

Rudder 3.1 - User Manual

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Chapter 1

Online version

You can also read [the *Rudder* User Documentation on the Web](#).

Chapter 2

Introduction

This chapter presents the main concepts and the architecture of *Rudder*: what are the server types and their interactions. Reading this chapter will help you to learn the terms used, and to prepare the deployment of a *Rudder* installation.

2.1 Concepts

2.1.1 Rudder functions

Rudder addresses two main functions:

1. Configuration management;
2. Asset management;

The configuration management function relies on the asset management function. The purpose of the asset management function is to identify *Nodes* and some of their characteristics which can be useful to perform configuration management. The purpose of configuration management is to apply rules on *Nodes*. A rule can include the installation of a tool, the configuration of a service, the execution of a daemon, etc. To apply rules on *Nodes*, *Rudder* uses the information produced by the asset management function to identify these *Nodes* and evaluate some specific information about them.

2.1.2 Asset management concepts

Each *Node* is running a *Rudder Agent*, which is sending regularly an inventory to the *Rudder Server*.

2.1.2.1 New Nodes

Following the first inventory, *Nodes* are placed in a transit zone. You can then view the detail of their inventory, and accept the final *Node* in the *Rudder* database if desired. You may also reject the *Node*, if it is not a machine you would like to manage with *Rudder*.

2.1.2.2 Search Nodes

An advanced search engine allows you to identify the required *Nodes* (by name, IP address, OS, versions, etc.)

2.1.2.3 Groups of Nodes

You will have to create sets of *Nodes*, called groups. These groups are derived from search results, and can either be static or a dynamic:

Static group *Group of Nodes* based on search criteria. The search is performed once and the resulting list of *Nodes* is stored. Once declared, the list of nodes will not change, except manual change.

Dynamic group *Group of Nodes* based on search criteria. The search is replayed every time the group is queried. The list will always contain the nodes that match the criteria, even if the data nodes have changed since the group was created.

2.1.3 Configuration management concepts

We adopted the following terms to describe the configurations in *Rudder*:

Technique This is a configuration skeleton, adapted to a function or a particular service (e.g. DNS resolver configuration). This skeleton includes the configuration logic for this function or service, and can be set according to a list of variables (in the same example: IP addresses of DNS servers, the default search box, ...)

Directive This is an instance of a *Technique*, which allows to set values for the parameters of the latter. Each *Directive* can have a unique name. A *Directive* should be completed with a short and a long description, and a collection of parameters for the variables defined by the *Technique*.

Rule It is the application of one or more directives to a group of nodes. It is the glue between both Asset Management and Configuration Management parts of the application.

Applied Policy This is the result of the conversion of a Policy Instance into a set of *CFEngine* Promises for a particular *Node*.

As illustrated in this summary diagram, the rules are linking the functions of inventory management and configuration management.

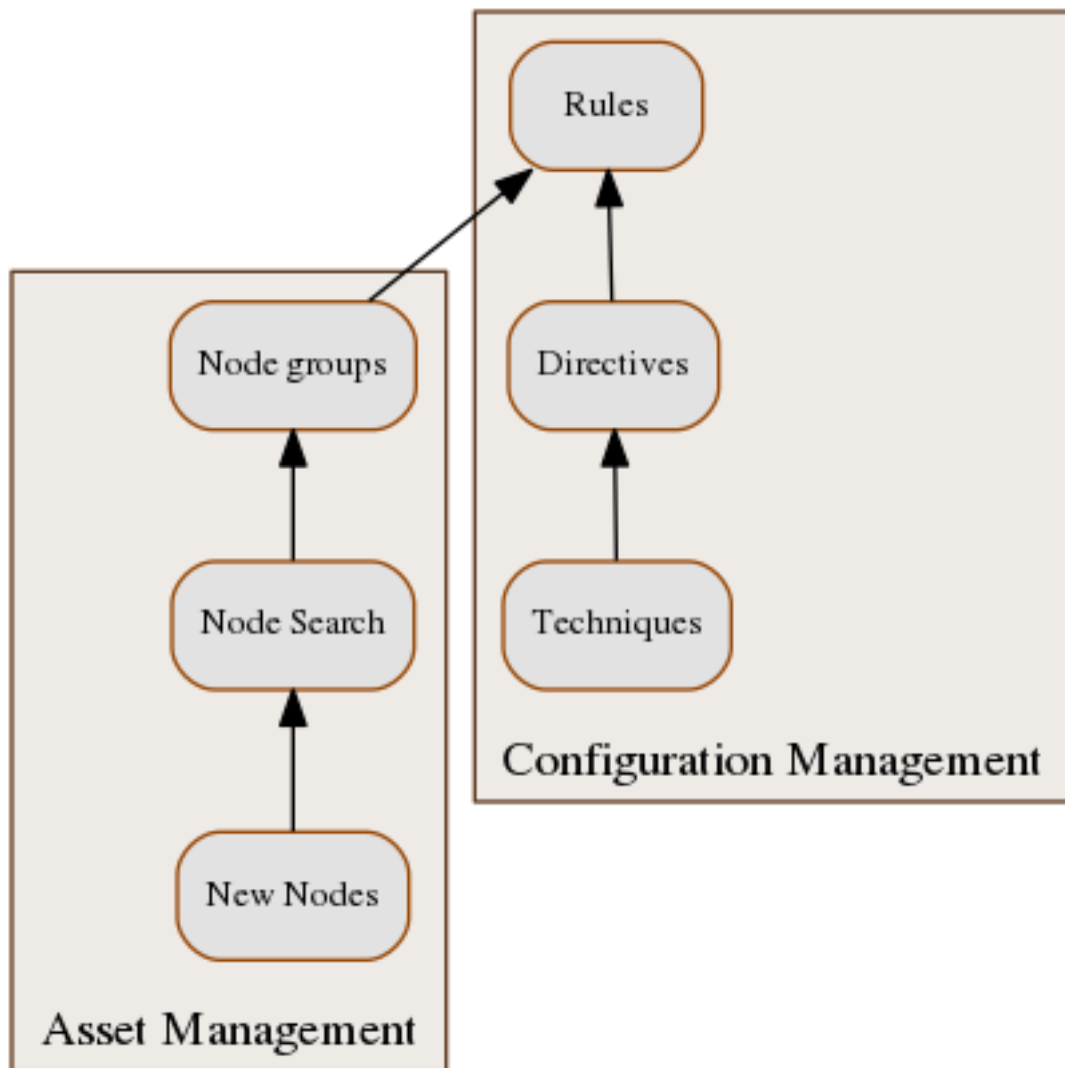


Figure 2.1: Concepts diagram

2.2 Rudder components

The *Rudder* infrastructure uses three types of machines:

Rudder Node A *Node* is client computer managed by *Rudder*. To be managed, a *Node* must first be accepted as an authorized node.

Rudder Root Server This is the core of the *Rudder* infrastructure. This server must be a dedicated machine (either virtual or physical), and contains the main application components: the web interface, databases, configuration data, logs...

Rudder Relay Server Relay servers are an optional component in a *Rudder* architecture. They can act as a proxy for all network communications between *Rudder* agents and a *Rudder* server. This enables them to be installed in a remote datacenter, or inside a restricted network zone, to limit the network flows required to use *Rudder*.

Chapter 3

Installation

3.1 Requirements

3.1.1 Networking

3.1.1.1 Mandatory flows

The following flows from the *Nodes* to the *Rudder Root Server* have to be allowed:

Port 5309, TCP *CFEngine* communication port, used to communicate the policies to the rudder nodes.

Port 443, TCP, for nodes WebDAV/HTTPS communication port, used to send inventory and fetch the id of the *Rudder Server*.

Port 514, TCP/UDP Syslog port, used to centralize reports.

And this one is optional:

Port 5310, TCP *CFEngine* communication port, used to communicate the policies to the *Rudder* nodes when debugging communication between a *Node* and a policy server with the `rudder server debug` command.

Open the following flow from the clients desktop to the *Rudder Root Server*:

Port 443, TCP, for users HTTP/S communication port, used to access the *Rudder* web interface.

3.1.1.2 Optional flows

These flows are recommended for compatibility:

Port 80, TCP, for nodes WebDAV/HTTP communication port, kept for compatibility with pre-3.1 nodes and AIX nodes.

These flows are used to add features to *Rudder*:

CFEngine Enterprise Managing *Windows* machines requires the commercial version of *CFEngine*, called *Enterprise*. It needs to open the port 5308 TCP from the *Node* to the *Rudder Root Server*.

This version used to be called Nova before.

3.1.1.3 DNS - Name resolution

By default, *Rudder* relies on the *Node* declared hostnames to identify them, for security reasons. It is required that each *Node* hostname can be resolved to its IP address that will be used to contact the *Rudder Server*.

If you can not make every node resolution consistent, it is possible to remove this constraint by unticking "Use reverse DNS lookups on nodes to reinforce authentication to policy server:" in the Administration - Settings tab of the *Rudder* web interface.

3.1.2 Supported Operating Systems

3.1.2.1 For Rudder Nodes

The following operating systems are supported for *Rudder Nodes* and packages are available for these platforms:

GNU/Linux:

- *Debian* 5 to 8
- RedHat *Enterprise Linux (RHEL)* / *RHEL*-like 3 to 7
- *Fedora* 18
- *SuSE Linux Enterprise Server (SLES)* 10 SP3, 11 SP1 and SP3, 12
- *Ubuntu* 10.04 LTS (Lucid), 12.04 LTS (Precise), 12.10 (Quantal), 14.04 LTS (Trusty)

Other Unix systems:

- IBM AIX 5.3, 6.1 and 7.1

Windows:

- **Microsoft Windows** Server 2008, 2008 R2, 2012, 2012 R2

Windows and AIX Nodes

- On *Windows*, installing *Rudder* requires the commercial version of *CFEngine* (named *CFEngine Enterprise*)
- For IBM AIX, pre-built RPM packages are distributed by *Normation* only

Hence, as a starting point, we suggest that you only use Linux machines. Once you are accustomed to *Rudder*, contact *Normation* to obtain a demo version for these platforms.



Unsupported Operating Systems

It is possible to use *Rudder* on other platforms than the ones listed here. However, we haven't tested the application on them, and can't currently supply any packages for them. Moreover, some *Techniques* may not work properly. If you wish to try *Rudder* on other systems, please get in touch with us!

A reference about how to manually build a *Rudder* agent is available on *Rudder*'s website here: <http://www.rudder-project.org/foswiki/Development/AgentBuild>

3.1.2.2 For Rudder Root Server

The following operating systems are supported as a Root server:

GNU/Linux:

- *Debian* 7 and 8
- RedHat *Enterprise Linux (RHEL)* / *RHEL*-like 6 and 7
- *SuSE Linux Enterprise Server (SLES)* 11 SP1 and SP3
- *Ubuntu* 12.04 LTS (Precise), 14.04 LTS (Trusty)

3.1.3 Hardware specifications and sizing for Rudder Root Server

A dedicated server is strongly recommended, either physical or virtual with at least one dedicated core. *Rudder Server* runs on both 32 (if available) and 64 bit versions of every supported Operating System.

3.1.3.1 Memory

The required amount of RAM mainly depends on the number of managed nodes. A general rule for the minimal value on a stand-alone installation is:

- less than 50 nodes: 2GB
- between 50 and 1000 nodes: 4GB
- more than 1000 nodes: 4GB + 1GB of RAM by 500 nodes above 1000.
- more than 4000 nodes: 10GB + 2GB of RAM by 500 nodes above 4000.

When managing more than 1000 nodes, we also recommend you to use a multiserver installation for *Rudder* as described in chapter [Multiserver Rudder](#).

When your server has more than 2 GB of RAM, you have to configure the RAM allocated to the Java Virtual Machine as explained in the section [about webapplication RAM configuration](#)

When your server has more than 4 GB, you may need to also tune the PostgreSQL server, as explained in the [Optimize PostgreSQL Server](#) section

Tip

As an example, a *Rudder* server which manages 2600 nodes (with a lot of policies checked) will need:

- A server with 8 GB of RAM,
- 4 GB of RAM will be allocated to the JVM.

In our load-tests, with such a configuration, the server is not stressed and the user experience is good.

3.1.3.2 Disk

The PostgreSQL database will take up most disk space needed by *Rudder*. The storage necessary for the database can be estimated by counting around 150 to 400 kB by *Directive*, by *Node* and by day of retention of node's execution reports (the default is 4 days):

```
max_space = number of Directives * number of Nodes * retention duration in days * 400 kB
```

For example, a default installation with 500 nodes and an average of 50 *Directives* by node, should require between 14 GB and 38 GB of disk space for PostgreSQL.

Follow the [Reports Retention](#) section to configure the retention duration.

3.2 Install Rudder Server

This chapter covers the installation of a *Rudder Root Server*, from the specification of the underlying server, to the initial setup of the application.

Before all, you need to setup a server according to [the server specifications](#). You should also [configure the network](#). These topics are covered in the Architecture chapter.

Ideally, this machine should have Internet access, but this is not a strict requirement.

As *Rudder* data can grow really fast depending on your number of managed nodes and number of rules, it is advised to separate partitions to prevent /var getting full and break your system. Special attention should be given to:

/var/lib/pgsql (OS dependent). Please see the [database maintenance](#) chapter for more details about the PostgreSQL database size estimation.

/var/rudder Contains most of your server information, the configuration-repository, *LDAP* database, etc. . . *Rudder* application-related files should stay under 1GB, but the size of the configuration-repository will depend of the amount of data you store in it, especially in the shared-files folder (files that will get distributed to the agents using the "Download a file for the shared folder" *Technique*).

/var/log/rudder Report logs (/var/log/rudder/reports) size will depend on the amount of nodes you manage. It is possible to reduce this drastically by unticking "Log all reports received to /var/log/rudder/reports/all.log" under the Administration - Settings tab in the *Rudder* web interface. This will prevent *Rudder* from recording this logs in a text file on disk, and will only store them in the SQL database. This saves on space, and doesn't remove any functionality, but does however make debugging harder.

3.2.1 Install Rudder Root server on Debian or Ubuntu

Warning

Any nodes running **syslogd** (not syslog-ng or rsyslog) will **fail** to send any reports about the configuration rules they have applied to a *Rudder Server* running on *Ubuntu* (and only on *Ubuntu*). *Rudder* will apply rules on nodes but will never get reports from them. Therefore *Rudder* will not be able to calculate compliance.

The only supported platform using syslogd by default is **RHEL/CentOS 5**, and several workarounds are available to fix this:



1. Install another syslog server on your nodes, such as rsyslog or syslog-ng.
2. Change the rsyslog configuration on the *Rudder* server (running *Ubuntu* 12.04 or later) to use port 514 and authorize this in the rsyslog configuration.
3. Setup iptables on the node to send syslog traffic to the correct port on your *Rudder* server.
4. Use a different OS for your *Rudder* server than *Ubuntu* Server 12.04 or later.

3.2.1.1 Add the Rudder packages repository

Each package that is published by *Rudder Project* is signed with our GPG signature. To ensure the packages you will install are official builds and have not been altered, import our key into apt using the following command:

```
wget --quiet -O- "https://www.rudder-project.org/apt-repos/rudder_apt_key.pub" | sudo apt-key add -
```

Our key fingerprint is:

```
pub 4096R/474A19E8 2011-12-15 Rudder Project (release key) <security@rudder-project.org>
Key fingerprint = 7C16 9817 7904 212D D58C B4D1 9322 C330 474A 19E8
```

Then run the following commands as root:

```
echo "deb http://www.rudder-project.org/apt-3.1/ $(lsb_release -cs) main" > /etc/apt/sources.list.d/rudder.list
apt-get update
```

This will add the package repository and finally update the local package cache.

3.2.1.2 Install your Rudder Root Server

To begin the installation, you should simply install the `rudder-server-root` metapackage, which will install the required components:

```
apt-get install rudder-server-root
```

3.2.2 Initial configuration of your Rudder Root Server

After the installation, you have to configure some system elements, by launching the following initialisation script:

```
/opt/rudder/bin/rudder-init
```

This script will ask you to fill in the following details:

Allowed networks A list of IP networks authorized to connect to the server. It uses the network/CIDR mask notation, for instance `192.168.0.0/24` or `10.0.0.0/8`. To add several networks, first type the first network, then press the return key - the script will ask if you wish to add some more networks. Also, the allowed networks can be adjusted later in the web interface in the Administration - Settings tab without having to run the script again.

Tip

In case of typing error, or if you wish to reconfigure *Rudder*, you can execute this script again as many times as you want.

3.2.3 Validate the installation

Once all these steps have been completed, use your web browser to go to the URL given in the output of `rudder-init`.

You should see a loading screen, then a login prompt. The default login is "admin" with password "admin", authenticating you in the *Rudder* web interface with full administrative privileges. You are strongly advised to **change this password** as soon as possible.

The setup of the *Rudder* server is now over. If you plan to manage hundreds or thousands of *Nodes*, please note that some **performance tuning** can be necessary on the system.

3.2.4 Install Rudder Root server on SLES

3.2.4.1 Configure the package manager

Rudder requires three packages that are not always packaged by *SuSE* on all versions:

- PostgreSQL 9
 - Java RE (version 7 at least).
-

PostgreSQL 9 can be installed through the OpenSuSE build service: <https://build.opensuse.org/project/show/server:database:postgresql> or through the system repositories, on post-SP1 systems.

The Java RE 7 can be found either using the OpenSuSE build service, or through Oracle's website: <http://www.java.com>

Also, *Rudder* server requires the `git` software, that can be found on SLES SDK DVD under the name `git-core`.



Warning

SLES 11 will try to install PostgreSQL 8.3 by default, which is not supported by *Rudder* and will cause various glitches in the web interface, as well as reporting failures. It is really mandatory to either add the OpenSuSE build service repository, or install `postgresql91-server` (if available) beforehand to prevent the system from choosing the default PostgreSQL implementation.

Warning

You may encounter a segmentation fault in Zypper in the following cases:

- On SLES 11 when trying to install *Rudder* rpm files locally with Zypper (for example with `zypper install rudder-agent-version.release-1.SLES.11.x86_64.rpm`)



- On SLES 12 GA when installing *Rudder* packages, locally or from the repository

This is due to a bug ([bnc#929483](#) on SuSE bugtracker) in Zypper's RPM headers parsing. You can either:

- Only for SLES 11, install the packages directly from the repository, as described below
- Upgrade your `libzypp` package to a version including the fix provided by SuSE (upgrade for **SLES11SP3** and for **SLES12**)
- Use the `rpm` command to install packages locally (for example with `rpm -i rudder-agent-version.release-1.SLES.11.x86_64.rpm`)



Warning

Zypper seems to be quite tolerant to missing dependencies and will let you install `rudder-server-root` even if you are missing something like `git-core` for example, if nothing provides it or you did not install it beforehand. Special care should be taken during initial installation not to say "Continue anyway" if Zypper does complain a dependency can not be resolved and asks what to do.

3.2.4.2 Add the Rudder packages repository

Each package that is published by *Rudder* Project is signed with our GPG signature. To ensure the packages you will install are official builds and have not been altered, import our key into rpm using the following command:

```
rpm --import https://www.rudder-project.org/rpm-repos/rudder_rpm_key.pub
```

Our key fingerprint is:

```
pub 1024R/6F07D355 2012-11-09 Rudder Project (RPM release key) <security@rudder-project. ←
org>
Key fingerprint = 1141 A947 CDA0 4E83 82C1 B9C4 ADAB 3BD3 6F07 D355
```

Then run the following commands as root:

```
zypper ar -n "Rudder SLES repository" http://www.rudder-project.org/rpm-3.1/SLES_11/ Rudder
zypper refresh
```

This will add the *Rudder* package repository, then update the local package cache.

3.2.4.3 Install your Rudder Root Server

To begin the installation, you should simply install the `rudder-server-root` metapackage, which will install the required components:

```
zypper in rudder-server-root
```

3.2.5 Initial configuration of your Rudder Root Server

After the installation, you have to configure some system elements, by launching the following initialisation script:

```
/opt/rudder/bin/rudder-init
```

This script will ask you to fill in the following details:

Allowed networks A list of IP networks authorized to connect to the server. It uses the network/CIDR mask notation, for instance `192.168.0.0/24` or `10.0.0.0/8`. To add several networks, first type the first network, then press the return key - the script will ask if you wish to add some more networks. Also, the allowed networks can be adjusted later in the web interface in the Administration - Settings tab without having to run the script again.

Tip

In case of typing error, or if you wish to reconfigure *Rudder*, you can execute this script again as many times as you want.

3.2.6 Validate the installation

Once all these steps have been completed, use your web browser to go to the URL given in the output of `rudder-init`.

You should see a loading screen, then a login prompt. The default login is "admin" with password "admin", authenticating you in the *Rudder* web interface with full administrative privileges. You are strongly advised to **change this password** as soon as possible.

The setup of the *Rudder* server is now over. If you plan to manage hundreds or thousands of *Nodes*, please note that some **performance tuning** can be necessary on the system.

3.2.7 Install Rudder Root server on RHEL-like systems

3.2.7.1 Add the Rudder packages repository

Each package that is published by *Rudder* Project is signed with our GPG signature. To ensure the packages you will install are official builds and have not been altered, import our key into rpm using the following command:

```
rpm --import https://www.rudder-project.org/rpm-repos/rudder_rpm_key.pub
```

Our key fingerprint is:

```
pub 1024R/6F07D355 2012-11-09 Rudder Project (RPM release key) <security@rudder-project. ←
org>
Key fingerprint = 1141 A947 CDA0 4E83 82C1 B9C4 ADAB 3BD3 6F07 D355
```

Then run the following command as root:

```
echo '[Rudder_3.1]
name=Rudder 3.1 EL repository
baseurl=http://www.rudder-project.org/rpm-3.1/RHEL_$releasever/
gpgcheck=1
gpgkey=http://www.rudder-project.org/rpm-3.1/RHEL_$releasever/repodata/repomd.xml.key' > / ←
etc/yum.repos.d/rudder.repo
```

3.2.7.2 Install your Rudder Root Server

To begin the installation, you should simply install the `rudder-server-root` metapackage, which will install the required components:

```
yum install rudder-server-root
```

On Red Hat-like systems, a firewall setup is enabled by default, and would need to be adjusted for *Rudder* to operate properly. You have to allow all the flows described in the [Network](#) section.

Tip

On EL6, the `/etc/sysconfig/iptables` file configures the firewall:

```
*filter
:INPUT ACCEPT [0:0]
:FORWARD ACCEPT [0:0]
:OUTPUT ACCEPT [0:0]
-A INPUT -m state --state ESTABLISHED,RELATED -j ACCEPT
-A INPUT -p icmp -j ACCEPT
-A INPUT -i lo -j ACCEPT
# Allow SSH access (Maintenance)
-A INPUT -m state --state NEW -m tcp -p tcp --dport 22 -j ACCEPT
# Allow HTTPS access (Rudder)
-A INPUT -m state --state NEW -m tcp -p tcp --dport 443 -j ACCEPT
-A INPUT -j REJECT --reject-with icmp-host-prohibited
-A FORWARD -j REJECT --reject-with icmp-host-prohibited
COMMIT
```

The important line to have access to the Web interface being:

```
# Allow HTTPS access (Rudder)
-A INPUT -m state --state NEW -m tcp -p tcp --dport 443 -j ACCEPT
```

Tip

On EL7, the default firewall is `firewalld`, and you can enable HTTP/S access by running

```
firewall-cmd --permanent --zone=public --add-port=443/tcp
```

3.2.8 Initial configuration of your Rudder Root Server

After the installation, you have to configure some system elements, by launching the following initialisation script:

```
/opt/rudder/bin/rudder-init
```

This script will ask you to fill in the following details:

Allowed networks A list of IP networks authorized to connect to the server. It uses the network/CIDR mask notation, for instance `192.168.0.0/24` or `10.0.0.0/8`. To add several networks, first type the first network, then press the return key - the script will ask if you wish to add some more networks. Also, the allowed networks can be adjusted later in the web interface in the Administration - Settings tab without having to run the script again.

Tip

In case of typing error, or if you wish to reconfigure *Rudder*, you can execute this script again as many times as you want.

3.2.9 Validate the installation

Once all these steps have been completed, use your web browser to go to the URL given in the output of `rudder-init`.

You should see a loading screen, then a login prompt. The default login is "admin" with password "admin", authenticating you in the *Rudder* web interface with full administrative privileges. You are strongly advised to **change this password** as soon as possible.

The setup of the *Rudder* server is now over. If you plan to manage hundreds or thousands of *Nodes*, please note that some **performance tuning** can be necessary on the system.

Files installed by the application

/etc System-wide configuration files are stored here: init scripts, configuration for apache, logrotate and rsyslog.

/opt/rudder Non variable application files are stored here.

/opt/rudder/etc Configuration files for *Rudder* services are stored here.

/var/log/rudder Log files for *Rudder* services are stored here.

/var/rudder Variable data for *Rudder* services are stored here.

/var/rudder/configuration-repository/techniques *Techniques* are stored here.

/var/rudder/cfengine-community Data for *CFEngine Community* is stored here.

/var/cfengine Data for *CFEngine Enterprise* is stored here.

/usr/share/doc/rudder* Documentation about *Rudder* packages.

3.3 Install Rudder Agent

This chapter gives a general presentation of the *Rudder* Agent, and describes the different configuration steps to deploy the *Rudder* agent on the *Nodes* you wish to manage. Each Operating System has its own set of installation procedures.

The machines managed by *Rudder* are called *Nodes*, and can either be physical or virtual. For a machine to become a managed *Node*, you have to install the *Rudder* Agent on it. The *Node* will afterwards register itself on the server. And finally, the *Node* should be acknowledged in the *Rudder Server* interface to become a managed *Node*. For a more detailed description of the workflow, please refer to the **Advanced Usage** part of this documentation.

Components

This agent contains the following tools:

1. The community version of *CFEngine*, a powerful open source configuration management tool.
2. *FusionInventory*, an inventory software.
3. An initial configuration set for the agent, to bootstrap the *Rudder Root Server* access.

These components are recognized for their reliability and minimal impact on performances. Our tests showed their memory consumption is usually under 10 MB of RAM during their execution. So you can safely install them on your servers.

We grouped all these tools in one package, to ease the *Rudder* Agent installation.

To get the list of supported Operating systems, please refer to **the list of supported Operating Systems for the Nodes**.

3.3.1 Install Rudder Agent on Debian or Ubuntu

Each package that is published by *Rudder* Project is signed with our GPG signature. To ensure the packages you will install are official builds and have not been altered, import our key into apt using the following command:

```
wget --quiet -O- "https://www.rudder-project.org/apt-repos/rudder_apt_key.pub" | sudo apt-key add -
```

Our key fingerprint is:

```
pub 4096R/474A19E8 2011-12-15 Rudder Project (release key) <security@rudder-project.org>
Key fingerprint = 7C16 9817 7904 212D D58C B4D1 9322 C330 474A 19E8
```

Then add *Rudder's* package repository:

```
echo "deb http://www.rudder-project.org/apt-3.1/ $(lsb_release -cs) main" > /etc/apt/sources.list.d/rudder.list
```

Update your local package database to retrieve the list of packages available on our repository:

```
sudo apt-get update
```

Install the `rudder-agent` package:

```
sudo apt-get install rudder-agent
```

3.3.2 Install Rudder Agent on RHEL-like systems

Each package that is published by *Rudder Project* is signed with our GPG signature. To ensure the packages you will install are official builds and have not been altered, import our key into rpm using the following command:

```
rpm --import https://www.rudder-project.org/rpm-repos/rudder_rpm_key.pub
```

Our key fingerprint is:

```
pub 1024R/6F07D355 2012-11-09 Rudder Project (RPM release key) <security@rudder-project.org>
Key fingerprint = 1141 A947 CDA0 4E83 82C1 B9C4 ADAB 3BD3 6F07 D355
```

Then define a yum repository for *Rudder*:

```
echo '[Rudder_3.1]
name=Rudder 3.1 EL repository
baseurl=http://www.rudder-project.org/rpm-3.1/RHEL_$releasever/
gpgcheck=1
gpgkey=http://www.rudder-project.org/rpm-3.1/RHEL_$releasever/repodata/repomd.xml.key' > /etc/yum.repos.d/rudder.repo
```

Tip

The RPM can be directly downloaded for a standalone installation, from the following URL: http://www.rudder-project.org/rpm-3.1/RHEL_7/ (or *RHEL_6*, *RHEL_5*, etc, depending on your host's OS version)

Install the package:

```
yum install rudder-agent
```

Or:

```
yum install rudder-agent-3.1.0-1.EL.7.x86_64.rpm
```

3.3.3 Install Rudder Agent on SLES

Following commands are executed as the `root` user.

Warning

You may encounter a segmentation fault in Zypper in the following cases:

- On SLES 11 when trying to install *Rudder* rpm files locally with Zypper (for example with `zypper install rudder-agent-version.release-1.SLES.11.x86_64.rpm`)



- On SLES 12 GA when installing *Rudder* packages, locally or from the repository

This is due to a bug ([bnc#929483](#) on *SuSE* bugtracker) in Zypper's RPM headers parsing. You can either:

- Only for SLES 11, install the packages directly from the repository, as described below
 - Upgrade your libzypp package to a version including the fix provided by *SuSE* (upgrade for **SLES11SP3** and for **SLES12**)
 - Use the `rpm` command to install packages locally (for example with `rpm -i rudder-agent-version.release-1.SLES.11.x86_64.rpm`)
-

Each package that is published by *Rudder* Project is signed with our GPG signature. To ensure the packages you will install are official builds and have not been altered, import our key into `rpm` using the following command:

```
rpm --import https://www.rudder-project.org/rpm-repos/rudder_rpm_key.pub
```

Our key fingerprint is:

```
pub 1024R/6F07D355 2012-11-09 Rudder Project (RPM release key) <security@rudder-project. ↵
org>
Key fingerprint = 1141 A947 CDA0 4E83 82C1 B9C4 ADAB 3BD3 6F07 D355
```

Then add the *Rudder* packages repository:

- on SLES 12:

```
zypper ar -n 'Rudder SLES 12 repository' http://www.rudder-project.org/rpm-3.1/SLES_12/ ↵
Rudder
```

- on SLES 11:

```
zypper ar -n 'Rudder SLES repository' http://www.rudder-project.org/rpm-3.1/SLES_11_SP1/ ↵
Rudder
```

- on SLES 10:

```
zypper sa 'http://www.rudder-project.org/rpm-3.1/SLES_10_SP3/' Rudder
```

Update your local package database to retrieve the list of packages available on our repository:

```
zypper ref
```

Install the `rudder-agent` package:

```
zypper install rudder-agent
```

Tip

The use of the `rug` package manager on SLES 10 is strongly discouraged, due to poor performance and possible stability issues.

3.3.4 Configure and validate

3.3.4.1 Configure Rudder Agent

Configure the IP address or hostname of the *Rudder Root Server* in the following file

```
echo '<rudder server ip or hostname>' > /var/rudder/cfengine-community/policy_server.dat
```

Tip

We advise you to use the IP address of the *Rudder Root Server*. The DNS name of this server can also be accepted if you have a trusted DNS infrastructure with proper reverse resolutions.

You can now start the *Rudder* service with:

```
service rudder start
```

3.3.4.2 Validate new Node

Several minutes after the start of the agent, a new *Node* should be pending in the *Rudder* web interface. You will be able to browse its inventory, and accept it to manage its configuration with *Rudder*.

You may force the agent to run and send an inventory by issuing the following command:

```
rudder agent inventory
```

You may force the agent execution by issuing the following command:

```
rudder agent run
```

3.4 Install Rudder Relay (optional)

Relay servers can be added to *Rudder*, for example to manage a DMZ or to isolate specific nodes from the main environment for security reasons.

Relay server's purpose is to solve a simple problem: sometimes, one would want to manage multiple networks from *Rudder*, without having to allow all the subnet access to the other for security reasons. A solution for this would be to have a kind of "*Rudder*" proxy that would be relaying information between the subnet and the main *Rudder* server. This is the reason relay servers were created.

Using a relay, you are able to:

- Separate your *Rudder* architecture into separate entities that still report to one server
- Prevent laxist security exceptions to the *Rudder* server
- Ease maintenance

The first part is to be done on the machine that will become a relay server. The procedure will:

- Add the machine as a regular node
 - Configure the relay components (Syslog, Apache HTTPd, CFEngine)
 - Switch this node to the relay server role (from the root server point of view)
-

3.4.1 On the relay

To begin, please install a regular *Rudder* agent on the OS, following the [installation instructions](#), and install the *rudder-server-relay* package in addition to the *rudder-agent* package.

To complete this step, please make sure that your node is configured successfully and appears in your *Rudder* web interface.

3.4.2 On the root server

You have to tell the *Rudder Root* server that a node will be a relay. To do so, launch the *rudder-node-to-relay* script on the root server, supplying the UUID of the host to be considered as a relay. You can find the UUID of your node with the *rudder agent info* command.

```
/opt/rudder/bin/rudder-node-to-relay aaaaaaaa-bbbb-cccc-dddd-eeeeeeee
```

3.4.3 Validation

When every step has completed successfully:

- The *Rudder* root server will recognize the new node as a relay
- It will generate specific promises for the relay
- The relay will update and switch to his new role

This is an example of node details pane showing a relay server. Note the "Role: *Rudder* relay server" part that shows that the machine has successfully changed from a node to a relay.

The screenshot displays the 'Node Details' page for the node 'relays-relay.cobbler.com' (last updated 2013-10-15 06:25). The interface includes a top navigation bar with tabs: Node summary, Hardware, File systems, Network interfaces, Software, Environment variables, Processes, Virtual machines, and Reports. Below this is a 'Technical logs' section. The main content area is divided into two panels. The left panel, titled 'Groups containing this node', shows a tree structure with 'Root of the group and group categories' and 'System groups'. The right panel, titled 'Node characteristics', contains a 'Delete this node' button and detailed information about the node. This information is organized into sections: General (Hostname, Machine type, Total physical memory, Total swap space), Operating system details (Operating System, Operating System Type, Operating System Name, Operating System Version, Operating System Service Pack), Rudder information (Role, Inventory date, Date inventory last received, Date first accepted in Rudder, Agent name, Rudder ID, Rudder Policy Server), and Accounts (Administrator account, Local account(s)).

Section	Key	Value
General	Hostname	relays-relay.cobbler.com
	Machine type	Virtual machine (QEMU/KVM)
	Total physical memory (RAM)	490 MB
	Total swap space	1.97 GB
Operating system details	Operating System	CentOS release 6.2 (Final)
	Operating System Type	Linux
	Operating System Name	CentOS
	Operating System Version	6.2
	Operating System Service Pack	None
Rudder information	Role	Rudder relay server
	Inventory date	2013-10-15 06:25
	Date inventory last received	2013-10-15 06:25
	Date first accepted in Rudder	2013-10-11 13:30
	Agent name	CFEngine Community
	Rudder ID	F0F98CD3-48AC-4418-A6E8-A61E75C6EC28
Accounts	Administrator account	root
	Local account(s)	abrt, adm, apache, bin, daemon, dbus, ftp, games, gopher, haldaemon, halt, lp, mail, nobody, ntp, operator, postfix, saslauth, shutdown, sshd, sync, tcpdump, uucp, vcsa

Figure 3.1: Rudder relay node

3.4.4 Adding nodes to a relay server

When you have at least one relay, you will likely want to add nodes on it.

You then have two possible cases:

- You want to switch an already existing node to the relay
- You want to add a new one

The procedure on both cases is the same, you have to:

- Create / update the file `/var/rudder/cfengine-community/policy_server.dat` with the IP address or the fully qualified domain name of the relay server (instead of the root server)

```
echo "rudder-relay.example.com" > /var/rudder/cfengine-community/policy_server.dat
```

- Trigger an inventory immediately to make sure the node is registered correctly

```
rudder agent inventory
```

After those steps, the node should be registered correctly on your *Rudder* infrastructure.

Chapter 4

Upgrade

This short chapter covers the upgrade of the *Rudder Server* Root and *Rudder Agent* from older versions to the latest version, 3.1.

The upgrade is quite similar to the installation.

A big effort has been made to ensure that all upgrade steps are performed automatically by packaging scripts. Therefore, you shouldn't have to do any upgrade procedures manually, but you will note that several data migrations occur during the upgrade process.

4.1 Upgrade from Rudder 2.11 or 3.0

Migration from 2.11 or 3.0 are supported, so you can upgrade directly to 3.1.

4.2 Upgrade from Rudder 2.10 or older

Direct upgrades from 2.10.x and older are no longer supported on 3.1. If you are still running one of those, either on servers or nodes, please first upgrade to one of the supported versions above, and then upgrade to 3.1.

4.3 Caution cases

4.3.1 Compatibility between Rudder server 3.1 and older agent versions

4.3.1.1 2.11.x and 3.0.x agents

As they use a compatible *CFEngine* version, *Rudder* agent 2.11.x and 3.0.x are fully compatible with *Rudder* server 3.1.x. It is therefore not necessary to update your agents to 3.1.x.

However, *Rudder* 3.1 provides a new inventory signing feature which will only be enabled on nodes running *Rudder* 3.1 agents. On nodes running an older agent version, the inventories won't be signed.

4.3.1.2 2.10.x or older

These agents are not compatible with *Rudder* 3.1, and you have to upgrade them. Be careful to follow the upgrade path explained [above](#).

4.3.2 Protocol for reporting

Rudder 3.1 uses syslog messages over UDP by default for reporting, but if you upgraded your server from a previous version, you will keep the previous setting which uses syslog messages over TCP.

