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Advanced Terraform Techniques

Moving Beyond the Scaffolding

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DEVNET-2565

Cisco Webex App

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How

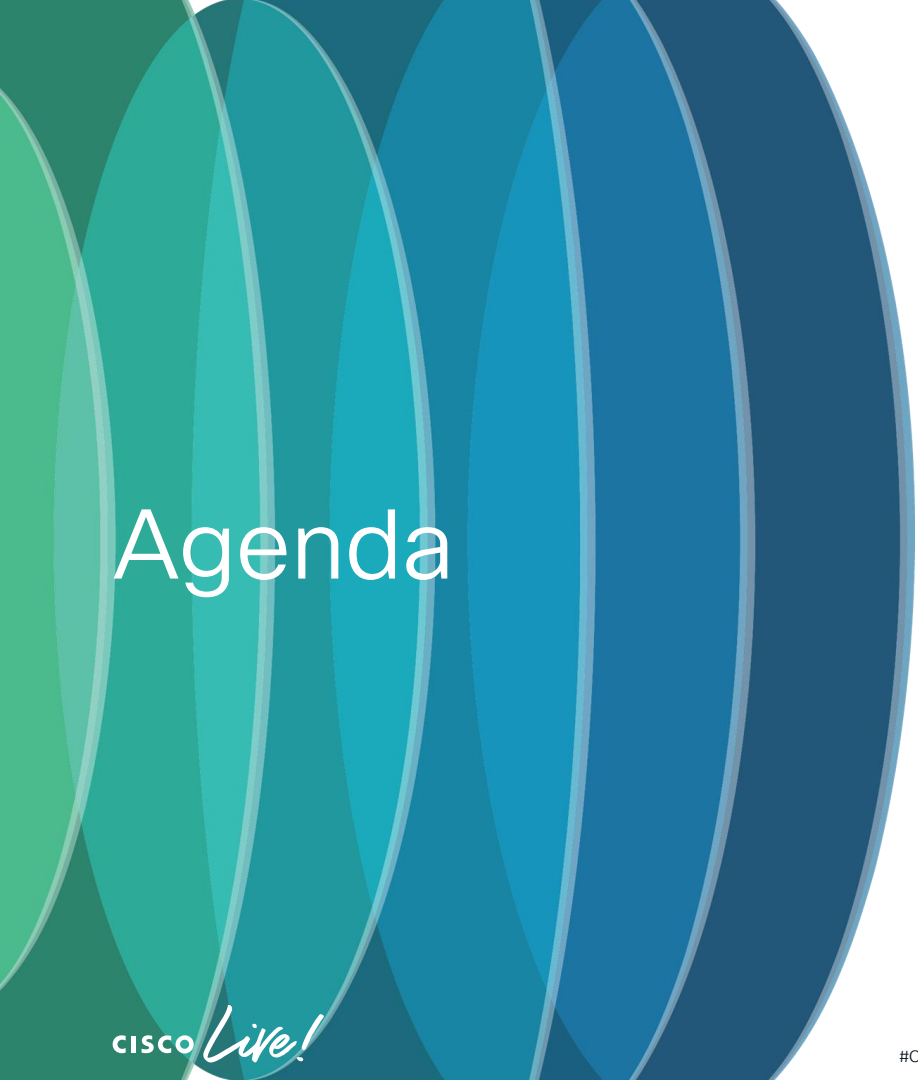
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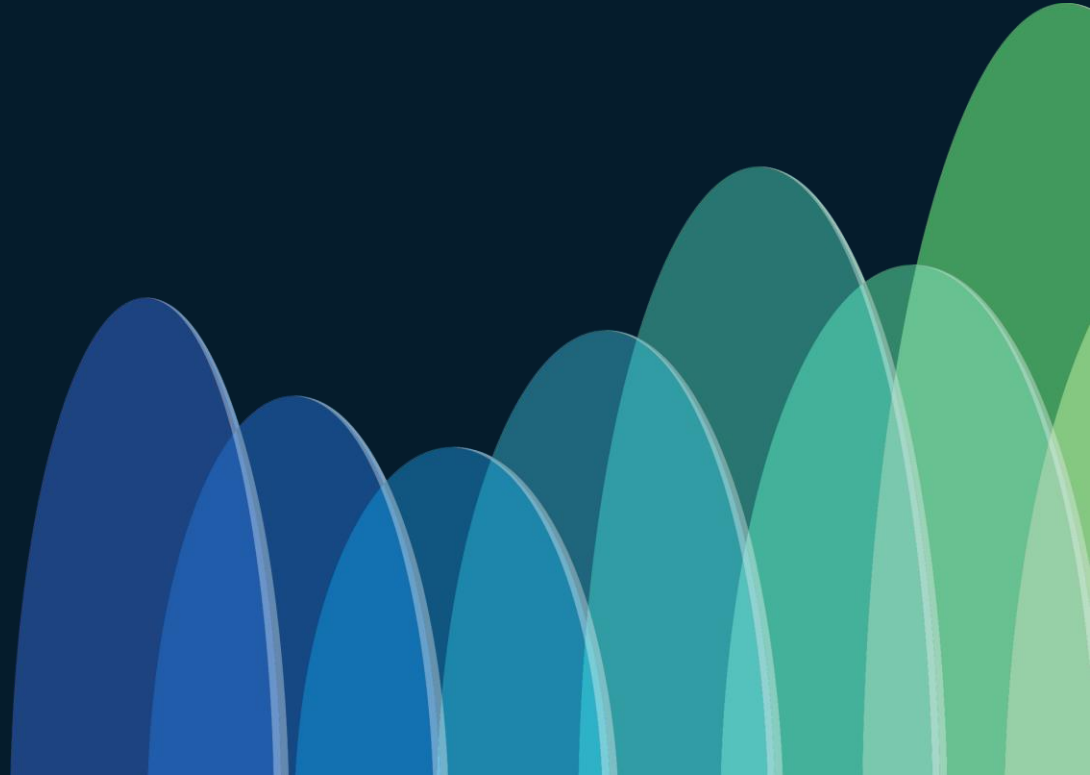




