Manufacturing your infrastructure with Terraform

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18F

HashiCorp Terraform

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The manual way

2

The automated way

3

Demo

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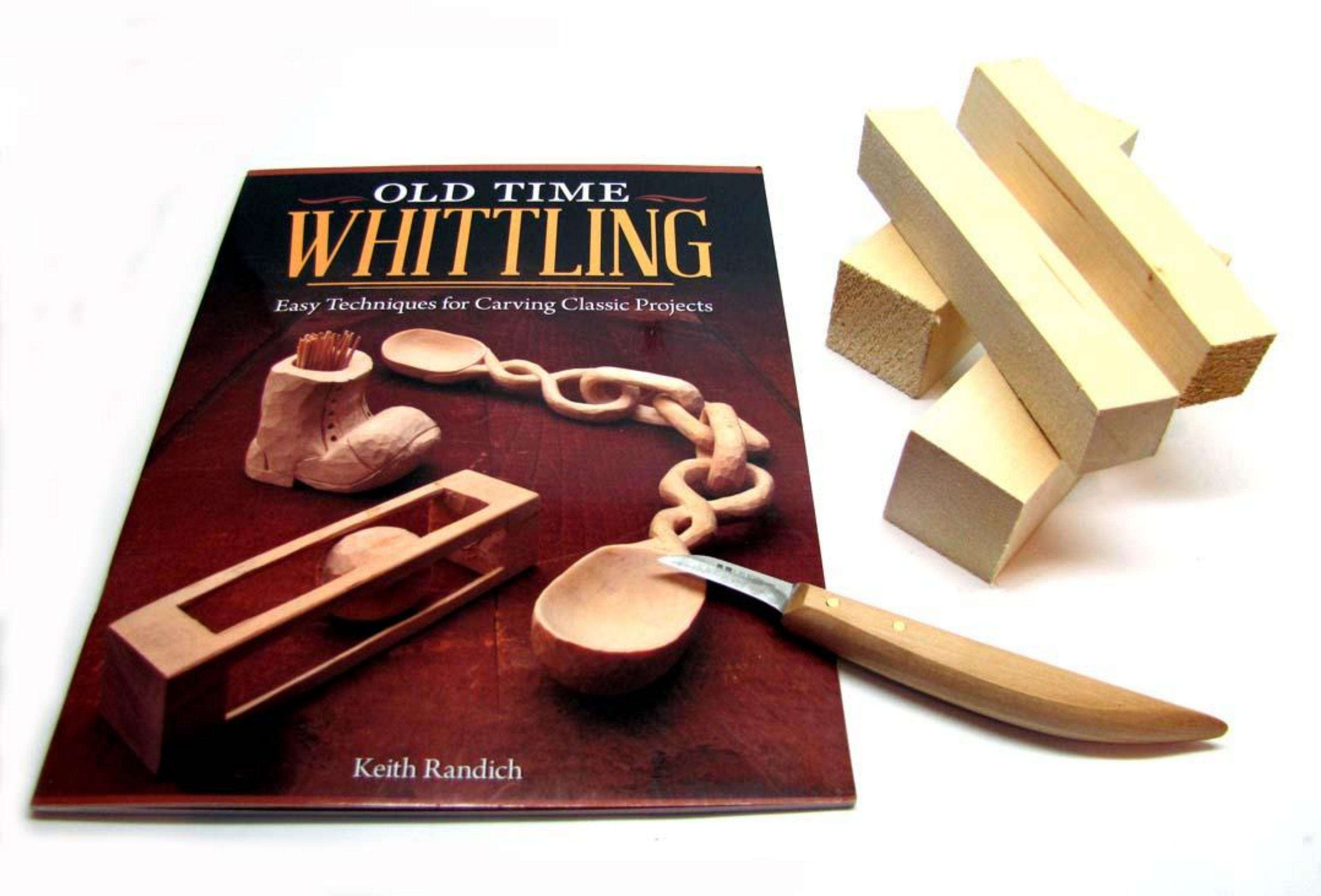
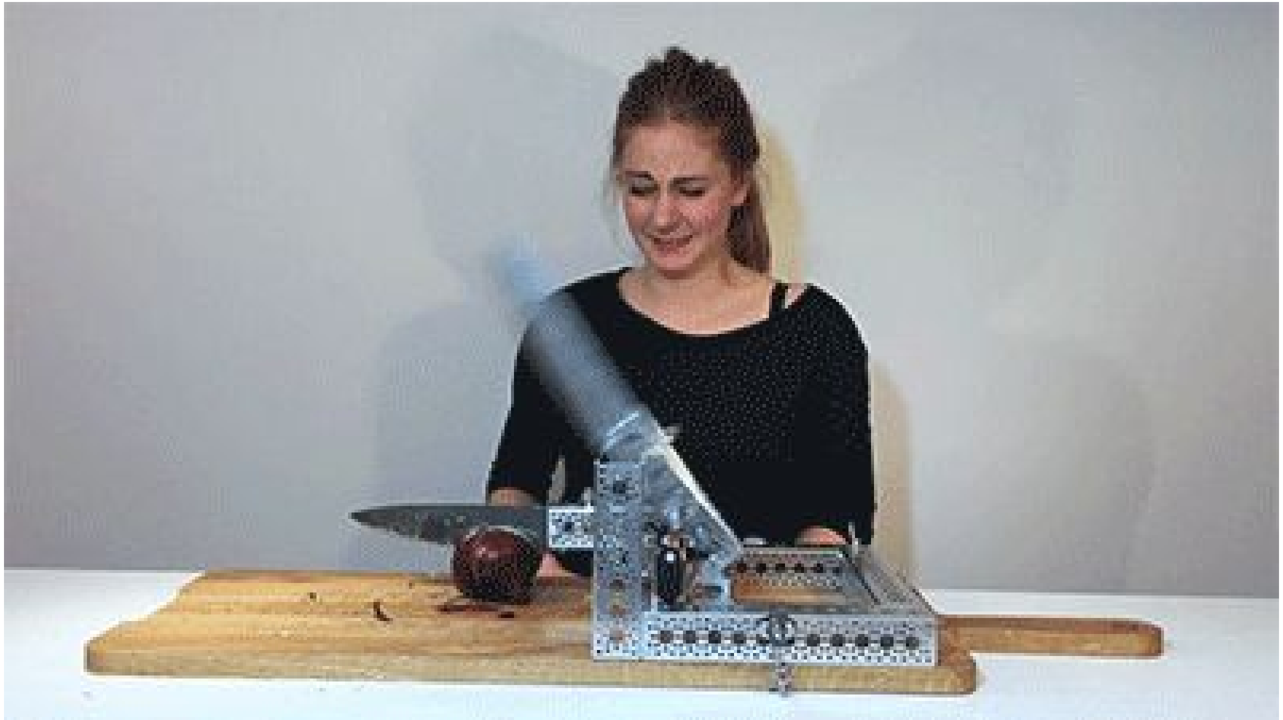
Q&A

