

CISCO *Live!*



#CiscoLive



The bridge to possible

Simplify Infrastructure as Code for on premises environment using Cisco Intersight and HashiCorp Terraform Cloud

Alan Chen, CXPM – Cloud and Compute Solution Architect

DEVNET-3026



#CiscoLive

Cisco Webex App

Questions?

Use Cisco Webex App to chat with the speaker after the session

How

- 1 Find this session in the Cisco Live Mobile App
- 2 Click “Join the Discussion”
- 3 Install the Webex App or go directly to the Webex space
- 4 Enter messages/questions in the Webex space

Webex spaces will be moderated by the speaker until June 17, 2022.



<https://ciscolive.ciscoevents.com/ciscolivebot/#DEVNET-3026>

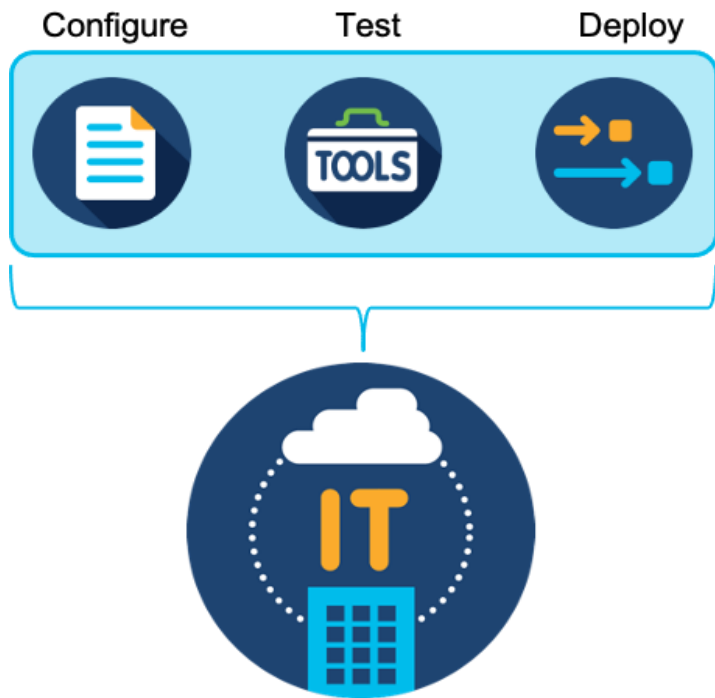


Agenda

- IaC Overview & Challenges
- Cisco Intersight & HashiCorp Terraform
- Cisco Intersight Services for HashiCorp Terraform
- Step by Step Demo
- Next Steps

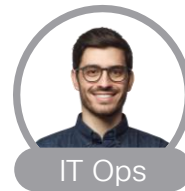
laC Overview & Challenges

What is Infrastructure-as-Code (IaC)?



- IaC evolved to solve the problem of environment drift in the release pipeline.
- Management of infrastructure in a declarative model, using versioning for source code. Git is the “Single Source of Truth”
- CI/CD toolchains automatically test, deploy and track pull requests and configuration changes to your infrastructure
- Deployments should always set the target environment to the same configuration, regardless of the environment’s starting state
- Enables users to transition from mutable workloads to immutable workloads

Hybrid Cloud IaC challenges



Management

Can I implement IaC on-prem without introducing another tool to maintain and manage?



Security

How can I ensure that my on-prem resources are secure when managed via SaaS?



Orchestration

What about all the other things that are not immutable?



Training

How do I encourage my team to level-up their skills?

Cisco Intersight & HashiCorp Terraform

Cisco Intersight

Cloud operations platform

Apps



Traditional



Hybrid



Cloud-native

DevOps



Service
Management



Support



Governance
and Security



CISCO
INTERSIGHT



Serverless



Containers



Virtual
Machines



Bare Metal

Infra



Edge



Branch



Data center



Colo



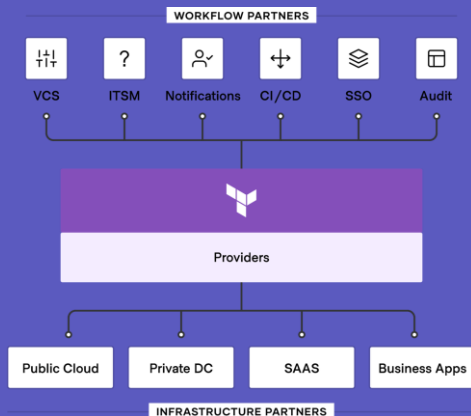
Public Cloud

Terraform Cloud Business Tier



HashiCorp

Terraform Cloud



Infrastructure as Code

Create and provision infrastructure

Collaborative Infrastructure as Code

Manage and share infrastructure

Team Management and Governance

Manage and enforce teams and policies (as code)