Agenda

- Introduction
- tfenv
- terraform fmt
- terraform graph
- terraform console
- Terraform modules
- Conclusion

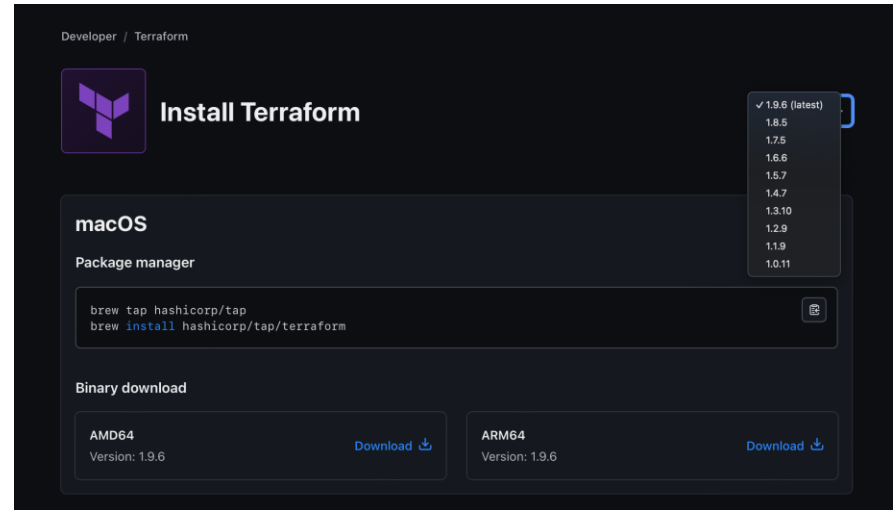
Managing Terraform Versions



Terraform installation is a snap...

