HashiCorp Consul

Consul Integrations

August 2022

Agenda

1. What is NIA
2. What is CTS
3. NIA & CTS Together

Consul Enterprise Path to Production

Weeks 1-3	Weeks 4-5	Weeks 6-7	Weeks 8-9	Weeks 10
Consul Deployed	**Service Discovery**	**Service Mesh and API Gateway**	**Service Configuration and Integrations**	**Ready for Production!**
• Kick Off Webinar • Architectural Deep Dive Webinar • Terraform starter code modules • Operationalizing Consul	• Service Discovery and Health Monitoring • Service Registration and Consumption • Office Hours	• Service Mesh Configuration and Consumption • Ingress & API Gateways • Office Hours	• Consul Integrations & Network Infrastructure Automation (NIA) • Office Hours	• Exit Ramp & Operational Readiness Checklist

01

Network Infrastructure Automation (NIA)

Current Challenges

What enterprises are currently facing

Slow Manual Processes

Ticketing systems are not allowing networks to move as fast as developers want

Increased Costs

Organizations want to find a way to optimize and increase efficiency with their existing and new networking infrastructure

Increased Risk

Higher risk in network outage from misconfigurations across multiple networking infrastructure devices

What is NIA?

- Network Infrastructure Automation (NIA) is the overarching concept, and Consul-Terraform-Sync (CTS) is the primary technology used within NIA
- NIA is the idea that changes in our deployment should automatically trigger changes to our network infrastructure devices to reflect the deployment and drive traffic to them
- In order to automate the NIA workflow, a tool has to watch for changes and trigger a handler. The primary tool for watching for changes is CTS.

NIA Example

CODE EDITOR

```
resource "panos_dag_tags" "example" {
 for_each = var.services
 # vsys name to associate IP address and TAG
 vsys = var.vsys_name
 register {
     # Service or node address to associate the TAG
     ip = each.value.address == "" ? each.value.node_address : each.value.address
     # TAGs based on service name
     tags = [each.value.name]
 }
}
```

02

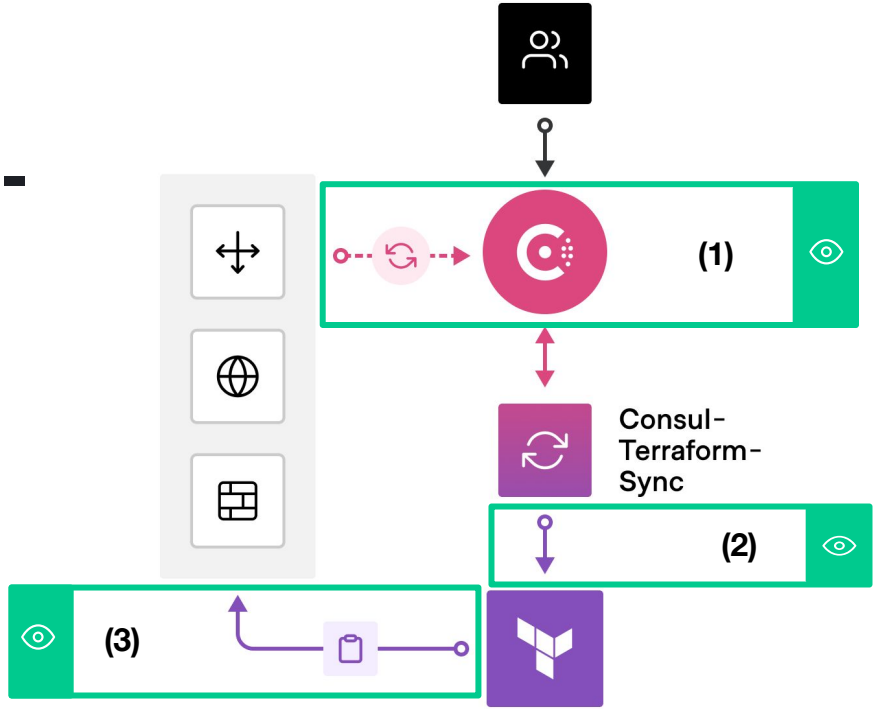
Consul Terraform Sync

Consul Terraform Sync

- Consul-Terraform-Sync (CTS) is a utility that watches for changes in Consul, and triggers actions in Terraform in near real time
- Terraform is used as the underlying automation tool
- CTS leverages the rich ecosystem of providers in Terraform, an modules in the Private Module Registry, and well as governance via Sentinel policies

