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The bridge to possible

Getting Started with IaC and Terraform

Have No Fear, HCL is Here!

Quinn Snyder | Technical Advocate, Cisco Learning and Certifications
@qsnyder

DEVLIT-2785

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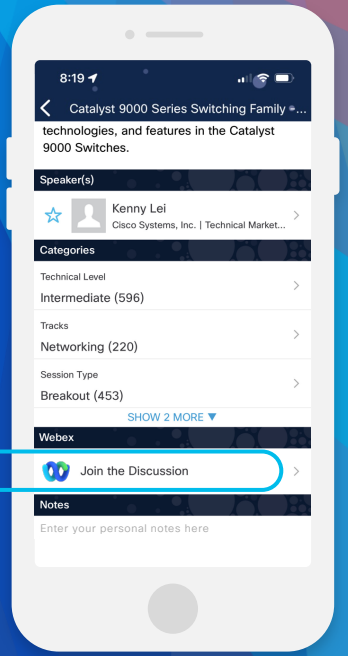

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Agenda

- Introduction, Background
- Terraform Workflow
- HCL Syntax, Control
- Demo
- Wrap-Up

"The act of managing and provisioning computer datacenters through machine readable definition files, rather than interactive configuration tools."

~ Wikipedia Entry on IaC

Terraform background

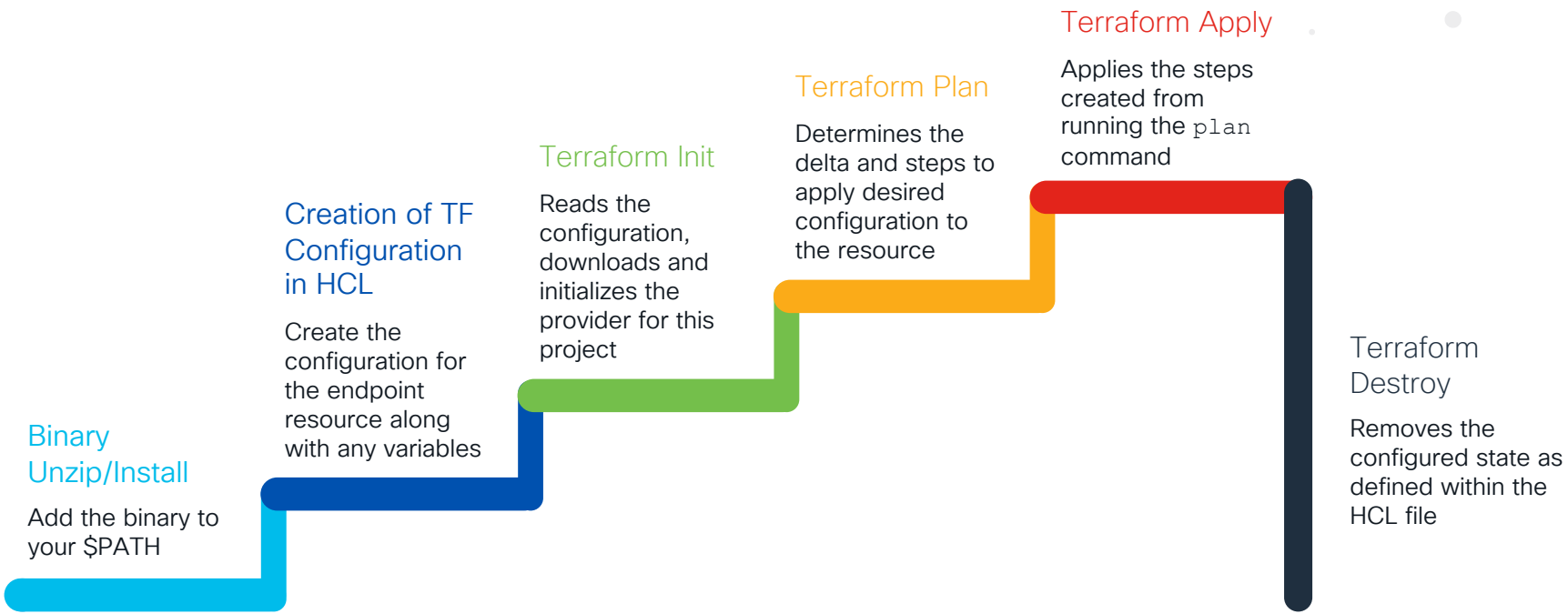
Developed by HashiCorp; initial release in July 2014

Designed to be a full Infrastructure as Code (IaC) management tool for datacenters

Completely written in Go, creating a single binary file

Fully declarative leveraging HashiCorp Configuration Language (HCL). Requires “provider” for target system/controller to be configured.

