Introduction to Ansible

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Obrázek: flamingtext.com

Motivace

Video: youtu.be/dvqNFTqu57s, Gif: gph.is/2N4va7l

Pojmy

Automatizace

Orchestrace

Obrázek: youtu.be/dvqNFTqu57s, http://harrypotter.wikia.com

Orchestrace

Cíl

- Konfigurace, správa a deploying všech serverů najednou
- Iaas (Infrastructure as a service)
- Propojení se službami poskytujícími "zdroje" (Amazon, OpenStack, DigitalOcean, ...)
- *A admini nebudou mít co žrát.*

Řešení

- Puppet
- Chef
- CFEngine3
- SaltStack (OpenSuse)
- **Ansible** (RedHat)
- ...

Ansible

- Open source v Pythonu.
- Komunikace probíhá přes SSH spojení: šifrované, "bezpečné", pomalé.
- Nepotřebuje nainstalovaného agenta:
    - *Puppet je výborný, ale stejně potřebujete Ansible, abyste jej jednoduše a najednou nainstalovali.* (Věroš Kaplan)
- Potřebuje Python3 (resp. Python2 pro některé moduly ☹)
- Popisujeme stav stroje - jak má vypadat.
- Idempotentní by design (stejná akce = stejný stav).
- Formáty/jazyky: ini, YaML, Jinja2.

Instalace a konfigurace

Instalace:

- Ubuntu 18.04: 2.5.1
- pip: 2.7.0

Cesta konfiguračního souboru (dle priority):

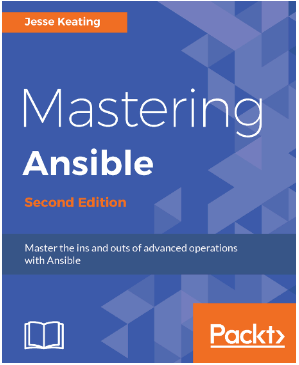
- `$ANSIBLE_CFG`
- `./ansible.cfg`
- `$HOME/ansible.cfg`
- `/etc/ansible/ansible.cfg`

Obrázek: https://cs.wikipedia.org/wiki/Ansible_(software)

Příprava prostředí

Zdroj inspirace

Jessee Keating:
Mastering Ansible -
Second edition



Praktické příklady

https://xmv.cz/ansible

```
sudo apt install git python-pip
sudo pip install ansible
git clone https://gitlab.labs.nic.cz/\
    mvician/ansible-introduction-examples
cd ansible-introduciton-examples
```

Soubory pro spuštění:

```
./??-run.sh
```

Slajdy: https://vician.cz/slides/

Zdroj obrázku: www.packtpub.com

Inventory

- konfigurace: `inventory = hosts`
- přepínače: `-i/--inventory INVENTORY_PATH`
- typické cesty:
  - soubor: `hosts`
  - složka: `inventory/*`
- seznam strojů spravovaných Ansiblem
- `ini` formát
- proměnné určující spojení (konvence) - např.:
  - `ansible_connection`: `local, smart, ssh, paramiko, docker`
  - `ansible_user`
  - `ansible_port`
  - ...
- sdružení strojů do skupin

```
ansible localhost -m ping
```

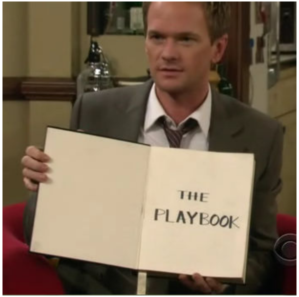
Proměnné v inventory

```
muj-pocitac ansible_connection=local

server.example.com ansible_port=9022

turris.example.com ansible_user=root

tajnyserver.tajnadomena.tld ansible_host=1.1.1.1

muj-arch-desktop ansible_python_interpreter=/usr/bin/python2

desktop-doma.example.com ansible_ssh_common_args=' \
   -o ProxyCommand="ssh -W %h:%p -q root@turris.example.com"'
```

https://docs.ansible.com/ansible/latest/intro_inventory.html#list-of-behavioral-inventory-parameters

Playbook

- složka: `playbooks` (konvence)
- seznam stavů/úkolů
- omezuje se množina serverů z inventory
- lineární procházení úkolů
- standardně se vykonává úkol po úkolu na daných strojích
- `yaml` - všude stejný počet mezer/tabulátorů



Spuštění:

```
ansible-playbook -i 02-hosts playbooks/02-hello-word.yml
```

Obrázek: how-i-met-your-mother.wikia.com

Struktura playbooku

`playbooks/03-playbook.yml`:

```
- hosts: all
  tasks:
    - debug:
        msg: Hello world!
    - debug:
        msg: And again!
```