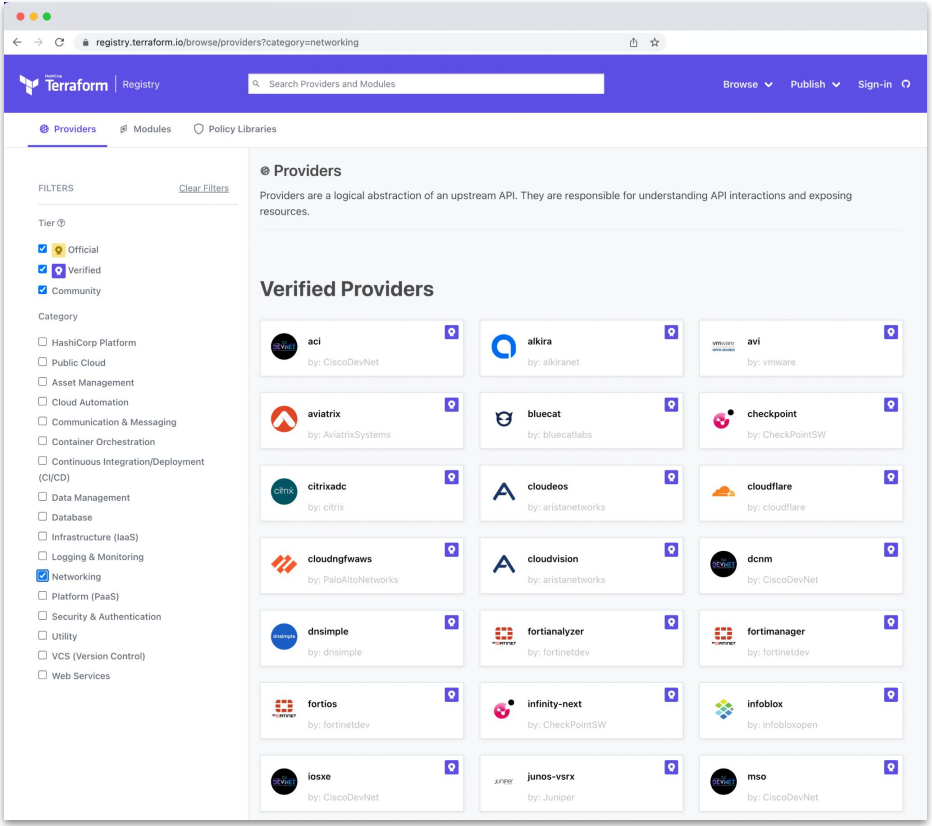
Consul-Terraform-Sync (CTS)

CTS generates new Terraform manifest and initiates a Terraform run to apply changes.



Leverage the Terraform Ecosystem

- Modules in the Terraform Private Module Registry (PMR) can be leveraged for automation with CTS
- Sentinel in Terraform Cloud/Enterprise will provide the governance necessary to make sure that the automation is safe
- There are many providers to us in automation tasks

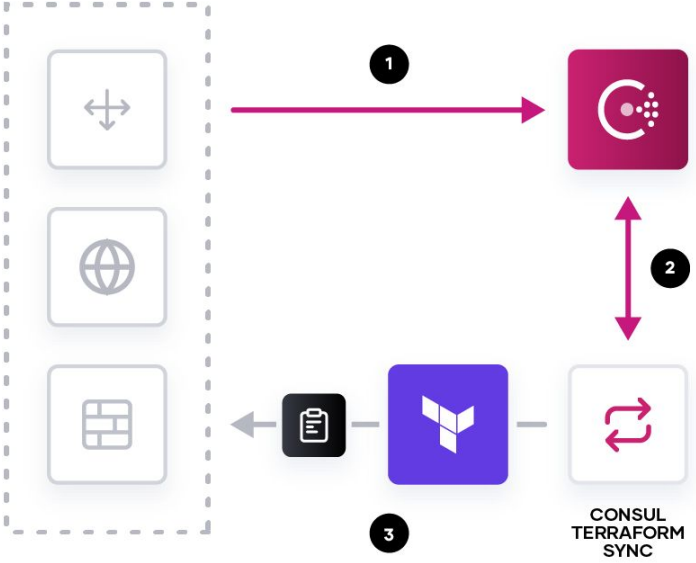


CTS Installation Best Practices

- The server running CTS should be a dedicated instance
- Consul Agent **should be** installed onto the CTS server, if not installed CTS **must** be able to reach a Consul Agent
- CTS should run under a **dedicated user** account
- The working and configuration directories for CTS require full write permissions
- When CTS is deployed in conjunction with Consul admin partitions, each admin partition requires a CTS instance

Declarative, Service & Workflow Driven Network Automation

- Automate manual tasks across multiple network devices
- Lightweight installation
- Robust ecosystem

