

# Introduction to Ansible

Network Startup Resource Center



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# Are your servers Pets or Cattle?



- Pets are given names like pussinboots.cern.ch
- They are unique, lovingly hand raised and cared for
- When they get ill, you nurse them back to health



- Cattle are given numbers like vm0042.cern.ch
- They are almost identical to other cattle
- When they get ill, you get another one

Source:

<http://www.slideshare.net/gmccance/cern-data-centre-evolution>



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# What is Ansible?

- *A configuration management tool*
- Applies changes to your system to bring it to a desired state
- Similar applications include puppet, chef, salt, juju, cfengine



# Why choose Ansible?

- Target system requires only sshd and python
  - No daemons or agents to install
- Security
  - Relies on ssh
- Easy to get started, compared to the others!



# Ansible running with cowsay

```
< TASK: [install /etc/hosts] >
```

```
-----  
      ^  ^  
      (oo)\_____  
      (__)\\       )\\/\  
           ||----w |  
           ||     ||
```

```
ok: [pc1.example.com]
```



# Modules

- Ansible “modules” are small pieces of code which perform one function
  - e.g. copy a file, start or stop a daemon
- Most are “idempotent”: running repeatedly has the same effect as running once
  - only makes a change when the system is not already in the desired state
- Many modules supplied as standard
  - <http://docs.ansible.com/modules.html>



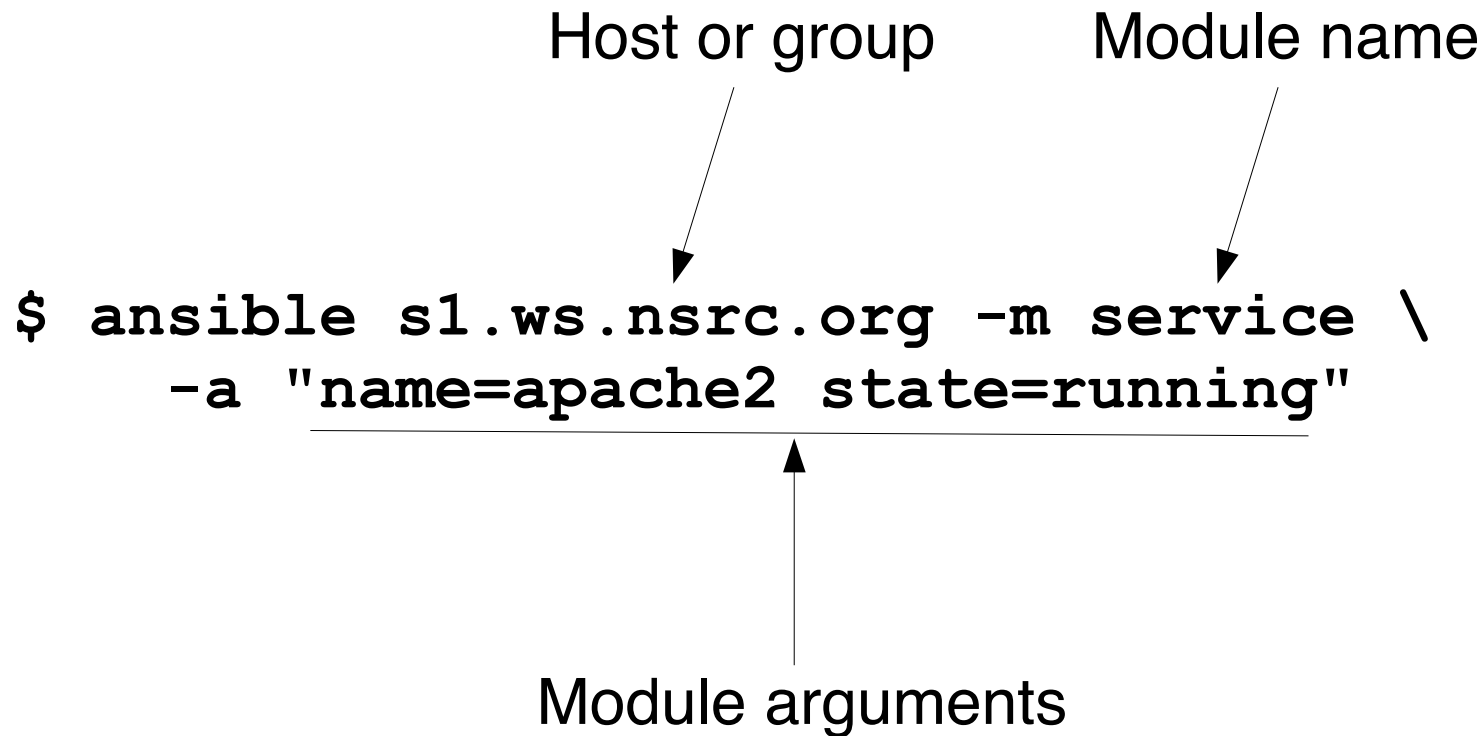
# Invoking modules from shell

Host or group      Module name

\$ ansible s1.ws.nsrc.org -m service \

-a "name=apache2 state=running"