Tell me if this sounds familiar...


OLD TIME
WHITTLING
Easy Techniques for Carving Classic Projects
Keith Randich



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Infrastructure as code

Your infrastructure becomes:

- Repeatable
- Auditable
- Reusable
- Declarative

Repeatable

If it’s all in code, it should work the same every time

Auditable

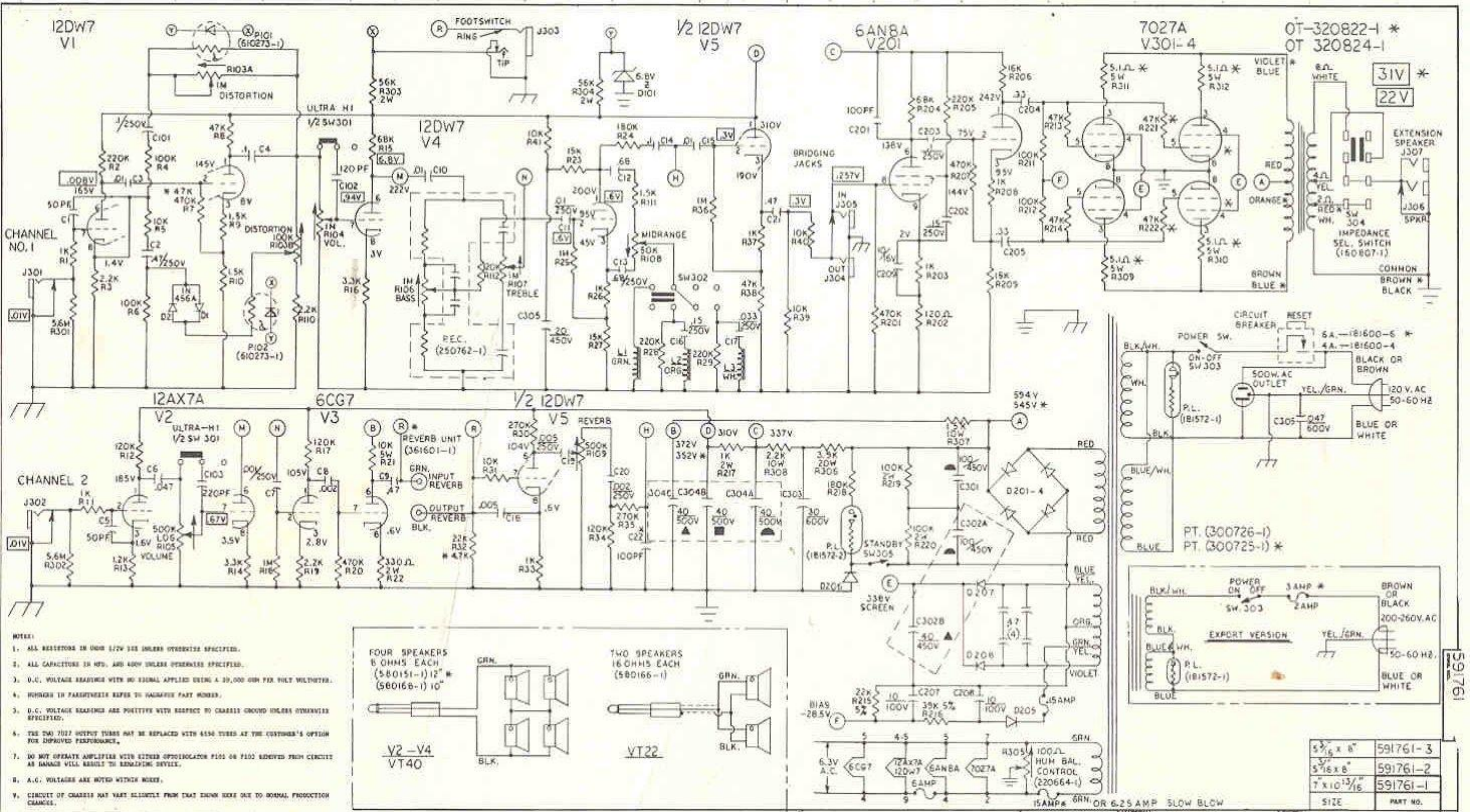
All the configuration is in files, tracked through version control

Reusable

Configuration is easy to copy and tweak, or make modular

Declarative

Specify the desired state, and it figures out how to get there



NOTES:

1. ALL RESISTORS IN OHMS 1/2W 10% UNLESS OTHERWISE SPECIFIED.

2. ALL CAPACITORS IN MFD. AND 400V UNLESS OTHERWISE SPECIFIED.

3. D.C. VOLTAGE READINGS WITH NO SIGNAL APPLIED USING A 20,000 OHM PER VOLT VOLTMETER.

4. NUMBERS IN PARENTHESIS REFER TO MAGNAVOX PART NUMBER.

5. D.C. VOLTAGE READINGS ARE POSITIVE WITH RESPECT TO CHASSIS GROUND UNLESS OTHERWISE SPECIFIED.

6. THE TWO 7027 OUTPUT TUBES MAY BE REPLACED WITH 6550 TUBES AT THE CUSTOMER'S OPTION FOR IMPROVED PERFORMANCE.

7. DO NOT OPERATE AMPLIFIER WITH EITHER OPTOISOLATOR P101 OR P102 REMOVED FROM CIRCUIT AS DAMAGE WILL RESULT TO REMAINING DEVICE.

8. A.C. VOLTAGES ARE NOTED WITHIN BOXES.

9. CIRCUIT OF CHASSIS MAY VARY SLIGHTLY FROM THAT SHOWN HERE DUE TO NORMAL PRODUCTION CHANGES.

* PARTS INDICATED WITH ASTERISK ARE USED ON V4 AND VT22 MODELS ONLY.

5 5/16" x 8"	591761-3
5 5/16" x 8"	591761-2
7" x 10 13/16"	591761-1
SIZE	PART NO.