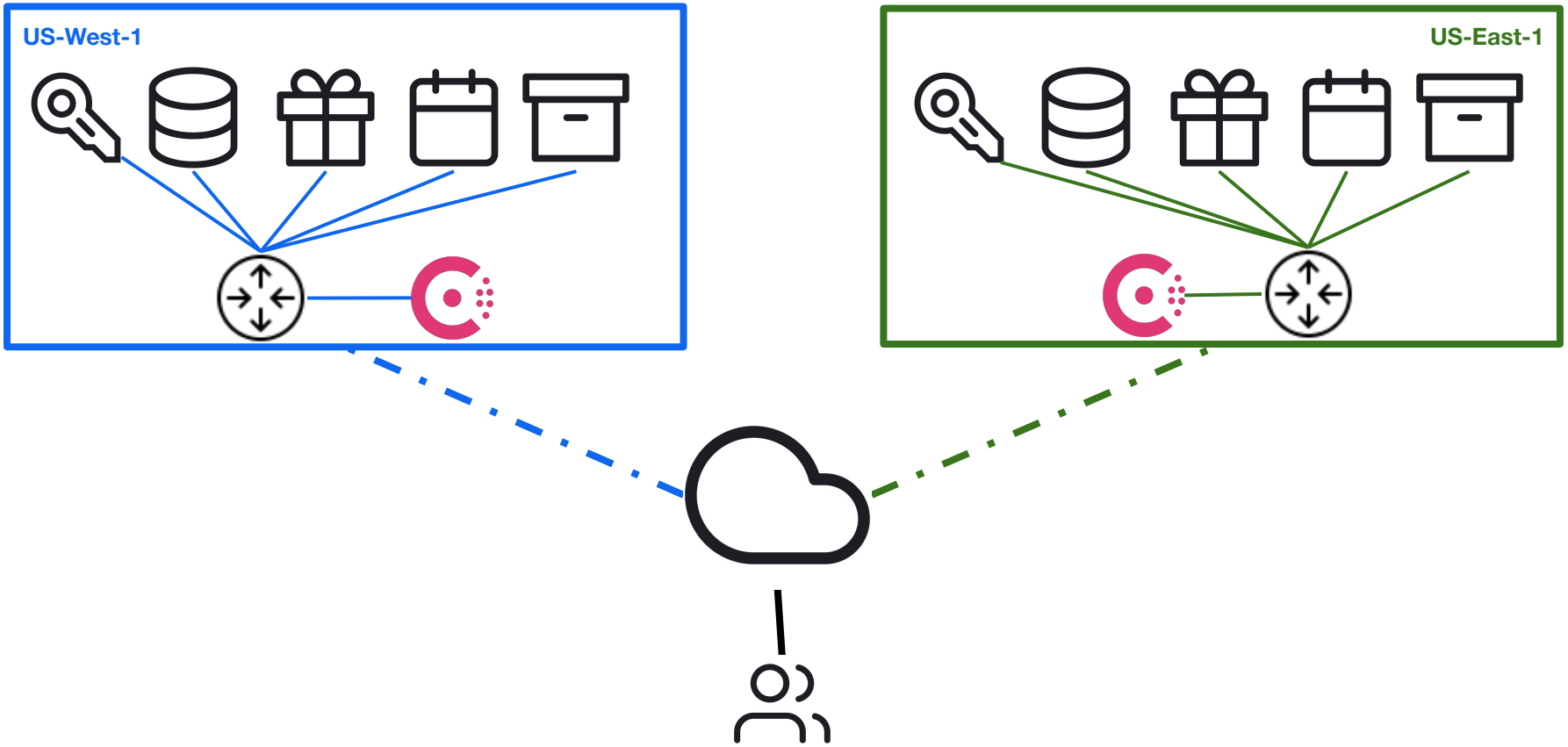


1) Consul catalog updated with new service registrations/changes

2) Consul-Terraform-Sync pulls service info from Consul catalog

3) Consul-Terraform-Sync generates new Terraform manifest and initiates a Terraform run to apply changes

A practical example: “The Dreaded X”



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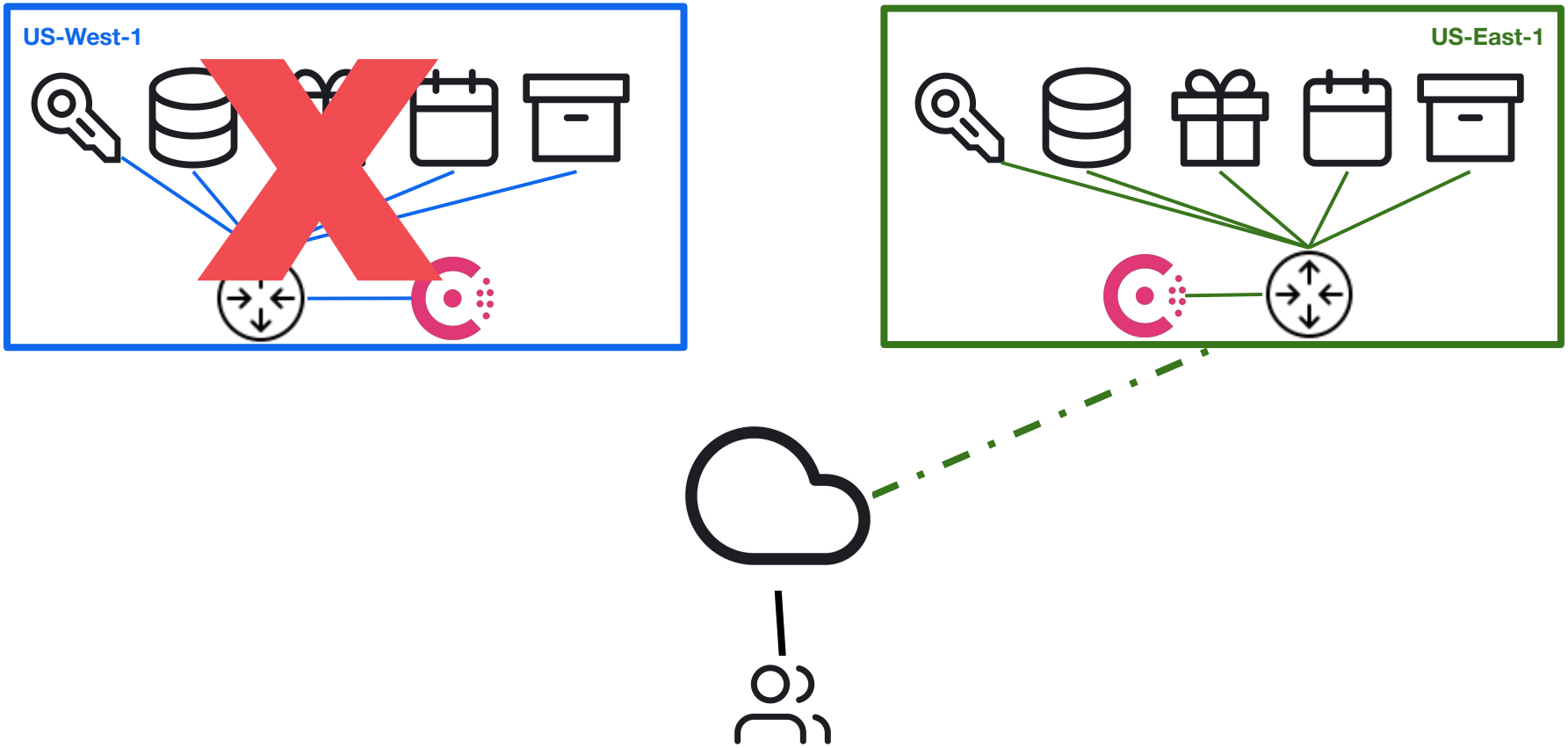

