of the reference types. In 'rdoc' mode, this also outputs documentation for all resources.

--help

> Print this help message

--outputdir

> Used only in 'rdoc' mode. The directory to which the rdoc output should be written.

--mode

> Determine the output mode. Valid modes are 'text', 'pdf' and 'rdoc'. The 'pdf' mode creates PDF formatted files in the /tmp directory. The default mode is 'text'. In 'rdoc' mode you must provide 'manifests-path'

--reference

> Build a particular reference. Get a list of references by running 'puppet doc --list'.

--charset

> Used only in 'rdoc' mode. It sets the charset used in the html files produced.

--manifestdir

> Used only in 'rdoc' mode. The directory to scan for stand-alone manifests. If not supplied, puppet doc will use the manifestdir from puppet.conf.

--modulepath

> Used only in 'rdoc' mode. The directory or directories to scan for modules. If not supplied, puppet doc will use the modulepath from puppet.conf.

--environment

> Used only in 'rdoc' mode. The configuration environment from which to read the modulepath and manifestdir settings, when reading said settings from puppet.conf. Due to a known bug, this option is not currently effective.

EXAMPLE

```
$ puppet doc -r type > /tmp/type_reference.markdown
```

or

```
$ puppet doc --outputdir /tmp/rdoc --mode rdoc /path/to/manifests
```

or

```
$ puppet doc /etc/puppet/manifests/site.pp
```

or

```
$ puppet doc -m pdf -r configuration
```

AUTHOR

Luke Kanies

COPYRIGHT

puppet filebucket Manual Page

NAME

`puppet-filebucket` – Store and retrieve files in a filebucket

SYNOPSIS

A stand-alone Puppet filebucket client.

USAGE

puppet filebucket mode [-h|--help] [-V|--version] [-d|--debug] [-v|--verbose] [-l|--local] [-r|--remote] [-s|--server server] [-b|--bucket directory] file file ...

Puppet filebucket can operate in three modes, with only one mode per call:

backup: Send one or more files to the specified file bucket. Each sent file is printed with its resulting md5 sum.

get: Return the text associated with an md5 sum. The text is printed to stdout, and only one file can be retrieved at a time.

restore: Given a file path and an md5 sum, store the content associated with the sum into the specified file path. You can specify an entirely new path to this argument; you are not restricted to restoring the content to its original location.

DESCRIPTION

This is a stand-alone filebucket client for sending files to a local or central filebucket.

Note that 'filebucket' defaults to using a network-based filebucket available on the server named 'puppet'. To use this, you'll have to be running as a user with valid Puppet certificates. Alternatively, you can use your local file bucket by specifying '--local'.

OPTIONS

Note that any configuration parameter that's valid in the configuration file is also a valid long argument. For example, 'ssldir' is a valid configuration parameter, so you can specify '--ssldir directory' as an argument.

See the configuration file documentation at http://docs.puppetlabs.com/references/stable/configuration.html for the full list of acceptable parameters. A commented list of all configuration options can also be generated by running puppet with '--genconfig'.□

--debug

> Enable full debugging.

--help

> Print this help message

--local

> Use the local filebucket. This will use the default configuration information.□

--remote

> Use a remote filebucket. This will use the default configuration information.□

--server

> The server to send the file to, instead of locally.□

--verbose

> Print extra information.

--version

> Print version information.

EXAMPLE

```
$ puppet filebucket backup /etc/passwd
/etc/passwd: 429b225650b912a2ee067b0a4cf1e949
$ puppet filebucket restore /tmp/passwd 429b225650b912a2ee067b0a4cf1e949
```

AUTHOR

Luke Kanies

COPYRIGHT

puppet inspect Manual Page

NAME

`puppet-inspect` – Send an inspection report

SYNOPSIS

Prepares and submits an inspection report to the puppet master.

USAGE

puppet inspect [--archive_files] [--archive_file_server]

DESCRIPTION

This command uses the cached catalog from the previous run of 'puppet agent' to determine which attributes of which resources have been marked as auditable with the 'audit' metaparameter. It then examines the current state of the system, writes the state of the specified resource attributes to a report, and submits the report to the puppet master.

Puppet inspect does not run as a daemon, and must be run manually or from cron.

OPTIONS

Any configuration setting which is valid in the configuration file is also a valid long argument, e.g. '--server=master.domain.com'. See the configuration file documentation at http://docs.puppetlabs.com/references/latest/configuration.html for the full list of acceptable settings.

--archive_files

> During an inspect run, whether to archive files whose contents are audited to a file bucket.

--archive_file_server

> During an inspect run, the file bucket server to archive files to if archive_files is set. The default value is '$server'.

AUTHOR

Puppet Labs

COPYRIGHT

Copyright (c) 2011 Puppet Labs, LLC Licensed under the Apache 2.0 License

puppet kick Manual Page

NAME

`puppet-kick` – Remotely control puppet agent

SYNOPSIS

Trigger a puppet agent run on a set of hosts.

USAGE

puppet kick [-a|--all] [-c|--class class] [-d|--debug] [-f|--foreground] [-h|--help] [--host host] [--no-fqdn] [--ignoreschedules] [-t|--tag tag] [--test] [-p|--ping] host [host [...]]

DESCRIPTION

This script can be used to connect to a set of machines running 'puppet agent' and trigger them to run their configurations. The most common usage would be to specify a class of hosts and a set of tags, and 'puppet kick' would look up in LDAP all of the hosts matching that class, then connect to each host and trigger a run of all of the objects with the specified tags.

If you are not storing your host configurations in LDAP, you can specify hosts manually.

You will most likely have to run 'puppet kick' as root to get access to the SSL certificates.

'puppet kick' reads 'puppet master''s configuration file, so that it can copy things like LDAP settings.

USAGE NOTES

Puppet kick is useless unless puppet agent is listening for incoming connections and allowing access to the `run` endpoint. This entails starting the agent with `listen = true` in its puppet.conf file, and allowing access to the `/run` path in its auth.conf file; see `http://docs.puppetlabs.com/guides/rest_auth_conf.html` for more details.

Additionally, due to a known bug, you must make sure a namespaceauth.conf file exists in puppet agent's $confdir. This file will not be consulted, and may be left empty.

OPTIONS

Note that any configuration parameter that's valid in the configuration file is also a valid long argument. For example, 'ssldir' is a valid configuration parameter, so you can specify '--ssldir directory' as an argument.

See the configuration file documentation at http://docs.puppetlabs.com/references/latest/configuration.html for the full list of acceptable parameters. A commented list of all configuration options can also be generated by running puppet master with '--genconfig'.

--all

> Connect to all available hosts. Requires LDAP support at this point.

--class

> Specify a class of machines to which to connect. This only works if you have LDAP configured, at the moment.

--debug

> Enable full debugging.

--foreground

> Run each configuration in the foreground; that is, when connecting to a host, do not return until the host has finished its run. The default is false.

--help

> Print this help message

--host

> A specific host to which to connect. This flag can be specified more than once.

--ignoreschedules

> Whether the client should ignore schedules when running its configuration. This can be used to force the client to perform work it would not normally perform so soon. The default is false.

--parallel

> How parallel to make the connections. Parallelization is provided by forking for each client to which to connect. The default is 1, meaning serial execution.

--tag

> Specify a tag for selecting the objects to apply. Does not work with the --test option.

--test

> Print the hosts you would connect to but do not actually connect. This option requires LDAP support at this point.

--ping

> Do a ICMP echo against the target host. Skip hosts that don't respond to ping.

EXAMPLE

```
$ sudo puppet kick -p 10 -t remotefile -t webserver host1 host2
```

AUTHOR

Luke Kanies

COPYRIGHT

puppet master Manual Page

NAME

`puppet-master` – The puppet master daemon

SYNOPSIS

The central puppet server. Functions as a certificate authority by default.

USAGE

puppet master [-D|--daemonize|--no-daemonize] [-d|--debug] [-h|--help] [-l|--logdest file|console|syslog] [-v|--verbose] [-V|--version] [--compile node-name]

DESCRIPTION

This command starts an instance of puppet master, running as a daemon and using Ruby's built-in Webrick webserver. Puppet master can also be managed by other application servers; when this is the case, this executable is not used.

OPTIONS

Note that any configuration parameter that's valid in the configuration file is also a valid long argument. For example, 'ssldir' is a valid configuration parameter, so you can specify '--ssldir directory' as an argument.

See the configuration file documentation at http://docs.puppetlabs.com/references/stable/configuration.html for the full list of acceptable parameters. A commented list of all configuration options can also be generated by running puppet master with '--genconfig'.

--daemonize

> Send the process into the background. This is the default.

--no-daemonize

> Do not send the process into the background.

--debug

> Enable full debugging.

--help

> Print this help message.

--logdest

> Where to send messages. Choose between syslog, the console, and a log file. Defaults to sending messages to syslog, or the console if debugging or verbosity is enabled.

--verbose

> Enable verbosity.

--version

> Print the puppet version number and exit.

--compile

> Compile a catalogue and output it in JSON from the puppet master. Uses facts contained in the $vardir/yaml/ directory to compile the catalog.

EXAMPLE

puppet master

DIAGNOSTICS

When running as a standalone daemon, puppet master accepts the following signals:

SIGHUP

> Restart the puppet master server.

SIGINT and SIGTERM

> Shut down the puppet master server.

AUTHOR

Luke Kanies

COPYRIGHT

Copyright (c) 2011 Puppet Labs, LLC Licensed under the Apache 2.0 License

puppet queue Manual Page

NAME

`puppet-queue` – Queuing daemon for asynchronous storeconfigs

SYNOPSIS

Retrieves serialized storeconfigs records from a queue and processes them in order.

USAGE

puppet queue [-d|--debug] [-v|--verbose]

DESCRIPTION

This application runs as a daemon and processes storeconfigs data, retrieving the data from a stomp server message queue and writing it to a database.

For more information, including instructions for properly setting up your puppet master and message queue, see the documentation on setting up asynchronous storeconfigs at: http://projects.puppetlabs.com/projects/1/wiki/Using_Stored_Configuration

OPTIONS

Note that any configuration parameter that's valid in the configuration file is also a valid long argument. For example, 'server' is a valid configuration parameter, so you can specify '--server servername' as an argument.

See the configuration file documentation at http://docs.puppetlabs.com/references/stable/configuration.html for the full list of acceptable parameters. A commented list of all configuration options can also be generated by running puppet queue with '--genconfig'.

--debug

> Enable full debugging.

--help

> Print this help message

--verbose

> Turn on verbose reporting.

--version

> Print the puppet version number and exit.

EXAMPLE

```
$ puppet queue
```

AUTHOR

Luke Kanies

COPYRIGHT

Copyright (c) 2011 Puppet Labs, LLC Licensed under the Apache 2.0 License

puppet resource Manual Page

NAME

`puppet-resource` – The resource abstraction layer shell

SYNOPSIS

Uses the Puppet RAL to directly interact with the system.

USAGE

puppet resource [-h|--help] [-d|--debug] [-v|--verbose] [-e|--edit] [-H|--host host] [-p|--param parameter] [-t|--types] type [name] [attribute=value ...]

DESCRIPTION

This command provides simple facilities for converting current system state into Puppet code, along with some ability to modify the current state using Puppet's RAL.

By default, you must at least provide a type to list, in which case puppet resource will tell you everything it knows about all resources of that type. You can optionally specify an instance name, and puppet resource will only describe that single instance.

If given a type, a name, and a series of attribute=value pairs, puppet resource will modify the state of the specified resource. Alternately, if given a type, a name, and the '--edit' flag, puppet resource will write its output to a file, open that file in an editor, and then apply the saved file as a Puppet transaction.

OPTIONS

Note that any configuration parameter that's valid in the configuration file is also a valid long argument. For example, 'ssldir' is a valid configuration parameter, so you can specify '--ssldir directory' as an argument.

See the configuration file documentation at http://docs.puppetlabs.com/references/stable/configuration.html for the full list of acceptable parameters. A commented list of all configuration options can also be generated by running puppet with '--genconfig'.

--debug

> Enable full debugging.

--edit

> Write the results of the query to a file, open the file in an editor, and read the file back in as an executable Puppet manifest.

--host

> When specified, connect to the resource server on the named host and retrieve the list of resouces of the type specified.

--help

> Print this help message.

--param

> Add more parameters to be outputted from queries.

--types

> List all available types.

--verbose

> Print extra information.

EXAMPLE

This example uses `puppet resource` to return a Puppet configuration for the user `luke`:

```
$ puppet resource user luke
user { 'luke':
 home => '/home/luke',
 uid => '100',
 ensure => 'present',
 comment => 'Luke Kanies,,,',
 gid => '1000',
 shell => '/bin/bash',
 groups => ['sysadmin','audio','video','puppet']
}
```

AUTHOR

Luke Kanies

COPYRIGHT

Copyright (c) 2011 Puppet Labs, LLC Licensed under the Apache 2.0 License

Puppet Module Manual Page

NAME

`puppet-module` – Creates, installs and searches for modules on the Puppet Forge.

SYNOPSIS

puppet module action

DESCRIPTION

This subcommand can find, install, and manage modules from the Puppet Forge, a repository of user-contributed Puppet code. It can also generate empty modules, and prepare locally developed modules for release on the Forge.

OPTIONS

Note that any configuration parameter that's valid in the configuration file is also a valid long argument, although it may or may not be relevant to the present action. For example, `server` is a valid configuration parameter, so you can specify `--server <servername>` as an argument.

See the configuration file documentation at http://docs.puppetlabs.com/references/stable/configuration.html for the full list of acceptable parameters. A commented list of all configuration options can also be generated by running puppet with `--genconfig`.

--mode MODE

> The run mode to use for the current action. Valid modes are `user`, `agent`, and `master`.

--render-as FORMAT

> The format in which to render output. The most common formats are `json`, `s` (string), `yaml`, and `console`, but other options such as `dot` are sometimes available.

--verbose

> Whether to log verbosely.

--debug

> Whether to log debug information.

ACTIONS

`build` - Build a module release package.

> `SYNOPSIS`
>
> puppet module build path
>
> `DESCRIPTION`
>
> Prepares a local module for release on the Puppet Forge by building a ready-to-upload archive file. Before using this action, make sure that the module directory's name is in the standard username-module format.
>
> This action uses the Modulefile in the module directory to set metadata used by the Forge. See http://links.puppetlabs.com/modulefile for more about writing modulefiles.
>
> After being built, the release archive file can be found in the module's `pkg` directory.
>
> `RETURNS`
>
> Pathname object representing the path to the release archive.

`changes` - Show modified files of an installed module.

> `SYNOPSIS`

> puppet module changes path
>
> `DESCRIPTION`
>
> Shows any files in a module that have been modified since it was installed. This action compares the files on disk to the md5 checksums included in the module's metadata.
>
> `RETURNS`
>
> Array of strings representing paths of modified files.

`clean` - **Clean the module download cache.**

> `SYNOPSIS`
>
> puppet module clean
>
> `DESCRIPTION`
>
> Cleans the module download cache.
>
> `RETURNS`
>
> A status Hash:
>
> { :status => "success", :msg => "Cleaned module cache." }

`generate` - **Generate boilerplate for a new module.**

> `SYNOPSIS`
>
> puppet module generate name
>
> `DESCRIPTION`
>
> Generates boilerplate for a new module by creating the directory structure and files recommended for the Puppet community's best practices.
>
> A module may need additional directories beyond this boilerplate if it provides plugins, files, or templates.
>
> `RETURNS`
>
> Array of Pathname objects representing paths of generated files.

`install` - **Install a module from a repository or release archive.**

> `SYNOPSIS`
>
> puppet module install [--force | -f] [--dir DIR | -i DIR] [--module-repository REPO | -r REPO] [--ignore-dependencies] [--modulepath MODULEPATH] [--version VER | -v VER] name
>
> `DESCRIPTION`
>
> Installs a module from the Puppet Forge, from a release archive file on-disk, or from a private

> Forge-like repository.
>
> The specified module will be installed into the directory specified with the --dir option, which defaults to /Users/nick/Documents/modules.
>
> `OPTIONS`
>
> --dir DIR | -i DIR - The directory into which modules are installed; defaults to the first directory in the modulepath. Explicitly setting this option will re-set the modulepath; if you need the install to check for dependencies in other directories, you must set the --modulepath option on the command line.
>
> --force | -f - Force overwrite of existing module, if any.
>
> --ignore-dependencies - Do not attempt to install dependencies
>
> --module-repository REPO | -r REPO - The module repository to use, as a URL. Defaults to http://forge.puppetlabs.com.
>
> --modulepath MODULEPATH - The directory into which modules are installed; defaults to the first directory in the modulepath. If the dir option is also given, it is prepended to the modulepath.
>
> --version VER | -v VER - Module version to install; can be an exact version or a requirement string, eg '>= 1.0.3'. Defaults to latest version.
>
> `RETURNS`
>
> Pathname object representing the path to the installed module.

`list` - List installed modules

> `SYNOPSIS`
>
> puppet module list [--env ENVIRONMENT] [--modulepath MODULEPATH] [--tree]
>
> `DESCRIPTION`
>
> Lists the installed puppet modules. By default, this action scans the modulepath from puppet.conf's `[main]` block; use the --modulepath option to change which directories are scanned.
>
> The output of this action includes information from the module's metadata, including version numbers and unmet module dependencies.
>
> `OPTIONS`
>
> --env ENVIRONMENT - Which environments' modules to list
>
> --modulepath MODULEPATH - Which directories to look for modules in; use the system path separator character (`:` on Unix-like systems) to specify multiple directories.
>
> --tree - Whether to show dependencies as a tree view

> `RETURNS`
>
> hash of paths to module objects

`search` - Search a repository for a module.

> `SYNOPSIS`
>
> puppet module search [--module-repository= | -r=] search_term
>
> `DESCRIPTION`
>
> Searches a repository for modules whose names, descriptions, or keywords match the provided search term.
>
> `OPTIONS`
>
> --module-repository= | -r= - The module repository to use. Defaults to http://forge.puppetlabs.com.
>
> `RETURNS`
>
> Array of module metadata hashes

`uninstall` - Uninstall a puppet module.

> `SYNOPSIS`
>
> puppet module uninstall [--force | -f] [--environment=NAME | --env=NAME] [--version=] [--modulepath=] name
>
> `DESCRIPTION`
>
> Uninstalls a puppet module from the modulepath (or a specific target directory).□
>
> `OPTIONS`
>
> --environment=NAME | --env=NAME - The target environment to search for modules.
>
> --force | -f - Force the uninstall of an installed module even if there are local changes or the possibility of causing broken dependencies.
>
> --modulepath= - The target directory to search for modules.
>
> --version= - The version of the module to uninstall. When using this option a module that matches the specified version must be installed or an error is raised.□
>
> `RETURNS`
>
> Hash of module objects representing uninstalled modules and related errors.

`upgrade` - Upgrade a puppet module.

> `SYNOPSIS`

> puppet module upgrade [--force | -f] [--ignore-dependencies] [--environment=NAME | --env=NAME] [--version=] name
>
> `DESCRIPTION`
>
> Upgrades a puppet module.
>
> `OPTIONS`
>
> --environment=NAME | --env=NAME - The target environment to search for modules.
>
> --force | -f - Force the upgrade of an installed module even if there are local changes or the possibility of causing broken dependencies.
>
> --ignore-dependencies - Do not attempt to install dependencies
>
> --version= - The version of the module to upgrade to.
>
> `RETURNS`
>
> Hash

EXAMPLES

`build`

Build a module release:

$ puppet module build puppetlabs-apache notice: Building /Users/kelseyhightower/puppetlabs-apache for release puppetlabs-apache/pkg/puppetlabs-apache-0.0.1.tar.gz

`changes`

Show modified files of an installed module:□

$ puppet module changes /etc/puppet/modules/vcsrepo/ warning: 1 files modified□ lib/puppet/provider/vcsrepo.rb

`clean`

Clean the module download cache:

$ puppet module clean Cleaned module cache.

`generate`

Generate a new module in the current directory:

$ puppet module generate puppetlabs-ssh notice: Generating module at /Users/kelseyhightower/puppetlabs-ssh puppetlabs-ssh puppetlabs-ssh/tests puppetlabs-ssh/tests/init.pp puppetlabs-ssh/spec puppetlabs-ssh/spec/spec_helper.rb puppetlabs-ssh/spec/spec.opts puppetlabs-ssh/README puppetlabs-ssh/Modulefile puppetlabs-□ ssh/metadata.json puppetlabs-ssh/manifests puppetlabs-ssh/manifests/init.pp `install`

Install a module from the default repository:

$ puppet module install puppetlabs/vcsrepo notice: Installing puppetlabs-vcsrepo-0.0.4.tar.gz to /etc/puppet/modules/vcsrepo

Install a specific module version from a repository:□

$ puppet module install puppetlabs/vcsrepo -v 0.0.4 notice: Installing puppetlabs-vcsrepo-0.0.4.tar.gz to /etc/puppet/modules/vcsrepo

Install a module into a specific directory:□

$ puppet module install puppetlabs/vcsrepo --dir=/usr/share/puppet/modules notice: Installing puppetlabs-vcsrepo-0.0.4.tar.gz to /usr/share/puppet/modules/vcsrepo

Install a module into a specific directory and check for dependencies in other directories:□

$ puppet module install puppetlabs/vcsrepo --dir=/usr/share/puppet/modules --modulepath /etc/puppet/modules notice: Installing puppetlabs-vcsrepo-0.0.4.tar.gz to /usr/share/puppet/modules/vcsrepo Install a module from a release archive:

$ puppet module install puppetlabs-vcsrepo-0.0.4.tar.gz notice: Installing puppetlabs-vcsrepo-0.0.4.tar.gz to /etc/puppet/modules/vcsrepo

`list`

List installed modules:

$ puppet module list /etc/puppet/modules ├── bodepd-create_resources (v0.0.1) ├── puppetlabs-bacula (v0.0.2) ├── puppetlabs-mysql (v0.0.1) ├── puppetlabs-sqlite (v0.0.1) └── puppetlabs-stdlib (v2.2.1) /usr/share/puppet/modules (no modules installed)

List installed modules in a tree view:

$ puppet module list --tree /etc/puppet/modules └─┬ puppetlabs-bacula (v0.0.2)

```
  ├── puppetlabs-stdlib (v2.2.1)
  ├─┬ puppetlabs-mysql (v0.0.1)
  │ └── bodepd-create_resources (v0.0.1)
  └── puppetlabs-sqlite (v0.0.1)
```

/usr/share/puppet/modules (no modules installed)

List installed modules from a specified environment:□

$ puppet module list --env 'production' /etc/puppet/modules ├── bodepd-create_resources (v0.0.1) ├── puppetlabs-bacula (v0.0.2) ├── puppetlabs-mysql (v0.0.1) ├── puppetlabs-sqlite (v0.0.1) └── puppetlabs-stdlib (v2.2.1) /usr/share/puppet/modules (no modules installed)

List installed modules from a specified modulepath:□

$ puppet module list --modulepath /usr/share/puppet/modules /usr/share/puppet/modules (no modules installed)

`search`

Search the default repository for a module:

```
$ puppet module search puppetlabs NAME DESCRIPTION AUTHOR KEYWORDS bacula This is a generic Apache module @puppetlabs backups
```

`uninstall`

Uninstall a module from all directories in the modulepath:

```
$ puppet module uninstall ssh Removed /etc/puppet/modules/ssh (v1.0.0)
```

Uninstall a module from a specific directory:□

```
$ puppet module uninstall --modulepath /usr/share/puppet/modules ssh Removed /usr/share/puppet/modules/ssh (v1.0.0)
```

Uninstall a module from a specific environment:□

```
$ puppet module uninstall --environment development Removed /etc/puppet/environments/development/modules/ssh (v1.0.0)
```

Uninstall a specific version of a module:□

```
$ puppet module uninstall --version 2.0.0 ssh Removed /etc/puppet/modules/ssh (v2.0.0)
```

`upgrade`

upgrade an installed module to the latest version

```
$ puppet module upgrade puppetlabs-apache /etc/puppet/modules └── puppetlabs-apache (v1.0.0 -> v2.4.0)
```

upgrade an installed module to a specific version□

```
$ puppet module upgrade puppetlabs-apache --version 2.1.0 /etc/puppet/modules └── puppetlabs-apache (v1.0.0 -> v2.1.0)
```

upgrade an installed module for a specific environment□

```
$ puppet module upgrade puppetlabs-apache --env test /usr/share/puppet/environments/test/modules └── puppetlabs-apache (v1.0.0 -> v2.4.0)
```

COPYRIGHT AND LICENSE

Copyright 2011 by Puppet Labs Apache 2 license; see COPYING

HTTP API

Both puppet master and puppet agent have pseudo-RESTful HTTP API’s that they use to communicate. The basic structure of the url to access this API is

```
https://yourpuppetmaster:8140/{environment}/{resource}/{key}
https://yourpuppetclient:8139/{environment}/{resource}/{key}
```

Details about what resources are available and the formats they return are below.

HTTP API Security

Puppet usually takes care of security and SSL certificate management for you, but if you want to use the HTTP API outside of that you'll need to manage certificates yourself when you connect. This can be done by using a pre-existing signed agent certificate, by generating and signing a certificate on the puppet master and manually distributing it to the connecting host, or by re-implementing puppet agent's generate / submit signing request / received signed certificate behavior in your custom app.

The security policy for the HTTP API can be controlled through the `rest_authconfig` file. For testing purposes, it is also possible to permit unauthenticated connections from all hosts or a subset of hosts; see the `rest_authconfig` documentation for more details.

Testing the HTTP API using curl

An example of how you can use the HTTP API to retrieve the catalog for a node can be seen using curl.

```
curl --cert /etc/puppet/ssl/certs/mymachine.pem --key
/etc/puppet/ssl/private_keys/mymachine.pem --cacert
/etc/puppet/ssl/ca/ca_crt.pem -H 'Accept: yaml'
https://puppetmaster:8140/production/catalog/mymachine
```

Most of this command consists of pointing curl to the appropriate SSL certificates, which will be different depending on your ssldir location and your node's certname. For simplicity and brevity, future invocations of curl will be provided in insecure mode, which is specified with the `-k` or `--insecure` flag. Insecure connections can be enabled for one or more nodes in the `rest_authconfig` file. The above curl invocation without certificates would be as follows:

```
curl --insecure -H 'Accept: yaml'
https://puppetmaster:8140/production/catalog/mymachine
```

Basically we just send a header specifying the format or formats we want back, and the HTTP URI for getting a catalog for mymachine in the production environment. Here's a snippet of the output you might get back:

```
--- &id001 !ruby/object:Puppet::Resource::Catalog
  aliases: {}
    applying: false
      classes: []
      ...
```

Another example to get back the CA Certificate of the puppetmaster doesn’t require you to be authenticated with your own signed SSL Certificates, since that’s something you would need before you authenticate.

```
curl --insecure -H 'Accept: s'
https://puppetmaster:8140/production/certificate/ca

-----BEGIN CERTIFICATE-----
MIICHTCCAYagAwIBAgIBATANBgkqhkiG9w0BAQUFADAXMRUwEwYDVQQDDAxwdXBw
```

The master and agent shared API

Resources

Returns a list of resources, like executing `puppet resource` (`ralsh`) on the command line.

GET `/{environment}/resource/{resource_type}/{resource_name}`

GET `/{environment}/resources/{resource_type}`

Example:

```
curl -k -H "Accept: yaml"
https://puppetmaster:8140/production/resource/user/puppet
curl -k -H "Accept: yaml" https://puppetclient:8139/production/resources/user
```

Certificate

Get a certficate or the master’s CA certificate.

GET `/certificate/{ca, other}`

Example:

```
curl -k -H "Accept: s" https://puppetmaster:8140/production/certificate/ca
curl -k -H "Accept: s"
https://puppetclient:8139/production/certificate/puppetclient
```

The master HTTP API

A valid and signed certificate is required to retrieve these resources.

Catalogs

Get a catalog from the node.

GET `/{environment}/catalog/{node certificate name}`

Example:

```
curl -k -H "Accept: pson" https://puppetmaster:8140/production/catalog/myclient
```

Certificate Revocation List

Get the certificate revocation list.

GET `/certificate_revocation_list/ca`

Example:

```
curl -k -H "Accept: s"
https://puppetmaster:8140/production/certificate_revocation_list/ca
```

Certificate Request

Retrieve or save certificate requests.

GET `/{environment}/certificate_requests/no_key`

GET `/{environment}/certificate_request/{node certificate name}`

PUT `/{environment}/certificate_request/no_key`

Example:

```
curl -k -H "Accept: yaml"
https://puppetmaster:8140/production/certificate_requests/all
curl -k -H "Accept: yaml"
https://puppetmaster:8140/production/certificate_request/{agent certname}
curl -k -X PUT -H "Content-Type: text/plain" --data-binary @cert_request.csr
https://puppetmaster:8140/production/certificate_request/no_key
```

To manually generate a CSR from an existing private key:

```
openssl req -new -key private_key.pem -subj "/CN={node certname}" -out
request.csr
```

The subject can only include a /CN=, nothing else. Puppet master will determine the certname from the body of the cert, so the request can be pointed to any key for this endpoint.

Certificate Status

Puppet 2.7.0 and later.

Read or alter the status of a certificate or pending certificate request. This endpoint is roughly equivalent to the puppet cert command; rather than returning complete certificates, signing requests, or revocation lists, this endpoint returns information about the various certificates (and potential and former certificates) known to the CA.

GET `/{environment}/certificate_status/{certname}`

Retrieve a PSON hash containing information about the specified host's certificate. Similar to `puppet cert --list {certname}`.

GET `/{environment}/certificate_statuses/no_key`

Retrieve a list of PSON hashes containing information about all known certificates. Similar to `puppet cert --list --all`.

PUT `/{environment}/certificate_status/{certname}`

Change the status of the specified host's certificate. The desired state is sent in the body of the PUT request as a one-item PSON hash; the two allowed complete hashes are `{"desired_state":"signed"}` (for signing a certificate signing request; similar to `puppet cert --sign`) and `{"desired_state":"revoked"}` (for revoking a certificate; similar to `puppet cert --revoke`); see examples below for details.

