BSD Systems Management with Ansible

Transforming your Sysadmin Shell Scripts to Ansible

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September 9, 2017

vBSDcon 2017

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About me

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- Central fileserver with NFS mounts for `/home` dirs of the nodes
- 40 nodes now, mixed FreeBSD/Ubuntu environment (gradually ~~subverting~~ migrating to FreeBSD)

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Stripped it down to bare minimum with custom Ubuntu/FreeBSD ISO, only doing:

- Partitioning
- Installing the base OS
- Setup Networking
- Reboot

Result of that: Managed to drop install time by less than half.

For FreeBSD, custom base install shell script takes barely 3 minutes.

Refining, tweaking, and optimizing is an ongoing process

Ansible for all the rest

Once a node is in multi-user mode, Ansible scripts run for final setup tasks depending on usage

Allows us a much more flexible machine use, quicker provisioning for end-users

Previously, shell scripts were doing the work of setting up NoSQL databases:

- MongoDB
- Couchbase
- Hadoop (Java)
- Pig

Generally works well, encourages further use

Before, when using shell scripts, we ran into some interesting scenarios...

Problems with Shell Scripts...


OOOPS...
I DID IT AGAIN.
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Oops, I did it again...

Have you ever accidentally ran your shell setup script twice? Rolled out into production?

- Config files have the same lines in it twice, where each one must not appear more than once
- Now I need a lot of extra code to check for and prevent duplication
- A simple script becomes a big if-this-then-that-take-care-of-all-eventualities mess
- Undoing is even worse, probably resulting in yet another script...
- Different scripts for different environments, OSes, package managers, heterogenous networks
- Sometimes not even clear what operating system is running on the (reinstalled) remote machine

Introduction to Ansible

Ansible is a lightweight way of automating, provisioning and configuration management

It can run in ad-hoc mode (commandline) and more complex scripts called playbooks

Defines a control machine to send commands to multiple target machines in parallel

Target machines retrieve them via SSH and executes these instructions in idempotent fashion

No need for a client running on target host other than SSH and python environment

Abstracts concrete commands/OS specifics away into modules like `package`, `copy`, `fetch`, `lineinfile`, etc.

Bootstrapping Ansible: BSD specifics

- Install the `sysutils/ansible` port/package on the control machine
- Create an inventory file with hosts to manage:

```
[freebsd:vars]
ansible_python_interpreter=/usr/local/bin/python2.7

[mygroup]
bsdhost1
```

- Install Python 2.7 on the remote machines:

```
ansible -m raw -a "pkg install -y python27" bsdhost1
```

Example Playbook

```
$ cat ssh-access.yml
- name: "Allow {{user_id}} to log in via SSH"
  gather_facts: false
  hosts: '{{ host }}'
  tasks:
    - name: Adding the user {{user_id}} to the AllowUsers line in sshd_config
      replace:
        backup: no
        dest: /etc/ssh/sshd_config
        regexp: '^(AllowUsers(?!.*\b{{ user_id }}\b).*)$'
        replace: '\1 {{ user_id }}'

    - name: Restarting SSH service
      service:
        name: sshd
        state: restarted
```

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Execute with:

```
$ ansible-playbook -Kb ssh-access.yml -e 'host=bsdhost1 user_id=joe'
```

Things Ansible does for you

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- Takes away tedious, repetitive tasks, so you can focus on the important bits.
- Repetitions, iterations, and loops are comparably simple (`with_items`)
- Obscure options are abstracted away
- Do multiple things at once: create/fetch/copy a file, change owner, and permissions
- Newer versions suggest modules instead of you using `command`/`shell`/`sed` everywhere:

```
[WARNING]: Consider using template or lineinfile module rather than running
sed
```

- A `setup` step collects a lot of info for you and presents it as ready-to-use variables

Setup & Variables

- A problem in shell scripts is getting certain machine information other than the one in $ENV
- No central registry or information repository to query in the OS
- Often results in a lot of `greping` and `awking` to get what you want
- Ansible can run a `setup` task that gathers so called **facts** from a target machine
- Facts: Information stored in JSON format and available as `{{variables}}` in the playbook
- Includes: Network information, hardware, date & time, partitions, OS distribution and kernel, environment variables, SSH hostkeys, etc.

