redocs Documentation

Release 0.0.1

See AUTHORS

September 16, 2014

Contents

Release Engine is a collection of open-source tools that provides the functionality necessary to continuously deploy packaged code from a development team's continuous integration server of choice to all environments and automate certain business processes associated with the release of code.

The home of the Release Engines is on GitHub in the RHInception Organization.

Put very simply: the Release Engine is an orchestration tool (*re-core*) that runs commands on purpose-built workers (*re-worker*). The commands to run (and where to run them) are defined in *playbooks* in YAML or JSON format.

Interaction with the engine happens via a REST interface (*re-rest*). Additional workers exist for the purposes of aggregating logs, as well as sending notifications over any preferred method (such as email, or IRC). A bare-minimal Release Engine installation would require **re-rest**, **re-core**, and any given **re-worker**.

To learn more about the RH Inception group, follow us on the Red Hat Developer Blog under the tag inception.

CHAPTER 1

Introduction

This section provides a very high-level overview of the Release Engine and it's component parts. Let's begin with a high-level overview of the complete system.

1.1 Overview

This section is a narrative, or story, introducing us to the individiual roles each component plays in the Release Engine. At the end of this narrative we'll have learned:

- Overall workflow
- About the key components
- How components communicate

1.1.1 Scenario

We work in a software shop and we have been told to decrease our time to delivery. We took some measurements and realized that even with Jenkins and some home-brewed systems for deployment, we're still spending **20%** of our sprint time on *just deploying to test environments*. Let's focus on getting back that 20%.

How do we approach this? What functionality must be present in any kind of system which can automate deployments? Also consider that we're just one stop in a much larger shop. Given that constraint, it follows that whatever we build should be accessible to outsiders, extensible so other teams can build on it to fit their requirements, as well as have a clear language for describing steps in a release.

- Authentication and authorization
- Storage for deployment playbooks
- Loosey coupled components, so individual installations can scale to meet their owners requirements
- Something to manage all of the actual steps happening
- And, some sort of configurable notification system, so we can get updates in real time.

When used together, the Release Engine provides all these things.

1.2 Components

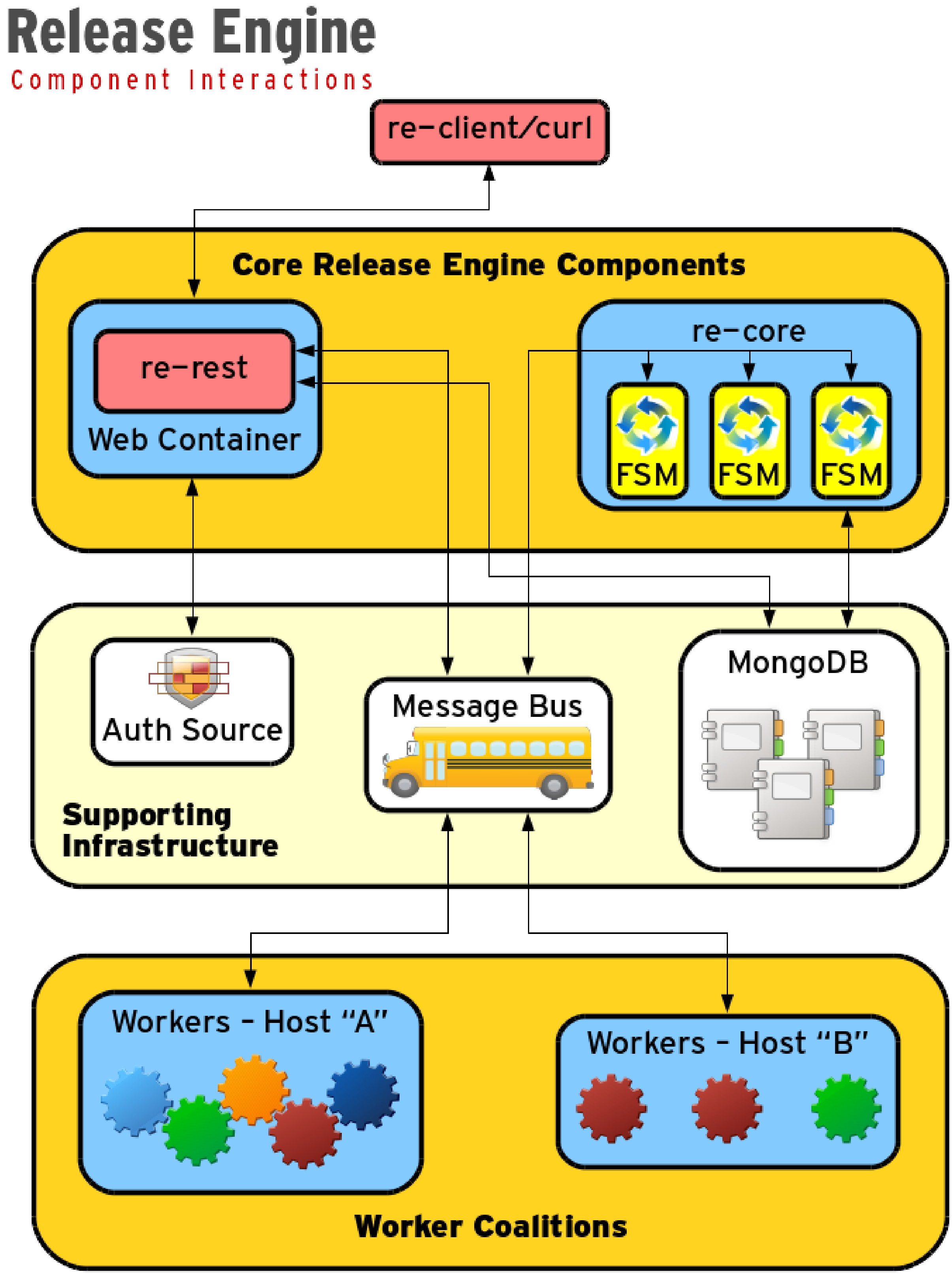
The Release Engine has three required components. Each of which is documented thoroughly in its own separate section. The following are brief descriptions of each component.

- *RE-CORE*
  - A finite state machine which oversees the execution of all steps required to complete a release
- *RE-REST*
  - A REST endpoint which handles authentication/authorization
  - The primary point of interaction for clients
- *One or more workers*
  - Workers are the components which are actually executed as release steps
  - There are several pre-built workers, you can view them on github

In addition to the required components:

- *RE-CLIENT*
  - Command line took for easily interacting with the Release Engine
  - Create, read, update, delete, and run playbooks

1.2.1 Component Diagram



1.2.2 Interactions & Workflow

This section describes how the Release Engine components interact with each other and the *supporting infrastructure*. We’ll review these interaction by examining a typical workflow.

CHAPTER 2

Setting Up

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2.1 Infrastructure Requirements

2.1.1 The Bus

Release Engine requires an AMQP service allowing messages to pass between components. The current, verified to work, AMQP service used with Release Engine is RabbitMQ, an Erlang-based open source messaging service. For more information on setting up a RabbitMQ server please read the project's server documentation.

For security best practices, each component that transmits on the bus should have it's own username and password combination. By enforcing component username/passwords access can be restricted to just what a component needs. This also allows quick deactivation of a component in the event something goes terribly wrong or a service is compromised.

Setup Steps

Note: Provision or utilize an existing server to install RabbitMQ or similar AMQP compliant service. For the rest of this article we will assume that you are running the service on RabbitMQ.

- Install RabbitMQ Server
- Open ports **5672** (*AMQP*) and **15672** (*management*)
- Enable RabbitMQ management via the Management Plugin
- Start RabbitMQ
- Create an exchange called "re" using topics

- Create a user for RE-REST (the rest interface into Release Engine)
- Create a user for RE-CORE (the state machine)
- Create a queue for RE-CORE
- Bind the RE-CORE queue to the re exchange with job.create
- Create a user for each component your instance will support
- Create a queue for each component your instance will support
- Bind the queue for each additional component (not including RE-REST and RE-CORE which are mandatory and separate from any additional components) to the re exchange with connectors that describe the step or plugin that your instance will support.

Todo

List binding instructions for queues

Test Setup

Todo

How to verify it's ready.

2.1.2 The Datastore

Release engine utilizes MongoDB for storing playbooks and other persistent data. Authentication must be turned on and it's highly recommended to create a username/password for every component that requires access to the data store.

Setup Steps

Note: Provision or utilize an existing server to install MongoDB or similar service like Amazon DynamoDB for the NoSQL service. For the rest of this article we will assume that you are running a local MongoDB service.

- Provision or choose a server to utilize for the datastore
- Install MongoDB on the server
- Open port 27017
- Update MongoDB for authentication (see the documentation)
- Start MongoDB
- Create a database called "re"
- Create a user for RE-CORE on database "re"
- Create a user for RE-REST on database "re"
- Import the initial data for the database via MongoDB Command Line Tools or one of the many MongoDB UI Tools.

Todo

Provide a link to the initial database import

Test Setup

Todo

How to verify it's ready.

2.2 Core Component Requirements

There are two components you must have no matter what workers you choose to support. These components are: RE-REST and RE-CORE.

2.2.1 RE-REST

RE-REST is the REST endpoint for interacting with the Release Engine. This is the only interaction point by design. RE-REST is a Flask based application and requires a few libraries before it will work properly.

Setup Steps

- Provision or choose a server to utilize for RE-REST
- Install Python v2
- Install the python v2 libraries listed on the re-rest GitHub page.
- Follow the RE-REST configuration instruction at *RE-REST → Configuration*.
- Choose and implement a RE-REST deployment strategy via *RE-REST Deployment*.

Test Setup

Todo

How to verify it's ready.

2.2.2 RE-CORE

The core is essentially a finite state machine (FSM) hooked into a message bus and a database.

The core oversees the execution of all release steps for any given project. The core is separate from the actual execution of each release step. Execution is delegated to the worker components.

Setup Steps

- Provision or choose a server to utilize for RE-CORE
- Install Python v2
- Install the python v2 libraries listed on the re-core GitHub page.
- Follow the RE-CORE configuration instructions at *RE-CORE Configuration*.
- Choose and implement a RE-CORE deployment strategy via *RE-CORE Deployment*.

Test Setup

Todo

How to verify it's ready.

CHAPTER 3

Components

3.1 RE-CORE

The core is essentially a finite state machine (**FSM**) hooked into a message bus and a database.

The core oversees the execution of all *release steps* for any given project. The core is separate from the actual execution of each release step. Execution is delegated to the **worker** component.

3.1.1 Running From Source

```
$ . ./hacking/setup-env
$ re-core -c ./examples/settings-example.json
```

3.1.2 RE-CORE Configuration

Configuration of the server is done in JSON. You can find an example configuration file in the examples/ directory.

You must point to a specific configuration file using the `-c` command-line option to start the FSM:

```
$ re-core -c settings.json
```

Descriptions of all settings directives:

Name	Type	Parent	Value
LOGFILE	str	None	File name for the application level log
RELEASE_LOG_DIR	str	None	Directory for per-release logging (default: `None`)
MQ	dict	None	Where all of the MQ connection settings are
SERVER	str	MQ	Hostname or IP of the server
NAME	str	MQ	Username to connect with
PASSWORD	str	MQ	Password to authenticate with
QUEUE	str	MQ	Queue on the server to bind
DB	dict	None	Where all the DB connection settings are
SERVERS	list	DB	List of all of the MongoDB hostname/IPs
DATABASE	str	DB	Name of the MongoDB database
NAME	str	DB	Username to connect with
PASSWORD	str	DB	Password to authenticate with
PHASE_NOTIFICATION	dict	None	Notifications that will always happen in a phase
TABOOT_URL	str	PHASE_NOTIFICATION	URL with `%s` to taboot tailer EX: http://example.com/taboot/%s/
TOPIC	str	PHASE_NOTIFICATION	The topic (*routing key*) to send notification on. EX: `notify.irc`.
TARGET	list	PHASE_NOTIFICATION	The targets to send the notification to. EX: `["#mychannel", "auser"]`
PRE_DEPLOY_CHECK	list	None	The yes/no checks to make prior to deployment (see below for more information)

For an example see example-config.json.

3.1.3 RE-CORE Deployment

Note: The release engine is only deployable via source code at this time.

Note: Release engine components are no fully demonized at this time. Therefore, deployment requires running each component in something like **screen**.

- Change into the directory you cloned **re-core** into
- Run **screen**
- Update your *re-core config file* with appropriate values
- Update your paths by running: `. ./hacking/setup-env`
- Run `re-core -c path/to/settings.json`

You should see output similar to the following:

```
[~/release-engine/re-core] $ re-core -c ./real-settings.json
2014-05-19 13:56:00,179 - __init__:start_logging:43 - DEBUG - initialized stdout logger
2014-05-19 13:56:00,180 - __init__:parse_config:53 - DEBUG - Parsed configuration file
```

Additional output will be directed to the log file you configured in the `settings.json` file. The default log file is called `recore.log` and will be in your present working directory.

3.1.4 Per-release Logging

By default, the FSM will log to the console and a single logfile (`LOGFILE`).

Optionally, one may log the FSM activity for **each release** to a separate file. This is done by configuring the re-core `RELEASE_LOG_DIR` setting with the path to the log-holding directory.

If per-release logging is enabled, the log files will be created as: `RELEASE_LOG_DIR/FSM-STATE_ID.log`

> **Warning:** Be sure the FSM has permission to write the specified directory. You won't find out it can't until the first release is attempted.

```
{
    "LOGFILE": "recore.log",
    "RELEASE_LOG_DIR": "/var/log/recore",
    "MQ": {
        "SERVER": "amqp.example.com"
    }
}
```

3.1.5 Pre-Deployment Checks

An re-core instance may be configured to run one or more scripts prior to the deployment of any playbook. Each pre-deployment check defines the command to run and the expected result from the command. If expected equals observed, then the check is considered to have passed. If expected is not equal to observed, then the check has failed and the entire deployment is marked as failed.

> **Important:** These checks apply to *all* deployments

Configuration of pre-deployment checks takes place in the re-core `setting.json` file.

Example settings

```
1  {
2      "LOGFILE": "recore.log",
3      "RELEASE_LOG_DIR": null,
4
5      "PRE_DEPLOY_CHECK": [{
6          "Require Change Record": {
7              "COMMAND": "servicenow",
8              "SUBCOMMAND": "getchangerecord",
9              "PARAMETERS": {},
10             "EXPECTATION": {
11                 "status": "completed",
12                 "data": {
13                     "exists": true
14                 }
15             }
16         }
17     }]
18 }
```

Here we see a new directive, `PRE_DEPLOY_CHECK` (line **5**), this key holds a list whose members are nested dictionaries (lines **6** → **16**). This example has one nested-dictionary. It has one key, that is the name of the check, **Require Change Record**. You can give any name you want to keys as long as it is JSON parsable.

