ANSIBLE

Writing Modules For Ansible

Magnus Glantz
Senior Solution Architect
Red Hat

redhat

About Me

- Worked with Puppet for 5 years but is now starting to regret those years

GitHub/freenode: mglantz
http://github.com/mglantz/presentations

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What Are Modules?

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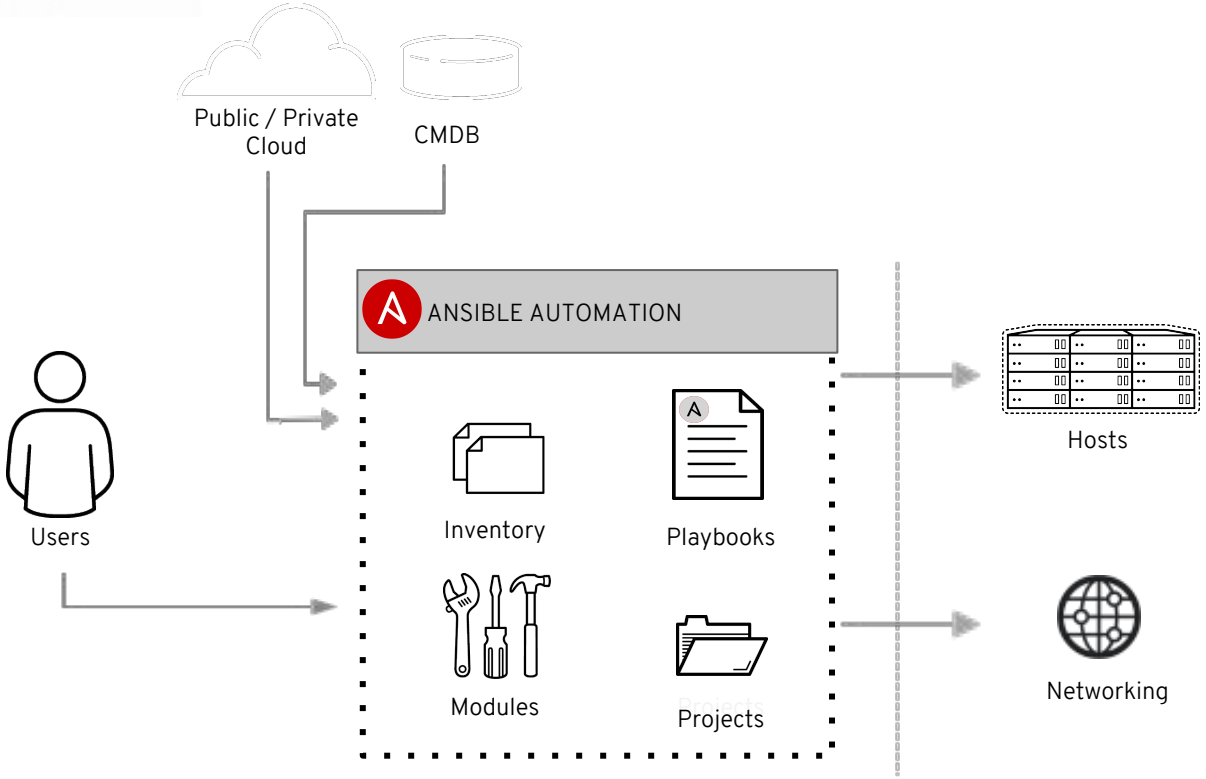
HOW DOES IT WORK?



