# Terraform & Infrastructure as Code

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(kind of a big deal)

((seriously - I've helped hijack a spacecraft))

# What IaC isn't - The Anti-pattern


**Configuration Management:**

Chef already does this "very well", and although there are commonalities (and extensions) it's first vs second order.

**Remote Execution:**

It can do this, but not as well as Ansible or Expect

# What IaC Isn’t

Traditionally a server has been a significant item

(hands up those people whose laptop doesn't have a ‘special’ name)

HP DL-380 - £10,000 (+ software)

HP C9000 - £30,000 (+ software)

If they get sick, you fix them... And isn't open source great!

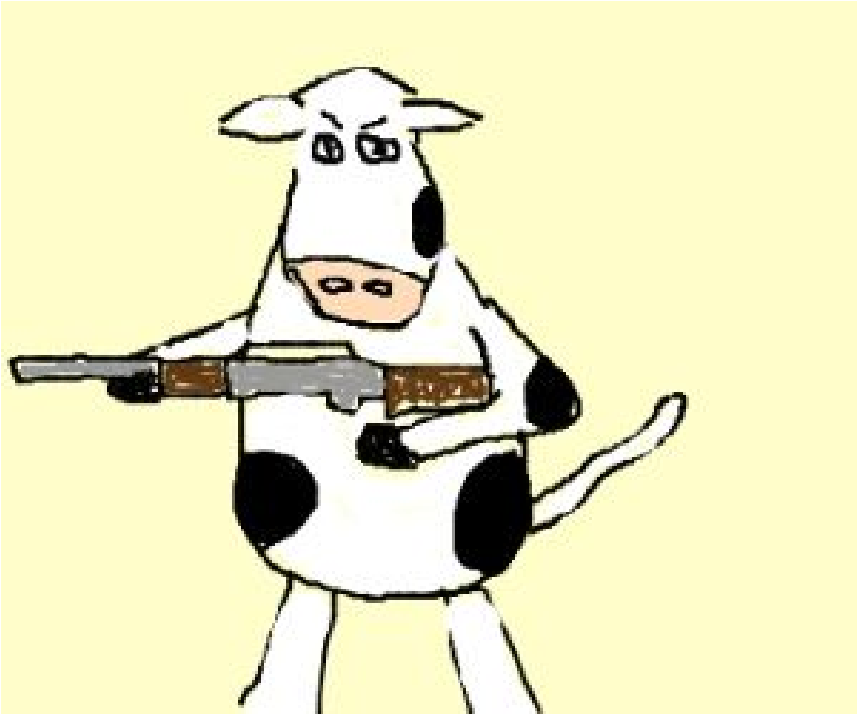
# What IaC Is

The server is cattle now, not a pet

It has no more existence, or right thereof more than any other software process

It gets sick...

# Do I need to paint you a picture...



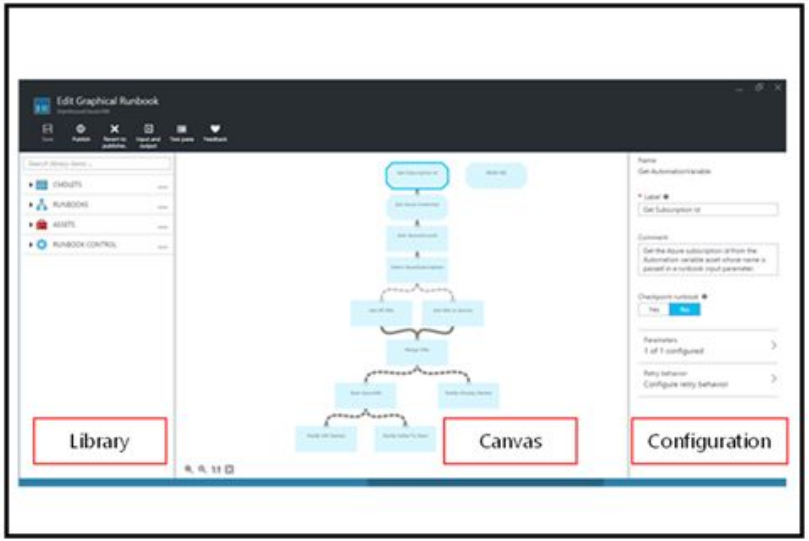
# Seriously...

```
le3
ome/tmd # ps -ef | grep -i
d        17319 17308 81 17:39
ot       18458 18456  0 18:00
ome/tmd # kill -
```