Now let's look at this nested-dictionary closer:

```
{
    "COMMAND": "servicenow",
    "SUBCOMMAND": "getchangerecord",
```

```
    "PARAMETERS": {},
    "EXPECTATION": {
        "status": "completed",
        "data": {
            "exists": true
        }
    }
}
```

- COMMAND - Name of the worker to run the check with, *re-worker-servicenow* in this example
- SUBCOMMAND - The specific sub-command to run on that worker
- PARAMETERS - Dictionary with variable keys depending on what your worker requires
- EXPECTATION - The result we expected to get back from the check.

Pass or fail is determined by comparing the *actual* response against EXPECTATION. If they are the same then the check passes. If they differ then the check fails and the deployment is marked as *failed* and aborted.

3.2 RE-REST

Simple REST Api for the Release Engine. By design RE-REST is the only way to interact with the Release Engine.

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3.2.1 RE-REST Configuration

Configuration of the server is done in JSON and is by default kept in the current directories settings.json file.

You can override the location by setting `REREST_CONFIG` environment variable.

Name	Type	Parent	Value
LOGFILE	str	None	File name for the application level log
LOGLEVEL	str	None	DEBUG, INFO (default), WARN, FATAL
MQ	dict	None	Where all of the MQ connection settings are
SERVER	str	MQ	Hostname or IP of the server
PORT	int	MQ	Port to connect on
USER	str	MQ	Username to connect with
PASSWORD	str	MQ	Password to authenticate with
VHOST	str	MQ	vhost on the server to utilize
MONGODB_SETTINGS	dict	None	Where all of the MongoDB settings live
DB	str	MONGODB_Settings	Name of the database to use
USERNAME	str	MONGODB_Settings	Username to auth with
Password	str	MONGODB_Settings	Password to auth with
HOST	str	MONGODB_Settings	Host to connect to
PORT	int	MONGODB_Settings	Port to connect to on the host
PLAYBOOK_UI	bool	None	Turn's on/off the experimental playbook ui. It's off by default.
AUTHORIZATION_CALLABLE	str	None	module.location:callable. Eg: `rerest.authorization:no_authorization`
AUTHORIZATION_CONFIG	dict	None	Authorization callable specific configuration items

Further configuration items can be found in the Flask Documentation or look at specific `AUTHORIZATION_CALLABLE` documentation.

For an example see example-settings.json

3.2.2 Authentication

re-rest uses a simple decorator which enforces a `REMOTE_USER` be set.

rerest.decorators:remote_user_required

This decorator assumes that re-rest is running behind another web server which is taking care of authentication. If `REMOTE_USER` is passed to re-rest from the web server re-rest assumes authentication has succeeded. If it is not passed through re-rest treats the users as unauthenticated.

> **Warning:** When using this decorator it is very important that re-rest not be reachable by any means other than through the front end webserver!!

3.2.3 Authorization

re-rest uses a decorator which keys off the `AUTHORIZATION_CALLABLE` configuration parameters.

rerest.authroziation.no_authorization

Warning: This should not be used in a production environment**

To use this callable set `AUTHORIZATION_CALLABLE` to `rerest.authorization:no_authorization`.

rerest.authroziation.ldap_search

To use this callable set `AUTHORIZATION_CALLABLE` to `rerest.authorization:ldap_search` and set the following items in your configuration file.

Name	Type	Parent	Value
LDAP_URI	str	AUTHORIZATION_CONFIG	A full ldap URI such as `ldaps://127.0.0.1`
LDAP_USER	str	AUTHORIZATION_CONFIG	User to bind with
LDAP_PASSWORD	str	AUTHORIZATION_CONFIG	Password to bind with
LDAP_SEARCH_BASE	str	AUTHORIZATION_CONFIG	Search base for all queries. Ex: `dc=example,dc=com`
LDAP_MEMBER_ID	str	AUTHORIZATION_CONFIG	The name of the field that houses the username
LDAP_FIELD_MATCH	str	AUTHORIZATION_CONFIG	What field to use against the lookup table
LDAP_LOOKUP_TABLE	dict	AUTHORIZATION_CONFIG	key: list table of `LDAP_FIELD_MATCH` items to allowed groups. A * means all groups.

Here's a command-line example of how the `LDAP_LOOKUP_TABLE` property is used. In this example we will learn how authorization of the user **testuser** is determined.

Our organization has an ldap server at **ldap.example.com**, and groups are organized under the **ou=Groups,dc=example,dc=com** sub-tree. In this example re-rest will not attempt to **bind** (authenticate) with the LDAP server. Here is an example of this configuration:

```
{
    "AUTHORIZATION_CONFIG": {
        "LDAP_URI": "ldap://ldap.example.com",
        "LDAP_USER": "",
        "LDAP_PASSWORD": "",
        "LDAP_SEARCH_BASE": "ou=Groups,dc=example,dc=com",
        "LDAP_MEMBER_ID": "memberUid",
        "LDAP_FIELD_MATCH": "cn",
        "LDAP_LOOKUP_TABLE": {
            "admins": ["prod"],
            "superadmins": ["*"]
        }
    }
}
```

The **admins** group could look like this:

```
dn: cn=admins,ou=Groups,dc=example,dc=com
cn: admins
objectClass: top
objectClass: posixGroup
gidNumber: 1337
```

```
6 memberUid: testuser
7 memberUid: testboss
```

On line **6** we can see that this user is a member of the LDAP group **admins**. We also see here that group membership is denoted by use of the `memberUid` attribute. Note how this matches the the `LDAP_MEMBER_ID` setting we previously mentioned.

Let's pretend **testuser** is attempting to run a playbook with the *group* field set to **prod** (short for **production**). To determine authorization, **re-rest** will perform an LDAP search to query for records which match **two** conditions:

1. A record for a group exists in the `ou=Groups,dc=example,dc=com` sub-tree with a `cn` of **admins**
2. The discovered record has a `memberUid` attribute which matches the user's name: **testuser**

In LDAP search filter syntax, this query would look like the following:

```
(&(cn=admins)(memberUid=testuser))
```

With the `ldapsearch` command-line tool, we can test this authorization with the following command:

```
$ ldapsearch -xLLL -b ou=Groups,dc=example,dc=com -h ldap.example.com '(&(cn=admins)(memberUid=testus
```

If no results are returned, then the user is **not** authorized. If a result is resturned, then the user **is** authorized.

3.2.4 RE-REST Deployment

Apache with mod_wsgi

mod_wsgi can be used with Apache to mount rerest. Example mod_wsgi files are located in contrib/mod_wsgi.

- rerest.conf: The mod_wsgi configuration file. This should be modified and placed in /etc/httpd/conf.d/.
- rerest.wsgi: The WSGI file that mod_wsgi will use. This should be modified and placed in the location noted in rerest.conf

Gunicorn

Gunicorn (http://gunicorn.org/) is a popular open source Python WSGI server. It's still recommend to use Apache (or another web server) to handle auth before gunicorn since gunicorn itself is not set up for it.

```
$ gunicorn --user=YOUR_WORKER_USER --group=YOUR_WORKER_GROUP -D -b 127.0.0.1:5000 --access-logfile=/y
```

3.2.5 Running From Source

To run directly from source in order to test out the server run:

```
$ python rundevserver.py
```

The dev server will allow any HTTP Basic Auth user/password combination.

3.2.6 URLs

/api/v0/*$GROUP*/playbook/*$PLAYBOOKID*/deployment/

- **PUT**: Creates a new deployment.

- **Response Type**: json
- **Response Example**: `{"status": "created", "id": 1}`
- **Input Format**: None
- **Inputs**: optional json

/api/v0/playbooks/

- **GET**: Gets a list of **all** playbooks.
- **Response Type**: json
- **Response Example**: `{"status": "ok", "items": [...]}`
- **Input Format**: None
- **Inputs**: None

/api/v0/*$GROUP*/playbook/

- **GET**: Gets a list of all playbooks for a group.
- **Response Type**: json
- **Response Example**: `{"status": "ok", "items": [...]}`
- **Input Format**: None
- **Inputs**: None
- **PUT**: Creates a new playbook.
- **Response Type**: json
- **Response Example**: `{"status": "created", "id": "53614ccf1370129d6f29c7dd"}`
- **Input Format**: json/yaml
- **Inputs**: Optional format parameter which controls submit type. Can be json or yaml. Default is json.

/api/v0/*$GROUP*/playbook/*$ID*/

- **GET**: Gets a playbooks for a group.
- **Response Type**: json/yaml
- **Response Example**: `{"status": "ok", "item": ...}`
- **Input Format**: None
- **Inputs**: Optional format parameter which controls response type. Can be json or yaml. Default is json.
- **POST**: Replace a playbook in a group.
- **Response Type**: json
- **Response Example**: `{"status": "ok", "id": "53614ccf1370129d6f29c7dd"}`
- **Input Format**: json/yaml
- **Inputs**: Optional format parameter which controls response type. Can be json or yaml. Default is json.
- **DELETE**: Delete a playbook in a group.

- **Response Type**: json
- **Response Example**: `{"status": "gone"}`
- **Input Format**: None
- **Inputs**: None

3.2.7 Platform Gotchas

RHEL 6

You may need to add the following to your PYTHONPATH to be able to use Jinja2:

`/usr/lib/python2.6/site-packages/Jinja2-2.6-py2.6.egg`

3.2.8 What's Happening

1. User requests a new job via the REST endpoint
2. The REST server creates a temporary response queue and binds it to the exchange with the same name.
3. The REST server creates a message with a reply_to of the temporary response queue's topic.
4. The REST server sends the message to the bus on exchange *re* and topic *job.create*. Body Example: {"group": "nameofgroup"}
5. The REST server waits on the temporary response queue for a response.
6. Once a response is returned the REST service loads the body into a json structure and pulls out the id parameter.
7. The REST service then responds to the user with the job id.
8. The temporary response queue then is automatically deleted by the bus.

3.2.9 Usage Example

The authentication mechanism used in the front end webserver could be set up to use vastly different schemes. Instead of covering every possible authentication style which could be used we will work with two common ones in usage examples: htacces and kerberos.

Note: Setting up the front end proxy server for authentication is out of scope for this documentation.

htaccess / HTTP Basic Auth

```
$ curl -X PUT --user "USERNAME" -H "Content-Type: application/json" --data @file.json https://rerest
Password:

... # 201 and json data if exists, otherwise an error code
```

kerberos

```
$ kinit -f USERNAME
Password for USERNAME@DOMAIN:
$ curl --negotiate -u 'a:a' -H "Content-Type: application/json" --data @file.json -X PUT https://rere

... # 201 and json data if exists, otherwise an error code
```

Dynamic Variables

Passing dynamic variables requires two additions

1. We must set the `Content-Type` header (`-H ...` below) to `application/json`
2. We must pass **data** (`-d '{....}'` below) for the `PUT` to send to the server

This example sets the `Content-Type` and passes two **dynamic variables**: `cart` which is the name of a Juicer release cart, and `environment`, which is the environment to push the release cart contents to.

```
$ curl -u "user:passwd" -H "Content-Type: application/json" -d '{"cart": "bitmath", "environment": "r

 ... # 201 and json data if exists, otherwise an error code
```

See also:

- *RE-WORKER-JUICER*
- *Playbooks → Dynamic Variables*

Important: Release Engine workers require the *RE-WORKER* module

3.3 Playbook Workers

These workers are usable in *playbooks*.

3.3.1 RE-WORKER-BIGIP

Release Engine Worker Plugin that interfaces with F5 BigIP devices.

Attention: This plugin is internal to Red Hat only.

This worker takes the normal MQ configuration (`conf/mq_settings.json`) as it's only configuration file:

```
{
  "server": "127.0.0.1",
  "port": 5672,
  "vhost": "/",
  "user": "guest",
  "password": "guest"
}
```

- Set the `MQ config file` parameters to sane values (see also: *Setting Up The Bus*)
- Run the worker: `python ./replugin/emailworker/__init__.py $YOUR_MQ_CONF.json`

We should see output similar to the following if everything well:

```
[user@frober re-worker-bigip]$ python ./replugin/bigipworker/__init__.py
2014-05-19 14:39:47,080 - BigipWorker - WARNING - No app logger passed in. Defaulting to Streamandle
2014-05-19 14:39:47,083 - BigipWorker - INFO - Attempting connection with amqp://inceptadmin:***@mes
2014-05-19 14:39:47,412 - BigipWorker - INFO - Connection and channel open.
2014-05-19 14:39:47,413 - BigipWorker - INFO - Consuming on queue worker.bigip
```

Commands

The BigIP Worker steps are documented in *Worker Steps: BigIP*

3.3.2 RE-WORKER-FUNC

Release Engine Worker Plugin to run commands over FUNC.

What's FUNC?

Func stands for *Fedora Unified Network Controller*. Func allows for running commands on remote systems in a secure way, like SSH, but offers several improvements.

Func is extensible, as such it comes with several modules. Each module gives you more options for what you do with func. Here's a few of the modules which Func ships with:

- Command for running arbitrary commands somewhere remote
- Nagios for handling common tasks in Nagios related to downtime and notifications
- Service for starting, stopping, and checking the status of system services

This plugin allows you to run any number of func worker instances. Each instance is configured to allow for calling specific func module commands through it. However, this requires configuration before it can work.

Note: Installation and configuration of a func infrastructure is outside of the scope of this documentation. Please refer to the upstream documentation for additional information.

Configuration

Each running func worker requires a worker and an MQ configuration file. The worker configuration file defines exactly which func modules and methods the worker is allowed to run.

The configuration file uses the following **pattern** in JSON format:

```
{
    "queue": "QUEUE_NAME",
    "FUNC_MODULE": {
        "METHOD_1": ["REQUIRED", "PARAMETERS"],
        "METHOD_2": ["ONE_ITEM"],
```

```
6           "METHOD_N": []
7   }
```

In this example on line 2 we see a parameter `queue`. This is how we set a specific name for the queue to bind to on the message bus. This parameter is **required** if you are running more than one func worker concurrently. Using a name that defines what the workers does. For example, if you're using the Nagios plugin, you would create and bind to a queue such as `nagios` (which is expanded to `worker.nagios` internally).