Module arguments



# Configuring Ansible behaviour

- *Tasks* are modules called with specific arguments
- *Handlers* are triggered when something changes
  - e.g. restart daemon when a config file is changed
- *Roles* are re-usable bundles of tasks, handlers and templates
- All defined using YAML





# Diversion: YAML

- A way of storing structured data as text
- Conceptually similar to JSON
  - String and numeric values
  - Lists: ordered sequences
  - Hashes: unordered groups of key-value pairs
- String values don't normally need quotes
- Lists and hashes can be nested
- Indentation used to define nesting



# YAML list (ordered sequence)

- Single line form

```
[birth, taxes, death]
```

- Multi-line form

- birth
- taxes
- death

↑ *Space after dash required*



# YAML hash (key-value pairs)

- Single line form

```
{item: shirt, colour: red, size: 42}
```

↑ *Space after colon required*

- Multi-line form

```
item: shirt
colour: red
size: 42
description: |
    this is a very long multi-line
    text field which is all one value
```



# Nesting: list of hashes

- Compact

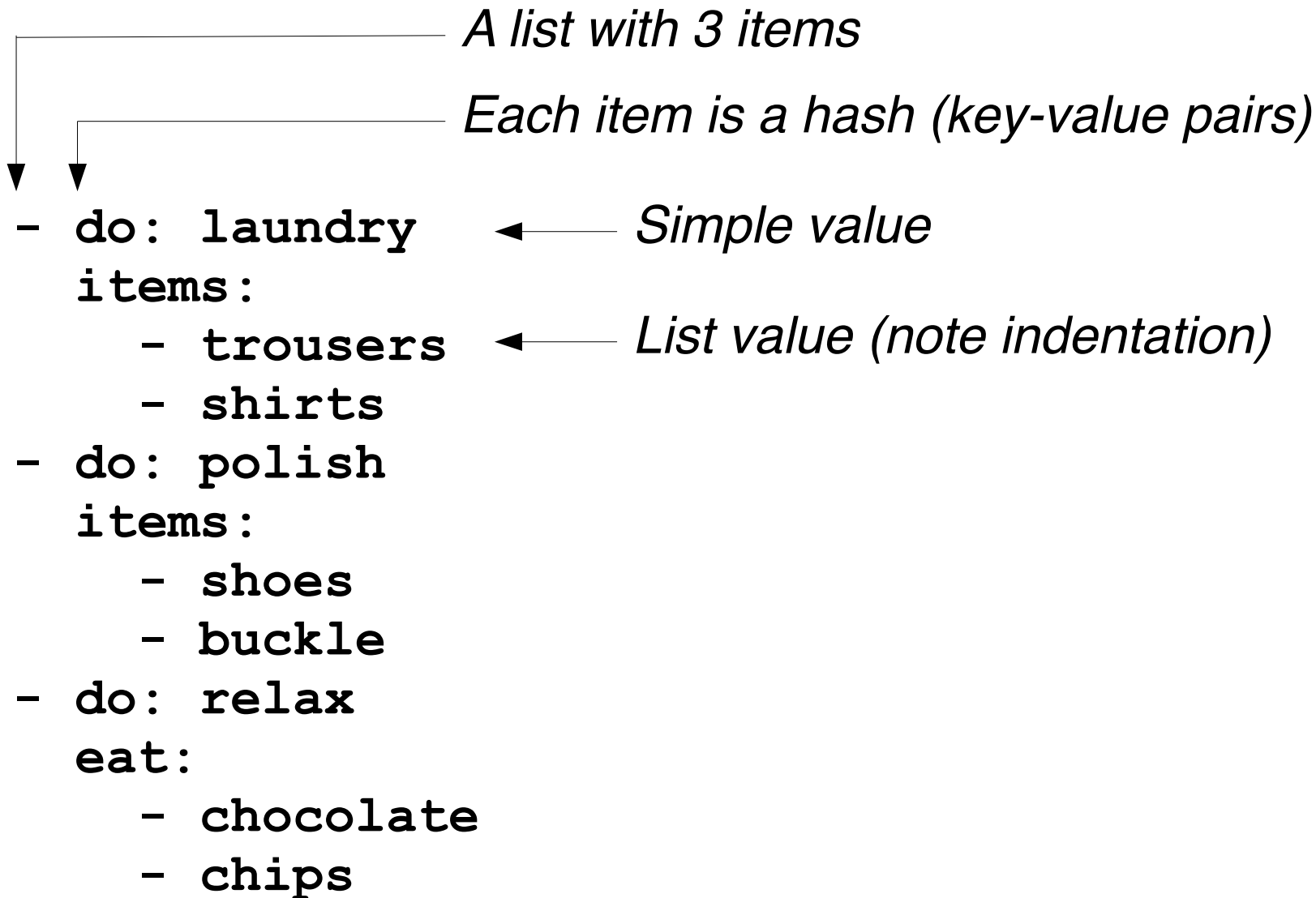
- `{item: shirt, colour: red, size: 42}`
- `{item: shirt, colour: blue, size: 44}`