Advanced Security, Compliance and Governance

SSO, audit, private data center networking

Self-Service Infrastructure

Allow end-users to CRUD infrastructure

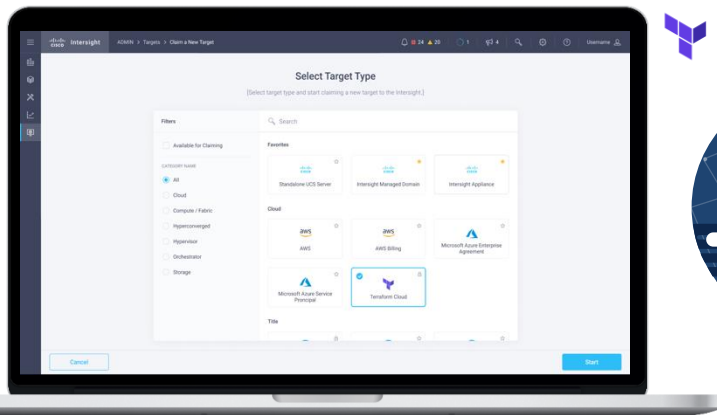
Performance and Scale

Concurrent Runs & Functional Workspaces

Cisco Intersight Service for HashiCorp Terraform

Cisco Intersight Service for HashiCorp Terraform

Simplify and secure your IaC strategy across hybrid cloud



HashiCorp
Terraform Cloud



Secure integration with Terraform Cloud Business
Single-sign-on, secure on-prem access

One SaaS-delivered control point for orchestration
Consolidate APIs in a common automation framework

Bridge the gap between DevOps and IT Ops
Consistent IaC experience anywhere

Reduce Operational
Complexity

Lower Risk and Attack
Surface

Accelerate Application
Innovation Consistently

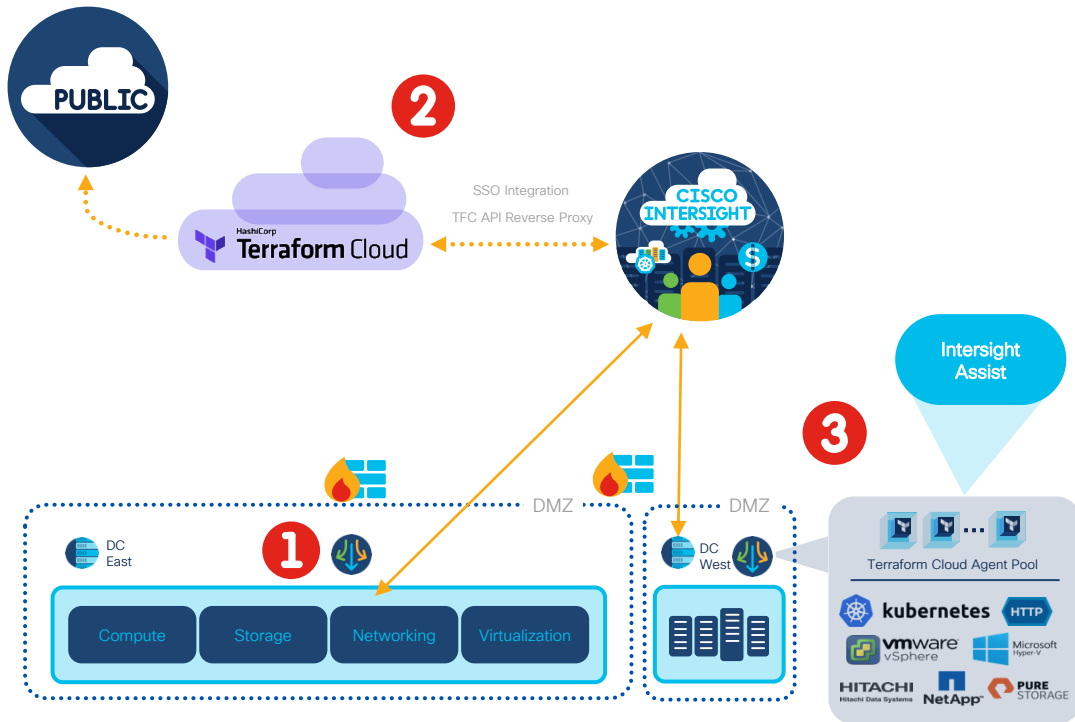
Step by Step Demo

Integrating IaC with On-Prem Resources in **3** Easy Steps



Intersight securely extends the ability to manage, automate and orchestrate on-prem infrastructure and software.

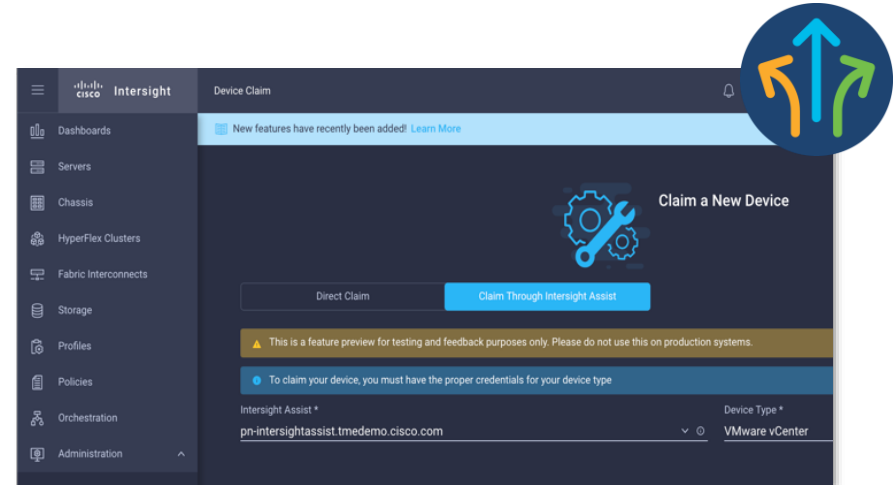
- **Simple:** Intersight manages the end-to-end lifecycle (deployments, upgrades, scaling, networking) of Terraform Agents
- **Integrated:** Reduces the operational overhead of connecting IaC pipelines with infrastructure domain management
- **Extensible:** Intersight Assist delivers a growing library of integrations with Terraform, Pure Storage, NetApp, Hitachi and VMware to help up-level IT operations