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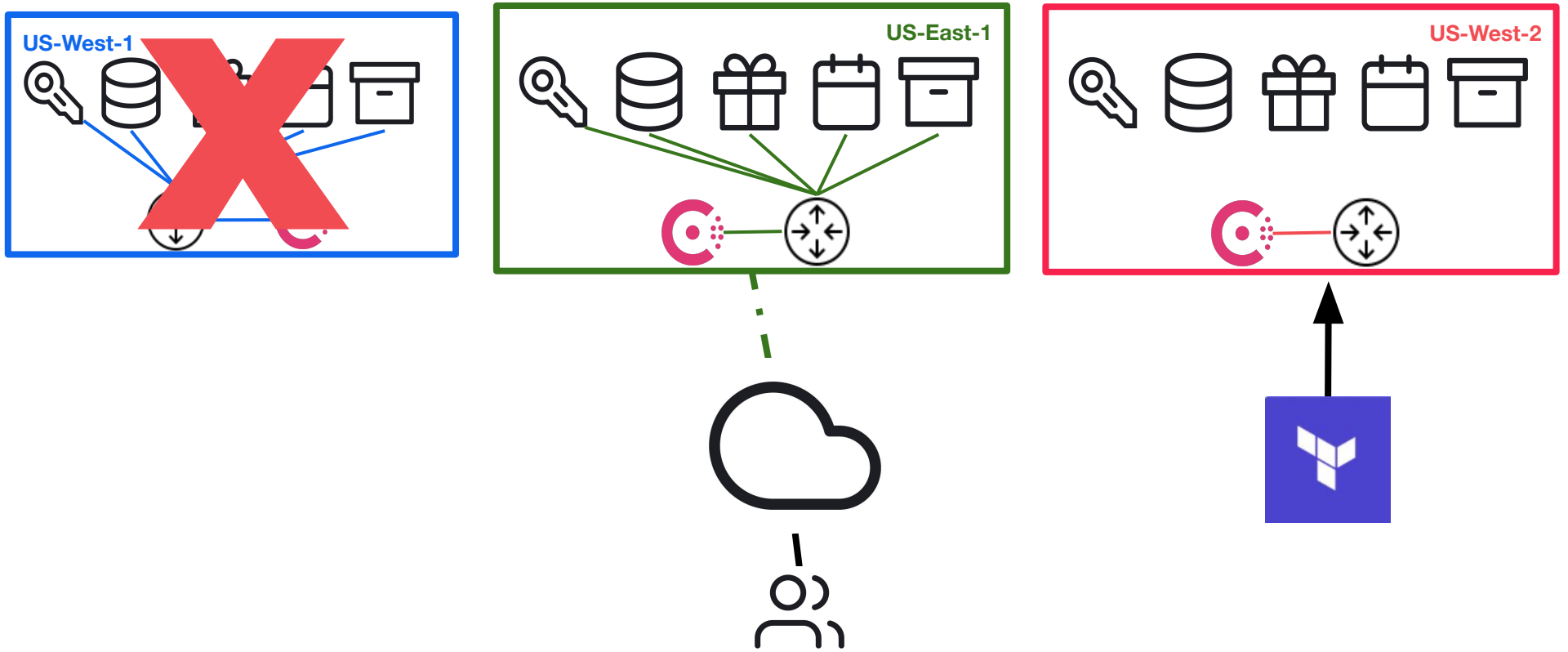