When revoking certificates, you may wish to use a DELETE request instead, which will also clean up other info about the host.

DELETE `/{environment}/certificate_status/{hostname}`

Cause the certificate authority to discard all SSL information regarding a host (including any certificates, certificate requests, and keys). This does not revoke the certificate if one is present; if you wish to emulate the behavior of `puppet cert --clean`, you must PUT a `desired_state` of revoked before deleting the host's SSL information.

Examples:

```
curl -k -H "Accept: pson"
https://puppetmaster:8140/production/certificate_status/testnode.localdomain
curl -k -H "Accept: pson"
https://puppetmaster:8140/production/certificate_statuses/all
curl -k -X PUT -H "Content-Type: text/pson" --data '{"desired_state":"signed"}'
https://puppetmaster:8140/production/certificate_status/client.network.address
curl -k -X PUT -H "Content-Type: text/pson" --data
'{"desired_state":"revoked"}'
https://puppetmaster:8140/production/certificate_status/client.network.address
curl -k -X DELETE -H "Accept: pson"
https://puppetmaster:8140/production/certificate_status/client.network.address
```

Reports

Submit a report.

PUT `/{environment}/report/{node certificate name}`

Example:

```
curl -k -X PUT -H "Content-Type: text/yaml" -d "{key:value}"
https://puppetclient:8139/production/report/puppetclient
```

Resource Types

Return a list of resources from the master

GET `/{environment}/resource_type/{hostclass,definition,node}`

GET `/{environment}/resource_types/*`

Example:

```
curl -k -H "Accept: yaml"
https://puppetmaster:8140/production/resource_type/puppetclient
curl -k -H "Accept: yaml" https://puppetmaster:8140/production/resource_types/*
```

File Bucket

Get or put a file into the file bucket.

GET `/{environment}/file_bucket_file/md5/{checksum}`

PUT `/{environment}/file_bucket_file/md5/{checksum}`

GET `/{environment}/file_bucket_file/md5/{checksum}?diff_with={checksum}` (diff 2 files; Puppet 2.6.5 and later)

HEAD `/{environment}/file_bucket_file/md5/{checksum}` (determine if a file is present; Puppet 2.6.5 and later)

Examples:

```
curl -k -H "Accept: s"
https://puppetmaster:8140/production/file_bucket_file/md5/e30d4d879e34f64e33c10377

curl -k -X PUT -H "Content-Type: text/plain" Accept: s"
https://puppetmaster:8140/production/file_bucket_file/md5/e30d4d879e34f64e33c10377
--data-binary @foo.txt
curl -k -H "Accept: s"
https://puppetmaster:8140/production/file_bucket_file/md5/e30d4d879e34f64e33c10377
diff_with=6572b5dc4c56366aaa36d996969a8885
curl -k -I -H "Accept: s"
https://puppetmaster:8140/production/file_bucket_file/md5/e30d4d879e34f64e33c10377
```

File Server

Get a file from the file server.

GET `/file_{metadata, content}/{file}`

File serving is covered in more depth in the fileserver configuration documentation

Node

Returns the Puppet::Node information (including facts) for the specified node

GET `/{environment}/node/{node certificate name}`

Example:

```
curl -k -H "Accept: yaml"
https://puppetmaster:8140/production/node/puppetclient
```

Status

Just used for testing

GET `/{environment}/status/no_key`

Example:

```
curl -k -H "Accept: pson"
https://puppetmaster:8140/production/status/puppetclient
```

Facts

GET `/{environment}/facts/{node certname}`

```
curl -k -H "Accept: yaml" https://puppetmaster:8140/production/facts/{node
certname}
```

PUT `/{environment}/facts/{node certname}`

```
curl -k -X PUT -H 'Content-Type: text/yaml' --data-binary
@/var/lib/puppet/yaml/facts/hostname.yaml
https://localhost:8140/production/facts/{node certname}
```

Facts Search

GET `/{environment}/facts_search/search?{facts search string}`

```
curl -k -H "Accept: pson"
https://puppetmaster:8140/production/facts_search/search?
facts.processorcount.ge=2&facts.operatingsystem=Ubuntu
```

Facts search strings are constructed as a series of terms separated by `&`; if there is more than one term, the search combines the terms with boolean AND. There is currently no API for searching with boolean OR. Each term is composed as follows:

```
facts.{name of fact}.{comparison type}={string for comparison}
```

If you leave off the `.{comparison type}`, the comparison will default to simple equality. The following comparison types are available:

STRING/GENERAL COMPARISON

- `eq` — `==` (default)
- `ne` — `!=`

NUMERIC COMPARISON

- `lt` — `<`
- `le` — `<=`
- `gt` — `>`
- `ge` — `>=`

The agent HTTP API

By default, puppet agent is set not to listen to HTTP requests. To enable this you must set `listen = true` in the puppet.conf or pass `--listen true` to puppet agent when starting. Due to a known bug in the 2.6.x releases of Puppet, puppet agent will not start with `listen = true` unless a namespaceauth.conf file exists, even though this file is not consulted. The node's rest_authconfig file must also allow access to the agent's resources, which isn't permitted by default.

Facts

GET `/{environment}/facts/no_key`

Example:

```
curl -k -H "Accept: yaml" https://puppetclient:8139/production/facts/no_key
```

Run

Cause the client to update like puppetrun or puppet kick

PUT `/{environment}/run/no_key`

Example:

```
curl -k -X PUT -H "Content-Type: text/pson" -d "{}"
https://puppetclient:8139/production/run/no_key
```

Type Reference

Type Reference

This page is autogenerated; any changes will get overwritten (last generated on Tue Jun 18 16:59:01 -0700 2013)

Resource Types

- The namevar is the parameter used to uniquely identify a type instance. This is the parameter that gets assigned when a string is provided before the colon in a type declaration. In general, only developers will need to worry about which parameter is the `namevar`.

  In the following code:

  ```
  file { "/etc/passwd":
    owner => root,
    group => root,
    mode  => 644
  }
  ```

  `/etc/passwd` is considered the title of the file object (used for things like dependency handling), and because `path` is the namevar for `file`, that string is assigned to the `path` parameter.

- Parameters determine the specific configuration of the instance. They either directly modify the system (internally, these are called properties) or they affect how the instance behaves (e.g., adding a search path for `exec` instances or determining recursion on `file` instances).

- Providers provide low-level functionality for a given resource type. This is usually in the form of calling out to external commands.

  When required binaries are specified for providers, fully qualifed paths indicate that the binary must exist at that specific path and unqualified binaries indicate that Puppet will search for the binary using the shell path.

- Features are abilities that some providers might not support. You can use the list of supported features to determine how a given provider can be used.

  Resource types define features they can use, and providers can be tested to see which features they provide.

---

augeas

Apply a change or an array of changes to the filesystem using the augeas tool.

Requires:

- Augeas
- The ruby-augeas bindings

Sample usage with a string:

```
augeas{"test1" :
  context => "/files/etc/sysconfig/firstboot",
  changes => "set RUN_FIRSTBOOT YES",
  onlyif  => "match other_value size > 0",
}
```

Sample usage with an array and custom lenses:

```
augeas{"jboss_conf":
  context   => "/files",
  changes   => [
      "set etc/jbossas/jbossas.conf/JBOSS_IP $ipaddress",
      "set etc/jbossas/jbossas.conf/JAVA_HOME /usr",
    ],
  load_path => "$/usr/share/jbossas/lenses",
}
```

FEATURES

- execute_changes: Actually make the changes
- need_to_run?: If the command should run
- parse_commands: Parse the command string

Provider	execute changes	need to run?	parse commands
augeas	X	X	X

PARAMETERS

changes

> The changes which should be applied to the filesystem. This can be a command or an array□ of commands. The following commands are supported:
>
> `set <PATH> <VALUE>`
>
> > Sets the value `VALUE` at loction `PATH`
>
> `setm <PATH> <SUB> <VALUE>`
>
> > Sets multiple nodes (matching `SUB` relative to `PATH`) to `VALUE`
>
> `rm <PATH>`
>
> > Removes the node at location `PATH`
>
> `remove <PATH>`
>
> > Synonym for `rm`
>
> `clear <PATH>`
>
> > Sets the node at `PATH` to `NULL`, creating it if needed

> `clearm <PATH> <SUB>`
>
> > Sets multiple nodes (matching `SUB` relative to `PATH`) to `NULL`
>
> `ins <LABEL> (before|after) <PATH>`
>
> > Inserts an empty node `LABEL` either before or after `PATH`.
>
> `insert <LABEL> <WHERE> <PATH>`
>
> > Synonym for `ins`
>
> `mv <PATH> <OTHER PATH>`
>
> > Moves a node at `PATH` to the new location `OTHER PATH`
>
> `move <PATH> <OTHER PATH>`
>
> > Synonym for `mv`
>
> `defvar <NAME> <PATH>`
>
> > Sets Augeas variable `$NAME` to `PATH`
>
> `defnode <NAME> <PATH> <VALUE>`
>
> > Sets Augeas variable `$NAME` to `PATH`, creating it with `VALUE` if needed
>
> If the `context` parameter is set, that value is prepended to any relative `PATH`s.

context

> Optional context path. This value is prepended to the paths of all changes if the path is relative. If the `incl` parameter is set, defaults to `/files + incl`; otherwise, defaults to the empty string.

force

> Optional command to force the augeas type to execute even if it thinks changes will not be made. This does not overide the `onlyif` parameter.

incl

> Load only a specific file, e.g. `/etc/hosts`. This can greatly speed up the execution the resource. When this parameter is set, you must also set the `lens` parameter to indicate which lens to use.

lens

> Use a specific lens, e.g. `Hosts.lns`. When this parameter is set, you must also set the `incl` parameter to indicate which file to load.□

load_path

> Optional colon-separated list or array of directories; these directories are searched for schema definitions. The agent's `$libdir/augeas/lenses` path will always be added to support pluginsync.

name

> The name of this task. Used for uniqueness.

onlyif

> Optional augeas command and comparisons to control the execution of this type. Supported onlyif syntax:
>
> - `get <AUGEAS_PATH> <COMPARATOR> <STRING>`
> - `match <MATCH_PATH> size <COMPARATOR> <INT>`
> - `match <MATCH_PATH> include <STRING>`
> - `match <MATCH_PATH> not_include <STRING>`
> - `match <MATCH_PATH> == <AN_ARRAY>`
> - `match <MATCH_PATH> != <AN_ARRAY>`
>
> where:
>
> - `AUGEAS_PATH` is a valid path scoped by the context
> - `MATCH_PATH` is a valid match synatx scoped by the context
> - `COMPARATOR` is one of `>, >=, !=, ==, <=,` or `<`
> - `STRING` is a string
> - `INT` is a number
> - `AN_ARRAY` is in the form `['a string', 'another']`

provider

> The specific backend to use for this `augeas` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **augeas**
>
> > Supported features: `execute_changes`, `need_to_run?`, `parse_commands`.

returns

> The expected return code from the augeas command. Should not be set.

root

> A file system path; all files loaded by Augeas are loaded underneath `root`.

type_check

> Whether augeas should perform typechecking. Defaults to false. Valid values are `true`, `false`.

computer

Computer object management using DirectoryService on OS X.

Note that these are distinctly different kinds of objects to ‘hosts’, as they require a MAC address and can have all sorts of policy attached to them.

This provider only manages Computer objects in the local directory service domain, not in remote directories.

If you wish to manage `/etc/hosts` file on Mac OS X, then simply use the host type as per other platforms.

This type primarily exists to create localhost Computer objects that MCX policy can then be attached to.

Autorequires: If Puppet is managing the plist file representing a Computer object (located at `/var/db/dslocal/nodes/Default/computers/{name}.plist`), the Computer resource will autorequire it.

PARAMETERS

en_address

> The MAC address of the primary network interface. Must match en0.

ensure

> Control the existences of this computer record. Set this attribute to `present` to ensure the computer record exists. Set it to `absent` to delete any computer records with this name Valid values are `present`, `absent`.

ip_address

> The IP Address of the Computer object.

name

> The authoritative ‘short’ name of the computer record.

provider

> The specific backend to use for this `computer` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **directoryservice**
>
> > Computer object management using DirectoryService on OS X. Note that these are distinctly different kinds of objects to ‘hosts’, as they require a MAC address and can have all sorts of policy attached to them.
> >
> > This provider only manages Computer objects in the local directory service domain, not in remote directories.
> >
> > If you wish to manage /etc/hosts on Mac OS X, then simply use the host type as per

> > other platforms.
> >
> > Default for `operatingsystem` == `darwin`.

realname

> The ‘long’ name of the computer record.

---

cron

Installs and manages cron jobs. Every cron resource requires a command and user attribute, as well as at least one periodic attribute (hour, minute, month, monthday, weekday, or special). While the name of the cron job is not part of the actual job, it is used by Puppet to store and retrieve it.

If you specify a cron resource that duplicates the scheduling and command used by an existing crontab entry, then Puppet will take no action and defers to the existing crontab entry. If the duplicate cron resource specifies `ensure => absent`, all existing duplicated crontab entries will be removed. Specifying multiple duplicate cron resources with different `ensure` states will result in undefined behavior.□

Example:

```
cron { logrotate:
  command => "/usr/sbin/logrotate",
  user    => root,
  hour    => 2,
  minute  => 0
}
```

Note that all periodic attributes can be specified as an array of values:□

```
cron { logrotate:
  command => "/usr/sbin/logrotate",
  user    => root,
  hour    => [2, 4]
}
```

…or using ranges or the step syntax `*/2` (although there’s no guarantee that your `cron` daemon supports these):

```
cron { logrotate:
  command => "/usr/sbin/logrotate",
  user    => root,
  hour    => ['2-4'],
  minute  => '*/10'
}
```

An important note: the Cron type will not reset parameters that are removed from a manifest. For example, removing a `minute => 10` parameter will not reset the minute component of the associated cronjob to `*`. These changes must be expressed by setting the parameter to `minute =>`

`absent` because Puppet only manages parameters that are out of sync with manifest entries.

PARAMETERS

command

> The command to execute in the cron job. The environment provided to the command varies by local system rules, and it is best to always provide a fully qualified command. The user's profile is not sourced when the command is run, so if the user's environment is desired it should be sourced manually.
>
> All cron parameters support `absent` as a value; this will remove any existing values for that field.

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

environment

> Any environment settings associated with this cron job. They will be stored between the header and the job in the crontab. There can be no guarantees that other, earlier settings will not also affect a given cron job.
>
> Also, Puppet cannot automatically determine whether an existing, unmanaged environment setting is associated with a given cron job. If you already have cron jobs with environment settings, then Puppet will keep those settings in the same place in the file, but will not associate them with a specific job.
>
> Settings should be specified exactly as they should appear in the crontab, e.g., `PATH=/bin:/usr/bin:/usr/sbin`.

hour

> The hour at which to run the cron job. Optional; if specified, must be between 0 and 23, inclusive.

minute

> The minute at which to run the cron job. Optional; if specified, must be between 0 and 59, inclusive.

month

> The month of the year. Optional; if specified must be between 1 and 12 or the month name (e.g., December).

monthday

> The day of the month on which to run the command. Optional; if specified, must be between 1 and 31.

name

> The symbolic name of the cron job. This name is used for human reference only and is generated automatically for cron jobs found on the system. This generally won't matter, as Puppet will do its best to match existing cron jobs against specified jobs (and Puppet adds a comment to cron jobs it adds), but it is at least possible that converting from unmanaged

> jobs to managed jobs might require manual intervention.

provider

> The specific backend to use for this `cron` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **crontab**
>
> > Required binaries: `crontab`.

special

> A special value such as 'reboot' or 'annually'. Only available on supported systems such as Vixie Cron. Overrides more specific time of day/week settings.

target

> The username that will own the cron entry. Defaults to the value of $USER for the shell that invoked Puppet, or root if $USER is empty.

user

> The user to run the command as. This user must be allowed to run cron jobs, which is not currently checked by Puppet.
>
> The user defaults to whomever Puppet is running as.

weekday

> The weekday on which to run the command. Optional; if specified, must be between 0 and 7, inclusive, with 0 (or 7) being Sunday, or must be the name of the day (e.g., Tuesday).

---

exec

Executes external commands. It is critical that all commands executed using this mechanism can be run multiple times without harm, i.e., they are idempotent. One useful way to create idempotent commands is to use the checks like `creates` to avoid running the command unless some condition is met.

Note that you can restrict an `exec` to only run when it receives events by using the `refreshonly` parameter; this is a useful way to have your configuration respond to events with arbitrary commands.

Note also that if an `exec` receives an event from another resource, it will get executed again (or execute the command specified in `refresh`, if there is one).

There is a strong tendency to use `exec` to do whatever work Puppet can't already do; while this is obviously acceptable (and unavoidable) in the short term, it is highly recommended to migrate work from `exec` to native Puppet types as quickly as possible. If you find that you are doing a lot of work with `exec`, please at least notify us at Puppet Labs what you are doing, and hopefully we can work with you to get a native resource type for the work you are doing.

Autorequires: If Puppet is managing an exec's cwd or the executable file used in an exec's command, the exec resource will autorequire those files. If Puppet is managing the user that an exec should run as, the exec resource will autorequire that user.

PARAMETERS

command

> (Namevar: If omitted, this parameter's value defaults to the resource's title.)
>
> The actual command to execute. Must either be fully qualified or a search path for the command must be provided. If the command succeeds, any output produced will be logged at the instance's normal log level (usually `notice`), but if the command fails (meaning its return code does not match the specified code) then any output is logged at the `err` log level.

creates

> A file to look for before running the command. The command will only run if the file doesn't exist.
>
> This parameter doesn't cause Puppet to create a file; it is only useful if the command itself creates a file.
>
> ```
> exec { "tar -xf /Volumes/nfs02/important.tar":
>   cwd     => "/var/tmp",
>   creates => "/var/tmp/myfile",
>   path    => ["/usr/bin", "/usr/sbin"]
> }
> ```
>
> In this example, `myfile` is assumed to be a file inside `important.tar`. If it is ever deleted, the exec will bring it back by re-extracting the tarball. If `important.tar` does not actually contain `myfile`, the exec will keep running every time Puppet runs.

cwd

> The directory from which to run the command. If this directory does not exist, the command will fail.

environment

> Any additional environment variables you want to set for a command. Note that if you use this to set PATH, it will override the `path` attribute. Multiple environment variables should be specified as an array.

group

> The group to run the command as. This seems to work quite haphazardly on different platforms – it is a platform issue not a Ruby or Puppet one, since the same variety exists when running commands as different users in the shell.

logoutput

> Whether to log command output in addition to logging the exit code. Defaults to

`on_failure`, which only logs the output when the command has an exit code that does not match any value specified by the `returns` attribute. In addition to the values below, you may set this attribute to any legal log level. Valid values are `true`, `false`, `on_failure`.

onlyif

If this parameter is set, then this `exec` will only run if the command returns 0. For example:

```
exec { "logrotate":
  path   => "/usr/bin:/usr/sbin:/bin",
  onlyif => "test `du /var/log/messages | cut -f1` -gt 100000"
}
```

This would run `logrotate` only if that test returned true.

Note that this command follows the same rules as the main command, which is to say that it must be fully qualified if the path is not set.□

Also note that onlyif can take an array as its value, e.g.:

```
onlyif => ["test -f /tmp/file1", "test -f /tmp/file2"]
```

This will only run the exec if all conditions in the array return true.

path

The search path used for command execution. Commands must be fully qualified if no path□ is specified. □Paths can be specified as an array or as a ‘:’ separated list.□

provider

The specific backend to use for this `exec` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:

posix

Executes external binaries directly, without passing through a shell or performing any interpolation. This is a safer and more predictable way to execute most commands, but prevents the use of globbing and shell built-ins (including control logic like “for” and “if” statements).

Default for `feature` == `posix`.

shell

Passes the provided command through `/bin/sh`; only available on POSIX systems. This allows the use of shell globbing and built-ins, and does not require that the path to a command be fully-qualified. Although this can be more convenient than the `posix` provider, it also means that you need to be more careful with escaping; as ever, with great power comes etc. etc.

This provider closely resembles the behavior of the `exec` type in Puppet 0.25.x.

windows

Execute external binaries on Windows systems. As with the `posix` provider, this provider directly calls the command with the arguments given, without passing it through a shell or performing any interpolation. To use shell built-ins — that is, to emulate the `shell` provider on Windows — a command must explicitly invoke the shell:

```
exec {'echo foo':
  command => 'cmd.exe /c echo "foo"',
}
```

If no extension is specified for a command, Windows will use the `PATHEXT` environment variable to locate the executable.

Note on PowerShell scripts: PowerShell's default `restricted` execution policy doesn't allow it to run saved scripts. To run PowerShell scripts, specify the `remotesigned` execution policy as part of the command:

```
exec { 'test':
  path    => 'C:/Windows/System32/WindowsPowerShell/v1.0',
  command => 'powershell -executionpolicy remotesigned -file
C:/test.ps1',
}
```

Default for `operatingsystem` == `windows`.

refresh

How to refresh this command. By default, the exec is just called again when it receives an event from another resource, but this parameter allows you to define a different command for refreshing.

refreshonly

The command should only be run as a refresh mechanism for when a dependent object is changed. It only makes sense to use this option when this command depends on some other object; it is useful for triggering an action:

```
# Pull down the main aliases file
file { "/etc/aliases":
  source => "puppet://server/module/aliases"
}

# Rebuild the database, but only when the file changes
exec { newaliases:
  path        => ["/usr/bin", "/usr/sbin"],
  subscribe   => File["/etc/aliases"],
  refreshonly => true
}
```

Note that only `subscribe` and `notify` can trigger actions, not `require`, so it only makes sense to use `refreshonly` with `subscribe` or `notify`. Valid values are `true`, `false`.

returns

> The expected return code(s). An error will be returned if the executed command returns something else. Defaults to 0. Can be specified as an array of acceptable return codes or a single value.

timeout

> The maximum time the command should take. If the command takes longer than the timeout, the command is considered to have failed and will be stopped. The timeout is specified in seconds. The default timeout is 300 seconds and you can set it to 0 to disable the timeout.

tries

> The number of times execution of the command should be tried. Defaults to ‘1’. This many attempts will be made to execute the command until an acceptable return code is returned. Note that the timeout paramater applies to each try rather than to the complete set of tries.

try_sleep

> The time to sleep in seconds between ‘tries’.

unless

> If this parameter is set, then this `exec` will run unless the command returns 0. For example:
>
> ```
> exec { "/bin/echo root >> /usr/lib/cron/cron.allow":
>   path   => "/usr/bin:/usr/sbin:/bin",
>   unless => "grep root /usr/lib/cron/cron.allow 2>/dev/null"
> }
> ```
>
> This would add `root` to the cron.allow file (on Solaris) unless `grep` determines it’s already there.
>
> Note that this command follows the same rules as the main command, which is to say that it must be fully qualified if the path is not set.

user

> The user to run the command as. Note that if you use this then any error output is not currently captured. This is because of a bug within Ruby. If you are using Puppet to create this user, the exec will automatically require the user, as long as it is specified by name.

---

file

Manages files, including their content, ownership, and permissions.

The `file` type can manage normal files, directories, and symlinks; the type should be specified in the `ensure` attribute. Note that symlinks cannot be managed on Windows systems.

File contents can be managed directly with the `content` attribute, or downloaded from a remote source using the `source` attribute; the latter can also be used to recursively serve directories (when the `recurse` attribute is set to `true` or `local`). On Windows, note that file contents are managed in binary mode; Puppet never automatically translates line endings.

Autorequires: If Puppet is managing the user or group that owns a file, the file resource will autorequire them. If Puppet is managing any parent directories of a file, the file resource will autorequire them.

PARAMETERS

backup

> Whether (and how) file content should be backed up before being replaced. This attribute works best as a resource default in the site manifest (`File { backup => main }`), so it can affect all file resources.
>
> - If set to `false`, file content won't be backed up.
> - If set to a string beginning with `.` (e.g., `.puppet-bak`), Puppet will use copy the file in the same directory with that value as the extension of the backup. (A value of `true` is a synonym for `.puppet-bak`.)
> - If set to any other string, Puppet will try to back up to a filebucket with that title. See the `filebucket` resource type for more details. (This is the preferred method for backup, since it can be centralized and queried.)
>
> Default value: `puppet`, which backs up to a filebucket of the same name. (Puppet automatically creates a local filebucket named `puppet` if one doesn't already exist.)
>
> Backing up to a local filebucket isn't particularly useful. If you want to make organized use of backups, you will generally want to use the puppet master server's filebucket service. This requires declaring a filebucket resource and a resource default for the `backup` attribute in site.pp:
>
> ```
> # /etc/puppet/manifests/site.pp
> filebucket { 'main':
>   path   => false,                # This is required for remote
> filebuckets.
>   server => 'puppet.example.com', # Optional; defaults to the configured
> puppet master.
> }
>
> File { backup => main, }
> ```
>
> If you are using multiple puppet master servers, you will want to centralize the contents of the filebucket. Either configure your load balancer to direct all filebucket traffic to a single master, or use something like an out-of-band rsync task to synchronize the content on all masters.

checksum

> The checksum type to use when determining whether to replace a file's contents.
>
> The default checksum type is md5. Valid values are `md5`, `md5lite`, `mtime`, `ctime`, `none`.

content

> The desired contents of a file, as a string. This attribute is mutually exclusive with `source` and

`target`.

Newlines and tabs can be specified in double-quoted strings using standard escaped syntax — \n for a newline, and \t for a tab.

With very small files, you can construct content strings directly in the manifest…

```
define resolve(nameserver1, nameserver2, domain, search) {
    $str = "search $search
        domain $domain
        nameserver $nameserver1
        nameserver $nameserver2
        "

    file { "/etc/resolv.conf":
      content => "$str",
    }
}
```

…but for larger files, this attribute is more useful when combined with the template function.

ctime

A read-only state to check the file ctime.

ensure

Whether to create files that don't currently exist. Possible values are absent, present, file, and directory. Specifying `present` will match any form of file existence, and if the file is missing will create an empty file. Specifying `absent` will delete the file (or directory, if `recurse => true`).

Anything other than the above values will create a symlink; note that symlinks cannot be managed on Windows. In the interest of readability and clarity, symlinks should be created by setting `ensure => link` and explicitly specifying a target; however, if a `target` attribute isn't provided, the value of the `ensure` attribute will be used as the symlink target. The following two declarations are equivalent:

```
# (Useful on Solaris)

# Less maintainable:
file { "/etc/inetd.conf":
  ensure => "/etc/inet/inetd.conf",
}

# More maintainable:
file { "/etc/inetd.conf":
  ensure => link,
  target => "/etc/inet/inetd.conf",
}   Valid values are `absent` (also called `false`), `file`, `present`,
`directory`, `link`.  Values can match `/./`.
```

force

> Perform the file operation even if it will destroy one or more directories. You must use `force` in order to:
>
> - `purge` subdirectories
> - Replace directories with files or links
> - Remove a directory when `ensure => absent` Valid values are `true`, `false`.

group

> Which group should own the file. Argument can be either a group name or a group ID.
>
> On Windows, a user (such as “Administrator”) can be set as a file’s group and a group (such as “Administrators”) can be set as a file’s owner; however, a file’s owner and group shouldn’t be the same. (If the owner is also the group, files with modes like `0640` will cause log churn, as they will always appear out of sync.)

ignore

> A parameter which omits action on files matching specified patterns during recursion. Uses Ruby’s builtin globbing engine, so shell metacharacters are fully supported, e.g. `[a-z]*`. Matches that would descend into the directory structure are ignored, e.g., `*/*`.

links

> How to handle links during file actions. During file copying, `follow` will copy the target file instead of the link, `manage` will copy the link itself, and `ignore` will just pass it by. When not copying, `manage` and `ignore` behave equivalently (because you cannot really ignore links entirely during local recursion), and `follow` will manage the file to which the link points. Valid values are `follow`, `manage`.

mode

> The desired permissions mode for the file, in symbolic or numeric notation. Puppet uses traditional Unix permission schemes and translates them to equivalent permissions for systems which represent permissions differently, including Windows.
>
> Numeric modes should use the standard four-digit octal notation of `<setuid/setgid/sticky><owner><group><other>` (e.g. 0644). Each of the “owner,” “group,” and “other” digits should be a sum of the permissions for that class of users, where read = 4, write = 2, and execute/search = 1. When setting numeric permissions for directories, Puppet sets the search permission wherever the read permission is set.
>
> Symbolic modes should be represented as a string of comma-separated permission clauses, in the form `<who><op><perm>`:
>
> - “Who” should be u (user), g (group), o (other), and/or a (all)
> - “Op” should be = (set exact permissions), + (add select permissions), or - (remove select permissions)
> - “Perm” should be one or more of:
>   - r (read)
>   - w (write)
>   - x (execute/search)

> - t (sticky)
> - s (setuid/setgid)
> - X (execute/search if directory or if any one user can execute)
> - u (user's current permissions)
> - g (group's current permissions)
> - o (other's current permissions)
>
> Thus, mode `0664` could be represented symbolically as either `a=r,ug+w` or `ug=rw,o=r`. See the manual page for GNU or BSD `chmod` for more details on numeric and symbolic modes.
>
> On Windows, permissions are translated as follows:
>
> - Owner and group names are mapped to Windows SIDs
> - The "other" class of users maps to the "Everyone" SID
> - The read/write/execute permissions map to the `FILE_GENERIC_READ`, `FILE_GENERIC_WRITE`, and `FILE_GENERIC_EXECUTE` access rights; a file's owner always has the `FULL_CONTROL` right
> - "Other" users can't have any permissions a file's group lacks, and its group can't have any permissions its owner lacks; that is, 0644 is an acceptable mode, but 0464 is not.

mtime

> A read-only state to check the file mtime.

owner

> The user to whom the file should belong. Argument can be a user name or a user ID.
>
> On Windows, a group (such as "Administrators") can be set as a file's owner and a user (such as "Administrator") can be set as a file's group; however, a file's owner and group shouldn't be the same. (If the owner is also the group, files with modes like `0640` will cause log churn, as they will always appear out of sync.)

path

> (Namevar: If omitted, this parameter's value defaults to the resource's title.)
>
> The path to the file to manage. Must be fully qualified.
>
> On Windows, the path should include the drive letter and should use `/` as the separator character (rather than `\\`).

provider

> The specific backend to use for this `file` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **posix**
>
> > Uses POSIX functionality to manage file ownership and permissions.