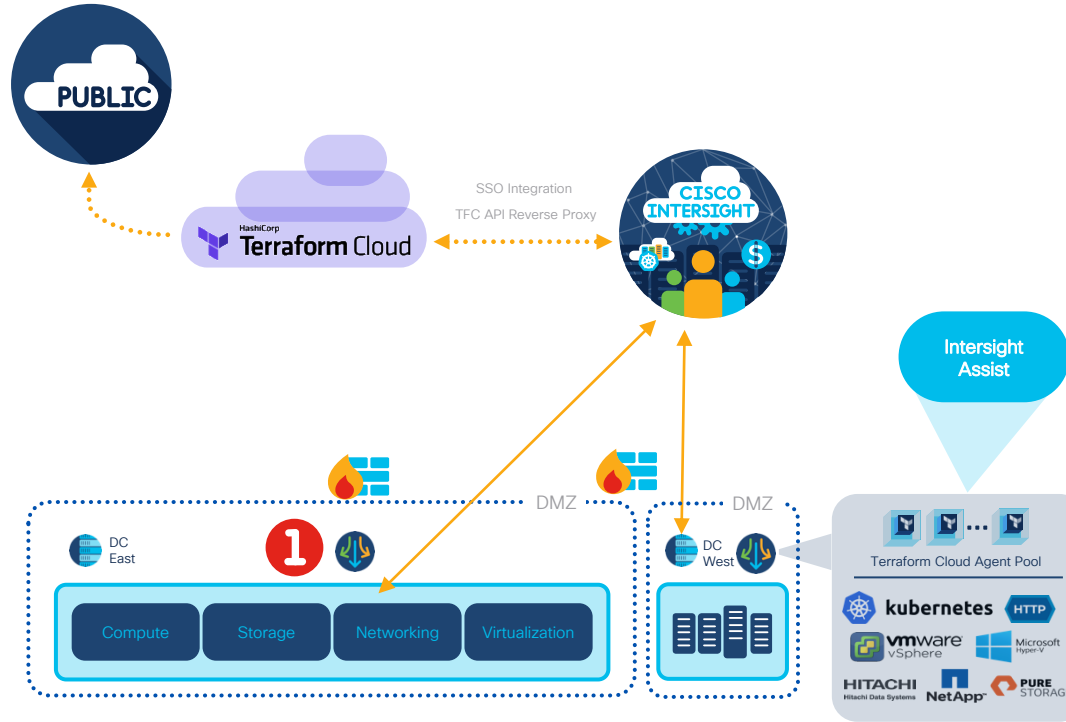
1) Deploy an Intersight Assist

Intersight Assist - Overview

- Responsible for establishing and maintaining a secure channel between Cisco Intersight and 3rd party devices and software – potentially 0 routing or firewall changes need to be implemented.
- Communication between Cisco Intersight and the 3rd party device/software is processed by a **Device Connector** running within the Intersight Assist.
- Updates are securely and automatically delivered from Intersight.com
- Installed via Intersight Appliance OVA:
 - [Cisco.com Installation Guide](#)
 - **Note:** Setting up Intersight Appliance requires an IP address and 2 hostnames for that IP address. The hostnames must be in specific formats - *myhost.mydomain.com* and *dc-myhost.mydomain.com*.
 - [Intersight.com Installation Video](#)