# Public Cloud Providers

# Azure

**Automation Runbooks** -




Powershell based with a GUI

Very useful for a pure Microsoft environment, integrates into OMS, but limited in support of non-Microsoft products

Really configuration management-lite

# Google

**Cloud Deployment Manager** - Similar to CloudFormation, but using a simpler YAML markup structure to work with GCE and GCP (and of course the API's)

```
resources:
- type: compute.v1.instance
  name: vm-my-first-deployment
  properties:
    zone: us-central1-f
    machineType: https://www.googleapis.com/compute/v1/projects/bentest/zones/us-central1-f/machineTypes/f1-micro
    disks:
    - deviceName: boot
      type: PERSISTENT
      boot: true
      autoDelete: true
      initializeParams:
        sourceImage: https://www.googleapis.com/compute/v1/projects/debian-cloud/global/images/debian-8-jessie-v20160301
    networkInterfaces:
    - network: https://www.googleapis.com/compute/v1/projects/bentest/global/networks/default
      accessConfigs:
      - name: External NAT
        type: ONE_TO_ONE_NAT
```

# Cloud Providers - AWS

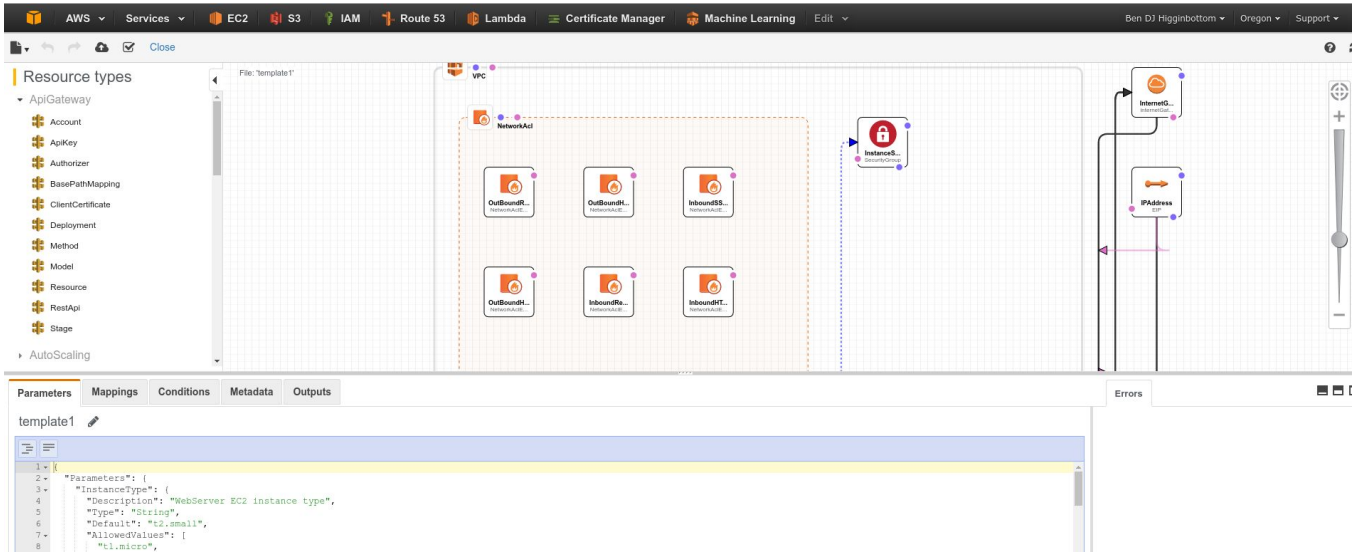
**Elastic Beanstalk** - often called Amazon's PaaS system, it's really automated provisioning with a templating mechanism.