> **windows**
>
> > Uses Microsoft Windows functionality to manage file ownership and permissions.

purge

> Whether unmanaged files should be purged. This option only makes sense when managing directories with `recurse => true`.
>
> - When recursively duplicating an entire directory with the `source` attribute, `purge => true` will automatically purge any files that are not in the source directory.
> - When managing files in a directory as individual resources, setting `purge => true` will purge any files that aren't being specifically managed.
>
> If you have a filebucket configured, the purged files will be uploaded, but if you do not, this will destroy data. Valid values are `true`, `false`.

recurse

> Whether and how deeply to do recursive management. Options are:
>
> - `inf,true` — Regular style recursion on both remote and local directory structure.
> - `remote` — Descends recursively into the remote directory but not the local directory. Allows copying of a few files into a directory containing many unmanaged files without scanning all the local files.
> - `false` — Default of no recursion. Valid values are `true`, `false`, `inf`, `remote`.

recurselimit

> How deeply to do recursive management. Values can match `/^[0-9]+$/`.

replace

> Whether to replace a file or symlink that already exists on the local system but whose content doesn't match what the `source` or `content` attribute specifies. Setting this to false allows file resources to initialize files without overwriting future changes. Note that this only affects content; Puppet will still manage ownership and permissions. Defaults to `true`. Valid values are `true` (also called `yes`), `false` (also called `no`).

selinux_ignore_defaults

> If this is set then Puppet will not ask SELinux (via matchpathcon) to supply defaults for the SELinux attributes (seluser, selrole, seltype, and selrange). In general, you should leave this set at its default and only set it to true when you need Puppet to not try to fix SELinux labels automatically. Valid values are `true`, `false`.

selrange

> What the SELinux range component of the context of the file should be. Any valid SELinux range component is accepted. For example `s0` or `SystemHigh`. If not specified it defaults to the value returned by matchpathcon for the file, if any exists. Only valid on systems with SELinux support enabled and that have support for MCS (Multi-Category Security).

selrole

> What the SELinux role component of the context of the file should be. Any valid SELinux role

> component is accepted. For example `role_r`. If not specified it defaults to the value returned by matchpathcon for the file, if any exists. Only valid on systems with SELinux support enabled.

seltype

> What the SELinux type component of the context of the file should be. Any valid SELinux type component is accepted. For example `tmp_t`. If not specified it defaults to the value returned by matchpathcon for the file, if any exists. Only valid on systems with SELinux support enabled.

seluser

> What the SELinux user component of the context of the file should be. Any valid SELinux user component is accepted. For example `user_u`. If not specified it defaults to the value returned by matchpathcon for the file, if any exists. Only valid on systems with SELinux support enabled.

show_diff

> Whether to display differences when the file changes, defaulting to true. This parameter is useful for files that may contain passwords or other secret data, which might otherwise be included in Puppet reports or other insecure outputs. If the global ``show_diff `configuration parameter is false, then no diffs will be shown even if this parameter is true. Valid values are `true`, `false`.

source

> A source file, which will be copied into place on the local system. Values can be URIs pointing to remote files, or fully qualified paths to files available on the local system (including files on NFS shares or Windows mapped drives). This attribute is mutually exclusive with `content` and `target`.
>
> The available URI schemes are puppet and file. Puppet URIs will retrieve files from Puppet's built-in file server, and are usually formatted as:
>
> `puppet:///modules/name_of_module/filename`
>
> This will fetch a file from a module on the puppet master (or from a local module when using puppet apply). Given a `modulepath` of `/etc/puppetlabs/puppet/modules`, the example above would resolve to `/etc/puppetlabs/puppet/modules/name_of_module/files/filename`.
>
> Unlike `content`, the `source` attribute can be used to recursively copy directories if the `recurse` attribute is set to `true` or `remote`. If a source directory contains symlinks, use the `links` attribute to specify whether to recreate links or follow them.
>
> Multiple `source` values can be specified as an array, and Puppet will use the first source that exists. This can be used to serve different files to different system types:
>
> ```
> file { "/etc/nfs.conf":
>   source => [
>     "puppet:///modules/nfs/conf.$host",
> ```

>```
>       "puppet:///modules/nfs/conf.$operatingsystem",
>       "puppet:///modules/nfs/conf"
>     ]
>   }
>```
>
> Alternately, when serving directories recursively, multiple sources can be combined by setting the `sourceselect` attribute to `all`.

sourceselect

> Whether to copy all valid sources, or just the first one. This parameter only affects recursive directory copies; by default, the first valid source is the only one used, but if this parameter is set to `all`, then all valid sources will have all of their contents copied to the local system. If a given file exists in more than one source, the version from the earliest source in the list will be used. Valid values are `first`, `all`.

target

> The target for creating a link. Currently, symlinks are the only type supported. This attribute is mutually exclusive with `source` and `content`.
>
> Symlink targets can be relative, as well as absolute:
>
>```
>   # (Useful on Solaris)
>   file { "/etc/inetd.conf":
>     ensure => link,
>     target => "inet/inetd.conf",
>   }
>```
>
> Directories of symlinks can be served recursively by instead using the `source` attribute, setting `ensure` to `directory`, and setting the `links` attribute to `manage`. Valid values are `notlink`. Values can match `/./`.

type

> A read-only state to check the file type.

---

filebucket

A repository for storing and retrieving file content by MD5 checksum. Can be local to each agent node, or centralized on a puppet master server. All puppet masters provide a filebucket service that agent nodes can access via HTTP, but you must declare a filebucket resource before any agents will do so.

Filebuckets are used for the following features:

- Content backups. If the `file` type's `backup` attribute is set to the name of a filebucket, Puppet will back up the old content whenever it rewrites a file; see the documentation for the `file` type for more details. These backups can be used for manual recovery of content, but are more commonly used to display changes and differences in a tool like Puppet Dashboard.
- Content distribution. The optional static compiler populates the puppet master's filebucket with

the desired content for each file, then instructs the agent to retrieve the content for a specific checksum. For more details, see the `static_compiler` section in the catalog indirection docs.

To use a central filebucket for backups, you will usually want to declare a filebucket resource and a resource default for the `backup` attribute in site.pp:

```
# /etc/puppet/manifests/site.pp
filebucket { 'main':
  path   => false,                # This is required for remote filebuckets.
  server => 'puppet.example.com', # Optional; defaults to the configured puppet
master.
}

File { backup => main, }
```

Puppet master servers automatically provide the filebucket service, so this will work in a default configuration. If you have a heavily restricted `auth.conf` file, you may need to allow access to the `file_bucket_file` endpoint.

PARAMETERS

name

> The name of the filebucket.

path

> The path to the local filebucket; defaults to the value of the `clientbucketdir` setting. To use a remote filebucket, you must set this attribute to `false`.

port

> The port on which the remote server is listening. Defaults to the value of the `masterport` setting, which is usually 8140.

server

> The server providing the remote filebucket service. Defaults to the value of the `server` setting (that is, the currently configured puppet master server).
>
> This setting is only consulted if the `path` attribute is set to `false`.

---

group

Manage groups. On most platforms this can only create groups. Group membership must be managed on individual users.

On some platforms such as OS X, group membership is managed as an attribute of the group, not the user record. Providers must have the feature ‘manages_members’ to manage the ‘members’ property of a group record.

FEATURES

- libuser: Allows local groups to be managed on systems that also use some other remote NSS method of managing accounts.

- manages_aix_lam: The provider can manage AIX Loadable Authentication Module (LAM) system.
- manages_members: For directories where membership is an attribute of groups not users.
- system_groups: The provider allows you to create system groups with lower GIDs.

Provider	libuser	manages aix lam	manages members	system groups
aix		X	X	
directoryservice			X	
groupadd				X
ldap				
pw			X	
windows_adsi			X	

PARAMETERS

allowdupe

> Whether to allow duplicate GIDs. Defaults to `false`. Valid values are `true`, `false`.

attribute_membership

> Whether specified attribute value pairs should be treated as the only attributes of the user or whether they should merely be treated as the minimum list. Valid values are `inclusive`, `minimum`.

attributes

> Specify group AIX attributes in an array of `key=value` pairs. Requires features manages_aix_lam.

auth_membership

> whether the provider is authoritative for group membership.

ensure

> Create or remove the group. Valid values are `present`, `absent`.

forcelocal

> Forces the mangement of local accounts when accounts are also being managed by some other NSS Valid values are `true`, `false`. Requires features libuser.

gid

> The group ID. Must be specified numerically. If no group ID is specified when creating a new group, then one will be chosen automatically according to local system standards. This will likely result in the same group having different GIDs on different systems, which is not recommended.
>
> On Windows, this property is read-only and will return the group’s security identifier (SID).

ia_load_module

> The name of the I&A module to use to manage this user Requires features manages_aix_lam.

members

> The members of the group. For directory services where group membership is stored in the group objects, not the users. Requires features manages_members.

name

> The group name. While naming limitations vary by operating system, it is advisable to restrict names to the lowest common denominator, which is a maximum of 8 characters beginning with a letter.
>
> Note that Puppet considers group names to be case-sensitive, regardless of the platform's own rules; be sure to always use the same case when referring to a given group.

provider

> The specific backend to use for this `group` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **aix**
>
> > Group management for AIX.
> >
> > Required binaries: `/usr/bin/chgroup`, `/usr/sbin/lsgroup`, `/usr/sbin/rmgroup`, `/usr/bin/mkgroup`. Default for `operatingsystem` == `aix`. Supported features: `manages_aix_lam`, `manages_members`.
>
> **directoryservice**
>
> > Group management using DirectoryService on OS X.
> >
> > Required binaries: `/usr/bin/dscl`. Default for `operatingsystem` == `darwin`. Supported features: `manages_members`.
>
> **groupadd**
>
> > Group management via `groupadd` and its ilk. The default for most platforms.
> >
> > Required binaries: `groupmod`, `groupdel`, `lgroupadd`, `groupadd`. Supported features: `system_groups`.
>
> **ldap**
>
> > Group management via LDAP.
> >
> > This provider requires that you have valid values for all of the LDAP-related settings in `puppet.conf`, including `ldapbase`. You will almost definitely need settings for `ldapuser` and `ldappassword` in order for your clients to write to LDAP.

> > Note that this provider will automatically generate a GID for you if you do not specify one, but it is a potentially expensive operation, as it iterates across all existing groups to pick the appropriate next one.
>
> **pw**
>
> > Group management via `pw` on FreeBSD and DragonFly BSD.
> >
> > Required binaries: `pw`. Default for `operatingsystem` == `freebsd, dragonfly`. Supported features: `manages_members`.
>
> **windows_adsi**
>
> > Local group management for Windows. Nested groups are not supported.
> >
> > Default for `operatingsystem` == `windows`. Supported features: `manages_members`.

system

> Whether the group is a system group with lower GID. Valid values are `true`, `false`.

---

host

Installs and manages host entries. For most systems, these entries will just be in `/etc/hosts`, but some systems (notably OS X) will have different solutions.

PARAMETERS

comment

> A comment that will be attached to the line with a # character.

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

host_aliases

> Any aliases the host might have. Multiple values must be specified as an array.

ip

> The host’s IP address, IPv4 or IPv6.

name

> The host name.

provider

> The specific backend to use for this `host` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **parsed**

target

> The file in which to store service information. Only used by those providers that write to disk. On most systems this defaults to `/etc/hosts`.

---

interface

This represents a router or switch interface. It is possible to manage interface mode (access or trunking, native vlan and encapsulation) and switchport characteristics (speed, duplex).

PARAMETERS

allowed_trunk_vlans

> Allowed list of Vlans that this trunk can forward. Valid values are `all`. Values can match `/./`.

description

> Interface description.

device_url

> The URL at which the router or switch can be reached.

duplex

> Interface duplex. Valid values are `auto`, `full`, `half`.

encapsulation

> Interface switchport encapsulation. Valid values are `none`, `dot1q`, `isl`.

ensure

> The basic property that the resource should be in. Valid values are `present` (also called `no_shutdown`), `absent` (also called `shutdown`).

etherchannel

> Channel group this interface is part of. Values can match `/^\d+/`.

ipaddress

> IP Address of this interface. Note that it might not be possible to set an interface IP address; it depends on the interface type and device type.
>
> Valid format of ip addresses are:
>
> - IPV4, like 127.0.0.1
> - IPV4/prefixlength like 127.0.1.1/24□
> - IPV6/prefixlength like FE80::21A:2FFF:FE30:ECF0/128□
> - an optional suffix for IPV6 addresses from this list: `eui-64`, `link-local`
>
> It is also possible to supply an array of values.

mode

> Interface switchport mode. Valid values are `access`, `trunk`.

name

> The interface's name.

native_vlan

> Interface native vlan (for access mode only). Values can match `/^\d+/`.

provider

> The specific backend to use for this `interface` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **cisco**
>
> > Cisco switch/router provider for interface.

speed

> Interface speed. Valid values are `auto`. Values can match `/^\d+/`.

---

k5login

Manage the `.k5login` file for a user. Specify the full path to the `.k5login` file as the name, and an array of principals as the `principals` attribute.

PARAMETERS

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

mode

> The desired permissions mode of the `.k5login` file. Defaults to `644`.

path

> (Namevar: If omitted, this parameter's value defaults to the resource's title.)
>
> The path to the `.k5login` file to manage. Must be fully qualified.

principals

> The principals present in the `.k5login` file. This should be specified as an array.

provider

> The specific backend to use for this `k5login` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **k5login**

> The k5login provider is the only provider for the k5login type.

---

macauthorization

Manage the Mac OS X authorization database. See the Apple developer site for more information.

Note that authorization store directives with hyphens in their names have been renamed to use underscores, as Puppet does not react well to hyphens in identifiers.

Autorequires: If Puppet is managing the `/etc/authorization` file, each macauthorization resource will autorequire it.

PARAMETERS

allow_root

> Corresponds to `allow-root` in the authorization store. Specifies whether a right should be allowed automatically if the requesting process is running with `uid == 0`. AuthorizationServices defaults this attribute to false if not specified. Valid values are `true`, `false`.

auth_class

> Corresponds to `class` in the authorization store; renamed due to 'class' being a reserved word in Puppet. Valid values are `user`, `evaluate-mechanisms`, `allow`, `deny`, `rule`.

auth_type

> Type — this can be a `right` or a `rule`. The `comment` type has not yet been implemented. Valid values are `right`, `rule`.

authenticate_user

> Corresponds to `authenticate-user` in the authorization store. Valid values are `true`, `false`.

comment

> The `comment` attribute for authorization resources.

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

group

> A group which the user must authenticate as a member of. This must be a single group.

k_of_n

> How large a subset of rule mechanisms must succeed for successful authentication. If there are 'n' mechanisms, then 'k' (the integer value of this parameter) mechanisms must succeed. The most common setting for this parameter is `1`. If `k-of-n` is not set, then every mechanism — that is, 'n-of-n' — must succeed.

mechanisms

> An array of suitable mechanisms.

name

> The name of the right or rule to be managed. Corresponds to `key` in Authorization Services. The key is the name of a rule. A key uses the same naming conventions as a right. The Security Server uses a rule's key to match the rule with a right. Wildcard keys end with a '.'. The generic rule has an empty key value. Any rights that do not match a specific rule use the generic rule.

provider

> The specific backend to use for this `macauthorization` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **macauthorization**
>
> > Manage Mac OS X authorization database rules and rights.
> >
> > Required binaries: `/usr/bin/sw_vers`, `/usr/bin/security`. Default for `operatingsystem` == `darwin`.

rule

> The rule(s) that this right refers to.

session_owner

> Whether the session owner automatically matches this rule or right. Corresponds to `session-owner` in the authorization store. Valid values are `true`, `false`.

shared

> Whether the Security Server should mark the credentials used to gain this right as shared. The Security Server may use any shared credentials to authorize this right. For maximum security, set sharing to false so credentials stored by the Security Server for one application may not be used by another application. Valid values are `true`, `false`.

timeout

> The number of seconds in which the credential used by this rule will expire. For maximum security where the user must authenticate every time, set the timeout to 0. For minimum security, remove the timeout attribute so the user authenticates only once per session.

tries

> The number of tries allowed.

---

mailalias

Creates an email alias in the local alias database.

PARAMETERS

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

name

> The alias name.

provider

> The specific backend to use for this `mailalias` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **aliases**

recipient

> Where email should be sent. Multiple values should be specified as an array.□

target

> The file in which to store the aliases. Only used by those providers that write to disk.

---

maillist

Manage email lists. This resource type can only create and remove lists; it cannot currently reconfigure them.□

PARAMETERS

admin

> The email address of the administrator.

description

> The description of the mailing list.

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`, `purged`.

mailserver

> The name of the host handling email for the list.

name

> The name of the email list.

password

> The admin password.

provider

> The specific backend to use for this `maillist` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:

> **mailman**
>
> > Required binaries: `/var/lib/mailman/mail/mailman`, `list_lists`, `rmlist`, `newlist`.

webserver

> The name of the host providing web archives and the administrative interface.

---

mcx

MCX object management using DirectoryService on OS X.

The default provider of this type merely manages the XML plist as reported by the `dscl -mcxexport` command. This is similar to the content property of the file type in Puppet.□

The recommended method of using this type is to use Work Group Manager to manage users and groups on the local computer, record the resulting puppet manifest using the command `puppet resource mcx`, then deploy it to other machines.

Autorequires: If Puppet is managing the user, group, or computer that these MCX settings refer to, the MCX resource will autorequire that user, group, or computer.

FEATURES

- manages_content: The provider can manage MCXSettings as a string.

Provider	manages content
mcxcontent	X

PARAMETERS

content

> The XML Plist used as the value of MCXSettings in DirectoryService. This is the standard output from the system command:
>
> ```
> dscl localhost -mcxexport /Local/Default/<ds_type>/ds_name
> ```
>
> Note that `ds_type` is capitalized and plural in the dscl command. Requires features manages_content.

ds_name

> The name to attach the MCX Setting to. (For example, `localhost` when `ds_type => computer`.) This setting is not required, as it can be automatically discovered when the resource name is parseable. (For example, in `/Groups/admin`, `group` will be used as the dstype.)

ds_type

> The DirectoryService type this MCX setting attaches to. Valid values are `user`, `group`, `computer`, `computerlist`.

ensure

> Create or remove the MCX setting. Valid values are `present`, `absent`.

name

> The name of the resource being managed. The default naming convention follows Directory Service paths:
>
> ```
> /Computers/localhost
> /Groups/admin
> /Users/localadmin
> ```
>
> The `ds_type` and `ds_name` type parameters are not necessary if the default naming convention is followed.

provider

> The specific backend to use for this `mcx` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **mcxcontent**
>
> > MCX Settings management using DirectoryService on OS X.
> >
> > This provider manages the entire MCXSettings attribute available to some directory services nodes. This management is ‘all or nothing’ in that discrete application domain key value pairs are not managed by this provider.
> >
> > It is recommended to use WorkGroup Manager to configure Users, Groups, Computers, or ComputerLists, then use ‘ralsh mcx’ to generate a puppet manifest from the resulting configuration.
> >
> > Original Author: Jeff McCune (mccune.jeff@gmail.com)
> >
> > Required binaries: `/usr/bin/dscl`. Default for `operatingsystem` == `darwin`. Supported features: `manages_content`.

---

mount

Manages mounted filesystems, including putting mount information into the mount table. The actual behavior depends on the value of the ‘ensure’ parameter.

Note that if a `mount` receives an event from another resource, it will try to remount the filesystems if `ensure` is set to `mounted`.

FEATURES

- refreshable: The provider can remount the filesystem.

Provider	refreshable
parsed	X

PARAMETERS

atboot

> Whether to mount the mount at boot. Not all platforms support this.

blockdevice

> The device to fsck. This is property is only valid on Solaris, and in most cases will default to the correct value.

device

> The device providing the mount. This can be whatever device is supporting by the mount, including network devices or devices specified by UUID rather than device path, depending□ on the operating system.

dump

> Whether to dump the mount. Not all platform support this. Valid values are `1` or `0`. or `2` on FreeBSD, Default is `0`. Values can match `/(0|1)/`, `/(0|1)/`.

ensure

> Control what to do with this mount. Set this attribute to `unmounted` to make sure the filesystem is in the filesystem table but not mounted (if the filesystem is currently mounted, it□ will be unmounted). Set it to `absent` to unmount (if necessary) and remove the filesystem□ from the fstab. Set to `mounted` to add it to the fstab and mount it. Set to `present` to add to fstab but not change mount/unmount status. Valid values are `defined` (also called `present`), `unmounted`, `absent`, `mounted`.

fstype

> The mount type. Valid values depend on the operating system. This is a required option.

name

> The mount path for the mount.

options

> Mount options for the mounts, as they would appear in the fstab.

pass

> The pass in which the mount is checked.

provider

> The specific backend to use for this `mount` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **parsed**
>
> > Required binaries: `mount`, `umount`. Supported features: `refreshable`.

remounts

> Whether the mount can be remounted `mount -o remount`. If this is false, then the filesystem will be unmounted and remounted manually, which is prone to failure. Valid values are `true`, `false`.

target

> The file in which to store the mount table. Only used by those providers that write to disk.

---

nagios_command

The Nagios type command. This resource type is autogenerated using the model developed in Naginator, and all of the Nagios types are generated using the same code and the same library.

This type generates Nagios configuration statements in Nagios-parseable configuration files. By default, the statements will be added to `/etc/nagios/nagios_command.cfg`, but you can send them to a different file by setting their `target` attribute.

You can purge Nagios resources using the `resources` type, but only in the default file locations. This is an architectural limitation.

PARAMETERS

command_line

> Nagios configuration file parameter.

command_name

> (Namevar: If omitted, this parameter's value defaults to the resource's title.)
>
> The name of this nagios_command resource.

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

poller_tag

> Nagios configuration file parameter.

provider

> The specific backend to use for this `nagios_command` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **naginator**

target

> The target.

use

> Nagios configuration file parameter.

---

nagios_contact

The Nagios type contact. This resource type is autogenerated using the model developed in Naginator, and all of the Nagios types are generated using the same code and the same library.

This type generates Nagios configuration statements in Nagios-parseable configuration files. By default, the statements will be added to `/etc/nagios/nagios_contact.cfg`, but you can send them to a different file by setting their `target` attribute.

You can purge Nagios resources using the `resources` type, but only in the default file locations. This is an architectural limitation.

PARAMETERS

address1

> Nagios configuration file parameter.

address2

> Nagios configuration file parameter.

address3

> Nagios configuration file parameter.

address4

> Nagios configuration file parameter.

address5

> Nagios configuration file parameter.

address6

> Nagios configuration file parameter.

alias

> Nagios configuration file parameter.

can_submit_commands

> Nagios configuration file parameter.

contact_name

> (Namevar: If omitted, this parameter’s value defaults to the resource’s title.)
>
> The name of this nagios_contact resource.

contactgroups

> Nagios configuration file parameter.

email

> Nagios configuration file parameter.

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

host_notification_commands□

> Nagios configuration file parameter.□

host_notification_options□

> Nagios configuration file parameter.□

host_notification_period□

> Nagios configuration file parameter.□

host_notifications_enabled□

> Nagios configuration file parameter.□

pager

> Nagios configuration file parameter.□

provider

> The specific backend to use for this `nagios_contact` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **naginator**

register

> Nagios configuration file parameter.□

retain_nonstatus_information

> Nagios configuration file parameter.□

retain_status_information

> Nagios configuration file parameter.□

service_notification_commands□

> Nagios configuration file parameter.□

service_notification_options□

> Nagios configuration file parameter.□

service_notification_period□

> Nagios configuration file parameter.□

service_notifications_enabled□

> Nagios configuration file parameter.□

target

> The target.

use

> Nagios configuration file parameter.□

---

nagios_contactgroup

The Nagios type contactgroup. This resource type is autogenerated using the model developed in Naginator, and all of the Nagios types are generated using the same code and the same library.

This type generates Nagios configuration statements in Nagios-parseable configuration files. By default, the statements will be added to `/etc/nagios/nagios_contactgroup.cfg`, but you can send them to a different file by setting their `target` attribute.

You can purge Nagios resources using the `resources` type, but only in the default file locations.□ This is an architectural limitation.

PARAMETERS

alias

> Nagios configuration file parameter.□

contactgroup_members

> Nagios configuration file parameter.□

contactgroup_name

> (Namevar: If omitted, this parameter’s value defaults to the resource’s title.)
>
> The name of this nagios_contactgroup resource.

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

members

> Nagios configuration file parameter.□

provider

> The specific backend to use for this `nagios_contactgroup` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **naginator**

register

> Nagios configuration file parameter.□

target

> The target.

use

> Nagios configuration file parameter.

---

nagios_host

The Nagios type host. This resource type is autogenerated using the model developed in Naginator, and all of the Nagios types are generated using the same code and the same library.

This type generates Nagios configuration statements in Nagios-parseable configuration files. By default, the statements will be added to `/etc/nagios/nagios_host.cfg`, but you can send them to a different file by setting their `target` attribute.

You can purge Nagios resources using the `resources` type, but only in the default file locations. This is an architectural limitation.

PARAMETERS

action_url

> Nagios configuration file parameter.

active_checks_enabled

> Nagios configuration file parameter.

address

> Nagios configuration file parameter.

alias

> Nagios configuration file parameter.

business_impact

> Nagios configuration file parameter.

check_command

> Nagios configuration file parameter.

check_freshness

> Nagios configuration file parameter.

check_interval

> Nagios configuration file parameter.

check_period

> Nagios configuration file parameter.

contact_groups

> Nagios configuration file parameter.

contacts

> Nagios configuration file parameter.□

display_name

> Nagios configuration file parameter.□

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

event_handler

> Nagios configuration file parameter.□

event_handler_enabled

> Nagios configuration file parameter.□

failure_prediction_enabled

> Nagios configuration file parameter.□

first_notification_delay□

> Nagios configuration file parameter.□

flap_detection_enabled□

> Nagios configuration file parameter.□

flap_detection_options□

> Nagios configuration file parameter.□

freshness_threshold

> Nagios configuration file parameter.□

high_flap_threshold□

> Nagios configuration file parameter.□

host_name

> (Namevar: If omitted, this parameter's value defaults to the resource's title.)
>
> The name of this nagios_host resource.

hostgroups

> Nagios configuration file parameter.□

icon_image

> Nagios configuration file parameter.□

icon_image_alt

> Nagios configuration file parameter.□

initial_state

> Nagios configuration file parameter.□

low_flap_threshold□

> Nagios configuration file parameter.□

max_check_attempts

> Nagios configuration file parameter.□

notes

> Nagios configuration file parameter.□

notes_url

> Nagios configuration file parameter.□

notification_interval□

> Nagios configuration file parameter.□

notification_options□

> Nagios configuration file parameter.□

notification_period□

> Nagios configuration file parameter.□

notifications_enabled□

> Nagios configuration file parameter.□

obsess_over_host

> Nagios configuration file parameter.□

parents

> Nagios configuration file parameter.□

passive_checks_enabled

> Nagios configuration file parameter.□

poller_tag

> Nagios configuration file parameter.□

process_perf_data

> Nagios configuration file parameter.□

provider

> The specific backend to use for this `nagios_host` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **naginator**

realm

> Nagios configuration file parameter.□

register

> Nagios configuration file parameter.□

retain_nonstatus_information

> Nagios configuration file parameter.□

retain_status_information

> Nagios configuration file parameter.□

retry_interval

> Nagios configuration file parameter.□

stalking_options

> Nagios configuration file parameter.□

statusmap_image

> Nagios configuration file parameter.□

target

> The target.

use

> Nagios configuration file parameter.□

vrml_image

> Nagios configuration file parameter.□

---

nagios_hostdependency

The Nagios type hostdependency. This resource type is autogenerated using the model developed in Naginator, and all of the Nagios types are generated using the same code and the same library.

This type generates Nagios configuration statements in Nagios-parseable configuration files. By default, the statements will be added to `/etc/nagios/nagios_hostdependency.cfg`, but you can send them to a different file by setting their `target` attribute.

You can purge Nagios resources using the `resources` type, but only in the default file locations.□ This is an architectural limitation.

PARAMETERS

_naginator_name

> (Namevar: If omitted, this parameter’s value defaults to the resource’s title.)
>
> The name of this nagios_hostdependency resource.

dependency_period

> Nagios configuration file parameter.

dependent_host_name

> Nagios configuration file parameter.

dependent_hostgroup_name

> Nagios configuration file parameter.

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

execution_failure_criteria

> Nagios configuration file parameter.

host_name

> Nagios configuration file parameter.

hostgroup_name

> Nagios configuration file parameter.

inherits_parent

> Nagios configuration file parameter.

notification_failure_criteria

> Nagios configuration file parameter.

provider

> The specific backend to use for this `nagios_hostdependency` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **naginator**

register

> Nagios configuration file parameter.

target

> The target.

use

> Nagios configuration file parameter.

---

nagios_hostescalation

The Nagios type hostescalation. This resource type is autogenerated using the model developed in Naginator, and all of the Nagios types are generated using the same code and the same library.

This type generates Nagios configuration statements in Nagios-parseable configuration files. By default, the statements will be added to `/etc/nagios/nagios_hostescalation.cfg`, but you can send them to a different file by setting their `target` attribute.

You can purge Nagios resources using the `resources` type, but only in the default file locations. This is an architectural limitation.

PARAMETERS

_naginator_name

> (Namevar: If omitted, this parameter's value defaults to the resource's title.)
>
> The name of this nagios_hostescalation resource.

contact_groups

> Nagios configuration file parameter.

contacts

> Nagios configuration file parameter.