The second configuration file is the normal MQ configuration used for connecting to the bus:

```
{
  "server": "127.0.0.1",
  "port": 5672,
  "vhost": "/",
  "user": "guest",
  "password": "guest"
}
```

- Set the `MQ config file` parameters to sane values (see also: *Setting Up The Bus*)
- Run the worker: `python ./replugin/funcworker/__init__.py` -w $YOUR_CONFIG_FILE.json $YOUR_MQ_CONF.json`

We should see output similar to the following if everything well:

```
[root@frober re-worker-func]# python ./replugin/funcworker/__init__.py
2014-05-19 14:39:47,080 - FuncWorker - WARNING - No app logger passed in. Defaulting to Streamandler
2014-05-19 14:39:47,083 - FuncWorker - INFO - Attempting connection with amqp://JoeUser:***@mq.exampl
2014-05-19 14:39:47,412 - FuncWorker - INFO - Connection and channel open.
2014-05-19 14:39:47,413 - FuncWorker - INFO - Consuming on queue worker.nagios
```

Example Configuration

Here is a real-life example of a func worker which may be used to run the `yumcmd` modules `install`, `remove`, and `update` methods.

```
{
    "yumcmd": {
        "install": ["package"],
        "remove": ["package"],
        "update": []
    }
}
```

In the above example we see on the `install` line that there is a list, `["package"]`, with one item in it. This means that when used as a step in a playbook a **single** `package` parameter must also be provided.

In contrast, we can see that the `update` method has an empty list, `[]`, following it. This indicates that the `yumcmd.update` method accepts no parameters. Using this method in a playbook step would update all packages on the target system.

The following is an example using the `yumcmd` module in a playbook step.

Commands

The FUNC Worker steps are documented in *Worker Steps: FUNC*.

Example: Installing a package

The following is an example of a *playbook* which installs a single package:

```
1  ---
2  group: inception
3  name: Setup megafrobber
4  execution:
5    - description: install the megafrobber package
6      hosts:
7        - foo.bar.example.com
8      steps:
9         - yumcmd:install:
10            package: megafrobber
```

Here we can see in lines **9** → **10** how to call the `install` sub-command for the **funcworker**.

Example: Stopping a Service

In this example *playbook* we will use the **service** sub-command to restart the **megafrobber** system service. For reference, first we'll look at the **funcworker** configuration for the **service** module:

```
{
    "service": {
        "stop": ["service"],
        "start": ["service"],
        "restart": ["service"],
        "reload": ["service"],
        "status": ["service"]
    }
}
```

Recall from what we learned in the *configuration* section that this defines one module, `service`.

As we can see above, the `service` module has 5 sub-commands, each requires one parameter, `service`, which is the name of the service to control.

The following example shows how to use the `funcworker.service.restart` method to restart the `megafrobber` service. This happens in lines **9** → **10**:

```
1  ---
2  group: inception
3  name: Setup megafrobber
4  execution:
5    - description: restart the megafrobber service
6      hosts:
7        - foo.bar.example.com
8      steps:
9         - service:restart:
10            service: megafrobber
```

Example: Trying/Checking

We can also add optional parameters `tries` and `check_scripts`. `check_scripts` is an array of scripts that will be run after the command. If they all return success (a zero return value) the whole command is considered successful. However if any return a non zero value the step is considered failed. The `tries` parameter tells the worker to try the step *X* number of times before giving up.

The following example will attempt the restart `megafrobber` and run the check_script `/usr/bin/diditwork`. If the either the restart or the check script return a failure it will try again until it's limit of 5 tries has been hit (at which point it returns failure back to the bus).

```
---
group: inception
name: Setup megafrobber
execution:
  - description: restart the megafrobber service
    hosts:
      - foo.bar.example.com
    steps:
       - service:restart:
           service: megafrobber
           tries: 5
           check_scripts: ["/usr/bin/diditwork"]
```

More Modules

The func worker ships with support for several other func modules out-of-the-box. To see them all, check out GitHub: re-worker-func/conf/

See Func - Module List for more information.

3.3.3 RE-WORKER-JUICER

Release Engine Worker Plugin to run Juicer commands

What's Juicer?

The **Juicer** worker allows you to upload and promote batches of RPMs into Yum repositories. In juicer terminology, these batches of RPMs are referred to as release carts.

About & Setup

A **juicer** worker allows you to upload/promote RPMs as just another step in your release process. **Note** however that the juicer plugin requires that additional information is passed to it when the release is started. See *Dynamic Variables* for more information on this topic.

To run the worker the normal MQ configuration must be defined and used.

```
{
  "server": "127.0.0.1",
  "port": 5672,
  "vhost": "/",
  "user": "guest",
```

```
  "password": "guest"
}
```

- Set the `MQ config file` parameters to sane values (see also: *Setting Up The Bus*)
- Run the worker
  - **From source:** `python ./replugin/juicerworker/__init__.py $YOUR_MQ_CONF.json`
  - **From install:** `re-worker-juicer $YOUR_MQ_CONF.json`

We should see output similar to the following if everything well:

```
[user@frober re-worker-juicerworker]$ re-worker-juicer mq_conf.json
2014-05-19 14:39:47,080 - JuicerWorker - WARNING - No app logger passed in. Defaulting to Streamandle
2014-05-19 14:39:47,083 - JuicerWorker - INFO - Attempting connection with amqp://inceptadmin:***@mes
2014-05-19 14:39:47,412 - JuicerWorker - INFO - Connection and channel open.
2014-05-19 14:39:47,413 - JuicerWorker - INFO - Consuming on queue worker.juicer
```

Juicer Client Configuration

See the upstream juicer configuration documentation for instructions on how to setup a system accounts juicer configuration file.

Dependencies

Use of the juicer worker requires a configured and running Pulp Server installation. Setup and maintenance of pulp servers is out of scope for this documentation. However, they provide detailed setup instructions to help get you started.

Commands

The Juicer Worker steps are documented in *Worker Steps: Juicer*.

3.3.4 RE-WORKER-SERVICENOW

Release Engine Worker Plugin that does basic interaction with Service Now.

This worker takes two configuration files. The first is the SERVICE NOW configuration file. It should look like this:

```
{
    "servicenow_user": "username",
    "servicenow_password": "secret",
    "api_root_url": "https://127.0.0.1/api/now/v1"
}
```

- Set the `MQ config file` parameters to sane values (see also: *Setting Up The Bus*)
- Run the worker
  - **From source:** `python ./replugin/servicenowworker/__init__.py -w $YOUR_SERVICE_NOW_CONF.json $YOUR_MQ_CONF.json`
  - **From install:** `re-worker-servicenow -w $YOUR_SERVICE_NOW_CONF.json $YOUR_MQ_CONF.json`

We should see output similar to the following if everything well:

```
[user@frober]$ re-worker-servicenow -w servicenow.json mq.json`
2014-05-19 14:39:47,080 - ServiceNowWorker - WARNING - No app logger passed in. Defaulting to Streama
2014-05-19 14:39:47,083 - ServiceNowWorker - INFO - Attempting connection with amqp://inceptadmin:***
2014-05-19 14:39:47,412 - ServiceNowWorker - INFO - Connection and channel open.
2014-05-19 14:39:47,413 - ServiceNowWorker - INFO - Consuming on queue worker.servicenow
```

Commands

The ServiceNow Worker steps are documented in *Worker Steps: ServiceNow*.

3.3.5 RE-WORKER-SLEEP

Release Engine Worker Plugin that sleeps for a period of seconds.

This worker takes the normal MQ configuration as it's only configuration file:

```
{
  "server": "127.0.0.1",
  "port": 5672,
  "vhost": "/",
  "user": "guest",
  "password": "guest"
}
```

- Set the `MQ config file` parameters to sane values (see also: *Setting Up The Bus*)
- Run the worker: `python ./replugin/emailworker/__init__.py $YOUR_MQ_CONF.json`

We should see output similar to the following if everything well:

```
[user@frober re-worker-sleep]$ python ./replugin/sleepworker/__init__.py
2014-05-19 14:39:47,080 - SleepWorker - WARNING - No app logger passed in. Defaulting to Streamandler
2014-05-19 14:39:47,083 - SleepWorker - INFO - Attempting connection with amqp://inceptadmin:***@mess
2014-05-19 14:39:47,412 - SleepWorker - INFO - Connection and channel open.
2014-05-19 14:39:47,413 - SleepWorker - INFO - Consuming on queue worker.sleep
```

Commands

The Sleep Worker steps are documented in *Worker Steps: Sleep*.

3.4 Auxiliary Workers

These workers are support workers and handle various other tasks. They are **not** usable in playbooks.

3.4.1 RE-WORKER-EMAILNOTIFY

Release Engine Worker Plugin can send notifications via email.

Note: This is a notification handler and is not meant to be used in steps.

This worker takes two configuration files. The first is the EMAILNOTIFY configuration file. It should look like this:

```
{
  "smtp_host": "127.0.0.1",
  "smtp_port": 25,
  "smtp_from": "noreply@example.com"
}
```

- Set the `EMAILNOTIFY` parameters to match your email server configuration.

The second configuration file is the normal MQ configuration:

```
{
  "server": "127.0.0.1",
  "port": 5672,
  "vhost": "/",
  "user": "guest",
  "password": "guest"
}
```

- Set the `MQ config file` parameters to sane values (see also: *Setting Up The Bus*)
- Run the worker: `python ./replugin/emailworker/__init__.py` -w $YOUR_CONFIG_FILE.json $YOUR_MQ_CONF.json`

We should see output similar to the following if everything well:

```
[user@frober re-worker-emailnotify]$ python ./replugin/emailworker/__init__.py -w myconf.json mq.jso
2014-05-19 14:39:47,080 - EmailNotifyWorker - WARNING - No app logger passed in. Defaulting to Strea
2014-05-19 14:39:47,083 - EmailNotifyWorker - INFO - Attempting connection with amqp://inceptadmin:*
2014-05-19 14:39:47,412 - EmailNotifyWorker - INFO - Connection and channel open.
2014-05-19 14:39:47,413 - EmailNotifyWorker - INFO - Consuming on queue worker.emailnotifyworker
```

3.4.2 RE-WORKER-IRCNOTIFY

Release Engine Worker Plugin can send notifications to IRC.

Note: This is a notification handler and is not meant to be used in steps.

This worker takes two configuration files. The first is the IRCNOTIFY configuration file. It should look like this:

```
{
  "server": "127.0.0.1",
  "port": 6697,
  "ssl": true,
  "channels": ["#release-engine"],
  "nick": "renotify"
}
```

- Set the `IRCNOTIFY` parameters to match your IRC server configuration.

The second configuration file is the normal MQ configuration:

```
{
  "server": "127.0.0.1",
  "port": 5672,
  "vhost": "/",
  "user": "guest",
  "password": "guest"
}
```

- Set the `MQ config file` parameters to sane values (see also: *Setting Up The Bus*)
- Run the worker: `re-worker-ircnotify -w $YOUR_CONFIG_FILE.json $YOUR_MQ_CONF.json`

We should see output similar to the following if everything well:

```
[user@frober re-worker-ircnotify]$ re-worker-ircnotify -w $YOUR_CONFIG_FILE.json $YOUR_MQ_CONF.json
2014-05-19 14:39:47,080 - IRCNotifyWorker - WARNING - No app logger passed in. Defaulting to Streamar
2014-05-19 14:39:47,083 - IRCNotifyWorker - INFO - Attempting connection with amqp://inceptadmin:***(
2014-05-19 14:39:47,412 - IRCNotifyWorker - INFO - Connection and channel open.
2014-05-19 14:39:47,413 - IRCNotifyWorker - INFO - Consuming on queue worker.ircnotifyworker
```

3.4.3 RE-WORKER-OUTPUT

Release Engine Worker Plugin consumes output from other works on the bus and writes it to files.

Note: This is an output consumer and is not meant to be used in steps.

This worker takes two configuration files. The first is the worker configuration file. It should look like this:

```
{
    "queue": "output",
    "output_dir": "/tmp/"
}
```

- Set the `output_dir` to where the output files should reside.

The second configuration file is the normal MQ configuration:

```
{
  "server": "127.0.0.1",
  "port": 5672,
  "vhost": "/",
  "user": "guest",
  "password": "guest"
}
```

- Set the `MQ config file` parameters to sane values (see also: *Setting Up The Bus*)
- Run the worker * **From source:** `python ./replugin/outputworker/__init__.py` -w $YOUR_CONFIG_FILE.json $YOUR_MQ_CONF.json` * **From install:** `re-worker-output -w $YOUR_SERVICE_NOW_CONF.json $YOUR_MQ_CONF.json`

Note: You may need to add the following to your PYTHONPATH to be able to use Jinja2 on RHEL6: `/usr/lib/python2.6/site-packages/Jinja2-2.6-py2.6.egg`

We should see output similar to the following if everything well:

```
[user@frober]$ re-worker-output -w myconf.json mq.json
2014-05-19 14:39:47,080 - IRCNotifyWorker - WARNING - No app logger passed in. Defaulting to Streamar
2014-05-19 14:39:47,083 - IRCNotifyWorker - INFO - Attempting connection with amqp://inceptadmin:***(
2014-05-19 14:39:47,412 - IRCNotifyWorker - INFO - Connection and channel open.
2014-05-19 14:39:47,413 - IRCNotifyWorker - INFO - Consuming on queue worker.output
```

3.5 Libraries/Helpers

3.5.1 RE-CLIENT

Release Engine - Client Tool

Todo

Define what this is better.

Running From Checkout

Todo

How do they install it?

```
$ export PYTHONPATH=`pwd`/src/:$PYTHONPATH
$ ./bin/re-client
```

At this point you'll be prompted to enter some configuration values:

```
Could not load base rerest url from /home/tbielawa/.reclient.conf
Enter the hostname of your rerest endpoint
This will be saved in /home/tbielawa/.reclient.conf for reuse later
Hostname:
```

At this point you would enter the hostname of your re-rest endpoint.

```
Hostname: rerest.example.com

0) Get all playbooks ever
1) Get all playbooks for a project
2) Get a single playbook for a project
3) Update a playbook
4) Delete a playbook
5) Create a new playbook
6) Start a deployment (without any dynamic keys)
7) Quit
command>>
```

Release Engine Client Tools are now setup and ready to use.

Command Line Options

The `re-client` command accepts two optional parameters:

- `--project`, `-p` - Set the default project
- `--id`, `-i` - Set the default playbook ID
- `--format`, `-f` - Select yaml/json for the format. Default: yaml

Usage Example

Let's work with **example project** for the duration of this session:

```
$ ./bin/re-client -p 'example project'
```

Notes

The REPL (command loop) has **readline** history enabled. This means the up/down arrow keys work and you can edit lines of input **like a boss**.