**OpsWorks** - Run Chef cookbooks targeting EC2, RDS and most other components, however it's config management that can also do some IaC

**API's** - Coupled with the SDK's this provides a massively powerful and flexible solution, but requires a considerable amount of effort

# Cloudformation + CloudDesigner

Template driven IaC solutions, very flexible, very powerful, coupled with a graphical interface not dissimilar to Visio, but very domain specific - for a Single EC2 instance its this -



# Cloudformation

This is approximately ¼ of the JSON definition needed to build a single EC2 instance in a single VPC

Partially this is down to it acting like a silicon compiler from the 00’s

Massively powerful, but a task in of itself to work with and maintain

# Terraform - Hashicorp

The one consistent problem is that all these solutions have been domain specific. Terraform however takes an alternate tack, by using pluggable modules called providers, it allows you to implement IaC on multiple public clouds, private clouds and indeed many traditional virtualisation systems

| | | | |
|---|---|---|---|
| Archive | DNSMadeEasy | Logentries | StatusCake |
| Atlas | DNSimple | Mailgun | SoftLayer |
| AWS | Docker | Microsoft Azure | Scaleway |
| Chef | Dyn | MySQL | Template |
| CenturyLinkClou | GitHub | OpenStack | Terraform |
| CloudFlare | Fastly | Packet | TLS |
| CloudStack | Google Cloud | PostgreSQL | Triton |
| Cobbler | Grafana | PowerDNS | UltraDNS |
| Consul | Heroku | RabbitMQ | vCloud Director |
| Datadog | InfluxDB | Random | vSphere |
| DigitalOcean | Librato | Rundeck | |

# Terraform - The Demo

Let's build a simple development server

```
provider "aws" {
  region                  = "${var.aws_region}"
  shared_credentials_file = "/home/ben/.aws/pers"
}

data "aws_ami" "list" {
    most_recent = true
    filter {
        name = "tag:Author"
        values = ["Ben"]
    }
}

resource "aws_instance" "test2" {
    count = 1
    ami = "${data.aws_ami.list.id}"
    vpc_security_group_ids = ["sg-80a0f4e7"]
    subnet_id = "subnet-d18f60b5"
    key_name = "bentest"
    instance_type = "t2.micro"
    availability_zone = "${var.aws_region}a"
    tags = {
        Name = "Terraformed-${count.index}"
    }
}
```

# Terraform - The Demo

The first stanza is the provider which tells terraform what API's to talk to with what permissions

```
provider "aws" {
  region                  = "${var.aws_region}"
  shared_credentials_file = "/home/ben/.aws/pers"
}
```

You can have multiple providers in a configuration, so AWS+Azure, AWS+Chef and so on...

# Terraform - The Demo

This is a datasource that lets me query the provider to find a particular value.

In this case I'm searching for an AMI with a Tag 'Author' and a value 'Ben'

Names, ID's and similar can also be used with wildcards

```
data "aws_ami" "list" {
  most_recent = true
    filter {
      name = "tag:Author"
      values = ["Ben"]
    }
}
```

# Terraform - The Demo

And finally the resource, or what we want to create, here it's a t2.micro instance using the AMI I searched for with the datasource called test2

I also really like tagging things!

```
resource "aws_instance" "test2" {
    count = 1
    ami = "${data.aws_ami.list.id}"
    vpc_security_group_ids = ["sg-80a0f4e7"]
    subnet_id = "subnet-d18f60b5"
    key_name = "bentest"
    instance_type = "t2.micro"
    availability_zone = "${var.aws_region}a"
    tags = {
    Name = "Terraformed-${count.index}"
  }
}
```