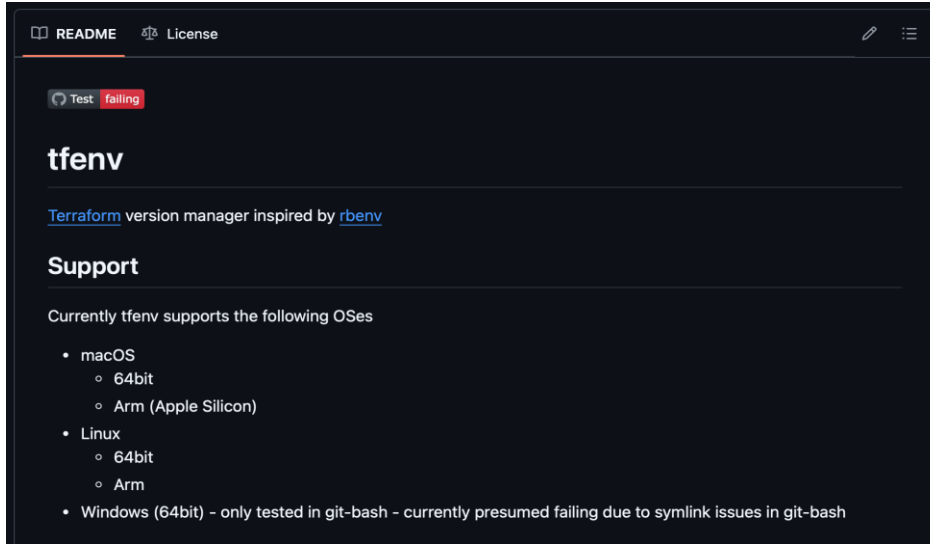
...but how do you handle versioning?

- Terraform uses single, compiled binary (written in Go)
- Support for package managers or direct install to \$PATH
- Each binary is still called terraform
 - You're on your own for semver



Enter tfenv

Similar concept to pyenv or rbenv



- CLI tool that manages installed version of terraform in executable path
- Cross-platform support
- This supports **all** versions of TF
- Can automatically install TF version based on project folder definitions

tfenv Demo



Making your .tf files readable

Does format and layout matter?

No, but also kinda sorta...

- Terraform is based on Go -> well defined structures and types, along with syntax
- Its not Python (and its supporting cast); whitespace isn't a dealbreaker
- Code can be formatted in such a way to enable easier readability
- Enter `terraform fmt` -> does the heavy-lifting so you don't have to
- Only impacts *.tf files!

Transform your definitions

```
variable "fabric_inventory" {  
  description = "Complete inventory for DevNet_Fabric"  
  type        = map  
  default = {  
    spine1 = {  
      name = "spine1"  
      ip   = "10.10.20.171"  
      role = "spine"  
    },  
    spine2 = {  
      name = "spine2"  
      ip   = "10.10.20.172"  
      role = "spine"  
    },  
    leaf1 = {  
      name = "leaf1"  
      ip   = "10.10.20.173"  
      role = "leaf"  
    },  
    leaf2 = {  
      name = "leaf2"  
      ip   = "10.10.20.174"  
      role = "leaf"  
    },  
    leaf3 = {  
      name = "leaf3"  
      ip   = "10.10.20.175"  
      role = "leaf"  
    },  
  },  
}
```