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

escalation_options

> Nagios configuration file parameter.

escalation_period

> Nagios configuration file parameter.

first_notification

> Nagios configuration file parameter.

host_name

> Nagios configuration file parameter.

hostgroup_name

> Nagios configuration file parameter.

last_notification

> Nagios configuration file parameter.

notification_interval

> Nagios configuration file parameter.

provider

> The specific backend to use for this `nagios_hostescalation` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform.

> Available providers are:
>
> **naginator**

register

> Nagios configuration file parameter.

target

> The target.

use

> Nagios configuration file parameter.

---

nagios_hostextinfo

The Nagios type hostextinfo. This resource type is autogenerated using the model developed in Naginator, and all of the Nagios types are generated using the same code and the same library.

This type generates Nagios configuration statements in Nagios-parseable configuration files. By default, the statements will be added to `/etc/nagios/nagios_hostextinfo.cfg`, but you can send them to a different file by setting their `target` attribute.

You can purge Nagios resources using the `resources` type, but only in the default file locations. This is an architectural limitation.

PARAMETERS

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

host_name

> (Namevar: If omitted, this parameter’s value defaults to the resource’s title.)
>
> The name of this nagios_hostextinfo resource.

icon_image

> Nagios configuration file parameter.

icon_image_alt

> Nagios configuration file parameter.

notes

> Nagios configuration file parameter.

notes_url

> Nagios configuration file parameter.

provider

> The specific backend to use for this `nagios_hostextinfo` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **naginator**

register

> Nagios configuration file parameter.□

statusmap_image

> Nagios configuration file parameter.□

target

> The target.

use

> Nagios configuration file parameter.□

vrml_image

> Nagios configuration file parameter.□

---

nagios_hostgroup

The Nagios type hostgroup. This resource type is autogenerated using the model developed in Naginator, and all of the Nagios types are generated using the same code and the same library.

This type generates Nagios configuration statements in Nagios-parseable configuration files. By default, the statements will be added to `/etc/nagios/nagios_hostgroup.cfg`, but you can send them to a different file by setting their `target` attribute.

You can purge Nagios resources using the `resources` type, but only in the default file locations.□ This is an architectural limitation.

PARAMETERS

action_url

> Nagios configuration file parameter.□

alias

> Nagios configuration file parameter.□

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

hostgroup_members

> Nagios configuration file parameter.□

hostgroup_name

> (Namevar: If omitted, this parameter’s value defaults to the resource’s title.)
>
> The name of this nagios_hostgroup resource.

members

> Nagios configuration file parameter.□

notes

> Nagios configuration file parameter.□

notes_url

> Nagios configuration file parameter.□

provider

> The specific backend to use for this `nagios_hostgroup` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **naginator**

realm

> Nagios configuration file parameter.□

register

> Nagios configuration file parameter.□

target

> The target.

use

> Nagios configuration file parameter.□

---

nagios_service

The Nagios type service. This resource type is autogenerated using the model developed in Naginator, and all of the Nagios types are generated using the same code and the same library.

This type generates Nagios configuration statements in Nagios-parseable configuration files. B□y default, the statements will be added to `/etc/nagios/nagios_service.cfg`, but you can send them to a different file by setting their `target` attribute.

You can purge Nagios resources using the `resources` type, but only in the default file locations.□ This is an architectural limitation.

PARAMETERS

_naginator_name

> (Namevar: If omitted, this parameter’s value defaults to the resource’s title.)

> The name of this nagios_service resource.

action_url

> Nagios configuration file parameter.□

active_checks_enabled

> Nagios configuration file parameter.□

business_impact

> Nagios configuration file parameter.□

check_command

> Nagios configuration file parameter.□

check_freshness

> Nagios configuration file parameter.□

check_interval

> Nagios configuration file parameter.□

check_period

> Nagios configuration file parameter.□

contact_groups

> Nagios configuration file parameter.□

contacts

> Nagios configuration file parameter.□

display_name

> Nagios configuration file parameter.□

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

event_handler

> Nagios configuration file parameter.□

event_handler_enabled

> Nagios configuration file parameter.□

failure_prediction_enabled

> Nagios configuration file parameter.□

first_notification_delay□

> Nagios configuration file parameter.□

flap_detection_enabled

> Nagios configuration file parameter.

flap_detection_options

> Nagios configuration file parameter.

freshness_threshold

> Nagios configuration file parameter.

high_flap_threshold

> Nagios configuration file parameter.

host_name

> Nagios configuration file parameter.

hostgroup_name

> Nagios configuration file parameter.

icon_image

> Nagios configuration file parameter.

icon_image_alt

> Nagios configuration file parameter.

initial_state

> Nagios configuration file parameter.

is_volatile

> Nagios configuration file parameter.

low_flap_threshold

> Nagios configuration file parameter.

max_check_attempts

> Nagios configuration file parameter.

normal_check_interval

> Nagios configuration file parameter.

notes

> Nagios configuration file parameter.

notes_url

> Nagios configuration file parameter.

notification_interval

> Nagios configuration file parameter.

notification_options

> Nagios configuration file parameter.

notification_period

> Nagios configuration file parameter.

notifications_enabled

> Nagios configuration file parameter.

obsess_over_service

> Nagios configuration file parameter.

parallelize_check

> Nagios configuration file parameter.

passive_checks_enabled

> Nagios configuration file parameter.

poller_tag

> Nagios configuration file parameter.

process_perf_data

> Nagios configuration file parameter.

provider

> The specific backend to use for this `nagios_service` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **naginator**

register

> Nagios configuration file parameter.

retain_nonstatus_information

> Nagios configuration file parameter.

retain_status_information

> Nagios configuration file parameter.

retry_check_interval

> Nagios configuration file parameter.

retry_interval

> Nagios configuration file parameter.

service_description

> Nagios configuration file parameter.

servicegroups

> Nagios configuration file parameter.

stalking_options

> Nagios configuration file parameter.

target

> The target.

use

> Nagios configuration file parameter.

---

nagios_servicedependency

The Nagios type servicedependency. This resource type is autogenerated using the model developed in Naginator, and all of the Nagios types are generated using the same code and the same library.

This type generates Nagios configuration statements in Nagios-parseable configuration files. By default, the statements will be added to `/etc/nagios/nagios_servicedependency.cfg`, but you can send them to a different file by setting their `target` attribute.

You can purge Nagios resources using the `resources` type, but only in the default file locations. This is an architectural limitation.

PARAMETERS

_naginator_name

> (Namevar: If omitted, this parameter's value defaults to the resource's title.)
>
> The name of this nagios_servicedependency resource.

dependency_period

> Nagios configuration file parameter.

dependent_host_name

> Nagios configuration file parameter.

dependent_hostgroup_name

> Nagios configuration file parameter.

dependent_service_description

> Nagios configuration file parameter.

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

execution_failure_criteria

> Nagios configuration file parameter.

host_name

> Nagios configuration file parameter.

hostgroup_name

> Nagios configuration file parameter.

inherits_parent

> Nagios configuration file parameter.

notification_failure_criteria

> Nagios configuration file parameter.

provider

> The specific backend to use for this `nagios_servicedependency` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **naginator**

register

> Nagios configuration file parameter.

service_description

> Nagios configuration file parameter.

target

> The target.

use

> Nagios configuration file parameter.

---

nagios_serviceescalation

The Nagios type serviceescalation. This resource type is autogenerated using the model developed in Naginator, and all of the Nagios types are generated using the same code and the same library.

This type generates Nagios configuration statements in Nagios-parseable configuration files. By default, the statements will be added to `/etc/nagios/nagios_serviceescalation.cfg`, but you can send them to a different file by setting their `target` attribute.

You can purge Nagios resources using the `resources` type, but only in the default file locations. This is an architectural limitation.

PARAMETERS

_naginator_name

> (Namevar: If omitted, this parameter’s value defaults to the resource’s title.)
>
> The name of this nagios_serviceescalation resource.

contact_groups

> Nagios configuration file parameter.□

contacts

> Nagios configuration file parameter.□

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

escalation_options

> Nagios configuration file parameter.□

escalation_period

> Nagios configuration file parameter.□

first_notification□

> Nagios configuration file parameter.□

host_name

> Nagios configuration file parameter.□

hostgroup_name

> Nagios configuration file parameter.□

last_notification□

> Nagios configuration file parameter.□

notification_interval□

> Nagios configuration file parameter.□

provider

> The specific backend to use for this `nagios_serviceescalation` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **naginator**

register

> Nagios configuration file parameter.□

service_description

> Nagios configuration file parameter.□

servicegroup_name

> Nagios configuration file parameter.

target

> The target.

use

> Nagios configuration file parameter.

---

nagios_serviceextinfo

The Nagios type serviceextinfo. This resource type is autogenerated using the model developed in Naginator, and all of the Nagios types are generated using the same code and the same library.

This type generates Nagios configuration statements in Nagios-parseable configuration files. By default, the statements will be added to `/etc/nagios/nagios_serviceextinfo.cfg`, but you can send them to a different file by setting their `target` attribute.

You can purge Nagios resources using the `resources` type, but only in the default file locations. This is an architectural limitation.

PARAMETERS

_naginator_name

> (Namevar: If omitted, this parameter's value defaults to the resource's title.)
>
> The name of this nagios_serviceextinfo resource.

action_url

> Nagios configuration file parameter.

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

host_name

> Nagios configuration file parameter.

icon_image

> Nagios configuration file parameter.

icon_image_alt

> Nagios configuration file parameter.

notes

> Nagios configuration file parameter.

notes_url

> Nagios configuration file parameter.

provider

> The specific backend to use for this `nagios_serviceextinfo` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **naginator**

register

> Nagios configuration file parameter.

service_description

> Nagios configuration file parameter.

target

> The target.

use

> Nagios configuration file parameter.

---

nagios_servicegroup

The Nagios type servicegroup. This resource type is autogenerated using the model developed in Naginator, and all of the Nagios types are generated using the same code and the same library.

This type generates Nagios configuration statements in Nagios-parseable configuration files. By default, the statements will be added to `/etc/nagios/nagios_servicegroup.cfg`, but you can send them to a different file by setting their `target` attribute.

You can purge Nagios resources using the `resources` type, but only in the default file locations. This is an architectural limitation.

PARAMETERS

action_url

> Nagios configuration file parameter.

alias

> Nagios configuration file parameter.

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

members

> Nagios configuration file parameter.

notes

> Nagios configuration file parameter.

notes_url

> Nagios configuration file parameter.□

provider

> The specific backend to use for this `nagios_servicegroup` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **naginator**

register

> Nagios configuration file parameter.□

servicegroup_members

> Nagios configuration file parameter.□

servicegroup_name

> (Namevar: If omitted, this parameter's value defaults to the resource's title.)
>
> The name of this nagios_servicegroup resource.

target

> The target.

use

> Nagios configuration file parameter.□

---

nagios_timeperiod

The Nagios type timeperiod. This resource type is autogenerated using the model developed in Naginator, and all of the Nagios types are generated using the same code and the same library.

This type generates Nagios configuration statements in Nagios-parseable configuration files. By default, the statements will be added to `/etc/nagios/nagios_timeperiod.cfg`, but you can send them to a different file by setting their `target` attribute.

You can purge Nagios resources using the `resources` type, but only in the default file locations.□ This is an architectural limitation.

PARAMETERS

alias

> Nagios configuration file parameter.□

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

exclude

> Nagios configuration file parameter.□

friday

> Nagios configuration file parameter.□

monday

> Nagios configuration file parameter.□

provider

> The specific backend to use for this `nagios_timeperiod` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **naginator**

register

> Nagios configuration file parameter.□

saturday

> Nagios configuration file parameter.□

sunday

> Nagios configuration file parameter.□

target

> The target.

thursday

> Nagios configuration file parameter.□

timeperiod_name

> (Namevar: If omitted, this parameter's value defaults to the resource's title.)
>
> The name of this nagios_timeperiod resource.

tuesday

> Nagios configuration file parameter.□

use

> Nagios configuration file parameter.□

wednesday

> Nagios configuration file parameter.□

---

notify

Sends an arbitrary message to the agent run-time log.

PARAMETERS

message

> The message to be sent to the log.

name

> An arbitrary tag for your own reference; the name of the message.

withpath

> Whether to show the full object path. Defaults to false. Valid values are `true`, `false`.

---

package

Manage packages. There is a basic dichotomy in package support right now: Some package types (e.g., yum and apt) can retrieve their own package files, while others (e.g., rpm and sun) cannot. For those package formats that cannot retrieve their own files, you can use the `source` parameter to point to the correct file.

Puppet will automatically guess the packaging format that you are using based on the platform you are on, but you can override it using the `provider` parameter; each provider defines what it requires in order to function, and you must meet those requirements to use a given provider.

Autorequires: If Puppet is managing the files specified as a package's `adminfile`, `responsefile`, or `source`, the package resource will autorequire those files.

FEATURES

- holdable: The provider is capable of placing packages on hold such that they are not automatically upgraded as a result of other package dependencies unless explicit action is taken by a user or another package. Held is considered a superset of installed.
- install_options: The provider accepts options to be passed to the installer command.
- installable: The provider can install packages.
- purgeable: The provider can purge packages. This generally means that all traces of the package are removed, including existing configuration files. This feature is thus destructive and should be used with the utmost care.
- uninstall_options: The provider accepts options to be passed to the uninstaller command.
- uninstallable: The provider can uninstall packages.
- upgradeable: The provider can upgrade to the latest version of a package. This feature is used by specifying `latest` as the desired value for the package.
- versionable: The provider is capable of interrogating the package database for installed version(s), and can select which out of a set of available versions of a package to install if asked.

Provider	holdable	install options	installable	purgeable	uninstall options	uninstallable	upgradeable	versionable
aix			X			X	X	X
appdmg			X					
apple			X					

apt	X		X	X		X	X	X
aptitude	X		X	X		X	X	X
aptrpm			X	X		X	X	X
blastwave			X			X	X	
dpkg	X		X	X		X	X	
fink□	X		X	X		X	X	X
freebsd			X			X		
gem			X			X	X	X
hpux			X			X		
macports			X			X	X	X
msi		X	X		X	X		
nim			X			X	X	X
openbsd			X			X		X
opkg			X			X	X	
pacman			X			X	X	
pip			X			X	X	X
pkg	X		X			X	X	X
pkgdmg			X					
pkgin			X			X		
pkgutil			X			X	X	
portage			X			X	X	X
ports			X			X	X	
portupgrade			X			X	X	
rpm			X			X	X	X
rug			X			X	X	X
sun		X	X			X	X	
sunfreeware			X			X	X	
up2date			X			X	X	
urpmi			X			X	X	X
windows		X	X		X	X		
yum			X	X		X	X	X
zypper			X			X	X	X

PARAMETERS

adminfile□

> A file containing package defaults for installing packages. This is currently only used on Solaris. The value will be validated according to system rules, which in the case of Solaris means that it should either be a fully qualified path or it should be in `/var/sadm/install/admin`.

allowcdrom

> Tells apt to allow cdrom sources in the sources.list file. Normally apt will bail if you try this. Valid values are `true`, `false`.

category

> A read-only parameter set by the package.

configfiles

> Whether configfiles should be kept or replaced. Most packages types do not support this parameter. Defaults to `keep`. Valid values are `keep`, `replace`.

description

> A read-only parameter set by the package.

ensure

> What state the package should be in. On packaging systems that can retrieve new packages on their own, you can choose which package to retrieve by specifying a version number or `latest` as the ensure value. On packaging systems that manage configuration files separately from “normal” system files, you can uninstall config files by specifying `purged` as the ensure value. Valid values are `present` (also called `installed`), `absent`, `purged`, `held`, `latest`. Values can match `/./`.

flavor

> Newer versions of OpenBSD support ‘flavors’, which are further specifications for which type of package you want.

install_options

> An array of additional options to pass when installing a package. These options are package-specific, and should be documented by the software vendor. One commonly implemented option is `INSTALLDIR`:
>
> ```
> package { 'mysql':
>   ensure          => installed,
>   source          => 'N:/packages/mysql-5.5.16-winx64.msi',
>   install_options => [ '/S', { 'INSTALLDIR' => 'C:\mysql-5.5' } ],
> }
> ```
>
> Each option in the array can either be a string or a hash, where each key and value pair are interpreted in a provider specific way. Each option will automatically be quoted when passed to the install command.
>
> On Windows, this is the only place in Puppet where backslash separators should be used. Note that backslashes in double-quoted strings must be double-escaped and backslashes in single-quoted strings may be double-escaped. Requires features install_options.

instance

A read-only parameter set by the package.

name

The package name. This is the name that the packaging system uses internally, which is sometimes (especially on Solaris) a name that is basically useless to humans. If you want to abstract package installation, then you can use aliases to provide a common name to packages:

```
# In the 'openssl' class
$ssl = $operatingsystem ? {
  solaris => SMCossl,
  default => openssl
}

# It is not an error to set an alias to the same value as the
# object name.
package { $ssl:
  ensure => installed,
  alias  => openssl
}

. etc. .

$ssh = $operatingsystem ? {
  solaris => SMCossh,
  default => openssh
}

# Use the alias to specify a dependency, rather than
# having another selector to figure it out again.
package { $ssh:
  ensure  => installed,
  alias   => openssh,
  require => Package[openssl]
}
```

platform

A read-only parameter set by the package.

provider

The specific backend to use for this `package` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:

aix

Installation from an AIX software directory, using the AIX `installp` command. The `source` parameter is required for this provider, and should be set to the absolute path (on the puppet agent machine) of a directory containing one or more BFF package files.□

The `installp` command will generate a table of contents file (named `.toc`) in this

> directory, and the `name` parameter (or resource title) that you specify for your `package` resource must match a package name that exists in the `.toc` file.
>
> Note that package downgrades are not supported; if your resource specifies a specific version number and there is already a newer version of the package installed on the machine, the resource will fail with an error message.
>
> Required binaries: `/usr/bin/lslpp`, `/usr/sbin/installp`. Default for `operatingsystem` == `aix`. Supported features: `installable`, `uninstallable`, `upgradeable`, `versionable`.

appdmg

> Package management which copies application bundles to a target.
>
> Required binaries: `/usr/bin/hdiutil`, `/usr/bin/curl`, `/usr/bin/ditto`. Supported features: `installable`.

apple

> Package management based on OS X's builtin packaging system. This is essentially the simplest and least functional package system in existence – it only supports installation; no deletion or upgrades. The provider will automatically add the `.pkg` extension, so leave that off when specifying the package name.
>
> Required binaries: `/usr/sbin/installer`. Supported features: `installable`.

apt

> Package management via `apt-get`.
>
> Required binaries: `/usr/bin/apt-cache`, `/usr/bin/debconf-set-selections`, `/usr/bin/apt-get`. Default for `operatingsystem` == `debian, ubuntu`. Supported features: `holdable`, `installable`, `purgeable`, `uninstallable`, `upgradeable`, `versionable`.

aptitude

> Package management via `aptitude`.
>
> Required binaries: `/usr/bin/apt-cache`, `/usr/bin/aptitude`. Supported features: `holdable`, `installable`, `purgeable`, `uninstallable`, `upgradeable`, `versionable`.

aptrpm

> Package management via `apt-get` ported to `rpm`.
>
> Required binaries: `apt-cache`, `apt-get`, `rpm`. Supported features: `installable`, `purgeable`, `uninstallable`, `upgradeable`, `versionable`.

blastwave

> Package management using Blastwave.org’s `pkg-get` command on Solaris.
>
> Required binaries: `pkg-get`. Supported features: `installable`, `uninstallable`, `upgradeable`.

dpkg

> Package management via `dpkg`. Because this only uses `dpkg` and not `apt`, you must specify the source of any packages you want to manage.
>
> Required binaries: `/usr/bin/dpkg-deb`, `/usr/bin/dpkg`, `/usr/bin/dpkg-query`. Supported features: `holdable`, `installable`, `purgeable`, `uninstallable`, `upgradeable`.

fink

> Package management via `fink`.
>
> Required binaries: `/sw/bin/apt-cache`, `/sw/bin/dpkg-query`, `/sw/bin/apt-get`, `/sw/bin/fink`. Supported features: `holdable`, `installable`, `purgeable`, `uninstallable`, `upgradeable`, `versionable`.

freebsd

> The specific form of package management on FreeBSD. This is an extremely quirky packaging system, in that it freely mixes between ports and packages. Apparently all of the tools are written in Ruby, so there are plans to rewrite this support to directly use those libraries.
>
> Required binaries: `/usr/sbin/pkg_delete`, `/usr/sbin/pkg_info`, `/usr/sbin/pkg_add`. Supported features: `installable`, `uninstallable`.

gem

> Ruby Gem support. If a URL is passed via `source`, then that URL is used as the remote gem repository; if a source is present but is not a valid URL, it will be interpreted as the path to a local gem file. If source is not present at all, the gem will be installed from the default gem repositories.
>
> Required binaries: `gem`. Supported features: `installable`, `uninstallable`, `upgradeable`, `versionable`.

hpux

> HP-UX’s packaging system.
>
> Required binaries: `/usr/sbin/swremove`, `/usr/sbin/swinstall`, `/usr/sbin/swlist`. Default for `operatingsystem` == `hp-ux`. Supported features: `installable`, `uninstallable`.

macports

> Package management using MacPorts on OS X.
>
> Supports MacPorts versions and revisions, but not variants. Variant preferences may be specified using the MacPorts variants.conf file.
>
> When specifying a version in the Puppet DSL, only specify the version, not the revision. Revisions are only used internally for ensuring the latest version/revision of a port.
>
> Required binaries: `/opt/local/bin/port`. Supported features: `installable`, `uninstallable`, `upgradeable`, `versionable`.

msi

> Windows package management by installing and removing MSIs.
>
> The `msi` provider is deprecated. Use the `windows` provider instead.
>
> Supported features: `install_options`, `installable`, `uninstall_options`, `uninstallable`.

nim

> Installation from an AIX NIM LPP source. The `source` parameter is required for this provider, and should specify the name of a NIM `lpp_source` resource that is visible to the puppet agent machine. This provider supports the management of both BFF/installp and RPM packages.
>
> Note that package downgrades are not supported; if your resource specifies a specific version number and there is already a newer version of the package installed on the machine, the resource will fail with an error message.
>
> Required binaries: `/usr/sbin/nimclient`, `/usr/bin/lslpp`, `rpm`. Supported features: `installable`, `uninstallable`, `upgradeable`, `versionable`.

openbsd

> OpenBSD's form of `pkg_add` support.
>
> Required binaries: `pkg_delete`, `pkg_info`, `pkg_add`. Default for `operatingsystem` == `openbsd`. Supported features: `installable`, `uninstallable`, `versionable`.

opkg

> Opkg packaging support. Common on OpenWrt and OpenEmbedded platforms
>
> Required binaries: `opkg`. Default for `operatingsystem` == `openwrt`. Supported features: `installable`, `uninstallable`, `upgradeable`.

pacman

> Support for the Package Manager Utility (pacman) used in Archlinux.

> Required binaries: `/usr/bin/pacman`. Default for `operatingsystem` == `archlinux`. Supported features: `installable`, `uninstallable`, `upgradeable`.

pip

> Python packages via `pip`.
>
> Supported features: `installable`, `uninstallable`, `upgradeable`, `versionable`.

pkg

> OpenSolaris image packaging system. See pkg(5) for more information
>
> Required binaries: `/usr/bin/pkg`. Default for `osfamily` == `solaris` and `kernelrelease` == `5.11`. Supported features: `holdable`, `installable`, `uninstallable`, `upgradeable`, `versionable`.

pkgdmg

> Package management based on Apple’s Installer.app and DiskUtility.app. This package works by checking the contents of a DMG image for Apple pkg or mpkg files. Any□ number of pkg or mpkg files may exist in the root directory of the DMG file system.□ Subdirectories are not checked for packages. See the wiki docs on this provider for more detail.
>
> Required binaries: `/usr/bin/hdiutil`, `/usr/bin/curl`, `/usr/sbin/installer`. Default for `operatingsystem` == `darwin`. Supported features: `installable`.

pkgin

> Package management using pkgin, a binary package manager for pkgsrc.
>
> Required binaries: `pkgin`. Default for `operatingsystem` == `dragonfly`. Supported features: `installable`, `uninstallable`.

pkgutil

> Package management using Peter Bonivart’s `pkgutil` command on Solaris.
>
> Required binaries: `pkgutil`. Supported features: `installable`, `uninstallable`, `upgradeable`.

portage

> Provides packaging support for Gentoo’s portage system.
>
> Required binaries: `/usr/bin/emerge`, `/usr/bin/eix`, `/usr/bin/eix-update`. Default for `operatingsystem` == `gentoo`. Supported features: `installable`, `uninstallable`, `upgradeable`, `versionable`.

ports

> Support for FreeBSD's ports. Note that this, too, mixes packages and ports.
>
> Required binaries: `/usr/local/sbin/portupgrade`, `/usr/local/sbin/portversion`, `/usr/local/sbin/pkg_deinstall`, `/usr/sbin/pkg_info`. Default for `operatingsystem` == `freebsd`. Supported features: `installable`, `uninstallable`, `upgradeable`.

portupgrade

> Support for FreeBSD's ports using the portupgrade ports management software. Use the port's full origin as the resource name. eg (ports-mgmt/portupgrade) for the portupgrade port.
>
> Required binaries: `/usr/local/sbin/portupgrade`, `/usr/local/sbin/portversion`, `/usr/local/sbin/portinstall`, `/usr/local/sbin/pkg_deinstall`, `/usr/sbin/pkg_info`. Supported features: `installable`, `uninstallable`, `upgradeable`.

rpm

> RPM packaging support; should work anywhere with a working `rpm` binary.
>
> Required binaries: `rpm`. Supported features: `installable`, `uninstallable`, `upgradeable`, `versionable`.

rug

> Support for suse `rug` package manager.
>
> Required binaries: `/usr/bin/rug`, `rpm`. Default for `operatingsystem` == `suse, sles`. Supported features: `installable`, `uninstallable`, `upgradeable`, `versionable`.

sun

> Sun's packaging system. Requires that you specify the source for the packages you're managing.
>
> Required binaries: `/usr/sbin/pkgrm`, `/usr/bin/pkginfo`, `/usr/sbin/pkgadd`. Default for `osfamily` == `solaris`. Supported features: `install_options`, `installable`, `uninstallable`, `upgradeable`.

sunfreeware

> Package management using sunfreeware.com's `pkg-get` command on Solaris. At this point, support is exactly the same as `blastwave` support and has not actually been tested.
>
> Required binaries: `pkg-get`. Supported features: `installable`, `uninstallable`, `upgradeable`.

up2date

> Support for Red Hat’s proprietary `up2date` package update mechanism.
>
> Required binaries: `/usr/sbin/up2date-nox`. Default for `lsbdistrelease` == `2.1, 3, 4` and `osfamily` == `redhat`. Supported features: `installable`, `uninstallable`, `upgradeable`.

urpmi

> Support via `urpmi`.
>
> Required binaries: `urpmi`, `urpmq`, `rpm`. Default for `operatingsystem` == `mandriva, mandrake`. Supported features: `installable`, `uninstallable`, `upgradeable`, `versionable`.

windows

> Windows package management.
>
> This provider supports either MSI or self-extracting executable installers.
>
> This provider requires a `source` attribute when installing the package. It accepts paths paths to local files, mapped drives, or UNC paths.□
>
> If the executable requires special arguments to perform a silent install or uninstall, then the appropriate arguments should be specified using the `install_options` or `uninstall_options` attributes, respectively. Puppet will automatically quote any option that contains spaces.
>
> Default for `operatingsystem` == `windows`. Supported features: `install_options`, `installable`, `uninstall_options`, `uninstallable`.

yum

> Support via `yum`.
>
> Using this provider’s `uninstallable` feature will not remove dependent packages. To remove dependent packages with this provider use the `purgeable` feature, but note this feature is destructive and should be used with the utmost care.
>
> Required binaries: `python`, `yum`, `rpm`. Default for `operatingsystem` == `fedora, centos, redhat`. Supported features: `installable`, `purgeable`, `uninstallable`, `upgradeable`, `versionable`.

zypper

> Support for SuSE `zypper` package manager. Found in SLES10sp2+ and SLES11
>
> Required binaries: `/usr/bin/zypper`. Supported features: `installable`, `uninstallable`, `upgradeable`, `versionable`.

responsefile

> A file containing any necessary answers to questions asked by the package. This is currently used on Solaris and Debian. The value will be validated according to system rules, but it should generally be a fully qualified path.

root

> A read-only parameter set by the package.

source

> Where to find the actual package. This must be a local file (or on a network file system) or a URL that your specific packaging type understands; Puppet will not retrieve files for you, although you can manage packages as `file` resources.

status

> A read-only parameter set by the package.

uninstall_options

> An array of additional options to pass when uninstalling a package. These options are package-specific, and should be documented by the software vendor. For example:
>
> ```
> package { 'VMware Tools':
>   ensure            => absent,
>   uninstall_options => [ { 'REMOVE' => 'Sync,VSS' } ],
> }
> ```
>
> Each option in the array can either be a string or a hash, where each key and value pair are interpreted in a provider specific way. Each option will automatically be quoted when passed to the uninstall command.
>
> On Windows, this is the only place in Puppet where backslash separators should be used. Note that backslashes in double-quoted strings must be double-escaped and backslashes in single-quoted strings may be double-escaped. Requires features uninstall_options.

vendor

> A read-only parameter set by the package.

---

resources

This is a metatype that can manage other resource types. Any metaparams specified here will be passed on to any generated resources, so you can purge umanaged resources but set `noop` to true so the purging is only logged and does not actually happen.

PARAMETERS

name

> The name of the type to be managed.

purge

> Purge unmanaged resources. This will delete any resource that is not specified in your

> configuration and is not required by any specified resources. Valid values are `true`, `false`.

unless_system_user

> This keeps system users from being purged. By default, it does not purge users whose UIDs are less than or equal to 500, but you can specify a different UID as the inclusive limit. Valid values are `true`, `false`. Values can match `/^\d+$/`.