PARTS LIST:

ADDITIONAL

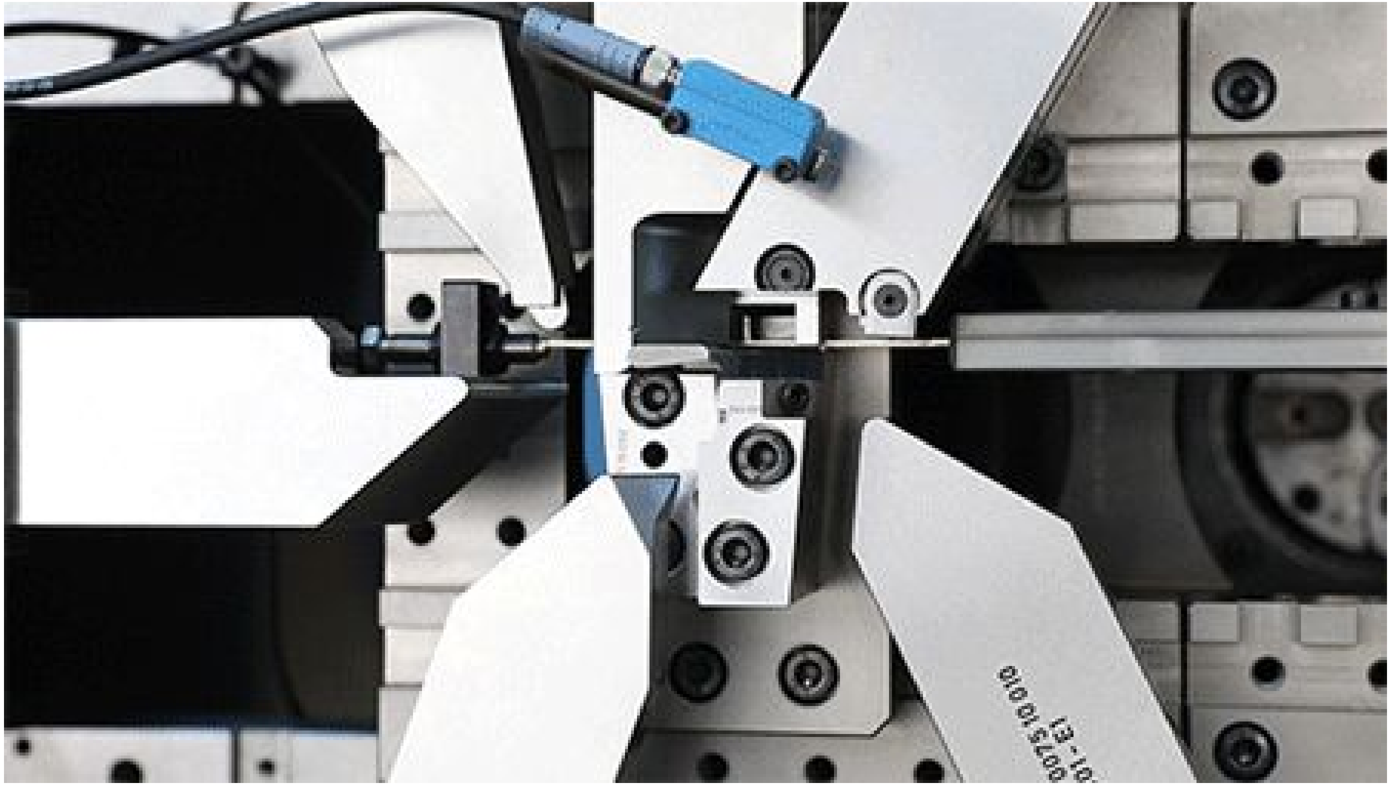
MATERIAL

FINISH

591761

- A couple of subnets
- A static IP address
- A load balancer
- These ports open
- A database server
- An autoscaling group