Spuštění:

```
ansible-playbook -i 03-hosts playbooks/03-playbook.yml
```

nebo: `./03-run.sh`

Skupiny strojů

Hosts

```
ginny

[twins]
fred
george

[prefects]
bill
charlie
percy
ron
```

Playbook

```
- hosts: twins
  tasks:
    - debug:
        msg: "Weasleys' Wizard Wheezes!!!"
- hosts: prefects
  tasks:
    - debug:
        msg: Am I also head-boy?
```

```
ansible-playbook -i 04-hosts playbooks/04-playbook-limit.yml
```

Limit strojů

```
- hosts: all:!percy
  tasks:
    - debug:
        msg: "Where is Percy?"
- hosts: twins
  tasks:
    - debug:
        msg: "Oh, are you a prefect, Percy?"
- hosts: percy
  tasks:
    - debug:
        msg: "Oh, shut up! "
```

```
ansible-playbook -i 05-hosts playbooks/05-playbook-more.yml
```

Runtime limit

Playbook

```
- hosts: all
  tasks:
    - debug:
        msg: "I'm Fred or George?"
```

Hosts

```
fred
george

[all:vars]
ansible_connection=...
```

```
ansible-playbook -i 06-hosts playbooks/06-limit.yml \
  --limit twins
```

Hiearchie skupin

```
[weasly]
ginny

[twins]
fred
george

[prefects]
bill
charlie
percy
ron

[weasly:children]
twins
prefects
```

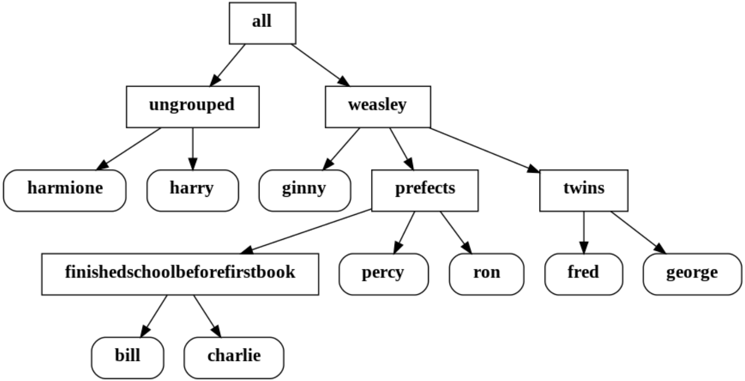
Playbook

```
- hosts: weasly
  tasks:
    - debug:
        msg: "We are ..."
```

Run

```
ansible-playbooks \
  -i 07-hosts \
  playbooks/07-groups.yml
```

Hiearchie skupin - znázornění



```
ansible-inventory-grapher -q -i 07-hosts all | dot -Tpng | \
  display png:-
```

https://github.com/willthames/ansible-inventory-grapher

Výstupy

```
- hosts: localhost
  tasks:
    - shell: date
      register: currenttime
    - debug:
        msg: "Current time is: {{ currenttime.stdout }}"
```

```
ansible-playbook -i 08-hosts playbooks/08-stdout.yml
```

Výstupy

```
ok: [localhost] => {
    "msg": {
        "changed": true,
        "cmd": "date",
        "delta": "0:00:00.001941",
        "end": "2018-06-27 12:57:20.775504",
        "failed": false,
        "rc": 0,
        "start": "2018-06-27 12:57:20.773563",
        "stderr": "",
        "stderr_lines": [],
        "stdout": "St čen 27 12:57:20 CEST 2018",
        "stdout_lines": [
            "St čen 27 12:57:20 CEST 2018"
        ]}}
```

Změny

```
- hosts: localhost
  tasks:
    - debug:
        msg: "No change"
      register: gringotts
    - debug:
        msg: "Was changed"
      when: gringotts is changed
    - debug:
        msg: "Success"
      when: gringotts is success
```

```
ok: [localhost] => {
  "gringotts": {
    "changed": false,
    "failed": false,
    "msg": "No change"
  }
}
```

```
ansible-playbook -i 09-hosts playbooks/09-changed.yml
```

Návratový kód

```
- hosts: kingscross
  tasks:
    - shell: sl
      register: hogwartsexpress
    - debug:
        msg: "Hogwarts Express isn't installed!"
      when: hogwartsexpress.rc == 2
```

```
ansible-playbook -i 10-hosts playbooks/10-return.yml
```

Návratový kód

https://docs.ansible.com/ansible/latest/user_guide/playbooks_error_handling.html

```
- hosts: kingscross
  tasks:
    - shell: sl
      register: hogwartsexpress
      failed_when: hogwartsexpress.rc == 2
```

Root? No, thank you!