---

router

Manages connected router.

PARAMETERS

url

> (Namevar: If omitted, this parameter's value defaults to the resource's title.)
>
> An SSH or telnet URL at which to access the router, in the form `ssh://user:pass:enable@host/` or `telnet://user:pass:enable@host/`.

---

schedule

Define schedules for Puppet. Resources can be limited to a schedule by using the `schedule` metaparameter.

Currently, schedules can only be used to stop a resource from being applied; they cannot cause a resource to be applied when it otherwise wouldn't be, and they cannot accurately specify a time when a resource should run.

Every time Puppet applies its configuration, it will apply the set of resources whose schedule does not eliminate them from running right then, but there is currently no system in place to guarantee that a given resource runs at a given time. If you specify a very restrictive schedule and Puppet happens to run at a time within that schedule, then the resources will get applied; otherwise, that work may never get done.

Thus, it is advisable to use wider scheduling (e.g., over a couple of hours) combined with periods and repetitions. For instance, if you wanted to restrict certain resources to only running once, between the hours of two and 4 AM, then you would use this schedule:

```
schedule { 'maint':
  range  => "2 - 4",
  period => daily,
  repeat => 1,
}
```

With this schedule, the first time that Puppet runs between 2 and 4 AM, all resources with this schedule will get applied, but they won't get applied again between 2 and 4 because they will have already run once that day, and they won't get applied outside that schedule because they will be outside the scheduled range.

Puppet automatically creates a schedule for each of the valid periods with the same name as that period (e.g., hourly and daily). Additionally, a schedule named `puppet` is created and used as the default, with the following attributes:

```
schedule { 'puppet':
  period => hourly,
  repeat => 2,
}
```

This will cause resources to be applied every 30 minutes by default.

PARAMETERS

name

The name of the schedule. This name is used to retrieve the schedule when assigning it to an object:

```
schedule { 'daily':
  period => daily,
  range  => "2 - 4",
}

exec { "/usr/bin/apt-get update":
  schedule => 'daily',
}
```

period

The period of repetition for a resource. The default is for a resource to get applied every time Puppet runs.

Note that the period defines how often a given resource will get applied but not when; if you would like to restrict the hours that a given resource can be applied (e.g., only at night during a maintenance window), then use the `range` attribute.

If the provided periods are not sufficient, you can provide a value to the repeat attribute, which will cause Puppet to schedule the affected resources evenly in the period the specified number of times. Take this schedule:

```
schedule { 'veryoften':
  period => hourly,
  repeat => 6,
}
```

This can cause Puppet to apply that resource up to every 10 minutes.

At the moment, Puppet cannot guarantee that level of repetition; that is, it can run up to every 10 minutes, but internal factors might prevent it from actually running that often (e.g., long-running Puppet runs will squash conflictingly scheduled runs).

See the `periodmatch` attribute for tuning whether to match times by their distance apart or by their specific value. Valid values are `hourly`, `daily`, `weekly`, `monthly`, `never`.

periodmatch

> Whether periods should be matched by number (e.g., the two times are in the same hour) or by distance (e.g., the two times are 60 minutes apart). Valid values are `number`, `distance`.

range

> The earliest and latest that a resource can be applied. This is always a hyphen-separated range within a 24 hour period, and hours must be specified in numbers between 0 and 23, inclusive. Minutes and seconds can optionally be provided, using the normal colon as a separator. For instance:
>
> ```
> schedule { 'maintenance':
>   range => "1:30 - 4:30",
> }
> ```
>
> This is mostly useful for restricting certain resources to being applied in maintenance windows or during off-peak hours. Multiple ranges can be applied in array context. As a convenience when specifying ranges, you may cross midnight (e.g.: range => “22:00 - 04:00”).

repeat

> How often a given resource may be applied in this schedule’s `period`. Defaults to 1; must be an integer.

weekday

> The days of the week in which the schedule should be valid. You may specify the full day name (Tuesday), the three character abbreviation (Tue), or a number corresponding to the day of the week where 0 is Sunday, 1 is Monday, etc. You may pass an array to specify multiple days. If not specified, the day of the week will not be considered in the schedule.
>
> If you are also using a range match that spans across midnight then this parameter will match the day that it was at the start of the range, not necessarily the day that it is when it matches. For example, consider this schedule:
>
> schedule { ‘maintenance_window’: range => ‘22:00 - 04:00’, weekday => ‘Saturday’, }
>
> This will match at 11 PM on Saturday and 2 AM on Sunday, but not at 2 AM on Saturday.

---

scheduled_task

Installs and manages Windows Scheduled Tasks. All attributes except `name`, `command`, and `trigger` are optional; see the description of the `trigger` attribute for details on setting schedules.

PARAMETERS

arguments

> Any arguments or flags that should be passed to the command. Multiple arguments should be specified as a space-separated string.

command

> The full path to the application to run, without any arguments.

enabled

> Whether the triggers for this task should be enabled. This attribute affects every trigger for the task; triggers cannot be enabled or disabled individually. Valid values are `true`, `false`.

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

name

> The name assigned to the scheduled task. This will uniquely identify the task on the system.

password

> The password for the user specified in the 'user' attribute. This is only used if specifying a user other than 'SYSTEM'. Since there is no way to retrieve the password used to set the account information for a task, this parameter will not be used to determine if a scheduled task is in sync or not.

provider

> The specific backend to use for this `scheduled_task` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **win32_taskscheduler**
>
> > This provider uses the win32-taskscheduler gem to manage scheduled tasks on Windows.
> >
> > Puppet requires version 0.2.1 or later of the win32-taskscheduler gem; previous versions can cause "Could not evaluate: The operation completed successfully" errors.
> >
> > Default for `operatingsystem` == `windows`.

trigger

> One or more triggers defining when the task should run. A single trigger is represented as a hash, and multiple triggers can be specified with an array of hashes.
>
> A trigger can contain the following keys:
>
> - For all triggers:
>   - `schedule` (Required) — The schedule type. Valid values are `daily`, `weekly`, `monthly`, or `once`.
>   - `start_time` (Required) — The time of day when the trigger should first become active. Several time formats will work, but we suggest 24-hour time formatted as HH:MM.
>   - `start_date` — The date when the trigger should first become active. Defaults to "today." Several date formats will work, including special dates like "today," but we suggest formatting dates as YYYY-MM-DD.
> - For daily triggers:

    - `every` — How often the task should run, as a number of days. Defaults to 1. (“2” means every other day, “3” means every three days, etc.)

- For weekly triggers:
    - `every` — How often the task should run, as a number of weeks. Defaults to 1. (“2” means every other week, “3” means every three weeks, etc.)
    - `day_of_week` — Which days of the week the task should run, as an array. Defaults to all days. Each day must be one of `mon`, `tues`, `wed`, `thurs`, `fri`, `sat`, `sun`, or `all`.

- For monthly-by-date triggers:
    - `months` — Which months the task should run, as an array. Defaults to all months. Each month must be an integer between 1 and 12.
    - `on` (Required) — Which days of the month the task should run, as an array. Each day must beeither an integer between 1 and 31, or the special value `last,` which is always the last day of the month.

- For monthly-by-weekday triggers:
    - `months` — Which months the task should run, as an array. Defaults to all months. Each month must be an integer between 1 and 12.
    - `day_of_week` (Required) — Which day of the week the task should run, as an array with only one element. Each day must be one of `mon`, `tues`, `wed`, `thurs`, `fri`, `sat`, `sun`, or `all`.
    - `which_occurrence` (Required) — The occurrence of the chosen weekday when the task should run. Must be one of `first`, `second`, `third`, `fourth`, `fifth`, or `last`.

Examples:

```
# Run at 8am on the 1st, 15th, and last day of the month in January,
March,
# May, July, September, and November, starting after August 31st, 2011.
trigger => {
  schedule   => monthly,
  start_date => '2011-08-31',   # Defaults to 'today'
  start_time => '08:00',        # Must be specified
  months     => [1,3,5,7,9,11], # Defaults to all
  on         => [1, 15, last],  # Must be specified
}

# Run at 8am on the first Monday of the month for January, March, and May,
# starting after August 31st, 2011.
trigger => {
  schedule         => monthly,
  start_date       => '2011-08-31', # Defaults to 'today'
  start_time       => '08:00',      # Must be specified
  months           => [1,3,5],      # Defaults to all
  which_occurrence => first,        # Must be specified
  day_of_week      => [mon],        # Must be specified
}
```

user

> The user to run the scheduled task as. Please note that not all security configurations will allow running a scheduled task as 'SYSTEM', and saving the scheduled task under these conditions will fail with a reported error of 'The operation completed successfully'. It is recommended that you either choose another user to run the scheduled task, or alter the security policy to allow v1 scheduled tasks to run as the 'SYSTEM' account. Defaults to 'SYSTEM'.
>
> Please also note that Puppet must be running as a privileged user in order to manage `scheduled_task` resources. Running as an unprivileged user will result in 'access denied' errors.

working_dir

> The full path of the directory in which to start the command.

---

selboolean

Manages SELinux booleans on systems with SELinux support. The supported booleans are any of the ones found in `/selinux/booleans/`.

PARAMETERS

name

> The name of the SELinux boolean to be managed.

persistent

> If set true, SELinux booleans will be written to disk and persist accross reboots. The default is `false`. Valid values are `true`, `false`.

provider

> The specific backend to use for this `selboolean` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **getsetsebool**
>
> > Manage SELinux booleans using the getsebool and setsebool binaries.
> >
> > Required binaries: `/usr/sbin/getsebool`, `/usr/sbin/setsebool`.

value

> Whether the the SELinux boolean should be enabled or disabled. Valid values are `on`, `off`.

---

selmodule

Manages loading and unloading of SELinux policy modules on the system. Requires SELinux support. See man semodule(8) for more information on SELinux policy modules.

Autorequires: If Puppet is managing the file containing this SELinux policy module (which is either explicitly specified in the `selmodulepath` attribute or will be found at {`selmoduledir`}/{`name`}.pp), the selmodule resource will autorequire that file.

PARAMETERS

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

name

> The name of the SELinux policy to be managed. You should not include the customary trailing .pp extension.

provider

> The specific backend to use for this `selmodule` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **semodule**
>
> > Manage SELinux policy modules using the semodule binary.
> >
> > Required binaries: `/usr/sbin/semodule`.

selmoduledir

> The directory to look for the compiled pp module file in. Currently defaults to `/usr/share/selinux/targeted`. If the `selmodulepath` attribute is not specified, Puppet will expect to find the module in `<selmoduledir>/<name>.pp`, where `name` is the value of the `name` parameter.

selmodulepath

> The full path to the compiled .pp policy module. You only need to use this if the module file is not in the `selmoduledir` directory.

syncversion

> If set to `true`, the policy will be reloaded if the version found in the on-disk file differs from the loaded version. If set to `false` (the default) the the only check that will be made is if the policy is loaded at all or not. Valid values are `true`, `false`.

---

service

Manage running services. Service support unfortunately varies widely by platform — some platforms have very little if any concept of a running service, and some have a very codified and powerful concept. Puppet's service support is usually capable of doing the right thing, but the more information you can provide, the better behaviour you will get.

Puppet 2.7 and newer expect init scripts to have a working status command. If this isn't the case for any of your services' init scripts, you will need to set `hasstatus` to false and possibly specify a custom status command in the `status` attribute.

Note that if a `service` receives an event from another resource, the service will get restarted. The actual command to restart the service depends on the platform. You can provide an explicit command for restarting with the `restart` attribute, or you can set `hasrestart` to true to use the init script's restart command; if you do neither, the service's stop and start commands will be used.

FEATURES

- controllable: The provider uses a control variable.
- enableable: The provider can enable and disable the service
- refreshable: The provider can restart the service.

Provider	controllable	enableable	refreshable
base			X
bsd		X	X
daemontools		X	X
debian		X	X
freebsd		X	X
gentoo		X	X
init			X
launchd		X	X
openrc		X	X
openwrt		X	X
redhat		X	X
runit		X	X
service			X
smf		X	X
src		X	X
systemd		X	X
upstart		X	X
windows		X	X

PARAMETERS

binary

> The path to the daemon. This is only used for systems that do not support init scripts. This binary will be used to start the service if no `start` parameter is provided.

control

> The control variable used to manage services (originally for HP-UX). Defaults to the upcased service name plus `START` replacing dots with underscores, for those providers that support the `controllable` feature.

enable

> Whether a service should be enabled to start at boot. This property behaves quite differently depending on the platform; wherever possible, it relies on local tools to enable or disable a given service. Valid values are `true`, `false`, `manual`. Requires features enableable.

ensure

> Whether a service should be running. Valid values are `stopped` (also called `false`), `running` (also called `true`).

hasrestart

> Specify that an init script has a `restart` command. If this is false and you do not specify a command in the `restart` attribute, the init script's `stop` and `start` commands will be used.
>
> Defaults to false. Valid values are `true`, `false`.

hasstatus

> Declare whether the service's init script has a functional status command; defaults to `true`. This attribute's default value changed in Puppet 2.7.0.
>
> The init script's status command must return 0 if the service is running and a nonzero value otherwise. Ideally, these exit codes should conform to the LSB's specification for init script status actions, but Puppet only considers the difference between 0 and nonzero to be relevant.
>
> If a service's init script does not support any kind of status command, you should set `hasstatus` to false and either provide a specific command using the `status` attribute or expect that Puppet will look for the service name in the process table. Be aware that 'virtual' init scripts (like 'network' under Red Hat systems) will respond poorly to refresh events from other resources if you override the default behavior without providing a status command. Valid values are `true`, `false`.

manifest

> Specify a command to config a service, or a path to a manifest to do so.

name

> The name of the service to run.
>
> This name is used to find the service; on platforms where services have short system names and long display names, this should be the short name. (To take an example from Windows, you would use "wuauserv" rather than "Automatic Updates.")

path

> The search path for finding init scripts. Multiple values should be separated by colons or provided as an array.

pattern

> The pattern to search for in the process table. This is used for stopping services on platforms

that do not support init scripts, and is also used for determining service status on those service whose init scripts do not include a status command.

Defaults to the name of the service. The pattern can be a simple string or any legal Ruby pattern.

provider

The specific backend to use for this `service` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:

base

The simplest form of Unix service support.

You have to specify enough about your service for this to work; the minimum you can specify is a binary for starting the process, and this same binary will be searched for in the process table to stop the service. As with `init`-style services, it is preferable to specify start, stop, and status commands.

Required binaries: `kill`. Supported features: `refreshable`.

bsd

FreeBSD's (and probably NetBSD's?) form of `init`-style service management.

Uses `rc.conf.d` for service enabling and disabling.

Supported features: `enableable`, `refreshable`.

daemontools

Daemontools service management.

This provider manages daemons supervised by D.J. Bernstein daemontools. When detecting the service directory it will check, in order of preference:

- `/service`
- `/etc/service`
- `/var/lib/svscan`

The daemon directory should be in one of the following locations:

- `/var/lib/service`
- `/etc`

…or this can be overriden in the resource's attributes:

```
service { "myservice":
  provider => "daemontools",
  path     => "/path/to/daemons",
```

> ```
> }
> ```
>
> This provider supports out of the box:
>
> - start/stop (mapped to enable/disable)
> - enable/disable
> - restart
> - status
>
> If a service has `ensure => "running"`, it will link /path/to/daemon to /path/to/service, which will automatically enable the service.
>
> If a service has `ensure => "stopped"`, it will only shut down the service, not remove the `/path/to/service` link.
>
> Required binaries: `/usr/bin/svc`, `/usr/bin/svstat`. Supported features: `enableable`, `refreshable`.

debian

> Debian's form of `init`-style management.
>
> The only differences from `init` are support for enabling and disabling services via `update-rc.d` and the ability to determine enabled status via `invoke-rc.d`.
>
> Required binaries: `/usr/sbin/invoke-rc.d`, `/usr/sbin/update-rc.d`. Default for `operatingsystem` == `debian, ubuntu`. Supported features: `enableable`, `refreshable`.

freebsd

> Provider for FreeBSD and DragonFly BSD. Uses the `rcvar` argument of init scripts and parses/edits rc files.□
>
> Default for `operatingsystem` == `freebsd, dragonfly`. Supported features: `enableable`, `refreshable`.

gentoo

> Gentoo's form of `init`-style service management.
>
> Uses `rc-update` for service enabling and disabling.
>
> Required binaries: `/sbin/rc-update`. Supported features: `enableable`, `refreshable`.

init

> Standard `init`-style service management.
>
> Supported features: `refreshable`.

launchd

> This provider manages jobs with `launchd`, which is the default service framework for Mac OS X (and may be available for use on other platforms).
>
> For `launchd` documentation, see:
>
> - http://developer.apple.com/macosx/launchd.html
> - http://launchd.macosforge.org/
>
> This provider reads plists out of the following directories:
>
> - `/System/Library/LaunchDaemons`
> - `/System/Library/LaunchAgents`
> - `/Library/LaunchDaemons`
> - `/Library/LaunchAgents`
>
> …and builds up a list of services based upon each plist's "Label" entry.
>
> This provider supports:
>
> - ensure => running/stopped,
> - enable => true/false
> - status
> - restart
>
> Here is how the Puppet states correspond to `launchd` states:
>
> - stopped — job unloaded
> - started — job loaded
> - enabled — 'Disable' removed from job plist file□
> - disabled — 'Disable' added to job plist file□
>
> Note that this allows you to do something `launchctl` can't do, which is to be in a state of "stopped/enabled" or "running/disabled".
>
> Note that this provider does not support overriding 'restart' or 'status'.
>
> Required binaries: `/bin/launchctl`, `/usr/bin/sw_vers`, `/usr/bin/plutil`. Default for `operatingsystem` == `darwin`. Supported features: `enableable`, `refreshable`.

openrc

> Support for Gentoo's OpenRC initskripts
>
> Uses rc-update, rc-status and rc-service to manage services.
>
> Required binaries: `/sbin/rc-service`, `/bin/rc-status`, `/sbin/rc-update`. Default for `operatingsystem` == `funtoo`. Supported features: `enableable`, `refreshable`.

openwrt

> Support for OpenWrt flavored init scripts.□
>
> Uses /etc/init.d/service_name enable, disable, and enabled.
>
> Default for `operatingsystem` == `openwrt`. Supported features: `enableable`, `refreshable`.

redhat

> Red Hat's (and probably many others') form of `init`-style service management. Uses `chkconfig` for service enabling and disabling.
>
> Required binaries: `/sbin/chkconfig`, `/sbin/service`. Default for `osfamily` == `redhat, suse`. Supported features: `enableable`, `refreshable`.

runit

> Runit service management.
>
> This provider manages daemons running supervised by Runit. When detecting the service directory it will check, in order of preference:
>
> - `/service`
> - `/var/service`
> - `/etc/service`
>
> The daemon directory should be in one of the following locations:
>
> - `/etc/sv`
>
> or this can be overriden in the service resource parameters::
>
> ```
> service { "myservice":
>   provider => "runit",
>   path => "/path/to/daemons",
> }
> ```
>
> This provider supports out of the box:
>
> - start/stop
> - enable/disable
> - restart
> - status
>
> Required binaries: `/usr/bin/sv`. Supported features: `enableable`, `refreshable`.

service

> The simplest form of service support.

> Supported features: `refreshable`.

smf

> Support for Sun's new Service Management Framework.
>
> Starting a service is effectively equivalent to enabling it, so there is only support for starting and stopping services, which also enables and disables them, respectively.
>
> By specifying `manifest => "/path/to/service.xml"`, the SMF manifest will be imported if it does not exist.
>
> Required binaries: `/usr/sbin/svccfg`, `/usr/sbin/svcadm`, `/usr/bin/svcs`. Default for `osfamily` == `solaris`. Supported features: `enableable`, `refreshable`.

src

> Support for AIX's System Resource controller.
>
> Services are started/stopped based on the `stopsrc` and `startsrc` commands, and some services can be refreshed with `refresh` command.
>
> Enabling and disabling services is not supported, as it requires modifications to `/etc/inittab`. Starting and stopping groups of subsystems is not yet supported.
>
> Required binaries: `/usr/bin/stopsrc`, `/usr/sbin/chitab`, `/usr/bin/startsrc`, `/usr/bin/refresh`, `/usr/bin/lssrc`, `/usr/sbin/lsitab`, `/usr/sbin/mkitab`, `/usr/sbin/rmitab`. Default for `operatingsystem` == `aix`. Supported features: `enableable`, `refreshable`.

systemd

> Manages `systemd` services using `systemctl`.
>
> Required binaries: `systemctl`. Default for `osfamily` == `archlinux`. Supported features: `enableable`, `refreshable`.

upstart

> Ubuntu service management with `upstart`.
>
> This provider manages `upstart` jobs, which have replaced `initd` services on Ubuntu. For `upstart` documentation, see http://upstart.ubuntu.com/.
>
> Required binaries: `/sbin/start`, `/sbin/status`, `/sbin/restart`, `/sbin/stop`, `/sbin/initctl`. Default for `operatingsystem` == `ubuntu`. Supported features: `enableable`, `refreshable`.

windows

> Support for Windows Service Control Manager (SCM). This provider can start, stop,

> > enable, and disable services, and the SCM provides working status methods for all services.
> >
> > Control of service groups (dependencies) is not yet supported, nor is running services as a specific user.
> >
> > Required binaries: `net.exe`. Default for `operatingsystem` == `windows`. Supported features: `enableable`, `refreshable`.

restart

> Specify a restart command manually. If left unspecified, the service will be stopped and then started.

start

> Specify a start command manually. Most service subsystems support a `start` command, so this will not need to be specified.

status

> Specify a status command manually. This command must return 0 if the service is running and a nonzero value otherwise. Ideally, these exit codes should conform to [the LSB's specification](#) for init script status actions, but Puppet only considers the difference between 0 and nonzero to be relevant.
>
> If left unspecified, the status of the service will be determined automatically, usually by looking for the service in the process table.

stop

> Specify a stop command manually.

---

ssh_authorized_key

Manages SSH authorized keys. Currently only type 2 keys are supported.

Autorequires: If Puppet is managing the user account in which this SSH key should be installed, the `ssh_authorized_key` resource will autorequire that user.

PARAMETERS

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

key

> The public key itself; generally a long string of hex characters. The key attribute may not contain whitespace: Omit key headers (e.g. 'ssh-rsa') and key identifiers (e.g. 'joe@joescomputer.local') found in the public key file.

name

> The SSH key comment. This attribute is currently used as a system-wide primary key and therefore has to be unique.

options

> Key options, see sshd(8) for possible values. Multiple values should be specified as an array.□

provider

> The specific backend to use for this `ssh_authorized_key` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **parsed**
>
> > Parse and generate authorized_keys files for SSH.□

target

> The absolute filename in which to store the SSH key. This property is optional and should□ only be used in cases where keys are stored in a non-standard location (i.e.` not in` ~user/.ssh/authorized_keys`).

type

> The encryption type used: ssh-dss or ssh-rsa. Valid values are `ssh-dss` (also called `dsa`), `ssh-rsa` (also called `rsa`), `ecdsa-sha2-nistp256`, `ecdsa-sha2-nistp384`, `ecdsa-sha2-nistp521`.

user

> The user account in which the SSH key should be installed. The resource will automatically depend on this user.

---

sshkey

Installs and manages ssh host keys. At this point, this type only knows how to install keys into `/etc/ssh/ssh_known_hosts`. See the `ssh_authorized_key` type to manage authorized keys.

PARAMETERS

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

host_aliases

> Any aliases the host might have. Multiple values must be specified as an array.□

key

> The key itself; generally a long string of hex digits.

name

> The host name that the key is associated with.

provider

> The specific backend to use for this `sshkey` resource. You will seldom need to specify this —

> Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **parsed**
>
> > Parse and generate host-wide known hosts files for SSH.

target

> The file in which to store the ssh key. Only used by the `parsed` provider.

type

> The encryption type used. Probably ssh-dss or ssh-rsa. Valid values are `ssh-dss` (also called `dsa`), `ssh-rsa` (also called `rsa`), `ecdsa-sha2-nistp256`, `ecdsa-sha2-nistp384`, `ecdsa-sha2-nistp521`.

---

stage

A resource type for specifying run stages. The actual stage should be specified on resources:

```
class { foo: stage => pre }
```

And you must manually control stage order:

```
stage { pre: before => Stage[main] }
```

You automatically get a 'main' stage created, and by default all resources get inserted into that stage.

You can only set stages on class resources, not normal builtin resources.

PARAMETERS

name

> The name of the stage. This will be used as the 'stage' for each resource.

---

tidy

Remove unwanted files based on specific criteria. Multiple criteria are OR'd together, so a file that is too large but is not old enough will still get tidied.

If you don't specify either `age` or `size`, then all files will be removed.

This resource type works by generating a file resource for every file that should be deleted and then letting that resource perform the actual deletion.

PARAMETERS

age

> Tidy files whose age is equal to or greater than the specified time. You can choose seconds,

minutes, hours, days, or weeks by specifying the first letter of any of those words (e.g., ‘1w’).

Specifying 0 will remove all files.

backup

Whether tidied files should be backed up. Any values are passed directly to the file resources used for actual file deletion, so consult the `file` type’s backup documentation to determine valid values.

matches

One or more (shell type) file glob patterns, which restrict the list of files to be tidied to those whose basenames match at least one of the patterns specified. Multiple patterns can be specified using an array.

Example:

```
tidy { "/tmp":
  age     => "1w",
  recurse => 1,
  matches => [ "[0-9]pub*.tmp", "*.temp", "tmpfile?" ]
}
```

This removes files from `/tmp` if they are one week old or older, are not in a subdirectory and match one of the shell globs given.

Note that the patterns are matched against the basename of each file – that is, your glob patterns should not have any ‘/’ characters in them, since you are only specifying against the last bit of the file.

Finally, note that you must now specify a non-zero/non-false value for recurse if matches is used, as matches only apply to files found by recursion (there’s no reason to use static patterns match against a statically determined path). Requiering explicit recursion clears up a common source of confusion.

path

(Namevar: If omitted, this parameter’s value defaults to the resource’s title.)

The path to the file or directory to manage. Must be fully qualified.

recurse

If target is a directory, recursively descend into the directory looking for files to tidy. Valid values are `true`, `false`, `inf`. Values can match `/^[0-9]+$/`.

rmdirs

Tidy directories in addition to files; that is, remove directories whose age is older than the specified criteria. This will only remove empty directories, so all contained files must also be tidied before a directory gets removed. Valid values are `true`, `false`.

size

Tidy files whose size is equal to or greater than the specified size. Unqualified values are in

> kilobytes, but b, k, m, g, and t can be appended to specify bytes, kilobytes, megabytes, gigabytes, and terabytes, respectively. Only the first character is significant, so the full word□ can also be used.

type

> Set the mechanism for determining age. Default: atime. Valid values are `atime`, `mtime`, `ctime`.

---

user

Manage users. This type is mostly built to manage system users, so it is lacking some features useful for managing normal users.

This resource type uses the prescribed native tools for creating groups and generally uses POSIX APIs for retrieving information about them. It does not directly modify `/etc/passwd` or anything.

Autorequires: If Puppet is managing the user's primary group (as provided in the `gid` attribute), the user resource will autorequire that group. If Puppet is managing any role accounts corresponding to the user's roles, the user resource will autorequire those role accounts.

FEATURES

- allows_duplicates: The provider supports duplicate users with the same UID.
- libuser: Allows local users to be managed on systems that also use some other remote NSS method of managing accounts.
- manages_aix_lam: The provider can manage AIX Loadable Authentication Module (LAM) system.
- manages_expiry: The provider can manage the expiry date for a user.
- manages_homedir: The provider can create and remove home directories.
- manages_password_age: The provider can set age requirements and restrictions for passwords.
- manages_password_salt: The provider can set a password salt. This is for providers that implement PBKDF2 passwords with salt properties.
- manages_passwords: The provider can modify user passwords, by accepting a password hash.
- manages_solaris_rbac: The provider can manage roles and normal users
- system_users: The provider allows you to create system users with lower UIDs.

Provider	allows duplicates	libuser	manages aix lam	manages expiry	manages homedir	manages password age	manages password salt	manages passwords	manages solaris rbac	system users
aix			X	X	X	X		X		
directoryservice							X	X		
hpuxuseradd	X				X			X		
ldap								X		
pw	X			X	X			X		
user_role_add	X				X	X		X	X	
useradd	X			X	X					X
windows_adsi					X			X		

PARAMETERS

allowdupe

> Whether to allow duplicate UIDs. Defaults to `false`. Valid values are `true`, `false`.

attribute_membership

> Whether specified attribute value pairs should be treated as the complete list (`inclusive`) or the minimum list (`minimum`) of attribute/value pairs for the user. Defaults to `minimum`. Valid values are `inclusive`, `minimum`.

attributes

> Specify AIX attributes for the user in an array of attribute = value pairs. Requires features manages_aix_lam.

auth_membership

> Whether specified auths should be considered the complete list (`inclusive`) or the minimum list (`minimum`) of auths the user has. Defaults to `minimum`. Valid values are `inclusive`, `minimum`.

auths

> The auths the user has. Multiple auths should be specified as an array. Requires features manages_solaris_rbac.

comment

> A description of the user. Generally the user's full name.

ensure

> The basic state that the object should be in. Valid values are `present`, `absent`, `role`.

expiry

> The expiry date for this user. Must be provided in a zero-padded YYYY-MM-DD format — e.g. 2010-02-19. If you want to make sure the user account does never expire, you can pass the special value `absent`. Valid values are `absent`. Values can match `/^\d{4}-\d{2}-\d{2}$/`. Requires features manages_expiry.

forcelocal

> Forces the mangement of local accounts when accounts are also being managed by some other NSS Valid values are `true`, `false`. Requires features libuser.

gid

> The user's primary group. Can be specified numerically or by name.
>
> Note that users on Windows systems do not have a primary group; manage groups with the `groups` attribute instead.

groups

> The groups to which the user belongs. The primary group should not be listed, and groups

> should be identified by name rather than by GID. Multiple groups should be specified as an array.

home

> The home directory of the user. The directory must be created separately and is not currently checked for existence.

ia_load_module

> The name of the I&A module to use to manage this user. Requires features manages_aix_lam.

iterations

> This is the number of iterations of a chained computation of the password hash (http://en.wikipedia.org/wiki/PBKDF2). This parameter is used in OS X Requires features manages_password_salt.

key_membership

> Whether specified key/value pairs should be considered the complete list (`inclusive`) or the minimum list (`minimum`) of the user's attributes. Defaults to `minimum`. Valid values are `inclusive`, `minimum`.

keys

> Specify user attributes in an array of key = value pairs. Requires features manages_solaris_rbac.

managehome

> Whether to manage the home directory when managing the user. This will create the home directory when `ensure => present`, and delete the home directory when `ensure => absent`. Defaults to `false`. Valid values are `true`, `false`.

membership

> Whether specified groups should be considered the complete list (`inclusive`) or the minimum list (`minimum`) of groups to which the user belongs. Defaults to `minimum`. Valid values are `inclusive`, `minimum`.

name

> The user name. While naming limitations vary by operating system, it is advisable to restrict names to the lowest common denominator, which is a maximum of 8 characters beginning with a letter.
>
> Note that Puppet considers user names to be case-sensitive, regardless of the platform's own rules; be sure to always use the same case when referring to a given user.

password

> The user's password, in whatever encrypted format the local system requires.
>
> - Most modern Unix-like systems use salted SHA1 password hashes. You can use Puppet's built-in `sha1` function to generate a hash from a password.