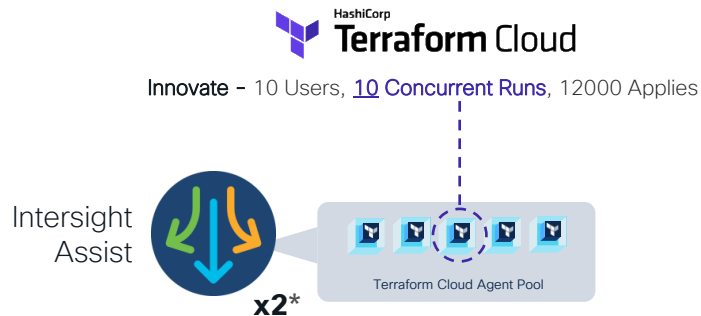


Step 1: Deploy an Intersight Assist



Intersight Assist – IST Requirements

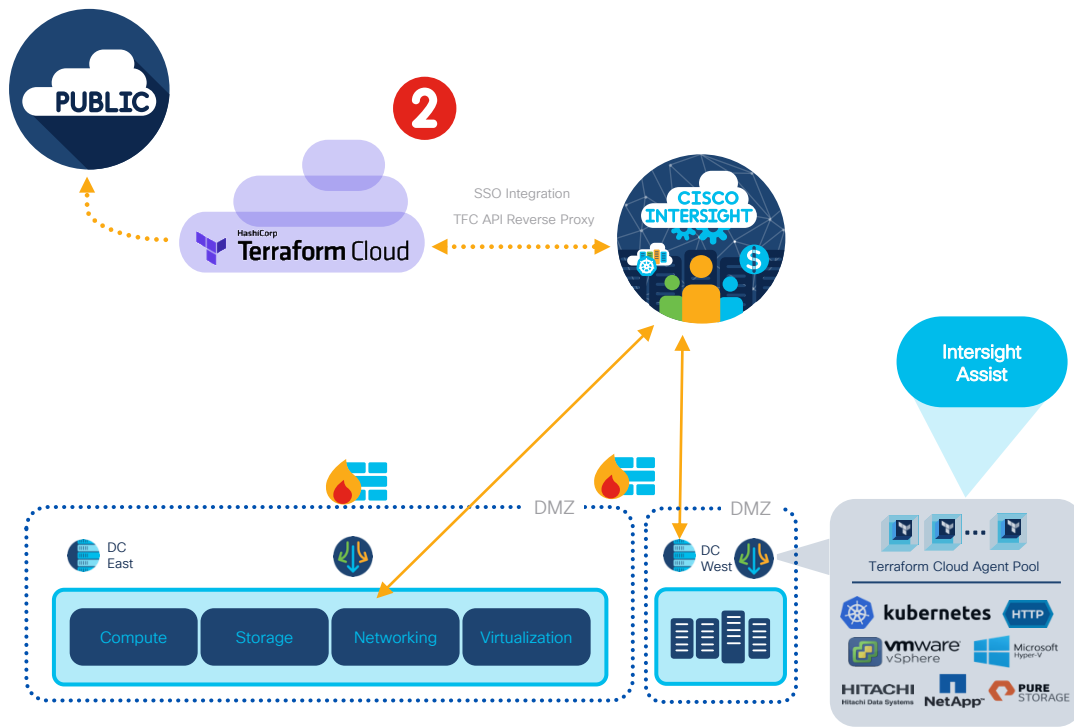
Resource Requirement	System Requirements	
	Small	Medium
vCPU	16	24
RAM (GiB)	32	64
Number of Terraform Agents	5	5
Supported Hypervisors	VMware ESXi 6.5 and higher	



*Each Intersight Assist is limited to running 5 Terraform Cloud Agents.

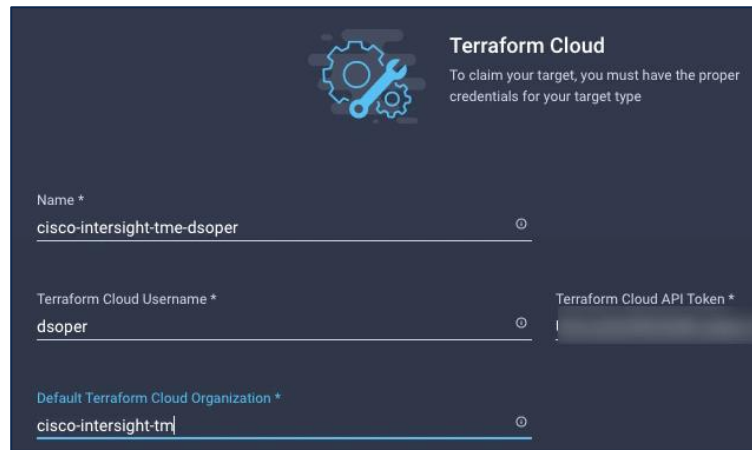
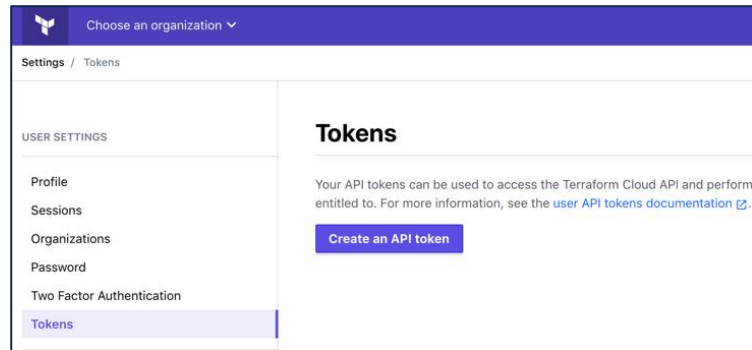
2) Add Terraform Cloud Target to Intersight

Step 2: Add Terraform Cloud Target to Intersight



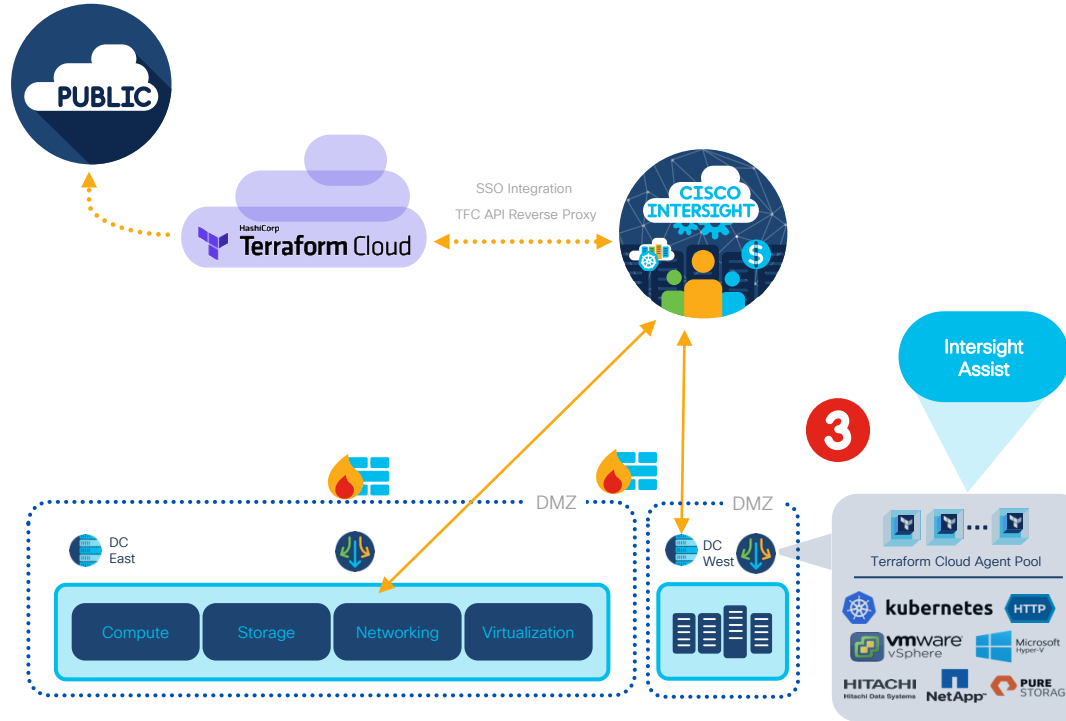
Add Terraform Cloud Target on Intersight