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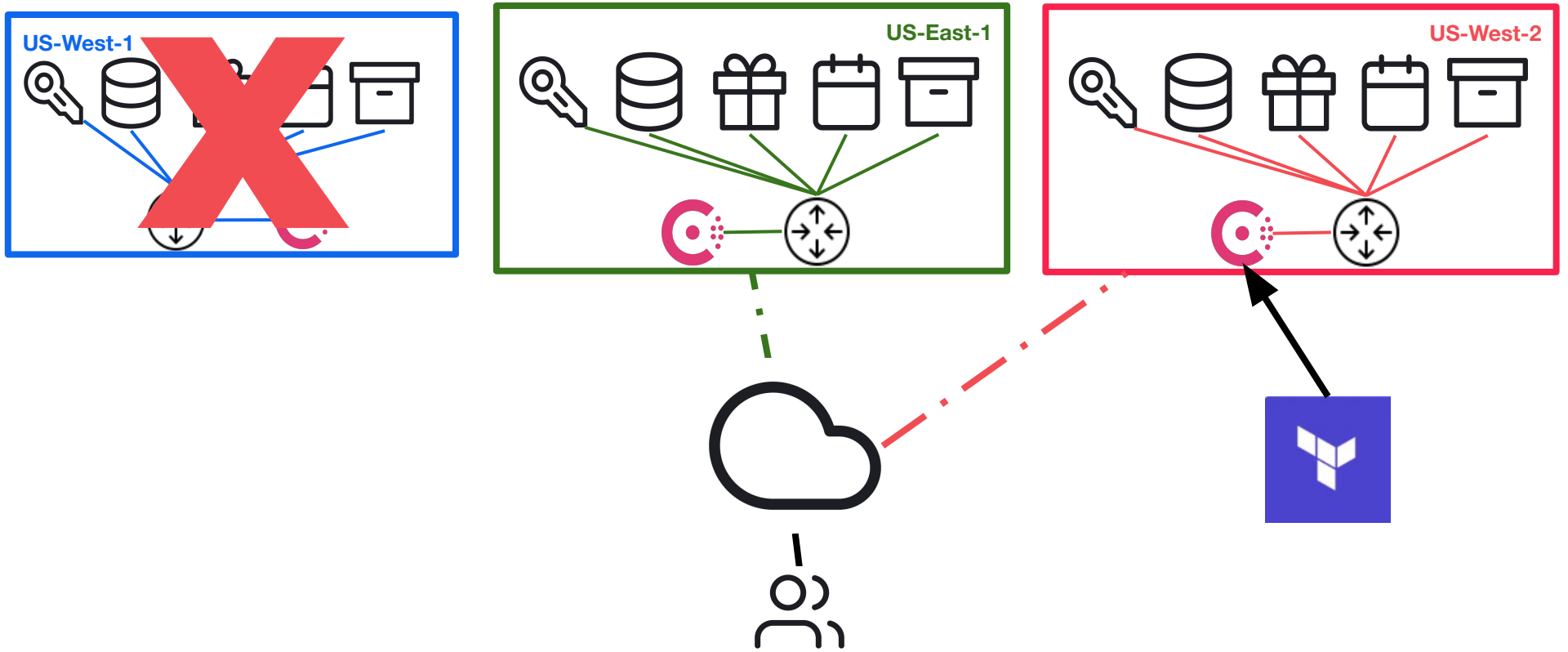

03

Combining NIA & CTS

Some Things Go Well Together

Just like a Peanut Butter and Jelly Sandwich, NIA and CTS go well together and provide a full automation solution

CTS Configuration Example

CODE EDITOR

```
log_level   = "INFO"
working_dir = "sync-tasks"
port        = 8558
id          = "cts-01"
syslog {
 enabled = true
 facility = "local2"
 name = "CTS"
}
buffer_period {
 enabled = true
 min     = "5s"
 max     = "20s"
}
tls {
 enabled  = true
 cert     = "/path/to/cert.pem"
 key      = "/path/to/key.pem"
 verify_incoming = true
 ca_cert  = "/path/to/ca.pem"
}
driver "terraform" {
 log         = false
 persist_log = false
 backend "consul" {
   gzip = true
 }
}
task {
name        = "cts-example"
description = "Example task"
module      = "findkim/print/cts"
version     = "0.1.0"
condition "services" {
 names = ["web", "api"]
 }
}
```

CTS License Block

If no license block is specified, then CTS will try to auto retrieve a license from Consul.

CODE EDITOR

```
license {
 path = "path/to/license.lic"
 auto_retrieval {
   enabled = true
 }
}
```

CTS: Terraform-cloud Network Driver

- Network Drivers are a set of tools that propagate the network infrastructure changes that CTS is pushing
- Only one network driver can be used per CTS deployment.
- The two primary network drivers used by CTS are the terraform and terraform-cloud drivers

CODE EDITOR

```
driver "terraform-cloud" {
hostname     = "https://app.terraform.io"
organization = "my-org"
token        = "<TEAM_TOKEN>"

workspaces {
  tags           = ["source:cts"]
  tags_allowlist = []
  tags_denylist  = []
}

required_providers {
  myprovider = {
    source  = "namespace/myprovider"
    version = "1.3.0"
  }
}
}
```

CTS: Global Configs

- ***"log_level"*** sets the logging level for the CTS process
- ***"working_dir"*** specifies working directory for CTS artifacts
- ***"port"*** sets the port number for API requests
- **"id"** is the CTS instance
- The ***"syslog"*** configuration block enables the CTS process to log to syslog

CODE EDITOR

```
log_level   = "INFO"
working_dir = "sync-tasks"
port        = 8558
id          = "cts-server01"

syslog {
 enabled = true
 facility = "local2"
 name = "CTS"
}
```

CTS: Global Configs

- The **“buffer_period”** block sets a timer to prevent a flapping change from instrumenting continuous changes
- The ***“tls”*** configuration block configures tls on the CTA API

CODE EDITOR

```
buffer_period {
 enabled = true
 min     = "5s"
 max     = "20s"
}

tls {
 enabled  = true
 cert     = "/path/to/cert.pem"
 key      = "/path/to/key.pem"
 verify_incoming = true
 ca_cert  = "/path/to/ca.pem"
}
```

CTS: Consul Configuration

- The Consul Agent can be run either on the host that is running CTS or on a separate host
- ***"transport"*** sets configuration for connecting to Consul

CODE EDITOR

```
consul {
 address = "consul.example.com"
 auth {}
 tls {}
 token = null

 transport {}
 service_registration {
   service_name = "cts"
   address = "172.22.0.2"
   default_check {
     address = "http://172.22.0.2:8558"
   }
 }
}
```