You should consider switching to UDP (in **Administration** → **Settings** → **Protocol**), as it will prevent breaking your server in case of networking or load issues, or if you want to manage a lot of nodes. The only drawback is that you can lose reports in these situations. It does not affect the reliability of policy enforcement, but may only temporarily affect reporting on the server. Read [performance notes](#) about rsyslog for detailed information.

4.3.3 Known issues

- After upgrade, if the web interface has display problems, empty your navigator cache and/or logout/login.

4.4 On Debian or Ubuntu

Following commands are executed as the `root` user.

Add the *Rudder* project repository:

```
echo "deb http://www.rudder-project.org/apt-3.1/ $(lsb_release -cs) main" > /etc/apt/sources.list.d/rudder.list
```

Update your local package database to retrieve the list of packages available on our repository:

```
apt-get update
```

For *Rudder Server*, upgrade all the packages associated to `rudder-server-root`:

- With `apt-get`:

```
apt-get install rudder-server-root ncf ncf-api-virtualenv
```

and after the upgrade of these packages, restart jetty to apply the changes on the Web application:

```
service rudder-jetty restart
```

For *Rudder Agent*, upgrade the `rudder-agent` package:

```
apt-get install rudder-agent
```



Warning

Rudder includes a script for upgrading all files, databases, etc... which need migrating. Therefore, you should not replace your old files by the new ones when `apt-get/aptitude` asks about this, unless you want to reset all your parameters.

You can now [upgrade your local techniques](#).

4.5 On RHEL or CentOS

Following commands are executed as the `root` user.

Update your yum repository:

```
echo '[Rudder_3.1]
name=Rudder 3.1 Repository
baseurl=http://www.rudder-project.org/rpm-3.1/RHEL_$releasever/
gpgcheck=1
gpgkey=http://www.rudder-project.org/rpm-3.1/RHEL_$releasever/repodata/repomd.xml.key' > /etc/yum.repos.d/rudder.repo
```

Tip

Replace *RHEL_7* with your *Enterprise* Linux version if necessary.

4.5.1 Rudder server

For *Rudder* server, upgrade the `rudder-*` and `ncf`-related packages:

```
yum update "rudder-*" ncf ncf-api-virtualenv
```

and after the upgrade of these packages, restart jetty to apply the changes on the Web application:

```
service rudder-jetty restart
```

From version 3.1, *Rudder* provides an SELinux policy. You can enable it after upgrading your server with:

```
sed -i "s%\s*SELINUX=.%\s*SELINUX=enabled%" /etc/sysconfig/selinux
setenforce 1
```

4.5.2 Rudder agent

For *Rudder* agent, upgrade the `rudder-agent` package:

```
yum update rudder-agent
```

You can now **upgrade your local techniques**.

4.6 On SLES

Following commands are executed as the `root` user.

Add the *Rudder* packages repository:

- On a SLES 11 system:

```
zypper ar -n "Rudder SLES repository" http://www.rudder-project.org/rpm-3.1/SLES_11_SP1/
Rudder
```

- On a SLES 10 system:
-

```
zypper sa "http://www.rudder-project.org/rpm-3.1/SLES_10_SP3/" Rudder
```

Update your local package database to retrieve the list of packages available on our repository:

```
zypper ref
```

For *Rudder Server*, upgrade all the packages associated to `rudder-server-root`:

```
zypper update "rudder-*" "ncf*"
```

**Warning**

SLES 11 uses PostgreSQL 8.3 by default, which is not supported by *Rudder* and will cause various glitches in the web interface, as well as reporting failures.

It is really mandatory to migrate to PostgreSQL 8.4 at least (9.1+ is recommended).

Please look at [Install Rudder Root server on SLES](#) for details.

and after the upgrade of these packages, restart jetty to apply the changes on the Web application:

```
service rudder-jetty restart
```

For *Rudder Agent*, upgrade the `rudder-agent` package:

```
zypper update rudder-agent
```

You can now [upgrade your local techniques](#).

4.7 Technique upgrade

At the first installation, *Rudder* will automatically deploy a *Technique* library in the `/var/rudder/configuration-repository/techniques` directory.

When upgrading *Rudder* to another version, a new (updated) *Technique* library will be deployed in `/opt/rudder/share/techniques`, and *Rudder* will automatically take care of updating the system *Techniques* in the configuration-repository directory.

However, the other *Techniques* will not be updated automatically (yet), so you will have to do it yourself.

**Caution**

Please keep in mind that if you did manual modifications on the *Techniques* in existing directories, or created new versions of them, you will have some merging work to do.

To upgrade you local techniques, run the following commands on the *Rudder Root Server*:

```
cd /var/rudder/configuration-repository
cp -a /opt/rudder/share/techniques/* techniques/
git status
#~Now, inspect the differences. If no conflict is noticeable, then go ahead.
git add techniques/
git commit -m "Technique upgrade" # Here, put a meaningful message about why you are ←
    updating.
rudder server reload-techniques
```

This last command will reload the *Technique* library and trigger a full redeployment on nodes.

Please check that the deployment is successful in the *Rudder* web interface.

4.8 Upgrade manually installed relays

With *Rudder 2.11*, there were no relay package and the configuration had to be done by hand.

To migrate a manually installed relay to 3.1 using the package, run the following instructions:

- Delete the previous *Apache* configuration file:
 - `/etc/httpd/conf.d/rudder-default.conf` file on *RHEL-like*
 - `/etc/apache2/sites-enabled/rudder-default` file on *Debian-like*
 - `/etc/apache2/vhosts.d/rudder-default.conf` file on *SuSE*
- Install the relay package named **rudder-server-relay**.

This is enough to replace the relay configuration, and no change is needed on the root server.

Chapter 5

Rudder Web Interface

This chapter is a general presentation of the *Rudder* Web Interface. You will find how to authenticate in the application, a description of the design of the screen, and some explanations about usage of common user interface items like the search fields and the reporting screens.

5.1 Authentication

When accessing the *Rudder* web interface, a login / password is required. The default account is "admin" (Password: admin).

You can change the user accounts by following the [User management](#) procedure.

5.2 Presentation of Rudder Web Interface

The web interface is organised according to the concepts described earlier. It is divided in three logical parts: *Node* Management, Configuration Management and Administration.

5.2.1 Rudder Home

The home page summarizes the content of the other parts and provides quick links for the most common actions.

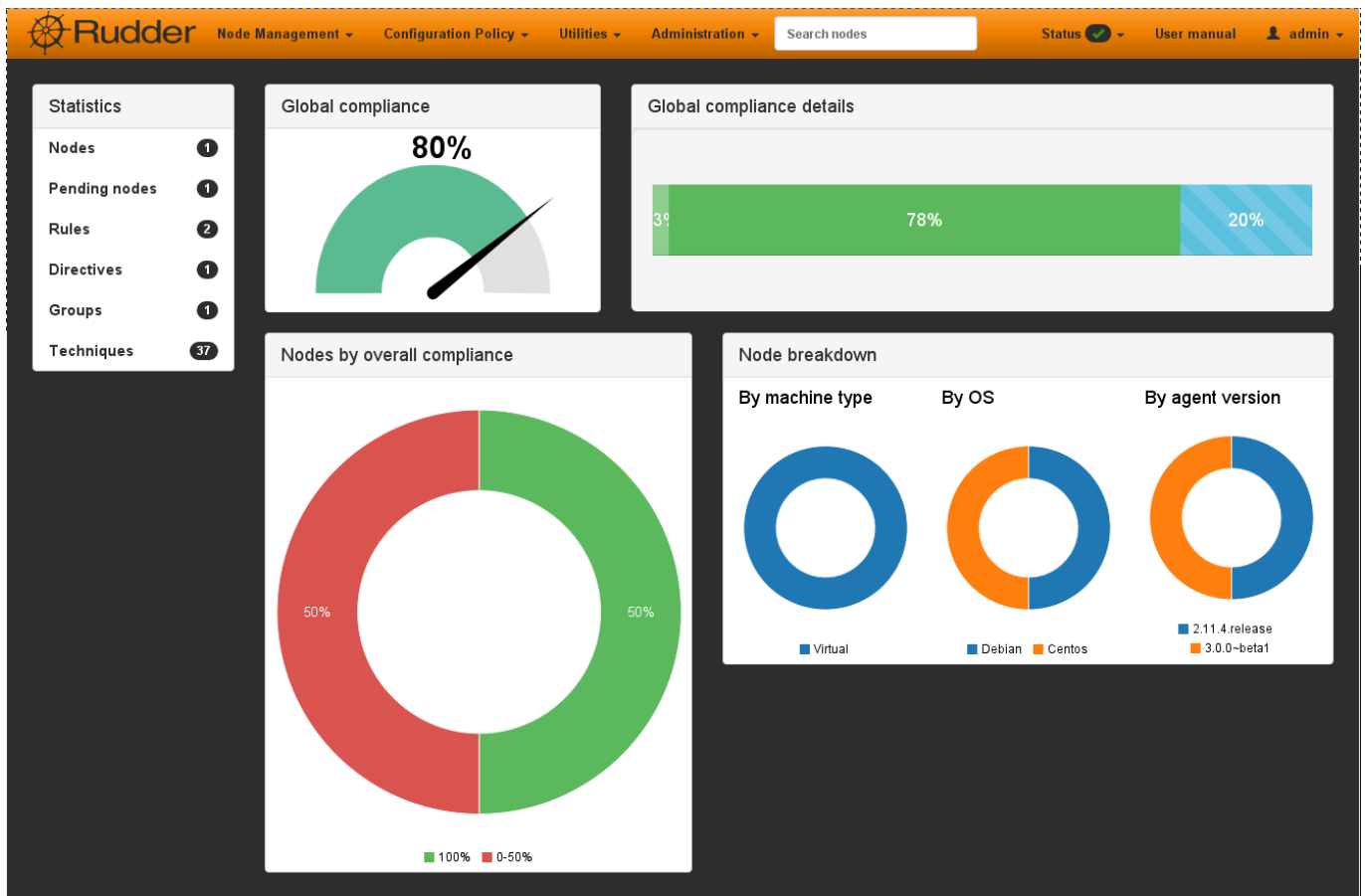


Figure 5.1: Rudder Homepage

5.2.2 Node Management

In the *Node* Management section, you will find the validation tool for new *Nodes*, a search engine for validated *Nodes*, and the management tool for groups of *Nodes*.

ACCEPT NEW NODES

Accept or refuse Nodes in your infrastructure that have declared themselves to Rudder by sending an inventory report. To add new nodes, install the rudder-agent package on a machine, and follow the instructions provided.

Review new nodes **History**

Click on a node name to view detailed inventory information.
Click on to list Rules that would be applied to this node if you accept it.

Select/deselect all ☐

Show entries

Node name	Operating system	IP addresses	Since	Directive
▶ android-box	Android XXX	192.168.1.4	2014-12-04 15:34	<input type="checkbox"/>
▶ centos-6-64	CentOS Linux release 6.0 (Final)	192.168.100.34 127.0.0.1	2014-12-04 15:34	<input type="checkbox"/>
▶ debian-5-32.labo.normation.com	Debian GNU/Linux 5.0.8 (lenny)	192.168.100.12 127.0.0.1	2014-12-04 15:34	<input type="checkbox"/>
▶ node1.rudder.local	Ubuntu 12.04.4 LTS	127.0.0.1 10.0.2.15 192.168.42.11	2014-12-04 15:34	<input type="checkbox"/>
▶ sles-10-64-sp3.labo.normation.com	SUSE Linux Enterprise Server 10 (x86_64)	192.168.100.38 127.0.0.1	2014-12-04 15:34	<input type="checkbox"/>
▶ sles-11-sp1-64.labo.normation.com	SUSE Linux Enterprise Server 11 (x86_64)	192.168.100.29 127.0.0.1	2014-12-04 15:34	<input type="checkbox"/>
▶ sovma136.labo.normation.com	AIX 5.3	127.0.0.1 10.168.168.136 192.168.253.136 10.255.254.136	2014-12-04 15:34	<input type="checkbox"/>
▶ win-a18cnplov5	Microsoft Windows Server 2012 Standard	10.104.14.5	2014-12-04 15:34	<input type="checkbox"/>

Showing 1 to 8 of 8 entries

First Previous 1 Next Last

Accept into Rudder **Refuse**

Figure 5.2: Accept new nodes screen

5.2.3 Configuration Management

In the Configuration Management section, you can select the *Techniques*, configure the *Directives* and manage the *Rules*.

CATEGORIES

NEW CATEGORY

Rules

RULE

NEW RULE ☒ Display Rules from subcategories

Name	Category	Status	Compliance	Recent changes
Configure users on all nodes		In application	100%	Edit
Global configuration for all nodes		Not applied		Edit
Set the MOTD on all CentOS machines		In application	100%	Edit
test CR		Not applied		Edit

Show entries

Showing 1 to 4 of 4 entries

First Previous 1 Next Last

Figure 5.3: Configuration Policy (Rules) screen

5.2.4 Administration

The Administration section provides some general settings: you can setup the available networks for the Policy Server, view the event logs and manage your plugin collection.

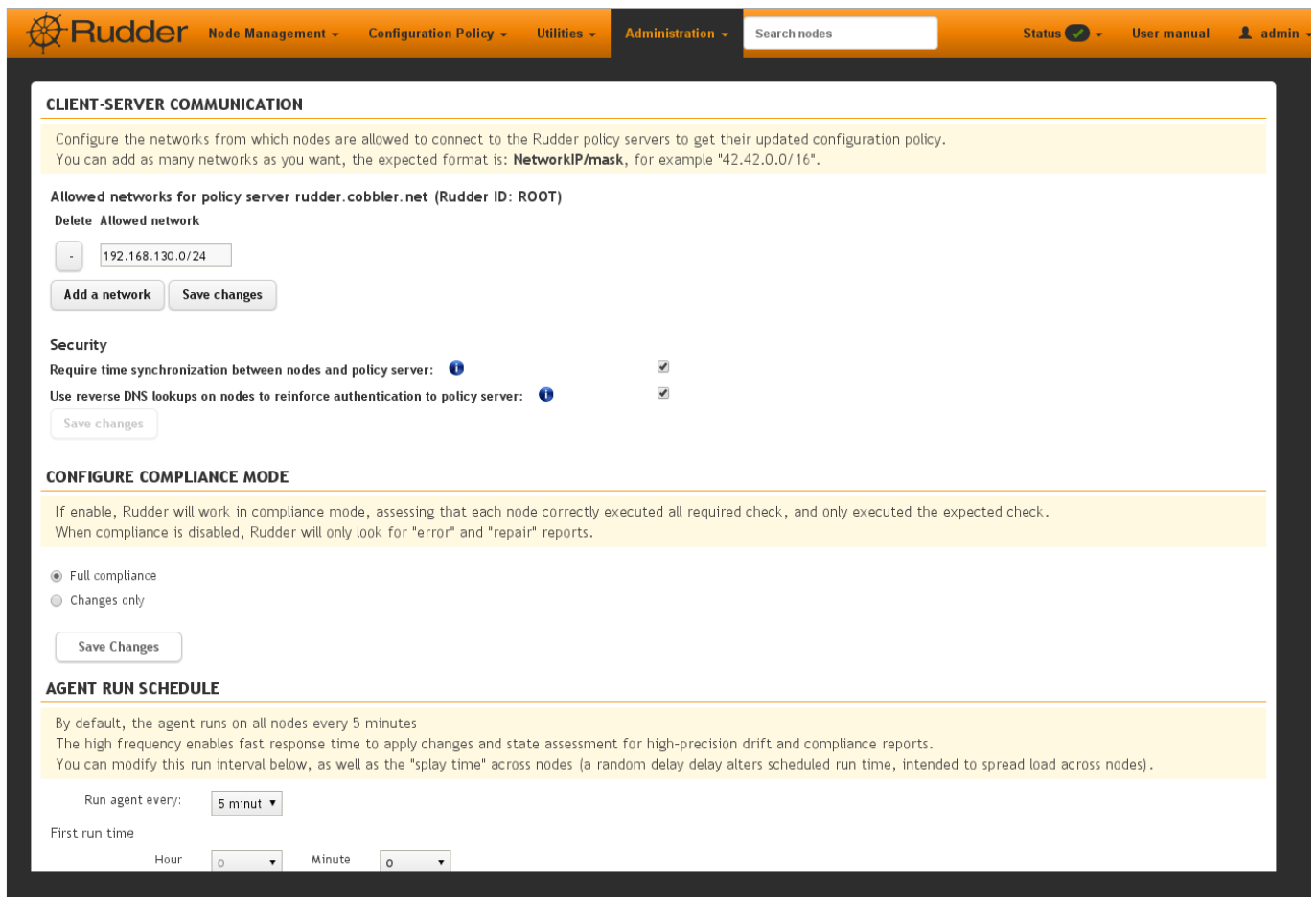


Figure 5.4: Settings screen

5.3 Units supported as search parameters

Some parameters for the advanced search tool allow using units. For example, in the search criterion for RAM size, you can type 512MB instead of a value in bytes. This paragraph describes supported units by parameter type.

5.3.1 Bytes and multiples

All criteria using a memory size (RAM, hard disk capacity, etc) is by default expected in bytes. If no other unit is specified, all values will be assumed to be in bytes.

5.3.2 Convenience notation

All memory sizes can be written using spaces or underscores (_) to make the numbers easier to read. Numbers must begin with a digit. For example, the following numbers are all valid and all worth 1234:

```
1234
1 234
1_234
1234_
```

The following number is not valid:

```
_1234
```

5.3.3 Supported units

Units used are non binary units, and a multiplication factor of 1024 is applied between each unit. Units are case-insensitive. Therefore, Mb is identical to mB or mb or MB.

In detail, the following units are supported (provided in lower case, see above):

Notation	Alternate	Value
b	o	bytes (equivalent to not specifying a unit)
kb	ko	1024 bytes
mb	mo	1024 ² bytes
gb	go	1024 ³ bytes
tb	to	1024 ⁴ bytes
pb	po	1024 ⁵ bytes
eb	eo	1024 ⁶ bytes
zb	zo	1024 ⁷ bytes
yb	yo	1024 ⁸ bytes

Table 5.1: Units supported by Rudder search engine

Chapter 6

Node Management

6.1 Node Inventory

Rudder integrates a node inventory tool which harvest useful information about the nodes. This information is used by *Rudder* to handle the nodes, and you can use the inventory information for Configuration Management purposes: search *Nodes*, create *Groups* of *Nodes*, determine some configuration management variables.

In the *Rudder* Web Interface, each time you see a *Node* name, you can click on it and display the collection of information about this *Node*. The inventory is organized as following: first tab is a *summary* of administrative information about the *Node*; other tabs are specialized for *hardware*, *network* interfaces, and *software* for every *Node*; tabs for *reports* and *logs* are added on *Rudder* managed *Nodes*.

The *Node Summary* presents administrative information like the *Node Hostname*, *Operating System*, *Rudder Client name*, *Rudder ID* and *Date* when the inventory was *last received*. When the *Node* has been validated, some more information is displayed like the *Node Name* and the *Date first accepted* in *Rudder*.

The *hardware* information is organized as following: *General*, *File systems*, *Bios*, *Controllers*, *Memory*, *Port*, *Processor*, *Slot*, *Sound*, *Storage*, *Video*.

Network connections are detailed as following: *Name* of the interface on the system, *IP address*, *Network Mask*, usage of *DHCP* or static configuration, *MAC address*, *Type* of connection, *Speed* of the connection and *Status*.

And finally, you get the list of every *software* package present on the system, including version and description.

On *Nodes* managed by *Rudder*, the *Reports* tab displays information about the status of the latest run of *Rudder Agent*, whereas the *Logs* tab displays information about changes for the *Node*.

6.2 Accept new Nodes

At the starting point, the *Rudder Server* doesn't know anything about the *Nodes*. After the installation of the *Rudder Agent*, each *Node* registers itself to the *Rudder Server*, and sends a first inventory. Every new *Node* must be manually validated in the *Rudder* Web Interface to become part of *Rudder* Managed *Nodes*. This task is performed in the **Node Management > Accept new Nodes** section of the application. You can select *Nodes* waiting for an approval, and determine whether you consider them as valid or not. Click on each *Node* name to display the extended inventory. Click on the magnifying glass icon to display the policies which will be applied after the validation.

Example 6.1 Accept the new Node `debian-node.rudder-project.org`

1. Install and configure the *Rudder Agent* on the new *Node* `debian-node.rudder-project.org`
 2. Wait a few minutes for the first run of the *Rudder Agent*.
 3. Navigate to **Node Management > Accept new Nodes**.
-

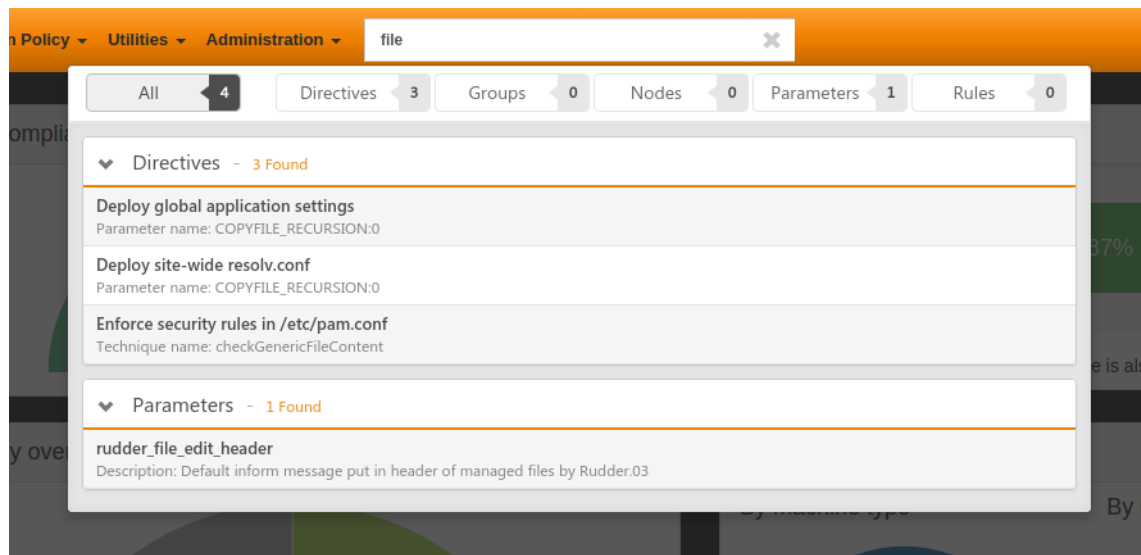
4. Select the new *Node* in the list.
5. Validate the *Node*.
6. The *Node* is now integrated in *Rudder*, you can search it using the search tools.

6.3 Search Nodes

You can navigate to **Node Management > Search Nodes** to display information about the *Nodes* which have been already validated, and are managed by *Rudder*.

6.3.1 Quick Search

You might have noticed the small text area at the top of the *Rudder* interface: it is the Quick Search bar. Its purpose is to enable a user to easily search for *Rudder* elements (*Nodes*, *Groups*, *Directives*, *Parameters*, *Rules*) based on their name, id, description, inventory...



An autocompletion list will appear as soon as *Rudder* detects an element it can identify, you just have to click on it to be redirected to the element configuration page.

More complex search queries can be input using the "in:" and "is:" keywords, "is" targets *Rudder* objects by type, and "in" targets elements like name, description...

Those keywords are used to refine a research in case a search query returns too many results.

The available search keywords are:

keyword	Description
node	<i>Nodes</i>
group	<i>Groups</i>
parameter	<i>Parameters</i>
directive	<i>Directives</i>
rule	<i>Rules</i>

Table 6.1: is: keywords

keyword	Search for
name	Names
id	IDs
description, long_description	Descriptions
enabled	Enabled elements (true or false)

Table 6.2: in: keywords (common)

keyword	Search for
hostname	Hostnames
os_type	OS types (windows, linux, aix...)
os_name	OS Names (<i>Windows</i> Server 2008, <i>Debian</i> ...)
os_version	OS versions (8, 2008 R2, ...)
os	OS Full Names (<i>Debian</i> GNU/Linux 6.0.10 (squeeze)...))
os_kernel_version	OS Kernel versions (3.16, 5.1...)
os_service_pack	OS Service Packs (for <i>Windows</i> and <i>SuSE</i> Linux)
architecture	OS Architectures (amd64, x86_64, i386)
ram	Machine memory
ips	Network IP addresses
policy_server_id	ID of a node's policy server (root...)
properties	<i>Node</i> properties (arbitrary key=values associated to a node)
rudder_roles	<i>Rudder</i> roles (rudder-reports, rudder-ldap...)

Table 6.3: in: keywords (nodes)

keyword	Search for
dynamic	Dynamic groups

Table 6.4: in: keywords (groups)

keyword	Search for
dir_param_name	<i>Directive</i> parameter names, as in the <i>Techniques</i> metadata.xml ("GENERIC_FILE_CONTENT_PATH"...)
dir_param_value	<i>Directive</i> parameter values
technique_id	<i>Technique</i> IDs
technique_name	<i>Technique</i> names ("Enforce a file content"...)
technique_version	<i>Technique</i> version

Table 6.5: in: keywords (directives)

keyword	Search for
parameter_name	<i>Parameter</i> names
parameter_value	<i>Parameter</i> values

Table 6.6: in: keywords (parameters)

keyword	Search for
directives	<i>Rules</i> containing those <i>Directive</i> IDs
groups	<i>Rules</i> containing those <i>Group</i> IDs

Table 6.7: in: keywords (rules)

Example 6.2 Example: Search for a Node called `debian-node`

Assuming you have one managed *Node* called `debian-node.rudder-project.org`, whose ID in *Rudder* is `d06b1c6c-f59b-4e5e-8049-d55f769ac33f`.

1. Type in the Quick Search field the `de` or `d0`.
 2. The search result will return this *Node*: `debian-node.rudder-project.org -- d06b1c6c-f59b-4e5e-8049-d55f769ac33f [d06b1c6c-f59b-4e5e-8049-d55f769ac33f]`.
-

Example 6.3 Example: Search for a directive called `Common users`

Assuming you have one *Directive* called `Common users`, whose ID in *Rudder* is `6e8ce05b-3f77-4fed-a424-edf0fdaa4231`.

1. Type in the Quick Search field `is:directive common`.
 2. The search result will return this *Directive*: `Common users -- 4a6aaea7-6471-4ca9-8c27-9ee9f44ed882 [6e8ce05b-3f77-4fed-a424-edf0fdaa4231]`.
-

Tip

This feature is enabled by default on new installations of *Rudder* from the following versions:

- 3.1.14
- 3.2.7
- 4.0.0

and may be enabled after an upgrade of a *Rudder* installation in the Settings tab.

6.3.2 Old-style Quick Search

The previous versions of *Rudder* (pre-3.1.14, 3.2.7 and 4.0.0) do include a simpler version of the Quick search bar: type the first letters of the Rudder *ID*, *Reference*, or *Hostname*, you want in the bar, click the result relevant to your needs in the autocompletion list and its details will open. This search tool can be very useful to help you create a new search in the Advanced Search.

6.3.3 Advanced Search

In the Advanced Search tool, you can create complex searches based on *Node Inventory* information. The benefit of the Advanced Search tool is to save the query and create a *Group* of *Nodes* based on the search criteria.

- 1. Select a field

The selection of the field upon which the criteria will apply is a two step process. The list of fields is not displayed unordered and extensively. Fields have been grouped in the same way they are displayed when you look at information about a *Node*. First you choose among these groups: *Node*, *Network Interface*, *Filesystem*, *Machine*, *RAM*, *Storage*, *BIOS*, *Controller*, *Port*, *Processor*, *Sound Card*, *Video Card*, *Software*, *Environment Variable*, *Processes*, *Virtual Machines*; then you choose among the list of fields concerning this theme.

- 2. Select the matching rule

The matching rule can be selected between following possibilities: *Is defined*, *Is not defined*, `=`, `≠` or *Regex* followed by the term you are searching for presence or absence. Depending on the field, the list of searchable terms is either a free text field, either the list of available terms.

- a. Regex matching rule

You can use regular expressions to find whatever you want in *Node* inventories. A search request using a regexp will look for every node that match the pattern you entered.

Those regexps follow Java Pattern rules. See <http://docs.oracle.com/javase/6/docs/api/java/util/regex/Pattern.html> for more details.

Example 6.4 Search node having an ip address matching `192.168.x.y`

Assuming you want to search every node using an ip address match `192.168.x.y`, where `x<10` and `y` could be everything. You will to add that line to your search request:

- Node *summary*, Ip address, Regex, `192\.168\.\d\.\d.*`
-

- b. Composite search

Some fields allow you to look for more than one piece of information at a time. That's the case for environment variable. For those fields you have to enter the first element then the separator then following elements. The name of the fields tells you about what is expected. It would look like `firstelement<sep>secondelement` assuming that `<sep>` is the separator.

Example 6.5 Search Environment Variable `LANG=C`.

Assuming you want to search every node having the environment variable `LANG` set to `C`. You will have to add that search line to your request:

- Environment variable, *key=value*, `=, LANG=C`.
-

- 3. Add another rule

You can select only one term for each matching rule. If you want to create more complex search, then you can add another rule using the `+` icon. All rules are using the same operand, either *AND* or *OR*. More complex searches mixing *AND* and *OR* operands are not available at the moment.

Example 6.6 Advanced search for Linux Nodes with `ssh`.

Assuming you want to search all Linux *Nodes* having `ssh` installed. You will create this 2 lines request:

1. Operator: *AND*.
 2. First search line: Node, *Operating System*, `=, Linux`.
 3. Second search line: *Software, Name*, `=, ssh`.
-

6.4 Group of Nodes

You can create *Group of Nodes* based on search criteria to ease attribution of *Rules* in Configuration Management. The creation of groups can be done from the *Node Management > Search Nodes* page, or directly from the *Groups* list in *Node Management > Groups*. A group can be either Dynamic or Static.

Dynamic group *Group of Nodes* based on search criteria. The search is replayed every time the group is queried. The list will always contain the nodes that match the criteria, even if the data nodes have changed since the group was created.

Static group *Group of Nodes* based on search criteria. The search is performed once and the resulting list of *Nodes* is stored. Once declared, the list of nodes will not change, except manual change.

Example 6.7 Create a dynamic group for Linux Nodes with `ssh` having an ip address in 192.18.42.x.

To create that dynamic group like described above, You first have to create a new group with group type set to `Dynamic`. Then you have to set its search request to:

1. Operator: `AND`.
2. First search line: Node, *Operating System*, =, *Linux*.
3. Second search line: *Software, Name*, =, `ssh`.
4. Third search line: Node *summary, Ip address*, `Regex`, `192\..168\.\d\.\d*`.

Finally, you have to click on Search to populate the group and click on Save to actually save it.

Chapter 7

Configuration Management

7.1 Techniques

7.1.1 Concepts

A *Technique* defines a set of operations and configurations to reach the desired behaviour. This includes the initial set-up, but also a regular check on the parameters, and automatic repairs (when possible).

All the *Techniques* are built with the possibility to change only part of a service configuration: each parameter may be either active, either set on the "Don't change" value, that will let the default values or in place. This allows for a progressive deployment of the configuration management.

Finally, the *Techniques* will generate a set of reports which are sent to the *Rudder Root Server*, which will let you analyse the percentage of compliance of your policies, and soon, detailed reports on their application.

7.1.2 Manage the Techniques

The *Techniques* shipped with *Rudder* are presented in a library that you can reorganize in **Configuration > Techniques**. The library is organized in two parts: the available *Techniques*, and the selection made by the user.

Technique Library This is an organized list of all available *Techniques*. This list can't be modified: every change made by a user will be applied to the *Active Techniques*.

Active Techniques This is an organized list of the *Techniques* selected and modified by the user. By default this list is the same as the *Technique Library*. *Techniques* can be disabled or deleted, and then activated again with a simple drag and drop. Categories can be reorganised according to the desired taxonomy. A *Technique* can appear only once in the *Active Techniques* list.

Tip

The current version of *Rudder* has only an handful of *Techniques*. We are aware that it considerably limits the use of the application, but we choose to hold back other *Techniques* that did not, from our point of view, have the sufficient quality. In the future, there will be some upgrades including more *Techniques*.



Warning

The creation of new *Techniques* is not covered by the Web interface. This is an advanced task which is currently not covered by this guide.

7.1.3 Available Techniques

7.1.3.1 Application management

Apache 2 HTTP server This Policy Template will configure the *Apache* HTTP server and ensure it is running. It will ensure the "apache2" package is installed (via the appropriate packaging tool for each OS), ensure the service is running and start it if not and ensure the service is configured to run on initial system startup. Configuration will create a rudder vhost file.

APT package manager configuration Configure the apt-get and aptitude tools on GNU/Linux *Debian* and *Ubuntu*, especially the source repositories.

OpenVPN client This Policy Template will configure the OpenVPN client service and ensure it is running. It will ensure the "openvpn" package is installed (via the appropriate packaging tool for each OS), ensure the service is running and start it if not and ensure the service is configured to run on initial system startup. Configuration will create a rudder.conf file. As of this version, only the PSK peer identification method is supported, please use the "Download File" Policy Template to distribute the secret key.

Package management for *Debian* / *Ubuntu* / APT based systems Install, update or delete packages, automatically and consistently on GNU/Linux *Debian* and *Ubuntu*.

Package management for *RHEL* / *CentOS* / RPM based systems Install, update or delete packages, automatically and consistently on GNU/Linux *CentOS* and *RHEL*.

7.1.3.2 Distributing files

Copy a file Copy a file on the machine

Distribute ssh keys Distribute ssh keys on servers

Download a file Download a file for a standard URL (HTTP/FTP), and set permissions on the downloaded file.

7.1.3.3 File state configuration

Set the permissions of files Set the permissions of files

7.1.3.4 System settings: Miscellaneous

Time settings Set up the time zone, the NTP server, and the frequency of time synchronisation to the hardware clock. Also ensures that the NTP service is installed and started.

7.1.3.5 System settings: Networking

Hosts settings Configure the contents of the hosts filed on any operating system (Linux and *Windows*).

IPv4 routing management Control IPv4 routing on any system (Linux and *Windows*), with four possible actions: add, delete (changes will be made), check presence or check absence (a warning may be returned, but no changes will be made) for a given route.

Name resolution Set up the IP address of the DNS server name, and the default search domain.

NFS Server Configure a NFS server

7.1.3.6 System settings: Process

Process Management Enforce defined parameters on system processes

7.1.3.7 System settings: Remote access

OpenSSH server Install and set up the SSH service on Linux nodes. Many parameters are available.

7.1.3.8 System settings: User management

Group management This Policy Template manages the target host(s) groups. It will ensure that the defined groups are present on the system.

Sudo utility configuration This Policy Template configures the sudo utility. It will ensure that the defined rights for given users and groups are correctly defined.

User management Control users on any system (Linux and *Windows*), including passwords, with four possible actions: add, delete (changes will be made), check presence or check absence (a warning may be returned, but no changes will be made) for a given user.

7.2 Directives

Once you have selected and organized your *Techniques*, you can create your configurations in the **Configuration Management > Directives** section.

Directive This is an instance of a *Technique*, which allows to set values for the parameters of the latter. Each *Directive* can have a unique name. A *Directive* should be completed with a short and a long description, and a collection of parameters for the variables defined by the *Technique*.

The screen is divided in three parts:

- on the left, your list of *Techniques* and *Directives*,
- on the right the description of the selected *Technique* or *Directive*.
- at the bottom, the configuration items of the selected *Directive*.

Click on the name of a *Technique* to show its description.

Click on the name of a *Directive* to see the *Directive Summary* containing the description of the *Technique* its derived from, and the configuration items of the *Directive*.

Example 7.1 Create a Directive for Name resolution

Use the *Technique Name resolution* to create a new *Directive* called `Google DNS Servers`, and shortly described as *Use Google DNS Server*. Check in the options *Set nameservers* and *Set DNS search suffix*. Set the value of the variable *DNS resolver* to `8.8.8.8` and of *Domain search suffix* according to your organization, like `rudder-project.org`.

7.3 Rules

Rule It is the application of one or more directives to a group of nodes. It is the glue between both Asset Management and Configuration Management parts of the application.

When a *Rule* is created or modified, the promises for the target nodes are generated. *Rudder* computes all the promises each nodes must have, and makes them available for the nodes. This process can take up to several minutes, depending on the number of managed nodes and the Policy Server configuration. During this time, the "Regenerate now" button is replaced by a moving bar and a message stating "Generating rules". You can also press the "Regenerate now" button on the top of the interface if you feel the generated promises should be modified (for instance, if you changed the configuration of *Rudder*)

7.4 Variables

7.4.1 User defined parameters

Rudder provides a simple way to add common and reusable variables in either plain *Directives*, or techniques created using the *Technique* editor: the parameters.

LIST OF GLOBAL PARAMETERS

Here, you can create, update or delete Global Parameters.
 Global Parameter is a name/value pair. Once defined, you can use the name in a directive parameter field and it will be replaced in the final rule by the value for that name.
 The syntax to call a parameter is `${rudder.param.name}`, where name is the chosen name for you Global Parameter.
 Be careful to exactly use (lower case) `rudder.param` and your parameter name with the same case (Global Parameter name are case sensitive).

Show entries

Name	Value	Change
rudder_file_edit_header	### Managed by Rudder, edit with care ###	<input type="button" value="Edit"/> <input type="button" value="Delete"/>

Showing 1 to 1 of 1 entries

The parameters enable the user to specify a content that can be put anywhere, using the following syntax:

- In *Directives*: `${rudder.param.name}` will expand the content of the "name" parameter.
- In the *Technique* Editor: `${rudder_parameters.name}` will do the same.

Using this, you can specify common file headers (this is the default parameter, "rudder_file_edit_header"), common DNS or domain names, backup servers, site-specific elements...