3.5.2 RE-WORKER

This library provides a simple base for release engine workers to build from.

Implementing a Worker

To implement a worker, subclass off of `reworker.worker.Worker` and override the `process` method.

If there are any inputs that need to be passed in, the class level variable `dynamic` should be populated.

```
class MyWorker(Worker):

    dynamic = ('environment', 'cart')

    ...
```

If a `config_file` is passed in on Worker creation it will be loaded as JSON and available as `self._config`. Otherwise `self._config` will be an empty dictionary.

Logging

When implementing your own worker, the `re-worker` base-class provides two mechanisms for logging and reporting worker progress.

Application-level Recording the kind of information system administrators need to see for debugging is facilitated by the `self.app_logger` instance variable. This information is logged to `stdout`.

```
def process(self, channel, basic_deliver, properties, body, output):

    # ...

    self.app_logger.debug("Going to frob the widget.")
```

User-level Reporting progress is facilitated by the `output` parameter which is passed to the `Worker.process` method. This information is send back to the message bus where it is then collected and saved by the *output worker*.

```
def process(self, channel, basic_deliver, properties, body, output):
    self.output = output

    # ...

```

```
    self.output.info("Release step successful with result: %s" % (
        str(result)))
```

Convenience Methods

Worker also provides a few convenience methods to simplify use:

Todo

Change to using actual sphinx API documentation.

Worker.send

Sends a message.

- **Inputs**:
- `topic`: the routing key
- `corr_id`: the correlation id
- `message_struct`: the dict or list to send as the body
- `exchange`: set to **''** to reply back to the FSM
- **Returns**: None

Worker.notify

- **Inputs**:
- `slug`: the short text to use in the notification
- `message`: a string which will be used in the notification
- `phase`: the phase to identify with in the notification
- `corr_id`: the correlation id. Default: **None**
- `exchange`: the exchange to publish on. Default: **re**
- **Returns**: None

Worker.ack

Acks a message.

- **Inputs**:
- `basic_deliver`: pika.Spec.Basic.Deliver instance
- **Returns**: None

Worker.run_forever

Starts the main loop.

- **Inputs**: None
- **Returns**: None

Worker.process

What a worker should do when a message is received. All output should be written to the *output logger*.

- **Inputs**:
- `channel`: pika.channel.Channel instance
- `basic_deliver`: pika.Spec.Basic.Deliver instance
- `properties`: pika.Spec.BasicProperties instance (ex: headers)
- `body`: dict or list that was json loaded off the message
- `output`: logger like instance to send output
- **Returns**: None

Running

Todo

Update this with how to run a custom **non-packaged** worker from source.

To run an instance you will need to make an instance of your worker by passing in a few items.

- **Inputs**:
  - mq_config: should house: user, password, server, port and vhost.
  - config_file: is an optional full path to a json config file
  - logger: is an optional logger. Defaults to a logger to stderr

CHAPTER 4

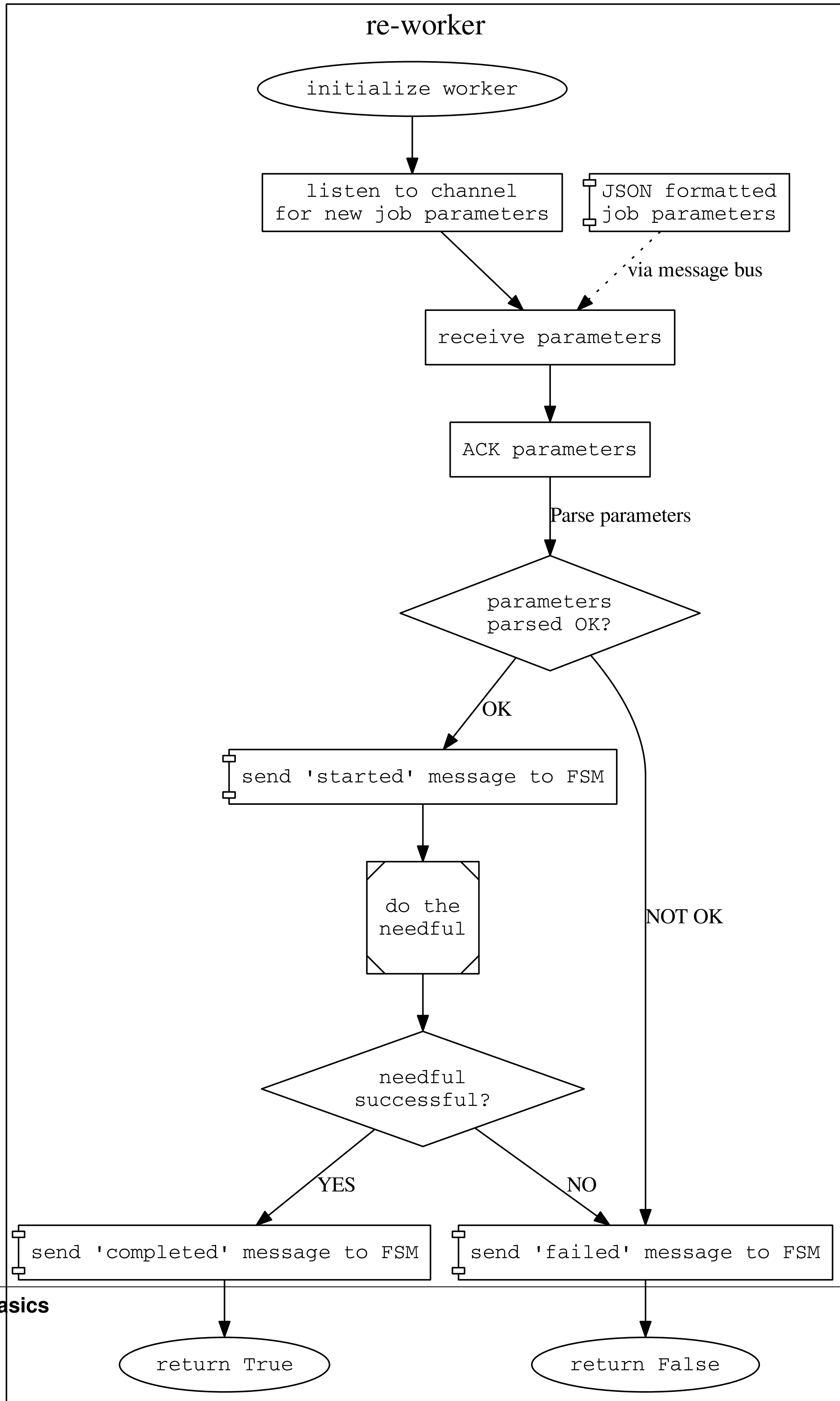
Tutorial: Writing Workers

This section contains tutorials for writing your own workers. If you haven't already, please take a few minutes and familiarize yourself with the *re-worker API documentation*.

4.1 Basics

Simple stuff.

4.1.1 Typical Worker Flow



Note: Not included in the chart are some of the various logging/notification steps which take place in a release.

Now, let's translate what this is saying into human readable words:

initialize worker In this state a process running the code representing our worker has just been started.

listen to channel Once the process has started our worker will open a channel to the message bus and begin consuming from a queue specifically dedicated to that kind of worker.

receive parameters Once our worker is consuming from its queue, it will sit in a waiting state until a message is received from the FSM (*re-core*). This message is only sent when a release is started.

The message will contain the parameters, or more generally speaking, the *configuration* of this step in the release. See the *re-core re-workers* Deployment Message Format documentation for the specifics on what is contained in this information.

Note: The message consumed from the message queue is a serialized JSON datastructure. Most workers will deserialized this message using a JSON library feature, such as the Python json.loads() method.

The **most important** piece of information contained in this first message is the `reply_to` property. This property tells our worker the name of the temporary queue to continue all further communication with the FSM on. Messages sent to *any other* destination will be lost in the message exchange.

Additionally, this first message will contain a **correlation ID**. This information should be recorded by our worker because it is used for logging and communicating back to the FSM.

ACK parameters Now that our worker has received its job parameters, the next step is to **acknowledge** receiving the parameters. Our worker does this using its AMQP librarie's `ack` function or method. If our worker is using the Python Pika AMQP module, it will provide the `delivery tag` as the parameter to the `ack` function.

parse parameters If our worker requires any unique information to do its job, then it must parse that information from the parameters provided by the FSM. This step typically involves verifying everything it needs to operate was provided and is valid.

This information often includes reading which sub-command (if applicable) to run, what (if any) hosts to operate on, parameters to provide to subcommands, and *dynamic values* passed in at deployment-time.

parameters verified If the parameters are parsed and it is verified that all the required information is present, then our worker will *reply* back to the FSM indicating that it is going to start running the step now.

The body of the message sent back to the FSM is a JSON **serialized** datastructure. See the *Response Message Format* documentation in the re-core re-worker docs for more information.

Workers using the *re-worker* library typically respond by calling the *worker.send()* method. When responding they should provide the `reply_to` variable as the `topic` parameter and leave the `exchange` parameter as an empty string.

parameters invalid Our worker must notify the FSM in the unfortunate event that the parameters provided were invalid. Similar to the previous step (valid parameters) our worker will use its `send()` method to send a *job failed* message.

Once the message has been sent our worker will abort all further execution. If the worker is designed such that it runs in a some kind of io-loop (such as in the *re-worker* library), this is as simple as returning `False` while still in the `process()` method.

do the needful At this point our worker has been initialized, received operating parameters from the FSM, and communicated back that it is going to proceed with the release. The next step is for the worker to begin doing what it was instructed to do.

The specifics of what happens in this step are different from worker to worker. The *BigIP* worker, for example, will run one of three sub-commands at this point. The exact sub-command is dictated by the value of the `subcommand` parameter.

step complete If *the needful* was a success, then our worker will reply back to the FSM one last time (again, using its `send()` method) with a JSON serialized datastructure. The message will include a `status` key set to `completed`.

After the message has been sent the worker will return `True` and continue its loop to begin the process all over again.

step failed If *the needful* was **not** a success, then our worker will reply back to the FSM one last time (again, using its `send()` method) with a JSON serialized datastructure. The message will include a `status` key set to `failed` and possibly another key, `data` with various information about the exact nature of the failure.

After the message has been sent the worker will return `False` and continue its loop to begin the process all over again.

4.1.2 Exercise: Write a Worker from Scratch

In this section we will build a worker from scratch. The worker will be written in Python. Additionally, the worker will utilize the *re-worker* library.

To keep things simple, our new worker will pretend to frob ("manipulate or adjust, to tweak") an arbitrary *thing* and then report the results. This worker will be called the **megafrobber** worker. The **megafrobber** worker will have one sub-command: `frob`.

The `frob` sub-command requires no arguments. When the sub-command is ran, it will take no actual actions. It will just randomly pass or fail.

This section is separated into several sub-sections. Each sub-section will incrementally build upon the work of the preceeding sections. At the end, we'll have a deployable worker.

Directory Structure

Workers adhere to the following directory structure:

```
re-worker-megafrobber/     - Top level
-- replugin/              - Python package directory
    -- megafrobberworker/ - Worker code directory
    |   -- __init__.py    - Worker code
    -- __init__.py        - Empty file, Python module requirement
```

In a command-line shell, you could create this structure using the following commands:

```
$ WORKER=megafrobber
$ mkdir -p re-worker-${WORKER}/replugin/${WORKER}worker
$ touch re-worker-${WORKER}/replugin/__init__.py
$ touch re-worker-${WORKER}/replugin/${WORKER}worker/__init__.py
$ find .
.
./re-worker-megafrobber
./re-worker-megafrobber/replugin
./re-worker-megafrobber/replugin/__init__.py
./re-worker-megafrobber/replugin/megafrobberworker
./re-worker-megafrobber/replugin/megafrobberworker/__init__.py
```

Scaffolding: Shebang and Imports

Note: The remainder of this tutorial assumes the present working directory is `re-worker-megafrobber`, the top-level directory

With our directory now created, we can begin filling in some scaffolding for our new worker. All of the following code snippets go into `replugin/megafrobberworker/__init__.py`.

The first things we'll add are the Python shebang and some standard imports:

```
1 #!/usr/bin/env python
2 import reworker.worker
3 import logging
```

The shebang (line **1**) is just there so that this script can be executed from the command line. It tells our shell (ex: BASH) what program to run the rest of the script in.

The import on line **2** will provide the standard **re-worker** library for us. Finally, line **3** will allow us to properly output application behavior.

Scaffolding: Class Definition

Following our imports comes the class definition. As we noted previously, this example worker will use the **re-worker** library. The **re-worker** library includes one class, `reworker.worker.Worker`.

As per the *re-worker* documentation, to *use* this class, our worker must:

- Subclass `reworker.worker.Worker` (line **1**)
- Define a `process` method (line **6**)

As we can see on line **1**, we call our class `MegafrobberWorker`.

```
1 class MegafrobberWorker(reworker.worker.Worker):
2     """
3     Plugin to frob the heck out of something
4     """
5
6     def process(self, channel, basic_deliver, properties, body, output):
```

The parameters that we see defined on line **6** are required. This is because of how the **re-worker** message bus integration code is written.

1. **re-worker** connects to the bus automatically upon startup
2. **re-worker** begins consuming from the workers dedicated queue
3. Upon receiving a message a callback is ran by the AMQP library (we use Pika for this). That callback flows into our `process` method
4. Once in the `process` method, the actual worker **work** happens (that's where we are now)

See also:

The Pika Documentation You can read more about callbacks and their usage on the Pika website.

Scaffolding: Record Job Properties

Our `process` method has a lot of arguments, this can appear overwhelming. Which do we need to care about?

To get us started, here are some common setup actions we might take with these properties.

```
def process(self, channel, basic_deliver, properties, body, output):
    # Output is a logger from the python logger library. This is
    # what we report progress through
    self.output = output

    # This is the ID given to the currently happening deployment. It
    # is a unique ID used to connect all passed messages together and
    # record the deployment state in the database.
    #
    # We use it when responding to the FSM.
    self.corr_id = str(properties.correlation_id)

    # If the FSM passed us any dynamic variables, they will be in
    # the 'dynamic' key of the body parameter
    dynamic = body.get('dynamic', {})

    # reply_to is the temporary message bus queue we respond to the
    # FSM through
    self.reply_to = properties.reply_to
```

Scaffolding: Make It Runnable

There are only two more things we need to add to make our worker runnable from the command line. The first is a `main` function, the second is the code to call that function when requested. These should go at the **end** of the file.

```
1 def main():  # pragma: no cover
2     from reworker.worker import runner
3     runner(MegafrobberWorker)
4
5
6 if __name__ == '__main__':  # pragma: no cover
7     main()
```

Note on line **3** that we pass the name of our class to the `runner` function.