CTS ACL Requirements

Policy	Resources
service:read	Any services monitored by tasks
node:read	Any nodes hosting services monitored by tasks
keys:read	Any Consul KV pairs monitored by tasks
namespace:read	Any namespaces for resources monitored by tasks. This is required for enterprise consul.
service:write	The CTS service when service registration is enabled
keys:write	Consul-terraform-sync - only required when using Consul as the Terraform backend

CTS: Task Block

The task block defines the automation task and the conditions that need to be met in order for the automation to be processed

CODE EDITOR

```
task {
name        = "cts-example"
description = "Example task"
module      = "findkim/print/cts"
version     = "0.1.0"
condition "services" {

 names = ["web", "api"]

}
}
```

CODE EDITOR

```
task {
 name      = "catalog_service_condition_task"
 module    = "path/to/catalog-services-module"
 providers = ["my-provider"]

 condition "catalog-services" {
   datacenter          = "dc1"
   regex               = "web.*"
   use_as_module_input = false
 }
 module_input "services" {
   names = ["web-api"]
   datacenter = "dc2"
 }
}
```

Condition Statements: Catalog Services

The catalog-services condition statement triggers an automation on initial registration/de-registration

CODE EDITOR

```
task {
 name        = "consul_kv_condition_task"
 description = "execute on changes to Consul KV entry"
 module      = "path/to/consul-kv-module"
 providers   = ["my-provider"
 condition "consul-kv" {
   path                = "my-key"
   recurse             = true
   datacenter          = "dc1"
   namespace           = "default"
   use_as_module_input = true
 }
}
}
```

Condition Statements: Consul KV

The consul KV condition statement is a trigger that executes on a change to a KV value

CODE EDITOR

```
task {
 name        = "scheduled_task"
 description = "execute every Monday using
service information from web and db"
 module      = "path/to/module"

 condition "schedule" {
   cron = "* * * * Mon"
 }

 module_input "services" {
   names = ["web"  "db"]
 }

}
```