Typical Terraform workflow



HashiCorp Configuration Language (HCL)

- JSON-ish in structure
- Composed of arguments and blocks
  - Arguments assign values to variables/attributes
  - Blocks serve as containers for other values and/or blocks (think: YANG style “containers”)
- Assignments for arguments can be static or set using variables

```
# Configure the provider with your Cisco APIC credentials.
provider "aci" {
  # APIC Username
  username = var.user.username
  # APIC Password
  password = var.user.password
  # APIC URL
  url      = var.user.url
  insecure = true
}

# Define an ACI Tenant Resource.
resource "aci_tenant" "terraform_tenant" {
    name        = var.tenant
    description = "This tenant is created by terraform"
}
```

HCL basics

- All HCL plans of similar structure
- Possible to ”read-in” for reuse without config
- Note the dotted notation nesting for relationships
- Sometimes variables are exposed without being declared as part of the provider

```
# Define an MSO Tenant Resource.
data "mso_tenant" "tenant_obj" {
    name         = var.tenant
    display_name = var.tenant
}

# Define an MSO Schema Resource.
resource "mso_schema" "schema_obj" {
    template_name = "Template1"
    name          = var.schema
    tenant_id     = data.mso_tenant.tenant_obj.id
}

# Define an MSO Schema VRF Resource.
resource "mso_schema_template_vrf" "vrf_obj" {
    schema_id     = mso_schema.schema_obj.id
    template      = mso_schema.schema_obj.template_name
    name          = var.vrf
    display_name  = var.vrf
}

# Define an MSO Schema BD Resource.
resource "mso_schema_template_bd" "bd_obj" {
    schema_id              = mso_schema.schema_obj.id
    template_name          = mso_schema.schema_obj.template_name
    name                   = var.bd
    display_name           = var.bd
    vrf_name               = mso_schema_template_vrf.vrf_obj.name
    layer2_unknown_unicast = "proxy"
    layer2_stretch         = true
}
```

HCL basics

- “Programmatic things” are limited similar to Ansible
- “For” loops defined by referencing top-level variable
- References to inner variables done through similar notation to “`with_items`” in Ansible; inner key-value assignments referenced in `main.tf`

```
resource "dcnm_inventory" "Sandbox_Switches" {
  for_each          = var.switches
  fabric_name       = "DevNet_Fabric"
  username          = "admin"
  password          = "admin12345"
  ip                = each.value.ip
  role              = each.value.role
  max_hops          = 0
  auth_protocol     = 0
  preserve_config   = "false"
  deploy            = "false"
  config_timeout    = "10"
}
```

```
variable "switches" {
  description = "Testbed Sandbox Switches"
  type = map
  default = {
    spine1 = {
      ip = "192.168.129.121"
      role = "spine"
    },
    spine2 = {
      ip = "192.168.129.122"
      role = "spine"
    },
    leaf1 = {
      ip = "192.168.129.123"
      role = "leaf"
    },
    leaf2 = {
      ip = "192.168.129.124"
      role = "leaf"
    },
    leaf3 = {
      ip = "192.168.129.125"
      role = "leaf"
    },
    leaf4 = {
      ip = "192.168.129.126"
      role = "leaf"
    },
  }
}
```