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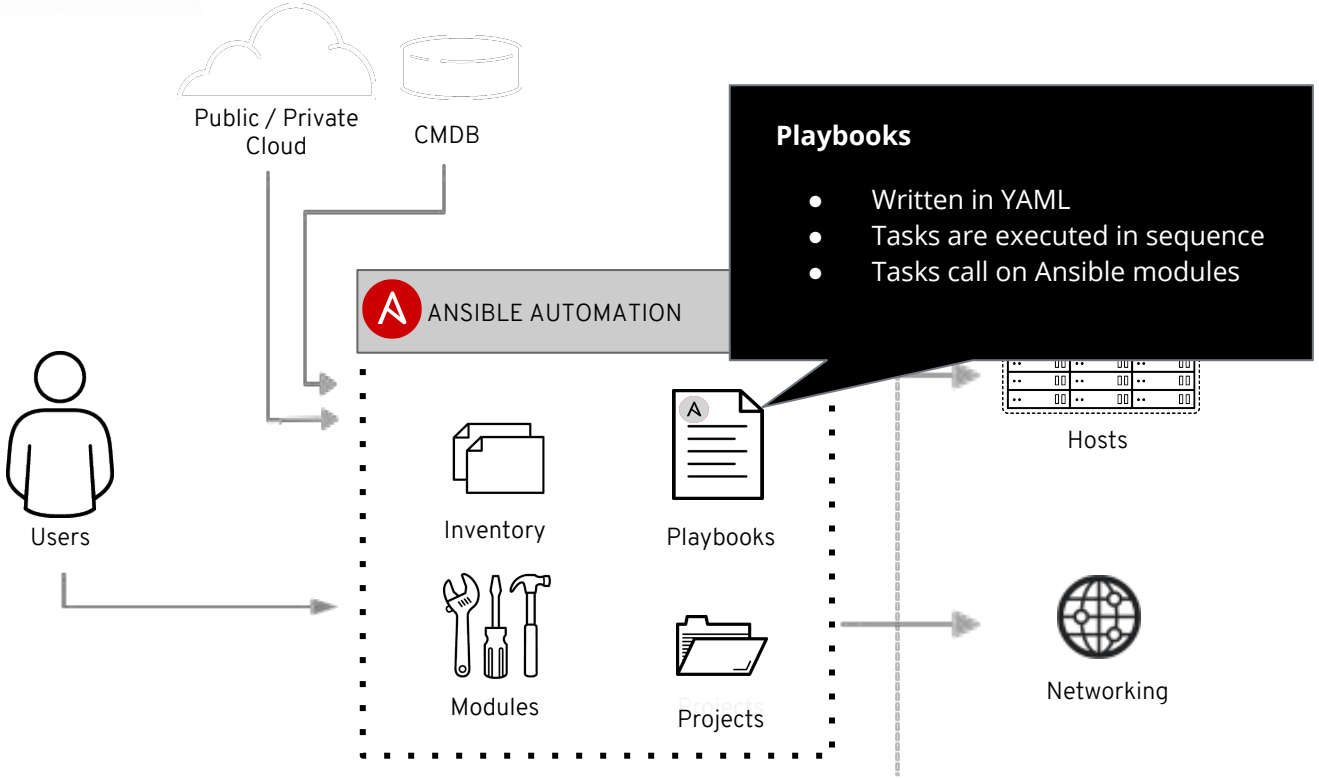