GO


0073 10 010

Demo

github.com/startup-systems/terraform-ansible-example

```
$ time ./deploy.sh
+ ssh-add -A
Identity added: /Users/aidanfeldman/.ssh/id_rsa (/Users/aidanfeldman/.ssh/id_rsa)
+ cd terraform
+ terraform init

Initializing provider plugins...

Terraform has been successfully initialized!

You may now begin working with Terraform. Try running "terraform plan" to see
any changes that are required for your infrastructure. All Terraform commands
should now work.

If you ever set or change modules or backend configuration for Terraform,
rerun this command to reinitialize your working directory. If you forget, other
commands will detect it and remind you to do so if necessary.
+ terraform apply -auto-approve
data.aws_ami.ubuntu: Refreshing state...
aws_key_pair.auth: Creating...
  fingerprint: "" => "<computed>"
  key_name:    "" => "terraform-ansible-example-key"
  public_key:  "" => "ssh-rsa
AAAAB3NzaC1yc2EAAAADAQABAAABAQC7PlFK+KRGCdz9cJARrwXX9zR4+xF+2vh1W69B0c5ybHKejXIv9myEh0U4TFUDaQiOjwp0NQwTdvdFa7zZHrr8qgY03yVZGAKm7TnCx6Ut9oAUd0l25JH/00m6eE6qJC+62mWGThrp5L
qe5wDeWABQQC+CPwIsepcZZru+ZmzTBBCCgOpkzbS2BNKK8RyauwE2OFxC3lsFnMc5lD+S+E8OnGSGjn/y/XJwSfsIhRwMi/Bef38E7H3OwqaB3Vzga6OysHT5Xea2bOdLHeK6fO9SZZeQoOGpuUjSAR6myzqIjY1LqE5Bby+8zi
kLdZudR+VUSiao+n7VaD7B6ZSrn9Dz aidanfeldman@rufus.local"
aws_vpc.default: Creating...
  assign_generated_ipv6_cidr_block: "" => "false"
  cidr_block:                       "" => "10.0.0.0/16"
  default_network_acl_id:           "" => "<computed>"
  default_route_table_id:           "" => "<computed>"
  default_security_group_id:        "" => "<computed>"
  dhcp_options_id:                  "" => "<computed>"
  enable_classiclink:               "" => "<computed>"
  enable_classiclink_dns_support:   "" => "<computed>"
  enable_dns_hostnames:             "" => "<computed>"
  enable_dns_support:               "" => "true"
  instance_tenancy:                 "" => "<computed>"
  ipv6_association_id:              "" => "<computed>"
  ipv6_cidr_block:                  "" => "<computed>"
  main_route_table_id:              "" => "<computed>"
  tags.%:                           "" => "2"
  tags.Repo:                        "" => "https://github.com/startup-systems/terraform-ansible-example"
  tags.Terraform:                   "" => "1"
aws_key_pair.auth: Creation complete after 0s (ID: terraform-ansible-example-key)
aws_vpc.default: Creation complete after 7s (ID: vpc-35fe505d)
aws_internet_gateway.default: Creating...
  tags.%:         "0" => "2"
  tags.Repo:      "" => "https://github.com/startup-systems/terraform-ansible-example"
  tags.Terraform: "" => "1"
  vpc_id:         "" => "vpc-35fe505d"
aws_subnet.default: Creating...
  assign_ipv6_address_on_creation: "" => "false"
```

```
$ cd terraform
$ terraform plan
Refreshing Terraform state in-memory prior to plan...
The refreshed state will be used to calculate this plan, but will not be
persisted to local or remote state storage.

aws_vpc.default: Refreshing state... (ID: vpc-35fe505d)
aws_key_pair.auth: Refreshing state... (ID: terraform-ansible-example-key)
data.aws_ami.ubuntu: Refreshing state...
aws_internet_gateway.default: Refreshing state... (ID: igw-aab2b4c3)
aws_security_group.default: Refreshing state... (ID: sg-a1a403ca)
aws_subnet.default: Refreshing state... (ID: subnet-ba6c81c0)
aws_route.internet_access: Refreshing state... (ID: r-rtb-1cad36741080289494)
aws_instance.web: Refreshing state... (ID: i-0eaca9678731492ad)

------------------------------------------------------------------------

An execution plan has been generated and is shown below.
Resource actions are indicated with the following symbols:
-/+ destroy and then create replacement

Terraform will perform the following actions:

-/+ aws_instance.web (new resource required)
      id:                           "i-0eaca9678731492ad" => <computed> (forces new resource)
      ami:                          "ami-4f80b52a" => "ami-4f80b52a"
      associate_public_ip_address:  "true" => <computed>
      availability_zone:            "us-east-2b" => <computed>
      ebs_block_device.#:           "0" => <computed>
      ephemeral_block_device.#:     "0" => <computed>
      instance_state:               "running" => <computed>
      instance_type:                "t2.micro" => "t2.micro"
      ipv6_address_count:           "" => <computed>
      ipv6_addresses.#:             "0" => <computed>
      key_name:                     "terraform-ansible-example-key" => "terraform-ansible-example-key"
      network_interface.#:          "0" => <computed>
      network_interface_id:         "eni-eebb70ba" => <computed>
      placement_group:              "" => <computed>
      primary_network_interface_id: "eni-eebb70ba" => <computed>
      private_dns:                  "ip-10-0-0-178.us-east-2.compute.internal" => <computed>
      private_ip:                   "10.0.0.178" => <computed>
      public_dns:                   "" => <computed>
      public_ip:                    "18.218.7.88" => <computed>
      root_block_device.#:          "1" => <computed>
      security_groups.#:            "0" => <computed>
      source_dest_check:            "true" => "true"
      subnet_id:                    "subnet-ba6c81c0" => "${aws_subnet.default.id}" (forces new resource)
      tags.%:                       "2" => "2"
      tags.Repo:                    "https://github.com/startup-systems/terraform-ansible-example" => "https://github.com/startup-systems/terraform-ansible-example"
      tags.Terraform:               "1" => "1"
      tenancy:                      "default" => <computed>
      volume_tags.%:                "0" => <computed>
      vpc_security_group_ids.#:     "1" => "1"
```