Parse Parameters

Some workers have subcommands which require parameters to run. By default three parameters are always passed to workers: `hosts`, `command`, and `subcommand`. Our worker will not require passing any extra parameters. Therefore, in this tutorial, we will show how to verify that a requested sub-command is valid.

For the cases where input is invalid, we will also demonstrate how to abort the worker.

Note: This is within the `process` method

```
# Begin parameter parsing
#
# It's usually a good idea to record all of your valid
# subcommands somewhere:
self._subcommands = ['frob']

# Grab the REQUESTED subcommand from the 'parameters' dictionary
_subcommand = body['parameters'].get('subcommand', None)

```

```
# Make sure it's recognized
if _subcommand in self._subcommands:
    # This is good, the requested subcommand is valid.
    #
    # ACK the message to make the message bus happy.
    self.ack(basic_deliver)
else:
    # This is bad, the playbook calls for an unknown subcommand
    #
    # Reject the message we received on the message bus
    self.reject(basic_deliver)

    # Output to the console that an error has occurred,
    # include the correlation ID so we can trace the error
    # back to this deployment
    self.app_logger.error(
        "%s - Rejecting message, invalid subcommand requested: %s" % (
            self.corr_id, _subcommand))

    # Use 'notify' to update the output worker of our
    # progress. This output is usually logged to a central
    # location.
    self.notify(
        'Frobbing Failed',
        "Frobbing failed. Invalid subcommand requested: %s" % _subcommand,
        'failed',
        self.corr_id)

    # Send a message to the FSM indicating that the release
    # has failed. This will cause the FSM to stop the
    # deployment.
    self.send(self.reply_to,
              self.corr_id,
              {'status': 'failed',
               "message": "invalid subcommand requested: %s" % _subcommand},
              exchange='')

    # Break out of this job and start over
    return False

# End parameter parsing
```

The `ack`, `notify`, and `send` methods are described in the primary *re-worker* documentation.

Run the Job

At this point we have set up all the usual scaffolding and validated the input parameters for this job. If we haven't aborted by now then we will run the actual `frob` sub-command.

For this tutorial, the `frob` sub-command will just randomly pass or fail. We'll need an additional library for this, `random`, so let's add the import to the top of our file:

```
import random
```

It's a good idea to write each of your sub-commands as a separate method. For the `frob` sub-command it is as simple as returning a random number grabbed from the random number generator:

```python
def _frob(self):
    """
    Frob the random number generator.

    If the result is even then "frob successful". If the result is
    odd, then "frob failed"
    """
    return random.randint(0, 100)
```

And then, back in the `process` method, call this sub-command and process the result:

```python
# Begin the actual job
#
# Let the FSM know we’re starting the job now
self.send(
    self.reply_to, self.corr_id, {’status’: ’started’}, exchange=’’)

self.app_logger.info(’Beginning the frobbing’)

_frob_result = self._frob()

# Process the results
if (_frob_result % 2) == 0:
    _msg = "The frobbing passed, even random number generated: %s" % _frob_result

    self.app_logger.info(_msg)
    self.notify(
        ’Frobbing passed’,
        _msg,
        ’completed’,
        self.corr_id)

    # When a job succeeds, let the FSM know by sending
    # a ’completed’ message
    self.send(self.reply_to,
              self.corr_id,
              {’status’: ’completed’,
               "message": _msg},
              exchange=’’)
    return True
else:
    _msg = ’Frobbing failed, odd random number generated: %s’ % _frob_result

    self.app_logger.error(_msg)
    self.notify(
        ’Frobbing failed’,
        _msg,
        ’failed’,
        self.corr_id)

    # When a job fails, let the FSM know by sending
    # a ’failed’ message
    self.send(self.reply_to,
              self.corr_id,
              {’status’: ’failed’,
               "message": _msg},
              exchange=’’)
    return False
```

Full MegaFrobber Worker Source

```python
#!/usr/bin/env python
import reworker.worker
import logging
import random

class MegafrobberWorker(reworker.worker.Worker):
    """
    Plugin to frob the heck out of something
    """

    def process(self, channel, basic_deliver, properties, body, output):
        # Output is a logger from the python logger library. This is
        # what we report progress through
        self.output = output

        # This is the ID given to the currently happening deployment. It
        # is a unique ID used to connect all passed messages together and
        # record the deployment state in the database.
        #
        # We use it when responding to the FSM.
        self.corr_id = str(properties.correlation_id)

        # If the FSM passed us any dynamic variables, they will be in
        # the 'dynamic' key of the body parameter
        dynamic = body.get('dynamic', {})

        # reply_to is the temporary message bus queue we respond to the
        # FSM through
        self.reply_to = properties.reply_to

        # Begin parameter parsing
        #
        # It's usually a good idea to record all of your valid
        # subcommands somewhere:
        self._subcommands = ['frob']

        # Grab the REQUESTED subcommand from the 'parameters' dictionary
        _subcommand = body['parameters'].get('subcommand', None)

        # Make sure it's recognized
        if _subcommand in self._subcommands:
            # This is good, the requested subcommand is valid.
            #
            # ACK the message to make the message bus happy.
            self.ack(basic_deliver)
        else:
            # This is bad, the playbook calls for an unknown subcommand
            #
            # Reject the message we received on the message bus
            self.reject(basic_deliver)

            # Output to the console that an error has occurred,
            # include the correlation ID so we can trace the error
            # back to this deployment
            self.app_logger.error(
                "%s - Rejecting message, invalid subcommand requested: %s" % (
```

```
                    self.corr_id, _subcommand))

            # Use 'notify' to update the output worker of our
            # progress. This output is usually logged to a central
            # location.
            self.notify(
                'Frobbing Failed',
                "Frobbing failed. Invalid subcommand requested: %s" % _subcommand,
                'failed',
                self.corr_id)

            # Send a message to the FSM indicating that the release
            # has failed. This will cause the FSM to stop the
            # deployment.
            self.send(self.reply_to,
                      self.corr_id,
                      {'status': 'failed',
                       "message": "invalid subcommand requested: %s" % _subcommand},
                      exchange='')

            # Break out of this job and start over
            return False

        # End parameter parsing

        # Begin the actual job
        #
        # Let the FSM know we're starting the job now
        self.send(
            self.reply_to, self.corr_id, {'status': 'started'}, exchange='')

        self.app_logger.info('Beginning the frobbing')

        _frob_result = self._frob()

        # Process the results
        if (_frob_result % 2) == 0:
            _msg = "The frobbing passed, even random number generated: %s" % _frob_result

            self.app_logger.info(_msg)
            self.notify(
                'Frobbing passed',
                _msg,
                'completed',
                self.corr_id)

            # When a job succeeds, let the FSM know by sending
            # a 'completed' message
            self.send(self.reply_to,
                      self.corr_id,
                      {'status': 'completed',
                       "message": _msg},
                      exchange='')
            return True
        else:
            _msg = 'Frobbing failed, odd random number generated: %s' % _frob_result

            self.app_logger.error(_msg)
```

```
            self.notify(
                'Frobbing failed',
                _msg,
                'failed',
                self.corr_id)

            # When a job fails, let the FSM know by sending
            # a 'failed' message
            self.send(self.reply_to,
                      self.corr_id,
                      {'status': 'failed',
                       "message": _msg},
                      exchange='')
            return False

    def _frob(self):
        """
        Frob the random number generator.

        If the result is even then "frob successful". If the result is
        odd, then "frob failed"
        """
        return random.randint(0, 100)


def main():  # pragma: no cover
    from reworker.worker import runner
    runner(MegafrobberWorker)


if __name__ == '__main__':  # pragma: no cover
    main()
```

4.2 Advanced Topics

Hard stuff.

4.2.1 Message Queue Bindings

This section will describe how to configure your message queue bindings so that messages are delivered to the right workers.

FSM - Topics

When the FSM reads a step from a playbook, the destination **topic** is determined by:

- Splitting the execution step name (ex: `juicer::promote`) on the first `::`, and taking the first item (ex: `juicer`)
- This string is then substituted into the string `worker.%s`

Therefore, an execution step of `juicer::promote` would result in the FSM sending messages to the topic `worker.juicer`.

Your message queue must be configured to route messages sent to this topic to somewhere intelligent. Preferably to a queue which matches the same name, i.e.: `worker.juicer`.

Read the next section on how workers select their queue for more information.

Worker - Queues

When a worker using the `re-worker` library first starts, the **default** behavior is to consume from a queue on the message bus whose name matches `worker.CLASS_STR` where `CLASS_STR` is the class name in all lower-case letters. For example, the **juicerworker** worker (from our previous example) would want to consume from the `worker.juicerworker` queue.

Still using the **juicer** worker as reference, if we desired it, this worker could be configured to consume from the `worker.juicer` queue by setting the `queue` parameter in the worker's configuration file to just `juicer`.

4.2.2 Other languages

Nothing is stopping you from writing a worker in any other language of your choice. If you decide to do so, keep a few things in mind:

- Try to follow the `re-worker` reference library as close as possible
- Make sure you ack receipt of the initial message
- The initial message is a dictionary serialized as a JSON string, you'll need to deserialize it
- Talk to the FSM on the temporary queue provided in the `reply_to` property
- Make sure you notify the FSM upon initial failure or start, and final failure or completion

CHAPTER 5

Development

5.1 Build States

Component	State
re-core re-rest re-client re-worker re-worker-bigip re-worker-emailnotify re-worker-func re-worker-ircnotify re-worker-juicer re-worker-output re-worker-sleep	n/a

Note:

More Inception Projects You can find the rest of the Red Hat Inception Team projects on github: GitHub: Red Hat Inception.

5.2 Contributing

This section describes the guidelines for contributing to the Release Engine.

5.2.1 General Guidelines

Please conform to **PEP 0008** for code formatting. This specification outlines the highlights that we require above and beyond. Your code must follow this (or note why it can't) before patches will be accepted. There is one consistent exception to this rule:

E501 Line too long

The `pep8` tests for the Release Engine include a `--ignore` option to specifically exclude **E501** from the tests.

Write unittests for any new functionality, *if you are up to the task*. Not a requirement, but it does get you a lot of karma.

Write intelligent commit messages.

5.2.2 Issue Reporting

If you are reporting an issue with the Release Engine, please use the following template when describing your issue:

```
Description of the issue (include full error messages):

How to reproduce the issue:

How reproducable (every time? intermittently?):

Version of the product effected (git hashes are OK):

Your operating system release-version:

What you expected to happen:

What actually happened:
```

5.3 Testing

All Release Engine code includes unit tests to verify expected functionality. In the rest of this section we'll learn how the unit tests are put together and how to interact with them.

5.3.1 Components

Release Engine unit tests are integrated with/depend on the following items:

- Travis CI - Free online service providing *continuous integration* functionality for open source projects. Tests are ran automatically on every git commit.
- unittest - Python unit testing framework. All Release Engine tests are written using this framework.
- nose - Per the **nose** website: "*extends unittest to make testing easier*". **nose** is used to run our unit tests.

- coverage - A tool for measuring code coverage of Python programs. For the Release Engine we require a minimum test coverage of **80%**. This is invoked by **nose** automatically.
- mock - A library for testing in Python. It allows you to replace parts of your *system under test* with mock objects (such as fake REST endpoints) and make assertions about how they have been used.
- pep8 - A tool to check Python code against some of the style conventions in **PEP 0008**.
- pyflakes - A simple program which checks Python source files for errors.
- virtualenv - A tool to create isolated Python environments. Allows us to install additonal package dependencies without requiring access to the system site-packages directory.
- Makefiles - Utility scripts used for project building and testing. How Release Engine uses **Makefiles** is described later in this section.

5.3.2 Requirements

- `python-nose`
- `python-coverage`
- `python-mock`

Some components may have additional test requirements. For example, *re-worker-func* requires `pyOpenSSL`, which requires `openssl-devel`, `openssl-libs`, and `libffi-devel`. Additionally, *re-rest* requires `openldap-devel` to run its unit tests.

Todo

Document other test dependencies

5.3.3 Targets

In the scope of this document and testing, we use the term *target* in the context of *makefile targets*. For the purpose of this documentation, we can think of these *targets* as pre-defined commands coded in a makefile. Release Engine testing targets include:

- `ci` - Run the tests exactly how they are ran in Travis-CI
- `pep8` - Run **PEP 0008** syntax checks
- `pyflakes` - Run *pyflakes* error checks
- `clean` - Remove temporary files and build artifacts from the checked-out repository.
- `tests` - A quicker version of `ci`. Different from `ci` in that `tests` uses libraries installed on the local development workstation. `tests` runs the **unittests**, **pep8** tests, and **pyflakes** tests automatically.

To ensure the highest degree of confidence in test results you should always use the `ci` target.

When Travis-CI runs an integration test, it calls the `ci` target.

5.3.4 Running the Tests

The Release Engine test suite is invoked via the Makefile. The following is an example of how to run the `ci` test target manually on the *re-core* component.

```
[~/re-core]$ make ci

#############################################
# Creating a virtualenv
#############################################
virtualenv re-coreenv
New python executable in re-coreenv/bin/python
Installing Setuptools..............................................done.
Installing Pip.....................................................done.
. re-coreenv/bin/activate && pip install -r requirements.txt
Downloading/unpacking pika>=0.9.12 (from -r requirements.txt (line 1))

... snip ...

Successfully installed pep8 nose coverage mock
Cleaning up...
#############################################
# Listing all pip deps
#############################################
. re-coreenv/bin/activate && pip freeze
coverage==3.7.1
mock==1.0.1
nose==1.3.3
pep8==1.5.7
pika==0.9.13
pymongo==2.7.1
wsgiref==0.1.2
#############################################
# Running PEP8 Compliance Tests in virtualenv
#############################################
. re-coreenv/bin/activate && pep8 --ignore=E501,E121,E124 src/recore/
#############################################
# Running Unit Tests in virtualenv
#############################################
. re-coreenv/bin/activate && nosetests -v --with-cover --cover-min-percentage=80 --cover-package=reco
Verify using init_amqp provides us with a connection ... ok
Loggers are created with appropriate handlers associated ... ok

... snip ...

Verify create_json_str produces proper json ... ok
Verify load_json_str produces proper structures ... ok
Verify config parsing works as expected. ... ok

Name                  Stmts   Miss  Cover   Missing
-------------------------------------------------
recore                   36      0   100%
recore.amqp              72      4    94%   79, 169-172
recore.constants          1      0   100%
recore.fsm              179     25    86%   97-103, 148-152, 199-249
recore.job                0      0   100%
recore.job.create        25      0   100%
recore.mongo             62      5    92%   92-100
recore.utils             13      0   100%
-------------------------------------------------
TOTAL                   388     34    91%
----------------------------------------------------------------------
Ran 35 tests in 0.047s
```

```
59
60 OK
61 :
```

On line **1** we see how to call a makefile target. In this case it's quite straightforward: `make ci`. Other targets are called in the same way. For example, to run the `clean` target, you run the command `make clean`.

