The bridge to possible

Allison Butler, Sr Automation Architect

DEVNET-1700

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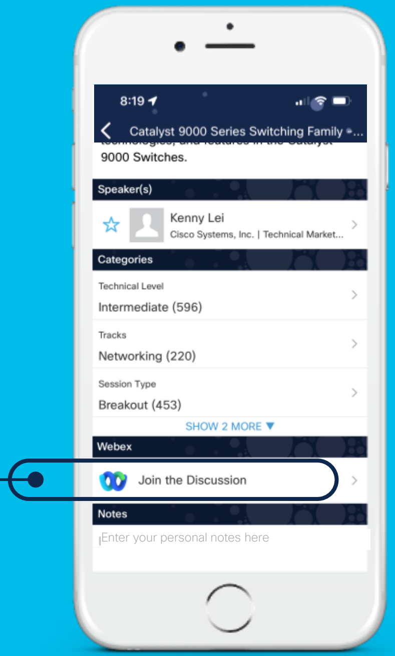

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9000 Switches.

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Agenda

- Meet DevNet Sandbox
- The Good
- The Bad
- The Ugly
- What’s Next

Allison Butler

- 4 years on the sandbox team
- Background in software engineering
- Focused on automation and development
- In my spare time, I like…
  - board games
  - video games
  - fencing
  - playing with my cats

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Meet DevNet Sandbox

To empower infrastructure and application developers to innovate with Cisco and open-source solutions, by providing them with hands-on easy access to great technology and APIs.

DevNet Sandbox Mission

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Sandbox Overview

- 8 people spread over 3 continents
- 2 datacenters to maintain
  - Everything done on-prem
- 60+ sandboxes to keep up-to-date

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Automation Wishlist

- ❑ Standardize processes for repeatability
- ❑ Terraform-based sandbox topologies
- ❑ CICD driven processes for sandbox creation and updates
- ❑ Automated testing of sandbox topologies
- ❑ Templates to streamline future projects

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What we're working with:

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Case Studies

The Good

k8s sandboxes w/ Terraform

The Bad

Python library upgrades

The Ugly

vCenter Cleanup

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The Good

Use Case: Terraform for Gold Images

- Motivation: increase # of sandboxes requiring k8s clusters
- Tools: Gitlab, vCenter, Ansible, Terraform
- Goal: automate the process to stand up a k8s cluster from scratch

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The Process

- Create VMs
  - for k8s, typically at least 3 VMs needed
- Customize VMs
  - Set IP, hostname, install tooling, etc
- Configure controller node + start cluster
  - Set up container networking, load balancing, etc
- Configure worker nodes + join to cluster
- Test that everything works
- Power off VMs + prep for linked clones
- Take snapshots that our orchestration software can use to spin up linked clones

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Before

- Everything done manually
- Lots of room for human error
- Inconsistent naming schemes
- Lengthy install process – could take a full day to get everything set up