Condition Statements: Scheduled Conditions

A scheduled condition is similar to a cron job

CTS Configuration Elements

Global Configurations

- log_level
- syslog
- buffer_period
- tls
- consul
- transport

License

Network Driver

- driver
- backend
- required_providers

Task Block

- task
- condition(s)
- module_input

CODE EDITOR

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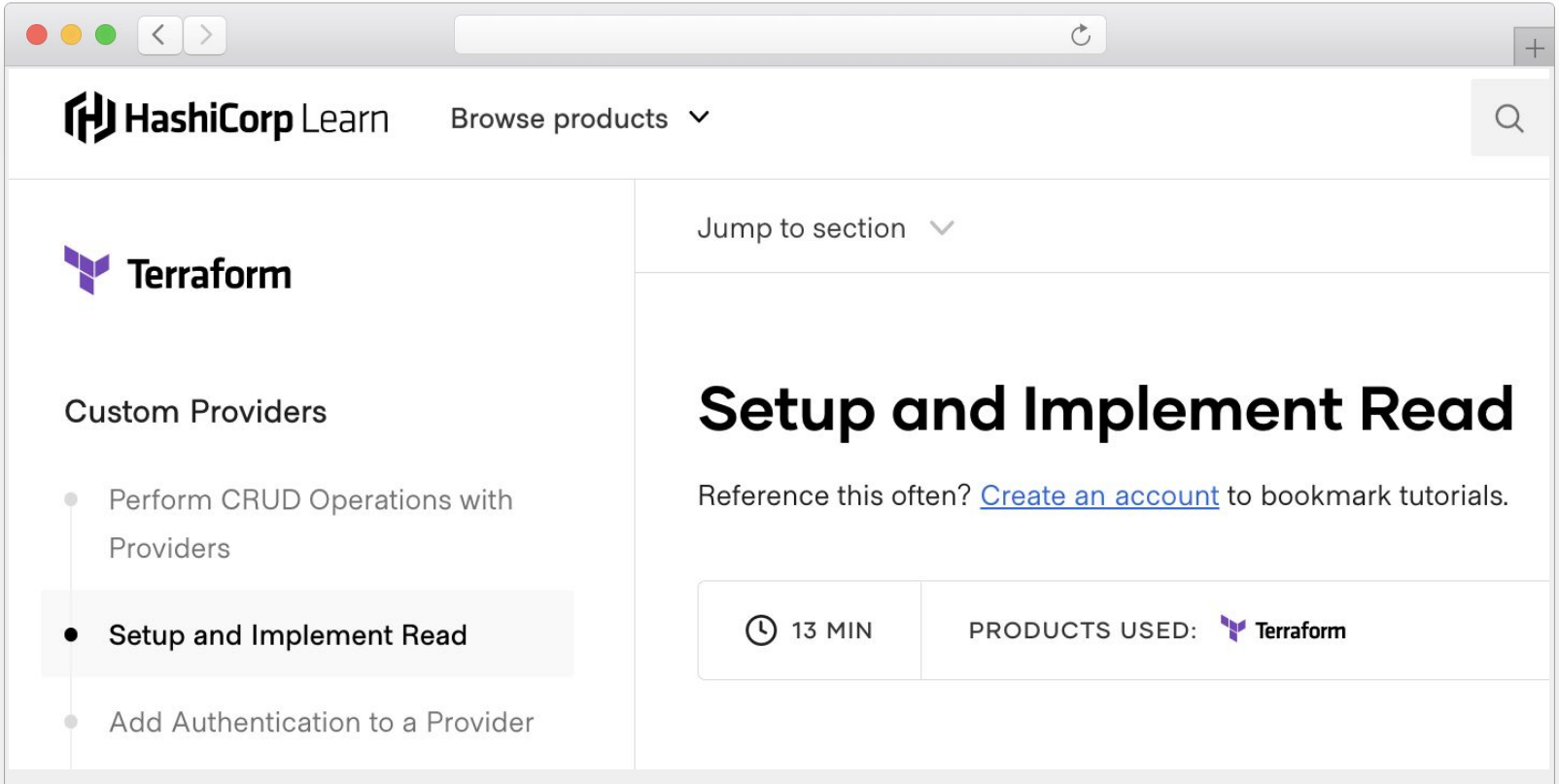
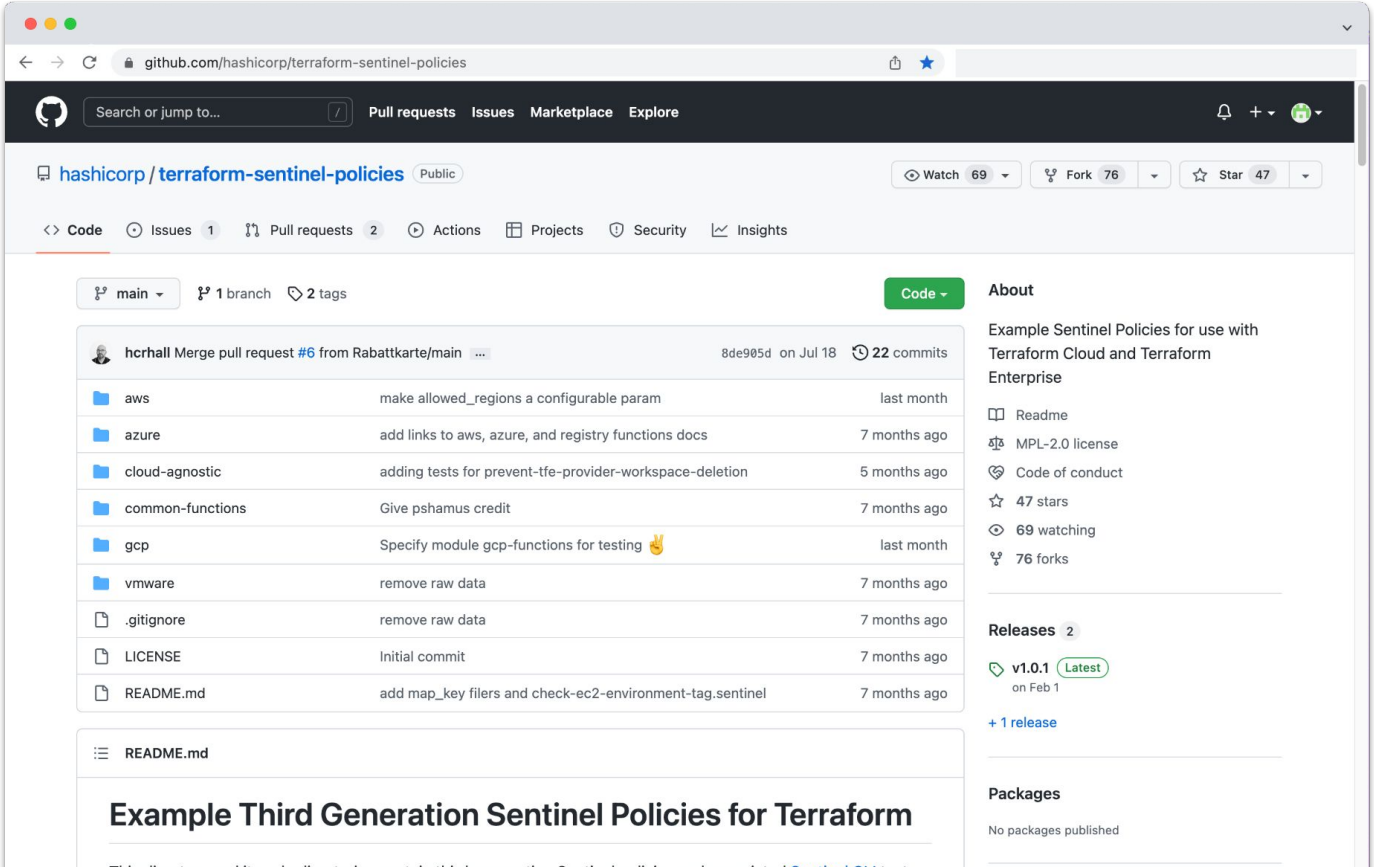
```

Custom Terraform Providers



Sentinel in TFE/TFC



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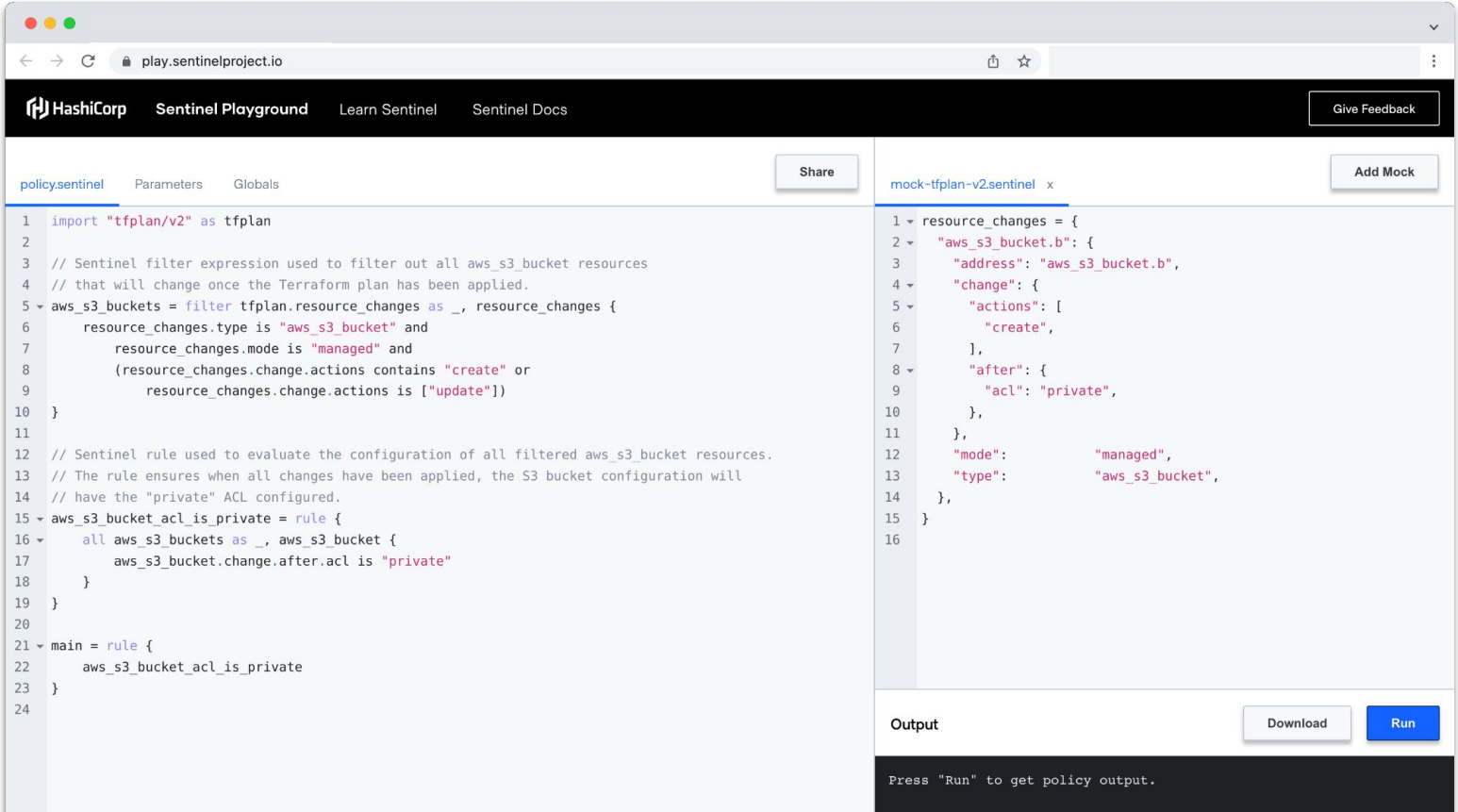

04

Next Steps

Learn

https://learn.hashicorp.com/consul

Step-by-step guides to accelerate deployment of Consul

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Consul

GET STARTED

Consul on HCP

Consul on Kubernetes

Consul on VMs

USE CASES

Kubernetes Service Mesh

Microservices

NIA

Service Discovery & Health

Service Mesh & Gateways

CERTIFICATION PREP

Associate

Docs | Forum

Deploy a fully managed service mesh

Sign up for HCP Consul →

Learn Consul fundamentals

7 TUTORIALS

HashiCorp Cloud Platform (HCP) Consul

Quickly get hands-on with HashiCorp Cloud Platform (HCP) Consul using the HCP portal quickstart deployment, experiment with the...

5 TUTORIALS

Get Started on Kubernetes