On line **29** we see a header printed, *Running PEP8 Compliance Tests in virtualenv*. By calling the `ci` target, **make** automatically knows what other targets must be called as well, such as `ci-pep8` and `ci-unittests` (seen on line **33**).

5.3.5 Troubleshooting

If you find yourself unable to run the unit tests:

1. Search for relevant error messages
2. **Read** the error message closely. The solution could be hidden in the error message output. The problem could be as simple as a missing dependency
3. If you are unable to figure out all the necessary dependencies to run the tests, file an issue on that specific projects GitHub issue tracker. Include the full error message.

CHAPTER 6

Message Formats

See also:

GitHub: RHInception/re-common The **re-common** repository holds JSON Schema files which can be used for message validation.

6.1 re-rest re-core

re-rest produces two formats: *Deployment Message Format* and *Notification Message Format*. It also receives on message format in return: *Deployment Response Message Format*.

6.1.1 Deployment Message Format

The Deployment Message format comes in two flavors, Simple and Dynamic.

Simple Deployment Message Format

The simple format has two required keys: `group` and `playbook_id`.

Required Keys:

- group: the group's name as a string
- playbook_id: the specific playbook in the group to utilize

Example:

```
{
   "group": "My Group",
   "playbook_id": "1234567890"
}
```

Dynamic Deployment Message Format

The dynamic format adds a key to the simple format: dynamic.

Note: For more information on dynamic variables see *Dynamic Variables*.

Required Keys:

- group: the group's name as a string
- playbook_id: the specific playbook in the group to utilize
- dynamic: a JSON object holding key/values for specific workers

Example:

```
{
   "group": "My Group",
   "playbook_id": "1234567890",
   "dynamic": {
       "cart": "my cart",
       "environment": "QA"
   }
}
```

Deployment Response Message Format

This format is sent from re-core back to re-rest which tells re-rest if the deployment was accepted or not. The message has one key: id. If the deployment was able to start the id will have a deployment id in it. If there was an issue starting a deployment, for example, because the group or playbook doesn't exist, the id will be null.

Required Keys:

- id: the deployment id or null

Example of a Deployment Successfully Starting:

```
{
   "id": "9999999999999999"
}
```

Example of a Deployment Failing to Start:

```
{
  "id": null
}
```

6.2 re-core re-workers

While executing releases, the **re-core** component emits messages in one of three formats. The format selected is determined by the type of *execution step* being ran.

Simple For execution steps which *require no arguments*

Argument For execution steps which require *defined*

Dynamic For execution steps which require *dynamic* arguments

In the rest of this section we will find that these three formats are very similar in structure. Each section will highlight the elements which make the respective format unique from the others.

6.2.1 Deployment Message Formats

This section describes the message formats emitted by **re-core** to workers.

Simple Message Format

On line **8** in the following playbook we can see there is only one step to execute, `bigip:OutOfRotation`. From how the step is written, as a simple string, we know that this step requires no arguments. That is to say, we do not need to define any parameters in the playbook or provide any dynamic data when starting the release.

```
1  {
2      "name": "docs test",
3      "group": "test",
4      "execution": [
5          {
6              "description": "sequence 0",
7              "hosts": [ "host01.example.com" ],
8              "steps": [ "bigip:OutOfRotation" ]
9          }
10     ]
11 }
```

For an execution step like this (line **8**), **re-core** selects the simple message format. The following example shows the format of the message which it would emit to the bus.

```
{
    "parameters": {
        "hosts": [ "host01.example.com" ],
        "command": "bigip",
        "subcommand": "OutOfRotation"
    },
    "group": "test",
    "dynamic": {},
    "notify": {}
}
```

This is the simplest message format used by **re-core** when interacting with simple workers. As such, we can see that it's quite terse. The *Argument* and *Dynamic* message formats use this same structure, however they fill in different items.

On line **2** we have the `parameters` item. This holds the basic information required for this worker to complete its job:

`hosts` An array of hosts to apply the step to

`command` The name of the worker being utilized

`subcommand` The specific action the worker should take

Additionally the `parameters` item has two sibblings: `group` and `dynamic`. These items are always sent to the worker, even if (as in this example), there is no dynamic data to send.

Argument Message Format

On line **10** in the following playbook we can see there is only one step to execute, `service:Restart`. From how the step is written, as a dictionary, we know that this step requires one argument, `service` which is defined as `megafrobber` (line **11**).

```
1  {
2      "name": "docs test",
3      "group": "test",
4      "execution": [
5          {
6              "description": "sequence 0",
7              "hosts": [ "host01.example.com" ],
8              "steps": [
9                  {
10                     "service:Restart": {
11                         "service": "megafrobber"
12                     }
13                 }
14             ]
15         }
16     ]
17 }
```

For an execution step like this (line **10**), **re-core** selects the *argument* message format. The following example shows the format of the message which it would emit to the bus.

```
1  {
2      "parameters": {
3          "service": "megafrobber",
4          "hosts": [
5              "host01.example.com"
6          ],
7          "subcommand": "Restart",
8          "command": "service"
9      },
10     "group": "test",
11     "dynamic": {},
12     "notify": {}
13 }
```

What makes this message format different from the previous format is the presence of an additional key in the `parameters` item. That key is `service` (line **3**). This comes directly from line **11** in the example playbook.

Dynamic Message Format

Still referencing the previous playbook (*Argument Message Format*), let's add an execution step which requires dynamic arguments (this example only shows the additional step).

```
1 {
2     "juicer:Promote": {
3         "dynamic": [
4             "cart",
5             "environment"
6         ]
7     }
8 }
```

See also:

RE-WORKER-JUICER Documentation for the **re-worker-juicer** worker

On line **2** we see that the execution step is called `juicer:Promote`. On the following line we see the dictionary key `dynamic`, and that it's value is a `list` type. The items in the list (lines **4** → **5**) indicate the required **dynamic** variables to run the step. This step requires two such variables, `cart` and `environment`. The user would supply the values for these variables when starting the release.

Note: For more information on dynamic variables see *Dynamic Variables*.

The following example shows the format of the message which **re-core** would emit to the bus.

```
1  {
2      "parameters": {
3          "command": "juicer",
4          "dynamic": [
5              "cart",
6              "environment"
7          ],
8          "subcommand": "Promote",
9          "hosts": [
10             "host01.example.com"
11         ]
12     },
13     "group": "test",
14     "dynamic": {
15         "cart": "bitmath",
16         "environment": "re"
17     },
18     "notify": {}
19 }
```

Here we see a familiar key appearing in the `parameters` item, `dynamic`.

Warning: In future releases, the `dynamic` key will **not** be copied to workers in the `parameters` item. It will only appear as a sibbling of the `parameters` item.

Now, different from the previous format (*argument*), we see the `dynamic` item (sibbling to `parameters`) contains actual key-values (lines **14** → **16**).

`dynamic` A dictionary with the required dynamic variables for a worker to run. The type of each argument is dictated by the respective worker.

Per-Step Notifications

Auxiliary to the formats we've just discussed, are per-step *notifications*. *Per-step notifications* are an **optional** item which may be added to any given step (*simple*, *argument*, and *dynamic*). Using the *previous example playbook* for reference, we would see notifications defined as in lines **6** → **8**, below:

```
1  {
2      "steps": [
3          {
4              "service:Restart": {
5                  "service": "megafrobber",
6                  "notify": {
7                      "started": {
8                          "irc": [ "PHB", "#teamchannel" ]
9                      }
10                 }
11             }
12         }
13     ]
14 }
```

The corresponding message sent to workers, with the additional `notify` item would look like lines **12** → **14** in the following example.

```
1  {
2      "parameters": {
3          "service": "megafrobber",
4          "hosts": [
5              "host01.example.com"
6          ],
7          "subcommand": "Restart",
8          "command": "service"
9      },
10     "group": "test",
11     "dynamic": {},
12     "notify": {
13         "started": {
14             "irc": [ "PHB", "#teamchannel" ]
15         }
16     }
17 }
```

See also:

Playbooks - Notify The documentation for *notify* elements in playbooks. That section defines the allowed syntax for the *notify* item.

6.2.2 Response Message Formats

Complimenting the *Deployment Message Formats* are the *Response Message Formats*. There are three status messages which workers may reply to **re-core** with. This section describes the messages which *workers* send to the *re-core* component.

General Syntax

Status messages are defined as:

- **Type:** `dict`
- **Required Keys:** *status*
  - **Type:** `string`
  - **Allowed Values:**
    - **started**
    - **completed**
    - **failed**
- **Optional Keys:** *data*
  - **Type:** Any JSON Serializable datastructure

Job Started

After a worker has received a message from **re-core**, the message payload is inspected for correctness. If the message payload is successfully verified then the worker will reply to **re-core** with a status update message indicating the job has been started:

```
{
    "status": "started"
}
```

Job Completed

Once a worker has completed the job it was given(without errors), the worker will reply to **re-core** with a status update message indicating success:

```
{
    "status": "completed"
}
```

Optionally a worker may reply to **re-core** with an additional item, `data`. The value of the `data` key may be of any type.

Example

```
1 {
2     "status": "completed",
3     "data": {
4         "items_frobbed": 1337,
5         "avg_time_to_frob_ms": 100
6     }
7 }
```

On line **3** we see the `data` key being defined in the response message. On lines **4** and **5** we see two additional items being reported: `items_frobbed` (the number of items which were frobnicated) and `avg_time_to_frob_ms`, the average amount of time (in miliseconds) it took to *frob* each item.

Important: The `data` item is not currently used by any Release Engine component

Remember that in the previous example, `items_frobbed` and `avg_time_to_frob_ms` are just made-up examples. In reality, workers should use the *notification system* for communicating such information.

Job Failed

If for some reason a worker cannot start a job (for example, due to insufficient or incorrect parameters), or if there is an error while executing the job, then the worker will reply to **re-core** with a status update message:

```
{
    "status": "failed"
}
```

6.3 Notification Message Format

Notifications are sent out by components of the Release Engine and follow a standard message format. This format is then consumed by notification workers who turn the standard format into an external notification of some kind (like email).

The Notification Message Format has 4 required keys: slug, message, phase and target.

Required Keys:

- slug: A "short" message (up to 80 characters).
- message: The message of the notification.
- phase: The phase that the notification occured within: "started", "completed", "failed"
- target: A list denoting where the notification should go. This may be irc nicknames, email address, etc.. and is different for different workers.

Note: Even though slug and message are required it does not mean the notification worker will use them both. Some notification workers will only use one or the other due to space constraints. However, if either key is missing the notification will be rejected as malformed and/or cause problems!

Example:

```
{
    "slug": "RPM's have been promoted",
    "message": "The rpms in deployment 12345667890 have been promoted from DEV to QA and are ready fo
    "phase": "completed",
    "target": ["someone@example.com"]
}
```

6.4 Output Message Format

Notifications are sent out by workers connected to the Release Engine and follow a standard and very simple message format. This format is then consumed by the output worker who turns the standard format into messages in a file.

The Output Message Format has 1 key: message. The only other bit of information needed by an output worker is the correlation id which happens to be stored in the AMQP properties.

Required Keys:

- message: The message which should be written to a file.

Example:

```
{
    "message": "Something happened and you should know about it"
}
```

CHAPTER 7

Playbooks

Playbooks are documents which describe the exact set of steps required to successfully start and finish a given software release. When the Release Engine begins *a deployment*, the actions it takes come directly from playbooks.

A playbook might be ran automatically each time a code builder finishes so that it may deploy the latest snapshots. Alternatively, if more control is desired over the release process, playbooks may be ran by hand. Playbooks may be written in YAML syntax, or optionally in *JSON Syntax*.

In this section we'll learn:

- what a playbook looks like (by reviewing a simple example)
- the major items of playbooks
- the basics of how to describe `execution` steps in your playbooks, including:
- describing a release step
- identifying which worker to use
- passing data to the worker

7.1 Example Playbook

Here is an example of what a **super simple** playbook looks like. The playbook is *owned* by the group called **inception**.

When ran, all this would do is restart the `httpd` service on `foo.bar.example.com`

```
1 ---
2 group: inception
3 name: Simple playbook
4 execution:
5   - description: restart httpd
6     hosts:
7       - foo.bar.example.com
8     steps:
9       - service:Restart: {service: httpd}
```

7.2 Playbook Components

A Release Engine playbook is made up of the following **required** items:

group A short string (acronyms are best) defining the ownership of this playbook. Think of it like the unix group a team might all be members of.

The `group` in our example is **inception**

execution A list of playbook *execution sequences*. These execution sequences are composed of release steps and are accompanied by supporting meta-data. These sequences are explained fully in *Execution Sequences*.

In our example, we have one execution sequence with one release step (`service:Restart`).

Additionally, a playbook may define the optional item:

name A short description of what this playbook accomplishes overall.

In our example the name is **Simple playbook**.

7.3 Execution Sequences

Recall that `execution` items hold a `list` type. Each item in the list is an *execution sequence*. This section describes exactly what execution sequences do, and how to write our own.

In our example, *simple playbook*, the execution sequence is defined in lines **5** → **9**. Let's review those lines again:

```
1 ---
2 group: inception
3 name: Simple playbook
4 execution:
5   - description: restart httpd
6     hosts:
7       - foo.bar.example.com
8     steps:
9       - service:Restart: {service: httpd}
```

Like playbooks themselves, each execution sequence is comprised of several required and optional elements. In *Sample playbook* we can see several items are already being used: `description`, `hosts`, and `steps`. The following sections will describe these, and all other items which are allowed in execution steps.

7.3.1 Required Items

This section describes the **required** items in execution sequences.