- Multi-line

- `item: shirt`  
`colour: red`  
`size: 42`
  - `item: shirt`  
`colour: blue`  
`size: 44`
- Note alignment*



# More complex YAML example



# Ansible playbook

*Top level: a list of "plays"*

*Each play has "hosts" plus "tasks" and/or "roles"*

- ▼
- ▼
- hosts:
  - pc1.example.com
  - pc3.example.com
- tasks:
  - name: install Apache
    - action: apt pkg=apache2 state=present
  - name: ensure Apache is running
    - action: service name=apache2 state=running
- hosts: dns\_servers
- roles:
  - dns\_server
  - ntp



# Roles

- A bundle of related tasks/handlers/templates

**roles**/*<rolename>*/**tasks**/main.yml

**roles**/*<rolename>*/**handlers**/main.yml

**roles**/*<rolename>*/**defaults**/main.yml

**roles**/*<rolename>*/**files**/...

**roles**/*<rolename>*/**templates**/...

### Recommended way to make re-usable configs

### Not all these files need to be present



# Tags

- Each role or individual task can be labelled with one or more "tags"
- When you run a playbook, you can tell it only to run tasks with a particular tag: `-t <tag>`
- Lets you selectively run parts of playbooks





# Inventory

- Lists all hosts which Ansible may manage
- Simple "INI" format, not YAML
- Can define groups of hosts
- Default is `/etc/ansible/hosts`
  - Can override using `-i <filename>`



# Inventory (hosts) example

```
[dns_servers]      ← Name of group
pc1.example.com    ← Hosts in this group
pc2.example.com
```

```
[misc]
pc3.example.com
pc4.example.com
```

```
# Note: the same host can be listed under
# multiple groups.
# Group "all" is created automatically.
```



# Inventory variables

- You can set variables on hosts or groups of hosts
- Variables can make tasks behave differently when applied to different hosts
- Variables can be inserted into templates
- Some variables control how Ansible connects



# Setting host vars

- Directly in the inventory (hosts) file

```
[core_servers]
pc1.example.com  ansible_connection=local
pc2.example.com
```

- In file `host_vars/pc2.example.com`

```
ansible_ssh_host: 10.10.0.241
ansible_ssh_user: root
flurble:
  - foo
  - bar
```

# This is in YAML and is preferred



# Setting group vars

- **group\_vars/dns\_servers**

```
# More YAML
flurble:
  - baz
  - qux
```

- **group\_vars/all**

```
# More YAML, applies to every host
# Note: host vars take priority over group vars
```



# "Facts"

- Facts are variables containing information collected automatically about the target host
- Things like what OS is installed, what interfaces it has, what disk drives it has
- Can be used to adapt roles automatically to the target system
- Gathered every time Ansible connects to a host (unless playbook has "gather\_facts: no")



# Showing facts

*Invoke the "setup" module*

```
$ ansible s1.ws.nsrc.org -m setup | less
s1.ws.nsrc.org | success >> {
  "ansible_facts": {
    "ansible_distribution": "Ubuntu",
    "ansible_distribution_version": "12.04",
    "ansible_domain": "ws.nsrc.org",
    "ansible_eth0": {
      "ipv4": {
        "address": "10.10.0.241",
        "netmask": "255.255.255.0",
        "network": "10.10.0.0"
      },
      ... etc
```



# jinja2 template examples

- Insert a variable into text

```
INTERFACES="{{ dhcp_interfaces }}"
```

- Looping over lists

```
search ws.nsrc.org  
{% for host in dns_servers %}  
nameserver {{ host }}  
{% endfor %}
```





# Many other cool features

- Conditionals

- `action: apt pkg=apache2 state=present`  
`when: ansible_os_family=='Debian'`

- Loops

- `action: apt pkg={{item}} state=present`  
`with_items:`
    - `openssh-server`
    - `acpid`
    - `rsync`
    - `telnet`



# Getting up-to-date Ansible

- Your package manager's version may be old
- For Ubuntu LTS: use the PPA

```
apt-get install python-software-properties  
add-apt-repository ppa:rquillo/ansible  
apt-get update  
apt-get install ansible
```



# More info and documentation

- <http://docs.ansible.com/>
- <http://docs.ansible.com/faq.html>
- <http://jinja.pocoo.org/docs/templates/>