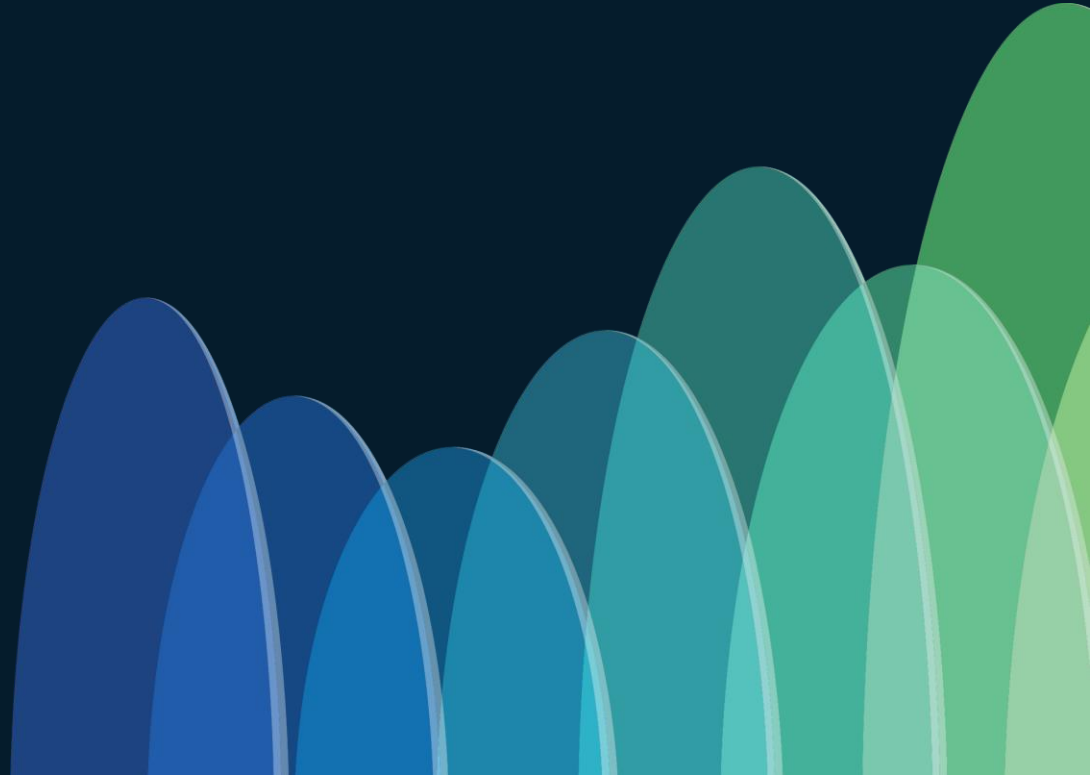
fmt

```
variable "fabric_inventory" {  
  description = "Complete inventory for DevNet_Fabric"  
  type        = map(any)  
  default = {  
    spine1 = {  
      name = "spine1"  
      ip   = "10.10.20.171"  
      role = "spine"  
    },  
    spine2 = {  
      name = "spine2"  
      ip   = "10.10.20.172"  
      role = "spine"  
    },  
    leaf1 = {  
      name = "leaf1"  
      ip   = "10.10.20.173"  
      role = "leaf"  
    },  
    leaf2 = {  
      name = "leaf2"  
      ip   = "10.10.20.174"  
      role = "leaf"  
    },  
    leaf3 = {  
      name = "leaf3"  
      ip   = "10.10.20.175"  
      role = "leaf"  
    },  
  },  
}
```

fmt Demo



Visualising Object Relationships



A picture is worth a thousand...

...lines of code?



- Terraform is “end-state” declarative; builds [resource graph](#)
- This resource graph is generated at all stages; includes state if present
 - Uses all files in project “folder”
- Graph can be visualised using native terraform commands
 - Native output in DOT format (Graphviz)
 - Can be converted to PNG using `dot` command