Do multiple things in one command

In Ansible:

```
- name: "Create User foo"
  user:
    name: foo
    home: /usr/home/foo
    shell: /bin/csh
    generate_ssh_key: yes
    ssh_key_type: 25519
    createhome: yes
```

In Shell:

```
$ sudo pw useradd -n foo -s /bin/csh -m
$ sudo -u foo ssh-keygen -t ed25519 \
 -f /home/foo/.ssh/ed25519
```

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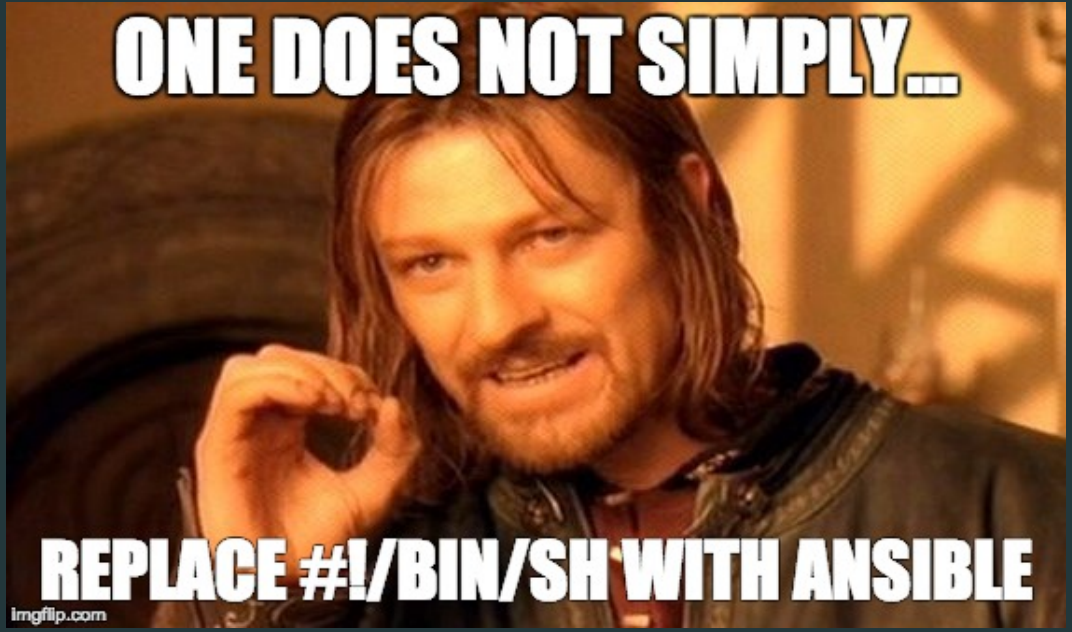
Other module options:

- ssh_key_bits
- ssh_key_comment
- ssh_key_file
- ssh_key_passphrase


ONE DOES NOT SIMPLY...
REPLACE #!/BIN/SH WITH ANSIBLE
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Making Playbooks work more like shell scripts

Normal invocation:

```
$ ansible-playbook myplaybook.yml
```

Should work more like a shell script with the interpreter in the first line:

```
$ head -n 1 myplaybook.yml
#!/usr/local/bin/ansible-playbook
$ chmod +x myplaybook.yml
./myplaybook.yml
```

What does FreeBSD need to work well with Ansible?

- Better setup results (compare to Linux)
- Continued vendor awareness about it's existence and integration
- Modules for jails, bhyve, geom/geli, other BSD specifics
- The usual: patches, bugfixes, suggestions
- Works surprisingly well despite the above

Where FreeBSD Scores in Relation to Automation Software like Ansible

- Reliable network interface names
- Ubuntu 14.04 and 16.04 gave us these on Dell C6320/C6220: `enf0s0`, `eno1`, `em1`, `p1p1`
  - Can be disabled via symlink
  - But why this naming in the first place?
  - FreeBSD uses driver/manufacturer name + number and does not change it!
- Stable API/ABIs between major versions for programs to attach to and use
- Powerful and easy to use ports/packages system

Ansible will not. . .

- Reduce the number of lines you have in a playbook vs. a shell script
- Make writing playbooks easy, you'll likely swear a lot about YAML syntax when starting out
- Run as fast without some config tuning for hundreds of hosts
  - increase `forks` setting in `ansible.cfg`
  - experiment with `strategy: free` to not have hosts wait for each other
- magically convert your scripts into playbooks, rewriting from scratch is more likely
- copy files from target machine to somewhere else on target machine
  - Always starts from the control machine, no client on target
  - Advantage of Ansible, but also it's greatest weakness
  - The `synchronize` module helps sometimes

Tips for converting your existing shell scripts

- Go over it line by line and look for equivalents in Ansible's list of all modules[1]
- Divide it up into functional parts (create users, install software, configuration, etc)
- Start with hard-coded values and replace with variables when working
- Test playbooks repeatedly to see that idempotency is actually enforced and working
- `name` each step to recognize which one currently executes
- Use loops and `with_items` often, just like in the shell script
- Make use of the `template` module to provision your own config files
- Check return codes, just like `$?`, don't assume everything magically works
- Don't gather facts if you don't use variables in your (mostly short) playbooks

[1] `docs.ansible.com/ansible/latest/list_of_all_modules.html`

Conclusion

Summary

- Ansible is relatively easy to get started with
- The more tasks you repeatedly execute, the more likely it is you will benefit from Ansible
- No silver bullet, writing playbooks takes time, YAML isn't that user-friendly
- Once you have them thought, huge time-saver through parallel execution
- Keep in mind the clientless architecture and central deployment machine

Special Thanks

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You for listening!

Questions?