> - Mac OS X 10.5 and 10.6 also use salted SHA1 hashes.
> - Mac OS X 10.7 (Lion) uses salted SHA512 hashes. The Puppet Labs stdlib module contains a `str2saltedsha512` function which can generate password hashes for Lion.
> - Windows passwords can only be managed in cleartext, as there is no Windows API for setting the password hash.
>
> Be sure to enclose any value that includes a dollar sign ($) in single quotes (') to avoid accidental variable interpolation. Requires features manages_passwords.

password_max_age

> The maximum number of days a password may be used before it must be changed. Requires features manages_password_age.

password_min_age

> The minimum number of days a password must be used before it may be changed. Requires features manages_password_age.

profile_membership□

> Whether specified roles should be treated as the complete list (`inclusive`) or the minimum list (`minimum`) of roles of which the user is a member. Defaults to `minimum`. Valid values are `inclusive`, `minimum`.

profiles□

> The profiles the user has. Multiple profiles should be specified as an array. Requires features manages_solaris_rbac.

project

> The name of the project associated with a user. Requires features manages_solaris_rbac.

provider

> The specific backend to use for this `user` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **aix**
>
> > User management for AIX.
> >
> > Required binaries: `/usr/sbin/lsgroup`, `/usr/bin/chuser`, `/bin/chpasswd`, `/usr/sbin/lsuser`, `/usr/sbin/rmuser`, `/usr/bin/mkuser`. Default for `operatingsystem` == `aix`. Supported features: `manages_aix_lam`, `manages_expiry`, `manages_homedir`, `manages_password_age`, `manages_passwords`.
>
> **directoryservice**
>
> > User management on OS X.
> >
> > Required binaries: `/usr/bin/dscl`, `/usr/bin/uuidgen`, `/usr/bin/dsimport`,

> `/usr/bin/plutil`, `/usr/bin/dscacheutil`. Default for `operatingsystem` == `darwin`. Supported features: `manages_password_salt`, `manages_passwords`.

hpuxuseradd

> User management for HP-UX. This provider uses the undocumented `-F` switch to HP-UX's special `usermod` binary to work around the fact that its standard `usermod` cannot make changes while the user is logged in.
>
> Required binaries: `/usr/sam/lbin/usermod.sam`, `/usr/sam/lbin/userdel.sam`, `/usr/sam/lbin/useradd.sam`. Default for `operatingsystem` == `hp-ux`. Supported features: `allows_duplicates`, `manages_homedir`, `manages_passwords`.

ldap

> User management via LDAP.
>
> This provider requires that you have valid values for all of the LDAP-related settings in `puppet.conf`, including `ldapbase`. You will almost definitely need settings for `ldapuser` and `ldappassword` in order for your clients to write to LDAP.
>
> Note that this provider will automatically generate a UID for you if you do not specify one, but it is a potentially expensive operation, as it iterates across all existing users to pick the appropriate next one.
>
> Supported features: `manages_passwords`.

pw

> User management via `pw` on FreeBSD and DragonFly BSD.
>
> Required binaries: `pw`. Default for `operatingsystem` == `freebsd, dragonfly`. Supported features: `allows_duplicates`, `manages_expiry`, `manages_homedir`, `manages_passwords`.

user_role_add

> User and role management on Solaris, via `useradd` and `roleadd`.
>
> Required binaries: `roleadd`, `usermod`, `roledel`, `rolemod`, `userdel`, `passwd`, `useradd`. Default for `osfamily` == `solaris`. Supported features: `allows_duplicates`, `manages_homedir`, `manages_password_age`, `manages_passwords`, `manages_solaris_rbac`.

useradd

> User management via `useradd` and its ilk. Note that you will need to install Ruby's shadow password library (often known as `ruby-libshadow`) if you wish to manage user passwords.

> > Required binaries: `usermod`, `userdel`, `luseradd`, `chage`, `useradd`. Supported features: `allows_duplicates`, `manages_expiry`, `manages_homedir`, `system_users`.
>
> **windows_adsi**
>
> > Local user management for Windows.
> >
> > Default for `operatingsystem` == `windows`. Supported features: `manages_homedir`, `manages_passwords`.

role_membership

> Whether specified roles should be considered the complete list (`inclusive`) or the minimum list (`minimum`) of roles the user has. Defaults to `minimum`. Valid values are `inclusive`, `minimum`.

roles

> The roles the user has. Multiple roles should be specified as an array. Requires features manages_solaris_rbac.

salt

> This is the 32 byte salt used to generate the PBKDF2 password used in OS X Requires features manages_password_salt.

shell

> The user's login shell. The shell must exist and be executable.
>
> This attribute cannot be managed on Windows systems.

system

> Whether the user is a system user, according to the OS's criteria; on most platforms, a UID less than or equal to 500 indicates a system user. Defaults to `false`. Valid values are `true`, `false`.

uid

> The user ID; must be specified numerically. If no user ID is specified when creating a new user, then one will be chosen automatically. This will likely result in the same user having different UIDs on different systems, which is not recommended. This is especially noteworthy when managing the same user on both Darwin and other platforms, since Puppet does UID generation on Darwin, but the underlying tools do so on other platforms.
>
> On Windows, this property is read-only and will return the user's security identifier (SID).

---

vlan

Manages a VLAN on a router or switch.

PARAMETERS

description

> The VLAN’s name.

device_url

> The URL of the router or switch maintaining this VLAN.

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

name

> The numeric VLAN ID. Values can match `/^\d+/`.

provider

> The specific backend to use for this `vlan` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> ##### cisco
>
> > Cisco switch/router provider for vlans.

---

yumrepo

The client-side description of a yum repository. Repository configurations are found by parsing `/etc/yum.conf` and the files indicated by the `reposdir` option in that file (see `yum.conf(5)` for details).

Most parameters are identical to the ones documented in the `yum.conf(5)` man page.

Continuation lines that yum supports (for the `baseurl`, for example) are not supported. This type does not attempt to read or verify the exinstence of files listed in the `include` attribute.

PARAMETERS

baseurl

> The URL for this repository. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/.*/`.

cost

> Cost of this repository. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/\d+/`.

descr

> A human-readable description of the repository. This corresponds to the name parameter in `yum.conf(5)`. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/.*/`.

enabled

> Whether this repository is enabled, as represented by a `0` or `1`. Set this to `absent` to remove it

> from the file completely. Valid values are `absent`. Values can match `/(0|1)/`.

enablegroups

> Whether yum will allow the use of package groups for this repository, as represented by a `0` or `1`. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/(0|1)/`.

exclude

> List of shell globs. Matching packages will never be considered in updates or installs for this repo. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/.*/`.

failovermethod

> The failover methode for this repository; should be either `roundrobin` or `priority`. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/roundrobin|priority/`.

gpgcheck

> Whether to check the GPG signature on packages installed from this repository, as represented by a `0` or `1`. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/(0|1)/`.

gpgkey

> The URL for the GPG key with which packages from this repository are signed. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/.*/`.

http_caching

> What to cache from this repository. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/packages|all|none/`.

include

> The URL of a remote file containing additional yum configuration settings. Puppet does not check for this file's existence or validity. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/.*/`.

includepkgs

> List of shell globs. If this is set, only packages matching one of the globs will be considered for update or install from this repo. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/.*/`.

keepalive

> Whether HTTP/1.1 keepalive should be used with this repository, as represented by a `0` or `1`. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/(0|1)/`.

metadata_expire

> Number of seconds after which the metadata will expire. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/[0-9]+/`.

mirrorlist

> The URL that holds the list of mirrors for this repository. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/.*/`.

name

> The name of the repository. This corresponds to the `repositoryid` parameter in `yum.conf(5)`.

priority

> Priority of this repository from 1-99. Requires that the `priorities` plugin is installed and enabled. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/[1-9][0-9]?/`.

protect

> Enable or disable protection for this repository. Requires that the `protectbase` plugin is installed and enabled. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/(0|1)/`.

proxy

> URL to the proxy server for this repository. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/.*/`.

proxy_password

> Password for this proxy. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/.*/`.

proxy_username

> Username for this proxy. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/.*/`.

sslcacert

> Path to the directory containing the databases of the certificate authorities yum should use to verify SSL certificates. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/.*/`.

sslclientcert

> Path to the SSL client certificate yum should use to connect to repos/remote sites. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/.*/`.

sslclientkey

> Path to the SSL client key yum should use to connect to repos/remote sites. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/.*/`.

sslverify

> Should yum verify SSL certificates/hosts at all. Possible values are ‘True’ or ‘False’. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/True|False/`.

timeout

> Number of seconds to wait for a connection before timing out. Set this to `absent` to remove it from the file completely. Valid values are `absent`. Values can match `/[0-9]+/`.

---

zfs

Manage zfs. Create destroy and set properties on zfs instances.

Autorequires: If Puppet is managing the zpool at the root of this zfs instance, the zfs resource will autorequire it. If Puppet is managing any parent zfs instances, the zfs resource will autorequire them.

PARAMETERS

aclinherit

> The aclinherit property. Valid values are `discard`, `noallow`, `restricted`, `passthrough`, `passthrough-x`.

aclmode

> The aclmode property. Valid values are `discard`, `groupmask`, `passthrough`.

atime

> The atime property. Valid values are `on`, `off`.

canmount

> The canmount property. Valid values are `on`, `off`, `noauto`.

checksum

> The checksum property. Valid values are `on`, `off`, `fletcher2`, `fletcher4`, `sha256`.

compression

> The compression property. Valid values are `on`, `off`, `lzjb`, `gzip`, `gzip-[1-9]`, `zle`.

copies

> The copies property. Valid values are `1`, `2`, `3`.

dedup

> The dedup property. Valid values are `on`, `off`.

devices

> The devices property. Valid values are `on`, `off`.

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

exec

> The exec property. Valid values are `on`, `off`.

logbias

> The logbias property. Valid values are `latency`, `throughput`.

mountpoint

> The mountpoint property. Valid values are `<path>`, `legacy`, `none`.

name

> The full name for this filesystem (including the zpool).□

nbmand

> The nbmand property. Valid values are `on`, `off`.

primarycache

> The primarycache property. Valid values are `all`, `none`, `metadata`.

provider

> The specific backend to use for this `zfs` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **zfs**
>
> > Provider for zfs.
> >
> > Required binaries: `zfs`.

quota

> The quota property. Valid values are `<size>`, `none`.

readonly

> The readonly property. Valid values are `on`, `off`.

recordsize

> The recordsize property. Valid values are powers of two between 512 and 128k.

refquota

> The refquota property. Valid values are `<size>`, `none`.

refreservation

> The refreservation property. Valid values are `<size>`, `none`.

reservation

> The reservation property. Valid values are `<size>`, `none`.

secondarycache

> The secondarycache property. Valid values are `all`, `none`, `metadata`.

setuid

> The setuid property. Valid values are `on`, `off`.

shareiscsi

> The shareiscsi property. Valid values are `on`, `off`, `type=<type>`.

sharenfs

> The sharenfs property. Valid values are `on`, `off`, share(1M) options

sharesmb

> The sharesmb property. Valid values are `on`, `off`, sharemgr(1M) options

snapdir

> The snapdir property. Valid values are `hidden`, `visible`.

version

> The version property. Valid values are `1`, `2`, `3`, `4`, `current`.

volsize

> The volsize property. Valid values are `<size>`

vscan

> The vscan property. Valid values are `on`, `off`.

xattr

> The xattr property. Valid values are `on`, `off`.

zoned

> The zoned property. Valid values are `on`, `off`.

---

zone

Manages Solaris zones.

Autorequires: If Puppet is managing the directory specified as the root of the zone's filesystem□

(with the `path` attribute), the zone resource will autorequire that directory.

PARAMETERS

autoboot

> Whether the zone should automatically boot. Valid values are `true`, `false`.

clone

> Instead of installing the zone, clone it from another zone. If the zone root resides on a zfs file system, a snapshot will be used to create the clone; if it resides on a ufs filesystem, a copy of the zone will be used. The zone from which you clone must not be running.

create_args

> Arguments to the `zonecfg` create command. This can be used to create branded zones.

dataset

> The list of datasets delegated to the non-global zone from the global zone. All datasets must be zfs filesystem names which are different from the mountpoint.

ensure

> The running state of the zone. The valid states directly reflect the states that `zoneadm` provides. The states are linear, in that a zone must be `configured`, then `installed`, and only then can be `running`. Note also that `halt` is currently used to stop zones. Valid values are `absent`, `configured`, `installed`, `running`.

id

> The numerical ID of the zone. This number is autogenerated and cannot be changed.

inherit

> The list of directories that the zone inherits from the global zone. All directories must be fully qualified.

install_args

> Arguments to the `zoneadm` install command. This can be used to create branded zones.

ip

> The IP address of the zone. IP addresses must be specified with the interface, separated by a colon, e.g.: bge0:192.168.0.1. For multiple interfaces, specify them in an array.

iptype

> The IP stack type of the zone. Valid values are `shared`, `exclusive`.

name

> The name of the zone.

path

> The root of the zone's filesystem. Must be a fully qualified file name. If you include `%s` in the

> path, then it will be replaced with the zone’s name. Currently, you cannot use Puppet to move a zone. Consequently this is a readonly property.

pool

> The resource pool for this zone.

provider

> The specific backend to use for this `zone` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **solaris**
>
> > Provider for Solaris Zones.
> >
> > Required binaries: `/usr/sbin/zoneadm`, `/usr/sbin/zonecfg`. Default for `osfamily` == `solaris`.

realhostname

> The actual hostname of the zone.

shares

> Number of FSS CPU shares allocated to the zone.

sysidcfg

> The text to go into the `sysidcfg` file when the zone is first booted. The best way is to use a template:
>
> ```
> # $confdir/modules/site/templates/sysidcfg.erb
> system_locale=en_US
> timezone=GMT
> terminal=xterms
> security_policy=NONE
> root_password=<%= password %>
> timeserver=localhost
> name_service=DNS {domain_name=<%= domain %> name_server=<%= nameserver %>}
> network_interface=primary {hostname=<%= realhostname %>
>   ip_address=<%= ip %>
>   netmask=<%= netmask %>
>   protocol_ipv6=no
>   default_route=<%= defaultroute %>}
> nfs4_domain=dynamic
> ```
>
> And then call that:
>
> ```
> zone { myzone:
>   ip          => "bge0:192.168.0.23",
>   sysidcfg    => template("site/sysidcfg.erb"),
>   path        => "/opt/zones/myzone",
>   realhostname => "fully.qualified.domain.name"
> }
> ```

> The `sysidcfg` only matters on the first booting of the zone, so Puppet only checks for it at that time.

---

zpool

Manage zpools. Create and delete zpools. The provider WILL NOT SYNC, only report differences.

Supports vdevs with mirrors, raidz, logs and spares.

PARAMETERS

disk

> The disk(s) for this pool. Can be an array or a space separated string.

ensure

> The basic property that the resource should be in. Valid values are `present`, `absent`.

log

> Log disks for this pool. This type does not currently support mirroring of log disks.

mirror

> List of all the devices to mirror for this pool. Each mirror should be a space separated string:
>
> ```
> mirror => ["disk1 disk2", "disk3 disk4"],
> ```

pool

> (Namevar: If omitted, this parameter's value defaults to the resource's title.)
>
> The name for this pool.

provider

> The specific backend to use for this `zpool` resource. You will seldom need to specify this — Puppet will usually discover the appropriate provider for your platform. Available providers are:
>
> **zpool**
>
> > Provider for zpool.
> >
> > Required binaries: `zpool`.

raid_parity

> Determines parity when using the `raidz` parameter.

raidz

> List of all the devices to raid for this pool. Should be an array of space separated strings:
>
> ```
> raidz => ["disk1 disk2", "disk3 disk4"],
> ```

spare

> Spare disk(s) for this pool.

This page autogenerated on Tue Jun 18 16:59:03 -0700 2013

Function Reference

Function Reference

This page is autogenerated; any changes will get overwritten (last generated on Tue Jun 18 16:58:31 -0700 2013)

There are two types of functions in Puppet: Statements and rvalues. Statements stand on their own and do not return arguments; they are used for performing stand-alone work like importing. Rvalues return values and can only be used in a statement requiring a value, such as an assignment or a case statement.

Functions execute on the Puppet master. They do not execute on the Puppet agent. Hence they only have access to the commands and data available on the Puppet master host.

Here are the functions available in Puppet:

alert

Log a message on the server at level alert.

- Type: statement

collect

Applies a parameterized block to each element in a sequence of entries from the first argument and returns an array with the result of each invocation of the parameterized block.

This function takes two mandatory arguments: the first should be an Array or a Hash, and the second a parameterized block as produced by the puppet syntax:

$a.collect	$x	{ … }

When the first argument is an Array, the block is called with each entry in turn. When the first argument is a hash the entry is an array with `[key, value]`.

Examples

# Turns hash into array of values $a.collect |$x|{ $x[1] }

# Turns hash into array of keys $a.collect |$x| { $x[0] }

Since 3.2

- Type: rvalue

create_resources

Converts a hash into a set of resources and adds them to the catalog.

This function takes two mandatory arguments: a resource type, and a hash describing a set of resources. The hash should be in the form `{title => {parameters} }`:

```
# A hash of user resources:
```

```
$myusers = {
  'nick' => { uid    => '1330',
              group  => allstaff,
              groups => ['developers', 'operations', 'release'], }
  'dan'  => { uid    => '1308',
              group  => allstaff,
              groups => ['developers', 'prosvc', 'release'], }
}

create_resources(user, $myusers)
```

A third, optional parameter may be given, also as a hash:

```
$defaults = {
  'ensure'   => present,
  'provider' => 'ldap',
}

create_resources(user, $myusers, $defaults)
```

The values given on the third argument are added to the parameters of each resource present in the set given on the second argument. If a parameter is present on both the second and third arguments, the one on the second argument takes precedence.

This function can be used to create defined resources and classes, as well as native resources.

Virtual and Exported resources may be created by prefixing the type name with @ or @@ respectively. For example, the $myusers hash may be exported in the following manner:

```
create_resources("@@user", $myusers)
```

The $myusers may be declared as virtual resources using:

```
create_resources("@user", $myusers)
```

- Type: statement

crit

Log a message on the server at level crit.

- Type: statement

debug

Log a message on the server at level debug.

- Type: statement

defined

Determine whether a given class or resource type is defined. This function can also determine whether a specific resource has been declared. Returns true or false. Accepts class names, type names, and resource references.

The `defined` function checks both native and defined types, including types provided as plugins via modules. Types and classes are both checked using their names:

```
defined("file")
defined("customtype")
defined("foo")
defined("foo::bar")
```

Resource declarations are checked using resource references, e.g. `defined( File['/tmp/myfile'] )`. Checking whether a given resource has been declared is, unfortunately, dependent on the parse order of the configuration, and the following code will not work:

```
if defined(File['/tmp/foo']) {
    notify("This configuration includes the /tmp/foo file.")
}
file {"/tmp/foo":
    ensure => present,
}
```

However, this order requirement refers to parse order only, and ordering of resources in the configuration graph (e.g. with `before` or `require`) does not affect the behavior of `defined`.

- Type: rvalue

each

Applies a parameterized block to each element in a sequence of selected entries from the first argument and returns the first argument.

This function takes two mandatory arguments: the first should be an Array or a Hash, and the second a parameterized block as produced by the puppet syntax:

$a.each {	$x	… }

When the first argument is an Array, the parameterized block should define one or two block parameters. For each application of the block, the next element from the array is selected, and it is passed to the block if the block has one parameter. If the block has two parameters, the first is the elements index, and the second the value. The index starts from 0.

$a.each {	$index, $value	… }

When the first argument is a Hash, the parameterized block should define one or two parameters. When one parameter is defined, the iteration is performed with each entry as an array of `[key, value]`, and when two parameters are defined the iteration is performed with key and value.

$a.each {	$entry	…“key ${$entry[0]}, value ${$entry[1]}” }
$a.each {	$key, $value	…“key ${key}, value ${value}” }

Since 3.2

- Type: rvalue

emerg

Log a message on the server at level emerg.

- Type: statement

err

Log a message on the server at level err.

- Type: statement

extlookup

This is a parser function to read data from external files, this version uses CSV files but the concept can easily be adjust for databases, yaml or any other queryable data source.

The object of this is to make it obvious when it’s being used, rather than magically loading data in when an module is loaded I prefer to look at the code and see statements like:

```
$snmp_contact = extlookup("snmp_contact")
```

The above snippet will load the snmp_contact value from CSV files, this in its own is useful but a common construct in puppet manifests is something like this:

```
case $domain {
  "myclient.com": { $snmp_contact = "John Doe <john@myclient.com>" }
  default:        { $snmp_contact = "My Support <support@my.com>" }
}
```

Over time there will be a lot of this kind of thing spread all over your manifests and adding an additional client involves grepping through manifests to find all the places where you have constructs like this.

This is a data problem and shouldn’t be handled in code, a using this function you can do just that.

First you configure it in site.pp:

```
$extlookup_datadir = "/etc/puppet/manifests/extdata"
$extlookup_precedence = ["%{fqdn}", "domain_%{domain}", "common"]
```

The array tells the code how to resolve values, first it will try to find it in web1.myclient.com.csv then in domain_myclient.com.csv and finally in common.csv

Now create the following data files in /etc/puppet/manifests/extdata:

```
domain_myclient.com.csv:
  snmp_contact,John Doe <john@myclient.com>
  root_contact,support@%{domain}
  client_trusted_ips,192.168.1.130,192.168.10.0/24

common.csv:
  snmp_contact,My Support <support@my.com>
  root_contact,support@my.com
```

Now you can replace the case statement with the simple single line to achieve the exact same outcome:

```
$snmp_contact = extlookup("snmp_contact")
```

The above code shows some other features, you can use any fact or variable that is in scope by simply using %{varname} in your data files, you can return arrays by just having multiple values in the csv after the initial variable name.

In the event that a variable is nowhere to be found a critical error will be raised that will prevent your manifest from compiling, this is to avoid accidentally putting in empty values etc. You can however specify a default value:

```
$ntp_servers = extlookup("ntp_servers", "1.${country}.pool.ntp.org")
```

In this case it will default to “1.${country}.pool.ntp.org” if nothing is defined in any data file.

You can also specify an additional data file to search first before any others at use time, for example:

```
$version = extlookup("rsyslog_version", "present", "packages")
package{"rsyslog": ensure => $version }
```

This will look for a version configured in packages.csv and then in the rest as configured by $extlookup_precedence if it’s not found anywhere it will default to `present`, this kind of use case makes puppet a lot nicer for managing large amounts of packages since you do not need to edit a load of manifests to do simple things like adjust a desired version number.

Precedence values can have variables embedded in them in the form %{fqdn}, you could for example do:

```
$extlookup_precedence = ["hosts/%{fqdn}", "common"]
```

This will result in /path/to/extdata/hosts/your.box.com.csv being searched.

This is for back compatibility to interpolate variables with %. % interpolation is a workaround for a problem that has been fixed: Puppet variable interpolation at top scope used to only happen on each run.

- Type: rvalue

fail

Fail with a parse error.

- Type: statement

file□

Return the contents of a file. Multiple files can be passed, and the first file that exists will be read in.□

- Type: rvalue

foreach

Applies a parameterized block to each element in a sequence of selected entries from the first□ argument and returns the first argument.□

This function takes two mandatory arguments: the first should be an Array or a Hash, and the□ second a parameterized block as produced by the puppet syntax:

$a.foreach {	$x	… }

When the first argument is an Array, the parameterized block should define one or two block□ parameters. For each application of the block, the next element from the array is selected, and it is passed to the block if the block has one parameter. If the block has two parameters, the first is the□ elements index, and the second the value. The index starts from 0.

$a.foreach {	$index, $value	… }

When the first argument is a Hash, the parameterized block should define one or two parameters.□ When one parameter is defined, the iteration is performed with each entry as an array of `[key, value]`, and when two parameters are defined the iteration is performed with key and value.□

$a.foreach {	$entry	…“key ${$entry[0]}, value ${$entry[1]}” }
$a.foreach {	$key, $value	…“key ${key}, value ${value}” }

Since 3.2

- Type: rvalue

fqdn_rand

Generates random numbers based on the node’s fqdn. Generated random values will be a range from 0 up to and excluding n, where n is the first parameter. The second argument specifies a□ number to add to the seed and is optional, for example:

```
$random_number = fqdn_rand(30)
$random_number_seed = fqdn_rand(30,30)
```

- Type: rvalue

generate

Calls an external command on the Puppet master and returns the results of the command. Any arguments are passed to the external command as arguments. If the generator does not exit with return code of 0, the generator is considered to have failed and a parse error is thrown. Generators can only have file separators, alphanumerics, dashes, and periods in them. This function will attempt to protect you from malicious generator calls (e.g., those with '..' in them), but it can never be entirely safe. No subshell is used to execute generators, so all shell metacharacters are passed directly to the generator.

- Type: rvalue

hiera

Performs a standard priority lookup and returns the most specific value for a given key. The returned value can be data of any type (strings, arrays, or hashes).

In addition to the required `key` argument, `hiera` accepts two additional arguments:

- a `default` argument in the second position, providing a value to be returned in the absence of matches to the `key` argument
- an `override` argument in the third position, providing a data source to consult for matching values, even if it would not ordinarily be part of the matched hierarchy. If Hiera doesn't find a matching key in the named override data source, it will continue to search through the rest of the hierarchy.

More thorough examples of `hiera` are available at: http://docs.puppetlabs.com/hiera/1/puppet.html#hiera-lookup-functions

- Type: rvalue

hiera_array

Returns all matches throughout the hierarchy — not just the first match — as a flattened array of unique values. If any of the matched values are arrays, they're flattened and included in the results.

In addition to the required `key` argument, `hiera_array` accepts two additional arguments:

- a `default` argument in the second position, providing a string or array to be returned in the absence of matches to the `key` argument
- an `override` argument in the third position, providing a data source to consult for matching values, even if it would not ordinarily be part of the matched hierarchy. If Hiera doesn't find a matching key in the named override data source, it will continue to search through the rest of the hierarchy.

If any matched value is a hash, puppet will raise a type mismatch error.

More thorough examples of `hiera` are available at: http://docs.puppetlabs.com/hiera/1/puppet.html#hiera-lookup-functions

- Type: rvalue

hiera_hash

Returns a merged hash of matches from throughout the hierarchy. In cases where two or more hashes share keys, the hierarchy order determines which key/value pair will be used in the returned hash, with the pair in the highest priority data source winning.

In addition to the required `key` argument, `hiera_hash` accepts two additional arguments:

- a `default` argument in the second position, providing a hash to be returned in the absence of any matches for the `key` argument
- an `override` argument in the third position, providing a data source to insert at the top of the hierarchy, even if it would not ordinarily match during a Hiera data source lookup. If Hiera doesn't find a match in the named override data source, it will continue to search through the rest of the hierarchy.

`hiera_hash` expects that all values returned will be hashes. If any of the values found in the data sources are strings or arrays, puppet will raise a type mismatch error.

More thorough examples of `hiera_hash` are available at:
http://docs.puppetlabs.com/hiera/1/puppet.html#hiera-lookup-functions

- Type: rvalue

hiera_include

Assigns classes to a node using an array merge lookup that retrieves the value for a user-specified key from a Hiera data source.

To use `hiera_include`, the following configuration is required:

- A key name to use for classes, e.g. `classes`.
- A line in the puppet `sites.pp` file (e.g. `/etc/puppet/manifests/sites.pp`) reading `hiera_include('classes')`. Note that this line must be outside any node definition and below any top-scope variables in use for Hiera lookups.
- Class keys in the appropriate data sources. In a data source keyed to a node's role, one might have:

```
    ---
    classes:
      - apache
      - apache::passenger
```

In addition to the required `key` argument, `hiera_include` accepts two additional arguments:

- a `default` argument in the second position, providing an array to be returned in the absence of matches to the `key` argument
- an `override` argument in the third position, providing a data source to consult for matching

values, even if it would not ordinarily be part of the matched hierarchy. If Hiera doesn't find a matching key in the named override data source, it will continue to search through the rest of the hierarchy.

More thorough examples of `hiera_include` are available at: http://docs.puppetlabs.com/hiera/1/puppet.html#hiera-lookup-functions

- Type: statement

include

Evaluate one or more classes.

- Type: statement

info

Log a message on the server at level info.

- Type: statement

inline_template

Evaluate a template string and return its value. See the templating docs for more information. Note that if multiple template strings are specified, their output is all concatenated and returned as the output of the function.

- Type: rvalue

md5

Returns a MD5 hash value from a provided string.