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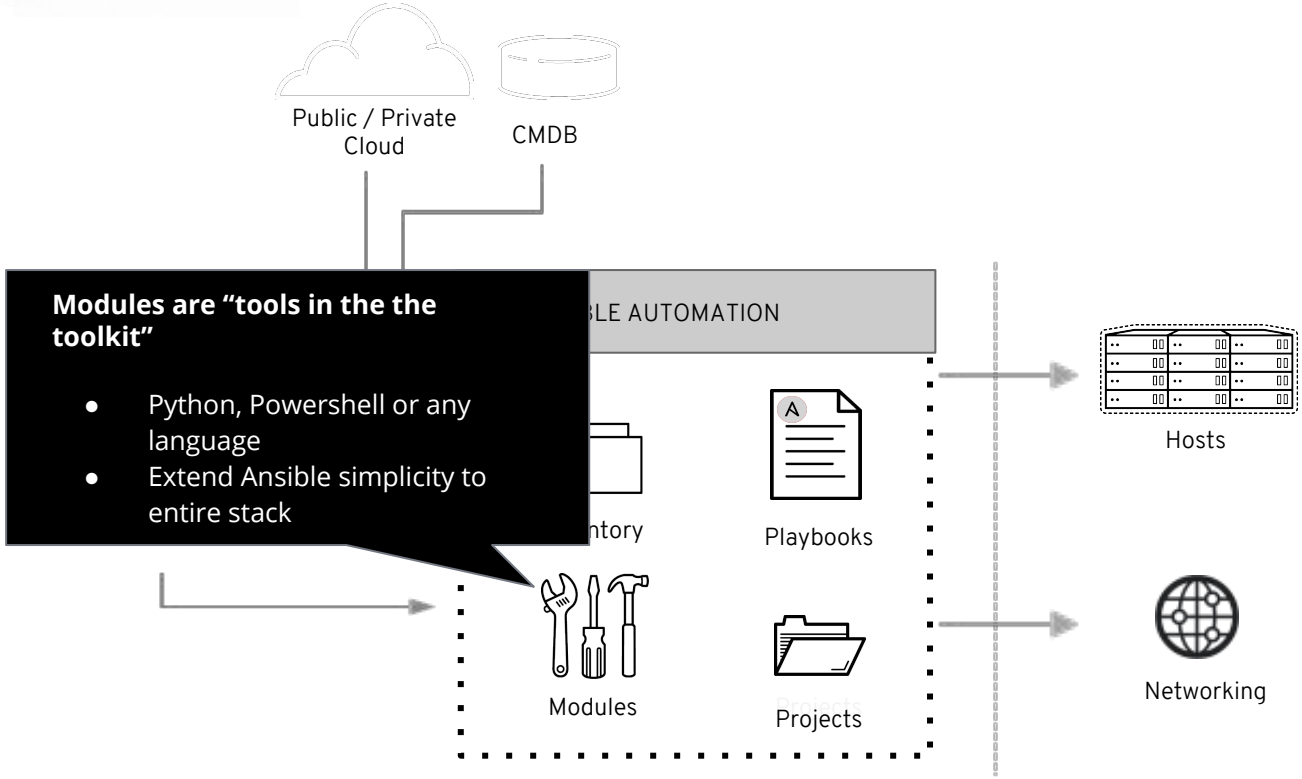

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What Are Modules?

Using shipped modules

Ansible 2.2 contained ~900 modules
Ansible 2.5 contains ~1650 modules

Documentation

Ansible
2.5

For previous versions, see the documentation archive.

Search docs

INSTALLATION, UPGRADE & CONFIGURATION

- Installation Guide
- Configuring Ansible
- Ansible Porting Guides

USING ANSIBLE

- User Guide
  - Ansible Quickstart
  - Getting Started
  - Working with Command Line Tools
  - Introduction To Ad-Hoc Commands
  - Working with Inventory
  - Working With Dynamic Inventory

Module Index

- All modules
- Cloud modules
- Clustering modules
- Commands modules
- Crypto modules
- Database modules
- Files modules
- Identity modules
- Inventory modules
- Messaging modules
- Monitoring modules
- Net Tools modules
- Network modules
- Notification modules
- Packaging modules
- Remote Management modules
- Source Control modules
- Storage modules
- System modules
- Utilities modules
- Web Infrastructure modules
- Windows modules

Should you develop a module?

Should you develop a module?

Before starting development, answer these questions

- **Does a** similar module exist?
  - http://docs.ansible.com/ansible/latest/modules/modules_by_category.html
- **Is there** development already ongoing for a similar module?
  - https://github.com/ansible/ansible/labels/new_module
  - https://github.com/ansible/ansible/labels/module
  - https://ansible.sivel.net/pr/byfile.html
- **Should you** use or develop an action plugin instead?
- **Should you** use a role instead? (14 000 exists on Galaxy)
- **Should you** write one or multiple modules?
  - Remember that complexity kills productivity

Philips Hue Lightbulbs - Why Write a Module?