- IST uses Terraform User API tokens to create and manage resources in Terraform Cloud.
- In TFC navigate to *Settings > Tokens* and then select *Create User API token* – keep this token safe!
- This token is required to claim a TFC Target in Intersight.
- In Intersight navigate to *Admin > Targets* and then select *Claim* in the top right-hand corner. *Once the wizard loads, provide the Terraform Username (i.e. email), User API token, and Default Terraform Organization*



3) Deploy Terraform Cloud Agents to Intersight Assist

Step 3: Deploy Terraform Cloud Agents to Intersight Assist



Deploy Terraform Cloud Agents to Intersight Assist

- Users can deploy Terraform Cloud Agents directly to any [valid] Intersight Assist.
- In Intersight navigate to Admin > Targets > Terraform Cloud and then select *Claim Agent* from the action menu. Provide the necessary information, which includes the Agent Name, Agent Pool Name, Managed Hosts and the previously deployed Intersight Assist.
- By default, Terraform Cloud Agents routes and black-holes all traffic to Intersight. This is a security feature that prevents users from applying Terraform plans against on-prem resources without explicit configuration. **Managed Hosts** indicates the local devices and infrastructure accessible by TFC.


The screenshot shows the 'Terraform Cloud Agent' configuration interface in Intersight. A dropdown menu is open for the 'Terraform Cloud' target, showing options: 'Edit', 'Unclaim', 'Launch Terraform Cloud', and 'Claim Terraform Cloud Agent'. The main form contains the following fields:

- Name ***: tme-lab-sjc07-agent
- Intersight Assist ***: pn-iassist.tmedemo.cisco.com
- Terraform Cloud Organization ***: cisco-intersight-tme
- Terraform Cloud Agent Pool Name ***: tme-lab-sjc07-its
- Managed Hosts**:
 - Hostname / IP Address / Subnets *: 172.28.224.0/23
 - Hostname / IP Address / Subnets *: 172.22.248.0/22

Important: Underscores (_) are not supported for the Name or Pool Name.

Configure Terraform Cloud Organization

Configure TFC IST Agents



cxpmteam

▼

Workspaces


Registry

Usage

Settings

HashiCorp Cloud Platform [↗](#)

?



cxpmteam / Settings / Agents

Organization settings

General

Teams

Users

Integrations

Cost Estimation

Policies

Policy Sets

Security

Agents

API Tokens

Agents



Create agent pool

An agent pool represents a group of agents that can be used to allow Terraform Cloud to communicate with isolated, private, or on-premises infrastructure. Each agent pool has its own set of tokens which are not shared across pools. When a workspace is configured to execute runs using agents, any available agent in that workspace's associated agent pool is eligible to complete the run. [Read more in our documentation.](#)

AGENT POOLS

2 OUT OF 5 PURCHASED AGENTS*

ist-agent-pool

AGENT NAME	CORE VERSION	STATUS	ID	IP ADDRESS	LAST SEEN
ist-tfc-agent	0.2.1	 IDLE	agent-teu7XG7V7iVB7Q8V	54.164.75.68	a few seconds ago
ist-tfc-agent	0.1.14	 EXITED	agent-yMuLgc7kNQXMFDeW	34.200.239.65	2 minutes ago

Add VCS provider in TFC

Add VCS Provider

To connect workspaces, modules, and policy sets to git repositories containing Terraform configurations, Terraform Cloud needs access to your version control system (VCS) provider. Use this page to configure OAuth authentication with your VCS provider. For more information, please see the Terraform Cloud documentation on [Configuring Version Control Access](#).

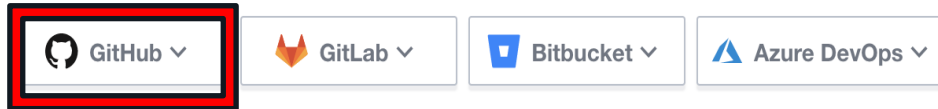
1 Connect to VCS

2 Set up provider

3 Set up SSH keypair

Choose a version control provider to connect

Choose the version control provider you would like to connect.



GitHub Application Registration – Client Secret

You can list your application in the [GitHub Marketplace](#) so that other users can discover it.