7.4.2 System variables

Rudder also provides system variables that contain information about nodes and their policy server. You can use them like user defined parameters.

The information about a *Node*:

- `${rudder.node.id}` returns the *Rudder* generated id of the *Node*
- `${rudder.node.hostname}` returns the hostname of the *Node*
- `${rudder.node.admin}` returns the administrator login of the *Node*

The information about a *Node*'s policy server.

- `${rudder.node.policyserver.id}` returns the *Rudder* generated id of the Policy Server
- `${rudder.node.policyserver.hostname}` returns the hostname of the Policy Server
- `${rudder.node.policyserver.admin}` returns the administrator login of the Policy Server

7.5 Compliance

A *Directive* contains one or multiple components. Each component generates one or multiple reports, based on the number of keys in this component. For example, for a Sudoers *Directive*, each user is a key. These states are available in reports:

Success The system is already in the desired state. No change is needed. Conformity is gained.

Repaired The system was not in the desired state. *Rudder* applied some change and repaired what was not correct. Now the system is in the desired state. Conformity is gained.

Error The system is not in the desired state. *Rudder* couldn't repair the system.

Applying When a *Directive* is applied, *Rudder* waits during 10 minutes for a report. During this period, the *Directive* is said *Applying*.

No report The system didn't send any reports. *Rudder* waited for 10 minutes and no report was received.

A *Directive* has gained conformity on a *Node* if every report for each component, for each key, is in *Success* state. This is the only condition.

Based on these facts, the compliance of a *Rule* is calculated like this:

Number of *Nodes* for which conformity is reached for every *Directive* of the *Rule* / Total number of *Nodes* on which the *Rule* has been applied

▼ Compliance by Directive

Filter

Directive

▼ Common MOTD for all CentOS machines ⓘ

Component

MOTD Configuration

Compliance

100%

100%

Show 10 entries

Showing 1 to 1 of 1 entries

First

Previous

1

Next

Last

▼ Compliance by Node

Filter

Node

▼ rudder.cobbler.net ⓘ

Directive

▼ Common MOTD for all CentOS machines ⓘ

Component

▼ MOTD Configuration

Value

None

Messages

The MOTD file was correct

Status

Success

Compliance

100%

100%

100%

Show 10 entries

Showing 1 to 1 of 1 entries

First

Previous

1

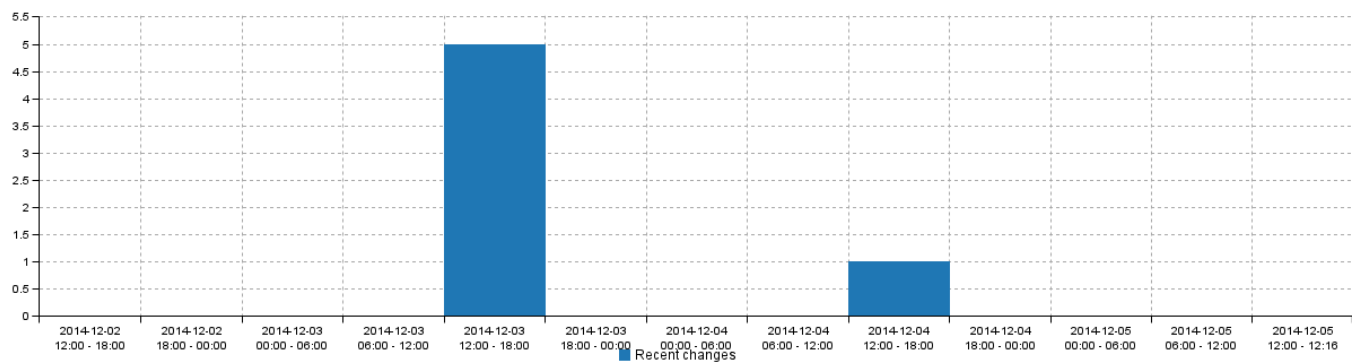
Next

Last

Figure 7.1: Compliance on a Rule

The *Rule* detailed compliance screen will also graph compliance deviations on a recent period as well as display a deviation log history for this period.

▼ Recent changes



Execution Date	Node	Directive	Component	Value	Message
2014-12-03 14:16	rudder.cobbler.net	Common MOTD for all CentOS machines	MOTD Configuration	None	The MOTD file was repaired
2014-12-03 14:20	rudder.cobbler.net	Common MOTD for all CentOS machines	MOTD Configuration	None	The MOTD file was repaired
2014-12-03 14:21	rudder.cobbler.net	Common MOTD for all CentOS machines	MOTD Configuration	None	The MOTD file was repaired
2014-12-03 14:22	rudder.cobbler.net	Common MOTD for all CentOS machines	MOTD Configuration	None	The MOTD file was repaired
2014-12-03 14:26	rudder.cobbler.net	Common MOTD for all CentOS machines	MOTD Configuration	None	The MOTD file was repaired
2014-12-04 17:26	rudder.cobbler.net	Common MOTD for all CentOS machines	MOTD Configuration	None	The MOTD file was repaired

Show 10 entries Showing 1 to 6 of 6 entries

First Previous 1 Next Last

Figure 7.2: Compliance history on a Rule

7.6 Validation workflow in Rudder

The validation workflow is a feature whose purpose is to hold any change (*Rule*, *Directive*, *Group*) made by users in the web interface, to be reviewed first by other users with the adequate privileges before actual deployment.

The goal is to improve safety and knowledge sharing in the team that is using *Rudder*.

To enable it, you only have to tick "Enable Change Requests" in the Administration - Settings tab of the web interface. (This feature is optional and can be disabled at any time without any problem, besides risking the invalidation of yet-unapproved changes)

CONFIGURE CHANGE REQUESTS (VALIDATION WORKFLOW)

If enabled, all changes to configuration (Directives, Rules, Groups and Parameters) will be submitted for validation via a Change Request. A new Change Request will enter the "Pending validation" status, then can be moved to "Pending deployment" (approved but not yet deployed) or "Deployed" (approved and deployed) statuses. Only users with the "validator" or "deployer" roles are authorized to perform these steps (see `/opt/rudder/etc/rudder-users.xml`).

If disabled, all changes to configuration will be immediately deployed.

Enable Change Requests: ☐

Allow self validation: ☐

Allow self deployment: ☒

Save changes

7.6.1 What is a Change request ?

A Change request represents a modification of a *Rule/Directive/Group* from an old state to a new one. The Change is not saved and applied by the configuration, before that, it needs to be reviewed and approved by other members of the team.

A Change request has:

- An Id (an integer > 0)
- A title.
- A description.
- A creator.
- A status.
- Its own history.

This information can be updated on the change request detail page. For now, a Change request is linked to one change at a time.

7.6.1.1 Change request status

There is 4 Change request status:

Pending validation

- The change has to be reviewed and validated.
- Can be send to: Pending deployment, Deployed, Cancelled.

Pending deployment

- The change was validated, but now require to be deployed.
- Can be send to: Deployed, Cancelled.

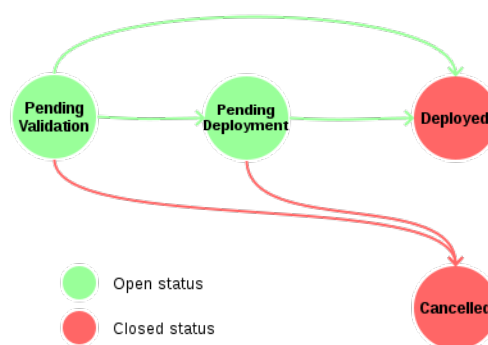
Deployed

- The change is deployed.
- This is a final state, it can't be moved anymore.

Cancelled

- The change was not approved.
- This is a final state, it can't be moved anymore.

Here is a diagram about all those states and transitions:



7.6.1.2 Change request management page

All Change requests can be seen on the `/secure/utilities/changeRequests` page. There is a table containing all requests, you can access to each of them by clicking on their id. You can filter change requests by status and only display what you need.

The screenshot shows the 'CHANGE REQUESTS' page in the Rudder interface. The top navigation bar includes 'Node Management', 'Configuration Policy', 'Utilities', and 'Administration'. A search bar for nodes is present, along with indicators for 'CR 2', 'Status' (with a green checkmark), 'User manual', and 'admin'. The main content area has a 'Status' dropdown set to 'Open' with a 'more' link. Below this is a table with columns: ID, Status, Name, Creator, and Last modification. Two entries are visible:

ID	Status	Name	Creator	Last modification
3	Pending validation	Update Rule Configure users on all nodes	admin	2014-12-03 12:02
Z	Pending deployment	Update Rule Set the MOTD on all machines	admin	2014-12-05 12:28

Below the table, it says 'Showing 1 to 2 of 2 entries (filtered from 7 total entries)'. Navigation buttons for 'First', 'Previous', '1', 'Next', and 'Last' are at the bottom right of the table area.

7.6.1.3 Change request detail page

Each Change request is reachable on the `/secure/utilities/changeRequest/id`.

The screenshot shows the detail page for 'CR #7: Update Rule Set the MOTD on all machines'. The top navigation bar is the same as the previous page. A 'Back to change request list' link is at the top left. The status 'Pending deployment' is shown in a yellow box at the top right. The main content area includes:

- Title:** * Update Rule Set the MOTD on all machines
- State:** Pending deployment
- ID:** 7
- Description:** (empty text area)
- Update** button

On the left, there is a 'Changes' sidebar with a tree view showing 'Directives', 'Rules' (selected), 'Set the MOTD on all CentOS machines', 'Groups', and 'Global Parameters'. The main area below the form shows a 'Change history' table with a 'Diff' tab selected:

Action	Actor	Date	Reason
Status changed from Pending validation to Pending deployment	admin	2014-12-05 12:28	
Change request created	admin	2014-12-05 12:28	
Modify rule <u>Set the MOTD on all machines</u>	admin	2014-12-05 12:28	

Below the table, it says 'Showing 1 to 3 of 3 entries'. Navigation buttons for 'First', 'Previous', '1', 'Next', and 'Last' are at the bottom right. At the bottom left is a 'Decline' button, and at the bottom right is a 'Deploy' button.

The page is divided into two sections:

Change request information display common information (title, description, status, id) and a form to edit them.

CR #3: Update Rule Configure users on all nodes

State changed from Pending validation to Pending deployment on 2014-12-05 12:32 by admin

Title: *	Update Rule Configure users on all nodes
State:	Pending deployment
ID:	3
Description:	<div></div>

Update

Change request content In this section, there is two tabs:

- History about that change request

Change history

Diff

Show 10 entries

Filter

Action	Actor	Date	Reason
Status changed from Pending validation to Pending deployment	admin	2014-12-05 12:32	It looks good to me, pending deployment. - MCE
Change request created	admin	2014-12-03 12:02	
Modify rule Configure users on all nodes	admin	2014-12-03 12:02	

Showing 1 to 3 of 3 entries

FirstPrevious1NextLast

- Display the change proposed


Change history	Diff
Rule overview: <ul style="list-style-type: none"> Rule: Configure users on all nodes (Rudder ID: D1A35D75-5F28-483B-8D3A-73D031CF5228) Name: Configure users on all nodes Category: Short description: Target: Include <ul style="list-style-type: none"> all Nodes from: <ul style="list-style-type: none"> - All nodes (System) + Group CentOS machines (Inc. PolServ) (Rudder ID: B5B60DB3-1828-494D-8C13-CD117F51614B) Exclude <ul style="list-style-type: none"> + All nodes (System) Directives: <ul style="list-style-type: none"> Directive Touch /tmp/beacon (Rudder ID: 181D8271-5B38-4285-9880-7F6396E7894F) Enabled: true System: Long description: 	

7.6.2 How to create a Change request ?


If they are enabled in *Rudder*, every change in *Rudder* will make you create a Change request. You will have a popup to enter the name of your change request and a change message.

The change message will be used as description for you Change Request, so we advise to fill it anyway to keep an explanation about your change.

Delete a Directive


Are you sure that you want to delete this Directive?


Deleting this Directive will also remove it from the following Rules.



Name	Category	Status	Compliance
Base configuration on all system		In application	0%

Show entries
Showing 1 to 1 of 1 entries

First
Previous
1
Next
Last


Workflows are enabled in Rudder, your change has to be validated in a Change request

Change request title: *

Please enter a message explaining the reason for this change.

Message: *












This Directive contains a misconfiguration that breaks the compliance. (NTP server contains spaces)

Cancel

Submit for Validation

Change request are not available for *Rule/Directive/Groups* creation, they are only active if the *Rule/Directive/Groups* existed before:

Here is a small table about all possibilities:

Action \ Object	Creation	Deletion	Update	Disable/ Enable
Rule				
Directive				
Group				N/A

7.6.3 How to validate a Change request ?

7.6.3.1 Roles

Not every user can validate or deploy change in *Rudder*. Only those with one of the following roles can act on Change request:

Validator Can validate Change request

Deployer To deploy Change Request

Both of those roles:

- Give you access to pending Change requests
- Allow you to perform actions on them (validate or cancel)

You have to change users in `/opt/rudder/etc/rudder-users.xml` and include those rights. Without one of those roles, you can only access Change Request in *Deployed* or *Cancelled* and those you opened before.

You can deploy directly if you have both the validator and deployer roles. The **administrator** Role gives you both the deployer and validator role.

There is also the possibility to access Change requests in Read only mode by using the role *validator_read* or *deployer_read*.



Validate CR #8: Delete Rule Set the MOTD on all CentOS machines

You have to chose a next status for the change request before you confirm

Next state:

Please enter a message explaining the reason for this change.

Message:

7.6.3.2 Self Validations

Using Change requests means that you want your team to share knowledge, and validate each other change. So by default:

- **Self validation** is disabled.
- **Self deployment** is enabled.

Those two behaviours can be changed in the property file `/opt/rudder/etc/rudder-web.properties`. `rudder.workflow.self.validation` and `rudder.workflow.self.deployment` are the properties that define this behaviour.

7.6.4 Change request and conflicts

When the initial state of a Change request has changed (i.e.: you want to modify a *Directive*, but someone else changes about that *Directive* has been accepted before yours), your change can't be validated anymore.

CR #7: Update Rule Set the MOTD on all machines

State changed from Pending validation to Pending deployment on 2014-12-05 12:28 by admin

Title: *

State: Pending deployment

ID: 7

Description:



This change request can not be accepted because configuration state was modified since change request creation. Only "decline" action is available.

Changes

- Directives
- Rules
 - Set the MOTD on all CentOS machines
- Groups
- Global Parameters

Change history

Diff

Show entries

Action	Actor	Date	Reason
Status changed from Pending validation to Pending deployment	admin	2014-12-05 12:28	
Change request created	admin	2014-12-05 12:28	
Modify rule Set the MOTD on all machines	admin	2014-12-05 12:28	

Showing 1 to 3 of 3 entries

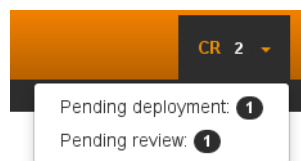
For now, we decided to reduce to the possibility of an error or inconsistency when there are concurrent changes. In a future version of *Rudder*, there will be a system to handle those conflicts, and make sure actual changes are not overwritten.

7.6.5 Notifications:

In several parts of *Rudder* webapp there are some Notifications about Change requests.

7.6.5.1 Pending change requests

This notification is displayed only if the validator/deployer role is active on your user account. It shows you how many Change requests are waiting to be reviewed/deployed. Clicking on it will lead you to the Change request management page, with a filter already applied.



7.6.5.2 Change already proposed on Rule/Directive/Group

When there is a change about the *Rule/Directive/Group* already proposed but not deployed/cancelled, you will be notified that there are some pending Change requests about that element. You will be provided a Link to those change request, So you can check if the change is already proposed.

Compliance detail
Edit parameters

The following pending change requests affect this Rule, you should check that your modification is not already pending:

- CR #7: Update Rule Set the MOTD on all machines
- CR #8: Delete Rule Set the MOTD on all CentOS machines

Note: the Rule will be applied only if its status is Enabled and its Directive, Technique and target node group are all Enabled.

7.7 Technique editor

7.7.1 Introduction

7.7.1.1 First, what is a Technique ?

A technique is a description in code form of what the agent has to do on the node. This code is actually composed of a series of Generic method calls. These different Generic method calls are conditional.

7.7.1.2 What is a Generic method?

A generic method is a description of an elementary state independent of the operating system (ex: a package is installed, a file contains such line, etc...). Generic methods are independent of the operating system (It has to work on any operating system). Generic methods calls are conditioned by class expressions, which are boolean expression combining basic conditions with classic boolean operators (ex : operating system is *Debian*, such generic method produced a modification, did not produce any modification, produced an error, etc...)

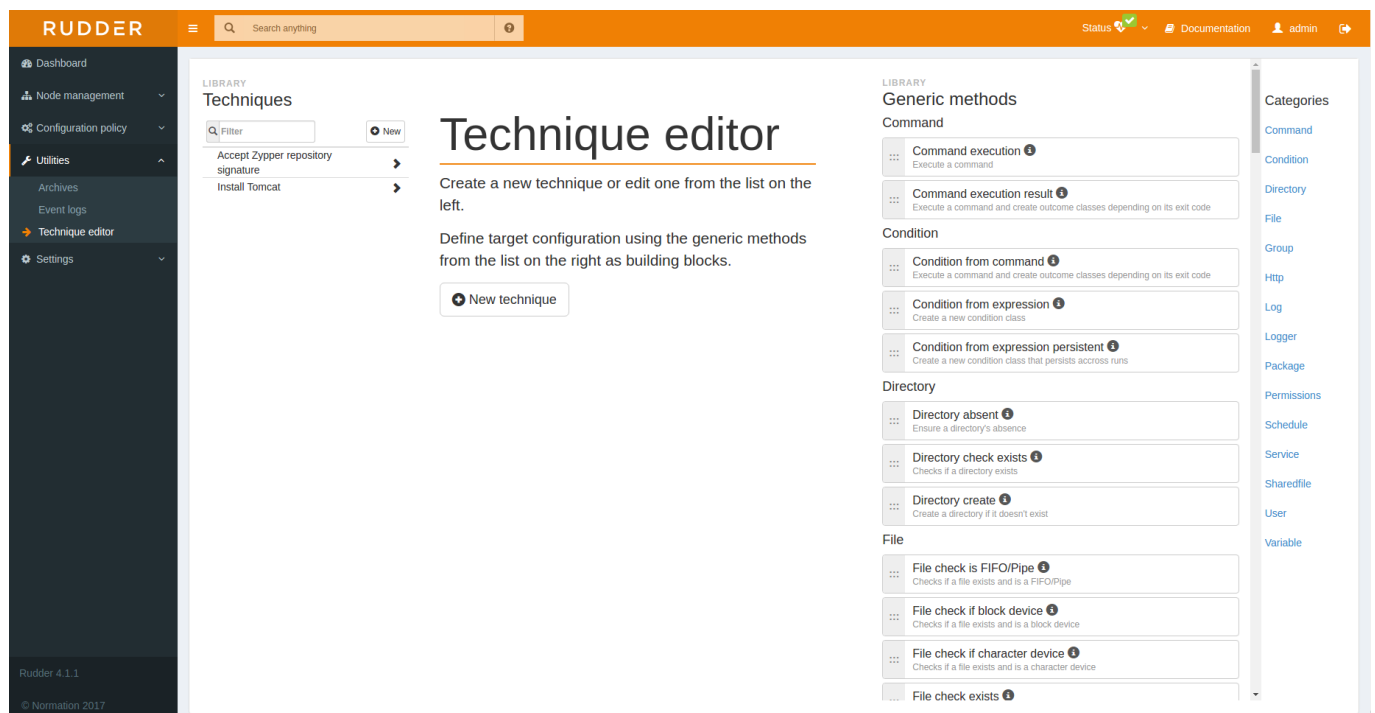
7.7.2 Technique Editor

7.7.2.1 Utility

Rudder provides a set of pre-defined *Techniques* that cover some basic configuration and system administration needs. Of course, this set of techniques cannot respond to all of the specific needs of each client. That's why *Rudder* integrates the **Technique editor**, a tool to create advanced *Techniques*. Directly accessible from Rudder menu (*Utilities* > *Technique editor*), this tool has an easy-to-use interface, which doesn't require any programming skills but nevertheless allows to create complex *Techniques*.

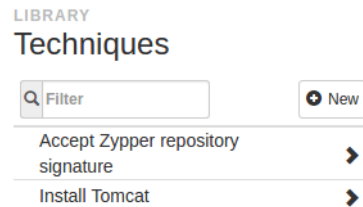
7.7.2.2 Interface

Here is an overview of its interface :



The interface is divided into 3 columns:

- A column listing custom *Techniques*



Here, we can see our previously created *Techniques*. We can click on them to see their details/edit them, or create a new one by clicking on the “New” button. These *Techniques* are visible in the **ncf techniques** category in the *Directives tree*, so can be used to create new *Directives*.

- A column with the *Technique* content

When we create a new *Technique*, or when we edit an existing one, the configuration form appears at the center of the interface, instead of the title and the description of the tool.

TECHNIQUE

Configure NTP

Clone Delete

▼ General information

Name:

Description:

Bundle name:

Version: 1.0

Package install ⓘ

Install or update a package in its latest version available

ntp

File from template ⓘ

Build a file from a legacy CFEngine template

/etc/ntp.conf

Service restart ⓘ

Restart a service using the appropriate method

ntp

Service ensure running ⓘ

Ensure that a service is running using the appropriate method

ntp

Then we can see the name, the description, the Bundle name, the version and the Generic methods list of the current *Technique*. Only the name and the description are editable, the Bundle name and the version are automatically defined during the *Technique* creation.

- A column listing Generic methods / displaying generic method details

To the right of the interface is the list of Generic methods available for *Technique* configuration. This list is made up of about a hundred Generic methods, grouped according to their category to make them easier to use. (An exhaustive list of them available at any time in the online product documentation can be found on the following link: http://www.rudder-project.org/doc/_generic_methods.html)

The screenshot shows a web interface for the 'Generic methods' library. On the left, under the heading 'LIBRARY Generic methods', there are four categories: 'Command', 'Condition', 'Directory', and 'File'. Each category contains a list of methods with their names and brief descriptions. For example, under 'Command', there are 'Command execution' and 'Command execution result'. Under 'Condition', there are 'Condition from command', 'Condition from expression', and 'Condition from expression persistent'. Under 'Directory', there are 'Directory absent', 'Directory check exists', and 'Directory create'. Under 'File', there are 'File check is FIFO/Pipe', 'File check if block device', 'File check if character device', and 'File check exists'. On the right side, there is a vertical sidebar titled 'Categories' with a list of categories: Command, Condition, Directory, File, Group, Http, Log, Logger, Package, Permissions, Schedule, Service, Sharedfile, User, and Variable. The 'Command' category is currently selected, highlighted in blue.

LIBRARY
Generic methods

Command

- ... **Command execution** ⓘ
Execute a command
- ... **Command execution result** ⓘ
Execute a command and create outcome classes depending on its exit code

Condition

- ... **Condition from command** ⓘ
Execute a command and create outcome classes depending on its exit code
- ... **Condition from expression** ⓘ
Create a new condition class
- ... **Condition from expression persistent** ⓘ
Create a new condition class that persists accross runs

Directory

- ... **Directory absent** ⓘ
Ensure a directory's absence
- ... **Directory check exists** ⓘ
Checks if a directory exists
- ... **Directory create** ⓘ
Create a directory if it doesn't exist

File

- ... **File check is FIFO/Pipe** ⓘ
Checks if a file exists and is a FIFO/Pipe
- ... **File check if block device** ⓘ
Checks if a file exists and is a block device
- ... **File check if character device** ⓘ
Checks if a file exists and is a character device
- ... **File check exists** ⓘ

Categories

- Command
- Condition
- Directory
- File
- Group
- Http
- Log
- Logger
- Package
- Permissions
- Schedule
- Service
- Sharedfile
- User
- Variable

You just need to click on a Generic method or drag'n drop it in the area provided for such purpose to add it to the current *Technique*. Once it's done, you can configure it by clicking on it. Then a new display containing the method details appears instead of the Generic methods list:

TECHNIQUE

Configure NTP

Clone Delete

General information

Name: Configure NTP

Description: Install, configure and ensure the ntpd is running. Uses a template file for configuration.

Bundle name: Configure_NTP

Version: 1.0

Package install

Install or update a package in its latest version available

ntp

File from template

Build a file from a legacy CFEngine template

/etc/ntp.conf

Service restart

Restart a service using the appropriate method

ntp

Service ensure running

Ensure that a service is running using the appropriate method

ntp

METHOD

Package install

Reset

Conditions

Operating system:

Type: Any

Other CFEngine classes:

CFEngine class context:

any

Parameters

package_name:

Name of the package to install

ntp

Add methods

Reset Save

Result classes defined by this method

Success: package_install_ntp_kept

Repaired: package_install_ntp_repaired

Error: package_install_ntp_error

The Generic method details are divided into 3 blocks :

1. Conditions

- Conditions allow user to restrict the execution of the method.

2. Parameters

- *Parameters* are in mono or multi line text format. They can contains variables which will be extended at the time of the execution.

3. Result classes

- One result class of three will be defined following the execution of a generic method:
 - Success, when the configuration is correct and no action are needed
 - Repaired, when the configuration is wrong and actions to fix it were executed with success
 - Error, when the configuration is wrong but actions to fix it failed

Theses classes can be used in another Generic methods conditions. ie, you can execute a command if a previous one failed or was repaired.

7.7.3 Create your first Technique

Now we are going to see how to create a simple technique to configure a ntp server, step by step.

7.7.3.1 1. General information

Let's start from the beginning. Click on the "New Technique" button and start filling in the General information fields (only name is required).

In our case:

- **Name:** *Configure NTP*
- **Description:** *Install, configure and ensure the ntpd is running. Uses a template file to configuration.*

7.7.3.2 2. Add and configure generic methods

Now, we have to find and add the generic methods which correspond to the actions we want to execute. In our case, we want to add the following methods:

- Package install (You can find it in the **Package category**)
 - This method only take one parameter, the name of the package to install. So here, fill in the **package_name** field with the value *ntp*.
- File from template (You can find it in the **File category**)
 - This method take two parameters. The first one corresponds to the absolute path of the source file containing a template to be expanded. We are going to use a *Rudder* variable here to get the correct path. Fill in the **source_template** field with the value *\${path_technique}/templates/ntp.conf*.
 - The second corresponds to the absolute path of the destination file. Fill in with the value */etc/ntp.conf*.
- Service restart (You can find it in the **Service category**)
 - This method only take one parameter, the name of the service we want to restart. So here, fill in the **service_name** field with the value *ntp*.
 - Also, we want to restart the service only if it has just been installed, so only if the result classes defined following the execution of **Package install** method is **Repaired** (*package_install_ntp_repaired*). So here, fill in the **Other CFEngine classes** field in the Conditions panel with the value *package_install_ntp_repaired*.
- Service ensure running (You can find it in the **Service category**)
 - This method only take one parameter, the name of the service we want to check. Again, here, fill in the **service_name** field with the value *ntp*.

7.7.3.3 3. Save and apply your technique

And... It's already done. Rather fast, right? Don't forget to save. Now you can see it in the **Directives tree**, and use it to create a *Directive* that will be applied on your Nodes thanks to a Rule.

Chapter 8

Manage your IT

8.1 How to

8.1.1 Enforce a line is present in a file only once

Enforcing that a line to be present in a single occurrence in a file is not an easy process to automate. Providing templates is an easy way to achieve this but not always possible.

If you don't want to use a template, you can use *Technique* **Enforce a File content** to control the content of a file.

The whole logic to edit a file so it contain only one occurrence of a line is:

- Add the line, so it will be added if missing)
- Replace line that looks almost like our line by the line
- Delete all duplicated lines

With these 3 steps, You will end with one line!

So, here is a small example: let's say you want `/etc/sysconfig/sysctl` to contain line `ENABLE_SYSRQ="yes"`

You will need to create a *Directive* based on Enforce a File content with the following content:

Path or file name:	<input type="text" value="/etc/sysconfig/sysctl"/>
Enforce the content of the file: ?	<input type="checkbox"/>
Enable the deletion of lines using a regexp:	<input checked="" type="checkbox"/>
Enable the creation of the file if it doesn't exist:	<input checked="" type="checkbox"/>
Enforce the content of the file only at creation: ?	<input type="checkbox"/>
Enable the replacement of lines using a regexp:	<input checked="" type="checkbox"/>
Limit file modification to a zone of the file: ?	<input type="checkbox"/>

▼ Section: File content

ENABLE_SYSRQ="yes"

Content of the file (optional): ?

▼ Section: Line deletion regular expressions

Regular expression: ?

▼ Section: Line replacement regular expressions

Regular expression: ?

String used as a replacement (optional):

8.2 Security considerations

8.2.1 Data confidentiality

Rudder is designed to strictly separate policies between nodes, and to only let a node access its own policies. This section will give details about how the policies are secured, and which content is node-specific or global.

8.2.1.1 Private data

All confidential information should be stored in private data, namely:

- the directives, groups, rules, and their parameters
- the techniques parameters in the *Technique* Editor
- the shared-files directory

There are:

- always transferred encrypted between nodes (using agent copy protocol or https for the interface and the API)
- only available to the nodes that need it
- only accessible locally by the users that need it

More precisely:

- root server:
 - all the data is present on it
 - files are readable and writable only by the root user and (for some of them) the rudder group
 - some data is also accessible from our backends (PostgreSQL, OpenLDAP), but only locally (the services are listening on loopback) and from *Rudder*-specific users, which passwords are only accessible to the root user
 - accessible remotely by the Web interface (needs an authorized user account) or the API (needs a token)
- relay: only the data needed for the served nodes and the relay itself are available and stored locally, only accessible to the root user
- node: only the data needed to configure the node is available and stored locally, only accessible to the root user

8.2.1.2 Common data

This refers to content available from all nodes in the authorized networks, readable from all users on the nodes, and that can be transferred without encryption.

These unprotected contents are:

- the tools (`/var/rudder/tools`)
 - the common ncf part (`/var/rudder/ncf/common`), which includes all the content distributed in the `ncf` package
 - the *Rudder* techniques sources (without parameters), which includes all the content distributed in the `rudder-techniques` package
-

Chapter 9

Administration

This chapter covers basic administration task of *Rudder* services like configuring some parameters of the *Rudder* policy server, reading the services log, and starting, stopping or restarting *Rudder* services.

9.1 Archives

9.1.1 Archive usecases

The archive feature of *Rudder* allows to:

- Exchange configuration between multiple *Rudder* instances, in particular when having distinct environments;
- Keep an history of major changes.

9.1.1.1 Changes testing

Export the current configuration of *Rudder* before you begin to make any change you have to test: if anything goes wrong, you can return to this archived state.

9.1.1.2 Changes qualification

Assuming you have multiple *Rudder* instances, each on dedicated for the development, qualification and production environment. You can prepare the changes on the development instance, export an archive, deploy this archive on the qualification environment, then on the production environment.



Versions of the Rudder servers

If you want to export and import configurations between environments, the version of the source and target *Rudder* server must be exactly the same. If the versions don't match (even if only the minor versions are different), there is a risk that the import will break the configuration on the target *Rudder* server.

9.1.2 Concepts

In the *Administration > Archives* section of the *Rudder Server* web interface, you can export and import the configuration of *Rudder Groups*, *Directives* and *Rules*. You can either archive the complete configuration, or only the subset dedicated to *Groups*, *Directives* or *Rules*.

When archiving configuration, a *git tag* is created into `/var/rudder/configuration-repository`. This tag is then referenced in the *Rudder* web interface, and available for download as a zip file. Please note that each change in the *Rudder* web interface is also committed in the repository.

The content of this repository can be imported into any *Rudder* server (with the same version).

9.1.3 Archiving

To archive *Rudder Rules*, *Groups*, *Directives*, or make a global archive, you need to go to the *Administration > Archives* section of the *Rudder Server* web interface.

To perform a global archive, the steps are:

1. Click on *Archive everything* - it will update the drop down list *Choose an archive* with the latest data
2. In the drop down list *Choose an archive*, select the newly created archive (archives are sorted by date), for example 2015-01-08 16:39
3. Click on *Download as zip* to download an archive that will contains all elements.

9.1.4 Importing configuration

On the target server, importing the configuration will "merge" them with the existing configuration: every groups, rules, directives or techniques with the same identifier will be replaced by the import, and all others will remain untouched.

To import the archive on the target *Rudder* server, you can follow the following steps:

1. Uncompress the zip archive in `/var/rudder/configuration-repository`
2. If necessary, correct all files permissions: `chown -R root:rudder directives groups parameters ruleCategories rules techniques` and `chown -R ncf-api-venv:rudder ncf/50_techniques techniques/ncf_techniques`
3. Add all files in the git repository: `git add . && git commit -am "Importing configuration"`
4. Finally, in the Web interface, go to the *Administration > Archives* section, and select *Latest Git commit* in the drop down list in the Global archive section, and click on *Restore everything* to restore the configuration.

Tip

You can also perform the synchronisation from on environment to another by using git, through a unique git repository referenced on both environment.

For instance, using one unique git repository you can follow this workflow:

1. On *Rudder* test:
 - a. Use *Rudder* web interface to prepare your policy;
 - b. Create an archive;
 - c. `git push` to the central repository;
 2. On *Rudder* production:
 - a. `git pull` from the central repository;
 - b. Use *Rudder* web interface to import the qualified archive.
-

9.1.5 Deploy a preconfigured instance

You can use the procedures of Archiving and Restoring configuration to deploy preconfigured instance. You would prepare first in your labs the configuration for *Groups*, *Directives* and *Rules*, create an Archive, and import the Archive on the new *Rudder* server installation

9.2 Event Logs

Every action happening in the *Rudder* web interface are logged in the PostgreSQL database. The last 1000 event log entries are displayed in the **Administration > View Event Logs** section of *Rudder* web application. Each log item is described by its *ID*, *Date*, *Actor*, and *Event Type*, *Category* and *Description*. For the most complex events, like changes in nodes, groups, techniques, directives, deployments, more details can be displayed by clicking on the event log line.

Event Categories

- User Authentication
- Application
- *Configuration Rules*
- Policy
- *Technique*
- Policy Deployment
- *Node Group*
- *Nodes*
- *Rudder Agents*
- *Policy Node*
- Archives

9.3 Policy Server

The **Administration > Policy Server Management** section sum-up information about *Rudder* policy server and its parameters.

9.3.1 Configure allowed networks

Here you can configure the networks from which nodes are allowed to connect to *Rudder* policy server to get their updated rules.

You can add as many networks as you want, the expected format is: `networkip/mask`, for example `42.42.0.0/16`.

9.3.2 Clear caches

Clear cached data, like node configuration. That will trigger a full redeployment, with regeneration of all promises files.

9.3.3 Reload dynamic groups

Reload dynamic groups, so that new nodes and their inventories are taken into account. Normally, dynamic group are automatically reloaded unless that feature is explicitly disable in *Rudder* configuration file.

9.4 Plugins

Rudder is an extensible software. The **Administration > Plugin Management** section sum-up information about loaded plugins, their version and their configuration.

A plugin is a JAR archive. The web application must be restarted after installation of a plugin.

9.4.1 Install a plugin

To install a plugin, copy the JAR file and the configuration file in the according directories.

/opt/rudder/share/rudder-plugins/ This directory contains the JAR files of the plugins.

/opt/rudder/etc/plugins/ This directory contains the configuration files of the plugins.

Then, register the plugin, using its name without the ".jar" extension and restart *Rudder*:

```
# register plugin
/opt/rudder/bin/rudder-plugin register plugin-name-without-jar-extension
# restart Rudder
/etc/init.d/rudder-jetty restart
```

9.5 Basic administration of Rudder services

9.5.1 Restart the agent of the node

To restart the *Rudder* Agent, use following command on a node:

```
service rudder-agent restart
```

Tip

This command can take more than one minute to restart the *CFEngine* daemon. This is not a bug, but an internal protection system of *CFEngine*.

9.5.2 Restart the root rudder service

9.5.2.1 Restart everything

You can restart all components of the *Rudder Root Server* at once:

```
service rudder restart
```

9.5.2.2 Restart only one component

Here is the list of the components of the root server with a brief description of their role, and the command to restart them:

***CFEngine* server** Distribute the *CFEngine* configuration to the nodes.

```
service rudder-agent restart
```

Web server application Execute the web interface and the server that handles the new inventories.

```
service rudder-jetty restart
```

Web server front-end Handle the connection to the Web interface, the received inventories and the sharing of the UUID *Rudder Root Server*.

```
service apache2 restart
```

LDAP server Store the inventories and the *Node* configurations.

```
service rudder-slapped restart
```

SQL server Store the received reports from the nodes.

```
service postgresql* restart
```

9.6 Password upgrade

This version of *Rudder* uses a central file to manage the passwords that will be used by the application: `/opt/rudder/etc/rudder-passwords.conf`

When first installing *Rudder*, this file is initialized with default values, and when you run `rudder-init`, it will be updated with randomly generated passwords.

On the majority of cases, this is fine, however you might want to adjust the passwords manually. This is possible, just be cautious when editing the file, as if you corrupt it *Rudder* will not be able to operate correctly anymore and will spit numerous errors in the program logs.

As of now, this file follows a simple syntax: `ELEMENT:password`

You are able to configure three passwords in it: The OpenLDAP one, the PostgreSQL one and the authenticated WebDAV one.

If you edit this file, *Rudder* will take care of applying the new passwords everywhere it is needed, however it will restart the application automatically when finished, so take care of notifying users of potential downtime before editing passwords.