Declarative vs procedural

- *Declarative* configurations define end-state in ”human language”.
  - Declarative can be “per task” or “per plan”
- *Procedural* configurations require *a priori* knowledge of configuration process to move to end state

```yaml
- name: ENSURE TENANT VRF EXISTS
  cisco.aci.aci_vrf:
    <<: *login_info
    tenant: "{{ tenant }}"
    vrf: "{{ vrf }}"
    description: "VRF Created/Configured Using Ansible"
    state: "{{ aci_state }}"
    validate_certs: "{{ validate_certs }}"

- name: ENSURE TENANT BRIDGE DOM
  cisco.aci.aci_bd:
    <<: *login_info
    tenant: "{{ tenant }}"
    bd: "{{ item }}"
    vrf: "{{ vrf }}"
    description: "{{ bd_descript
    state: "{{ aci_state }}"
    validate_certs: "{{ validate
  loop: "{{ bds }}"

- name: ENSURE TENANT SUBNET EXI
  cisco.aci.aci_bd_subnet:
    <<: *login_info
    tenant: "{{ tenant }}"
    bd: "{{ item.bd }}"
    gateway: "{{ item.bd_gateway
    mask: "{{ item.bd_mask }}"
    scope: "{{ item.bd_scope }}'
    description: "{{ bd_subnet_c
    state: "{{ aci_state }}"
    validate_certs: "{{ validate
  loop: "{{ bd_subnets }}"
```

```
# Define an ACI Tenant Resource.
resource "aci_tenant" "terraform_tenant" {
    name        = var.tenant
    description = "This tenant is created by terraform"
}

# Define an ACI Tenant VRF Resource.
resource "aci_vrf" "terraform_vrf" {
    tenant_dn   = aci_tenant.terraform_tenant.id
    description = "VRF Created Using Terraform"
    name        = var.vrf
}

# Define an ACI Tenant BD Resource.
resource "aci_bridge_domain" "terraform_bd" {
    tenant_dn          = aci_tenant.terraform_tenant.id
    relation_fv_rs_ctx = aci_vrf.terraform_vrf.id
    description        = "BD Created Using Terraform"
    name               = var.bd
}

# Define an ACI Tenant BD Subnet Resource.
resource "aci_subnet" "terraform_bd_subnet" {
    parent_dn   = aci_bridge_domain.terraform_bd.id
    description = "Subnet Created Using Terraform"
    ip          = var.subnet
}
```

Dude, where's my code?!

Just because its not Python/Go/Node/etc; doesn't mean its not code!

- Declarative configurations are code!
- Placing all scaffolded config in HCL creates an archive of config intent
- Archived intent can be stored in VCS/SCM for versioning
- IaC + VCS = Most of a CI/CD network configuration system!

Demo

https://github.com/qsnyder/devlit-2785

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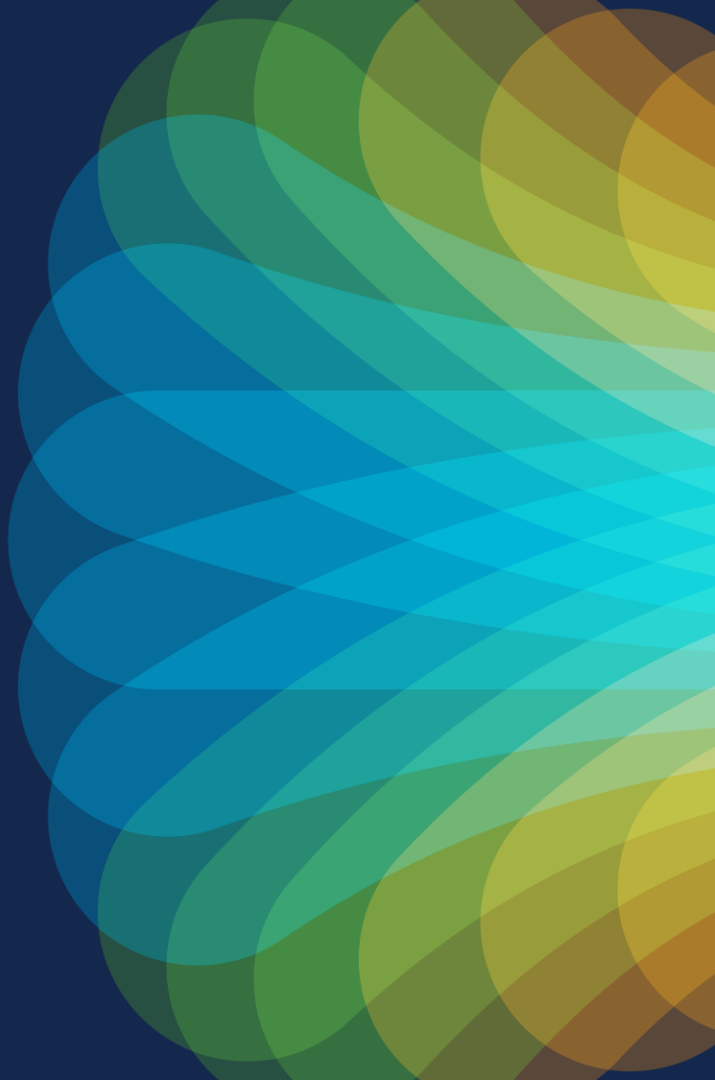
Thank you

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