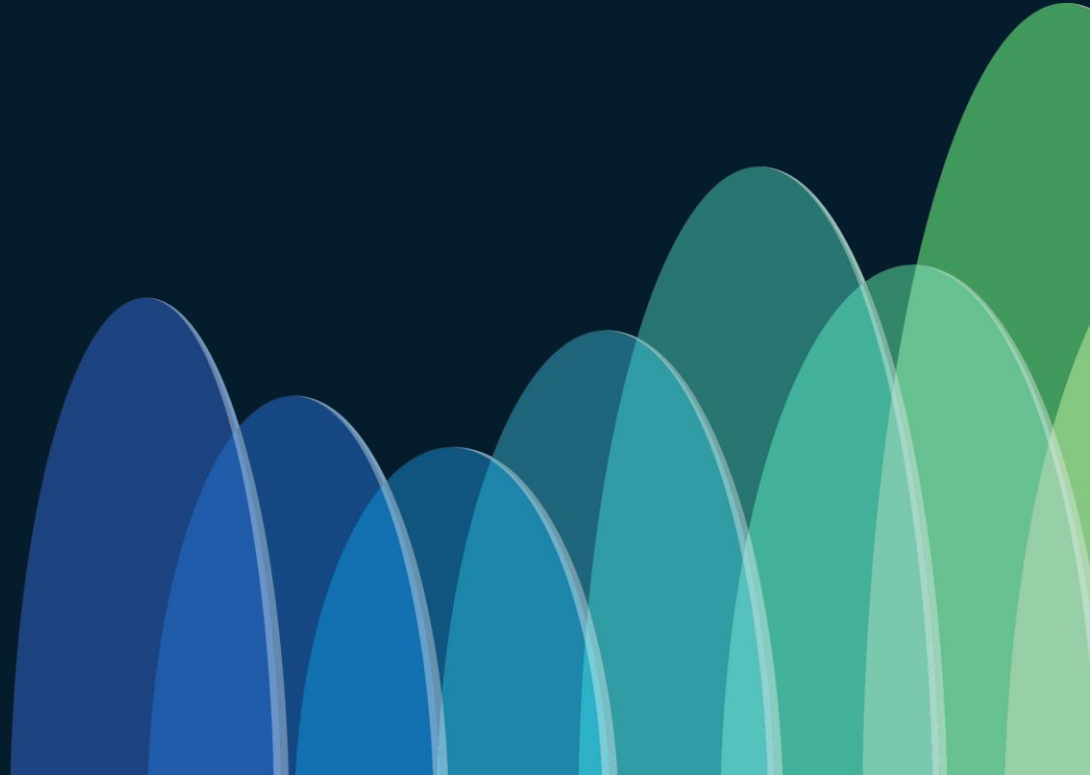
DOT Syntax

```
graph TD
    subgraph root
        direction TB
        acib["aci_bridge_domain.terraform_bd (expand)"]
        acisub["aci_subnet.terraform_bd_subnet (expand)"]
        acitenant["aci_tenant.terraform_tenant (expand)"]
        acivrf["aci_vrf.terraform_vrf (expand)"]
        provider["registry.terraform.io/cisco/devnet/aci"]
        varbd["var.bd"]
        varsubnet["var.subnet"]
        varentenant["var.tenant"]
        varuser["var.user"]
        varvrf["var.vrf"]
        acib --> acivrf
        acib --> varbd
        acisub --> acib
        acisub --> varsubnet
        acitenant --> varentenant
        acivrf --> acitenant
        acivrf --> varvrf
        provider --> acib
        provider --> acisub
        provider --> acitenant
        provider --> acivrf
        provider --> varbd
        provider --> varsubnet
        provider --> varentenant
        provider --> varuser
        provider --> varvrf
    end
```