- Type: rvalue

notice

Log a message on the server at level notice.

- Type: statement

realize

Make a virtual object real. This is useful when you want to know the name of the virtual object and don't want to bother with a full collection. It is slightly faster than a collection, and, of course, is a bit shorter. You must pass the object using a reference; e.g.: `realize User[luke]`.

- Type: statement

reduce

Applies a parameterized block to each element in a sequence of entries from the first argument (the collection) and returns the last result of the invocation of the parameterized block.

This function takes two mandatory arguments: the first should be an Array or a Hash, and the last a parameterized block as produced by the puppet syntax:

$a.reduce	$memo, $x	{ … }

When the first argument is an Array, the block is called with each entry in turn. When the first argument is a hash each entry is converted to an array with `[key, value]` before being fed to the block. An optional 'start memo' value may be supplied as an argument between the array/hash and mandatory block.

If no 'start memo' is given, the first invocation of the parameterized block will be given the first and second elements of the collection, and if the collection has fewer than 2 elements, the first element is produced as the result of the reduction without invocation of the block.

On each subsequent invocations, the produced value of the invoked parameterized block is given as the memo in the next invocation.

Examples

# Reduce an array $a = [1,2,3] $a.reduce |$memo, $entry| { $memo + $entry } #=> 6

# Reduce hash values $a = {a => 1, b => 2, c => 3} $a.reduce |$memo, $entry| { [sum, $memo[1]+$entry[1]] } #=> [sum, 6]

It is possible to provide a starting 'memo' as an argument.

Examples # Reduce an array $a = [1,2,3] $a.reduce(4) |$memo, $entry| { $memo + $entry } #=> 10

# Reduce hash values $a = {a => 1, b => 2, c => 3} $a.reduce([na, 4]) |$memo, $entry| { [sum, $memo[1]+$entry[1]] } #=> [sum, 10]

Since 3.2

- Type: rvalue

regsubst

Perform regexp replacement on a string or array of strings.

- Parameters (in order):
  - target The string or array of strings to operate on. If an array, the replacement will be performed on each of the elements in the array, and the return value will be an array.
  - regexp The regular expression matching the target string. If you want it anchored at the start and or end of the string, you must do that with ^ and $ yourself.
  - replacement Replacement string. Can contain backreferences to what was matched using \0 (whole match), \1 (first set of parentheses), and so on.
  - flags Optional. String of single letter flags for how the regexp is interpreted:
    - E Extended regexps
    - I Ignore case in regexps
    - M Multiline regexps
    - G Global replacement; all occurrences of the regexp in each target string will be replaced.

    Without this, only the first occurrence will be replaced.

  - encoding Optional. How to handle multibyte characters. A single-character string with the following values:
    - N None
    - E EUC
    - S SJIS
    - U UTF-8

- Examples

Get the third octet from the node’s IP address:

```
$i3 = regsubst($ipaddress,'^(\d+)\.(\d+)\.(\d+)\.(\d+)$','\3')
```

Put angle brackets around each octet in the node’s IP address:

```
$x = regsubst($ipaddress, '([0-9]+)', '<\1>', 'G')
```

- Type: rvalue

reject

Applies a parameterized block to each element in a sequence of entries from the first argument and returns an array with the entires for which the block did not evaluate to true.

This function takes two mandatory arguments: the first should be an Array or a Hash, and the second a parameterized block as produced by the puppet syntax:

$a.reject	$x	{ … }

When the first argument is an Array, the block is called with each entry in turn. When the first argument is a hash the entry is an array with `[key, value]`.

The returned filtered object is of the same type as the receiver.

Examples

# selects all that does not end with berry $a = [“rasberry”, “blueberry”, “orange”] $a.reject |$x| { $x =~ /berry$/ }

Since 3.2

- Type: rvalue

require

Evaluate one or more classes, adding the required class as a dependency.

The relationship metaparameters work well for specifying relationships between individual resources, but they can be clumsy for specifying relationships between classes. This function is a superset of the ‘include’ function, adding a class relationship so that the requiring class depends on the required class.

Warning: using require in place of include can lead to unwanted dependency cycles.

For instance the following manifest, with ‘require’ instead of ‘include’ would produce a nasty dependence cycle, because notify imposes a before between File[/foo] and Service[foo]:

```
class myservice {
  service { foo: ensure => running }
}

class otherstuff {
  include myservice
  file { '/foo': notify => Service[foo] }
}
```

Note that this function only works with clients 0.25 and later, and it will fail if used with earlier clients.

- Type: statement

search

Add another namespace for this class to search. This allows you to create classes with sets of definitions and add those classes to another class’s search path.□

- Type: statement

## select

Applies a parameterized block to each element in a sequence of entries from the first argument and□ returns an array with the entires for which the block evaluates to true.

This function takes two mandatory arguments: the first should be an Array or a Hash, and the□ second a parameterized block as produced by the puppet syntax:

$a.select	$x	{ … }

When the first argument is an Array, the block is called with each entry in turn. When the first□ argument is a hash the entry is an array with `[key, value]`.

The returned filtered object is of the same type as the receiver.□

Examples

# selects all that end with berry $a = [“raspberry”, “blueberry”, “orange”] $a.select |$x| { $x =~ /berry$/ }

Since 3.2

- Type: rvalue

sha1

Returns a SHA1 hash value from a provided string.

- Type: rvalue

shellquote

Quote and concatenate arguments for use in Bourne shell.

Each argument is quoted separately, and then all are concatenated with spaces. If an argument is an array, the elements of that array is interpolated within the rest of the arguments; this makes it possible to have an array of arguments and pass that array to shellquote instead of having to specify each argument individually in the call.

- Type: rvalue

slice

Applies a parameterized block to each slice of elements in a sequence of selected entries from the first argument and returns the first argument, or if no block is given returns a new array with a concatenation of the slices.

This function takes two mandatory arguments: the first should be an Array or a Hash, and the second the number of elements to include in each slice. The optional third argument should be a a parameterized block as produced by the puppet syntax:

```
|$x| { ... }
```

The parameterized block should have either one parameter (receiving an array with the slice), or the same number of parameters as specified by the slice size (each parameter receiving its part of the slice). In case there are fewer remaining elements than the slice size for the last slice it will contain the remaining elements. When the block has multiple parameters, excess parameters are set to :undef for an array, and to empty arrays for a Hash.

```
$a.slice(2) |$first, $second| { ... }
```

When the first argument is a Hash, each key,value entry is counted as one, e.g, a slice size of 2 will produce an array of two arrays with key, value.

```
$a.slice(2) |$entry|          { notice "first ${$entry[0]}, second
${$entry[1]}" }
$a.slice(2) |$first, $second| { notice "first ${first}, second ${second}" }
```

When called without a block, the function produces a concatenated result of the slices.

```
slice($[1,2,3,4,5,6], 2) # produces [[1,2], [3,4], [5,6]]
```

Since 3.2

- Type: rvalue

split

Split a string variable into an array using the specified split regexp.

Example:

```
$string     = 'v1.v2:v3.v4'
$array_var1 = split($string, ':')
$array_var2 = split($string, '[.]')
$array_var3 = split($string, '[.:]')
```

`$array_var1` now holds the result `['v1.v2', 'v3.v4']`, while `$array_var2` holds `['v1', 'v2:v3', 'v4']`, and `$array_var3` holds `['v1', 'v2', 'v3', 'v4']`.

Note that in the second example, we split on a literal string that contains a regexp meta-character (.), which must be escaped. A simple way to do that for a single character is to enclose it in square brackets; a backslash will also escape a single character.

- Type: rvalue

sprintf

Perform printf-style formatting of text.

The first parameter is format string describing how the rest of the parameters should be formatted. See the documentation for the `Kernel::sprintf` function in Ruby for all the details.

- Type: rvalue

tag

Add the specified tags to the containing class or definition. All contained objects will then acquire that tag, also.

- Type: statement

tagged

A boolean function that tells you whether the current container is tagged with the specified tags. The tags are ANDed, so that all of the specified tags must be included for the function to return true.

- Type: rvalue

template

Evaluate a template and return its value. See the templating docs for more information.

Note that if multiple templates are specified, their output is all concatenated and returned as the output of the function.

- Type: rvalue

versioncmp

Compares two version numbers.

Prototype:

```
$result = versioncmp(a, b)
```

Where a and b are arbitrary version strings.

This function returns:

- `1` if version a is greater than version b
- `0` if the versions are equal
- `-1` if version a is less than version b

Example:

```
if versioncmp('2.6-1', '2.4.5') > 0 {
    notice('2.6-1 is > than 2.4.5')
}
```

This function uses the same version comparison algorithm used by Puppet’s `package` type.

- Type: rvalue

warning

Log a message on the server at level warning.

- Type: statement

This page autogenerated on Tue Jun 18 16:58:31 -0700 2013

Metaparameter Reference

Metaparameter Reference

This page is autogenerated; any changes will get overwritten (last generated on Tue Jun 18 16:58:45 -0700 2013)

Metaparameters

Metaparameters are parameters that work with any resource type; they are part of the Puppet framework itself rather than being part of the implementation of any given instance. Thus, any defined metaparameter can be used with any instance in your manifest, including defined components.

Available Metaparameters

alias

Creates an alias for the object. Puppet uses this internally when you provide a symbolic title:

```
file { 'sshdconfig':
  path => $operatingsystem ? {
    solaris => "/usr/local/etc/ssh/sshd_config",
    default => "/etc/ssh/sshd_config"
  },
  source => "..."
}

service { 'sshd':
  subscribe => File['sshdconfig']
}
```

When you use this feature, the parser sets `sshdconfig` as the title, and the library sets that as an alias for the file so the dependency lookup in `Service['sshd']` works. You can use this metaparameter yourself, but note that only the library can use these aliases; for instance, the following code will not work:

```
file { "/etc/ssh/sshd_config":
  owner => root,
  group => root,
  alias => 'sshdconfig'
}

file { 'sshdconfig':
  mode => 644
}
```

There's no way here for the Puppet parser to know that these two stanzas should be affecting the same file.

See the Language Guide for more information.

audit

Marks a subset of this resource's unmanaged attributes for auditing. Accepts an attribute name, an array of attribute names, or `all`.

Auditing a resource attribute has two effects: First, whenever a catalog is applied with puppet apply or puppet agent, Puppet will check whether that attribute of the resource has been modified, comparing its current value to the previous run; any change will be logged alongside any actions performed by Puppet while applying the catalog.

Secondly, marking a resource attribute for auditing will include that attribute in inspection reports generated by puppet inspect; see the puppet inspect documentation for more details.

Managed attributes for a resource can also be audited, but note that changes made by Puppet will be logged as additional modifications. (I.e. if a user manually edits a file whose contents are audited and managed, puppet agent's next two runs will both log an audit notice: the first run will log the user's edit and then revert the file to the desired state, and the second run will log the edit made by Puppet.)

before

References to one or more objects that depend on this object. This parameter is the opposite of require — it guarantees that the specified object is applied later than the specifying object:

```
file { "/var/nagios/configuration":
  source  => "...",
  recurse => true,
  before  => Exec["nagios-rebuid"]
}

exec { "nagios-rebuild":
  command => "/usr/bin/make",
  cwd     => "/var/nagios/configuration"
}
```

This will make sure all of the files are up to date before the make command is run.

loglevel

Sets the level that information will be logged. The log levels have the biggest impact when logs are sent to syslog (which is currently the default). Valid values are `debug`, `info`, `notice`, `warning`, `err`, `alert`, `emerg`, `crit`, `verbose`.

noop

Boolean flag indicating whether work should actually be done. Valid values are `true`, `false`.

notify

References to one or more objects that depend on this object. This parameter is the opposite of subscribe — it creates a dependency relationship like before, and also causes the dependent object(s) to be refreshed when this object is changed. For instance:

```
  file { "/etc/sshd_config":
    source => "....",
    notify => Service['sshd']
  }

  service { 'sshd':
    ensure => running
  }
```

This will restart the sshd service if the sshd config file changes.

require

References to one or more objects that this object depends on. This is used purely for guaranteeing that changes to required objects happen before the dependent object. For instance:

```
# Create the destination directory before you copy things down
file { "/usr/local/scripts":
  ensure => directory
}

file { "/usr/local/scripts/myscript":
  source  => "puppet://server/module/myscript",
  mode    => 755,
  require => File["/usr/local/scripts"]
}
```

Multiple dependencies can be specified by providing a comma-separated list of resources, enclosed in square brackets:

```
require => [ File["/usr/local"], File["/usr/local/scripts"] ]
```

Note that Puppet will autorequire everything that it can, and there are hooks in place so that it’s easy for resources to add new ways to autorequire objects, so if you think Puppet could be smarter here, let us know.

In fact, the above code was redundant — Puppet will autorequire any parent directories that are being managed; it will automatically realize that the parent directory should be created before the script is pulled down.

Currently, exec resources will autorequire their CWD (if it is specified) plus any fully qualified paths that appear in the command. For instance, if you had an `exec` command that ran the `myscript` mentioned above, the above code that pulls the file down would be automatically listed as a requirement to the `exec` code, so that you would always be running againts the most recent version.

schedule

On what schedule the object should be managed. You must create a schedule object, and then reference the name of that object to use that for your schedule:

```
schedule { 'daily':
  period => daily,
  range  => "2-4"
}

exec { "/usr/bin/apt-get update":
  schedule => 'daily'
  }
```

The creation of the schedule object does not need to appear in the configuration before objects that use it.

stage

Which run stage a given resource should reside in. This just creates a dependency on or from the named milestone. For instance, saying that this is in the ‘bootstrap’ stage creates a dependency on the ‘bootstrap’ milestone.

By default, all classes get directly added to the ‘main’ stage. You can create new stages as resources:

```
stage { ['pre', 'post']: }
```

To order stages, use standard relationships:

```
stage { 'pre': before => Stage['main'] }
```

Or use the new relationship syntax:

```
Stage['pre'] -> Stage['main'] -> Stage['post']
```

Then use the new class parameters to specify a stage:

```
class { 'foo': stage => 'pre' }
```

Stages can only be set on classes, not individual resources. This will fail:

```
file { '/foo': stage => 'pre', ensure => file }
```

subscribe

References to one or more objects that this object depends on. This metaparameter creates a dependency relationship like require, and also causes the dependent object to be refreshed when the subscribed object is changed. For instance:

```
class nagios {
  file { 'nagconf':
    path   => "/etc/nagios/nagios.conf"
    source => "puppet://server/module/nagios.conf",
  }
  service { 'nagios':
    ensure    => running,
    subscribe => File['nagconf']
  }
}
```

Currently the `exec`, `mount` and `service` types support refreshing.

tag

Add the specified tags to the associated resource. While all resources are automatically tagged with as much information as possible (e.g., each class and definition containing the resource), it can be useful to add your own tags to a given resource.

Multiple tags can be specified as an array:

```
file {'/etc/hosts':
  ensure => file,
  source => 'puppet:///modules/site/hosts',
  mode   => 0644,
  tag    => ['bootstrap', 'minimumrun', 'mediumrun'],
}
```

Tags are useful for things like applying a subset of a host's configuration with the `tags` setting:

```
puppet agent --test --tags bootstrap
```

This way, you can easily isolate the portion of the configuration you're trying to test.

This page autogenerated on Tue Jun 18 16:58:47 -0700 2013

Configuration Reference

Configuration Reference

This page is autogenerated; any changes will get overwritten (last generated on Tue Jun 18 16:58:23 -0700 2013)

Configuration Settings

- Each of these settings can be specified in `puppet.conf` or on the command line.
- When using boolean settings on the command line, use `--setting` and `--no-setting` instead of `--setting (true|false)`.
- Settings can be interpolated as `$variables` in other settings; `$environment` is special, in that puppet master will interpolate each agent node's environment instead of its own.
- Multiple values should be specified as comma-separated lists; multiple directories should be separated with the system path separator (usually a colon).
- Settings that represent time intervals should be specified in duration format: an integer immediately followed by one of the units 'y' (years of 365 days), 'd' (days), 'h' (hours), 'm' (minutes), or 's' (seconds). The unit cannot be combined with other units, and defaults to seconds when omitted. Examples are '3600' which is equivalent to '1h' (one hour), and '1825d' which is equivalent to '5y' (5 years).
- Settings that take a single file or directory can optionally set the owner, group, and mode for their value: `rundir = $vardir/run { owner = puppet, group = puppet, mode = 644 }`
- The Puppet executables will ignore any setting that isn't relevant to their function.

See the configuration guide for more details.

---

agent_catalog_run_lockfile

A lock file to indicate that a puppet agent catalog run is currently in progress. The file contains the pid of the process that holds the lock on the catalog run.

- Default: $statedir/agent_catalog_run.lock

agent_disabled_lockfile

A lock file to indicate that puppet agent runs have been administratively disabled. File contains a JSON object with state information.

- Default: $statedir/agent_disabled.lock

allow_duplicate_certs

Whether to allow a new certificate request to overwrite an existing certificate.

- Default: false

allow_variables_with_dashes

Permit hyphens (`-`) in variable names and issue deprecation warnings about them. This setting should always be `false`; setting it to `true` will cause subtle and wide-ranging bugs. It will be removed in a future version. Hyphenated variables caused major problems in the language, but were allowed between Puppet 2.7.3 and 2.7.14. If you used them during this window, we apologize for the inconvenience — you can temporarily set this to `true` in order to upgrade, and can rename your variables at your leisure. Please revert it to `false` after you have renamed all affected variables.

- Default: false

archive_file_server

During an inspect run, the file bucket server to archive files to if archive_files is set.

- Default: $server

archive_files

During an inspect run, whether to archive files whose contents are audited to a file bucket.

- Default: false

async_storeconfigs

Whether to use a queueing system to provide asynchronous database integration. Requires that `puppet queue` be running.

- Default: false

autoflush

Whether log files should always flush to disk.

- Default: true

autosign

Whether to enable autosign. Valid values are true (which autosigns any key request, and is a very bad idea), false (which never autosigns any key request), and the path to a file, which uses that configuration file to determine which keys to sign.

- Default: $confdir/autosign.conf

bindaddress

The address a listening server should bind to.

- Default: 0.0.0.0

bucketdir

Where FileBucket files are stored.

- Default: $vardir/bucket

ca

Whether the master should function as a certificate authority.

- Default: true

ca_name

The name to use the Certificate Authority certificate.

- Default: Puppet CA: $certname

ca_port

The port to use for the certificate authority.

- Default: $masterport

ca_server

The server to use for certificate authority requests. It's a separate server because it cannot and does not need to horizontally scale.

- Default: $server

ca_ttl

The default TTL for new certificates. If this setting is set, ca_days is ignored. Can be specified as a duration.

- Default: 5y

cacert

The CA certificate.

- Default: $cadir/ca_crt.pem

cacrl

The certificate revocation list (CRL) for the CA. Will be used if present but otherwise ignored.

- Default: $cadir/ca_crl.pem

cadir

The root directory for the certificate authority.

- Default: $ssldir/ca

cakey

The CA private key.

- Default: $cadir/ca_key.pem

capass

Where the CA stores the password for the private key

- Default: $caprivatedir/ca.pass

caprivatedir

Where the CA stores private certificate information.

- Default: $cadir/private

capub

The CA public key.

- Default: $cadir/ca_pub.pem

catalog_cache_terminus

How to store cached catalogs. Valid values are 'json' and 'yaml'. The agent application defaults to 'json'.

- Default:

catalog_format

(Deprecated for 'preferred_serialization_format') What format to use to dump the catalog. Only supports 'marshal' and 'yaml'. Only matters on the client, since it asks the server for a specific format.

catalog_terminus

Where to get node catalogs. This is useful to change if, for instance, you'd like to pre-compile catalogs and store them in memcached or some other easily-accessed store.

- Default: compiler

cert_inventory

A Complete listing of all certificates

- Default: $cadir/inventory.txt

certdir

The certificate directory.

- Default: $ssldir/certs

certdnsnames

The `certdnsnames` setting is no longer functional, after CVE-2011-3872. We ignore the value completely. For your own certificate request you can set `dns_alt_names` in the configuration and it will apply locally. There is no configuration option to set DNS alt names, or any other `subjectAltName` value, for another nodes certificate. Alternately you can use the `--dns_alt_names` command line option to set the labels added while generating your own CSR.

certificate_expire_warning

The window of time leading up to a certificate's expiration that a notification will be logged. This applies to CA, master, and agent certificates. Can be specified as a duration.

- Default: 60d

certificate_revocation

Whether certificate revocation should be supported by downloading a Certificate Revocation List

(CRL) to all clients. If enabled, CA chaining will almost definitely not work.

- Default: true

certname

The name to use when handling certificates. Defaults to the fully qualified domain name.

- Default: (the system's fully qualified domain name)

classfile

The file in which puppet agent stores a list of the classes associated with the retrieved configuration. Can be loaded in the separate `puppet` executable using the `--loadclasses` option.

- Default: $statedir/classes.txt

client_datadir

The directory in which serialized data is stored on the client.

- Default: $vardir/client_data

clientbucketdir

Where FileBucket files are stored locally.

- Default: $vardir/clientbucket

clientyamldir

The directory in which client-side YAML data is stored.

- Default: $vardir/client_yaml

code

Code to parse directly. This is essentially only used by `puppet`, and should only be set if you're writing your own Puppet executable

color

Whether to use colors when logging to the console. Valid values are `ansi` (equivalent to `true`), `html`, and `false`, which produces no color. Defaults to false on Windows, as its console does not support ansi colors.

- Default: ansi

confdir

The main Puppet configuration directory. The default for this setting is calculated based on the user. If the process is running as root or the user that Puppet is supposed to run as, it defaults to a system directory, but if it's running as any other user, it defaults to being in the user's home directory.

- Default: /etc/puppet

config

The configuration file for the current puppet application

- Default: $confdir/${config_file_name}

config_file_name

The name of the puppet config file.

- Default: puppet.conf

config_version

How to determine the configuration version. By default, it will be the time that the configuration is parsed, but you can provide a shell script to override how the version is determined. The output of this script will be added to every log message in the reports, allowing you to correlate changes on your hosts to the source version on the server.

configprint

Print the value of a specific configuration setting. If the name of a setting is provided for this, then the value is printed and puppet exits. Comma-separate multiple values. For a list of all values, specify 'all'.

configtimeout

How long the client should wait for the configuration to be retrieved before considering it a failure. This can help reduce flapping if too many clients contact the server at one time. Can be specified as a duration.

- Default: 2m

couchdb_url

The url where the puppet couchdb database will be created

- Default: http://127.0.0.1:5984/puppet

csrdir

Where the CA stores certificate requests

- Default: $cadir/requests

daemonize

Whether to send the process into the background. This defaults to true on POSIX systems, and to false on Windows (where Puppet currently cannot daemonize).

- Default: true

data_binding_terminus

Where to retrive information about data.

- Default: hiera

dbadapter

The type of database to use.

- Default: sqlite3

dbconnections

The number of database connections for networked databases. Will be ignored unless the value is a positive integer.

dblocation

The database cache for client configurations. Used for querying within the language.

- Default: $statedir/clientconfigs.sqlite3

dbmigrate

Whether to automatically migrate the database.

- Default: false

dbname

The name of the database to use.

- Default: puppet

dbpassword

The database password for caching. Only used when networked databases are used.

- Default: puppet

dbport

The database password for caching. Only used when networked databases are used.

dbserver

The database server for caching. Only used when networked databases are used.

- Default: localhost

dbsocket

The database socket location. Only used when networked databases are used. Will be ignored if the value is an empty string.

dbuser

The database user for caching. Only used when networked databases are used.

- Default: puppet

default_file_terminus

The default source for files if no server is given in a uri, e.g. puppet:///file. The default of `rest` causes the file to be retrieved using the `server` setting. When running `apply` the default is `file_server`, causing requests to be filled locally.

- Default: rest

deviceconfig

Path to the device config file for puppet device

- Default: $confdir/device.conf

devicedir

The root directory of devices' $vardir

- Default: $vardir/devices

diff

Which diff command to use when printing differences between files. This setting has no default value on Windows, as standard `diff` is not available, but Puppet can use many third-party diff tools.

- Default: diff

diff_args

Which arguments to pass to the diff command when printing differences between files. The command to use can be chosen with the `diff` setting.

- Default: -u

dns_alt_names

The comma-separated list of alternative DNS names to use for the local host. When the node generates a CSR for itself, these are added to the request as the desired `subjectAltName` in the certificate: additional DNS labels that the certificate is also valid answering as. This is generally required if you use a non-hostname `certname`, or if you want to use `puppet kick` or `puppet resource -H` and the primary certname does not match the DNS name you use to communicate with the host. This is unnecessary for agents, unless you intend to use them as a server for `puppet kick` or remote `puppet resource` management. It is rarely necessary for servers; it is usually helpful only if you need to have a pool of multiple load balanced masters, or for the same master to respond on two physically separate networks under different names.

document_all

Document all resources

- Default: false

dynamicfacts

(Deprecated) Facts that are dynamic; these facts will be ignored when deciding whether changed facts should result in a recompile. Multiple facts should be comma-separated.

- Default: memorysize,memoryfree,swapsize,swapfree

environment

The environment Puppet is running in. For clients (e.g., `puppet agent`) this determines the environment itself, which is used to find modules and much more. For servers (i.e., `puppet master`) this provides the default environment for nodes we know nothing about.

- Default: production

evaltrace

Whether each resource should log when it is being evaluated. This allows you to interactively see exactly what is being done.

- Default: false

external_nodes

An external command that can produce node information. The command’s output must be a YAML dump of a hash, and that hash must have a `classes` key and/or a `parameters` key, where `classes` is an array or hash and `parameters` is a hash. For unknown nodes, the command should exit with a non-zero exit code. This command makes it straightforward to store your node mapping information in other data sources like databases.

- Default: none

factpath

Where Puppet should look for facts. Multiple directories should be separated by the system path separator character. (The POSIX path separator is ‘:’, and the Windows path separator is ‘;’.)

- Default: $vardir/lib/facter:$vardir/facts

facts_terminus

The node facts terminus.

- Default: facter

fileserverconfig

Where the fileserver configuration is stored.

- Default: $confdir/fileserver.conf

filetimeout

The minimum time to wait between checking for updates in configuration files. This timeout determines how quickly Puppet checks whether a file (such as manifests or templates) has changed on disk. Can be specified as a duration.

- Default: 15s

freeze_main

Freezes the ‘main’ class, disallowing any code to be added to it. This essentially means that you can’t have any code outside of a node, class, or definition other than in the site manifest.

- Default: false

genconfig

Whether to just print a configuration to stdout and exit. Only makes sense when used interactively. Takes into account arguments specified on the CLI.

- Default: false

genmanifest

Whether to just print a manifest to stdout and exit. Only makes sense when used interactively. Takes into account arguments specified on the CLI.

- Default: false

graph

Whether to create dot graph files for the different configuration graphs. These dot files can be interpreted by tools like OmniGraffle or dot (which is part of ImageMagick).

- Default: false

graphdir

Where to store dot-outputted graphs.

- Default: $statedir/graphs

group

The group puppet master should run as.

- Default: puppet

hiera_config

The hiera configuration file. Puppet only reads this file on startup, so you must restart the puppet master every time you edit it.

- Default: $confdir/hiera.yaml

hostcert

Where individual hosts store and look for their certificates.

- Default: $certdir/$certname.pem

hostcrl

Where the host's certificate revocation list can be found. This is distinct from the certificate authority's CRL.

- Default: $ssldir/crl.pem

hostcsr

Where individual hosts store and look for their certificate requests.

- Default: $ssldir/csr_$certname.pem

hostprivkey

Where individual hosts store and look for their private key.

- Default: $privatekeydir/$certname.pem

hostpubkey

Where individual hosts store and look for their public key.

- Default: $publickeydir/$certname.pem

http_compression

Allow http compression in REST communication with the master. This setting might improve performance for agent -> master communications over slow WANs. Your puppet master needs to support compression (usually by activating some settings in a reverse-proxy in front of the puppet master, which rules out webrick). It is harmless to activate this settings if your master doesn't support compression, but if it supports it, this setting might reduce performance on high-speed LANs.

- Default: false

http_proxy_host

The HTTP proxy host to use for outgoing connections. Note: You may need to use a FQDN for the server hostname when using a proxy.

- Default: none

http_proxy_port

The HTTP proxy port to use for outgoing connections

- Default: 3128

httplog

Where the puppet agent web server logs.

- Default: $logdir/http.log

ignorecache

Ignore cache and always recompile the configuration. This is useful for testing new configurations, where the local cache may in fact be stale even if the timestamps are up to date - if the facts change or if the server changes.

- Default: false

ignoreimport

If true, allows the parser to continue without requiring all files referenced with `import` statements to exist. This setting was primarily designed for use with commit hooks for parse-checking.

- Default: false

ignoremissingtypes

Skip searching for classes and definitions that were missing during a prior compilation. The list of missing objects is maintained per-environment and persists until the environment is cleared or the master is restarted.

- Default: false

ignoreschedules

Boolean; whether puppet agent should ignore schedules. This is useful for initial puppet agent runs.

- Default: false

inventory_port

The port to communicate with the inventory_server.

- Default: $masterport

inventory_server

The server to send facts to.

- Default: $server

inventory_terminus

Should usually be the same as the facts terminus

- Default: $facts_terminus

keylength

The bit length of keys.

- Default: 4096

lastrunfile

Where puppet agent stores the last run report summary in yaml format.

- Default: $statedir/last_run_summary.yaml

lastrunreport

Where puppet agent stores the last run report in yaml format.

- Default: $statedir/last_run_report.yaml

ldapattrs

The LDAP attributes to include when querying LDAP for nodes. All returned attributes are set as variables in the top-level scope. Multiple values should be comma-separated. The value 'all' returns all attributes.

- Default: all

ldapbase

The search base for LDAP searches. It’s impossible to provide a meaningful default here, although the LDAP libraries might have one already set. Generally, it should be the ‘ou=Hosts’ branch under your main directory.

ldapclassattrs

The LDAP attributes to use to define Puppet classes. Values should be comma-separated.