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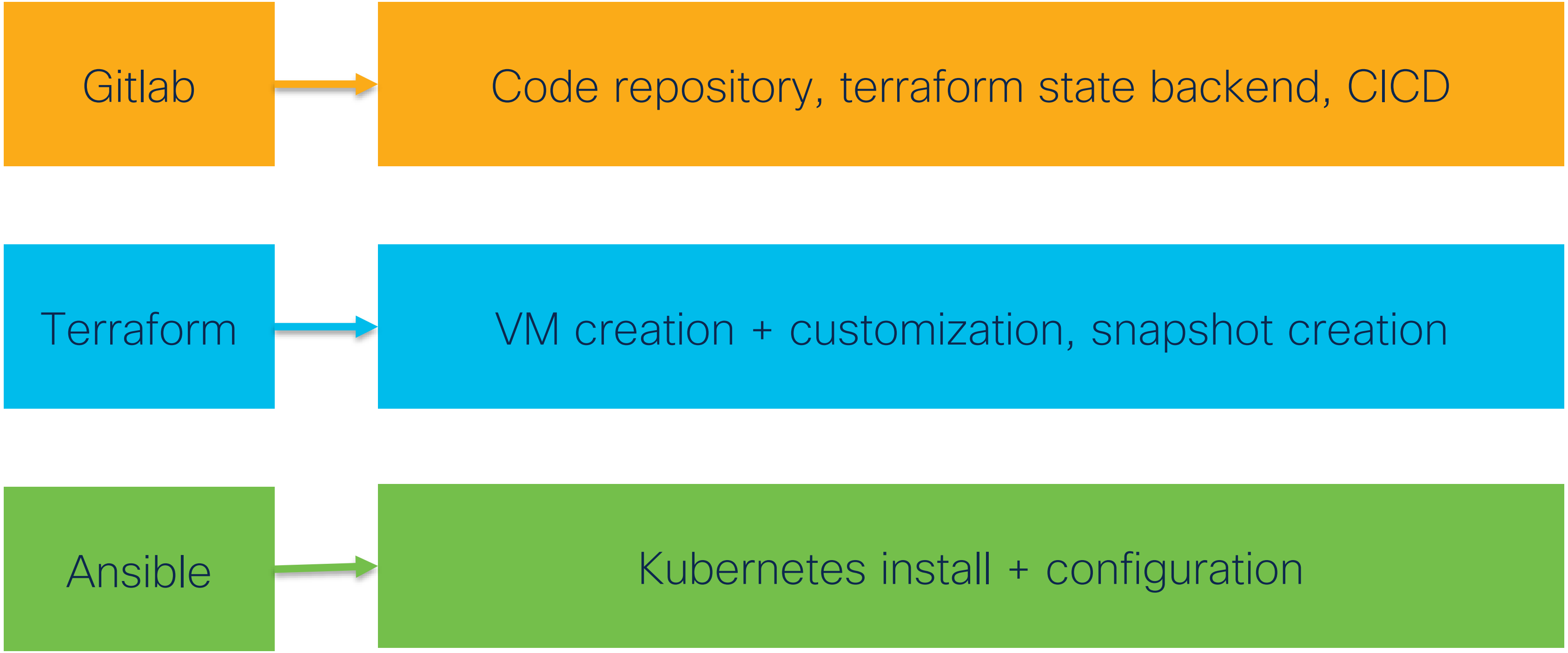
Tools Used



Gitlab → Code repository, terraform state backend, CICD

Terraform → VM creation + customization, snapshot creation

Ansible → Kubernetes install + configuration

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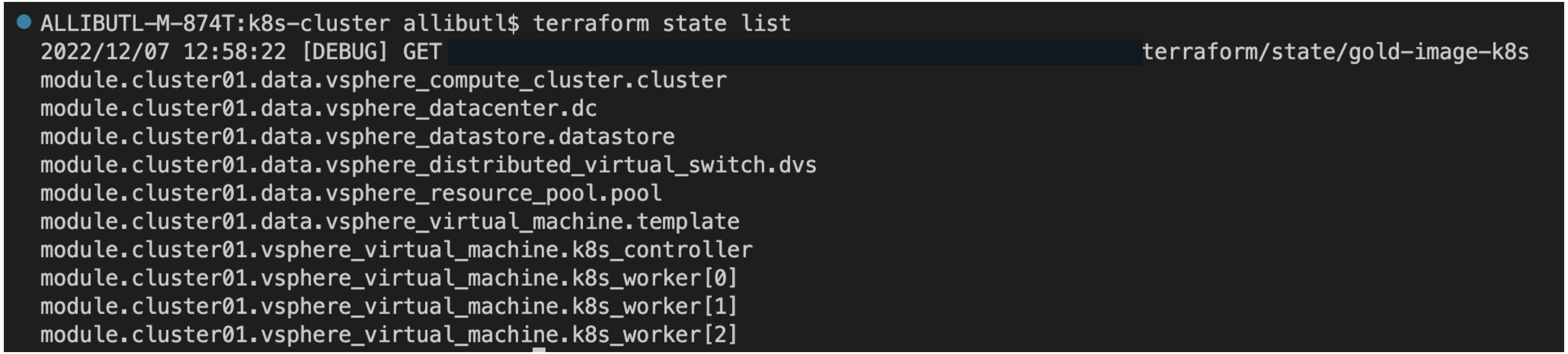
After