Hosts

- **Required**: Yes
- **Argument** type: `list`
- **Default**: None

The `hosts` element is used to describe the target hosts for the script to act on.

```yaml
---
- hosts:
   - www01.web.ext.example.com
   - www02.web.ext.example.com
   - www03.web.ext.example.com
```

Or in YAML shorthand:

```yaml
---
- hosts: [www01.web.ext.example.com, www02.web.ext.example.come, www03.web.ext.example.com]
```

Steps

- **Required**: Yes
- **Argument** type: `list`
- **Default**: None

The `steps` element defines the steps that will be performed on each host in `hosts`. The syntax of each possible step varies, however they will assume one of three legal forms, respective to the information (if any) which the execution step requires to run. In brief, these forms are described below:

- Some steps require no information at all, as such they are given as strings
- Some require explicit parameters given in the form of keyword arguments
- Similar to the previous form, some steps require an enumeration of their *dynamic* parameters

Steps - Strings

An execution step may be a simple string. To us, this means that this given step requires no additional information. The actual *workers* implementing each step may include possible several sub-commands. Because of this it is common to see step names given in colon delimited notation. In this form the string leading up to but not including the colon (":") character refers to the worker or module. The string after the colon character refers to the specific sub-command to run.

OK. Enough of the boring stuff. Let's see some examples.

Assume there is a module called `logrotate`, this module provides one sub-command: `Rotate`.

The documentation for the `logrotate` module tell us that the `Rotate` sub-command requires no keyword parameters. That is to say, we can define it in our execution steps as a simple string. Recall that steps are denoted using colon notation, where the module name comes first, followed by the sub-command. In this case our module is `logrotate` and our sub-command is `Rotate`. We can see this on line **9** in the following example:

```yaml
1 ---
2 group: inception
3 name: Simple playbook
4 execution:
5   - description: Rotate all the megafrobber logs
```

```
6      hosts:
7        - foo.bar.example.com
8      steps:
9        - logrotate:Rotate
```

But what is happening exactly in this example? On line **9** we see the entry: `- logrotate:Rotate`. Recall that each step is given as an item to the `steps` list. This is why line **9** in the previous code example begins with a hyphen character. In YAML this indicates a list item.

Note closely exactly how we gave `logrotate:Rotate`, because in the next example this will change very slightly.

Steps - Keyword Arguments

Now let us assume there is a module called `service` which can control system services. The documentation for this module tells us that there are three sub-commands provided: `Start`, `Stop`, and `Restart`. Additionally, the documentation tells us that each sub-command requires one keyword parameter: `service`. On lines **9** and **10** in the following example, we see how to provide keyword arguments to steps:

```
1  ---
2  group: inception
3  name: Simple playbook
4  execution:
5    - description: Restart the megafrobber service
6      hosts:
7        - foo.bar.example.com
8      steps:
9        - service:Restart:
10           service: megafrobber
```

Or in YAML shorthand (only focusing on the step definition)

```
---
# ...
      - service:Restart: {service: megafrobber}
```

Let's look closer at this and see exactly what is happening.

Recall that playbooks are **YAML Documents**. As such, there are defined ways to describe different datastructures. Review the *dictionary* section in *YAML Scripts* if you need a refresher.

The `service:Restart` sub-command requires one parameter, `service`. You describe parameters in execution steps by using a hash, or dictionary. For our example, a dictionary describing a keyword `service` with value `megafrobber` would look like the following example in YAML:

```
---
service: megafrobber
```

Additionally, recall that you can nest datastructure in YAML. If we wanted to represent a list of dictionaries, we could do that in the following way. Here's an example of a list of nested dictionaries:

```
---
- thingies:
    service: megafrobber
- stuffs:
    penguins: cute
```

Or in alternative representation:

```
---
[{thingies: {service: megafrobber}}, {stuffs: {penguins: cute}}]
```

Now that we know all of this, to give the required parameters to our step we will define the step as a **dictionary key** with a nested-dictionary describing our parameters. This is shown on lines **8** and **9** in the following example:

```
1 ---
2 # ...
3 execution:
4   - description: Restart the megafrobber service
5     hosts:
6       - foo.bar.example.com
7     steps:
8       - service:Restart:
9           service: megafrobber
```

Important:

Note the syntax change In the previous example we only gave the string: `logrotate:Rotate`. Now, instead of a string we're describing a **dictionary key**.

Therefore, the text for this step begins with a hyphen character (to indicate a list item) and ends with a colon character.

Finally, on line **4** you see the provided parameters.

If there were a module which required more than one parameter, the syntax is very similar. Lines **4** → **6** show this in the following example:

```
1 ---
2 # ...
3       - service:Restart:
4           service: megafrobber
5           foo: bar
6           noop: true
```

Steps - Dynamic Arguments

This section is about *dynamic arguments*. Dynamic arguments differ from normal arguments in that their values are not stored in playbooks. Rather, within a playbook, we assert that their values will be provided by the calling client when starting a deployment. The syntax for defining dynamic arguments differs only slightly from how keyword arguments are defined.

The scope of this section is limited to the role of dynamic arguments in **playbooks** only. That is to say, discussion of dynamic arguments in *worker development* will not be covered here. Instead, see the *re-worker documentation* for that information.

> **Caution:** The ability for clients to provide a broad spectrum of dynamic data is both a pro and a con.
> If you're writing a new *worker*, think very carefully before making arguments dynamic. Consider if the there is a *non-interactive* way for the information to be obtained instead.

Use Cases Situations where dynamic arguments may be required are generally limited to actions which require data that changes every, or nearly every, release. Examples might include:

- Change Record IDs
- User Story IDs

  - *or any other agile/scrum related work item*
- A target environment

For a more complete example, imagine our workplace has strict policies around software releases. These policies state that any software release must have an associated change record with it. Additionally the policy states that every time a release happens for a change, an update to the change record document must be recorded. This update must indicate the date of the release.

In this situation, the pragmatic approach to automating this task would be to develop a worker which can interface with the change management system and add updates to the change record over an API. Let's pretend such a worker already exists.

It is clear that we cannot hard-code change record numbers into the worker. And storing this information in the playbook would require a manual update to the playbook every time a new change is created. Furthermore, this limitation effectively nullifies the ability of a playbook to be used for two changes happening in an overlapping time span.

This is an excellent opportunity to use dynamic variables.

The following examples will be using a fictional worker called *change*. This worker has one usable function: `Update`. The **change** worker documentation provides the following API signature for the `change:Update` function:

- **Function:** `change:Update`
  - **Arguments:**
    - None
  - **Dynamic Arguments:**
    - **Name:** id
      - **Required:** `True`
      - **Type:** `string` or `int`
      - **Description:** The ID of the change record to update

For the rest of this section, let's pretend our `id` is **CHG1337**.

Dynamic Argument Syntax Let's begin by considering our example *simple playbook* again.

```
---
group: inception
name: Simple playbook
execution:
  - description: restart httpd
    hosts:
      - foo.bar.example.com
    steps:
      - service:Restart: {service: httpd}
```

However, instead of just restarting the *httpd* service, we have to have an additional step: updating the change record (`CHG1337`). In this section we will learn how add that step.

The general syntax for defining a step with dynamic arguments is shown on lines **4** → **9** in the following example:

```
1 ---
2 # ...
3     steps:
4       - worker:Function:
```

```
5         dynamic:
6            - arg_name_0
7            - arg_name_1
8            - arg_name_2
```

Line 4 As before, we begin by providing the **worker.Function** name, ending with a `:` character

Line 5 We define a dictionary key called `dynamic`. **Again** note, this must end with a `:` character.

Lines 6 → 9 We define the value of the `dynamic` key. This value **must** be a list.

The items in the list are `arg_name_0`, `arg_name_1`, and `arg_name_1`. Each of these is the name of a dynamic variable required by **worker:Function**.

Applying this example to our fictional situation will yield the following playbook:

```
1  ---
2  group: inception
3  name: Simple playbook
4  execution:
5    - description: restart httpd
6      hosts:
7        - foo.bar.example.com
8      steps:
9        - change:Update:
10           dynamic:
11             - id
12       - service:Restart: {service: httpd}
```

Line 9 Insert the new sequence step, `change:Update`

Line 10 Begin the `dynamic` argument dictionary

Line 11 Define the dynamic argument list with one item: `id`

Providing Values Now that we have learned how to add a sequence step that requires dynamic arguments to a playbook, it might be helpful to quickly review how clients can provide the information.

A commonly used command line tool for interacting with REST endpoints (such as *RE-REST*) is `curl`. Put simply, curl allows you to make a request to anything `http`. This is exactly like following a hyperlink in a web page.

The following is an example of how to use the curl command to provide the value of the dynamic argument, `id`, to the release engine and start a deployment.

```
1  $ curl -u "user:passwd" -H "Content-Type: application/json" \
2  -d '{"id": "CHG1337"}' \
3  -X PUT \
4  http://rerest.example.com/api/v0/test/playbook/12345/deployment/
```

Line **2** utilizes the `-d` (or `--data`) option to provide the value of the dynamic argument. When curl is ran in this manner, dynamic arguments are provided by describing a dictionary including *key-value pairs* where the key is the dynamic argument name, and the value is the unique-value of that argument for this particular deployment. In this example the dictionary is `{"id": "CHG1337"}`.

See also:

RE-REST - Dynamic Variables See the *RE-REST → dynamic variables* documentation for a complete review of this topic.

7.3.2 Optional Items

This section describes the **optional** items which are allowed in execution sequences.

Description

Finally, an execution step **may** define a optional `description` item.

- **Required**: No
- **Argument Type**: `string`
- **Default**: None

The `description` element allows you to provide a useful human-readable description of what the step is exactly supposed to do. Use of `description` items are **encouraged**.

Recall our previous example of using `service.Restart` to restart the `megafrobber` service. Below, line **5**, shows an example of how to use the `description` item.

```
1 ---
2 group: inception
3 name: Simple playbook
4 execution:
5   - description: Restart the megafrobber service
6     hosts:
7       - foo.bar.example.com
8     steps:
9       - service.Restart: {service: megafrobber}
```

Because this item is optional, we could just as well have omitted it entirely:

```
---
group: inception
name: Simple playbook
execution:
  - hosts:
      - foo.bar.example.com
    steps:
      - service.Restart: {service: megafrobber}
```

Notify

- **Required**: No
- **Argument type**: `dict`
- **Default**: None

The `notify` element allows you to set custom notification hooks which trigger at different **phases** of each sequence step. For example, you may desire to receive an email every time an RPM promotion step completes, *or fails*.

Here's an example of a notify step that updates IRC when the step has started:

```
---
# ...
    steps:
      - service:Restart:
          service: httpd
          notify:
```

```
7           started:
8             irc: [ "PHB", "#teamchannel" ]
```

Line 6 Shows the beginning of the `notify` syntax.

Line 7 This indicates which **phase** of worker execution this notification is for.

Recognized **phases** include: `started`, `completed`, and `failed`

Line 8 Define the IRC notification parameters.

For the `irc` item we define a list of users/channels for messages to be sent to.

In this example, the user **PHB** would be notified *directly* with status updates. Additionally, a notification would be sent to the channel **#teamchannel**.

See also:

Components For a list of available notification workers, see the *Components* section.

7.4 Putting it all together

To finish up, let's put together everything we've seen up to now. That will include `hosts`, and some example items for `steps`.

```
---
# Playbook owned by group inception
group: inception

# This playbook is clearly awesome:
name: Simple playbook

# This playbook executes **two** sequences of steps for this
# release:
execution:

  #################################################################
  # Sequence 1
  #################################################################
  # Including a description is optional. This must be a string.
  - description: frobnicate these lil guys
    hosts:
      - foo.dev.example.com
      - bar.ops.example.com

    # Install megafrobber on all our hosts ahead of time
    preflight:
      - yumcmd:install:
          package: "megafrobber"

    steps:
      # Some steps don't require parameters:
      - bigip:OutOfRotation

      # Whereas, some require parameters:
      - misc:Echo:
          input: "This is a test message"

      # And some times you just want to tell the world what you're doing
```

```
      - frob:Nicate:
          things: "all the things"
          notify:
              started:
                  irc: [ "PHB", "#myteam" ]

##################################################################
# Sequence 2
##################################################################
- description: then frobnicate the other half
  hosts:
    - dev.foo.example.com
    - ops.bar.example.com

  steps:
    - bigip:OutOfRotation

    # Some may even accept lists as the value of their parameters
    - misc:ListFrob:
        frob_list:
          - item1
          - item2
          - item3
```

Todo

Describe interesting parts of the previous example

CHAPTER 8

Worker Steps

This section documents the *Playbook* syntax for all of the workers included with the Release Engine. What follows includes formal *signatures* of each step, as well as examples of each step in playbooks.

8.1 Juicer

8.1.1 juicer:promote

Promote a release cart to a specified environment. It is recommended that this command is used in an execution sequence only a single dummy host listed in the `hosts` array. This will prevent the step from being ran multiple times.

Parameters

- `dynamic` (type: list)
  - **Required:** True
  - **Items:** The strings `environment` and `cart`

Example

```
hosts: ['localhost']
steps:
    - juicer:promote:
        dynamic:
            - environment
            - cart
```

Note: Recall that playbooks which have steps including *dynamic parameters* require the values for those parameters to be passed when starting the deployment.

8.2 BigIP

8.2.1 bigip:InRotation

Enable the current host in the BigIP.

Example

```
hosts: ["example01.com", "example02.com"]
steps:
    - bigip:InRotation
```

8.2.2 bigip:OutOfRotation

Disable the current host in the BigIP.

Example

```
hosts: ["example01.com", "example02.com"]
steps:
    - bigip:OutOfRotation
```

8.2.3 bigip:ConfigSync

Sync the BigIP configuration from a primary to a secondary.

Parameters

- `envs` (type: list)
  - **Required:** True
  - **Items:** Strings of environment names

Example

```
hosts: ["example01.com", "example02.com"]
steps:
    - bigip:ConfigSync:
        envs: ["qa", "stage", "prod"]
```

8.3 FUNC

The FUNC worker has several commands (with their own subcommands) available. They are all documented on this page.

8.3.1 Puppet

The **puppet** module allows you to interact with the `puppet` service on remote hosts.

puppet:Run

Parameters

The parameters to the `Run` subcommand can be mixed and matched together. That is to say, *none of the parameters given below are mutually exclusive*.