Here is a sample command to regenerate the WebDAV password with a random password, that is portable on all supported systems. Just change the "RUDDER_WEBDAV_PASSWORD" to any password file statement corresponding to the password you want to change.

```
sed -i s/RUDDER_WEBDAV_PASSWORD.*/RUDDER_WEBDAV_PASSWORD:$(dd if=/dev/urandom count=128 bs ←  
=1 2>&1 | md5sum | cut -b-12)/ /opt/rudder/etc/rudder-passwords.conf
```

9.7 User management

Change the users authorized to connect to the application. You can define authorization level for each user

9.7.1 Configuration of the users using a XML file

9.7.1.1 Generality

The credentials of a user are defined in the XML file `/opt/rudder/etc/rudder-users.xml`. This file expects the following format:

```
<authentication hash="sha512">
  <user name="alice" password="xxxxxxx" role="administrator"/>
  <user name="bob" password="xxxxxxx" role="administration_only, node_read"/>
  <user name="custom" password="xxxxxxx" role="node_read,node_write,configuration_read, ↵
    rule_read,rule_edit,directive_read,technique_read"/>
</authentication>
```

The name and password attributes are mandatory (non empty) for the user tags. The role attribute can be omitted but the user will have no permission, and only valid attributes are recognized.

Every modification of this file should be followed by a restart of the *Rudder* web application to be taken into account:

```
service rudder-jetty restart
```

9.7.1.2 Passwords

The authentication tag should have a "hash" attribute, making "password" attributes on every user expect hashed passwords. Not specifying a hash attribute will fallback to plain text passwords, but it is strongly advised not to do so for security reasons.

The algorithm to be used to create the hash (and verify it during authentication) depend on the value of the hash attribute. The possible values, the corresponding algorithm and the Linux shell command need to obtain the hash of the "secret" password for this algorithm are listed here:

Value	Algorithm	Linux command to hash the password
"md5"	MD5	<code>read mypass; echo -n \$mypass md5sum</code>
"sha" or "sha1"	SHA1	<code>read mypass; echo -n \$mypass shasum</code>
"sha256" or "sha-256"	SHA256	<code>read mypass; echo -n \$mypass sha256sum</code>
"sha512" or "sha-512"	SHA512	<code>read mypass; echo -n \$mypass sha512sum</code>

Table 9.1: Hashed passwords algorithms list

When using the suggested commands to hash a password, you must enter the command, then type your password, and hit return. The hash will then be displayed in your terminal. This avoids storing the password in your shell history.

Here is an example of authentication file with hashed password:

```
<authentication hash="sha256">

  <!-- In this example, the hashed password is: "secret", hashed as a sha256 value -->
  <user name="carol" password="2 ↵
    bb80d537b1da3e38bd30361aa855686bde0eacd7162fef6a25fe97bf527a25b" role="administrator ↵
    "/>

</authentication>
```

9.7.2 Configuring an LDAP authentication provider for Rudder

If you are operating on a corporate network or want to have your users in a centralized database, you can enable *LDAP* authentication for *Rudder* users.

9.7.2.1 LDAP is only for authentication

Take care of the following limitation of the current process: only **authentication** is delegated to *LDAP*, NOT **authorizations**. So you still have to declare user's authorizations in the *Rudder* user file (*rudder-users.xml*).

A user whose authentication is accepted by *LDAP* but not declared in the *rudder-users.xml* file is considered to have no rights at all (and so will only see a reduced version of *Rudder* homepage, with no action nor tabs available).

The credentials of a user are defined in the XML file `/opt/rudder/etc/rudder-users.xml`. It expects the same format as regular file-based user login, but in this case "name" will be the login used to connect to *LDAP* and the *password* field will be ignored and should be set to "*LDAP*" to make it clear that this *Rudder* installation uses *LDAP* to log users in.

Every modification of this file should be followed by a restart of the *Rudder* web application to be taken into account:

```
service rudder-jetty restart
```

9.7.2.2 Enable LDAP authentication

LDAP authentication is enabled by setting the property `rudder.auth.ldap.enable` to `true` in file `/opt/rudder/etc/rudder-web.properties`

The *LDAP* authentication process is a bind/search/rebind in which an application connection (bind) is used to search (search) for a user entry given some base and filter parameters, and then, a bind (rebind) is tried on that entry with the credential provided by the user.

So next, you have to set-up the connection parameters to the *LDAP* directory to use. There are five properties to change:

- `rudder.auth.ldap.connection.url`
- `rudder.auth.ldap.connection.bind.dn`
- `rudder.auth.ldap.connection.bind.password`
- `rudder.auth.ldap.searchbase`
- `rudder.auth.ldap.filter`

The search base and filter are used to find the user. The search base may be left empty, and

Here are some usage examples,

on standard *LDAP*:

```
rudder.auth.ldap.searchbase=ou=People
rudder.auth.ldap.filter=(&(uid={0}))(objectclass=person))
```

on *Active Directory*:

```
rudder.auth.ldap.searchbase=
rudder.auth.ldap.filter=(&(sAMAccountName={0}))(objectclass=user))
```

9.7.3 Authorization management

For every user you can define an access level, allowing it to access different pages or to perform different actions depending on its level.

You can also build custom roles with whatever permission you want, using a type and a level as specified below.

In the xml file, the role attribute is a list of permissions/roles, separated by a comma. Each one adds permissions to the user. If one is wrong, or not correctly spelled, the user is set to the lowest rights (NoRights), having access only to the dashboard and nothing else.

9.7.3.1 Pre-defined roles

Name	Access level
administrator	All authorizations granted, can access and modify everything
administration_only	Only access to administration part of rudder, can do everything within it.
user	Can access and modify everything but the administration part
configuration	Can only access and act on configuration section
read_only	Can access to every read only part, can perform no action
inventory	Access to information about nodes, can see their inventory, but can't act on them
rule_only	Access to information about rules, but can't modify them

For each user you can define more than one role, each role adding its authorization to the user.

Example: "rule_only,administration_only" will only give access to the "Administration" tab as well as the *Rules*.

9.7.3.2 Custom roles

You can set a custom set of permissions instead of a pre-defined role.

A permission is composed of a type and a level:

- Type: Indicates what kind of data will be displayed and/or can be set/updated by the user
 - "configuration", "rule", "directive", "technique", "node", "group", "administration", "deployment".
- Level: Access level to be granted on the related type
 - "read", "write", "edit", "all" (Can read, write, and edit)

Depending on that value(s) you give, the user will have access to different pages and action in *Rudder*.

Usage example:

- configuration_read → Will give read access to the configuration (*Rule* management, *Directives* and *Parameters*)
- rule_write, node_read → Will give read and write access to the *Rules* and read access to the *Nodes*

9.7.4 Going further

Rudder aims at integrating with your IT system transparently, so it can't force its own authentication system.

To meet this need, *Rudder* relies on the modular authentication system Spring Security that allows to easily integrate with databases or an enterprise SSO like CAS, OpenID or SPNEGO. The documentation for this integration is not yet available, but don't hesitate to reach us on this topic.

9.8 Monitoring

This section will give recommendations for:

- Monitoring *Rudder* itself (besides standard monitoring)
- Monitoring the state of your configuration management

9.8.1 Monitoring Rudder itself

9.8.1.1 Monitoring a Node

The monitoring of a node mainly consists in checking that the *Node* can speak with its policy server, and that the agent is run regularly.

A good place to start is to check the content of the last run log file. It can be found in `/var/rudder/cfengine-community/output/previous`.

You can search lines containing *FATAL:*, *Fatal :*, or *could not get an updated configuration* with a log monitoring tool to automatically detect communication issues with the policy server.

To get the last run time, you can lookup the modification date of `/var/rudder/cfengine-community/last_successful_inputs_update`.

9.8.1.2 Monitoring a Server

You can use regular API calls to check the server is running and has access to its data. For example, you can issue the following command to get the list of currently defined rules:

```
curl -X GET -H "X-API-Token: yourToken" http://your.rudder.server/rudder/api/latest/rules
```

You can then check the status code (which should be 200). See the [API documentation](#) for more information.

You can also check the webapp logs (in `/var/log/rudder/webapp/year_month_day.stderrout.log`) for error messages.

9.8.2 Monitoring your configuration management

There are two interesting types of information:

- **Events:** all the changes made by the the agents on your *Nodes*
- **Compliance:** the current state of your *Nodes* compared with the expected configuration

9.8.2.1 Monitor compliance

You can use the *Rudder* API to get the current compliance state of your infrastructure. It can be used to simply check for configuration errors, or be integrated in other tools.

Here is an very simple example of API call to check for errors (exits with 1 when there is an error):

```
curl -s -H "X-API-Token: yourToken" -X GET 'https://your.rudder.server/rudder/api/latest/ ↵  
compliance/rules' | grep -qv '"status": "error"'
```

See the [API documentation](#) for more information about general API usage, and the [compliance API documentation](#) for a list of available calls.

9.8.2.2 Monitor events

The Web interface gives access to this, but we will here see how to process events automatically. They are available on the root server, in `/var/log/rudder/compliance/non-compliant-reports.log`. This file contains two types of reports about all the nodes managed by this server:

- All the modifications made by the agent
- All the errors that prevented the application of a policy

The lines have the following format:

```
[%DATE%] N: %NODE_UUID% [%NODE_NAME%] S: [%RESULT%] R: %RULE_UUID% [%RULE_NAME%] D: % ←
DIRECTIVE_UUID% [%DIRECTIVE_NAME%] T: %TECHNIQUE_NAME%/%TECHNIQUE_VERSION% C: [% ←
COMPONENT_NAME%] V: [%KEY%] %MESSAGE%
```

In particular, the *RESULT* field contains the type of event (change or error, respectively *result_repaired* and *result_error*).

You can use the following regex to match the different fields:

```
^\[(?P<Date>[^\]]+)\] N: (?P<NodeUUID>[^\ ]+) \[(?P<NodeFQDN>[^\]]+)\] S: \[(?P<Result <
>[^\]]+)\] R: (?P<RuleUUID>[^\ ]+) \[(?P<RuleName>[^\]]+)\] D: (?P<DirectiveUUID>[^\ ]+) <
\[(?P<DirectiveName>[^\]]+)\] T: (?P<TechniqueName>[^\ ]+)/(?P<TechniqueVersion>[^\ ]+) C: <
\[(?P<ComponentName>[^\]]+)\] V: \[(?P<ComponentKey>[^\]]+)\] (?P<Message>.+)$
```

Below is a basic **Logstash** configuration file for parsing *Rudder* events. You can then use **Kibana** to explore the data, and create graphs and dashboards to visualize the changes in your infrastructure.

```
input {
  file {
    path => "/var/log/rudder/compliance/non-compliant-reports.log"
  }
}

filter {
  grok {
    match => { "message" => "^\[(?P<date>[^\]]+)\] N: (?P<node_uuid>[^\ ]+) \[(?P<node_fqdn>[^\]]+)\] S: \[(?P<result <
>[^\]]+)\] R: (?P<rule_uuid>[^\ ]+) \[(?P<rule_name>[^\]]+)\] D: (?P<directive_uuid>[^\ ]+) <
\[(?P<directive_name>[^\]]+)\] T: (?P<technique_name>[^\ ]+)/(?P<technique_version>[^\ ]+) C: \[(?P<component_name>[^\]]+)\] V: \[(?P<component_key>[^\]]+)\] (?P<message>.+)$" }
  }
  # Replace the space in the date by a "T" to make it parseable by Logstash
  mutate {
    gsub => [ "date", " ", "T" ]
  }
  # Parse the event date
  date {
    match => [ "date", "ISO8601" ]
  }
  # Remove the date field
  mutate { remove => "date" }
  # Remove the key field if it has the "None" value
  if [key] == "None" {
    mutate { remove => "key" }
  }
}

output {
  stdout { codec => rubydebug }
}
```

9.9 Use Rudder inventory in other tools

Rudder centralizes the information about your managed systems, and you can use this information in other tools, mainly through the API. We will here give a few examples.

9.9.1 Export to a spreadsheet

You can export the list of your nodes to a spreadsheet file (xls format) by using a [tool](#) available in the rudder-tools repository. Simply follow the installation instructions, and run it against your *Rudder* server. You will get a file containing:

	A	B	C	D	E
1	Node	Machine type	Operating system	Agent version	Node ID
2	server.rudder.local	Virtual	Centos 6.7	3.0.13	root
3	agent1.rudder.local	Virtual	Centos 7.1	3.1.5	8f57cebc-9cb7-4c20-aca1-d1b053e21675

You can easily modify the script to add other information.

9.9.2 Use the inventory in Rundeck

[Rundeck](#) is a tool that helps automating infrastructures, by defining jobs that can be run manually or automatically. There is a [plugin](#) for Rundeck that allows using *Rudder* inventory data in Rundeck.

9.9.3 Use the inventory in Ansible

There is an [inventory plugin](#) for Ansible that makes possible to use *Rudder* inventory (including groups, nodes, group ids, node ids, and node properties) as inventory for Ansible, for example for orchestration tasks on your platform.

Chapter 10

Usecases

This chapter gives a few examples for using *Rudder*. We have no doubt that you'll have your own ideas, that we're impatient to hear about...

10.1 Dynamic groups by operating system

Create dynamic groups for each operating system you administer, so that you can apply specific policies to each type of OS. When new nodes are added to *Rudder*, these policies will automatically be enforced upon them.

10.2 Library of preventive policies

Why not create policies for emergency situations in advance? You can then put your IT infrastructure in "panic" mode in just a few clicks.

For example, using the provided *Techniques*, you could create a Name resolution *Directive* to use your own internal DNS servers for normal situations, and a second, alternative *Directive*, to use Google's public DNS servers, in case your internal DNS servers are no longer available.

10.3 Standardizing configurations

You certainly have your own best practices (let's call them good habits) for setting up your SSH servers.

But is that configuration the same on all your servers? Enforce the settings you really want using an OpenSSH server policy and apply it to all your Linux servers. SSH servers can then be stopped or reconfigured manually many times, *Rudder* will always restore your preferred settings and restart the SSH server in less than 5 minutes.

Chapter 11

Advanced usage

This chapter describe advanced usage of *Rudder*.

11.1 Node management

11.1.1 Reinitialize policies for a Node

To reinitialize the policies for a *Node*, delete the local copy of the Applied Policies fetched from the *Rudder Server*, and create a new local copy of the initial promises.

```
rudder agent reset
```

At next run of the *Rudder Agent* (it runs every five minutes), the initial promises will be used.

**Caution**

Use this procedure with caution: the Applied Policies of a *Node* should never get broken, unless some major change has occurred on the *Rudder* infrastructure, like a full reinstallation of the *Rudder Server*.

11.1.2 Completely reinitialize a Node

You may want to completely reinitialize a *Node* to make it seen as a new node on the server, for example after cloning a VM.

**Warning**

This command will permanently delete your node uuid and keys, and no configuration will be applied before re-accepting and configuring the node on the server.

The command to reinitialize a *Node* is:

```
rudder agent reinit
```

This command will delete all local agent data, including its uuid and keys, and also reset the agent internal state. The only configuration kept is the server hostname or ip configured in `policy_server.dat`. It will also send an inventory to the server, which will treat it as a new node inventory.

11.1.3 Change the agent run schedule

By default, the agent runs on all nodes every 5 minutes. You can modify this value in **Administration** → **Settings** → **Agent Run Schedule**, as well as the "splay time" across nodes (a random delay that alters scheduled run time, intended to spread load across nodes).



Warning

When reducing notably the run interval length, reporting can be in *No report* state until the next run of the agent, which can take up to the previous (longer) interval.

11.1.4 Installation of the Rudder Agent

11.1.4.1 Static files

At installation of the *Rudder* Agent, files and directories are created in following places:

/etc Scripts to integrate *Rudder* Agent in the system (init, cron).

/opt/rudder/share/initial-promises Initialization promises for the *Rudder* Agent. These promises are used until the *Node* has been validated in *Rudder*. They are kept available at this place afterwards.

/opt/rudder/lib/perl5 The *FusionInventory Inventory* tool and its Perl dependencies.

/opt/rudder/bin/run-inventory Wrapper script to launch the inventory.

/opt/rudder/sbin Binaries for *CFEngine Community*.

/var/rudder/cfengine-community This is the working directory for *CFEngine Community*.

11.1.4.2 Generated files

At the end of installation, the *CFEngine Community* working directory is populated for first use, and unique identifiers for the *Node* are generated.

/var/rudder/cfengine-community/bin/ *CFEngine Community* binaries are copied there.

/var/rudder/cfengine-community/inputs Contains the actual working *CFEngine Community* promises. Initial promises are copied here at installation. After validation of the *Node*, Applied Policies, which are the *CFEngine* promises generated by *Rudder* for this particular *Node*, will be stored here.

/var/rudder/cfengine-community/ppkeys An unique SSL key generated for the *Node* at installation time.

/opt/rudder/etc/uuid.hive An unique identifier for the *Node* is generated into this file.

11.1.4.3 Services

After all of these files are in place, the *CFEngine Community* daemons are launched:

cf-execd This *CFEngine Community* daemon is launching the *CFEngine Community Agent* `cf-agent` every 5 minutes.

cf-serverd This *CFEngine Community* daemon is listening on the network on *Rudder Root* and Relay servers, serving policies and files to *Rudder Nodes*.

11.1.4.4 Configuration

At this point, you should configure the *Rudder Agent* to actually enable the contact with the server. Type in the IP address of the *Rudder Root Server* in the following file:

```
echo *root_server_IP_address* > /var/rudder/cfengine-community/policy_server.dat
```

11.1.5 Rudder Agent interactive

You can force the *Rudder Agent* to run from the console and observe what happens.

```
rudder agent run
```

Error: the name of the Rudder Root Server can't be resolved

If the *Rudder Root Server* name is not resolvable, the *Rudder Agent* will issue this error:

```
rudder agent run
```



```
Unable to lookup hostname (rudder-root) or cfengine service: Name or service not known ↩
```

To fix it, either you set up the agent to use the IP address of the *Rudder* root server instead of its Domain name, either you set up accurately the name resolution of your *Rudder Root Server*, in your DNS server or in the hosts file.

The *Rudder Root Server* name is defined in this file

```
echo *IP_of_root_server* > /var/rudder/cfengine-community/policy_server.dat
```

Error: the CFEngine service is not responding on the Rudder Root Server

If the *CFEngine* is stopped on the *Rudder Root Server* you will get this error:

```
# rudder agent run
!! Error connecting to server (timeout)
!!! System error for connect: "Operation now in progress"
!! No server is responding on this port
Unable to establish connection with rudder-root
```



Restart the *CFEngine* service:

```
service rudder-agent restart
```

11.1.6 Processing new inventories on the server

11.1.6.1 Verify the inventory has been received by the Rudder Root Server

There is some delay between the time when the first inventory of the *Node* is sent, and the time when the *Node* appears in the New *Nodes* of the web interface. For the brave and impatient, you can check if the inventory was sent by listing incoming *Nodes* on the server:

```
ls /var/rudder/inventories/incoming/
```

11.1.6.2 Process incoming inventories

On the next run of the *CFEngine* agent on *Rudder Root Server*, the new inventory will be detected and sent to the *Inventory* Endpoint. The inventory will be then moved in the directory of received inventories. The *Inventory* Endpoint do its job and the new *Node* appears in the interface.

You can force the execution of *CFEngine* agent on the console:

```
rudder agent run
```

11.1.6.3 Validate new Nodes

User interaction is required to validate new *Nodes*.

11.1.6.4 Prepare policies for the Node

Policies are not shared between the *Nodes* for obvious security and confidentiality reasons. Each *Node* has its own set of policies. Policies are generated for *Nodes* according in the following states:

1. *Node* is new;
2. *Inventory* has changed;
3. *Technique* has changed;
4. *Directive* has changed;
5. *Group* of *Node* has changed;
6. *Rule* has changed;
7. Regeneration was forced by the user.

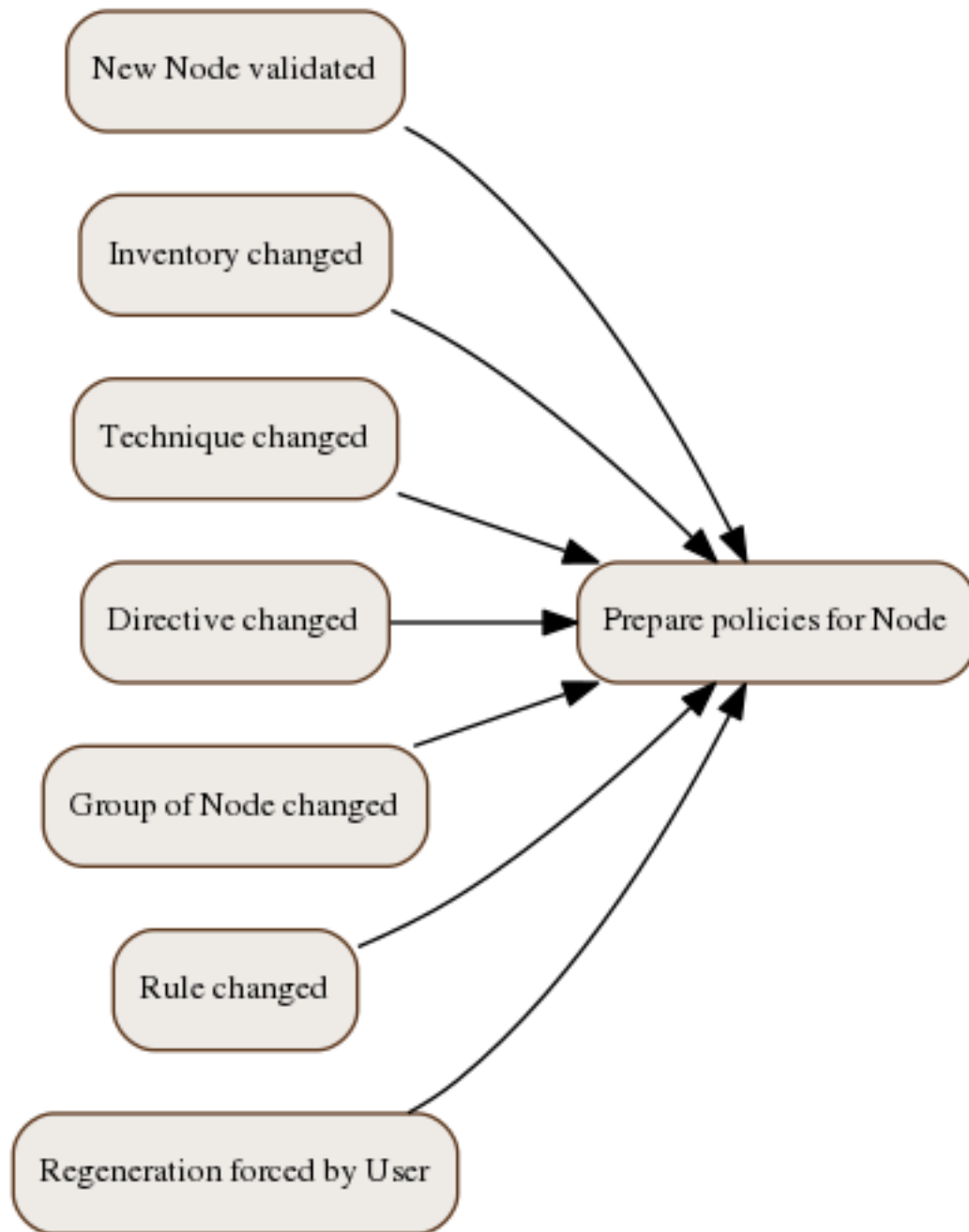


Figure 11.1: Generate policy workflow

11.1.7 Agent execution frequency on nodes

11.1.7.1 Checking configuration (CFEngine)

Rudder is configured to check and repair configurations using the *CFEngine* agent every 5 minutes, at 5 minutes past the hour, 10 minutes past the hour, etc.

The exact run time on each machine will be delayed by a random interval, in order to "smooth" the load across your infrastructure (also known as "splay time"). This reduces simultaneous connections on relay and root servers (both for the *CFEngine* server and for sending reports).

Up to and including *Rudder 2.10.x*, this random interval is between 0 and 1 minutes. As of *Rudder 2.10.x* and later, this random interval is between 0 and 5 minutes.

11.1.7.2 Inventory (FusionInventory)

The *FusionInventory* agent collects data about the node it's running on such as machine type, OS details, hardware, software, networks, running virtual machines, running processes, environment variables. . .

This inventory is scheduled once every 24 hours, and will happen in between 0:00 and 5:00 AM. The exact time is randomized across nodes to "smooth" the load across your infrastructure.

11.2 Password management

You might want to change the default passwords used in *Rudder's* managed daemons for evident security reasons.

11.2.1 Configuration of the postgres database password

You will have to adjust the postgres database and the `rudder-web.properties` file.

Here is a semi-automated procedure:

- Generate a decently fair password. You can use an arbitrary one too.

```
PASS=`dd if=/dev/urandom count=128 bs=1 2>&1 | md5sum | cut -b-12`
```

- Update the Postgres database user

```
su - postgres -c "psql -q -c \"ALTER USER blah WITH PASSWORD '$PASS'\""
```

- Insert the password in the `rudder-web.properties` file

```
sed -i "s%^rudder.jdbc.password.*%rudder.jdbc.password=$PASS%" /opt/rudder/etc/rudder-web. ←  
properties
```

11.2.2 Configuration of the OpenLDAP manager password

You will have to adjust the OpenLDAP and the `rudder-web.properties` file.

Here is a semi-automated procedure:

- Generate a decently fair password. You can use an arbitrary one too.

```
PASS=`dd if=/dev/urandom count=128 bs=1 2>&1 | md5sum | cut -b-12`
```

- Update the password in the slapd configuration

```
HASHPASS=`/opt/rudder/sbin/slappasswd -s $PASS`  
sed -i "s%^rootpw.*%rootpw $HASHPASS%" /opt/rudder/etc/openldap/slapd.conf
```

- Update the password in the `rudder-web.properties` file

```
sed -i "s%^ldap.authpw.*%ldap.authpw=$PASS%" /opt/rudder/etc/rudder-web.properties
```

11.2.3 Configuration of the WebDAV access password

This time, the procedure is a bit more tricky, as you will have to update the *Technique* library as well as a configuration file. Here is a semi-automated procedure:

- Generate a decently fair password. You can use an arbitrary one too.

```
PASS=`dd if=/dev/urandom count=128 bs=1 2>&1 | md5sum | cut -b-12`
```

- Update the password in the apache htaccess file

Tip

On some systems, especially *SuSE* ones, `htpasswd` is called as `"htpasswd2"`

```
htpasswd -b /opt/rudder/etc/htpasswd-webdav rudder $PASS
```

- Update the password in *Rudder's* system *Techniques*

```
cd /var/rudder/configuration-repository/techniques/system/common/1.0/
sed -i "s%^.davpw.*$% \"davpw\" string => \"$PASS\"\\;\" site.st
git commit -m "Updated the rudder WebDAV access password" site.st
```

- Update the *Rudder Directives* by either reloading them in the web interface (in the "Configuration Management/*Techniques*" tab) or restarting jetty (NOT recommended)

11.3 Policy generation

Each time a change occurs in the *Rudder* interface, having an impact on the policy needed by a node, it is necessary to regenerate the modified promises for every impacted node. By default this process is launched after each change.

11.3.1 Update button

The button `Update` on the top right of the screen, in the `Status` menu, allows you to force the regeneration of the policies. As changes in the inventory of the nodes are not automatically taken into account by *Rudder*, this feature can be useful after some changes impacting the inventory information.

11.4 Technique creation

Rudder provides a set of pre-defined *Techniques* that cover some basic configuration and system administration needs. You can also create your own *Techniques*, to implement new functionalities or configure new services. This paragraph will walk you through this process.

There is two ways to configure new *Techniques*, either thanks to the web *Technique* Editor in *Rudder* or by coding them by hand.

The use of the *Technique* Editor (code name: **ncf-builder**) is the easiest way to create new *Techniques* and is fully integrated with *Rudder*. On the other hand, it does not allow the same level of complexity and expressiveness than coding a *Technique* by hand. Of course, coding new *Techniques* by hand is a more involved process that needs to learn how the *Technique* description language and *Technique* reporting works.

We advice to always start to try to create new *Techniques* with the *Technique* Editor and switch to the hand-coding creation only if you discover specific needs not addressed that way.

11.4.1 Recommended solution: Technique Editor

The easiest way to create your own *Techniques* is to use the *Technique* editor, a web interface to create and manage *Techniques* based on the ncf framework.

Creating a technique in the *Technique* Editor will generate a *Technique* for *Rudder* automatically. You can then use that *Technique* to create a *Directive* that will be applied on your *Nodes* thanks to a *Rule*.

For more information about ncf and the *Technique* editor, you can visit: <http://www.ncf.io/>

11.4.1.1 Using the Technique Editor

The *Technique* Editor is available in the *Directive* screen or directly in the Utilities menu. Once on the *Technique* Editor, creating a *Technique* simply consist to add desired "Generic Methods" building block and configure them.

When the *Technique* match your expectations, hitting save will automatically add it to available *Technique* in the *Directive* screen of *Rudder* (in the "User *Technique*" category).

11.4.1.2 Logs

In case of any issue with the *Technique* Editor, the first step should always be to look for its log messages. These logs are sent to *Apache* system error logs:

- On *Debian*, by default: `/var/log/apache2/error.log`
- On *RHEL*, by default: `/var/log/httpd/error_log`

11.4.2 Understanding how Technique Editor works

In this chapter, we are giving an overview about how the *Technique* Editor works and how it is integrated with the main *Rudder* application.

11.4.2.1 Directory layout

As explained in <http://www.ncf.io/>, ncf uses a structured directory tree composed of several layers of logic, from internal libraries to *Techniques* and user services. All the files and logic in these folders will be named "library" for simplicity

ncf directory structure exists in two root folders:

- `/usr/share/ncf/tree`
 - This is the standard library installation folder. It is created and updated by the the ncf package. This folder will be completely overwritten when you update ncf package so you should never modify anything here: it will be lost at some point.
- `/var/rudder/configuration-repository/ncf`
 - This is where you add your own ncf Generic Methods and *Techniques*. *Techniques* created with the *Technique* Editor will be located here, and both Generic Methods and *Techniques* in that place will be accessible in the *Technique* Editor alongside what is provided by the standard library.

To share those folders to all nodes, *Rudder* makes a copy of these folders in `/var/rudder/ncf`:

- `/var/rudder/ncf/local` is a copy of `/var/rudder/configuration-repository/ncf`
- `/var/rudder/ncf/common` is a copy `/usr/share/ncf/tree`

They are synchronized automatically by the agent running on the server. So any modification done in files in these directories will be lost at the next synchronization.

A node updates its ncf local library by copying the content of these two folders during its promise update phase.

11.4.2.2 Technique Editor integration with Rudder

Here we will explain *Technique* Editor behavior and what workflow are initialized by different action on the *Technique* Editor.

Each action in the *Technique* Editor interface produces requests to an API defined over ncf.

All of the requests are authenticated thanks to a token passed in the JSESSIONID header. The token is generated when an authenticated user is connected to the *Rudder* interface (typically thanks to his browser).

That token is shared to the *Technique* Editor interface, which itself passes the JSESSIONID header to all requests.

If you have authentication issue, check that your *Rudder* session is not expired.

Get request Get request will get all *Techniques* and Generic Methods in a path passed as parameters of the request in the "path" javascript variable:

<https://your.rudder.server/ncf-builder/#!?path=/var/rudder/configuration-repository/ncf>

Get requests are triggered when accessing *Technique* editor.

The ncf API will parse all files in the parameter path by running "cf-promises -pjson" on all *Techniques*, checking that all *Techniques* are correctly formed.

The ncf API will also look to all Generic Methods description data to build the catalog of available Generic Methods.

The resulting information are sent back to the *Technique* Editor for displaying.

Post requests Post requests are issued when a *Technique* is created, modified or deleted. They will only work on *Techniques* available in the path given in parameter.

They are triggered when clicking on save/delete button.

The main difference with get requests is that hooks are launched before and after the action is made.

We will see all hooks behavior in the following dedicated hooks section.

11.4.2.3 Hooks

On each POST request, pre- and post- hooks are executed by the *Technique* Editor. These hooks are used for the *Rudder* integration to help transform pure ncf *Techniques* into *Rudder* one.

- pre-hooks are located in: /var/rudder/configuration-repository/ncf/pre-hooks.d
- post-hooks are located in: /var/rudder/configuration-repository/ncf/post-hooks.d

As of March 2015, we have two post-hooks defined and no pre-hooks:

- post.write_technique.commit.sh
 - It commits the *Technique* newly created into *Rudder* Git configuration repository located in /var/rudder/configuration-repository.
- post.write_technique.rudderify.sh
 - It generates a valid *Rudder Technique* from a the newly created *Technique* and reloads *Rudder Technique* Library so that updates are taken into account.

If you want to run post hooks by hand, you can use the following command:

```
/var/rudder/configuration-repository/ncf/post-hooks.d/post.write_technique.commit. ↵
sh /var/rudder/configuration-repository bundle_name
```

11.4.3 Create Technique manually

11.4.3.1 Prerequisite

To create a *Technique*, you'll need a few things:

CFEngine knowledge *Rudder's Techniques* are implemented using *CFEngine*. *Rudder* takes care of a lot of the work of using *CFEngine*, but you'll need to have a reasonable understanding of the *CFEngine* syntax.

Rudder installation for testing To be able to test your new *Technique*, you'll need a working *Rudder* installation (at least a server and a node).

Text editor The only other tool you need is your favorite text editor!

11.4.3.2 Define your objective

Before starting to create a new *Technique*, have you checked that it doesn't already exist in *Rudder*? The full list of current *Techniques* is available from GitHub, at [GitHub rudder-techniques repository](#).

OK, now we've got that over with, let's go on.

A *Technique* should be an abstract configuration. This means that your *Technique* shouldn't just configure something one way, but instead it should implement **how** to configure something, and offer options for users to choose what way they want it configured. Before starting, make sure you've thought through what you want to create.

Here's a quick checklist to help:

- Do you need to install packages?
- Do you need to create or edit configuration files?
- Do you need to copy files from a central location?
- Do you need to launch processes or check that they're running?
- Do you need to run commands to get things working?

Once you've made a list of what needs doing, consider what options could be presented in the user interface, when you create a *Directive* from your new *Technique*. Intuitively, the more variables there are, the more flexible your *Technique* will be. However, experience shows that making the *Technique* **too** configurable will actually make it harder to use, so a subtle balance comes in to play here.

At this stage, make a list of all the variables that should be presented to users configuring a *Directive* from your *Technique*.

11.4.3.3 Initialize your new Technique

The simplest way to create a new *Technique* and be able to test it as you work is to start on a *Rudder* server. Open a terminal and connect to your *Rudder* server by ssh, and cd into the directory where *Techniques* are stored:

```
cd /var/rudder/configuration-repository/techniques
```

Under this directory, you'll find a set of categories, and sub-categories. Before creating your *Technique*, choose a category to put it in, and change to that directory. For example:

```
cd applications
```

You can consult the description of each category by looking at the `category.xml` file in each directory. For this example:

```
cat category.xml
```

Will output:

```
<xml>
  <name>Application management</name>
  <description>This category contains Techniques designed to install,
    configure and manage applications</description>
</xml>
```

Once you've decided on a category, it's time to create the basic skeleton of your *Technique*. The technical name for your *Technique* is its directory name, so choose wisely:

```
mkdir sampleTechnique
```

All directories under this one are version numbers. Let's start with a simple 1.0 version. From now on, we'll work in this directory.

```
mkdir sampleTechnique/1.0
cd sampleTechnique/1.0
```

Now, you need a minimum of two files to get your *Technique* working:

metadata.xml This file describes the *Technique*, and configures how it will be displayed in the web interface.

st files These files are templates for *CFEngine* configuration files. You need at least one, but can have as many as you like. *Rudder* processes them to generate .cf files ready to be used by *CFEngine*.

To get started, copy and paste these sample files, or download them from GitHub:

metadata.xml (original file: [technique-metadata-sample.xml](#))

```
include::technique-metadata-sample.xml
```

sample_technique.st (original file: [technique-st-sample.xml](#))

```
include::technique-st-sample.xml
```

11.4.3.4 Define variables

WORK IN PROGRESS Define metadata. Enter the variables in sections in the metadata.xml file. Cf <http://www.rudder-project.org/foswiki/Development/PolicyTemplateXML>

11.4.3.5 First test in the Rudder interface

Load the new *Technique* into *Rudder* and check that the variables and sections are displayed as you expect.

11.4.3.6 Implement the behavior

WORK IN PROGRESS Write *CFEngine* promises to implement the behavior that your Template should have.

11.4.3.7 Read in the variables from Rudder

WORK IN PROGRESS Using StringTemplate notation. ... Cf <http://www.rudder-project.org/foswiki/Development/Technique>

11.4.3.8 Add reporting

WORK IN PROGRESS The reports format Cf <http://www.rudder-project.org/foswiki/Development/ReportsInTechniques>

11.5 Directives ordering

Configuration in *Rudder* are based on desired states, describing the expected state of the system. However, there are cases where having order is desirable (like ensuring that a JVM is present before deploying an Application server, or ensuring a user is present before setting it sudoers), even if it will converge over the course of several agent runs.

When policies are generated for each nodes, all *Directives* based on a same *Technique* are merged together, preventing a complete ordering of all *Directives*. However, *Rudder* uses a best-effort method for ordering *Directives*, based on alphanumeric ordering.

Rudder tries to order first on *Rules* name, then on *Directives* name.