Přihlašujeme se pomocí SSH klíčů.

Hosts

```
localhost ansible_user=lab
```

Playbook

```
- hosts: localhost
  tasks:
    - shell: whoami
```

```
ansible-playbook -i 11-hosts playbooks/11-sudo.yml \
  --become --ask-become-pass
```

Obrázek: http://www.techprone.com/

He-who-must-not-be-named

```yaml
- hosts: ron
  tasks:
    - name: Rat name
      debug:
        msg: "My rat is called Scabbers."
    - name: Mirror of Erised
      debug:
        msg: "I would like to win Quidditch World Cup."
```

```
ansible-playbook -i 12-hosts playbooks/12-names.yml
```

Inventory

```
./inventory/gryffindor
    johnson
    wood
    [harrysyear]
    weasley
    granger
./inventory/hufflepuff
    diggory
    [harrysyear]
    macmillan
```

```
./inventory/ravenclaw
    lovegood
    [harrysyear]
    patil
./inventory/slytherin
    flint
    [harrysyear]
    malfoy
    crabbe
    goyle
```

```
ansible-playbook -i 13-inventory playbooks/13-inventory.yml
```

Inventory

Ansible "jen" sloučí všechny soubory v adresáři

```
ansible-playbook -i 13-inventory playbooks/13-inventory.yml \
   -l gryffindor
```

```
- hosts: gryffindor
  tasks: ...
```

Obojí selže, ale `13-inventory/all` funguje:

```
[all:vars]
ansible_connection=local
```

Roles

- slučujeme úkoly do logických celků
- sdílíme role (`roles_path =\ roles:shared`)

```
./
./ansible.cfg
./hosts
./playbooks/hello.yml
./roles/hello/tasks/main.yml
./roles/myrole/tasks/main.yml
./shared/users/tasks/main.yml
./shared/sshd/tasks/main.yml
```

`tasks/main.yml`:

```
- name: first
  debug:
    msg: Hello World!
```

`playbooks/hello.yml`:

```
- hosts: localhost
  roles:
    - hello
    - users
```

```
ansible-playbook -i 15-hosts playbooks/15-roles.yml
```

Variables

- V inventory `ansible_port`, ...
- `group_vars`
- `host_vars`
- v rolích
  - vychozí
  - vynucné
- dočasné v úkolech
- v playboocích

```
ansible-playbook -i 16-hosts playbooks/16-variables.yml
```

Obrázek: https://www.ebay.co.uk/itm/12x-HARRY-POTTER-POTION-BOTTLES-/312069127320

Variables - hiearchy

https://docs.ansible.com/ansible/latest/user_guide/playbooks_variables.html#variable-precedence-where-should-i-put-a-variable

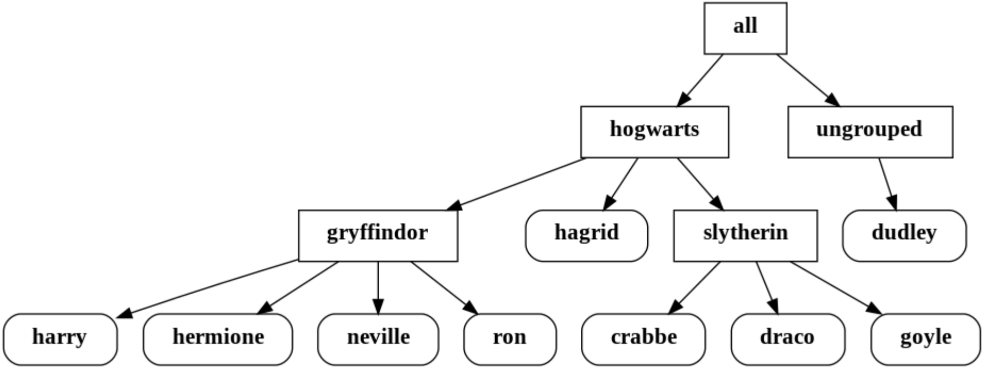
- Proměnná musí být definovaná!

  ```
  when: variable is not defined
  msg: "{{ variable | default('zapomnnel jsem definovat') }}"
  ```

```
ansible-playbook -i 17-hosts playbooks/17-variables.yml
```

- typicky:
  - proměnné do rolí `role/myrole/defaults/main.yml`
  - změny v `host_vars` a `group_vars`