List this application in the Marketplace

0 users

Revoke all user tokens


Client ID

53c6b37f032a5c921a74


Client secrets

Generate a new client secret

Make sure to copy your new client secret now. You won't be able to see it again.



Client secret

✓ aee5d4fdd0d5e857f1c986cafbcd18ef4c64fc8 

Added now by ansood

Never used

You cannot delete the only client secret. Generate a new client secret first.

Delete

GitHub Application Registration – Authorize..

Add VCS Provider

To connect workspaces, modules, and policy sets to git repositories containing Terraform configurations, Terraform Cloud needs access to your version control system (VCS) provider. Use this page to configure OAuth authentication with your VCS provider. For more information, please see the Terraform Cloud documentation on [Configuring Version Control Access](#).

1 Connect to VCS 2 **Set up provider** 3 Set up SSH keypair

Set up provider

For additional information about connecting to GitHub.com to Terraform Cloud, please read our [documentation](#).

1. On GitHub, [register a new OAuth Application](#). Enter the following information:

Application name: Terraform Cloud (cxpmtteam) Copied!

Homepage URL: <https://app.terraform.io> Copied!

Application description: Any description of your choice

Authorization callback URL: <https://app.terraform.io/auth/cc1d1962-7eb1-4f7e-8827-77ecc898140c/callback> Copied!

2. After clicking the "Register application" button, you'll be taken to the new application's page. Enter the Client ID below:

Name

ist-demo-github

An optional display name for your VCS Provider. This is helpful if you will be configuring multiple instances of the same provider.

Client ID

53c6b37f032a5c921a74




3. Next, generate a new client secret and enter the value below:

Client Secret


aae5d4fd0d5e85711c986cafbcdb18ef4c64fc8


< Back Cancel **Connect and continue**


Authorize Terraform Cloud (cxpmtteam)

Terraform Cloud (cxpmtteam) by ansood
wants to access your ansood account


 **Repository webhooks and services**
Admin access


 **Repositories**
Public and private


 **Personal user data**
Full access

Cancel **Authorize ansood**

Authorizing will redirect to
<https://app.terraform.io>

 Not owned or operated by GitHub

 Created less than a day ago

 Fewer than 10 GitHub users

Setup TFC Workspace

Setup TFC Workspace with VCS

Create a new Workspace

Workspaces determine how Terraform Cloud organizes infrastructure. A workspace contains your Terraform configuration (infrastructure as code), shared variable values, your current and historical Terraform state, and run logs. [Learn more](#) about workspaces in Terraform Cloud.



Choose Type



Connect to VCS



Choose a repository



Configure settings

Choose a repository

Choose the repository that hosts your Terraform source code. We'll watch this for commits and pull requests.

Don't have a repo? Here's an [example repo](#) you can copy to get started.