Example:

- given three *Techniques* A, B and C
- directives A1 and A2 based on *Technique* A, directives B1 and B2 based on B, directives C1 and C2 based on C
- rule R1 having A1, B1 and C2 and rule R2 having A2, B2 and C2, both applied on a same node,
- resulting ordering of directive will be: A1, A2, B1, B2, C2, C1

Please note that you should avoid configuration that relies on order to be applicable, due to the lack of strict ordering for now.

11.6 Node properties

Node properties can be found in the "properties" tab of each node in *Rudder*.

Node properties can be modified using *Rudder*'s API, see <http://www.rudder-project.org/rudder-api-doc/#api-Nodes-updateNodeProperties>

Each property is a key=value pair. The value can be a string or a well-formatted JSON data structure.

Some examples: datacenter=Paris datacenter= { "id": "FRA1", "name": "Colo 1, Paris", "location": "Paris, France", "dns_suffix": "paris.example.com" }

11.6.1 Using properties

You can use node properties almost everywhere in *Rudder*:

- in directive parameters
- in the technique editor
- in your own techniques and generic methods

To use a property, simply use the variable `node.properties` with the variable call syntax.

Example with a property named *datacenter*:

```
${node.properties[datacenter]}
```



Warning

Before *Rudder* 3.1.14 and 3.2.7, node properties could not be used in JavaScript expressions (see following section), since they are evaluated during policy generation and node properties were only made available to agents at runtime. Since *Rudder* 3.1.14, 3.2.7 and 4.0.0 and later, you can enable a feature switch in "Administration/Settings" to enable node properties expansion in directive parameters. More details are available at Section [11.7](#).

In a mustache template, use:

```
{{vars.node.properties.datacenter}}
```


11.6.2 Under the hood

On the server, one or more properties files are written for each node in the `/var/rudder/share/<uuid>/rules/cfengine-community/properties.d/` directory. This directory is then copied to each node by the agent with all other promise files.

In the agent, properties are made available in the `node.<namespace>` container that contains the values. Those values are read from `/var/rudder/cfengine-community/inputs/properties/*.json`. All files are taken in order and override the previous ones - the last one wins.

Each file must contain at least 2 levels of JSON content, the first level is the namespace level and the second level is the key level.

The namespace name must be an ASCII name that doesn't start with `_` and must match the following regex: `[a-zA-Z0-9][a-zA-Z0-9_]*`

For example:

```
{
  "properties":
  {
    "datacenter": "Paris",
    "environment": "production",
    "customer": "Normation"
  }
}
```

The merge is a first level merge done at the namespace level. This means that:

- a key in a namespace is fully overridden by the same key in the same namespace in a later file.
- a key in a namespace is never overridden by the same key in a different namespace
- a key that is overridden never retains original data even if it is a data container itself

The result key is available in the `node.<namespace>` data variable. A usage example:

```
${node.properties[datacenter]}
```

To get the original data (for debug only) there is the `properties.property_<fileid>` variable. A usage example:

```
${properties.property__var_rudder_cfengine_community_inputs_properties_d_properties_json[ ←
  properties][datacenter]}
```

11.7 Node properties expansion in directives

It is possible to use properties defined on nodes to build *Directive* values. The resulting values will be computed during policy generation, and can therefore provide unique values for each node or be used in JavaScript expressions.

Properties on nodes are defined using *Rudder's REST API*, with the *Update Node properties* API call. More details in our [API documentation](#).

11.7.1 Feature availability

This feature was introduced in *Rudder 3.1.14*, *Rudder 3.2.7* and *Rudder 4.0.0*.

If you upgraded to 3.1.14 (or a later 3.1.x version) or 3.2.7 (or a later 3.2.x version) from a previous *Rudder* version, this feature is disabled by default in order to mitigate any risk of undesired side effects on existing installations. You can enable it in the Administration/Settings page, using the **Enable node properties expansion in Directives** switch.

Rudder installations from 4.0.0 onwards have this feature enabled by default.

11.7.2 Usage

In any directive text field, you can access properties defined on nodes using the following syntax:

```
${node.properties[property_name][key_one][key_two]}
```

where:

- `property_name` is the name of the property defined via the API
- `key_one` and `key_two` are keys in the JSON structure
- the value obtained is the string representation, in compact mode, of the entire node property or sub-structure of the JSON value
- if the key is not found, an error will be raised that will stop policy generation
- spaces are authorized around separators (`[,],{,}`..)

11.7.2.1 Providing a default value

Most of the time, you will need to provide a default value to node properties expansion to avoid a policy generation error due to missing node properties. This is also a good case to allow a simple override mechanism for a parameter where only some nodes have a specific value.

You can also use other node properties, or other *Rudder* parameters as defaults, using the same syntax as above.

Some examples:

```
${node.properties[datacenter][id] | default = "LON2" }
${node.properties[datacenter][name] | default = "\"Co-location with \"Hosting Company\" in ↵
  Paris (allows quotes)\""} }
${node.properties[datacenter][id] | default = ${rudder.param.default_datacenter} }
${node.properties[netbios_name] | default = ${rudder.node.hostname} }
${node.properties[dns_suffix] | default = ${node.properties[datacenter][dns_suffix] | ↵
  default = "${rudder.node.hostname}.example.com" }
```

#or even use cfengine variables in the default

```
${node.properties[my_override] | default = "${cfengine.key}" }
```

11.7.2.2 Forcing expansion on the node

In some cases, you will want to use a `${node.properties[key]}` in a directive parameter, but you don't want to expand it during policy generation on the *Rudder* server, but instead let the value be expanded during the agent run on the node. Typically if the value is to be used by a templating tool, or if the value is known only on the node.

For these cases, you can add the "node" option to the property expression:

```
${node.properties[datacenter][id] | node }
```

This will be rewritten during policy generation into:

```
${node.properties[datacenter][id]}
```

Which will be considered as a standard variable by the agent, which will replace this expression by its value if it's defined, or kept as is if it's unknown.

The variable's content is read from `/var/rudder/cfengine-community/inputs/properties.d/properties.json`. You can find more information on node properties in [Section 11.6](#).

11.8 JavaScript evaluation in Directives

It is possible to use JavaScript expressions to build *Directive* values. The resulting values will be computed during policy generation, and can therefore provide unique values for each node.

11.8.1 Feature availability

This feature was introduced in *Rudder* 3.1.12, *Rudder* 3.2.5 for password fields only, and generalized for all fields in *Rudder* 3.1.14, *Rudder* 3.2.7 and *Rudder* 4.0.

If you upgraded to 3.1.12 (or a later 3.1.x version) or 3.2.5 (or a later 3.2.x version) from a previous *Rudder* version, this feature is disabled by default in order to mitigate any risk of undesired side effects on existing installations. You can enable it in the Administration/Settings page, using the **Enable script evaluation in Directives** parameter.

Rudder installations from 4.0 onwards have this feature enabled by default.

11.8.2 Usage

All standard JavaScript methods are available, and a *Rudder*-specific library, prefixed with `rudder.` also provides some extra utilities. This library is documented below.

For example, to get the first 3 letters of each node's hostname, you can write:

```
"${rudder.node.hostname}".substring(0,3)
```

Limitation of the scripting language

JavaScript expressions are evaluated in a sandboxed JavaScript environment. It has some limitations, such as:

- It cannot write on the filesystem
 - Scripts are killed after 5 seconds of execution, to prevent overloading the system
-

11.8.3 Rudder utility library

11.8.3.1 Standard hash methods

The following methods allow to simply hash a value using standard algorithms:

- `rudder.hash.md5(string)`
- `rudder.hash.sha256(string)`
- `rudder.hash.sha512(string)`

These methods do not use a salt for hashing, and as such are not suitable for distributing passwords for user accounts on UNIX systems. See below for a preferable approach for this.

11.8.3.2 UNIX password-compatible hash methods

The following methods are specially designed to provided hashes that can be used as user passwords on UNIX systems (in `/etc/shadow`, for example). Use these if you want to distribute hashes of unique passwords for each of your nodes, for example.

Two different cases exist: support for generic Unix-like systems (Linux, BSD, ...) and support for AIX systems (which use a different hash algorithm).

Available methods are:

- `rudder.password.auto(algorithm, password [, salt])`
- `rudder.password.unix(algorithm, password [, salt])`
- `rudder.password.aix(algorithm, password [, salt])`

The parameters are:

- `algorithm` can be "MD5", "SHA-512", "SHA512", "SHA-256", "SHA256" (case insensitive)
- `password` is the plain text password to hash
- `salt` is the optional salt to use in the password (we **strongly** recommend providing this value - see warning below)

The `unix` method generates Unix crypt password compatible hashes (for use on Linux, BSD, etc), while the `aix` method generates AIX password compatible hashes. The `auto` method automatically uses the appropriate algorithm for each node type (AIX nodes will have a AIX compatible hash, others will have a Unix compatible hash). We recommend always using `auto` for simplicity.

For example, to use the first 8 letters of each node's hostname as a password, you could write:

```
rudder.password.auto("SHA-256", "${rudder.node.hostname}".substring(0,8), "abcdefg")
```



Providing a salt

It is strongly recommended to provide a **salt** to the methods above. If no salt is provided, a random salt is created, and will be recreated at each policy generation, causing the resulting hashes to change each time. This, in turn, will generate an unnecessary "repaired" status for the password component on all nodes at each policy generation.

JVM requirements

This features is tested only on HotSpot 1.7 and 1.8, OpenJDK 1.7 and 1.8, IBM JVM 1.7 and 1.8.

JVM requirements for AIX password hashes

AIX password generation depends on the availability of **PBKDF2WithHmacSHA256** and **PBKDF2WithHmacSHA512** in the JVM. These algorithms are included by default on HotSpot 1.8 and OpenJDK 1.8 and upward. In the case where your JVM does not support these algorithms, typically on an IBM JDK or a JVM 1.7 version of HotSpot and OpenJDK, the hashing algorithm falls back to **SHA1** with **PBKDF2WithHmacSHA1**, and an error message will be logged. You can also check your JVM editor manual to add support for these algorithms.

11.8.4 Status and future support

In a future version of *Rudder*, JavaScript evaluation will be supported in all fields in *Directives*.

In the meantime, you can already test this functionality out by entering a JavaScript expression in any *Directive* field, prefixed by "evaljs:". Please be aware that this is unsupported and untested, so do this at your own risk.

If you do encounter any issues, please get in touch or open a ticket - we'd love to hear about them!

There is currently no plan to extend this support to the fields in the *Technique* editor.

11.9 REST API

Rudder can be used as a web service using a *REST API*.

This documentation covers the version 1 of *Rudder*'s API, that has been present since *Rudder* 2.4.

The version 2 has now been implemented, which is much more complete, in *Rudder* 2.7, and has a dedicated documentation available here: <http://www.rudder-project.org/rudder-api-doc/>



Warning

The version 1 is to be considered legacy and should not be used anymore. Please migrate to version 2 to benefit from the new authentication features and more complete existing methods.

11.9.1 Default setup

Access to *REST API* can be either using *Rudder* authentication, either unauthenticated, using authentication mechanisms set elsewhere, for instance at *Apache* level.

11.9.1.1 Rudder Authentication

By default, the access to the *REST API* is open to users not authenticated in *Rudder*.

The method of authentication can be configured in `/opt/rudder/etc/rudder-web.properties`

```
rudder.rest.allowNonAuthenticatedUser=true
```

11.9.1.2 Apache access rules

By default, the *REST API* is exposed for localhost only, at `http://localhost/rudder/api`.

Example 11.1 Example usage of non authenticated REST API

Unrestricted access can be granted to local scripts accessing to localhost, whereas remote access to the *REST API* will be either denied, or restricted through authentication at apache level.

11.9.1.3 User for REST actions

Actions done using the *REST API* are logged by default as run by the user `UnknownRestUser`.

To change the name of this user, add following header to the HTTP request:

```
X-REST-USERNAME: MyConfiguredRestUser
```

If the *REST API* is authenticated, the authenticated user name will be used in the logs.

11.9.2 Status

`http://localhost/rudder/api/status` Check if *Rudder* server is up and return OK. If *Rudder* server is not responding, an error is displayed.

11.9.3 Promises regeneration

`http://localhost/rudder/api/deploy/reload` Regenerate promises (same action as the `Regenerate now` button).

11.9.4 Dynamic groups regeneration

`http://localhost/rudder/api/dyngroup/reload` Check all dynamic groups for changes. If changes have occurred, regenerate the groups in the *LDAP* and the *CFEngine* promises.

11.9.5 Technique library reload

`http://localhost/rudder/api/techniqueLibrary/reload` Check the technique library for changes. If changes have occurred, reload the technique library in memory and regenerate the *CFEngine* promises.

11.9.6 Archives manipulation

Various methods are available to import and export items:

11.9.6.1 Archiving:

`http://localhost/rudder/api/archives/archive/groups` Export node groups and node groups categories.

`http://localhost/rudder/api/archives/archive/directives` Export policy library (categories, active techniques, directives).

`http://localhost/rudder/api/archives/archive/rules` Export rules

`http://localhost/rudder/api/archives/archive/full` Export everything

11.9.6.2 Listing:

`http://localhost/rudder/api/archives/list/groups` List available archives datetime for groups (the datetime is in the format awaited for restoration).

`http://localhost/rudder/api/archives/list/directives` List available archives datetime for policy library (the datetime is in the format awaited for restoration).

`http://localhost/rudder/api/archives/list/rules` List available archives datetime for configuration rules (the datetime is in the format awaited for restoration).

`http://localhost/rudder/api/archives/list/full` List available archives datetime for full archives (the datetime is in the format awaited for restoration).

11.9.6.3 Restoring a given archive:

`http://localhost/rudder/api/archives/restore/groups/datetime/[archiveId]` Restore given groups archive.

`http://localhost/rudder/api/archives/restore/directives/datetime/[archiveId]` Restore given directives archive.

`http://localhost/rudder/api/archives/restore/rules/datetime/[archiveId]` Restore given rules archive.

`http://localhost/rudder/api/archives/restore/full/datetime/[archiveId]` Restore everything.

11.9.6.4 Restoring the latest available archive (from a previously archived action, and so from a Git tag):

```
http://localhost/rudder/api/archives/restore/groups/latestArchive
http://localhost/rudder/api/archives/restore/directives/latestArchive
http://localhost/rudder/api/archives/restore/rules/latestArchive
http://localhost/rudder/api/archives/restore/full/latestArchive
```

11.9.6.5 Restoring the latest available commit (use Git HEAD):

```
http://localhost/rudder/api/archives/restore/groups/latestCommit
http://localhost/rudder/api/archives/restore/directives/latestCommit
http://localhost/rudder/api/archives/restore/rules/latestCommit
http://localhost/rudder/api/archives/restore/full/latestCommit
```

11.9.6.6 Downloading a ZIP archive

The *REST API* allows to download a ZIP archive of groups, directives and rules (as XML files) for a given Git commit ID (the commit HASH).

It is not designed to query for available Git commit ID, so you will need to get it directly from a Git tool (for example with Git log) or from the list API.

Note that that API allows to download ANY Git commit ID as a ZIP archive, not only the one corresponding to *Rudder* archives.

Note 2: you should rename the resulting file with a ".zip" extension as most zip utilities won't work correctly on a file not having it.

http://localhost/rudder/api/archives/zip/groups/[GitCommitId] Download groups for the given Commit ID as a ZIP archive.

http://localhost/rudder/api/archives/zip/directives/[GitCommitId] Download directives for the given Commit ID as a ZIP archive.

http://localhost/rudder/api/archives/zip/rules/[archiveId] Download rules for the given Commit ID as a ZIP archive.

http://localhost/rudder/api/archives/zip/all/[archiveId] Download groups, directives and rules for the given Commit ID as a ZIP archive.

11.10 Use a database on a separate server

This section allows installing a separate database only without splitting the rest of the server components like when using the *rudder-multiserver-setup* script. The setup is done in two places: on the database server and on the *Rudder* root server.

It also allows moving an existing database to another server.

Use different user and database names

It can be useful, for example if you want to share your database server between several *Rudder* root servers (see note below), to use a different database for your *Rudder* root server. To do so:

- Create the new database (replace `alternate_user_name`, `alternate_base_name` and specify a password):

```
su - postgres -c "psql -q -c \"CREATE USER alternate_user_name WITH PASSWORD '↵
GENERATE_A_PASSWORD'\""
su - postgres -c "psql -q -c \"CREATE DATABASE alternate_base_name WITH OWNER = ↵
alternate_user_name\""
```

- Initialize it. First copy the initialization script:

```
cp /opt/rudder/etc/postgresql/reportsSchema.sql /opt/rudder/etc/postgresql/reportsSchema ↵
-alternate.sql
```

- In the copied file, change the:

```
ALTER database rudder SET standard_conforming_strings=true;
```

To:

```
ALTER database alternate_base_name SET standard_conforming_strings=true;
```

- Then apply the script:

```
su - postgres -c "psql -q -U alternate_user_name -h localhost -d alternate_base_name ↵
-f /opt/rudder/etc/postgresql/reportsSchema-alternate.sql"
```

- Follow the standard instructions of this section, with two differences:
 - You need to adjust the line added to `pg_hba.conf` to match your user and database name.
 - You need to also change the database name and user in `rudder-web.properties`.

Use the same database server for several Rudder root servers



It is possible to share the same database server between several *Rudder* instances, by following the preceding tip to use a different database than the default one. However, there are some important points to know:

- This database server can only be used with the `rudder-db` role in case of multiserver setup.
- This database server can only be a node for one of the *Rudder* servers. This also means that this root server will have indirect access to the content of the other databases.

11.10.1 On the database server

- Install and configure the agent on the node, and install the **rudder-reports** package.
- Change the `postgresql.conf` file (usually in `/var/lib/pgsql` or `/etc/postgresql`), to listen on the right interface to communicate with the server:

```
# you can use '*' to listen on all interfaces
listen_addresses = 'IP_TO_USE'
```


- Also ensure that network policies (i.e. the firewall settings) allow PostgreSQL flows from the root server to the database server.
- Add an authorization line for the server (in `pg_hba.conf`, in the same directory):

```
host    rudder          rudder          ROOT_SERVER_IP/32    md5
```

- Restart postgresql to apply the new settings:

```
service postgresql restart
```

- Execute the following command to configure the password (that should be the same as `RUDDER_PSQL_PASSWORD` in `/opt/rudder/etc/rudder-passwords.conf` on the root server):

```
su - postgres -c "psql -c \"ALTER USER rudder WITH PASSWORD ' ←
    RUDDER_SERVER_DATABASE_PASSWORD'\""
```

- Run an inventory to the server:

```
rudder agent inventory
```

11.10.2 On the root server

In the following section, `DATABASE_HOST` refers to the hostname of the new database server, and `SERVER_HOST` to the hostname of the root server.

- Remove the `rudder-server-root` and `rudder-reports` packages if installed. For example, you can run on *Debian*:

```
service rudder restart
apt-mark manual rudder-webapp rudder-inventory-endpoint
apt-get remove --purge rudder-reports
```

- You can also remove the `postgresql` package and database from the server if installed, but keep in mind you will lose all existing data. You can follow the [backup and restore](#) procedure to migrate the data to the new database.
- Change the hostname in `/opt/rudder/etc/rudder-web.properties`:

```
rudder.jdbc.url=jdbc:postgresql://DATABASE_HOST:5432/rudder
```

- Edit `/var/rudder/cfengine-community/inputs/rudder-server-roles.conf` and set the following line:

```
rudder-db:DATABASE_HOST
```

- Edit the `/etc/rsyslog.d/rudder.conf` file and change the hostname in:

```
:ompgsql:DATABASE_HOST,rudder,rudder,...
```

- Run an inventory:

```
rudder agent inventory
```

- Restart rudder services:

```
service rsyslog restart
service rudder restart
```

- Clear the cache (in Administration → Settings)

You should now have finished configuring the database server. You can check the technical logs to see if reports are correctly written into the database and read by the web application.

11.11 Multiserver Rudder

From version 3.0 *Rudder* can be divided into 4 different components:

- rudder-web: an instance with the webapp and the central policy server
- rudder-ldap: the inventory endpoint and its ldap backend
- rudder-db: the postgresql storage
- rudder-relay-top: the contact point for nodes

11.11.1 Preliminary steps

You need the setup scripts provided at <https://github.com/normation/rudder-tools/tree/master/scripts/rudder-multiserver-setup>. You can download them with this command:

```
mkdir rudder-multiserver-setup
cd rudder-multiserver-setup
for i in add_repo detect_os.sh rudder-db.sh rudder-ldap.sh rudder-relay-top.sh rudder-web. ↵
do
    sh
done
wget --no-check-certificate https://raw.githubusercontent.com/Normation/rudder-tools/ ↵
master/scripts/rudder-multiserver-setup/$i
done
chmod 755 *
cd ..
```

You need 4 instances of supported OS, one for each component. Only the rudder-web instance need at least 2GB of RAM.

Register the 4 names in the DNS or add them in `/etc/hosts` on each instance.

Add firewall rules:

- from rudder-web to rudder-db port pgsql TCP
- from rudder-* to rudder-web port rsyslog 514 TCP
- from rudder-relay-top to rudder-ldap port 8080 TCP
- from rudder-web to rudder-ldap port 8080 TCP
- from rudder-web to rudder-ldap port 389 TCP
- from rudder-web to rudder-relay-top port 5309

11.11.2 Install rudder-relay-top

Copy the rudder-multiserver-setup directory to you instance.

Run rudder-relay-top.sh as root, replace <rudder-web> with the hostname of the rudder-web instance:

```
cd rudder-multiserver-setup
./rudder-relay-top.sh <rudder-web>
```

Take note of the UUID. If you need it later read, it is in the file /opt/rudder/etc/uuid.hive

11.11.3 Install rudder-db

Copy the rudder-multiserver-setup directory to you instance.

Run rudder-db.sh as root, replace <rudder-web> with the hostname of the rudder-web instance, replace <allowed-network> with the network containing the rudder-web instances:

```
cd rudder-multiserver-setup
./rudder-db.sh <rudder-web> <allowed-network>
```

11.11.4 Install rudder-ldap

Copy the rudder-multiserver-setup directory to you instance.

Run rudder-ldap.sh as root, replace <rudder-web> with the hostname of the rudder-web instance:

```
cd rudder-multiserver-setup
./rudder-ldap.sh <rudder-web>
```

11.11.5 Install rudder-web

Copy the rudder-multiserver-setup directory to you instance.

Run rudder-relay-top.sh as root, replace <rudder-*> with the hostname of the corresponding instance:

```
cd rudder-multiserver-setup
./rudder-web.sh <rudder-web> <rudder-ldap> <rudder-db> <rudder-relay-top>
```

Connect rudder web interface and accept all nodes. Then run the following command where <relay-uuid> is the uuid from rudder-relay-top setup.

```
/opt/rudder/bin/rudder-node-to-relay <relay-uuid>
```

11.12 Server migration

11.12.1 What files you need

To copy a server on a new location, you need at least to keep the configuration applied by your server.

You need to keep:

- *Rules*
- *Directives*

- **Groups**
- **Techniques**

If you keep your actual nodes, you also have to handle with *CFEngine* keys. New nodes won't have problems with the new server.

If your new server has a different IP, you will have to change it on your nodes.

You will have to accept nodes

There are multiple ways to migrate your server, here are the best we propose you.

11.12.2 Handle configuration files

11.12.2.1 Copy /var/rudder/configuration-repository

The simplest way to migrate your server to a new one is to copy `/var/rudder/configuration-repository` from your former server to the new one. In this folder you will find all your *Rules/Groups/Directives/Techniques* are stored. By copying that folder you will keep the git tree used by your server and keep your comments.

- Copy `/var/rudder/configuration-repository` to your new server
- In *Rudder* UI Go to **Administration > Policy Server**
- Reload the *Technique* Library
- Go to **Administration > Archives**
- In Global Archive, "Choose an archive" select *Latest git commit*
- Click on *Restore everything*
- After deployment, your configuration should be restored

11.12.2.2 Use Archive feature of Rudder

Alternatively, you can follow the Archive/Import procedures described in [Archives](#)

11.12.3 Handle CFEngine keys

11.12.3.1 Keep your CFEngine keys

Copy `/var/rudder/cfengine-community/ppkeys` to your new server

11.12.3.2 Change CFEngine keys

On every node that were using your old rudder server, you will have to erase the server public key (root-MD5=*.pub file)

Run `rm /var/rudder/cfengine-community/ppkeys/root-MD5=*.pub`

On the next run of rudder-agent, nodes will get the new public key of the server

11.12.4 On your nodes

If your server has changed of IP address you have to modify `/var/rudder/cfengine-community/policy_server.dat` with the new address

Then you force your nodes to send their inventory while running `rudder agent inventory`

In your *Rudder* UI, you should now be able to accept the nodes.

Your configuration is now totally migrated.

11.13 Mirroring Rudder repositories

You can also use your own packages repositories server instead of *www.rudder-project.org* if you want. This is possible with a synchronization from our repositories with rsync.

We've got public read only rsync modules *rudder-apt* and *rudder-rpm*.

To synchronize with the APT repository just type:

```
rsync -av www.rudder-project.org::rudder-apt /your/local/mirror
```

To synchronize with the RPM repository just type:

```
rsync -av www.rudder-project.org::rudder-rpm /your/local/mirror
```

Finally, you have to set up these directories (/your/local/mirror) to be shared by HTTP by a web server (i.e., *Apache*, *nginx*, *lighttpd*, etc...).

Chapter 12

Handbook

This chapter contains some tips and tricks you might want to know about using *Rudder* in a production environment, with some useful optimization and procedures.

12.1 Database maintenance

Rudder uses two backends to store information as of now: *LDAP* and *SQL*

To achieve this, OpenLDAP and PostgreSQL are installed with *Rudder*.

However, like every database, they require a small amount of maintenance to keep operating well. Thus, this chapter will introduce you to the basic maintenance procedure you might want to know about these particular database implementations.

12.1.1 Automatic PostgreSQL table maintenance

Rudder uses an automatic mechanism to automate the archival and pruning of the reports database.

By default, this system will:

- Archive reports older that 3 days (30 in *Rudder* 2.6)
- Remove reports older than 90 days

It thus reduces the work overhead by only making *Rudder* handle relevant reports (fresh enough) and putting aside old ones.

This is obviously configurable in `/opt/rudder/etc/rudder-web.properties`, by altering the following configuration elements:

- `rudder.batch.reportscleaner.archive.TTL`: Set the maximum report age before archival
- `rudder.batch.reportscleaner.delete.TTL`: Set the maximum report age before deletion

The default values are OK for systems under moderate load, and should be adjusted in case of excessive database bloating.

The estimated disk space consumption, with a 5 minute agent run frequency, is 150 to 400 kB per *Directive*, per day and per node, which is roughly 5 to 10 MB per *Directive* per month and per node.

Thus, 25 directives on 100 nodes, with a 7 day log retention policy, would take 2.5 to 10 GB, and 25 directives on 1000 nodes with a 1 hour agent execution period and a 30 day log retention policy would take 9 to 35 GB.

12.1.2 PostgreSQL database vacuum

In some cases, like a large report archiving or deletion, the *Rudder* interface will still display the old database size. This is because even if the database has been cleaned as requested, the physical storage backend did not reclaim space on the hard drive, resulting in a "fragmented" database. This is not an issue, as PostgreSQL handles this automatically, and new reports sent by the nodes to *Rudder* will fill the blanks in the database, resulting in a steady growth of the database. This task is handled by the autovacuum process, which periodically cleans the storage regularly to prevent database bloating.

However, to force this operation to free storage immediately, you can trigger a "vacuum full" operation by yourself, however keep in mind that this operation is very disk and memory intensive, and will lock both the *Rudder* interface and the reporting system for quite a long time with a big database.

Manual vacuuming using the psql binary

```
#~You can either use sudo to change owner to the postgres user, or use the rudder ↔
  connection credentials.

#~With sudo:
sudo -u postgres psql -d rudder

#~With rudder credentials, it will ask the password in this case:
psql -u rudder -d rudder -W

# And then, when you are connected to the rudder database in the psql shell, trigger a ↔
  vacuum:
rudder=# VACUUM FULL;

# And take a coffee.
```

12.1.3 LDAP database reindexing

In some very rare case, you will encounter some *LDAP* database entries that are not indexed and used during searches. In that case, OpenLDAP will output warnings to notify you that they should be.

LDAP database reindexing

```
# Stop OpenLDAP
service rudder-slaped stop

# Reindex the databases
service rudder-slaped reindex

# Restart OpenLDAP
service rudder-slaped restart
```

12.2 Migration, backups and restores

It is advised to backup frequently your *Rudder* installation in case of a major outage.

These procedures will explain how to backup your *Rudder* installation.

12.2.1 Backup

This backup procedure will operate on the three principal *Rudder* data sources:

- The *LDAP* database

- The PostgreSQL database
- The configuration-repository folder

It will also backup the application logs.

How to backup a Rudder installation

```
#~First, backup the LDAP database:
/opt/rudder/sbin/slappcat -l /tmp/rudder-backup-$(date +%Y%m%d).ldif

# Second, the PostgreSQL database:
sudo -u postgres pg_dump rudder > /tmp/rudder-backup-$(date +%Y%m%d).sql

#~Or without sudo, use the rudder application password:
pg_dump -U rudder rudder > /tmp/rudder-backup-$(date +%Y%m%d).sql

#~Third, backup the configuration repository:
tar -C /var/rudder -zvcf /tmp/rudder-backup-$(date +%Y%m%d).tar.gz configuration-repository ←
/ cfengine-community/ppkeys/

# Finally, backup the logs:
tar -C /var/log -zvcf /tmp/rudder-log-backup-$(date +%Y%m%d).tar.gz rudder/

#~And put the backups wherever you want, here /root:
cp /tmp/rudder-backup* /root
cp /tmp/rudder-log-backup* /root
```

12.2.2 Restore

Of course, after a total machine crash, you will have your backups at hand, but what should you do with it ?

Here is the restoration procedure:

How to restore a Rudder backup

```
# First, follow the standard installation procedure, this one assumes you have a working " ←
blank"
# Rudder on the machine

# Disable Rudder agent
rudder agent disable

# Stop Rudder services
service rudder stop

# Drop the OpenLDAP database
rm -rf /var/rudder/ldap/openldap-data/alock /var/rudder/ldap/openldap-data/*.bdb /var/ ←
rudder/ldap/openldap-data/__db* /var/rudder/ldap/openldap-data/log*

# Import your backups

#~Configuration repository
tar -C /var/rudder -zxvf /root/rudder-backup-XXXXXXXXX.tar.gz

#~LDAP backup
/opt/rudder/sbin/slappadd -l /root/rudder-backup-XXXXXXXXX.ldif

#~PostgreSQL backup
sudo -u postgres psql -d rudder < /root/rudder-backup-XXXXXXXXX.sql
#~or
psql -u rudder -d rudder -W < /root/rudder-backup-XXXXXXXXX.sql
```



```
# Enable Rudder agent
rudder agent enable

#~And restart the machine or just Rudder:
service rudder restart
```

12.2.3 Migration

To migrate a *Rudder* installation, just backup and restore your *Rudder* installation from one machine to another.

Please remember that The *CFEngine* key restoration is mandatory for the clients to update properly, but if the *Rudder* server address changes, the agents will block. You have to delete every root-*.pub key in /var/rudder/cfengine-community/ppkeys/ for things to work again.

12.3 Performance tuning

Rudder and some applications used by *Rudder* (like the *Apache* web server, or *Jetty*) can be tuned to your needs.

12.3.1 Reports retention

To lower *Rudder* server's disk usage, you can configure the retention duration for node's execution reports in /opt/rudder/etc/rudder-web.properties file with the options:

```
rudder.batch.reportscleaner.archive.TTL=30
rudder.batch.reportscleaner.delete.TTL=90
```

12.3.2 Apache web server

The *Apache* web server is used by *Rudder* as a proxy, to connect to the *Jetty* application server, and to receive inventories using the WebDAV protocol.

There are tons of documentation about *Apache* performance tuning available on the Internet, but the defaults should be enough for most setups.

12.3.3 Jetty

The *Jetty* application server is the service that runs *Rudder* web application and inventory endpoint. It uses the Java runtime environment (JRE).

The default settings fit the basic recommendations for minimal *Rudder* hardware requirements, but there are some configuration switches that you might need to tune to obtain better performance with *Rudder*, or correct e.g. timezone issues.

To look at the available optimization knobs, please take a look at /etc/default/rudder-jetty on your *Rudder* server.

12.3.4 Java "Out Of Memory Error"

It may happen that you get java.lang.OutOfMemoryError. They can be of several types, but the most common is: "java.lang.OutOfMemoryError: Java heap space".

This error means that the web application needs more RAM than what was given. It may be linked to a bug where some process consumed much more memory than needed, but most of the time, it simply means that your system has grown and needs more memory.

You can follow the configuration steps described in the following paragraph.

12.3.5 Configure RAM allocated to Jetty

To change the RAM given to Jetty, you have to:

```
# edit +/etc/default/rudder-jetty+ with your preferred text editor, for example vim:
vim /etc/default/rudder-jetty

Notice: that file is alike to +/opt/rudder/etc/rudder-jetty.conf+, which is the file with
default values. +/opt/rudder/etc/rudder-jetty.conf+ should never be modified directly ↔
because
modification would be erased by packaging in the following Rudder versuib update.

# modify JAVA_XMX to set the value to your need.
# The value is given in MB by default, but you can also use the "G" unit to specify a size ↔
in GB.

JAVA_XMX=2G

# save your changes, and restart Jetty:
service restart rudder-jetty
```

The amount of memory should be the half of the RAM of the server, rounded up to the nearest GB. For example, if the server has 5GB of RAM, 3GB should be allocated to Jetty.

12.3.6 Optimize PostgreSQL server

The default out-of-the-box configuration of PostgreSQL server is really not compliant for high end (or normal) servers. It uses a really small amount of memory.

The location of the PostgreSQL server configuration file is usually:

```
/etc/postgresql/9.x/main/postgresql.conf
```

On a *SuSE* system:

```
/var/lib/pgsql/data/postgresql.conf
```

12.3.6.1 Suggested values on an high end server

```
#
# Amount of System V shared memory
# -----
#
# A reasonable starting value for shared_buffers is 1/4 of the memory in your
# system:

shared_buffers = 1GB

# You may need to set the proper amount of shared memory on the system.
#
# $ sysctl -w kernel.shmmax=1073741824
#
# Reference:
# http://www.postgresql.org/docs/8.4/interactive/kernel-resources.html#SYSVIPC
#
# Memory for complex operations
# -----
#
# Complex query:
```

```

work_mem = 24MB
max_stack_depth = 4MB

# Complex maintenance: index, vacuum:

maintenance_work_mem = 240MB

# Write ahead log
# -----
#
# Size of the write ahead log:

wal_buffers = 4MB

# Query planner
# -----
#
# Gives hint to the query planner about the size of disk cache.
#
# Setting effective_cache_size to 1/2 of total memory would be a normal
# conservative setting:

effective_cache_size = 1024MB

```

12.3.6.2 Suggested values on a low end server

```

shared_buffers = 128MB
work_mem = 8MB
max_stack_depth = 3MB
maintenance_work_mem = 64MB
wal_buffers = 1MB
effective_cache_size = 128MB

```

12.3.7 CFEngine

If you are using *Rudder* on a highly stressed machine, which has especially slow or busy I/O's, you might experience a sluggish *CFEngine* agent run everytime the machine tries to comply with your *Rules*.

This is because the *CFEngine* agent tries to update its internal databases everytime the agent executes a promise (the *.lmdb* files in the */var/rudder/cfengine-community/state* directory), which even if the database is very light, takes some time if the machine has a very high iowait.

In this case, here is a workaround you can use to restore *CFEngine*'s full speed: you can use a RAMdisk to store *CFEngine* states.

You might use this solution either temporarily, to examine a slowness problem, or permanently, to mitigate a known I/O problem on a specific machine. We do not recommend as of now to use this on a whole IT infrastructure.

Be warned, this solution has a drawback: you should backup and restore the content of this directory manually in case of a machine reboot because all the persistent states are stored here, so in case you are using, for example the *jobScheduler Technique*, you might encounter an unwanted job execution because *CFEngine* will have "forgotten" the job state.

Also, note that the mode=0700 is important as *CFEngine* will refuse to run correctly if the state directory is world readable, with an error like:

```

error: UNTRUSTED: State directory /var/rudder/cfengine-community (mode 770) was not private ←
!

```

Here is the command line to use:

How to mount a RAMdisk on CFEngine state directory

```
# How to mount the RAMdisk manually, for a "one shot" test:
mount -t tmpfs -o size=128M,nr_inodes=2k,mode=0700,noexec,nosuid,noatime,nodiratime tmpfs / ←
    var/rudder/cfengine-community/state

# How to put this entry in the fstab, to make the modification permanent
echo "tmpfs /var/rudder/cfengine-community/state tmpfs defaults,size=128M,nr_inodes=2k,mode ←
    =0700,noexec,nosuid,noatime,nodiratime 0 0" >> /etc/fstab
mount /var/rudder/cfengine-community/state
```

12.3.8 Rsyslog

If you are using syslog over TCP as reporting protocol (it is set in **Administration** → **Settings** → **Protocol**), you can experience issues with rsyslog on *Rudder* policy servers (root or relay) when managing a large number of nodes. This happens because using TCP implies the system has to keep track of the connections. It can lead to reach some limits, especially:

- max number of open files for the user running rsyslog
- size of network backlogs
- size of the conntrack table

You have two options in this situation:

- Switch to UDP (in **Administration** → **Settings** → **Protocol**). It is less reliable than TCP and you can lose reports in case of networking or load issues, but it will prevent breaking your server, and allow to manage more *Nodes*.
- Stay on TCP. Do this only if you need to be sure you will get all your reports to the server. You will should follow the instructions below to tune your system to handle more connections.