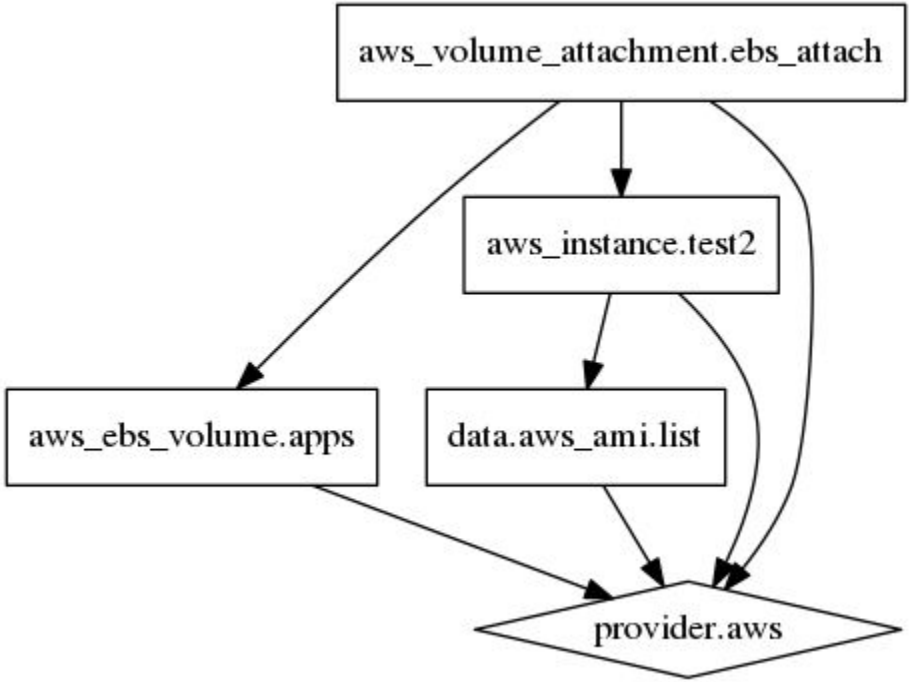
# Terraform - The Demo

http://asciinema.org/a/3ax8ecdrgp18qhmnrk6k2b24z

# Terraform - Change and Destroy

http://asciinema.org/a/eo50zdfdhb15cqw6d55g3zhy9

# Terraform - Graph

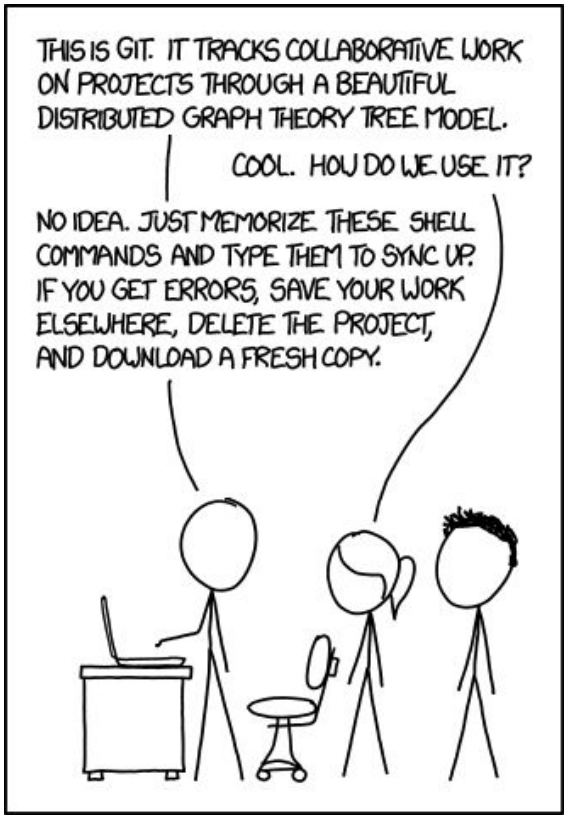


# Terraform - So it's like Git

Yes, and No, but let's gloss over that...

The key part is that internally (development is done in golang, so the concurrency model is awesome by default) Terraform generates a graph of your resources.

It by defaults generates 10 resources in a parallel fashion, but the graph itself determines the dependencies and builds everything appropriately



# Terraform - The Downside

Terraform maintains a state file (terraform.tfstate) that describes what the environment is, therefore although the recipe can be easily shared, anyone managing the environment needs to share this file as well

Although it can be shared by git (and a backend system is in 0.9 beyond Atlas), there is the option of the ‘terraform refresh’ to regenerate the state files (or re-align them if any changes are made outside terraform)

There are however several solutions to this issue (DynamoDB...)