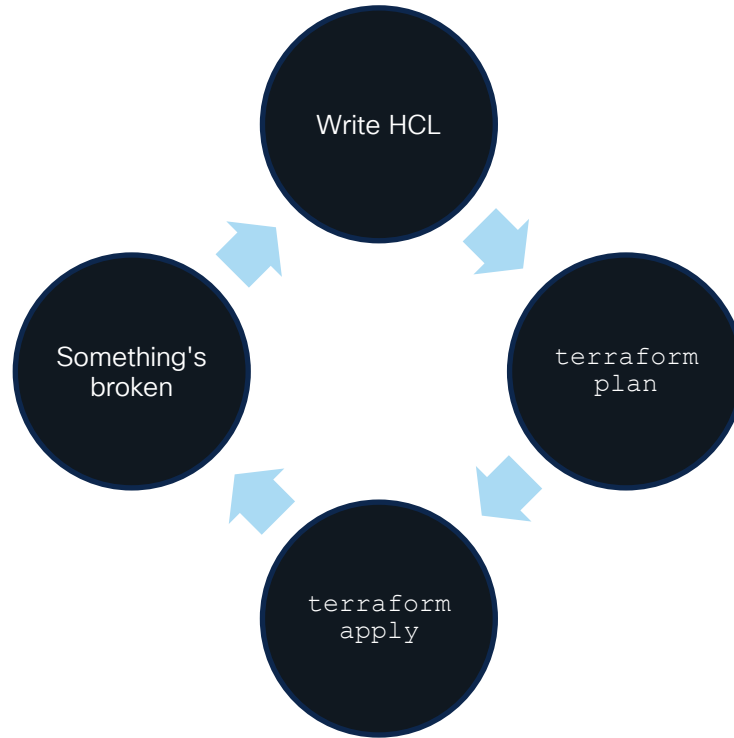
graph Demo



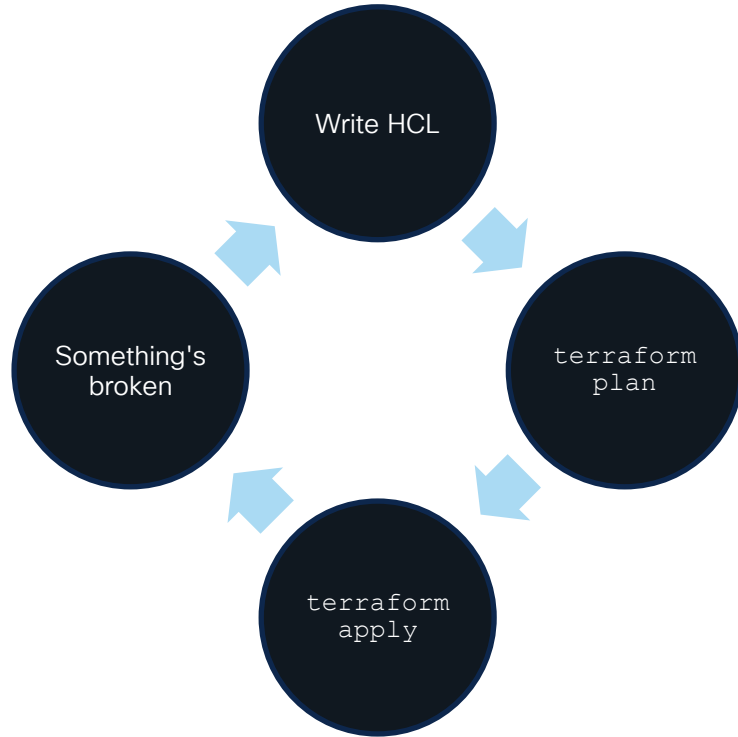
Interactive(ish) Terraform



How do we interact with Terraform plans?



How do we interact with Terraform plans?



- This works fine for simple HCL, since errors are probably typos or syntactical
- Single level of variable creation (maps, assignments) make for easy troubleshooting

How do we interact with Terraform to ensure some level of “function” prior to performing the TF cycle?

Terraform has a console!

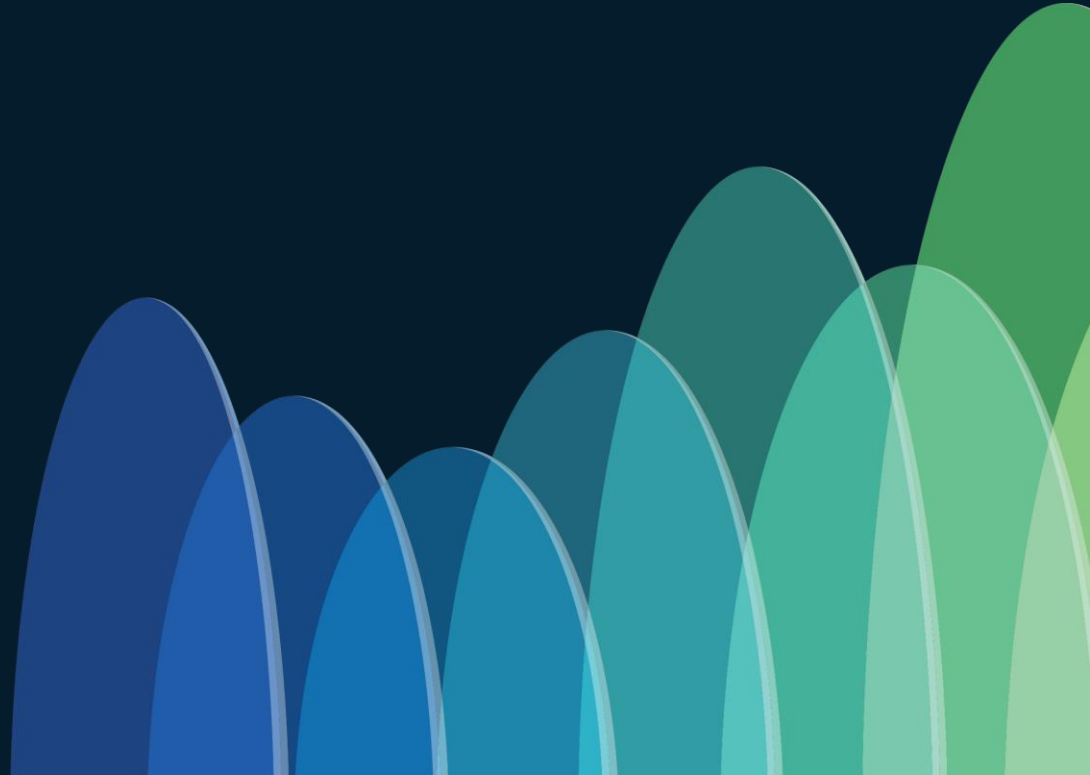
- `terraform console` allows for interactive interrogation of Terraform
 - Variables
 - Configurations
 - State (if present)
- Perform variable and data interpolations based on built-in functions within Terraform

However, there is no Terraform REPL!

console Demo



Simplifying the Automation



Ansible has roles, what about Terraform?