All settings needing to modify */etc/sysctl.conf* require to run *sysctl -p* to be applied.

12.3.8.1 Maximum number of file descriptors

If you plan to manage hundreds of *Nodes* behind a relay or a root server, you should increase the open file limit (10k is a good starting point, you might have to get to 100k with thousands of *Nodes*).

You can change the system-wide maximum number of file descriptors in */etc/sysctl.conf* if necessary:

```
fs.file-max = 100000
```

Then you have to get the user running rsyslog enough file descriptors. To do so, you have to:

- Have a high enough hard limit for rsyslog
- Set the limit used by rsyslog

The first one can be set in */etc/security/limits.conf*:

```
username hard nfile 8192
```

For the second one, you have two options:

- Set the soft limit (which will be used by default) in */etc/security/limits.conf* (with *username soft nfile 8192*)

- If you want to avoid changing soft limit (particularly if rsyslog is running as root), you can configure rsyslog to change its limit to a higher value (but not higher than the hard limit) with the *\$MaxOpenFiles* configuration directive in */etc/rsyslog.conf*

You have to restart rsyslog for these settings to take effect.

You can check current soft and hard limits by running the following commands as the user you want to check:

```
ulimit -Sn  
ulimit -Hn
```

12.3.8.2 Network backlog

You can also have issues with the network queues (which may for example lead to sending SYN cookies):

- You can increase the maximum number of connection requests awaiting acknowledgment by changing *net.ipv4.tcp_max_syn_backlog = 4096* (for example, the default is 1024) in */etc/sysctl.conf*.
- You may also have to increase the socket listen() backlog in case of bursts, by changing *net.core.somaxconn = 1024* (for example, default is 128) in */etc/sysctl.conf*.

12.3.8.3 Conntrack table

You may reach the size of the conntrack table, especially if you have other applications running on the same server. You can increase its size in */etc/sysctl.conf*, see [the Netfilter FAQ](#) for details.

Chapter 13

Troubleshooting and common issues

This chapter covers common issues and the available solutions.

13.1 Some reports are in "No report"

13.1.1 If you get no reports at all for the Node

First thing to check is to see if reports were received by *Rudder* server.

Check the last report time (called **Last seen**) in **List Nodes** page. If you see:

- **Never:** your *Node* is misconfigured or has a communication issue with the server
- A date far (more than 15 minutes) from current time: Synchronize server and node time
- A recent date: check if the node has correctly updated

Now we will check if promises were updated on the *Node*. Maybe the node could not update its promises anymore, even if the reporting looks ok and *Rules* seems to be applied but report keeps in 'No report'.

To check if a node can update its promises, run (on the node) *rudder agent run*. You'll get the result of the 'Update' component in the execution (in the *Common Technique*).

To update its promises, a *Node* needs to get a directory on *Rudder* server (*/var/rudder/share/node_uuid*), and *Rudder* checks if the node is authorized to access that directory. This check is based on the capability to resolve the ip as an accepted node. So if your node can't update its promises, it's probably because of a DNS issue!

13.1.2 If you get incomplete reporting for the Node

When the agent does not perform a normal execution, the reports will be incomplete, and some components will appear as missing on the server. Reasons could be:

- the execution of the agent encountered an error during its execution and could not complete. In this case, an error message is displayed when running *rudder agent run*. It is very likely a bug in the agent, please [report a bug](#)
- the agent is executed to launch specific bundles (with the *-b* option)
- reporting is missing on a *Technique*, in this case [report a bug](#)

13.2 Communication issues between agent and server

13.2.1 DNS issues

If one of the following problems happen:

- the agent does not manage to get its configuration back from the server with weird errors
- the server complains about being unable to resolve the node hostname
- when starting or restarting *Rudder* (or *rudder-agent*) service, *cf-serverd* start hangs

You probably have a name resolution problem. Please keep in mind that *Rudder* needs a working name resolution environment to operate properly, and therefore every machine should be at least able to resolve the name of their peer.

You have two options:

- Fix your DNS server or the */etc/hosts* on both the server and the node, so they can resolve each other (you can check using *nslookup*). You need to restart *rudder-agent* on the server to apply it
- Disable hostname checking on the server in **Administration** → **Settings** → **Use reverse DNS lookups on nodes to reinforce authentication to policy server**. This is the preferred solution if you have nodes behind a NAT.

13.2.2 Inventory issues

If you cannot send inventories to the server, it may be because of a proxy configured in */etc/profile* or shell configuration. *Rudder* agents use *cURL* to send inventories to their server, and the server actually uses it too to send received inventories to the inventory web application. There are two solutions usable to prevent this problem:

- Disable the proxy temporarily in your shell session, so *Rudder* can operate freely:

```
unset http_proxy; unset https_proxy; unset ftp_proxy; unset ftps_proxy; unset HTTP_PROXY; ↵  
unset HTTPS_PROXY; unset FTP_PROXY; unset FTPS_PROXY
```

- If you are using the Squid proxy, you are in luck, as the workaround might simply be to add this entry to your */etc/squid/squid.conf*: *ignore_expect_100 on*, it will make Squid more tolerant to programs like *cURL* than send some terse http requests. (Thanks to Albaro A. for this tip!)

13.3 Technique editing

If you have committed an invalid technique, then fixed it and committed it again, but the webapp still doesn't start, you have to force *Technique* library reloading.

To do this, deleting the attribute *techniqueLibraryVersion* from entry *techniqueCategoryId=Active Techniques,ou=Rudder,cn=rudder-configuration* in your *Rudder LDAP* backend. When re-starting, the webapp should now reload latest techniques.

13.4 Database is using too much space

Rudder stores a lot of data in the Postgresql database, and most historical data is removed from it. You can **configure** how many days of logs you want to keep in the database. However, due to the nature of Postgresql, when data are removed, space is not reclaimed on the storage system, it is simply marked as "free" for the database to write again in the removed rows. This space can be reclaimed by a *VACUUM FULL*, but it needs at least as much free space on the drive as the database size. Moreover, if

you are using Postgresql 8.3 (or in a lesser extend 8.4), you'll be likely to experience indexes bloating, where the physical size of the indexes grows without real reason, and need to be regularly purged.

There are two ways to reclaim space, the fast one (which doesn't reclaim completely all wasted space), and the complete one (which is unfortunately very slow)

Fast solution (especially for 8.x version of postgresql): Simply reindexing the database will save some space; depending on the size of your database, it may take several minutes to a couple of hours

```
# First, stop the Rudder server
rudder agent disable
service rudder-jetty stop

# Then log into postgresql
psql -U rudder -h localhost
REINDEX TABLE ruddersysevents;

#Exit postgresql
\q

# Restart the Rudder server
rudder agent enable
service rudder-jetty start
```

Complete solution: this solution will reclaim all that can be reclaimed, but is really really slow (can last several hours)

```
# First, stop the Rudder server
rudder agent disable
service rudder-jetty stop

# Then log into postgresql
psql -U rudder -h localhost
drop index component_idx;
drop index composite_node_execution_idx;
drop index keyvalue_idx;
drop index nodeid_idx;
drop index ruleid_idx;
drop index executiontimestamp_idx;
vacuum full ruddersysevents; -- this will take several hours

create index nodeid_idx on RudderSysEvents (nodeId);
CREATE INDEX executionTimeStamp_idx on RudderSysEvents (executionTimeStamp);
CREATE INDEX composite_node_execution_idx on RudderSysEvents (nodeId, executionTimeStamp);
CREATE INDEX component_idx on RudderSysEvents (component);
CREATE INDEX keyValue_idx on RudderSysEvents (keyValue);
CREATE INDEX ruleId_idx on RudderSysEvents (ruleId);

# Exit postgresql
\q

# Restart the Rudder server
rudder agent enable
service rudder-jetty start
```


Chapter 14

Reference

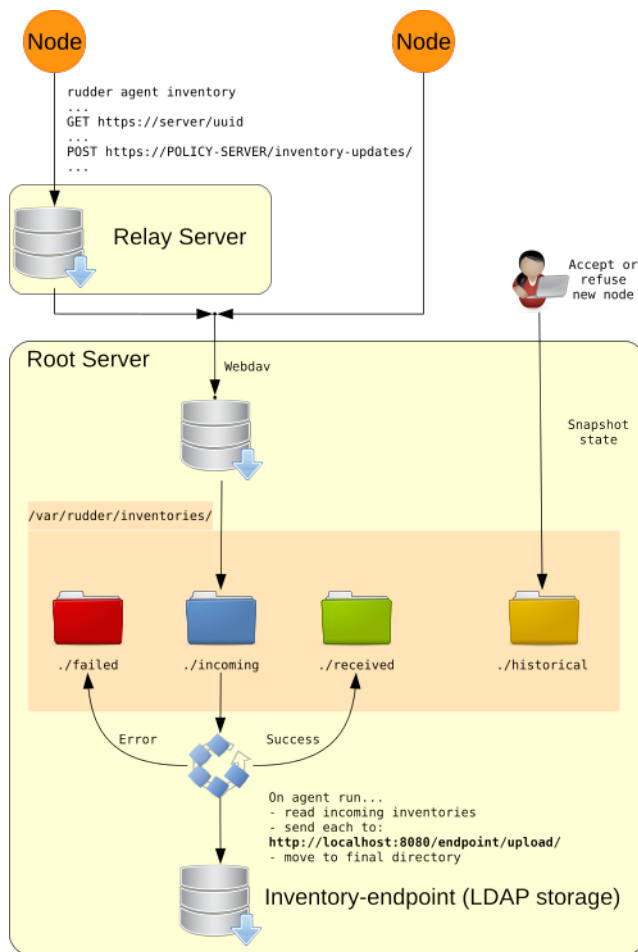
This chapter contains the reference *Rudder* configuration files

14.1 Inventory workflow, from nodes to Root server

One of the main information workflow in a *Rudder* managed system is the node's inventory one.

Node inventories are generated on nodes, are sent to the node policy server (be it a Relay or the Root server) up to the Root server, and stored in the *Rudder* database (technically an *LDAP* server), waiting for later use.

The goal of that section is to detail the different steps and explain how to spot and solve a problem on the inventory workflow. Following schema sum up the whole process.



14.1.1 Processing inventories on node

Inventories are generated daily during an agent run in the 00:00-06:00 time frame window local to the node. The exact time is randomly spread on the time frame for a set of nodes, but each node will always keep the same time (modulo the exact time of the run).

User can request the generation and upload of inventory with the command:

```
$ rudder agent inventory
```

In details, generating inventory does:

- ask the node policy server for its UUID with an HTTP GET on `https://server/uuid`,
- generate an inventory by scanning the node hardware and software components,
- optionally make a digital signature of the generated inventory file,
- send file(s) to the node's policy server on `https://POLICY-SERVER/inventory-updates/`

The individual commands can be displayed with the `-i` option to `rudder agent inventory` command.

14.1.2 Processing inventories on relays

On the Relay server:

- the inventory is received by a webdav endpoint,
- the webdav service store the file in the folder `/var/rudder/inventories/incoming`
- on each agent runs, files in `/var/rudder/inventories/incoming` are forwarded to the Relay own policy server.

14.1.3 Processing inventories on root server

On the Root server, the start of the workflow is the same than on a relay:

- the inventory is received by a webdav endpoint,
- the webdav service store the file in the folder `/var/rudder/inventories/incoming`

Then, on each run, the agent:

- look for inventory / signature pairs:
 - inventories without a corresponding signature file are processed only if they are older than 2 minutes,
- POST the inventory or inventory+signature pair to the local API of "inventory-endpoint" application on `http://localhost:8080/endpoint/upload/`
- the API makes some quick checks on inventory (well formed, mandatory fields...) and :
 - if checks are OK, **ACCEPTS** (HTTP code 200) the inventory,
 - if signature is configured to be mandatory and is missing, or if the signature is not valid, refuses with **UNAUTHORIZED** error (HTTP code 401)
 - else fails with a **PRECONDITION FAILED** error (HTTP code 412)
- on error, inventory file is moved to `/var/rudder/inventories/failed`,
- on success:
 - the inventory file is moved to `/var/rudder/inventories/received`,
 - in parallel, *inventory web* parses and updates *Rudder* database.

14.1.4 Queue of inventories waiting to be parsed

The *inventory endpoint* has a limited number of slot available for succesfully uploaded inventories to be queued waiting for parsing. That number can be configured in file `/opt/rudder/etc/inventory-web.properties`:

```
waiting.inventory.queue.size=50
```

Since *Rudder* 3.1.18 / 3.2.11 / 4.0.3, the number of currently waiting inventories can be obtained via a local *REST API* call to `http://localhost:8080/endpoint/api/info`:

```
$ curl http://localhost:8080/endpoint/api/info

{
  "queueMaxSize": 50,
  "queueFillCount": 50,
  "queueSaturated": true
}
```

14.2 Rudder Server data workflow

To have a better understanding of the Archive feature of *Rudder*, a description of the data workflow can be useful.

All the logic of *Rudder Techniques* is stored on the filesystem in `/var/rudder/configuration-repository/techniques`. The files are under version control, using git. The tree is organized as following:

1. At the first level, techniques are classified in categories: `applications`, `fileConfiguration`, `fileDistribution`, `jobScheduling`, `system`, `systemSettings`. The description of the category is included in `category.xml`.
2. At the second and third level, *Technique* identifier and version.
3. At the last level, each technique is described with a `metadata.xml` file and one or several *CFEngine* template files (name ending with `.st`).

An extract of Rudder Techniques filesystem tree

```
+-- techniques
|   +-- applications
|   |   +-- apacheServer
|   |   |   +-- 1.0
|   |   |       +-- apacheServerConfiguration.st
|   |   |       +-- apacheServerInstall.st
|   |   |       +-- metadata.xml
|   |   +-- aptPackageInstallation
|   |   |   +-- 1.0
|   |   |       +-- aptPackageInstallation.st
|   |   |       +-- metadata.xml
|   |   +-- aptPackageManagerSettings
|   |   |   +-- 1.0
|   |   |       +-- aptPackageManagerSettings.st
|   |   |       +-- metadata.xml
|   |   +-- category.xml
|   |   +-- openvpnClient
|   |   |   +-- 1.0
|   |   |       +-- metadata.xml
|   |   |       +-- openvpnClientConfiguration.st
|   |   |       +-- openvpnInstall.st
```

At *Rudder Server* startup, or after the user has requested a reload of the *Rudder Techniques*, each `metadata.xml` is mapped in memory, and used to create the *LDAP* subtree of *Active Techniques*. The *LDAP* tree contains also a set of subtrees for *Node Groups*, *Rules* and *Node Configurations*.

At each change of the *Node Configurations*, *Rudder Server* creates *CFEngine* draft policies (`Cf3PolicyDraft`) that are stored in memory, and then invokes `cf-clerk`. `cf-clerk` finally generates the *CFEngine* promises for the *Nodes*.

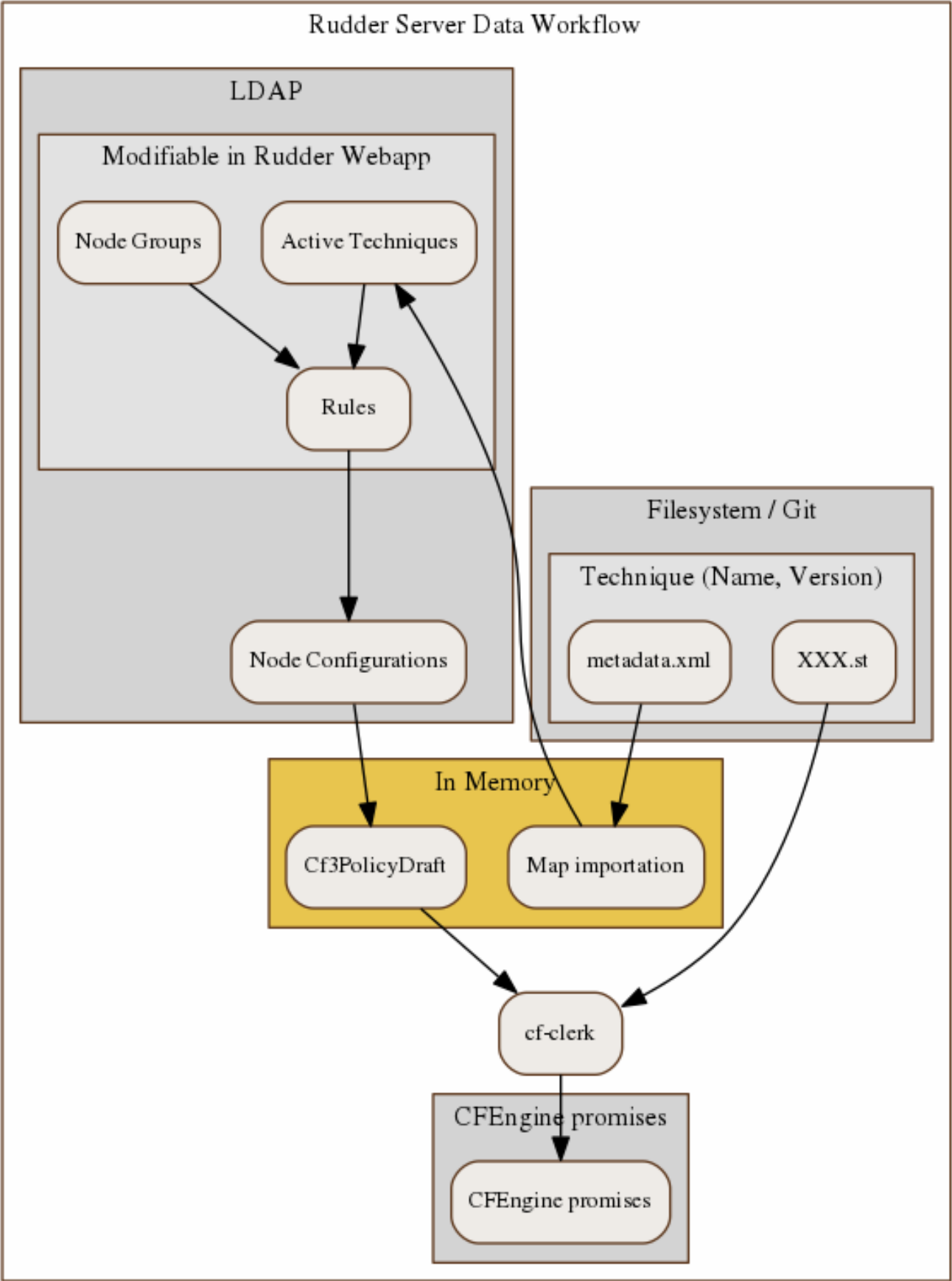


Figure 14.1: Rudder data workflow

14.3 Configuration files for Rudder Server

- /opt/rudder/etc/htpasswd-webdav
- /opt/rudder/etc/inventory-web.properties
- /opt/rudder/etc/logback.xml
- /opt/rudder/etc/openldap/slapd.conf
- /opt/rudder/etc/reportsInfo.xml
- /opt/rudder/etc/rudder-users.xml
- /opt/rudder/etc/rudder-web.properties

14.4 Rudder Agent workflow

In this chapter, we will have a more detailed view of the *Rudder Agent* workflow. What files and processes are created or modified at the installation of the *Rudder Agent*? What is happening when a new *Node* is created? What are the recurrent tasks performed by the *Rudder Agent*? How does the *Rudder Server* handle the requests coming from the *Rudder Agent*? The *Rudder Agent* workflow schema summarizes the process that will be described in the next pages.

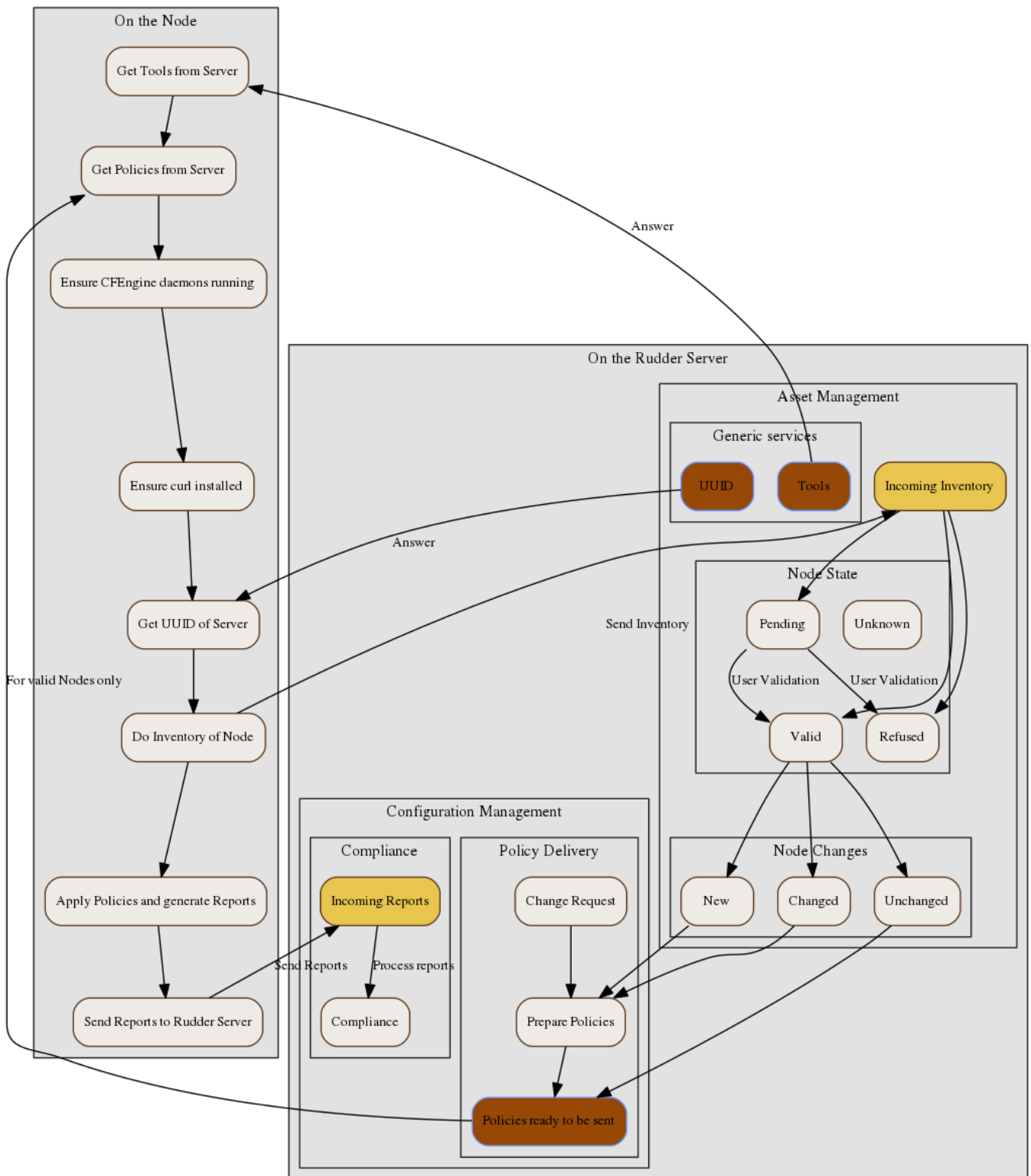


Figure 14.2: Rudder Agent workflow

Let's consider the *Rudder Agent* is installed and configured on the new *Node*.

The *Rudder Agent* is regularly launched and performs following tasks sequentially, in this order:

14.4.1 Request data from Rudder Server

The first action of *Rudder Agent* is to fetch the `tools` directory from *Rudder Server*. This directory is located at `/opt/rudder/share/tools` on the *Rudder Server* and at `/var/rudder/tools` on the *Node*. If this directory is already present, only changes will be updated.

The agent then try to fetch new Applied Policies from *Rudder Server*. Only requests from valid *Nodes* will be accepted. At first run and until the *Node* has been validated in *Rudder*, this step fails.

14.4.2 Launch processes

Ensure that the *CFEngine* community daemons `cf-execd` and `cf-serverd` are running. Try to start these daemons if they are not already started.

Daily between 5:00 and 5:05, relaunch the *CFEngine Community* daemons `cf-execd` and `cf-serverd`.

Add a line in `/etc/crontab` to launch `cf-execd` if it's not running.

Ensure again that the *CFEngine* community daemons `cf-execd` and `cf-serverd` are running. Try to start these daemons if they are not already started.

14.4.3 Identify Rudder Root Server

Ensure the `curl` package is installed. Install the package if it's not present.

Get the identifier of the *Rudder Root Server*, necessary to generate reports. The URL of the identifier is `http://Rudder_root_server/uuid`

14.4.4 Inventory

If no inventory has been sent since 8 hours, or if a forced inventory has been requested (class `force_inventory` is defined), do and send an inventory to the server.

```
rudder agent inventory
```

No reports are generated until the *Node* has been validated in *Rudder Server*.

14.4.5 Syslog

After validation of the *Node*, the system log service of the *Node* is configured to send reports regularly to the server. Supported system log providers are: `syslogd`, `rsyslogd` and `syslog-ng`.

14.4.6 Apply Directives

Apply other policies and write reports locally.

14.5 Configuration files for a Node

- `/etc/default/rudder-agent`

14.6 Packages organization

14.6.1 Packages

Rudder components are distributed as a set of packages.

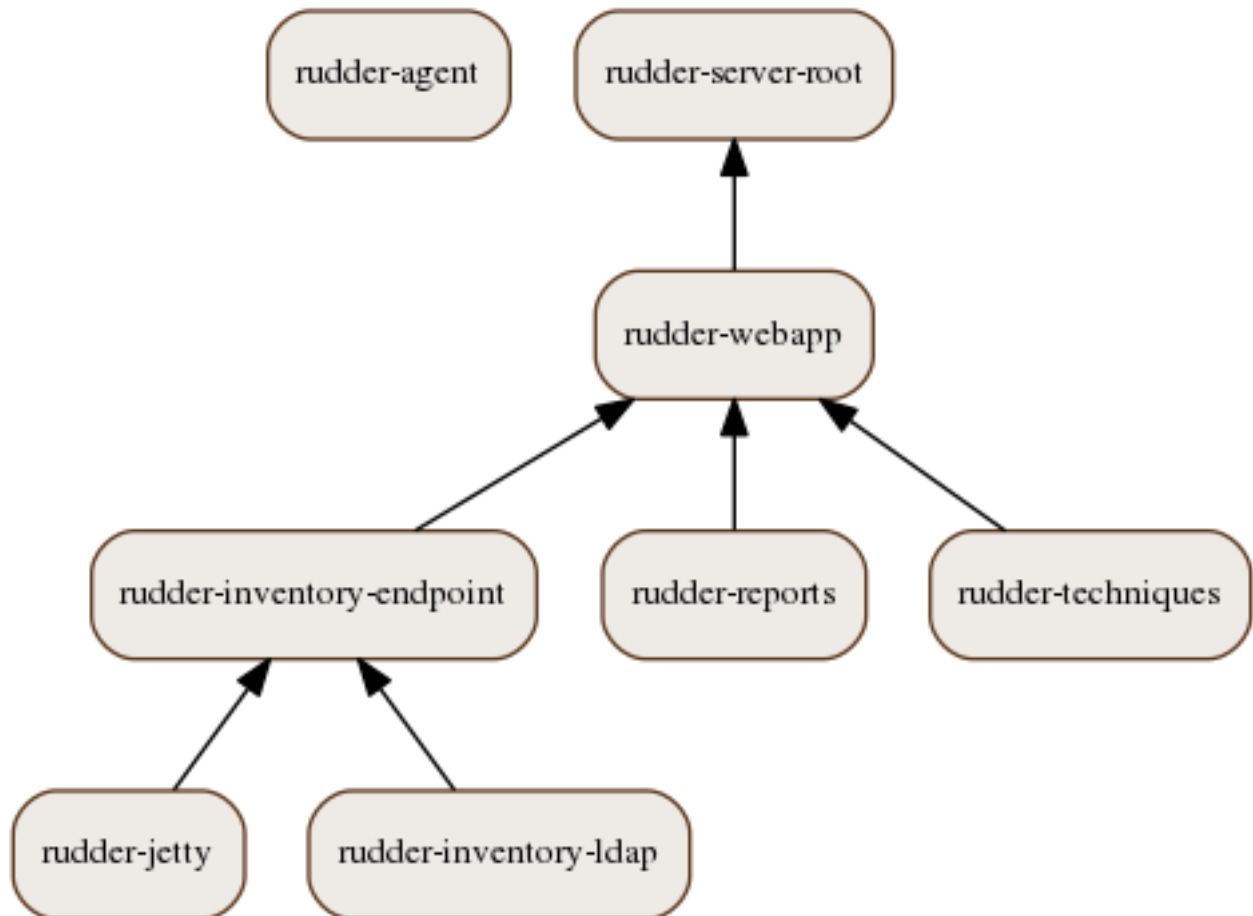


Figure 14.3: Rudder packages and their dependencies

rudder-webapp Package for the *Rudder* Web Application. It is the graphical interface for *Rudder*.

rudder-inventory-endpoint Package for the inventory reception service. It has no graphical interface. This service is using HTTP as transport protocol. It receives and parses the files sent by *FusionInventory* and insert the valuable data into the *LDAP* database.

rudder-jetty Application server for *rudder-webapp* and *rudder-inventory-endpoint*. Both packages are written in *Scala*. At compilation time, they are converted into *.war* files. They need to be run in an application server. *Jetty* is this application server. It depends on a compatible Java 7 Runtime Environment.

rudder-techniques Package for the *Techniques*. They are installed in `/opt/rudder/share/techniques`. At runtime, the *Techniques* are copied into a *git* repository in `/var/rudder/configuration-repository`. Therefore, the package depends on the *git* package.

rudder-inventory-ldap Package for the database containing the inventory and configuration information for each pending and validated *Node*. This *LDAP* database is build upon *OpenLDAP* server. The *OpenLDAP* engine is contained in the package.

rudder-reports Package for the database containing the logs sent by each *Node* and the reports computed by *Rudder*. This is a *PostgreSQL* database using the *PostgreSQL* engine of the distribution. The package has a dependency on the `postgresql` package, creates the database named `rudder` and installs the initialisation scripts for that database in `/opt/rudder/etc/postgresql/*.sql`.

rudder-server-root Package to ease installation of all *Rudder* services. This package depends on all above packages. It also

- installs the *Rudder* configuration script:

```
/opt/rudder/bin/rudder-init
```

- installs the initial promises for the Root Server in:

```
/opt/rudder/share/initial-promises/
```

- installs the init scripts (and associated default file):

```
/etc/init.d/rudder
```

- installs the logrotate configuration:

```
/etc/logrotate.d/rudder-server-root
```

rudder-agent One single package integrates everything needed for the *Rudder* Agent. It contains *CFEngine* Community, *FusionInventory*, and the initial promises for a *Node*. It also contains an init script:

```
/etc/init.d/rudder
```

The `rudder-agent` package depends on a few libraries and utilities:

- `OpenSSL`
- `libpcrc`
- `liblmbd` (On platforms where it is available as a package - on others the `rudder-agent` package bundles it)
- `uuidgen`

14.6.2 Software dependencies and third party components

The *Rudder* Web application requires the installation of Apache 2 *httpd*, *JRE* 7+, and *cURL*; the *LDAP Inventory* service needs *rsyslog* and the report service requires *PostgreSQL*.

When available, packages from your distribution are used. These packages are:

Apache The *Apache* Web server is used as a proxy to give HTTP access to the Web Application. It is also used to give writable WebDAV access for the inventory. The *Nodes* send their inventory to the WebDAV service, the inventory is stored in `/var/rudder/inventories/incoming`.

PostgreSQL The PostgreSQL database (version ≥ 8.4) is used to store logs sent by the *Nodes* and reports generated by *Rudder*. PostgreSQL 9.1+ is recommended for optimal performances.

rsyslog and rsyslog-pgsql The *rsyslog* server is receiving the logs from the nodes and insert them into a PostgreSQL database. On SLES, the `rsyslog-pgsql` package is not part of the distribution, it can be downloaded alongside *Rudder* packages.

Java 7+ JRE The Java runtime is needed by the Jetty application server. Where possible, the package from the distribution is used, else a Java RE must be downloaded from *Oracle's* website (<http://www.java.com>).

curl This package is used to send inventory files from `/var/rudder/inventories/incoming` to the *Rudder* Endpoint.

git The running *Techniques* Library is maintained as a git repository in `/var/rudder/configuration-repository/techniques`.

14.7 Generic methods

This section documents all the generic methods available in the **Technique Editor**.

14.7.1 Command

14.7.1.1 `command_execution`

Execute a command

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **command_name**: Command name

Classes defined

```
command_execution_${command_name}_{kept, repaired, not_ok, reached}
```

14.7.1.2 `command_execution_result`

Execute a command and create outcome classes depending on its exit code

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

Execute a command and create outcome classes depending on the exit codes given in parameters. If an exit code is not in the list it will lead to an error status. If you want 0 to be a success you have to list it in the `kept_codes` list

Parameters

- **command**: The command to run
- **kept_codes**: List of codes that produce a kept status separated with commas (ex: 1,2,5)
- **repaired_codes**: List of codes that produce a repaired status separated with commas (ex: 3,4,6)

Classes defined

```
command_execution_result_${command}_{kept, repaired, not_ok, reached}
```

14.7.2 Directory

14.7.2.1 `directory_absent`

Ensure a directory's absence

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

If `recursive` is false, only an empty directory can be deleted.

Parameters

- **target**: Directory to remove
- **recursive**: Should deletion be recursive, "true" or "false" (defaults to "false")

Classes defined

```
directory_absent_${target}_{kept, repaired, not_ok, reached}
```

14.7.2.2 directory_check_exists

Checks if a directory exists

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This bundle will define a class `directory_check_exists_${directory_name}_{ok, reached, kept}` if the directory exists, or `directory_check_exists_${directory_name}_{not_ok, reached, not_kept, failed}` if the directory doesn't exist

Parameters

- **directory_name:** Full path of the directory to check

Classes defined

```
directory_check_exists_${directory_name}_{kept, repaired, not_ok, reached}
```

14.7.2.3 directory_create

Create a directory if it doesn't exist

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **target:** Full path of directory to create (trailing / is optional)

Classes defined

```
directory_create_${target}_{kept, repaired, not_ok, reached}
```

14.7.3 File

14.7.3.1 file_check_FIFO_pipe

Checks if a file exists and is a FIFO/Pipe

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This bundle will define a class `file_check_FIFO_pipe_${file_name}_{ok, reached, kept}` if the file is a FIFO, or `file_check_FIFO_pipe_${file_name}_{not_ok, reached, not_kept, failed}` if the file is not a fifo or does not exist

Parameters

- **file_name:** File name (absolute path on the target node)

Classes defined

```
file_check_FIFO_pipe_${file_name}_{kept, repaired, not_ok, reached}
```

14.7.3.2 file_check_block_device

Checks if a file exists and is a block device

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This bundle will define a class `file_check_block_device_${file_name}_{ok, reached, kept}` if the file is a block device, or `file_check_block_device_${file_name}_{not_ok, reached, not_kept, failed}` if the file is not a block device or does not exist

Parameters

- **file_name:** File name (absolute path on the target node)

Classes defined

```
file_check_block_device_${file_name}_{kept, repaired, not_ok, reached}
```

14.7.3.3 file_check_character_device

Checks if a file exists and is a character device

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This bundle will define a class `file_check_character_device_${file_name}_{ok, reached, kept}` if the file is a character device, or `file_check_character_device_${file_name}_{not_ok, reached, not_kept, failed}` if the file is not a character device or does not exist

Parameters

- **file_name:** File name (absolute path on the target node)

Classes defined

```
file_check_character_device_${file_name}_{kept, repaired, not_ok, reached}
```

14.7.3.4 file_check_exists

Checks if a file exists

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This bundle will define a class `file_check_exists_${file_name}_{ok, reached, kept}` if the file exists, or `file_check_exists_${file_name}_{not_ok, reached, not_kept, failed}` if the file doesn't exist

Parameters

- **file_name:** File name (absolute path on the target node)

Classes defined

```
file_check_exists_${file_name}_{kept, repaired, not_ok, reached}
```

14.7.3.5 file_check_hardlink

Checks if two files are the same (hard links)

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This bundle will define a class `file_check_hardlink_${file_name_1}_{ok, reached, kept}` if the two files `${file_name_1}` and `${file_name_2}` are hard links of each other, or `file_check_hardlink_${file_name_1}_{not_ok, reached, not_kept, failed}` if the files are not hard links.

Parameters

- **file_name_1**: File name #1 (absolute path on the target node)
- **file_name_2**: File name #2 (absolute path on the target node)

Classes defined

```
file_check_hardlink_${file_name_1}_{kept, repaired, not_ok, reached}
```

14.7.3.6 file_check_regular

Checks if a file exists and is a regular file

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This bundle will define a class `file_check_regular_${file_name}_{ok, reached, kept}` if the file is a regular file, or `file_check_regular_${file_name}_{not_ok, reached, not_kept, failed}` if the file is not a regular file or does not exist

Parameters

- **file_name**: File name (absolute path on the target node)

Classes defined

```
file_check_regular_${file_name}_{kept, repaired, not_ok, reached}
```

14.7.3.7 file_check_socket

Checks if a file exists and is a socket

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This bundle will define a class `file_check_socket_${file_name}_{ok, reached, kept}` if the file is a socket, or `file_check_socket_${file_name}_{not_ok, reached, not_kept, failed}` if the file is not a socket or does not exist

Parameters

- **file_name**: File name (absolute path on the target node)

Classes defined

```
file_check_socket_${file_name}_{kept, repaired, not_ok, reached}
```

14.7.3.8 file_check_symlink

Checks if a file exists and is a symlink

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This bundle will define a class `file_check_symlink_${file_name}_{ok, reached, kept}` if the file is a symlink, or `file_check_symlink_${file_name}_{not_ok, reached, not_kept, failed}` if the file is not a symlink or does not exist

Parameters

- **file_name:** File name (absolute path on the target node)

Classes defined

```
file_check_symlink_${file_name}_{kept, repaired, not_ok, reached}
```

14.7.3.9 file_check_symlinkto

Checks if first file is symlink to second file

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This bundle will define a class `file_check_symlinkto_${target}_{ok, reached, kept}` if the file `${symlink}` is a symbolic link to `${target}`, or `file_check_symlinkto_${target}_{not_ok, reached, not_kept, failed}` if it is not a symbolic link, or any of the files does not exist. The symlink's path is resolved to the absolute path and checked against the target file's path, which must also be an absolute path.