- Terraform ensures VMs are normalized and scalable
- Ansible provides repeatable automation for cluster setup
- Setup is modular and can be used anywhere, by anyone
- Entire cluster build takes about 20 minutes



```
ALLIBUTL-M-874T:k8s-cluster allibutl$ terraform state list
2022/12/07 12:58:22 [DEBUG] GET [redacted]terraform/state/gold-image-k8s
module.cluster01.data.vsphere_compute_cluster.cluster
module.cluster01.data.vsphere_datacenter.dc
module.cluster01.data.vsphere_datastore.datastore
module.cluster01.data.vsphere_distributed_virtual_switch.dvs
module.cluster01.data.vsphere_resource_pool.pool
module.cluster01.data.vsphere_virtual_machine.template
module.cluster01.vsphere_virtual_machine.k8s_controller
module.cluster01.vsphere_virtual_machine.k8s_worker[0]
module.cluster01.vsphere_virtual_machine.k8s_worker[1]
module.cluster01.vsphere_virtual_machine.k8s_worker[2]
```

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See it live in the Calisti Sandbox!

The Bad

Use Case: Python Library Upgrade

- Motivation: current python version won’t support our future state automation
- Tools: Python, python, and more python ☺
- Goal: modernize the python used by our orchestration software

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Challenges

- Starting from Python 2 ☹
  - Yes, we should have done it a long time ago
- Upgrade in place with minimal downtime
  - LOTS of backend VMs to get updated
- Estimated time to complete: weeks
  - Actual time to complete: months, still ongoing

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Issues we've run into:

- Missing C++ dependency that caused python install to fail
- Setup scripts failing because of our network setup
- Previously functional scripts breaking in the new version
- Hundreds of objects to point to the new version

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How we’ve gotten through it

- Lots and lots of support tickets with our orchestration software vendor
- Breaking up into smaller milestones so we can measure how far we’ve come, even when it feels like we’re standing still

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The Ugly

Use Case: Python Library Upgrade

- Motivation: build out folder structures and naming conventions to support automation
- Tools: Python and REST APIs
- Goal: standardize VM naming schemes for a seamless transition to automated builds

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Background

- Sandboxes use linked clones to create instances, so we have a LOT of VMs
- Planning could only take us so far; we needed to actual implement name standards to see what worked and what didn't
- We had hypothetically had a structure and naming convention in place, but we knew not everything followed it

STEP 1: Inventory existing VMs

- I ran a python script to find all VMs that adhered to either our naming convention or our folder structure
- Total VM count was ALMOST 1000
- Some particularly fun ones:
  - 300 VMs designated as DevBox
  - VMs for IOS v1.2 (current sandbox is v1.15)
  - ~20 VMs of different version for the NSO sandbox (the topology has 3 VMs)

STEP 2: Map VMs to topologies

- More python scripts and REST APIs to map VM names in vCenter to VMs in use by topologies
- Total VMs in active topologies: about 300
- Total VMs to be deleted: 700

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STEP 3: Clean up VMs

- VMs that were not actively being used were marked TO_DELETE
  - We let these sit for a couple weeks to make sure no one complained about missing VMs first ☺
- Used APIs to generate a final list of VMs to delete as a JSON file
- Ansible VMWare connector to read the list and delete the VMs – it took multiple hours to get through all of them

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STEP 3: Clean up VMs continued

- Ansible VMWare module to read the list and delete the VMs
  - This was done in multiple batches which each took multiple hours to complete

Results

- vCenter has less junk!
- Helped shape our naming convention, especially around versioning and releases
- Highlighted the need for automation to clean up as well as create VMs

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What’s Next

Our automation journey isn’t over yet!

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Next steps

- Get everything updated to latest versions
- Clean up unused/deprecated sandboxes
- Start migrating more sandboxes to use terraform-based gold images
- Consolidate common VMs by relying on Ansible for configuration at runtime

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Thank you

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