5 repositories

Filter

acme-corp/infrastructure

ansood/cx-pm-tfc-demo



ansood/intersight_terraform_provider_demo



ansood/hashicat-aws



ansood/terraform-aws-s3-bucket

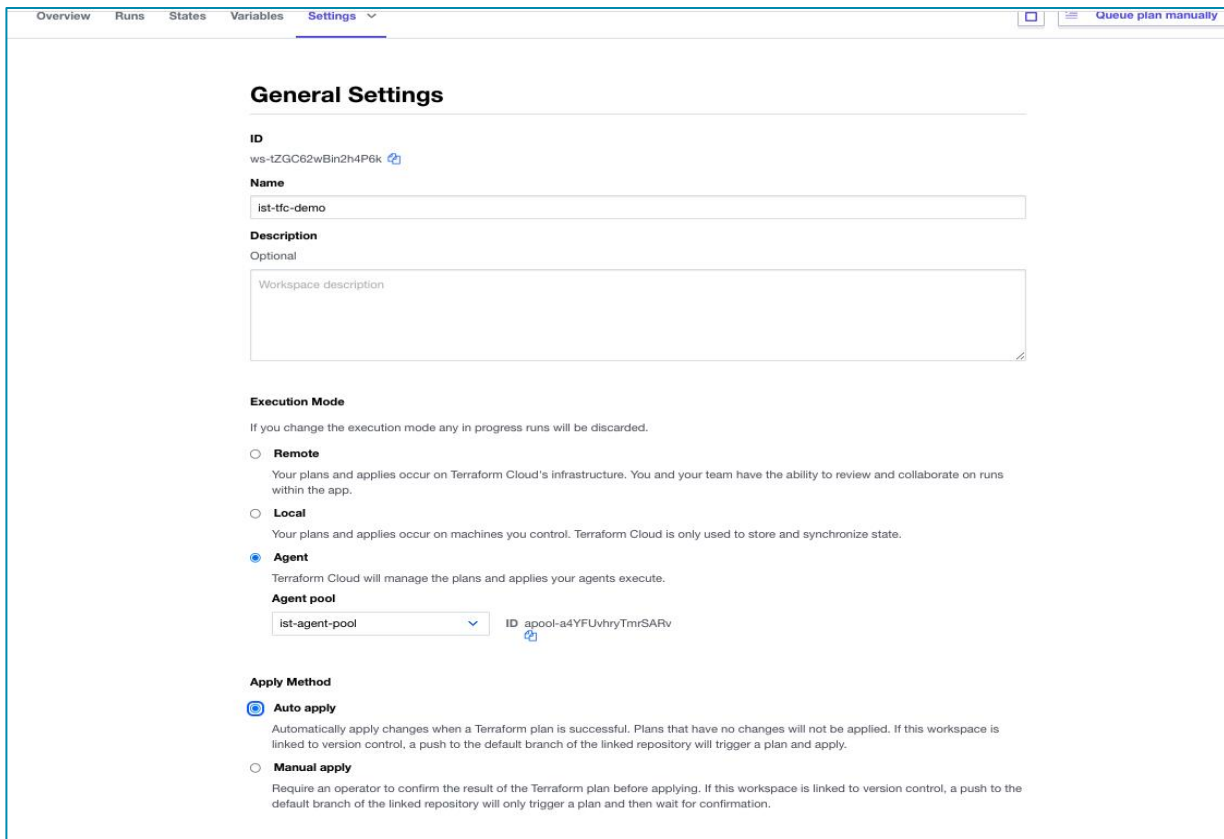


ansood/tfc-workshops-sentinel



Can't see your repository? Enter its ID below, e.g. `acme-corp/infrastructure` :

Setup TFC Workspace with IST Agents



The screenshot shows the 'Settings' tab of a Terraform Cloud workspace. The 'General Settings' section includes an 'ID' field with a copy icon, a 'Name' field containing 'ist-tfc-demo', and a 'Description' field with the placeholder text 'Workspace description'. The 'Execution Mode' section has three radio buttons: 'Remote', 'Local', and 'Agent' (which is selected). Below 'Agent' is a note about Terraform Cloud managing plans and agents. The 'Agent pool' is set to 'ist-agent-pool' with a dropdown arrow, and its ID is 'apool-a4YFUvhyTmrSARv' with a copy icon. The 'Apply Method' section has two radio buttons: 'Auto apply' (selected) and 'Manual apply'. The 'Auto apply' section explains that plans with no changes are not applied, and pushes to the default branch trigger a plan and apply. The 'Manual apply' section explains that pushes to the default branch trigger a plan and wait for confirmation.

Overview Runs States Variables Settings Queue plan manually

General Settings

ID
ws-tZGC62wBin2h4P6k

Name
ist-tfc-demo

Description
Optional
Workspace description

Execution Mode
If you change the execution mode any in progress runs will be discarded.

☐ Remote
Your plans and applies occur on Terraform Cloud's infrastructure. You and your team have the ability to review and collaborate on runs within the app.

☐ Local
Your plans and applies occur on machines you control. Terraform Cloud is only used to store and synchronize state.

☒ Agent
Terraform Cloud will manage the plans and applies your agents execute.

Agent pool
ist-agent-pool ID: apool-a4YFUvhyTmrSARv

Apply Method
☒ Auto apply
Automatically apply changes when a Terraform plan is successful. Plans that have no changes will not be applied. If this workspace is linked to version control, a push to the default branch of the linked repository will trigger a plan and apply.

☐ Manual apply
Require an operator to confirm the result of the Terraform plan before applying. If this workspace is linked to version control, a push to the default branch of the linked repository will only trigger a plan and then wait for confirmation.

Provision On-prem Infrastructure via TFC

HCL Infrastructure Code

The screenshot shows a GitHub repository page for 'alanchen2/cx-pm-tfc-demo'. The repository is public and forked from 'ansood/cx-pm-tfc-demo'. The main branch is 'main', and the selected file is 'terraform.tfvars.json'. The commit history shows a recent update by 'alanchen2' with the latest commit '14ab2aa' made 5 hours ago. The file content is a JSON configuration for Terraform, defining provider, template, and services. The file is 19 lines long (18 sloc) and 563 bytes.

```
1 {
2   "provider_name": "vmware",
3   "template": "CentOS7",
4
5   "services": [
6     {
7       "dc_name": "MediaPod",
8       "cluster_name": "General-Purpose",
9       "datastore_name": "MP-NFS-1_Shared",
10      "pool": "IST-TRAINING",
11      "servicecategory": "VM",
12      "service_name": "ist-demo",
13      "instance_count": "2",
14      "network": "dvSwitch/dv_VL041_CC-Deploy-1",
15      "num_cpus": "1",
16      "memory": "1024"
17    }
18  ]
19 }
```

Verify Execution of Terraform Workflow

Overview **Runs** States Variables Settings ▾

Queue plan manually ▾

Current Run

 **instance count changed to 1** CURRENT

#run-S7pSzbsH3wh6jCLf | ansood triggered from GitHub | Branch `main` | `ae7fed5`

APPLYING a minute ago

Run List

Next Step

DevNet Infrastructure as Code Developer Center

A central hub for all developer resources for “Infrastructure as Code”



Learning
Labs

Learning Labs

- Start automating Cisco ACI with Terraform
- Application and network policy with Terraform
- Terraform + Intersight