Parameters

- **symlink:** Symbolic link (absolute path on the target node)
- **target:** Target file (absolute path on the target node)

Classes defined

```
file_check_symlinkto_${symlink}_{kept, repaired, not_ok, reached}
```

14.7.3.10 file_copy_from_local_source

Ensure that a file or directory is copied from a local source

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **source:** Source file (absolute path on the target node)
- **destination:** Destination file (absolute path on the target node)

Classes defined

```
file_copy_from_local_source_${destination}_{kept, repaired, not_ok, reached}
```

14.7.3.11 file_copy_from_local_source_recursion

Ensure that a file or directory is copied from a local source

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **source:** Source file (absolute path on the target node)
- **destination:** Destination file (absolute path on the target node)
- **recursion:** Recursion depth to enforce for this path (0, 1, 2, ..., inf)

Classes defined

```
file_copy_from_local_source_${destination}_{kept, repaired, not_ok, reached}
```

14.7.3.12 file_copy_from_remote_source

Ensure that a file or directory is copied from a policy server

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

Note: This method uses *CFEngine* file copy protocol, and can only download files from the policy server. To download a file from an external source, you can use HTTP with the [file_download](#) method.

This method requires that the policy server is configured to accept copy of the source file from the agents it will be applied to.

You have to write the full path of the file on the policy server, for example:

```
/home/myuser/myfile
```

If you are using *Rudder*, you can download a file from the shared files with:

```
/var/rudder/configuration-repository/shared-files/PATH_TO_YOUR_FILE
```

Parameters

- **source:** Source file (absolute path on the policy server)
- **destination:** Destination file (absolute path on the target node)

Classes defined

```
file_copy_from_remote_source_${destination}_{kept, repaired, not_ok, reached}
```

14.7.3.13 file_copy_from_remote_source_recursion

Ensure that a file or directory is copied from a policy server

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This method requires that the policy server is configured to accept copy of the source file or directory from the agents it will be applied to.

You have to write the full path of the file or directory on the policy server, for example:

```
/home/myuser/mydirectory
```

If you are using *Rudder*, you can download a file from the shared files with:

```
/var/rudder/configuration-repository/shared-files/PATH_TO_YOUR_DIRECTORY_OR_FILE
```

Parameters

- **source:** Source file (absolute path on the policy server)
- **destination:** Destination file (absolute path on the target node)
- **recursion:** Recursion depth to enforce for this path (0, 1, 2, ..., inf)

Classes defined

```
file_copy_from_remote_source_${destination}_{kept, repaired, not_ok, reached}
```

14.7.3.14 file_create

Create a file if it doesn't exist

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **target:** File to create (absolute path on the target node)

Classes defined

```
file_create_${target}_{kept, repaired, not_ok, reached}
```

14.7.3.15 file_create_symlink

Create a symlink at a destination path and pointing to a source target except if a file or directory already exists.

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **source:** Source file (absolute path on the target node)
- **destination:** Destination file (absolute path on the target node)

Classes defined

```
file_create_symlink_${destination}_{kept, repaired, not_ok, reached}
```

14.7.3.16 file_create_symlink_enforce

Create a symlink at a destination path and pointing to a source target. This is also possible to enforce its creation

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **source:** Source file (absolute path on the target node)
- **destination:** Destination file (absolute path on the target node)
- **enforce:** Force symlink if file already exist (true or false)

Classes defined

```
file_create_symlink_${destination}_{kept, repaired, not_ok, reached}
```

14.7.3.17 file_create_symlink_force

Create a symlink at a destination path and pointing to a source target even if a file or directory already exists.

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **source:** Source file (absolute path on the target node)
- **destination:** Destination file (absolute path on the target node)

Classes defined

```
file_create_symlink_${destination}_{kept, repaired, not_ok, reached}
```

14.7.3.18 file_download

Download a file if it does not exist, using curl with a fallback on wget

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This method finds a HTTP command-line tool and downloads the given source into the destination.

It tries `curl` first, and `wget` as fallback.

Parameters

- **source:** URL to download from
- **destination:** File destination (absolute path on the target node)

Classes defined

```
file_download_${destination}_{kept, repaired, not_ok, reached}
```

14.7.3.19 file_enforce_content

Enforce the content of a file

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **file:** File name to edit (absolute path on the target node)
- **lines:** Line(s) to add in the file
- **enforce:** Enforce the file to contain only line(s) defined (true or false)

Classes defined

```
file_ensure_lines_present_${file}_{kept, repaired, not_ok, reached}
```

14.7.3.20 file_ensure_block_in_section

Ensure that a section contains exactly a text block

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **file:** File name to edit (absolute path on the target node)
- **section_start:** Start of the section
- **section_end:** End of the section
- **block:** Block representing the content of the section

Classes defined

```
file_ensure_block_in_section_${file}_{kept, repaired, not_ok, reached}
```

14.7.3.21 file_ensure_block_present

Ensure that a text block is present in a specific location

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **file:** File name to edit (absolute path on the target node)
- **block:** Block(s) to add in the file

Classes defined

```
file_ensure_block_present_${file}_{kept, repaired, not_ok, reached}
```

14.7.3.22 file_ensure_key_value

Ensure that the file contains a pair of "key separator value"

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

Edit (or create) the file, and ensure it contains an entry key → value with arbitrary separator between the key and its value. If the key is already present, the method will change the value associated with this key.

Parameters

- **file:** File name to edit (absolute path on the target node)
- **key:** Key to define
- **value:** Value to define
- **separator:** Separator between key and value (for example "=" or " ")

Classes defined

```
file_ensure_key_value_${file}_{kept, repaired, not_ok, reached}
```

14.7.3.23 file_ensure_key_value_option

Ensure that the file contains a pair of "key separator value", with options on the spacing around the separator

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

Edit (or create) the file, and ensure it contains an entry key → value with arbitrary separator between the key and its value. If the key is already present, the method will change the value associated with this key.

Parameters

- **file:** File name to edit (absolute path on the target node)
- **key:** Key to define
- **value:** Value to define
- **option:** Option for the spacing around the separator: strict, which prevent spacings (space or tabs) around separators, or lax which accepts any number of spaces around separators
- **separator:** Separator between key and value (for example "=" or " ")

Classes defined

```
file_ensure_key_value_${file}_{kept, repaired, not_ok, reached}
```

14.7.3.24 file_ensure_key_value_parameter_in_list

Ensure that one parameter exists in a list of parameters, on one single line, in the right hand side of a key→values line

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

Edit the file, and ensure it contains the defined parameter in the list of values on the right hand side of a key→values line. If the parameter is not there, it will be added at the end, separated by parameter_separator. Optionnaly, you can define leading and closing character to enclose the parameters If the key does not exist in the file, it will be added in the file, along with the parameter

14.7.3.25 Example

If you have an initial file (/etc/default/grub) containing

```
GRUB_CMDLINE_XEN="dom0_mem=16G"
```

To add parameter dom0_max_vcpus=32 in the right hand side of the line, you'll need the following policy

```
file_ensure_key_value_parameter_in_list("/etc/default/grub", "GRUB_CMDLINE", "=", ↵
    "dom0_max_vcpus=32", " ", "\"", "\"");
```

Parameters

- **file:** File name to edit (absolute path on the target node)
- **key:** Full key name
- **key_value_separator:** character used to separate key and value in a key-value line
- **parameter:** String representing the sub-value to ensure is present in the list of parameters that form the value part of that line

- **parameter_separator**: Character used to separate parameters in the list
- **leading_char_separator**: leading character of the parameters
- **closing_char_separator**: closing character of the parameters

Classes defined

```
file_ensure_key_value_parameter_in_list_${file}_{kept, repaired, not_ok, reached}
```

14.7.3.26 file_ensure_key_value_parameter_not_in_list

Ensure that a parameter doesn't exist in a list of parameters, on one single line, in the right hand side of a key→values line

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

Edit the file, and ensure it does not contain the defined parameter in the list of values on the right hand side of a key→values line. If the parameter is there, it will be removed. Please note that the parameter can be a regular expression. It will also remove any whitespace character between the parameter and parameter_separator. Optionnaly, you can define leading and closing character to enclose the parameters

14.7.3.27 Example

If you have an initial file (/etc/default/grub) containing

```
GRUB_CMDLINE_XEN="dom0_mem=16G dom0_max_vcpus=32"
```

To remove parameter dom0_max_vcpus=32 in the right hand side of the line, you'll need the following policy

```
file_ensure_key_value_parameter_not_in_list("/etc/default/grub", "GRUB_CMDLINE", ←
    "=", "dom0_max_vcpus=32", " ", "\"", "\"");
```

Parameters

- **file**: File name to edit (absolute path on the target node)
- **key**: Full key name
- **key_value_separator**: character used to separate key and value in a key-value line
- **parameter_regex**: Regular expression matching the sub-value to ensure is not present in the list of parameters that form the value part of that line
- **parameter_separator**: Character used to separate parameters in the list
- **leading_char_separator**: leading character of the parameters
- **closing_char_separator**: closing character of the parameters

Classes defined

```
file_ensure_key_value_parameter_not_in_list_${file}_{kept, repaired, not_ok, ←
    reached}
```

14.7.3.28 file_ensure_key_value_present_in_ini_section

Ensure that a key-value pair is present in a section in a specific location. The objective of this method is to handle INI-style files. Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **file:** File name to edit (absolute path on the target node)
- **section:** Name of the INI-style section under which the line should be added or modified (not including the [] brackets)
- **name:** Name of the key to add or edit
- **value:** Value of the key to add or edit

Classes defined

```
file_ensure_key_value_present_in_ini_section_${file}_{kept, repaired, not_ok, ↵  
    reached}
```

14.7.3.29 file_ensure_keys_values

Ensure that the file contains all pairs of "key separator value", with arbitrary separator between each key and its value. Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This method ensures key-value pairs are present in a file.

14.7.3.30 Usage

This method will iterate over the key-value pairs in the dict, and:

- If the key is not defined in the destination, add the *key separator + value* line.
- If the key is already present in the file, replace the *key separator + anything* by *key + separator + value*

This method always ignores spaces and tabs when replacing (which means for example that `key = value` will match the `=` separator).

Keys are considered unique (to allow replacing the value), so you should use `file_ensure_lines_present` if you want to have multiple lines with the same key.

14.7.3.31 Example

If you have an initial file (`/etc/myfile.conf`) containing:

```
key1 = something  
key3 = value3
```

To define key-value pairs, use the `variable_dict` or `variable_dict_from_file` methods.

For example, if you use the following content (stored in `/tmp/data.json`):

```
{  
  "key1": "value1",  
  "key2": "value2"  
}
```

With the following policy:

```
# Define the `content` variable in the `configuration` prefix from the json file
variable_dict_from_file("configuration", "content", "/tmp/data.json")
# Enforce the presence of the key-value pairs
file_ensure_keys_values("/etc/myfile.conf", "configuration.content", " = ")
```

The destination file (/etc/myfile.conf) will contain:

```
key1 = value1
key3 = value3
key2 = value2
```

Parameters

- **file:** File name to edit (absolute path on the target node)
- **keys:** Name of the dict structure (without "\${}") containing the keys (keys of the dict), and values to define (values of the dict)
- **separator:** Separator between key and value (for example "=" or " ")

Classes defined

```
file_ensure_keys_values_${file}_{kept, repaired, not_ok, reached}
```

14.7.3.32 file_ensure_line_present_in_ini_section

Ensure that a line is present in a section in a specific location. The objective of this method is to handle INI-style files.

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **file:** File name to edit (absolute path on the target node)
- **section:** Name of the INI-style section under which lines should be added (not including the [] brackets)
- **line:** Line to ensure is present inside the section

Classes defined

```
file_ensure_line_present_in_ini_section_${file}_{kept, repaired, not_ok, reached}
```

14.7.3.33 file_ensure_line_present_in_xml_tag

Ensure that a line is present in a tag in a specific location. The objective of this method is to handle XML-style files. Note that if the tag is not present in the file, it won't be added, and the edition will fail.

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **file:** File name to edit (absolute path on the target node)
- **tag:** Name of the XML tag under which lines should be added (not including the <> brackets)
- **line:** Line to ensure is present inside the section

Classes defined

```
file_ensure_line_present_in_xml_tag_${file}_{kept, repaired, not_ok, reached}
```

14.7.3.34 file_ensure_lines_absent

Ensure that a line is absent in a specific location

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **file:** File name to edit (absolute path on the target node)
- **lines:** Line(s) to remove in the file

Classes defined

```
file_ensure_lines_absent_${file}_{kept, repaired, not_ok, reached}
```

14.7.3.35 file_ensure_lines_present

Ensure that one or more lines are present in a file

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **file:** File name to edit (absolute path on the target node)
- **lines:** Line(s) to add in the file

Classes defined

```
file_ensure_lines_present_${file}_{kept, repaired, not_ok, reached}
```

14.7.3.36 file_from_template

Build a file from a legacy *CFEngine* template

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

See [file_from_template_type](#) for general documentation about templates usage.

Parameters

- **source_template:** Source file containing a template to be expanded (absolute path on the target node)
- **destination:** Destination file (absolute path on the target node)

Classes defined

```
file_from_template_${destination}_{kept, repaired, not_ok, reached}
```

14.7.3.37 file_from_template_mustache

Build a file from a mustache template

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

See [file_from_template_type](#) for general documentation about templates usage.

14.7.3.38 Syntax

Mustache is a logic-less templating language, available in a lot of languages, and used for file templating in *CFEngine*. The mustache syntax reference is <https://mustache.github.io/mustache.5.html>.

We will here describe the way to get agent data into a template. As explained in the general templating documentation, we can access various data in a mustache template.

The main specificity compared to standard mustache syntax of prefixes in all expanded values:

- `classes` to access classes
- `vars` to access all variables

Classes

Here is how to display content depending on classes definition:

```
{{#classes.my_class}}
  content when my_class is defined
{{/classes.my_class}}

{{^classes.my_class}}
  content when my_class is *not* defined
{{/classes.my_class}}
```

Note: You cannot use class expressions here.

Scalar variable

Here is how to display a scalar variable value (integer, string, ...), if you have defined `variable_string("variable_prefix", "my_variable", "my_value")`:

```
{{{vars.variable_prefix.my_variable}}}
```

We use the triple `{{{ }}` to avoid escaping html entities.

Iteration

Iteration is done using a syntax similar to scalar variables, but applied on container variables.

- Use `{{#vars.container}}` content `{{/vars.container}}` to iterate
- Use `{{{.}}}` for the current element value in iteration
- Use `{{{.key}}}` for the key value in current element
- Use `{{{@}}}` for the current element key in iteration

To iterate over a list, for example defined with:

```
variable_iterator("variable_prefix", "iterator_name", "a,b,c", ",")
```

Use the following file:

```
{{#vars.variable_prefix.iterator_name}}
{{{.}}} is the current iterator_name value
{{/vars.variable_prefix.iterator_name}}
```

Which will be expanded as:

```
a is the current iterator_name value
b is the current iterator_name value
c is the current iterator_name value
```

To iterate over a container defined by the following json file, loaded with `variable_dict_from_file("variable_prefix", "dict_name", "path")`:

```
{
  "hosts": [
    "host1",
    "host2"
  ],
  "files": [
    {"name": "file1", "path": "/path1", "users": [ "user1", "user11" ] },
    {"name": "file2", "path": "/path2", "users": [ "user2" ] }
  ],
  "properties": {
    "prop1": "value1",
    "prop2": "value2"
  }
}
```

Use the following template:

```
{{#vars.variable_prefix.dict_name.hosts}}
{{{.}}} is the current hosts value
{{/vars.variable_prefix.dict_name.hosts}}

# will display the name and path of the current file
{{#vars.variable_prefix.dict_name.files}}
{{{.name}}}: {{{.path}}}
{{/vars.variable_prefix.dict_name.files}}

# will display the users list of each file
{{#vars.variable_prefix.dict_name.files}}
{{{.name}}}:{{#users}} {{{.}}}{{/users}}
{{/vars.variable_prefix.dict_name.files}}

# will display the current properties key/value pair
{{#vars.variable_prefix.dict_name.properties}}
{{{@}}} -> {{{.}}}
{{/vars.variable_prefix.dict_name.properties}}
```

Which will be expanded as:

```
host1 is the current hosts value
host2 is the current hosts value

# will display the name and path of the current file
file1: /path1
file2: /path2

# will display the users list of each file
file1: user1 user11
file2: user2

# will display the current properties key/value pair
prop1 -> value1
prop2 -> value2
```

Note: Starting from *CFEngine* 3.7, you can use `{{#-top-}}` ... `{{/-top-}}` to iterate over the top level container.

Parameters

- **source_template**: Source file containing a template to be expanded (absolute path on the target node)
- **destination**: Destination file (absolute path on the target node)

Classes defined

```
file_from_template_${destination}_{kept, repaired, not_ok, reached}
```

14.7.3.39 file_from_template_type

Build a file from a template

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

These methods write a file based on a provided template and the data available to the agent.

14.7.3.40 Usage

To use these methods (`file_from_template_*`), you need to have:

- a template file
- data to fill this template

The template file should be somewhere on the local file system, so if you want to use a file shared from the policy server, you need to copy it first (using [file_copy_from_remote_source](#)).

It is common to use a specific folder to store those templates after copy, for example in `${sys.workdir}/templates/`.

The data that will be used while expanding the template is the data available in the agent at the time of expansion. That means:

- *CFEngine*'s sytem variables (`${sys.*}`, ...) and classes (`linux`, ``)
- data defined during execution (outcome classes of generic methods, ...)
- classes based on `condition_` generic methods
- data defined in ncf using `variable_*` generic methods, which allow for example to load data from local json or yaml files.

14.7.3.41 Template types

ncf currently supports two templating languages:

- mustache templates, which are documented in [file_from_template_mustache](#)
- *CFEngine* templates, which are a legacy implementation that is here for compatibility, and should not be used for new templates.

14.7.3.42 Example

Here is a complete example of templating usage:

The (basic) template file, present on the server in `/PATH_TO_MY_FILE/ntp.conf.mustache` (for syntax reference, see [file_from_template_mustache](#)):

```
{{#classes.linux}}
server {{{vars.configuration.ntp.hostname}}}
{{/classes.linux}}
{{^classes.linux}}
server hardcoded.server.example
{{/classes.linux}}
```

And on your local node in `/tmp/ntp.json`, the following json file:

```
{ "hostname": "my.hostname.example" }
```

And the following policy:

```
# Copy the file from the policy server
file_copy_from_remote_source("/PATH_TO_MY_FILE/ntp.conf.mustache", "${sys.workdir} ←
    }/templates/ntp.conf.mustache")
# Define the 'ntp' variable in the 'configuration' prefix from the json file
variable_dict_from_file("configuration", "ntp", "/tmp/ntp.json")
# Expand your template
file_from_template_type("${sys.workdir}/templates/ntp.conf.mustache", "/etc/ntp. ←
    conf", "mustache")
# or
# file_from_template_mustache("${sys.workdir}/templates/ntp.conf.mustache", "/etc/ ←
    ntp.conf")
```

The destination file will contain the expanded content, for example on a Linux node:

```
server my.hostname.example
```

Parameters

- **source_template**: Source file containing a template to be expanded (absolute path on the target node)
- **destination**: Destination file (absolute path on the target node)
- **template_type**: Template type (cfengine or mustache)

Classes defined

```
file_from_template_${destination}_{kept, repaired, not_ok, reached}
```

14.7.3.43 file_remove

Remove a file if it exists

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **target**: File to remove (absolute path on the target node)

Classes defined

```
file_remove_${target}_{kept, repaired, not_ok, reached}
```

14.7.3.44 file_replace_lines

Ensure that a line in a file is replaced by another one

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

You can replace lines in a files, based on regular expression and captured pattern

14.7.3.45 Syntax

The content to match in the file is a PCRE regular expression, unanchored that you can replace with the content of replacement.

Content can be captured in regular expression, and be reused with the notation `${match.1}` (for first matched content), `${match.2}` for second, etc, and the special captured group `${match.0}` for the whole text.

14.7.3.46 Example

Here is an example to remove enclosing specific tags

```
file_replace_lines("/PATH_TO_MY_FILE/file", "<my>(.*?)<pattern>", "my ${match.1} ← pattern")
```

Parameters

- **file:** File name to edit (absolute path on the target node)
- **line:** Line to match in the file
- **replacement:** Line to add in the file as a replacement

Classes defined

```
file_replace_lines_${file}_{kept, repaired, not_ok, reached}
```

14.7.3.47 file_template_expand

This is a bundle to expand a template in a specific location

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **tml_file:** File name (with full path within the framework) of the template file
- **target_file:** File name (with full path) where to expand the template
- **mode:** Mode of destination file
- **owner:** Owner of destination file
- **group:** Froup of destination file

Classes defined

```
file_template_expand_${target_file}_{kept, repaired, not_ok, reached}
```

14.7.4 Group

14.7.4.1 group_absent

Make sure a group is absent

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **group:** *Group* name

Classes defined

```
group_absent_${group}_{kept, repaired, not_ok, reached}
```

14.7.4.2 group_present

Create a group

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **group:** *Group* name

Classes defined

```
group_present_${group}_{kept, repaired, not_ok, reached}
```

14.7.5 Http

14.7.5.1 http_request_check_status_headers

Checks status of an HTTP URL

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

Perform a HTTP request on the URL, method and headers provided and check that the response has the expected status code (ie 200, 404, 503, etc)

Parameters

- **method:** Method to call the URL (GET, POST, PUT, DELETE)
- **url:** URL to query
- **expected_status:** Expected status code of the HTTP response
- **headers:** Headers to include in the HTTP request (as a string, without ')

Classes defined

```
http_request_check_status_headers_${url}_{kept, repaired, not_ok, reached}
```

14.7.5.2 http_request_content_headers

Make an HTTP request with a specific header

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

Perform a HTTP request on the URL, method and headers provided and send the content provided. Will return an error if the request failed.

Parameters

- **method:** Method to call the URL (POST, PUT)
- **url:** URL to send content to
- **content:** Content to send
- **headers:** Headers to include in the HTTP request

Classes defined

```
http_request_content_headers_${url}_{kept, repaired, not_ok, reached}
```

14.7.6 Logger

14.7.6.1 logger_rudder

Logging output for *Rudder* reports

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **message:** The common part of the message to display
- **class_prefix:** The prefix of the class for different states

Classes defined

```
logger_rudder_${class_prefix}_{kept, repaired, not_ok, reached}
```

14.7.7 Package

14.7.7.1 package_check_installed

Verify if a package is installed in any version

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This bundle will define a class `package_check_installed_${file_name}_{ok, reached, kept}` if the package is installed, or `package_check_installed_${file_name}_{not_ok, reached, not_kept, failed}` if the package is not installed

Parameters

- **package_name:** Name of the package to check

Classes defined

```
package_check_installed_${package_name}_{kept, repaired, not_ok, reached}
```

14.7.7.2 package_install

Install or update a package in its latest version available

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **package_name**: Name of the package to install

Classes defined

```
package_install_${package_name}_{kept, repaired, not_ok, reached}
```

14.7.7.3 package_install_version

Install or update a package in a specific version

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **package_name**: Name of the package to install
- **package_version**: Version of the package to install (can be "latest" to install it in its latest version)

Classes defined

```
package_install_${package_name}_{kept, repaired, not_ok, reached}
```

14.7.7.4 package_install_version_cmp

Install a package or verify if it is installed in a specific version, or higher or lower version than a version specified

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

Example:

```
methods:
  "any" usebundle => package_install_version_cmp("postgresql", ">=", "9.1", " ←
    verify");
```

Parameters

- **package_name**: Name of the package to install or verify
- **version_comparator**: Comparator between installed version and defined version, can be ==, <=, >=, <, >, !=
- **package_version**: The version of the package to verify (can be "latest" for latest version)
- **action**: Action to perform, can be add, verify (defaults to verify)

Classes defined

```
package_install_${package_name}_{kept, repaired, not_ok, reached}
```


14.7.7.5 package_install_version_cmp_update

Install a package or verify if it is installed in a specific version, or higher or lower version than a version specified, optionally test update or not (*Debian*-, Red Hat- or *SuSE*-like systems only)

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

Example:

methods:

```
"any" usebundle => package_install_version_cmp_update("postgresql", ">=", ←
    "9.1", "verify", "false");
```

Parameters

- **package_name**: Name of the package to install or verify
- **version_comparator**: Comparator between installed version and defined version, can be ==, <=, >=, <, >, !=
- **package_version**: The version of the package to verify (can be "latest" for latest version)
- **action**: Action to perform, can be add, verify (defaults to verify)
- **update_policy**: While verifying packages, check against latest version ("true") or just installed ("false")

Classes defined

```
package_install_${package_name}_{kept, repaired, not_ok, reached}
```

14.7.7.6 package_remove

Remove a package

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

Example:

methods:

```
"any" usebundle => package_remove("htop");
```

Parameters

- **package_name:** Name of the package to remove

Classes defined

```
package_remove_${package_name}_{kept, repaired, not_ok, reached}
```

14.7.7.7 package_verify

Verify if a package is installed in its latest version available

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **package_name**: Name of the package to verify

Classes defined

```
package_install_${package_name}_{kept, repaired, not_ok, reached}
```

14.7.7.8 package_verify_version

Verify if a package is installed in a specific version

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **package_name**: Name of the package to verify
- **package_version**: Version of the package to verify (can be "latest" for latest version)

Classes defined

```
package_install_${package_name}_{kept, repaired, not_ok, reached}
```

14.7.8 Permissions

14.7.8.1 permissions

Set permissions on a file or directory (non recursively)

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **path**: Path to the file/directory
- **mode**: Mode to enforce (like "640")
- **owner**: Owner to enforce (like "root")
- **group**: *Group* to enforce (like "wheel")

Classes defined

```
permissions_${path}_{kept, repaired, not_ok, reached}
```

14.7.8.2 permissions_dirs

Verify if a directory has the right permissions non recursively

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **path**: Path of the directory
- **mode**: Mode to enforce
- **owner**: Owner to enforce
- **group**: *Group* to enforce

Classes defined

```
permissions_${path}_{kept, repaired, not_ok, reached}
```

14.7.8.3 permissions_dirs_recurse

Verify if a directory has the right permissions recursively

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **path:** Path to the directory
- **mode:** Mode to enforce
- **owner:** Owner to enforce
- **group:** *Group* to enforce

Classes defined

```
permissions_${path}_{kept, repaired, not_ok, reached}
```

14.7.8.4 permissions_recurse

Verify if a file or directory has the right permissions recursively

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **path:** Path to the file / directory
- **mode:** Mode to enforce
- **owner:** Owner to enforce
- **group:** *Group* to enforce

Classes defined

```
permissions_${path}_{kept, repaired, not_ok, reached}
```

14.7.8.5 permissions_type_recursion

Ensure that a file or directory is present and has the right mode/owner/group

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **path:** Path to edit
- **mode:** Mode of the path to edit
- **owner:** Owner of the path to edit
- **group:** *Group* of the path to edit
- **type:** Type of the path to edit (all/files/directories)
- **recursion:** Recursion depth to enforce for this path (0, 1, 2, ..., inf)

Classes defined

```
permissions_${path}_{kept, repaired, not_ok, reached}
```

14.7.9 Schedule

14.7.9.1 schedule_simple

Trigger a repaired outcome when a job should be run

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This bundle will define a class `schedule_simple_${job_id}_{kept, repaired, not_ok, ok, reached} * _ok` or `_kept` for when there is nothing to do `* _repaired` if the job should run `* _not_ok` and `_reached` have their usual meaning

Parameters

- **job_id**: A string to identify this job
- **agent_periodicity**: How often you run the agent in minutes
- **max_execution_delay_minutes**: On how many minutes you want to spread the job
- **max_execution_delay_hours**: On how many hours you want to spread the job
- **start_on_minutes**: At which minute should be the first run
- **start_on_hours**: At which hour should be the first run
- **start_on_day_of_week**: At which day of week should be the first run
- **periodicity_minutes**: How often should the job run
- **periodicity_hours**: How often should the job run
- **periodicity_days**: How often should the job run
- **mode**: "nodups": avoid duplicate runs in the same period / "catchup": avoid duplicates and one or more run have been missed, run once before next period / "stateless": no check is done on past runs

Classes defined

```
schedule_simple_${job_id}_{kept, repaired, not_ok, reached}
```

14.7.9.2 schedule_simple_catchup

Trigger a repaired outcome when a job should be run

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This bundle will define a class `schedule_simple_${job_id}_{kept, repaired, not_ok, ok, reached} * _ok` or `_kept` for when there is nothing to do `* _repaired` if the job should run `* _not_ok` and `_reached` have their usual meaning

Parameters

- **job_id**: A string to identify this job
 - **agent_periodicity**: How often you run the agent in minutes
 - **max_execution_delay_minutes**: On how many minutes you want to spread the job
 - **max_execution_delay_hours**: On how many hours you want to spread the job
 - **start_on_minutes**: At which minute should be the first run
-

- **start_on_hours**: At which hour should be the first run
- **start_on_day_of_week**: At which day of week should be the first run
- **periodicity_minutes**: How often should the job run
- **periodicity_hours**: How often should the job run
- **periodicity_days**: How often should the job run
- **mode**: "nodups": avoid duplicate runs in the same period / "catchup": avoid duplicates and one or more run have been missed, run once before next period / "stateless": no check is done on past runs

Classes defined

```
schedule_simple_${job_id}_{kept, repaired, not_ok, reached}
```

14.7.9.3 schedule_simple_nodups

Trigger a repaired outcome when a job should be run

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This bundle will define a class `schedule_simple_${job_id}_{kept, repaired, not_ok, ok, reached} * _ok` or `_kept` for when there is nothing to do `* _repaired` if the job should run `* _not_ok` and `_reached` have their usual meaning

Parameters

- **job_id**: A string to identify this job
- **agent_periodicity**: How often you run the agent in minutes
- **max_execution_delay_minutes**: On how many minutes you want to spread the job
- **max_execution_delay_hours**: On how many hours you want to spread the job
- **start_on_minutes**: At which minute should be the first run
- **start_on_hours**: At which hour should be the first run
- **start_on_day_of_week**: At which day of week should be the first run
- **periodicity_minutes**: How often should the job run
- **periodicity_hours**: How often should the job run
- **periodicity_days**: How often should the job run
- **mode**: "nodups": avoid duplicate runs in the same period / "catchup": avoid duplicates and one or more run have been missed, run once before next period / "stateless": no check is done on past runs

Classes defined

```
schedule_simple_${job_id}_{kept, repaired, not_ok, reached}
```

14.7.9.4 `schedule_simple_stateless`

Trigger a repaired outcome when a job should be run

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This bundle will define a class `schedule_simple_${job_id}_{kept, repaired, not_ok, ok, reached} * _ok` or `_kept` for when there is nothing to do `* _repaired` if the job should run `* _not_ok` and `_reached` have their usual meaning

Parameters

- **job_id**: A string to identify this job
- **agent_periodicity**: How often you run the agent in minutes
- **max_execution_delay_minutes**: On how many minutes you want to spread the job
- **max_execution_delay_hours**: On how many hours you want to spread the job
- **start_on_minutes**: At which minute should be the first run
- **start_on_hours**: At which hour should be the first run
- **start_on_day_of_week**: At which day of week should be the first run
- **periodicity_minutes**: How often should the job run
- **periodicity_hours**: How often should the job run
- **periodicity_days**: How often should the job run
- **mode**: "nodups": avoid duplicate runs in the same period / "catchup": avoid duplicates and one or more run have been missed, run once before next period / "stateless": no check is done on past runs

Classes defined

```
schedule_simple_${job_id}_{kept, repaired, not_ok, reached}
```

14.7.10 Service

14.7.10.1 `service_action`

Trigger an action on a service using tools like `systemctl`, `service`, `init.d`, *Windows*...

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **service_name**: Service
- **action**: Action to trigger on the service (start, stop, restart, reload, ...)

Classes defined

```
service_action_${service_name}_{kept, repaired, not_ok, reached}
```

14.7.10.2 service_check_disabled_at_boot

Check if a service is set to not start at boot using the appropriate method

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **service_name**: Service name (as recognized by systemd, init.d, etc...)

Classes defined

```
service_check_disabled_at_boot_${service_name}_{kept, repaired, not_ok, reached}
```

14.7.10.3 service_check_running

Check if a service is running using the appropriate method

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **service_name**: Process name

Classes defined

```
service_check_running_${service_name}_{kept, repaired, not_ok, reached}
```

14.7.10.4 service_check_running_ps

Check if a service is running using ps

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **service_regex**: Regular expression used to select a process in ps output

Classes defined

```
service_check_running_${service_regex}_{kept, repaired, not_ok, reached}
```

14.7.10.5 service_check_started_at_boot

Check if a service is set to start at boot using the appropriate method

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **service_name**: Service name (as recognized by systemd, init.d, etc...)

Classes defined

```
service_check_started_at_boot_${service_name}_{kept, repaired, not_ok, reached}
```

14.7.10.6 **service_ensure_disabled_at_boot**

Force a service not to be enabled at boot

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **service_name**: Service name (as recognized by systemd, init.d, etc...)

Classes defined

```
service_ensure_disabled_at_boot_${service_name}_{kept, repaired, not_ok, reached}
```

14.7.10.7 **service_ensure_running**

Ensure that a service is running using the appropriate method

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **service_name**: Service name (as recognized by systemd, init.d, etc...)

Classes defined

```
service_ensure_running_${service_name}_{kept, repaired, not_ok, reached}
```

14.7.10.8 **service_ensure_running_path**

Ensure that a service is running using the appropriate method, specifying the path of the service in the ps output, or using *Windows* task manager

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **service_name**: Service name (as recognized by systemd, init.d, *Windows*, etc...)
- **service_path**: Service with its path, as in the output from *ps*

Classes defined

```
service_ensure_running_${service_name}_{kept, repaired, not_ok, reached}
```

14.7.10.9 **service_ensure_started_at_boot**

Force a service to be started at boot

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **service_name**: Service name (as recognized by systemd, init.d, *Windows*, SRC, SMF, etc...)

Classes defined

```
service_ensure_started_at_boot_${service_name}_{kept, repaired, not_ok, reached}
```

14.7.10.10 **service_ensure_stopped**

Ensure that a service is stopped using the appropriate method

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **service_name**: Service

Classes defined

```
service_ensure_stopped_${service_name}_{kept, repaired, not_ok, reached}
```

14.7.10.11 **service_reload**

Reload a service using the appropriate method

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **service_name**: Service

Classes defined

```
service_reload_${service_name}_{kept, repaired, not_ok, reached}
```

14.7.10.12 **service_restart**

Restart a service using the appropriate method

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **service_name**: Name of the service to restart in systemd, init.d, ...

Classes defined

```
service_restart_${service_name}_{kept, repaired, not_ok, reached}
```

14.7.10.13 **service_restart_if**

Restart a service using the appropriate method if the specified class is true, otherwise it is considered as not required and success classes are returned.

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **service_name**: Service
- **trigger_class**: class(es) which will trigger the restart of Service "(package_service_installed|service_conf_changed)" by example

Classes defined

```
service_restart_${service_name}_{kept, repaired, not_ok, reached}
```

14.7.10.14 service_start

Start a service using the appropriate method

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **service_name**: Service

Classes defined

```
service_start_${service_name}_{kept, repaired, not_ok, reached}
```

14.7.10.15 service_stop

Stop a service using the appropriate method

Compatible with nodes running *Rudder* 3.1 or higher.

Parameters

- **service_name**: Service

Classes defined

```
service_stop_${service_name}_{kept, repaired, not_ok, reached}
```

14.7.11 User

14.7.11.1 user_absent

Remove a user

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This method ensures that a user does not exist on the system.

Parameters

- **login**: User login

Classes defined

```
user_absent_${login}_{kept, repaired, not_ok, reached}
```

14.7.11.2 user_create

Create a user

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

This method does not create the user's home directory.

Parameters

- **login:** User login
- **description:** User description
- **home:** User's home directory
- **group:** User's primary group
- **shell:** User's shell
- **locked:** Is the user locked ? true or false

Classes defined

```
user_create_${login}_(kept, repaired, not_ok, reached)
```

14.7.12 Variable

14.7.12.1 variable_dict

Define a variable that contains key,value pairs (a dictionary)

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

To use the generated variable, you must use the form `${variable_prefix.variable_name[key]}` with each name replaced with the parameters of this method.

Be careful that using a global variable can lead to unpredictable content in case of multiple definition, which is implicitly the case when a technique has more than one instance (directive). Please note that only global variables are available within templates.