Setup Consul service mesh to get experience deploying service sidecar proxies and securing service with mTLS.

9 TUTORIALS

Get Started on VMs

Consul is a networking tool that provides a fully featured service mesh and service discovery. Try Consul locally.

Resources

- Learn Guide: Network Automation with CTS
- Consul Terraform Sync
- CTS Network Drivers
- CTS Tasks
- Configuration Options for CTS
- CTS Compatibility
- Secure CTS for Production
- A10 Network Terraform Modules & Provider(s)
- F5 Terraform Modules & Provider(s)
- Palo Alto Networks Terraform Modules & Provider(s)
- VMWare Terraform Modules & Provider(s)

Need Additional Help?

Customer Success

Contact our Customer Success Management team with any questions. We will help coordinate the right resources for you to get your questions answered.

customer.success@hashicorp.com

Technical Support

Something not working quite right? Engage with HashiCorp Technical Support by opening a ticket for your issue at support.hashicorp.com.

Discuss

Engage with the HashiCorp Cloud community including HashiCorp Architects and Engineers

discuss.hashicorp.com

Upcoming Onboarding Webinars

Webinar

Program Closing &

Readiness Checklist

Topics include: A readiness checklist and some great resources to continue on your Consul journey

Q & A

Thank You

customer.success@hashicorp.com
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