Sandbox

Sandbox

- ACI always-on Sandbox
- Intersight + Terraform Sandbox



Sample
Code



Terraform
Providers

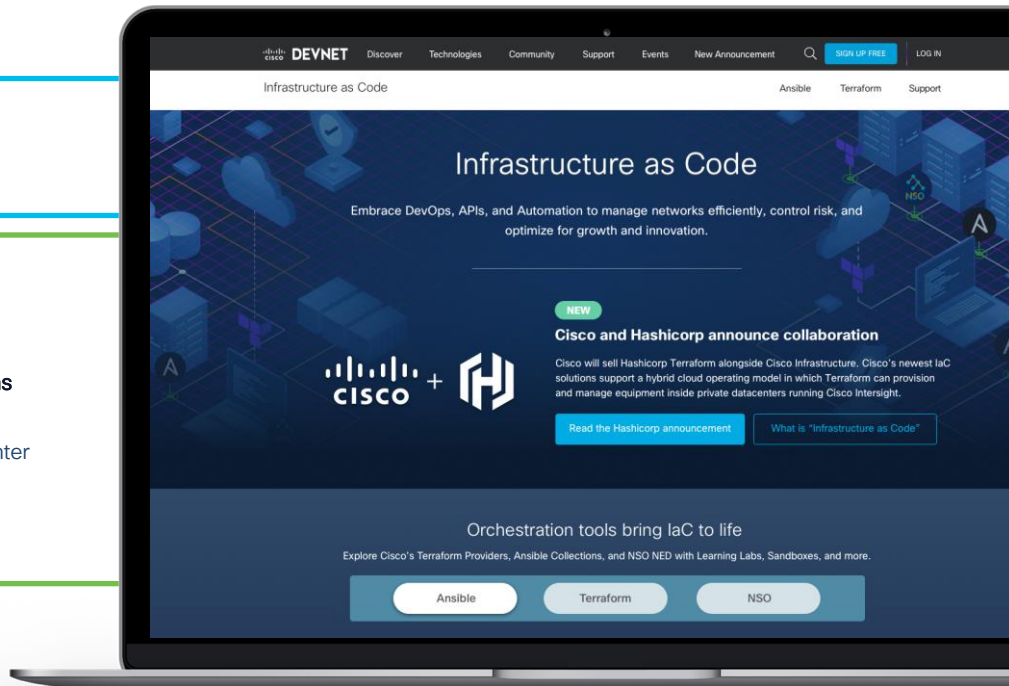
Providers

- Cisco DNA Center
- ACI
- Intersight
- MSO



Ansible
Collections

developer.cisco.com/iac



Technical Session Surveys

- Attendees who fill out a minimum of four session surveys and the overall event survey will get Cisco Live branded socks!
- Attendees will also earn 100 points in the Cisco Live Game for every survey completed.
- These points help you get on the leaderboard and increase your chances of winning daily and grand prizes.



Cisco Learning and Certifications

From technology training and team development to Cisco certifications and learning plans, let us help you empower your business and career. www.cisco.com/go/certs

Pay for Learning with Cisco Learning Credits

(CLCs) are prepaid training vouchers redeemed directly with Cisco.



Learn

Cisco U.

IT learning hub that guides teams and learners toward their goals

Cisco Digital Learning

Subscription-based product, technology, and certification training

Cisco Modeling Labs

Network simulation platform for design, testing, and troubleshooting

Cisco Learning Network

Resource community portal for certifications and learning



Train

Cisco Training Bootcamps

Intensive team & individual automation and technology training programs

Cisco Learning Partner Program

Authorized training partners supporting Cisco technology and career certifications

Cisco Instructor-led and Virtual Instructor-led training

Accelerated curriculum of product, technology, and certification courses



Certify

Cisco Certifications and Specialist Certifications

Award-winning certification program empowers students and IT Professionals to advance their technical careers

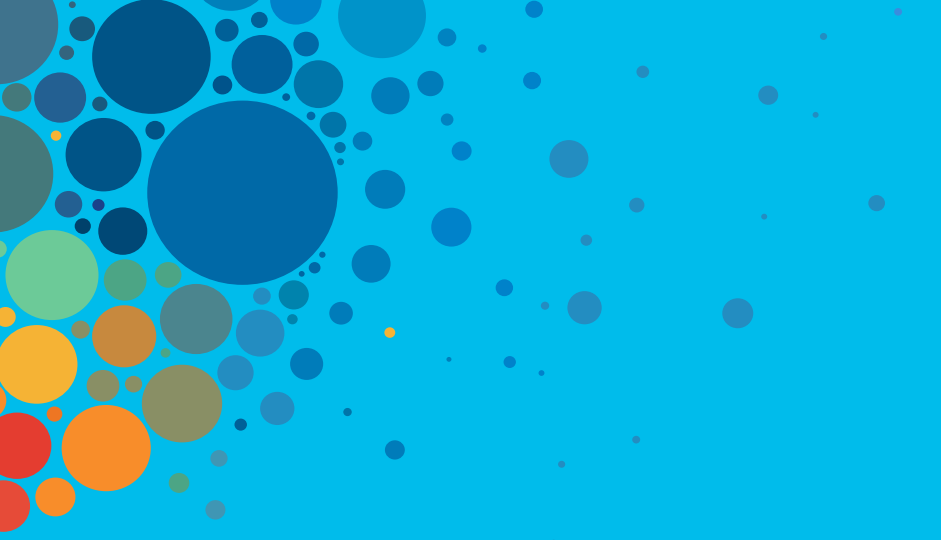
Cisco Guided Study Groups

180-day certification prep program with learning and support

Cisco Continuing Education Program

Recertification training options for Cisco certified individuals

Here at the event? Visit us at **The Learning and Certifications lounge at the World of Solutions**



Continue your education

- Visit the Cisco Showcase for related demos
- Book your one-on-one Meet the Engineer meeting
- Attend the interactive education with DevNet, Capture the Flag, and Walk-in Labs
- Visit the On-Demand Library for more sessions at www.CiscoLive.com/on-demand



The bridge to possible

Thank you

CISCO *Live!*



#CiscoLive