Complexity:

- You must register your app with the base station.
- The API is REST based and expects JSON for updates.
- The API returns JSON, which is complex to parse and validate in a playbook.
- Some actions require multiple API calls, which translate into individual tasks in a playbook (even when looping).
- RGB colors are not used by the API - you must use Hue/Saturation/Luminance or one of two other options.

How Modules Work

There are different types of modules, for example:

- **Action plugins** - always execute server-side and are sometimes able to do all work there (example: *debug, template)*
- **New-style modules** - all that ship with Ansible. Arguments embedded in module instead of separate file, more efficient.
- **Python** - New-style Python modules use the Ansiballz framework for constructing modules. These modules use imports from ansible.module_utils in order to pull in boilerplate module code, such as argument parsing, formatting of return values as JSON and various file operations.
- **Powershell** - use the Module Replacer framework for constructing modules.

There are different types of modules, for example:

- **JSONARGS** - Scripts that arrange for an argument string to be placed within them using special string:
  jsonargs = "<<INCLUDE_ANSIBLE_MODULE_JSON_ARGS>>"
- **Non-native WANT_JSON modules** - If a module has the string WANT_JSON in it anywhere, Ansible treats it as a non-native module that accepts a filename as its only command line parameter, the format of the argument file will then be in JSON. Otherwise it will be key=value.
- **Binary module** - compiled small program, works like a WANT_JSON module.
- **And more**
  http://docs.ansible.com/ansible/latest/dev_guide/developing_program_flow_modules.html

Modules written in other languages than Python/Powershell

- Modules can be written in any language an author wishes, they just need to specify certain special strings in their code.
- If not, a file containing the module args will be uploaded, and the path to that file is the first argument to the module. If your module contains the string WANT_JSON, that args file will be formatted as JSON (otherwise they're **key=value** pairs).
- As of Ansible version 2.0, modules must output JSON (key=value output is no longer allowed).

How Modules Work

./library/my_new_test_module

```
#!/bin/sh
set -e
source ${1} # Note, not using WANT_JSON
echo {\"changed\": true, \"msg\": \"${msg}\"}
exit 0
```

./test.yml

```
- hosts: localhost
  gather_facts: no
  tasks:
    - my_new_test_module:
        msg: "hello world"
```

```
$ ansible-playbook -vv test.yml
Using /etc/ansible/ansible.cfg as config file
1 plays in test.yml

PLAY ***************************************************************************

TASK [my_new_test_module] ******************************************************************
changed: [localhost] => {"changed": true, "msg": "hello world"}

PLAY RECAP *********************************************************************
localhost                  : ok=1 changed=1    unreachable=0 failed=0
```

How are modules executed?

- **task_executor -** TaskExecutor decides if it's an action plugin or a module. If module, it loads 'Normal Action Plugin' and passes info about what's to be done.
- **Normal Action Plugin** - Inits connection. Pushes module to host. Executes the module on the remote host. *Primary coordinator.*
- **module_common.py** - Identifies module type, selects preprocessor.
- **Module Replacer/Ansiballz** - Preprocessors which does substitutions of specific substring patterns in the module file. Read more.
- **Passing arguments** - module arguments are turned into a JSON-ified string and passed to the module.
- **Internal arguments** - parameters which implements global features. Often you do not need to know about these.