- `noop` (type: boolean)
  - **Required:** False
  - **Default:** `False`
  - **Description:** Set to `True` to enable `noop` mode (show what *would* have happened)
  - **CLI Equivalent:** `puppet agent --test --noop`
- `enable` (type: boolean)
  - **Required:** False
  - **Default:** `False`
  - **Description:** Set to `True` to enable the puppet agent prior to running puppet. **Note** that running puppet will not be attempted if the **enable** command fails
  - **CLI Equivalent:** `puppet agent --enable && puppet agent --test`
- `tags` (type: list of strings)
  - **Required:** False
  - **Default:** `None`
  - **Description:**
  - **CLI Equivalent:** `puppet agent --test --tags sometag anothertag moretags`

Example

```
hosts: ['localhost']
steps:
    # Basic subcommands
    - puppet:Run
    - puppet:Enable
    - puppet:Disable

    # Now with some extra options

    # Run puppet in noop mode
    - puppet:Run:
        noop: True

    # Run puppet in noop mode, and make sure the agent is enabled first
    - puppet:Enable
    - puppet:Run:
        noop: True

    # Run puppet in noop mode, and make sure the agent is enabled
    # first, but as one single step
    - puppet:Run:
        noop: True
        enable: True

    # Equivalent to 'puppet agent --test --tags yum auth package'
    - puppet:Run:
        tags:
          - yum
          - auth
          - package
```

puppet:Enable

Parameters

- The `Enable` subcommand does not accept any parameters

```
hosts: ['localhost']
steps:
    - puppet:Enable
```

puppet:Disable

Parameters

- `motd` (type: string or `False`)
  - **Required:** False
  - **Default:** `puppet disabled by Release Engine at 2014-09-16 16:27:11.075617`
  - **Description:** The `puppet:Disable` sub-command will automatically append a message to `/etc/motd` indicating that the puppet agent has been stopped. This behavior can be disabled by setting `motd` to `False`, or customized by setting `motd` to a message of your choice. Use `%s` to substitute a datestring (per `str(datetime.datetime.now())`) into your message

```
hosts: ['localhost']
steps:
    # Just disable the puppet agent, motd is still updated
    - puppet:Disable

    # Disable the agent, but don't update the motd
    - puppet:Disable
        motd: False

    # Disable the agent, and put a custom message in /etc/motd
    - puppet:Disable
        motd: "Puppet disabled for maintenance on %s"
```

8.3.2 Command

The **command** module allows you to run arbitrary commands on a remote host. It has one sub-command available, **run**.

command:run

Parameters

- `cmd` (type: string)
  - **Required:** True
  - **Description:** The command to run, as it would be typed into a shell prompt

Example

```
hosts: ['localhost']
steps:
    - command:run:
        cmd: puppet agent --test --color=false
```

8.3.3 Service

The **service** module allows you to interact with system services, as you would with the `service` or `systemctl` commands. Only one example is included in this section because the syntax for each of the **service** module steps are nearly identical.

Example

This example demonstrates how to restart the **megafrobber** service (see lines **3** and **4**).

```
1 hosts: ['localhost']
2 steps:
3     - service:restart:
4         service: megafrobber
```

To use any of the other sub-commands, on line **3** in this example we would replace `service:restart` with the desired subcommand. Such as `service:stop` or `service:reload`.

service:stop

Stop a given service.

service:start

Start a given service.

service:restart

Restart a given service.

service:status

Return the status (running, stopped, etc) of a given service.

service:reload

Tell a service to reload it's configuration files.

Note: Not all system services support all the given subcommands. This is especially true for **reload**.

8.3.4 Yum Cmd

yumcmd:install

Foo

yumcmd:remove

Bar

yumcmd:update

Bob

8.3.5 Nagios

The nagios module allows you to perform common tasks in Nagios related to downtime and notifications.

nagios:ScheduleDowntime

Depending on the exact invocation, `nagios:ScheduleDowntime` will schedule downtime for:

- A host
- Services on a host
- A host and it's services

Parameters

- `nagios_url` (type: string)
  - **Description:** Hostname of the nagios server
  - **Required:** True
  - **Default:** None
- `minutes` (type: int)
  - **Description:** Number of minutes to schedule downtime for
  - **Required:** False
  - **Default:** 30
- `service` (type: string or list)
  - **Description:** Service, or services, to schedule downtime for
  - **Required:** False
  - **Default:** Set downtime for the host itself (services on the host will continue to alert like normal)
  - **Extras:** Use the string `ALL` to schedule downtime for the host as well as all services on the host. Use the string `HOST` to explicitly set downtime for just a host. `HOST` and `ALL` are case-insensitive.
- `service_host` (type: string)
  - **Description:** An alternative host to schedule downtime for
  - **Required:** False
  - **Default:** None
  - **Extras:** See example below for **service host**

Example: Schedule Downtime for a host

In this example we set downtime for a host. Because `minutes` is not provided, the duration will be for the default of 30 minutes.

```
hosts: ['localhost']
steps:
    - nagios:ScheduleDowntime:
        nagios_url: nagios.example.com
        service: host
```

As stated in the parameter documentation above, we can give the string **host** in any mix of upper and lower case characters.

Example: Schedule Downtime for a service

In this example we set downtime for 15 minutes (line **5**) for a specific service (`megafrobber`, line **6**).

```
1 hosts: ['localhost']
2 steps:
3     - nagios:ScheduleDowntime:
4         nagios_url: nagios.example.com
5         minutes: 15
6         service: megafrobber
```

Example: Schedule Downtime for several services

Similar to the previous example, here we are setting downtime for several services at once. Note the difference below in syntax on lines **6** → **8** compared to line **6** above. Here we provide the services as a list to the `service` parameter.

```
1 hosts: ['localhost']
2 steps:
3     - nagios:ScheduleDowntime:
4         nagios_url: nagios.example.com
5         minutes: 15
6         service:
7            - megafrobber
8            - httpd
```

Example: Schedule Downtime for a host and all services on the host

In this example we will set an hour of downtime (**60 minutes**, line **5**) for a host and all services running on that host (line **6**).

```
1 hosts: ['localhost']
2 steps:
3     - nagios:ScheduleDowntime:
4         nagios_url: nagios.example.com
5         minutes: 60
6         service: ALL
```

Example: Using service_host to set downtime for an alternative host

In some deployments, **service hosts** are created in nagios to monitor services not exactly tied to a specific host.

For example, you may be using a vendor load balancing solution, like F5 LTM BigIPs. In a situation like this you may monitor the status of all balancer pools so that you can send alerts if members of the pool drop out of rotation unexpectedly.

However, while performing routine maintenance, is it expected for hosts to be taken out of the rotation. That's what `service_host` is for. Instead of setting downtime for a specific host, we might schedule downtime for a service representing a balancer pool on our **service host**.

```
1 hosts: ['localhost']
2 steps:
3     - nagios:ScheduleDowntime:
4         nagios_url: nagios.example.com
5         minutes: 60
6         service_host: lb01.example.com
7         service: megafrobber_pool_prod
```

In the above example on line **6** we tell the nagios worker that instead of setting downtime for `localhost`, instead, set downtime for `lb01.example.com`. Then on the following line (**7**) we indicate we are setting downtime for the production *megafrobber* balancer pool.

8.4 Sleep

8.4.1 sleep:Seconds

Pause all further playbook step execution for the given number of seconds.

Parameters

- `seconds` (type `int`)
  - **Required:** True
  - **Description:** The number of seconds to pause for

Example

To pause a playbook for 1,337 seconds:

```
hosts: ['localhost']
steps:
    - sleep:seconds:
        seconds: 1337
```

Note: If more than one host is given in `hosts`, the playbook will pause again for each host given.

8.5 ServiceNow

8.5.1 servicenow:DoesChangeRecordExist

Checks to see if a change record exists. Resulting data will have an exists key with a bool.

Dynamic Arguments

- `change_record` (type `str`)
  - **Required:** True
  - **Description:** The change record to look for.

Example

To check if a change record exists:

```
hosts: ['localhost']
steps:
    - servicenow:DoesChangeRecordExist:
        dynamic:
            - change_record
```

Note: This check is ran for each host in `hosts`

Note: This step has no direct side-effects. It is more useful as a *Pre-Deployment Step*

Appendices

This section includes all the appendices for the Release Engine Documentation

9.1 JSON Scripts

This page provides a basic overview of correct JSON syntax. Additionally it covers non-task specific modules that are valid in *Release Engine* playbooks.

See also:

Components → Pre-Built Workers For more information on the workers that ship with Release Engine

For the *Release Engine*, every JSON playbook must be a list at it's root-most element. Each item in the list is a dictionary. These dictionaries represent all the options you can use to write a *Release Engine* playbooks.

Tip: With the exception of **strings** all types (arrays, booleans, integers, numbers, nulls and objects) in a JSON list or dictionary are not required to be surrounded by double quotes (`"Foo"`). If added, these types become **strings**. Also, all lines in a list or dictionary must end in a comma `,` **except** the final member in the list or dictionary, which must explicitly **not** end with a comma.

In JSON a list can be represented in two ways. In one way all members of a list are lines beginning at the same indentation level surrounded by square brackets.

```
[
 "Apple",
 "Orange",
 "Strawberry",
 "Mango"
]
```

In the second way a list is represented as comma separated elements surrounded by square brackets. Newlines are permitted between elements:

```
["apple", "orange", "strawberry", "mango"]
```

A dictionary is represented in a simple `key:` and `value` form:

```
{
  "skill": "Elite",
  "job": "Developer",
  "name": "John Eckersberg"
}
```

Like lists, dictionaries can be represented in an abbreviated form:

```
{"skill": "Elite", "job": "Developer", "name": "John Eckersberg"}
```

You can specify a boolean value (true/false) in several forms:

```
{
  "knows_oop": true,
  "likes_emacs": true,
  "uses_cvs": false
}
```

Finally, you can combine these data structures:

```
{
 "name": "John Eckersberg",
 "python": "Elite",
 "job": "Developer",
 "languages": {
   "ruby": "Elite"
 },
 "foods": [
  "Apple",
  "Orange",
  "Strawberry",
  "Mango"
 ],
 "dotnet": "Lame",
 "employed": true,
 "skill": "Elite"
}
```

That's all you really need to know about JSON to get started writing *Release Engine* playbooks.

See also:

JSONLint JSON Lint gets the lint out of your JSON

See also:

Get Deeper into Playbooks

Now that we're comfortable with JSON, let's continue on and read the *Playbooks* section for an in-depth guide of playbooks.

9.2 YAML Scripts

This page provides a basic overview of correct YAML syntax. Additionally it covers non-task specific modules that are valid in *Release Engine* playbooks.

See also:

Components → Pre-Built Workers For more information on the workers that ship with Release Engine

For the *Release Engine*, every YAML playbook must be a list at it's root-most element. Each item in the list is a dictionary. These dictionaries represent all the options you can use to write a *Release Engine* playbook. In addition, all YAML files (regardless of their association with *Release Engine* or not) all YAML documents should start with `---`.

In YAML a list can be represented in two ways. In one way all members of a list are lines beginning at the same indentation level starting with a - character

```yaml
---
# A list of tasty fruits
- Apple
- Orange
- Strawberry
- Mango
```

In the second way a list is represented as comma separated elements surrounded by square brackets. Newlines are permitted between elements

```yaml
---
# A list of tasty fruits
[apple, orange, banana, mango]
```

A dictionary is represented in a simple `key:` and `value` form

```yaml
---
# An employee record
name: John Eckersberg
job: Developer
skill: Elite
```

Like lists, dictionaries can be represented in an abbreviated form

```yaml
---
# An employee record
{name: John Eckersberg, job: Developer, skill: Elite}
```

You can specify a boolean value (true/false) in several forms

```yaml
---
knows_oop: True
likes_emacs: TRUE
uses_cvs: false
```

Finally, you can combine these data structures

```yaml
---
# An employee record
name: John Eckersberg
job: Developer
skill: Elite
employed: True
foods:
    - Apple
    - Orange
    - Strawberry
    - Mango
languages:
    ruby: Elite
python: Elite
dotnet: Lame
```

That's all you really need to know about YAML to get started writing *Release Engine* playbooks.

See also:

YAMLLint YAML Lint gets the lint out of your YAML

See also:

Get Deeper into Playbooks

Now that we're comfortable with YAML, let's continue on and read the *Playbooks* section for an in-depth guide of playbooks.

9.3 Definitions

AMQP See **Message Bus**.

Finite State Machine (FSM) See **RE-CORE**

JSON Javascript Object Notation. Data which can be turned into code. Usually returned from REST APIs. It's also called a *data interchange standard*.

Message Bus Very similar to how the postal service works, but in software. Clients connect to the bus and consume or publish messages. It's like IPC, over the network, with queues, on steroids.

MongoDB A "schemaless" document object collection.

Basically MySQL without all the rigidly defined table structures.

Playbook A document describing a software release. This document is stored in MongoDB. Playbooks consists of three main items: ownership identification, target hosts, and a list of steps (See also: **Playbook Step**) required to finish so that the release can be considered completed.

Playbook Step A playbook step represents a unit of work in your overall release process.

Defining a playbook step is like instantiating a **Worker Plugin**. That is to say, using the api signature of a given Worker Plugin, you fill in the missing parameters.

Python The programming language the Release Engine is primarily written in.

RE-CLIENT The `re-client` tool is how end-users primarily interact with the release engine. The `re-client` tool interfaces with the **RE-REST** component and provides several options for creating, reading, updating, and deleting playbooks.

RE-CORE The ring-leader of the system. Orchestrates the delegation of **playbook steps** to **worker plugins**. Tracks the state of a release in mongo and manupilates the completed/active/remaining job stacks as workers update the FSM.

RE-REST A REST endpoint (see below) which all clients attempting to interact with the Release Engine must proxy their commands and requests through. This component in integrated into the overall authentication/authorization scheme.

Authorized requests made against the REST endpoint result in either: messages having been sent to the RE-CORE component (for example: begin a release for group **foo**), or in database create/relad/update/delete operations.

REST Representational State Transfer. Using the HTTP protocol in a programmatic way to interact with remote systems. Usually supports the basic CRUD operations: Creating, Reaing, Updating, and Deleting records.

Temporary Queue (See also: **Message Bus**) Temporary queues are created by various Release Engine components. These queues are ephemeral and usually automatically clean themselves up after all clients disconnect from them. The purpose of these temporary queues is to enable **direct communication** between two specific components, outside of the pre-defined channels of communication.

Worker (Plugin) Worker plugins do the actual work in a release. This could mean several things: running puppet on a server; restarting a host; uploading RPMs into a YUM repository, scheduling downtime, the possibilities are virtually endless.

It might help to think of Worker Plugins as Class definitions. See **Playbook Step** for the other half of that comparison.

YAML YAML Ain't Markup Language. YAML is an alternative syntax which may be used to write Playbooks in. The normative syntax is JSON.

See also:

YAML Basics Introduction to YAML formatting

See also:

Playbooks Everything you need to know to begin writing playbooks

CHAPTER 10

AGPLv3 License

The Release Engine uses AGPLv3+ for it's license.

```
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```
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```

```
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