Parameters

- **variable_prefix:** The prefix of the variable name
- **variable_name:** The variable to define, the full name will be `variable_prefix.variable_name`
- **value:** The variable content in JSON format

Classes defined

```
variable_dict_${variable_name}_(kept, repaired, not_ok, reached)
```

14.7.12.2 variable_dict_from_file

Define a variable that contains key,value pairs (a dictionary) from a JSON file

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

To use the generated variable, you must use the form `${variable_prefix.variable_name[key]}` with each name replaced with the parameters of this method.

Be careful that using a global variable can lead to unpredictable content in case of multiple definition, which is implicitly the case when a technique has more than one instance (directive). Please note that only global variables are available within templates.

Parameters

- **variable_prefix:** The prefix of the variable name
-

- **variable_name:** The variable to define, the full name will be variable_prefix.variable_name
- **file_name:** The file name with JSON content

Classes defined

```
variable_dict_from_file_${variable_name}_{kept, repaired, not_ok, reached}
```

14.7.12.3 variable_iterator

Define a variable that will be automatically iterated over

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

The generated variable is a special variable (slist in cfengine speaking) that is automatically iterated over. When you call a generic method with this variable as a parameter, n calls will be made, one for each items of the variable. Note: there is a limit of 10000 items

To use the generated variable, you must use the form `${variable_prefix.variable_name}` with each name replaced with the parameters of this method.

Be careful that using a global variable can lead to unpredictable content in case of multiple definition, which is implicitly the case when a technique has more than one instance (directive). Please note that only global variables are available within templates.

Parameters

- **variable_prefix:** The prefix of the variable name
- **variable_name:** The variable to define, the full name will be variable_prefix.variable_name
- **value:** The variable content
- **separator:** Regular expression that is used to split the value into items (usually: ,)

Classes defined

```
variable_iterator_${variable_name}_{kept, repaired, not_ok, reached}
```

14.7.12.4 variable_iterator_from_file

Define a variable that will be automatically iterated over

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

The generated variable is a special variable (slist in cfengine speaking) that is automatically iterated over. When you call a generic method with this variable as a parameter, n calls will be made, one for each items of the variable. Note: there is a limit of 10000 items Note: empty items are ignored

To use the generated variable, you must use the form `${variable_prefix.variable_name}` with each name replaced with the parameters of this method.

Be careful that using a global variable can lead to unpredictable content in case of multiple definition, which is implicitly the case when a technique has more than one instance (directive). Please note that only global variables are available within templates.

Parameters

- **variable_prefix:** The prefix of the variable name
- **variable_name:** The variable to define, the full name will be variable_prefix.variable_name

- **file_name**: The path to the file
- **separator_regex**: Regular expression that is used to split the value into items (usually:)
- **comments_regex**: Regular expression that is used to remove comments (usually: #.*?(?=))

Classes defined

```
variable_iterator_from_file_${variable_name}_{kept, repaired, not_ok, reached}
```

14.7.12.5 variable_string

Define a variable from a string parameter

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

To use the generated variable, you must use the form `${variable_prefix.variable_name}` with each name replaced with the parameters of this method.

Be careful that using a global variable can lead to unpredictable content in case of multiple definition, which is implicitly the case when a technique has more than one instance (directive). Please note that only global variables are available within templates.

Parameters

- **variable_prefix**: The prefix of the variable name
- **variable_name**: The variable to define, the full name will be `variable_prefix.variable_name`
- **value**: The variable content

Classes defined

```
variable_string_${variable_name}_{kept, repaired, not_ok, reached}
```

14.7.12.6 variable_string_from_file

Define a variable from a file content

Compatible with nodes running *Rudder* 3.1 or higher.

Usage

To use the generated variable, you must use the form `${variable_prefix.variable_name}` with each name replaced with the parameters of this method.

Be careful that using a global variable can lead to unpredictable content in case of multiple definition, which is implicitly the case when a technique has more than one instance (directive). Please note that only global variables are available within templates.

Parameters

- **variable_prefix**: The prefix of the variable name
- **variable_name**: The variable to define, the full name will be `variable_prefix.variable_name`
- **file_name**: The path of the file

Classes defined

```
variable_string_from_file_${variable_name}_{kept, repaired, not_ok, reached}
```

14.8 Man pages

14.8.1 **rudder(8)**

14.8.1.1 **NAME**

rudder - execute commands to control the *Rudder* configuration management tool.

14.8.1.2 **SYNOPSIS**

rudder *component* [-h] [-il-vl-d] *command*

rudder *component* help

14.8.1.3 **DESCRIPTION**

A tool to trigger actions or get information about a running rudder-agent, whether on agent or server. It only targets administration actions, for all node configuration tasks you can use the rudder-cli tool.

14.8.1.4 **OPTIONS**

- h** Print command-line syntax and command options.
- i** Print general information.
- v** Print detailed information.
- d** Print all available information.
- c** Do not colorize output.

14.8.1.5 **COMMANDS**

The commands below are listed by component.

14.8.1.6 **agent**

commands for rudder agent, run with **rudder agent** *command*

check check if rudder agent has no problem and is running properly. Check that rudder agent is working properly.

- generate missing UUID
- kill cfengine if there are too many processes
- run cfengine if its daemon is missing
- clean lock file if it is too big
- check and restore init files
- check that promises have been properly copied

disable forbid rudder-agent to be run by cron or service. This is useful when you want to temporarily prevent your *Rudder* agent from doing any modification to your system.

enable re-enable a disabled rudder-agent.

Options:

-s: start rudder-agent in addition to enabling it

info display a summary of agent information. Outputs detailed information about the agent configuration, especially what defines the node (hostname, uuid and key hash) and its policy server.

inventory force the agent to create and send a new inventory. This will trigger a new inventory creation and send it to the policy server. Even if the agent will do it regularly, it can be used to force the update after a modification on the node. This won't affect the node state, but only update server-side information.

Options:

-i: run the agent in information mode, prints basic information

-v: run the agent in verbose mode, prints detailed information

-d: run the agent in debug mode, prints low-level information

-q: run the agent in quiet mode (display only error messages)

-w: show full strings, never cut output

-c: run the agent without color output

-r: run the agent with raw output

-R: run the agent in completely unparsed mode, with no return code of 1 in case of error. A little faster.

-m: run the agent with multiline output

-f: run the agent even if it is disabled

log read log of old agent runs. This command will output historic logs of agent runs.

Options:

-w: show full strings, never cut output

-c: show log without color output

-r: show log with raw output

-R: show log in completely unparsed mode, with no return code of 1 in case of error. A little faster.

-m: show log with multiline output

-l: show log from the given file

-n: show log from the nth run before the last one

-d: show log from a given date

reinit re-initialise the agent to make it be seen as a new node on the server. This command will delete all local agent data, including its uuid and keys, and also reset the agent internal state. The only configuration kept is the server hostname or ip configured in *policy_server.dat*. It will also send an inventory to the server, which will treat it as a new node inventory.

WARNING: This command will permanently delete your node uuid and keys, and no configuration will be applied before re-accepting and configuring the node on the server.

reset reset agent status and cache. Remove all locks and state cache of the agent, and restore initial promises. This won't affect the desired state of the node, but will only reset the internal state of the agent. It is useful to test a rule without caching interference or when you have trouble with the promises updates. On the root server, initial promises won't be reset.

run force run agent promises. This command will force the agent to enforce current policies. You can run **rudder agent update** before to update the promises.

Options:

-i: run the agent in information mode, prints basic information

-v: run the agent in verbose mode, prints detailed information

-d: run the agent in debug mode, prints low-level information

-q: run the agent in quiet mode (display only error messages)

- w**: show full strings, never cut output
- c**: run the agent without color output
- r**: run the agent with raw output
- R**: run the agent in completely unparsed mode, with no return code of 1 in case of error. A little faster.
- m**: run the agent with multiline output
- b**: run the agent on a specific bundle
- D**: define a class for this run
- f**: run the agent even if it is disabled

update update promises on agent. The agent will fetch the last version of its promises from its configured policy server.

Options:

- i**: run the agent in information mode, prints basic information
- v**: run the agent in verbose mode, prints detailed information
- d**: run the agent in debug mode, prints low-level information
- c**: run the agent without color output
- f**: force full update

version get the agent version. Displays the version of the *Rudder* agent and of the underlying *CFEngine* agent.

14.8.1.7 remote

commands for rudder remote, run with **rudder remote** *command*

run trigger the execution of a remote agent. This command allows to override the agent run schedule and to immediately update the promises and enforce them on the specified node. This command is currently only allowed from the policy server of the target node.

Arguments:

node: IP or hostname of the target node

Options:

- i**: run the agent in information mode, prints basic information
- v**: run the agent in verbose mode, prints detailed information
- d**: run the agent in debug mode, prints low-level information
- c**: run the agent without color output

14.8.1.8 server

commands for rudder server, run with **rudder server** *command*

debug run a debug *cf-serverd* intended for a specific node. This command targets a specific node and does not affect the running infrastructure. It uses *iptables* to redirect the specific node communications to the port the debug server is listening on (5310 by default).

Use Ctrl+C to stop the debug server.

Arguments:

- e**: debug the cfengine enterprise server
- i**: run a debug server for the given node
- node**: IP or hostname of the host you want to debug

reload-groups reload dynamic groups. By default, dynamic groups are evaluated every 5 minutes. This command triggers a reload of all dynamic groups.

Options:

- i: run the agent in information mode, displays all executed commands
- c: do not colorize output

reload-techniques reload techniques. This command will reload the technique library into memory from the filesystem and regenerate the promises if necessary.

Options:

- i: run the agent in information mode, displays all executed commands
- c: do not colorize output

14.8.1.9 AUTHOR

Normation SAS (contact@normation.com)

14.8.1.10 RESOURCES

Main web site: <https://rudder-project.org/>

Sources of the rudder command-line: <https://github.com/Normation/rudder-agent/>

14.8.1.11 COPYING

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14.9 Technique reference

A technique is described by a XML file that lists:

- the template files
- the sections of the technique
- the variables that must be defined
- the compatibility list

14.9.1 Files organisation

The techniques are ordered in Categories. A Category is described by a category.xml file, that defines the name and description of a category. A Category can contain other Categories, or *Techniques*. A *Technique* is versioned, and can exist in several versions. The description of a *Technique* is the metadata.xml file.

```
techniques
+--- category.xml
+--- fileConfiguration
|   +--- category.xml
|   +--- security
|       +--- filesPermissions
|           +--- 1.0
|               +--- permlist.st
|               +--- metadata.xml
|               +--- filesPermissions.st
```

```
| | +--- category.xml
| | +--- sudoCheck
| | | +--- 2.0
| | | | +--- metadata.xml
| | | | +--- sudoCheck.st
| | | +--- 1.0
| | | | +--- metadata.xml
| | | | +--- sudoCheck.st
```

14.9.1.1 metadata.xml and CFEngine templates (*.st)

These files must reside in a folder with a version number. For each *Technique*, there can be several versions, *Rudder* will let you choose the version when creating a *Directive*.

14.9.1.2 Version number formatting

The version number follows a formatting "a la *Debian*" as described here: <https://www.debian.org/doc/debian-policy/index.html#s-f-version>, (without the *debian_revision* version)

14.9.2 General Rules

All the tag name in the .xml are in upper case, all the attributes are in camel case:

```
<SECTION name="example" component="true" componentKey="variable_name">
```

14.9.3 Details of the metadata.xml file

```
<TECHNIQUE id="technique_unique_id" name="human_name_of_the_technique">
  <DESCRIPTION>Description of the Technique</DESCRIPTION>
  <LONG_DESCRIPTION>Long description of the technique</LONG_DESCRIPTION>
  <DEPRECATED>Deprecation message</DEPRECATED>           <!-- Mark the Technique as ↵
    deprecated, deprecation message is mandatory, Only available since Rudder 3.0 -->
  <DISPLAY>true/false</DISPLAY>                             <!-- Define if the Technique ↵
    is displayed in the interface or not. Default value : true -->
  <COMPATIBLE>                                                <!-- Optional, describe the ↵
    version of the OS and CFEngine Agent the Technique has been tested on. Only for ↵
    information purpose -->
  <OS version=">=2.5">OS Name</OS>                           <!-- Optional; OS Name and ↵
    version on which the Technique has been tested -->
  <AGENT version=">=3.6">cfengine-community</AGENT>         <!-- Optional; Agent name and ↵
    version on which the Technique has been tested -->
</COMPATIBLE>
<MULTIINSTANCE>true/false</MULTIINSTANCE>                  <!-- Optional; defines if ↵
    several instances of this template with differents variables can be deployed on a node ↵
    ; default value : false -->
<SYSTEM>true/false</SYSTEM>                                 <!-- Optional, defines if ↵
    this Technique is a system Technique (internal Rudder usage); default value : false ↵
    -->
<BUNDLES>                                                    <!-- List of the bundles that ↵
    must be included in the bundlesequence -->
  <NAME>BundleName</NAME>
</BUNDLES>
<TMLS>                                                       <!-- List of all the ↵
    templates defined by this Technique -->
  <TML name="tmlName">                                       <!-- Container for a TML ( ↵
    without the trailing .st -->
```

```

    <OUTPATH>relativ/path/of/file</OUTPATH>           <!-- Optional; defines the ↵
        relative path for the generated file for this template; default : techniqueName/ ↵
        version/tmlName.cf -->
    <INCLUDED>true/false</INCLUDED>                   <!-- Optional; defines if the ↵
        template must be in the inputs list of the generated promises; default : true -->
</TML>
</TML>
<TRACKINGVARIABLE>                                   <!-- Defines a special system ↵
    variable TRACKINGKEY that contains all the necessary information to track which ↵
    Directive generated the promises -->
    <SAMESEAS>VariableName</SAMESEAS>                 <!-- Optional; defines the ↵
        cardinality of this variable based on the cardinality of the VariableName -->
</TRACKINGVARIABLE>
<SECTIONS>                                           <!-- Lists all the sections ↵
    of the promises -->
    <SECTION name="sectionName">                       <!-- Container of a section ( ↵
        see below) -->
    </SECTION>
</SECTIONS>

</TECHNIQUE>

```

14.9.3.1 The <SECTION> tag

In a metadata.xml, there can be only one SECTIONS tag, that encloses one or several SECTION tags. A SECTION tag contains variables declaration and subsections. A SECTION can contains Variables definitions and SECTION.

```

<SECTION name="sectionName" multivalued="true/false" component="true/false" componentKey=" ↵
    variableName/None">

```

A SECTION has the following attributes:

- name : mandatory, the name of the section
- multivalued : optional, default false, defines if the section is repeatable or not. If so, the Web Interface will display a "Add another" and "Delete" button for this section
- component : optional, default false; defines if the section is a component, and if true, the section will appear in the reporting, with its section name
- componentKey: optional, default None; defines the variable that is the key of the component. Note that the componentKey can only be defined if *component* is *true*
- displayPriority: optional, default high; defines if the section is displayed by default (high) or hidden by default (low)

Note

A multivalued section can only contain variable, and cannot contain section

Note

If there are no SECTION defined with *component="true"*, a default SECTION for reporting will be generated, named after the id of the *Technique* (the folder name of the *Technique*)

14.9.3.2 Variables definitions in the <SECTION> tags

There are three tags to create a variable:

- **SELECT1**: Can select only one value out of several. If there are less than 3 possible values, displays radio buttons, otherwise a select field.
- **SELECT**: Can select several values out of all the possibles. Displays checkboxes.
- **INPUT**: Displays an input field (that can be tuned)

```
<SELECT1/SELECT/INPUT>                                <!-- Depend ↵
  on the display and behaviour needed -->
  <NAME>variableName</NAME>
  <DESCRIPTION>variableDescription</DESCRIPTION>
  <LONGDESCRIPTION>longDescription</LONGDESCRIPTION>    <!-- Optional ↵
    , set the text in the tooltips -->
  <UNIQUEVARIABLE>true/false</UNIQUEVARIABLE>          <!-- Optional ↵
    , default false; if true, this variable will have the same value over all the instance ↵
    of this template for a given node -->
  <ITEM>                                                  <!-- Only for ↵
    SELECT and SELECT1, list of selectable values -->
    <VALUE>value</VALUE>                                <!-- value ↵
      that will be put in the template-->
    <LABEL>humanReadableText</LABEL>                    <!-- value ↵
      displayed in the web interface -->
  </ITEM>
  <CONSTRAINT>                                          <!-- Optional ↵
    , defines some constraints on values -->
    <DEFAULT>defaultValue</DEFAULT>                     <!-- Optional ↵
      ; Defines a default value -->
    <TYPE>variableType</TYPE>                           <!-- Optional ↵
      ; default string; variable type -->
    <MAYBEEMPTY>true/false</MAYBEEMPTY>                <!-- Optional ↵
      ; default false; defines if the variable is optional or not; only for the INPUT ↵
      variable -->
    <REGEX error="errorMsg">regex</REGEX>               <!-- Optional ↵
      ; only for the INPUT variable; define a regular expression the variable should match, ↵
      and an optional error message -->
    <PASSWORDHASH>hashtype</PASSWORDHASH>              <!-- Optional ↵
      ; only for the password TYPE variable; define the way a password will be handled ( ↵
      hashed or not, hash types allowed ...) -->
  </CONSTRAINT>
</SELECT1/SELECT/INPUT>
```

Note: It is possible to inline LABEL and VALUE in the ITEM tag

```
<ITEM label="Red" value="red"/>
```

is equivalent to

```
<ITEM>
  <LABEL>Red</LABEL>
  <VALUE>red</VALUE>
</ITEM>
```

Note

INPUT fields are automatically escaped, meaning any quote will be written in the policies as \" ; and any backslash will be written as \\

14.9.3.3 Available types for an INPUT variable

- **string** : any string is accepted (no specific displayer)
- **textarea** : accept any strings, but use a textarea in place of the input text.
- **perm** : display a matrix of read/write/execute by user/group/all
- **integer** : only accept integers
- **datetime** : display a JQuery calendar and check date format
- **boolean** : display a checkbox
- **mail** : only accept emails
- **ip** : only accept ips. Before *Rudder* 3.1.14, 3.2.7 and 4.0.0, "ip" was accepting only IPv4 ip. Since these releases, it accepts both IPv4 and IPv6 format.

- **ipv4** [since *Rudder* 3.1.14, 3.2.7, 4.0.0]: only accept IPv4 formatted IPs
- **ipv6** [since *Rudder* 3.1.14, 3.2.7, 4.0.0]: only accept IPv6 formatted IPs
- **size-<unit>** : (size-b, size-kb, size-mb, size-gb ou size-tb)
- **raw** : the content of this field will not be escaped when written in the promises (*Rudder* >= 2.6)
- **password** : the content of this field will be handled as a password, and thus be hidden and transformed if necessary (see "Password handling" below) (*Rudder* >= 2.6)

14.9.4 Examples

14.9.4.1 Multivalued sections

In the "NFS Client settings" *Technique*, there is a multivalued section with several entries. Here is a partial extract from it, with

- A multivalued section, named NFS mountpoint, that is multivalued and is a component. The variable reference for this component (the key) is NFS_CLIENT_LOCAL_PATH
- One SELECT1 field, that will show two radio buttons, Mount and Unmount, with the default value to Mount
- One INPUT field, named NFS_CLIENT_LOCAL_PATH, that is a text

```
<SECTION name="NFS mountpoint" multivalued="true" component="true" componentKey=" ↵
NFS_CLIENT_LOCAL_PATH">
  <SELECT1>
    <NAME>NFS_CLIENT_UMOUNT</NAME>
    <DESCRIPTION>Which operation should be done on this mountpoint</DESCRIPTION>
    <ITEM>
      <LABEL>Mount</LABEL>
      <VALUE>no</VALUE>
    </ITEM>
    <ITEM>
      <LABEL>Unmount</LABEL>
      <VALUE>yes</VALUE>
    </ITEM>
    <CONSTRAINT>
      <DEFAULT>no</DEFAULT>
    </CONSTRAINT>
  </SELECT1>
  <INPUT>
    <NAME>NFS_CLIENT_LOCAL_PATH</NAME>
```

```

    <DESCRIPTION>Local path to mount the remote on</DESCRIPTION>
  </INPUT>
  ...
</SECTION>

```

14.9.4.2 Unique variable across several instance

This variable can have only one value, over all the instances of this *Technique*, on a node

```

<SECTIONS>
  <INPUT>
    <NAME>UNIQUE</NAME>
    <DESCRIPTION>Unique variable</DESCRIPTION>
    <CONSTRAINT>
      <TYPE>string</TYPE>
      <CONSTRAINT>
        <UNIQUEVARIABLE>true</UNIQUEVARIABLE>
      </CONSTRAINT>
    </CONSTRAINT>
  </INPUT>
</SECTIONS>

```

14.9.4.3 Password handling

The password type allows to show an input text field whose content will be hashed when the form is submitted so that the password is never store in clear text.

▼ Section: Password

Enter password + hash	Enter pre-hashed value
Use clear text password	Enter script to set passwords

New password

Password for this account - Optional

Hash algorithm

SHA512

This password will be hashed using the **SHA512** algorithm and stored and distributed only as a hash. The plain text value entered above will not be stored.

Available hash formats

For now, the password field support these hash algorithms :

- **PLAIN** : that is not an hash algorithm, it just save the password in plain text, as inputed by the user.
- **MD5, SHA1, SHA256, SHA512** : uses the matching hash algorithm
- **LINUX-SHADOW-MD5, LINUX-SHADOW-SHA256, LINUX-SHADOW-SHA512** : build a string compatible with the Linux /etc/shadow format, as "specified" in <http://man7.org/linux/man-pages/man3/crypt.3.html>

Technique metadata content

To configure a password, you must specify two things in the <CONSTRAINT> section of the field:

- <TYPE>password</TYPE> : use the password type
- <PASSWORDHASH>comma, separated, list, of, hash</PASSWORDHASH> : specify the list of hash algo from witch the user will be allowed to choose.
- Available algorithm names are the ones from the section above (case insensitive).

- Choices are presented in order given by the list, the first being the default one.
- If the list contains only one algo, the drop down select if change to a phrase saying to the user that the given algo will be used.
- The list can not be empty. Moreover, if the `<MAYBEEMPTY>` constraint is set to false, the "None" option is not displayed to the user.

Password field definition example

```
<SECTION name="Password" component="true" componentKey="USERGROUP_USER_LOGIN">
  <INPUT>
    <NAME>USERGROUP_USER_PASSWORD</NAME>
    <DESCRIPTION>Password for this account</DESCRIPTION>
    <CONSTRAINT>
      <MAYBEEMPTY>true</MAYBEEMPTY>
      <TYPE>password</TYPE>
      <PASSWORDHASH>linux-shadow-md5,linux-shadow-sha256,linux-shadow-sha512</ ←
        PASSWORDHASH>
    </CONSTRAINT>
  </INPUT>
</SECTION>
```

14.9.5 Known limitations

There are several known limitations at the moment, that are acknowledged, and will be solved in a "not too distant" future:

14.9.5.1 Can't put a multivalued section in a multivalued section

It is not possible, due to limitation in the format in which the variable's values are stored in the *LDAP* tree, to put multivalued sections within multivalued sections.

14.9.5.2 Can't have several multivalued sections that are components with keys

For the moment, there is only one `TRACKINGKEY`, so it is not possible to have several multivalued sections that have keys.

14.9.5.3 Can't have several sections that are components with keys in multivalued Techniques.

It is a side effect of the previous limitation.

14.10 Reports reference

This page describes the concept behind the reporting in *Rudder*, and specifically how to write the *Techniques* to get proper reporting in *Rudder*.

14.10.1 Concepts

Each *Technique*, when converted into a *Directive* and applied to a *Node*, must generate reports for *Rudder* to get proper compliance reports. This reports must contains specific information :

- The Report type, that can be logs for information purpose or result to express a compliance
- The *Rule Id* (autogenerated)

- The *Directive* Id (autogenerated)
- The Version Id (revision of the *Rule*) (autogenerated)
- The name of the component the report is related to
- The value of the key variable in the component (or None if not available)
- The Execution Timestamp, to know in which execution of the agent the promise has been generated

These reports are sent via Syslog to the *Rudder Root Server*, parsed and put in a database, that is queried to generate the reporting

14.10.2 Report format

A report has the following format :

```
@@Technique@@Type@@RuleId@@DirectiveId@@VersionId@@Component@@Key@@ExecutionTimeStamp## ↔
  NodeId@#HumanReadableMessage
```

- *Technique* : Human readable *Technique* name
- *Type* : type of report (see bellow)
- *RuleId* : The Id of the *Configuration Rule*, autogenerated
- *DirectiveId* : The Id of the *Directive*, autogenerated
- *VersionId* : the revision of the *ConfigurationRule*, autogenerated
- *Component* : the name of the component this *Directive* is related to (if no component are defined in the metadata.xml, then the *Technique* name is used)
- *Key* : the value of the reference variable. If there is no reference variable, then the value None should be used
- *ExecutionTimeStamp* : the timestamp of the current *CFEngine* execution
- *NodeId* : the id of the node
- *HumanReadableMessage* : a message than a Human can understand

14.10.2.1 Valid report types

Variables used to generate the reports

Some facilities have been created to help putting the right values at the right place

- `&TRACKINGKEY&`: this is an auto generated variable, put in the technique file, that *Rudder* will replace when writing the promises by

```
<pre>RuleId@@DirectiveId@@VersionId
```

- `$(g.execRun)`: this is replaced at runtime by *CFEngine* 3 to the current execution time
- `$(g.uuid)`: this is replaced at runtime by *CFEngine* 3 to the *Node Id*

Name	Type	Max number	Details
log_trace	log	infinity	Should be used for advanced debugging purpose only.
log_debug	log	infinity	Should be used for debug purpose only.
log_info	log	infinity	Use for standard logging purposes.
log_warn	log	infinity	Used for logging only for the moment. Should be used when something unexpected happens.
log_repaired	log	infinity	Used for logging purposes, to list all that is repaired by the promises.
result_na	result	one per component/key	Defines the status of the Component to Not Applicable (if there are no result_success, result_repaired, result_error). Should be used only when the component is not applicable because it does not match the target context.
result_success	result	one per component/key	Defines the status of the Component to Success (if there are no result_repaired or result_error). Should be used only when everything is already in the correct state in this component for this key.
result_repaired	result	one per component/key	Defines the status of the Component to Repaired (if there are no result_error). Should be used only when something was not in the correct state, but could be corrected.
result_error	result	infinity per component/key	Defines the status of the Component to Error. Should be used when something was not in the correct state, and could not be corrected.

Table 14.1: Report Types

14.11 Syntax of the Techniques

14.11.1 Generalities

The *Techniques* use the **StringTemplate** engine. A *Technique* **must** have the .st extension to be extended by *Rudder* (have some variables replaced, some part removed or added given some parameters).

14.11.2 Variable replacement

Note : *Rudder* use a StringTemplate grammar slightly different from the default one. Rather than using "\$" as a variable identifier, the *Techniques* use "&" to avoid collision with the *CFEngine* variables

14.11.2.1 Single-valued variable replacement

```
&UUID&
```

- Will be replaced by the value of the variable UUID

14.11.2.2 Replacement of variable with one or more values

```
&DNS_RESOLVERS: { "&it&" };separator=", "&
```

- Will be replaced by "8.8.8.8", "8.8.4.4"
- Here, &it& is an alias for the current item in the list (with no confusion, because there is only one variable)

```
&POLICYCHILDREN, CHILDRENID : {host, uuid |
"/var/rudder/share/&uuid&/"
maproot => { host2ip("&host&"), escape("&host&") },
admit => { host2ip("&host&"), escape("&host&") };
} &
```

- `host` is an alias for the current value of `POLICYCHILDREN`
- `uuid` is an alias for the current value of `CHILDRENID`
- Both item are iterated at the same time, so both list must have the same length

14.11.2.3 Replacement of variable with one or more value, and writing an index all along

```
&FILE_AND_FOLDER_MANAGEMENT_PATH:{path | "file[&i&][path]" string => "&path&";
}&
```

- `i` is an iterator, starting at 1

The result would be:

```
"file[1][path]" string => "/var";
"file[2][path]" string => "/bin";
```

14.11.2.4 Conditionnal writing of a section

```
&if (NOVA) &
something
&endif&
```

The variable must either be:

- A boolean: If its value is true, then the section will be displayed
- A variable with the parameter `MAYBEEMPTY="true"`: If the value is not set, then the section won't be displayed, otherwise it will be displayed

More information can be found here: <https://theantlrguy.atlassian.net/wiki/display/ST/ST+condensed+--+Templates+and+expressions>

14.12 Best Practices for Techniques

14.12.1 Naming convention

- The name of bundle and classes should be written with underscore (i.e: `this_is_a_good_example`) instead of CamelCase (i.e: `ThisIsABadExample`)
- All variable, class and bundle names should be prefixed by `"rudder_"`
- The bundle entry point for the *Technique* should be named `rudder_<name_of_the_technique>`

- The bundles which makes all the actions should be suffixed by a meaningful name ("rudder_<name_of_the_Technique>_installation", "rudder_<name_of_the_Technique>_configuration", "rudder_<name_of_the_Technique>_reporting", ..). This rule applies even if there is only one bundle
- The prefix of classes should all be "rudder_<name of the Technique>_"
- The classes defined as an outcome should be named:
 - rudder_<name of the Technique>_<action>_kept
 - rudder_<name of the Technique>_<action>_repaired
 - rudder_<name of the Technique>_<action>_failed
 - rudder_<name of the Technique>_<action>_denied
 - rudder_<name of the Technique>_<action>_timeout
 - rudder_<name of the Technique>_<action>_error (error include failed, denied and timeout)
- The name of the bodies written in the *Rudder* Library should be prefixed: rudder_common_

14.12.2 Raising classes

- rudder_<name of the Technique>_<action>_error should be raised simultaneously as rudder_<name of the Technique>_<action>_failed, rudder_<name of the Technique>_<action>_denied or rudder_<name of the Technique>_<action>_timeout.
- The body **rudder_common_classes** automatically abide by this rule

14.12.3 Writing convention

14.12.3.1 In the Technique

- We try to follow *CFEngine* conventions but with some exceptions like using brackets "{}" instead of parenthesis "()"
- When defining bundles or bodies, the opening bracket should be on a dedicated line. Example:

```
bundle common control
{
  bundlesequence => { "exemple" };
}
```

- Indentation should be made by spaces. A incrementation of indentation is equal to two spaces
- The promise type should be indented by two spaces (instead of being at the same indentation level than the bundle name)
- The class expression should be indented by four spaces (two spaces after the promise type)
- The promiser should be indented by six spaces (two spaces after the class expression or four spaces after the promise type if no class expression is defined)
- Attributes of promises should be indented by eight spaces (two spaces after the promiser) and it should be only one attribute by line.
- Attribute's arrows \Rightarrow should all be at the same level, one character after the largest attribute name

```
bundle agent example
{
  type:
    "promiser"
    attribute => "value1";

  class::
    "promiser2"
    attribute2 => "value2";
}
```

- Attributes of promise type "vars" and "classes" should be on only one line except if there are more than one attribute.
- For promise type "vars" and "classes" on one line, attribute names and the arrows should be aligned
- A list should be written multilines if it needs more than 80 characters in one line
- Multilines list should have comma after each element, except the last one.
- Multilines list should begin with only a bracket "{"

```
vars:
  "value" slist =>
  {
    "one",
    "two",
    "three"
  };
```

- The name of the variable in argument of the bundle should be named "params"
- The call of the variables should be made with by using brackets `${var_correctly_called}` instead of parenthesis `$(var_wrongly_called)`
- Alternance of brackets and parenthesis are tolerated when lots of variables are imbricated for more readability: `${var_lvl1 [$(var_lvl2 [${var_lvl3}])]}`
- A *Technique* should have its bundle wrote with parameters
- All the bundles should have as first argument "prefix" which contains the prefix to use for all the classes made from an outcome. This prefix should never be hardcoded in the bundle.
- Always write comments with # when a promise needs more than 30 seconds of thought.
- If classes should be created in order to iterate for make a workaround of the normal ordering (i.e: "iteration_1", "iteration_2", "iteration_3"), they should always be defined at the end of the promise type "classes".
- The order to the promise type must always be in the order of the normal ordering : <https://docs.cfengine.com/docs/3.10/-reference-language-concepts-normal-ordering.html>
- StringTemplate variables should always be written in UPPERCASE
- StringTemplate variables should be written with underscore
- StringTemplate variables should always be prefixed by the *Technique* name in uppecase too. i.e: CHECK_GENERIC_FILE_FILE_NAME

14.12.3.2 In the metadata.xml

- Name of sections should always be written in literary English (no CamelCase or underscores).
- The value of variable "Don't change" should always be "dontchange" or "" if the easier.

14.12.4 Files convention

- File names in a *Technique* should not be prefixed by the name of the *Technique*
- When a *Technique* needs specific bodies, the bodies should be written in a bodies.st file
- The file containing the bundle which makes all the actions (and containing the bundle "run") should be named "main.cf"
- The file containing all the variables and calling the bundle "run" should be name config.st
- Initialization of a new *Technique* should always be made from the file "technique-metadata-sample.xml" which is present on the root of the "rudder-techniques" repository
- *Rudder* standard library should be located in "common" *Technique*

14.12.5 Maintenance

- These rules were introduced after the 2.5 release of *Rudder* and before the 2.6 release. Therefore, they were enforced as of rudder-techniques-2.6.*.
- Always follow the conventions above when *Techniques* are updated but only for the lines edited. This rule concerns the *Techniques* on all the branches of git.
- On any branches that have released versions on them, we only allow minimal modifications. No lines should be modified if not to fix a bug (respecting these best practices is not currently considered a bug).

14.12.6 Testing

- There is a test suite in scripts/check-techniques.sh that check metadata.xml and normal ordering in code
 - The list of all maintained techniques (techniques and versions) is in maintained-techniques file, and should be updated when new techniques or versions are created.
-

Chapter 15

Appendix: Glossary

Active Techniques This is an organized list of the *Techniques* selected and modified by the user. By default this list is the same as the *Technique Library*. *Techniques* can be disabled or deleted, and then activated again with a simple drag and drop. Categories can be reorganised according to the desired taxonomy. A *Technique* can appear only once in the *Active Techniques* list.

Applied Policy This is the result of the conversion of a Policy Instance into a set of *CFEngine* Promises for a particular *Node*.

cf-execd This *CFEngine* Community daemon is launching the *CFEngine* Community Agent `cf-agent` every 5 minutes.

cf-serverd This *CFEngine* Community daemon is listening on the network on *Rudder Root* and Relay servers, serving policies and files to *Rudder Nodes*.

CFEngine Enterprise Managing *Windows* machines requires the commercial version of *CFEngine*, called *Enterprise*. It needs to open the port 5308 TCP from the *Node* to the *Rudder Root Server*.

This version used to be called *Nova* before.

CFEngine server Distribute the *CFEngine* configuration to the nodes.

CFEngine *CFEngine* is a configuration management software. *CFEngine* comes from a contraction of “ConFiguRation Engine”.

Directive This is an instance of a *Technique*, which allows to set values for the parameters of the latter. Each *Directive* can have a unique name. A *Directive* should be completed with a short and a long description, and a collection of parameters for the variables defined by the *Technique*.

Dynamic group Group of *Nodes* based on search criteria. The search is replayed every time the group is queried. The list will always contain the nodes that match the criteria, even if the data nodes have changed since the group was created.

LDAP server Store the inventories and the *Node* configurations.

Port 443, TCP, for nodes WebDAV/HTTPS communication port, used to send inventory and fetch the id of the *Rudder Server*.

Port 443, TCP, for users HTTP/S communication port, used to access the *Rudder* web interface.

Port 514, TCP/UDP Syslog port, used to centralize reports.

Port 5308, TCP *CFEngine Enterprise* communication port, which is required to manage *Windows* nodes.

Port 5309, TCP *CFEngine* communication port, used to communicate the policies to the rudder nodes.

Port 5310, TCP *CFEngine* communication port, used to communicate the policies to the *Rudder* nodes when debugging communication between a *Node* and a policy server with the `rudder server debug` command.

Port 80, TCP, for nodes WebDAV/HTTP communication port, kept for compatibility with pre-3.1 nodes and AIX nodes.

Rudder Node A *Node* is client computer managed by *Rudder*. To be managed, a *Node* must first be accepted as an authorized node.

Rudder Relay Server Relay servers are an optional component in a *Rudder* architecture. They can act as a proxy for all network communications between *Rudder* agents and a *Rudder* server. This enables them to be installed in a remote datacenter, or inside a restricted network zone, to limit the network flows required to use *Rudder*.

Rudder Root Server This is the core of the *Rudder* infrastructure. This server must be a dedicated machine (either virtual or physical), and contains the main application components: the web interface, databases, configuration data, logs...

Rudder *Rudder* is a Drift Assessment software. *Rudder* associates Asset Management and Configuration Management. *Rudder* is a Free Software developed by *Normation*.

Rule It is the application of one or more directives to a group of nodes. It is the glue between both Asset Management and Configuration Management parts of the application.

SQL server Store the received reports from the nodes.

Static group *Group* of *Nodes* based on search criteria. The search is performed once and the resulting list of *Nodes* is stored. Once declared, the list of nodes will not change, except manual change.

Technique Library This is an organized list of all available *Techniques*. This list can't be modified: every change made by a user will be applied to the Active *Techniques*.

Technique This is a configuration skeleton, adapted to a function or a particular service (e.g. DNS resolver configuration). This skeleton includes the configuration logic for this function or service, and can be set according to a list of variables (in the same example: IP addresses of DNS servers, the default search box, ...)

Web server application Execute the web interface and the server that handles the new inventories.

Web server front-end Handle the connection to the Web interface, the received inventories and the sharing of the UUID *Rudder Root Server*.

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