Variables - hiearchy



TOP Modules

https://docs.ansible.com/ansible/latest/modules/modules_by_category.html

- `ping`
- `apt`, `yum`, `apt_key`, `apt_repo`, ...
- `pip`
- `systemd`
- `sysctl`
- `user`
- `git`
- `copy`
- `template`
- `uri`

Files

https://docs.ansible.com/ansible/latest/modules/copy_module.html

```
roles/gryffindor/tasks/main.yml
roles/gryffindor/files/fat-lady-password.txt
```

```
- copy:
    src: fat-lady-password.txt
    dest: /etc/gryffindor-door/fat-lady-password.txt
    owner: percy
    group: percy
    mode: 0644
```

Templates

- https://docs.ansible.com/ansible/latest/modules/template_module.html
- https://docs.ansible.com/ansible/latest/user_guide/playbooks_templating.html

```
roles/teachers/tasks/main.yml
roles/teachers/templates/.jinja2
```

```
- copy:
    src: herbology.jinja2
    dest: /etc/herbology.txt
    owner: dumbledore
    group: dumbledore
    mode: 0644
```

```
Teacher: {{ teacher }}
{% for item in ... %}
- {{ item }}
{% endfor %}
```

```
ansible-playbook -i 19-hosts playbooks/19-templates.yml
```

Loops

https://docs.ansible.com/ansible/latest/user_guide/playbooks_loops.html

```
- debug:
    msg: "I'm {{ item }} Weasley."
  with_items: [ Fred, George ]
- debug:
    msg: "I'm {{ item }} Weasley."
  with_items:
    - Fred
    - George
- debug:
    msg: "I'm {{ item }} Weasley."
  with_items: "{{ twins_names }}"
```

```
ansible-playbook -i 20-hosts playbooks/20-loops.yml
```

Handlers

https://docs.ansible.com/ansible/latest/user_guide/playbooks_intro.html#handlers-running-operations-on-change

```
roles/gryffindor/tasks/main.yml
roles/gryffindor/handlers/main.yml
```

```
- copy:
    dest: /etc/gryffindor-door/fat-lady-password.txt
    content: "{{ password }}"
  notify: fatlady reload
```

- notify jen při změně

```
ansible-playbook -i 21-hosts playbooks/21-handlers.yml
```

Tasks include

```
roles/users/tasks/main.yml
roles/users/tasks/user.yml
```

`main.yml`:

```
- name: Process each user
  include: user.yml
  with_items: "{{ users }}"
```

`user.yml`:

```
- user:
    name: "{{ item }}"
```

Tagy

https://docs.ansible.com/ansible/latest/user_guide/playbooks_tags.html

- tagovat lze:
  - task v roli
  - roli v playbooku

```
- hosts: all
  roles:
    - {role: users, tags: users}
    - {role: sshd, tags: sshd}
```

```
ansible-playbook example.yml --tags "users,sshd"
```

Konvence

- nepoužívat roli `common` (není jasné, co dělá)
- závislosti řešit na úrovni playbooku a ne v rolích
- jeden playbook pro jednu činnost
- citlivá data dohromady separátně
- v `playbooks` žádné `tasks`
- každá role má README.md
- proměnné jsou v `defaults`
- playbooky neobsahují duplikátní role
- proměnné obalené mezerami: {{ promenna }}
- proměnné s prefixem názvu role

Obrázek: http://harrypotter.wikia.com/wiki/File:Harry_Potter_Movie_Pictures-Professors.jpg

Sdílime role!

- ansible-galaxy: https://galaxy.ansible.com/ (spíš inspirace, pozor na bezpečnost)
- git submoduly s tagovanými čísly verzí

`ansible.cfg`:

```
roles_path = roles:companyroles:galaxy-roles
```

Obrázek: http://www.harrypotterpartyideas.com/the-props/monster-book-of-monsters-and-other-books

Ansible vault

`ansible.cfg`:

```
vault_password_file = vault.sh
```

```
#!/bin/sh
DN="$(dirname "$0")"
gpg2 --batch --use-agent --decrypt "$DN"/pass.gpg \
  2> /dev/null
```

```
ansible-vault [create|edit||view] file
```

- `group_vars/all/secure.yml`
- `host_vars/harry/diary.yml`

Become

```
- hosts: localhost
  tasks:
    - name: gitlab projects
      git:
        repo: "ssh://git@gitlab.com/project"
        dest: "/home/{{ ansible_env['USER'] }}/project"
      become: no
```

```
ansible-playbook playbooks/gitproject.yml --become \
  --ask-become-pass
```

Otázky?

Obrázek: www.quora.com