# Terraform - The Future State

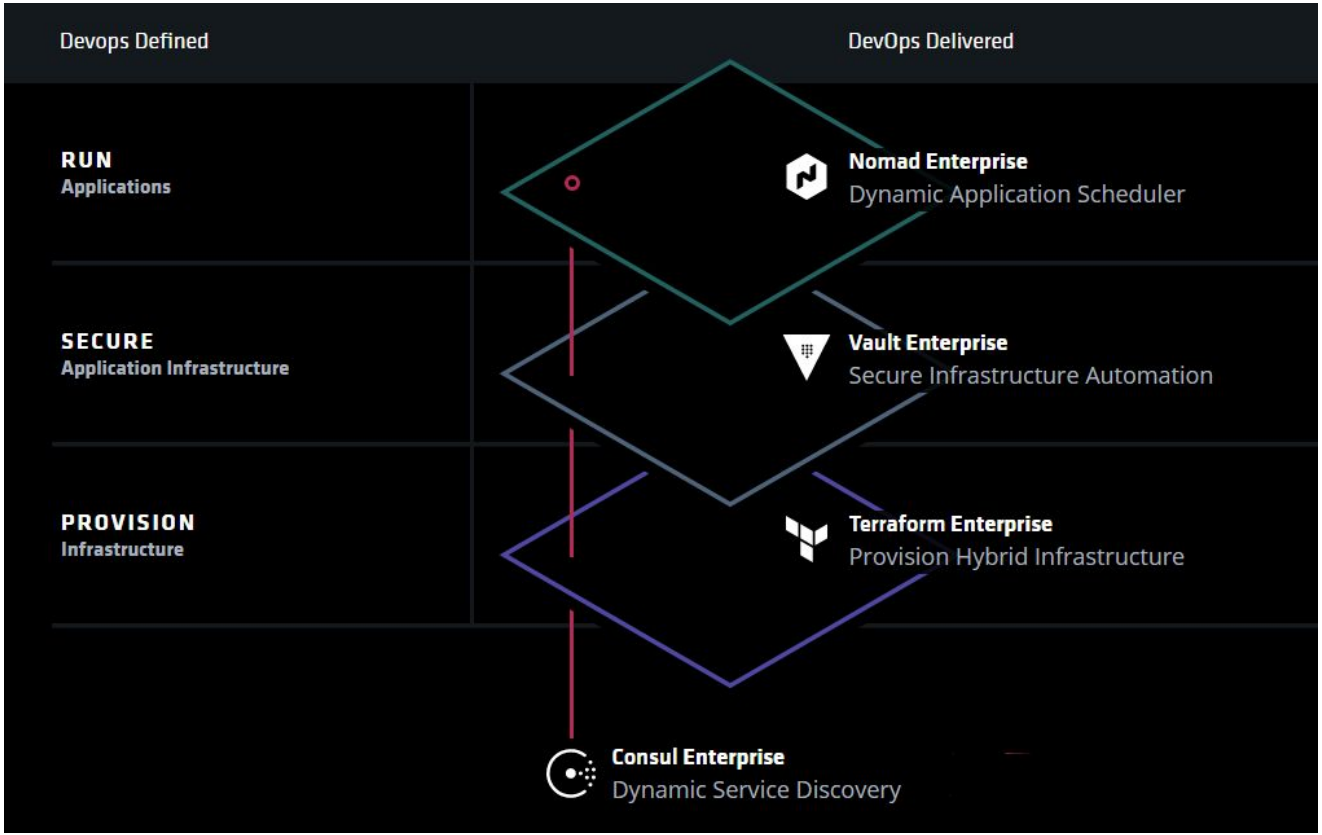
0.9 is now in beta - with backend support, more datasources and resources

Hashicorp are now concentrating on ‘Enterprise’ implementations

Expect more around compliance to specific standards along with collaborative development on infrastructure

Much better multi-environment support with pipeline integration (change requests anyone?)

# Hashicorp - Devops Do as opposed to Are



# Hashicorp - Just Generally Awesome


This isn't meant to be a Hashicorp fanboy rant - but as a rule I've not found a single company that hasn't looked at their product set and gone

"Oh that's perfect!!!"