Terraform uses the concept of “modules” for simplification and abstraction of a configuration

Every “project directory” is a “module” in the eyes of Terraform



Ansible has roles, what about Terraform?



```
[I] 05-network [main]x » tree
├── main.tf
├── sub_module
│   ├── main.tf
│   ├── outputs.tf
│   └── variables.tf
├── terraform.tfstate
└── variables.tf

2 directories, 6 files
```

Recall within a root “module”, all .tf files are analysed and interpolated; even in subfolders

This builds the concept for a module:

- Defined structure of desired state
- Abstract underlying complexity
- Feed only required info

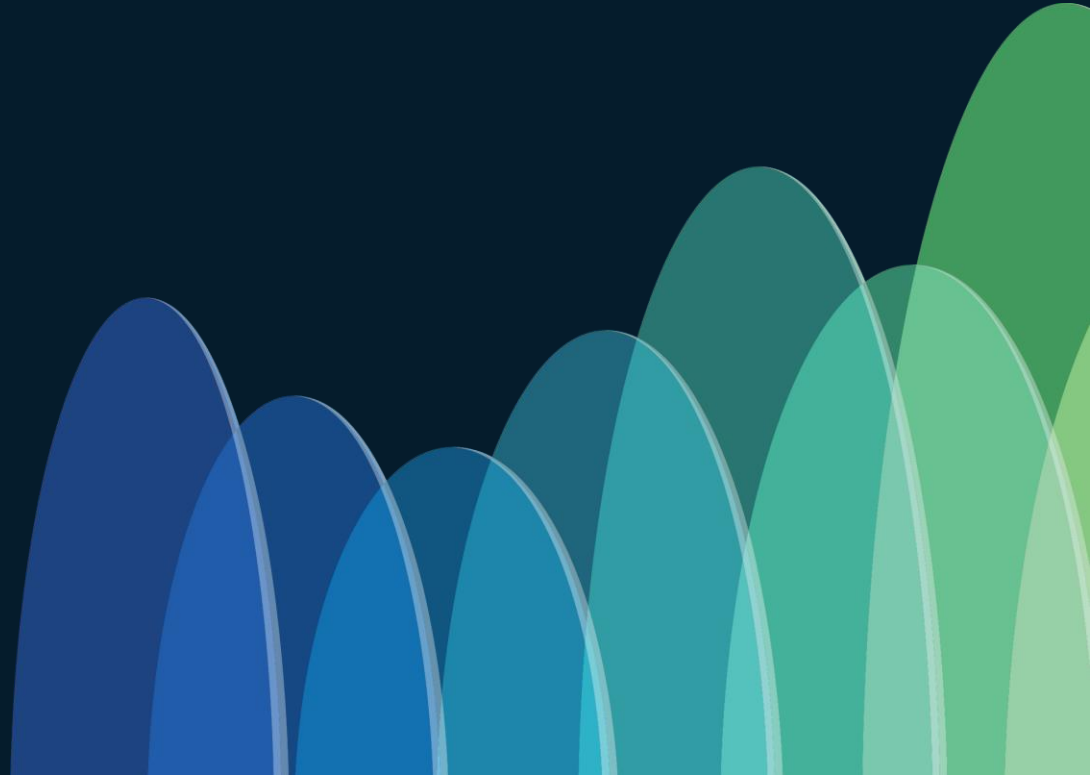
When to build modules?

- Simplify configuration
 - Abstract the complexity and present only top-level variables and resources
- Prevent configuration issues
 - Removal of configuration options provides easier to interrogate automation
- Configuration re-use
 - Common sets of automation routines can be packaged and shared across teams/organisations

Module Demo



Wrapping it All Up



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Thank you

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