- Default: puppetclass

ldapparentattr

The attribute to use to define the parent node.

- Default: parentnode

ldappassword

The password to use to connect to LDAP.

ldapport

The LDAP port. Only used if `node_terminus` is set to `ldap`.

- Default: 389

ldapserver

The LDAP server. Only used if `node_terminus` is set to `ldap`.

- Default: ldap

ldapssl

Whether SSL should be used when searching for nodes. Defaults to false because SSL usually requires certificates to be set up on the client side.

- Default: false

ldapstackedattrs

The LDAP attributes that should be stacked to arrays by adding the values in all hierarchy elements of the tree. Values should be comma-separated.

- Default: puppetvar

ldapstring

The search string used to find an LDAP node.

- Default: (&(objectclass=puppetClient)(cn=%s))

ldaptls

Whether TLS should be used when searching for nodes. Defaults to false because TLS usually requires certificates to be set up on the client side.

- Default: false

ldapuser

The user to use to connect to LDAP. Must be specified as a full DN.

libdir

An extra search path for Puppet. This is only useful for those files that Puppet will load on demand, and is only guaranteed to work for those cases. In fact, the autoload mechanism is responsible for making sure this directory is in Ruby's search path

- Default: $vardir/lib

listen

Whether puppet agent should listen for connections. If this is true, then puppet agent will accept incoming REST API requests, subject to the default ACLs and the ACLs set in the `rest_authconfig` file. Puppet agent can respond usefully to requests on the `run`, `facts`, `certificate`, and `resource` endpoints.

- Default: false

localcacert

Where each client stores the CA certificate.

- Default: $certdir/ca.pem

localconfig

Where puppet agent caches the local configuration. An extension indicating the cache format is added automatically.

- Default: $statedir/localconfig

logdir

The directory in which to store log files

- Default:

manage_internal_file_permissions

Whether Puppet should manage the owner, group, and mode of files it uses internally

- Default: true

manifest

The entry-point manifest for puppet master.

- Default: $manifestdir/site.pp

manifestdir

Where puppet master looks for its manifests.

- Default: $confdir/manifests

masterhttplog

Where the puppet master web server logs.

- Default: $logdir/masterhttp.log

masterlog

Where puppet master logs. This is generally not used, since syslog is the default log destination.

- Default: $logdir/puppetmaster.log

masterport

The port for puppet master traffic. For puppet master, this is the port to listen on; for puppet agent, this is the port to make requests on. Both applications use this setting to get the port.

- Default: 8140

max_deprecations

Sets the max number of logged/displayed parser validation deprecation warnings in case multiple errors have been detected. A value of 0 is the same as value 1. The count is per manifest.

- Default: 10

max_errors

Sets the max number of logged/displayed parser validation errors in case multiple errors have been detected. A value of 0 is the same as value 1. The count is per manifest.

- Default: 10

max_warnings

Sets the max number of logged/displayed parser validation warnings in case multiple errors have been detected. A value of 0 is the same as value 1. The count is per manifest.

- Default: 10

maximum_uid

The maximum allowed UID. Some platforms use negative UIDs but then ship with tools that do not know how to handle signed ints, so the UIDs show up as huge numbers that can then not be fed back into the system. This is a hackish way to fail in a slightly more useful way when that happens.

- Default: 4294967290

mkusers

Whether to create the necessary user and group that puppet agent will run as.

- Default: false

module_repository

The module repository

- Default: https://forge.puppetlabs.com

module_working_dir

The directory into which module tool data is stored

- Default: $vardir/puppet-module

modulepath

The search path for modules, as a list of directories separated by the system path separator character. (The POSIX path separator is ':', and the Windows path separator is ';'.)

- Default: $confdir/modules:/usr/share/puppet/modules

name

The name of the application, if we are running as one. The default is essentially $0 without the path or `.rb`.

- Default:

node_cache_terminus

How to store cached nodes. Valid values are (none), 'json', 'yaml' or write only yaml ('write_only_yaml'). The master application defaults to 'write_only_yaml', all others to none.

- Default:

node_name

How the puppet master determines the client's identity and sets the 'hostname', 'fqdn' and 'domain' facts for use in the manifest, in particular for determining which 'node' statement applies to the client. Possible values are 'cert' (use the subject's CN in the client's certificate) and 'facter' (use the hostname that the client reported in its facts)

- Default: cert

node_name_fact

The fact name used to determine the node name used for all requests the agent makes to the master. WARNING: This setting is mutually exclusive with node_name_value. Changing this setting also requires changes to the default auth.conf configuration on the Puppet Master. Please see http://links.puppetlabs.com/node_name_fact for more information.

node_name_value

The explicit value used for the node name for all requests the agent makes to the master. WARNING: This setting is mutually exclusive with node_name_fact. Changing this setting also requires changes to the default auth.conf configuration on the Puppet Master. Please see http://links.puppetlabs.com/node_name_value for more information.

- Default: $certname

node_terminus

Where to find information about nodes.

- Default: plain

noop

Whether puppet agent should be run in noop mode.

- Default: false

onetime

Run the configuration once, rather than as a long-running daemon. This is useful for interactively running puppetd.

- Default: false

parser

Selects the parser to use for parsing puppet manifests (in puppet DSL language/'.pp' files). Available choices are 'current' (the default), and 'future'. The 'curent' parser means that the released version of the parser should be used. The 'future' parser is a "time travel to the future" allowing early exposure to new language features. What these fatures are will vary from release to release and they may be invididually configurable. Available Since Puppet 3.2.

- Default: current

passfile

Where puppet agent stores the password for its private key. Generally unused.

- Default: $privatedir/password

path

The shell search path. Defaults to whatever is inherited from the parent process.

- Default: none

pidfile

The file containing the PID of a running process. This file is intended to be used by service management frameworks and monitoring systems to determine if a puppet process is still in the process table.

- Default: $rundir/${run_mode}.pid

plugindest

Where Puppet should store plugins that it pulls down from the central server.

- Default: $libdir

pluginsignore

What files to ignore when pulling down plugins.

- Default: .svn CVS .git

pluginsource

From where to retrieve plugins. The standard Puppet `file` type is used for retrieval, so anything that is a valid file source can be used here.

- Default: puppet://$server/plugins

pluginsync

Whether plugins should be synced with the central server.

- Default: true

postrun_command

A command to run after every agent run. If this command returns a non-zero return code, the entire Puppet run will be considered to have failed, even though it might have performed work during the normal run.

preferred_serialization_format

The preferred means of serializing ruby instances for passing over the wire. This won’t guarantee that all instances will be serialized using this method, since not all classes can be guaranteed to support this format, but it will be used for all classes that support it.

- Default: pson

prerun_command

A command to run before every agent run. If this command returns a non-zero return code, the entire Puppet run will fail.

privatedir

Where the client stores private certificate information.

- Default: $ssldir/private

privatekeydir

The private key directory.

- Default: $ssldir/private_keys

profile

Whether to enable experimental performance profiling

- Default: false

publickeydir

The public key directory.

- Default: $ssldir/public_keys

puppetdlog

The log file for puppet agent. This is generally not used.

- Default: $logdir/puppetd.log

puppetport

Which port puppet agent listens on.

- Default: 8139

queue_source

Which type of queue to use for asynchronous processing. If your stomp server requires authentication, you can include it in the URI as long as your stomp client library is at least 1.1.1

- Default: stomp://localhost:61613/

queue_type

Which type of queue to use for asynchronous processing.

- Default: stomp

rails_loglevel

The log level for Rails connections. The value must be a valid log level within Rails. Production environments normally use `info` and other environments normally use `debug`.

- Default: info

railslog

Where Rails-specific logs are sent□

- Default: $logdir/rails.log

report

Whether to send reports after every transaction.

- Default: true

report_port

The port to communicate with the report_server.

- Default: $masterport

report_server

The server to send transaction reports to.

- Default: $server

reportdir

The directory in which to store reports received from the client. Each client gets a separate subdirectory.

- Default: $vardir/reports

reportfrom

The ‘from’ email address for the reports.

- Default: report@(the system’s fully qualified domain name)

reports

The list of reports to generate. All reports are looked for in `puppet/reports/name.rb`, and multiple report names should be comma-separated (whitespace is okay).

- Default: store

reporturl

The URL used by the http reports processor to send reports

- Default: http://localhost:3000/reports/upload

req_bits

The bit length of the certificates.

- Default: 4096

requestdir

Where host certificate requests are stored.

- Default: $ssldir/certificate_requests

resourcefile

The file in which puppet agent stores a list of the resources associated with the retrieved configuration.

- Default: $statedir/resources.txt

rest_authconfig

The configuration file that defines the rights to the different rest indirections. This can be used as a fine-grained authorization system for `puppet master`.

- Default: $confdir/auth.conf

route_file

The YAML file containing indirector route configuration.

- Default: $confdir/routes.yaml

rrddir

The directory where RRD database files are stored. Directories for each reporting host will be created under this directory.

- Default: $vardir/rrd

rrdinterval

How often RRD should expect data. This should match how often the hosts report back to the server. Can be specified as a duration.

- Default: $runinterval

rundir

Where Puppet PID files are kept.

- Default:

runinterval

How often puppet agent applies the client configuration; in seconds. Note that a runinterval of 0 means “run continuously” rather than “never run.” If you want puppet agent to never run, you should start it with the `--no-client` option. Can be specified as a duration.

- Default: 30m

sendmail

Where to find the sendmail binary with which to send email.

- Default: /usr/sbin/sendmail

serial

Where the serial number for certificates is stored.

- Default: $cadir/serial

server

The server to which the puppet agent should connect

- Default: puppet

server_datadir

The directory in which serialized data is stored, usually in a subdirectory.

- Default: $vardir/server_data

show_diff

Whether to log and report a contextual diff when files are being replaced. This causes partial file contents to pass through Puppet’s normal logging and reporting system, so this setting should be used with caution if you are sending Puppet’s reports to an insecure destination. This feature currently requires the `diff/lcs` Ruby library.

- Default: false

signeddir

Where the CA stores signed certificates.

- Default: $cadir/signed

smtpserver

The server through which to send email reports.

- Default: none

splay

Whether to sleep for a pseudo-random (but consistent) amount of time before a run.

- Default: false

splaylimit

The maximum time to delay before runs. Defaults to being the same as the run interval. Can be specified as a duration.

- Default: $runinterval

srv_domain

The domain which will be queried to find the SRV records of servers to use.

- Default: (the system’s own domain)

ssl_client_ca_auth

Certificate authorities who issue server certificates. SSL servers will not be considered authentic unless they posses a certificate issued by an authority listed in this file. If this setting has no value then the Puppet master’s CA certificate (localcacert) will be used.

- Default:

ssl_client_header

The header containing an authenticated client’s SSL DN. This header must be set by the proxy to the authenticated client’s SSL DN (e.g., `/CN=puppet.puppetlabs.com`). Puppet will parse out the Common Name (CN) from the Distinguished Name (DN) and use the value of the CN field for authorization. Note that the name of the HTTP header gets munged by the web server common gateway inteface: an `HTTP_` prefix is added, dashes are converted to underscores, and all letters are uppercased. Thus, to use the `X-Client-DN` header, this setting should be `HTTP_X_CLIENT_DN`.

- Default: HTTP_X_CLIENT_DN

ssl_client_verify_header

The header containing the status message of the client verification. This header must be set by the proxy to ‘SUCCESS’ if the client successfully authenticated, and anything else otherwise. Note that the name of the HTTP header gets munged by the web server common gateway inteface: an `HTTP_` prefix is added, dashes are converted to underscores, and all letters are uppercased. Thus, to use the `X-Client-Verify` header, this setting should be `HTTP_X_CLIENT_VERIFY`.

- Default: HTTP_X_CLIENT_VERIFY

ssl_server_ca_auth

Certificate authorities who issue client certificates. SSL clients will not be considered authentic unless they posses a certificate issued by an authority listed in this file. If this setting has no value then the Puppet master’s CA certificate (localcacert) will be used.

- Default:

ssldir

Where SSL certificates are kept.

- Default: $confdir/ssl

statedir

The directory where Puppet state is stored. Generally, this directory can be removed without causing harm (although it might result in spurious service restarts).

- Default: $vardir/state

statefile

Where puppet agent and puppet master store state associated with the running configuration. In the case of puppet master, this file reflects the state discovered through interacting with clients.

- Default: $statedir/state.yaml

storeconfigs

Whether to store each client's configuration, including catalogs, facts, and related data. This also enables the import and export of resources in the Puppet language - a mechanism for exchange resources between nodes. By default this uses ActiveRecord and an SQL database to store and query the data; this, in turn, will depend on Rails being available. You can adjust the backend using the storeconfigs_backend setting.

- Default: false

storeconfigs_backend

Configure the backend terminus used for StoreConfigs. By default, this uses the ActiveRecord store, which directly talks to the database from within the Puppet Master process.

- Default: active_record

strict_hostname_checking

Whether to only search for the complete hostname as it is in the certificate when searching for node information in the catalogs.

- Default: false

summarize

Whether to print a transaction summary.

- Default: false

syslogfacility

What syslog facility to use when logging to syslog. Syslog has a fixed list of valid facilities, and you must choose one of those; you cannot just make one up.

- Default: daemon

tagmap

The mapping between reporting tags and email addresses.

- Default: $confdir/tagmail.conf

tags

Tags to use to find resources. If this is set, then only resources tagged with the specified tags will be applied. Values must be comma-separated.

templatedir

Where Puppet looks for template files. Can be a list of colon-separated directories.

- Default: $vardir/templates

thin_storeconfigs

Boolean; whether Puppet should store only facts and exported resources in the storeconfigs database. This will improve the performance of exported resources with the older `active_record` backend, but will disable external tools that search the storeconfigs database. Thinning catalogs is generally unnecessary when using PuppetDB to store catalogs.

- Default: false

trace

Whether to print stack traces on some errors

- Default: false

use_cached_catalog

Whether to only use the cached catalog rather than compiling a new catalog on every run. Puppet can be run with this enabled by default and then selectively disabled when a recompile is desired.

- Default: false

use_srv_records

Whether the server will search for SRV records in DNS for the current domain.

- Default: false

usecacheonfailure

Whether to use the cached configuration when the remote configuration will not compile. This option is useful for testing new configurations, where you want to fix the broken configuration rather than reverting to a known-good one.

- Default: true

user

The user puppet master should run as.

- Default: puppet

vardir

Where Puppet stores dynamic and growing data. The default for this setting is calculated specially, like `confdir`_.

- Default: /var/lib/puppet

waitforcert

The time interval ‘puppet agent’ should connect to the server and ask it to sign a certificate request. This is useful for the initial setup of a puppet client. You can turn off waiting for certificates by specifying a time of 0. Can be specified as a duration.

- Default: 2m

yamldir

The directory in which YAML data is stored, usually in a subdirectory.

- Default: $vardir/yaml

zlib

Boolean; whether to use the zlib library

- Default: true

This page autogenerated on Tue Jun 18 16:58:23 -0700 2013

Report Reference

Report Reference

This page is autogenerated; any changes will get overwritten (last generated on Tue Jun 18 16:58:54 -0700 2013)

Puppet clients can report back to the server after each transaction. This transaction report is sent as a YAML dump of the `Puppet::Transaction::Report` class and includes every log message that was generated during the transaction along with as many metrics as Puppet knows how to collect. See Reports and Reporting for more information on how to use reports.

Currently, clients default to not sending in reports; you can enable reporting by setting the `report` parameter to true.

To use a report, set the `reports` parameter on the server; multiple reports must be comma-separated. You can also specify `none` to disable reports entirely.

Puppet provides multiple report handlers that will process client reports:

http

Send reports via HTTP or HTTPS. This report processor submits reports as POST requests to the address in the `reporturl` setting. The body of each POST request is the YAML dump of a Puppet::Transaction::Report object, and the Content-Type is set as `application/x-yaml`.

log

Send all received logs to the local log destinations. Usually the log destination is syslog.

rrdgraph

Graph all available data about hosts using the RRD library. You must have the Ruby RRDtool library installed to use this report, which you can get from the RubyRRDTool RubyForge page. This package may also be available as `ruby-rrd` or `rrdtool-ruby` in your distribution's package management system. The library and/or package will both require the binary `rrdtool` package from your distribution to be installed.

This report will create, manage, and graph RRD database files for each of the metrics generated during transactions, and it will create a few simple html files to display the reporting host's graphs. At this point, it will not create a common index file to display links to all hosts.

All RRD files and graphs get created in the `rrddir` directory. If you want to serve these publicly, you should be able to just alias that directory in a web server.

If you really know what you're doing, you can tune the `rrdinterval`, which defaults to the `runinterval`.

store

Store the yaml report on disk. Each host sends its report as a YAML dump and this just stores the file on disk, in the `reportdir` directory.

These files collect quickly – one every half hour – so it is a good idea to perform some maintenance on them if you use this report (it's the only default report).

tagmail

This report sends specific log messages to specific email addresses based on the tags in the log messages.

See the documentation on tags for more information.

To use this report, you must create a `tagmail.conf` file in the location specified by the `tagmap` setting. This is a simple file that maps tags to email addresses: Any log messages in the report that match the specified tags will be sent to the specified email addresses.

Lines in the `tagmail.conf` file consist of a comma-separated list of tags, a colon, and a comma-separated list of email addresses. Tags can be !negated with a leading exclamation mark, which will subtract any messages with that tag from the set of events handled by that line.

Puppet's log levels (`debug`, `info`, `notice`, `warning`, `err`, `alert`, `emerg`, `crit`, and `verbose`) can also be used as tags, and there is an `all` tag that will always match all log messages.

An example `tagmail.conf`:

```
all: me@domain.com
webserver, !mailserver: httpadmins@domain.com
```

This will send all messages to `me@domain.com`, and all messages from webservers that are not also from mailservers to `httpadmins@domain.com`.

If you are using anti-spam controls such as grey-listing on your mail server, you should whitelist the sending email address (controlled by `reportfrom` configuration option) to ensure your email is not discarded as spam.

This page autogenerated on Tue Jun 18 16:58:54 -0700 2013

Indirection Reference

Indirection Reference

This page is autogenerated; any changes will get overwritten (last generated on Tue Jun 18 16:58:37 -0700 2013)

About Indirection

Puppet’s indirector support pluggable backends (termini) for a variety of key-value stores (indirections). Each indirection type corresponds to a particular Ruby class (the “Indirected Class” below) and values are instances of that class. Each instance’s key is available from its `name` method. The termini can be local (e.g., on-disk files) or remote (e.g., using a REST interface to talk to a□ puppet master).

An indirector has five methods, which are mapped into HTTP verbs for the REST interface:□

- `find(key)` – get a single value (mapped to GET or POST with a singular endpoint)
- `search(key)` – get a list of matching values (mapped to GET with a plural endpoint)
- `head(key)` – return true if the key exists (mapped to HEAD)
- `destroy(key)` – remove the key van value (mapped to DELETE)
- `save(instance)` – write the instance to the store, using the instance’s name as the key (mapped to PUT)

These methods are available via the `indirection` class method on the indirected classes. For example::

foo_cert = Puppet::SSL::Certificate.indirection.find(‘foo.example.com’)□

At startup, each indirection is configured with a terminus. In most cases, this is the default terminus□ defined by the indirected class, but it can be overridden by the application or face, or overridden□ with the `route_file` configuration. The available termini differ for each indirection, and are listed□ below.

Indirections can also have a cache, represented by a second terminus. This is a write-through cache: modifications are written both to the cache and to the primary terminus. Values fetched from□ the terminus are written to the cache.

Interaction with REST

REST endpoints have the form `/{environment}/{indirection}/{key}`, where the indirection can be singular or plural, following normal English spelling rules. On the server side, REST responses are generated from the locally-configured endpoints.□

Indirections and Termini

Below is the list of all indirections, their associated terminus classes, and how you select between them.

In general, the appropriate terminus class is selected by the application for you (e.g., `puppet agent` would always use the `rest` terminus for most of its indirected classes), but some classes are tunable via normal settings. These will have `terminus setting` documentation listed with them.

catalog

- Indirected Class: `Puppet::Resource::Catalog`
- Terminus Setting: catalog_terminus

Termini

active_record

> A component of ActiveRecord storeconfigs. ActiveRecord-based storeconfigs and inventory are deprecated. See http://links.puppetlabs.com/activerecord-deprecation

compiler

> Compiles catalogs on demand using Puppet's compiler.

json

> Store catalogs as flat files, serialized using JSON.

queue

> Part of async storeconfigs, requiring the puppet queue daemon. ActiveRecord-based storeconfigs and inventory are deprecated. See http://links.puppetlabs.com/activerecord-deprecation

rest

> Find resource catalogs over HTTP via REST.

static_compiler

> Compiles catalogs on demand using the optional static compiler. This functions similarly to the normal compiler, but it replaces puppet:/// file URLs with explicit metadata and file content hashes, expecting puppet agent to fetch the exact specified content from the filebucket. This guarantees that a given catalog will always result in the same file states. It also decreases catalog application time and fileserver load, at the cost of increased compilation time.
>
> This terminus works today, but cannot be used without additional configuration. Specifically:
>
> - You must create a special filebucket resource — with the title `puppet` and the `path` attribute set to `false` — in site.pp or somewhere else where it will be added to every node's catalog. Using `puppet` as the title is mandatory; the static compiler treats this title as magical.
>
>   ```
>   filebucket { puppet:
>     path => false,
>   }
>   ```
>
> - You must set `catalog_terminus = static_compiler` in the puppet master's puppet.conf.
> - The puppet master's auth.conf must allow authenticated nodes to access the `file_bucket_file` endpoint. This is enabled by default (see the `path /file` rule), but if you have made your auth.conf more restrictive, you may need to re-enable it.)

> - If you are using multiple puppet masters, you must configure load balancer affinity for agent nodes. This is because puppet masters other than the one that compiled a given catalog may not have stored the required file contents in their filebuckets.

store_configs

> Part of the “storeconfigs” feature. Should not be directly set by end users.

yaml

> Store catalogs as flat files, serialized using YAML.

certificate

This indirection wraps an `OpenSSL::X509::Certificate` object, representing a certificate (signed public key). The indirection key is the certificate CN (generally a hostname).

- Indirected Class: `Puppet::SSL::Certificate`

Termini

ca

> Manage the CA collection of signed SSL certificates on disk.

disabled_ca

> Manage SSL certificates on disk, but reject any remote access to the SSL data store. Used when a master has an explicitly disabled CA to prevent clients getting confusing ‘success’ behaviour.

file

> Manage SSL certificates on disk.

rest

> Find and save certificates over HTTP via REST.

certificate_request

This indirection wraps an `OpenSSL::X509::Request` object, representing a certificate signing request (CSR). The indirection key is the certificate CN (generally a hostname).

- Indirected Class: `Puppet::SSL::CertificateRequest`

Termini

ca

> Manage the CA collection of certificate requests on disk.

disabled_ca

> Manage SSL certificate requests on disk, but reject any remote access to the SSL data store. Used when a master has an explicitly disabled CA to prevent clients getting confusing ‘success’ behaviour.

file

> Manage the collection of certificate requests on disk.

rest

> Find and save certificate requests over HTTP via REST.

certificate_revocation_list

This indirection wraps an `OpenSSL::X509::CRL` object, representing a certificate revocation list (CRL). The indirection key is the CA name (usually literally `ca`).

- Indirected Class: `Puppet::SSL::CertificateRevocationList`

Termini

ca

> Manage the CA collection of certificate requests on disk.

disabled_ca

> Manage SSL certificate revocation lists, but reject any remote access to the SSL data store. Used when a master has an explicitly disabled CA to prevent clients getting confusing 'success' behaviour.

file

> Manage the global certificate revocation list.

rest

> Find and save certificate revocation lists over HTTP via REST.

certificate_status

This indirection represents the host that ties a key, certificate, and certificate request together. The indirection key is the certificate CN (generally a hostname).

- Indirected Class: `Puppet::SSL::Host`

Termini

file

> Manipulate certificate status on the local filesystem. Only functional on the CA.

rest

> Sign, revoke, search for, or clean certificates & certificate requests over HTTP.

data_binding

Where to find external data bindings.

- Indirected Class: `Puppet::DataBinding`

- Terminus Setting: data_binding_terminus

Termini

hiera

> Retrieve data using Hiera.

none

> A Dummy terminus that always returns nil for data lookups.

facts

- Indirected Class: `Puppet::Node::Facts`
- Terminus Setting: facts_terminus

Termini

active_record

> A component of ActiveRecord storeconfigs and inventory. ActiveRecord-based storeconfigs and inventory are deprecated. See http://links.puppetlabs.com/activerecord-deprecation

couch

> Store facts in CouchDB. This should not be used with the inventory service; it is for more obscure custom integrations. If you are wondering whether you should use it, you shouldn't; use PuppetDB instead.

facter

> Retrieve facts from Facter. This provides a somewhat abstract interface between Puppet and Facter. It's only `somewhat` abstract because it always returns the local host's facts, regardless of what you attempt to find.

inventory_active_record

> Medium-performance fact storage suitable for the inventory service. Most users should use PuppetDB instead. Note: ActiveRecord-based storeconfigs and inventory are deprecated. See http://links.puppetlabs.com/activerecord-deprecation

inventory_service

> Find and save facts about nodes using a remote inventory service.

memory

> Keep track of facts in memory but nowhere else. This is used for one-time compiles, such as what the stand-alone `puppet` does. To use this terminus, you must load it with the data you want it to contain.

network_device

> Retrieve facts from a network device.

rest

> Find and save facts about nodes over HTTP via REST.

store_configs□

> Part of the “storeconfigs” feature. Should not be directly set by end users.□

yaml

> Store client facts as flat files, serialized using YAML, or return deserialized facts from disk.□

file_bucket_file□

- Indirected Class: `Puppet::FileBucket::File`

Termini

file□

> Store files in a directory set based on their checksums.□

rest

> This is a REST based mechanism to send/retrieve file to/from the filebucket□

selector

> Select the terminus based on the request

file_content□

- Indirected Class: `Puppet::FileServing::Content`

Termini

file□

> Retrieve file contents from disk.□

file_server□

> Retrieve file contents using Puppet’s fileserver.□

rest

> Retrieve file contents via a REST HTTP interface.□

selector

> Select the terminus based on the request

file_metadata□

- Indirected Class: `Puppet::FileServing::Metadata`

Termini

file□

> Retrieve file metadata directly from the local filesystem.□

file_server□

> Retrieve file metadata using Puppet’s fileserver.□

rest

> Retrieve file metadata via a REST HTTP interface.□

selector

> Select the terminus based on the request

instrumentation_data

- Indirected Class: `Puppet::Util::Instrumentation::Data`

Termini

local

> Undocumented.

rest

> Undocumented.

instrumentation_listener

- Indirected Class: `Puppet::Util::Instrumentation::Listener`

Termini

local

> Undocumented.

rest

> Undocumented.

instrumentation_probe

- Indirected Class: `Puppet::Util::Instrumentation::IndirectionProbe`

Termini

local

> Undocumented.

rest

> Undocumented.

key

This indirection wraps an `OpenSSL::PKey::RSA object, representing a private key. The indirection key is the certificate CN (generally a hostname).□

- Indirected Class: `Puppet::SSL::Key`

Termini

ca

> Manage the CA's private on disk. This terminus only works with the CA key, because that's the only key that the CA ever interacts with.

disabled_ca

> Manage the CA private key, but reject any remote access to the SSL data store. Used when a master has an explicitly disabled CA to prevent clients getting confusing 'success' behaviour.

file

> Manage SSL private and public keys on disk.

node

Where to find node information. A node is composed of its name, its facts, and its environment.

- Indirected Class: `Puppet::Node`
- Terminus Setting: node_terminus

Termini

active_record

> A component of ActiveRecord storeconfigs. ActiveRecord-based storeconfigs and inventory are deprecated. See http://links.puppetlabs.com/activerecord-deprecation

exec

> Call an external program to get node information. See the External Nodes page for more information.

ldap

> Search in LDAP for node configuration information. See the LDAP Nodes page for more information. This will first search for whatever the certificate name is, then (if that name contains a `.`) for the short name, then `default`.

memory

> Keep track of nodes in memory but nowhere else. This is used for one-time compiles, such as what the stand-alone `puppet` does. To use this terminus, you must load it with the data you want it to contain; it is only useful for developers and should generally not be chosen by a normal user.

plain

> Always return an empty node object. Assumes you keep track of nodes in flat file manifests. You should use it when you don't have some other, functional source you want to use, as the compiler will not work without a valid node terminus.
>
> Note that class is responsible for merging the node's facts into the node instance before it is

> returned.

rest

> Get a node via REST. Puppet agent uses this to allow the puppet master to override its environment.

store_configs

> Part of the “storeconfigs” feature. Should not be directly set by end users.

write_only_yaml

> Store node information as flat files, serialized using YAML, does not deserialize (write only).

yaml

> Store node information as flat files, serialized using YAML, or deserialize stored YAML nodes.

report

- Indirected Class: `Puppet::Transaction::Report`

Termini

processor

> Puppet’s report processor. Processes the report with each of the report types listed in the ‘reports’ setting.

rest

> Get server report over HTTP via REST.

yaml

> Store last report as a flat file, serialized using YAML.

resource

- Indirected Class: `Puppet::Resource`

Termini

active_record

> A component of ActiveRecord storeconfigs. ActiveRecord-based storeconfigs and inventory are deprecated. See http://links.puppetlabs.com/activerecord-deprecation

ral

> Manipulate resources with the resource abstraction layer. Only used internally.

rest

> Maniuplate resources remotely? Undocumented.

store_configs

> Part of the “storeconfigs” feature. Should not be directly set by end users.

resource_type

- Indirected Class: `Puppet::Resource::Type`

Termini

parser

> Return the data-form of a resource type.

rest

> Retrieve resource types via a REST HTTP interface.

status

- Indirected Class: `Puppet::Status`

Termini

local

> Get status locally. Only used internally.

rest

> Get puppet master’s status via REST. Useful because it tests the health of both the web server and the indirector.

This page autogenerated on Tue Jun 18 16:58:38 -0700 2013