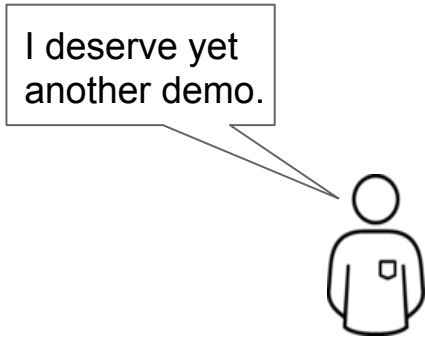
How to Write Modules

Example development environment

- Clone the Ansible repository:
  - $ git clone https://github.com/ansible/ansible.git
- Change directory into the repository root dir:
  - $ cd ansible
- Create a virtual environment:
  - $ python3 -m venv venv (or for Python 2 $ virtualenv venv. Note, this requires you to install the virtualenv package:
  - $ pip install virtualenv
- Activate the virtual environment:
  - $. venv/bin/activate
- Install development requirements:
  - $ pip install -r requirements.txt
- Run the environment setup script for each new dev shell process:
  - $. hacking/env-setup

Example module development

- Navigate to the directory that you want to develop your new module in. Example:
  - $ cd ~/ansible/lib/ansible/modules/cloud/my_new_test_module
- Create your new module file:
  - $ touch my_new_test_module
- Create test playbook
  - $ vi test.yml
- Copy module to module path
  - $ cp my_new_test_module /usr/share/ansible/plugins/modules/
- Test your first module
  - $ ansible-playbook -vv ./test.yml



Module Writing Methods/Strategies

1. Wrap a CLI command (what was just demoed)
2. Use a 3rd party library
3. Interact with the API directly

(sometimes modules use more than one of these methods)

Wrapping CLI Commands

Pros:

- Easy to write, low learning curve.
- Protects users from complexity

Cons:

- Output/results have to be scraped out of the CLI output, which is very fragile and prone to error

  cli_command|awk '{ print $6 '}|cut -d'/" -f2|sed 's/old/new/'
- Depending on use-case - only slightly more useful than using command/shell modules.

Using 3rd Party Libraries

Pros:

- Also very easy to get started with, since someone else has done the hard work for you.

Cons:

- Extra dependencies for users running your module remotely (the library must be installed everywhere you run the module).
- Modules may not cover API features you need (especially new features).
- Bugs and abandonment (don't forget to evaluate!)...

Interacting With the API Directly

Pros:

- No extra dependencies (Ansible provides helper code in `module_utils/urls.py` to make HTTP calls).
- New features are accessible immediately without having to wait.

Cons:

- Having to know the API and maintain the module.

Module Testing and Debugging

Tips for Testing and Debugging

Run your module with our module test wrapper:

```
$ hacking/test-module --help

Useful Options:
  -m MODULE_PATH, --module-path=MODULE_PATH
  -a MODULE_ARGS, --args=MODULE_ARGS
  -I INTERPRETER_TYPE=INTERPRETER_PATH,
--interpreter=INTERPRETER_TYPE=INTERPRETER_PATH
  -c, --check          run the module in check mode
  -n, --noexecute      do not run the resulting module
```

Tips for Testing and Debugging

Run your module with `ANSIBLE_KEEP_REMOTE_FILES=1` and `-vvv`:

```
127.0.0.1 EXEC /bin/sh -c 'LANG=en_US.UTF-8 LC_ALL=en_US.UTF-8
LC_MESSAGES=en_US.UTF-8 /usr/bin/python
/home/user/.ansible/tmp/ansible-tmp-1455631745.37-113407429292636/hue; rm -rf
"/home/user/.ansible/tmp/ansible-tmp-1455631745.37-113407429292636/" > /dev/null
2>&1'
```

```
/home/user/.ansible/tmp/ansible-tmp-1455631745.37-113407429292636/hue explode
```

Best Practices

For Modules You Want to Contribute

- GPLv3+
- Use Python.
- Include the DOCUMENTATION string in the module (especially make sure you set the version_added field).
- Include the EXAMPLES string in the module, and make sure the examples use the expanded YAML format (not key=value options).

General purpose best practices

1. http://docs.ansible.com/ansible/developing_modules.html
2. http://docs.ansible.com/ansible/latest/dev_guide/developing_modules_best_practices.html

Thank you

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