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Q&A

Thanks!

Terraform.io

Terraform: Up & Running

aidan.feldman@gsa.gov

Questions?

Terraform.io

Terraform: Up & Running

aidan.feldman@gsa.gov

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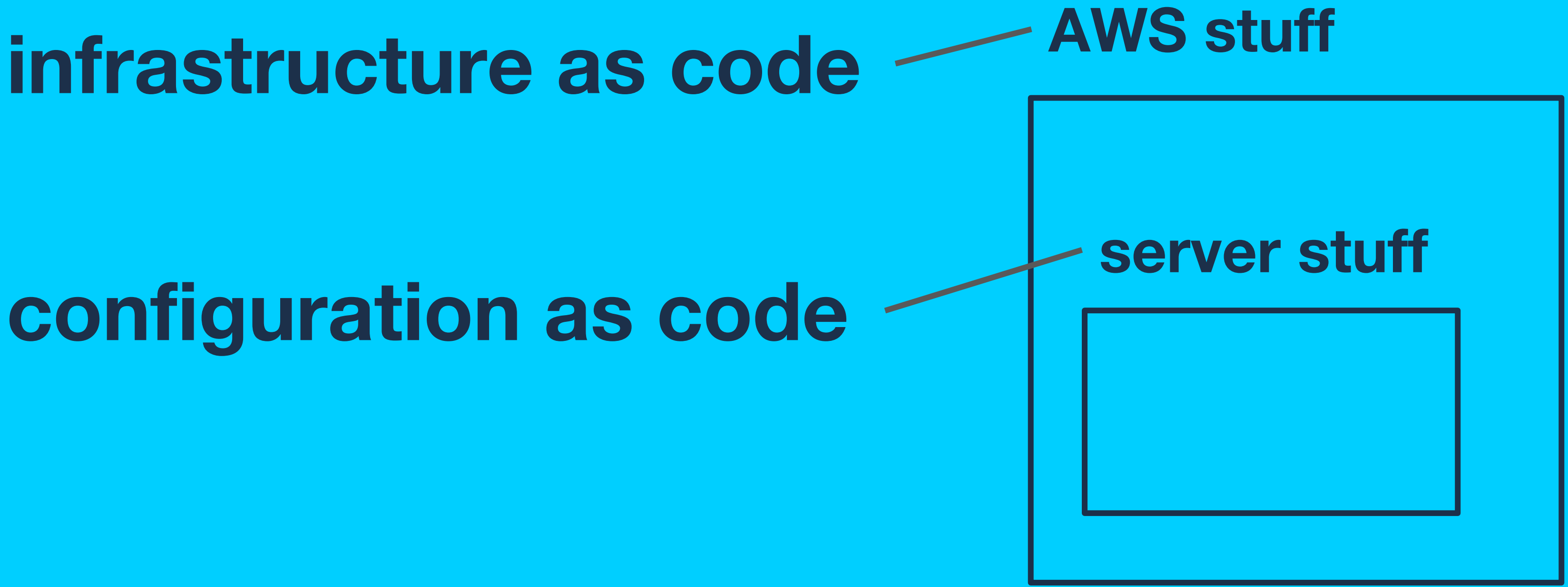
Backup slides

infrastructure as code

♥’s

version control



infrastructure as code

AWS stuff

configuration as code

server stuff

configuration as code

- Ansible
- Chef
- Puppet
- Salt
- ...

infrastructure as code

- AWS CloudFormation
- Azure Resource Manager
- Terraform
- ...
- Ansible
- Chef
- Puppet
- Salt

Why is Terraform cool?*

- Open source
- Modular
- Cloud-agnostic
- Curable
- Extensible (providers)

*compared to CloudFormation