

# An Introduction to Infrastructure Deployment on vSphere

With Terraform

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StephanMcTighe.com



VMware  
vSphere®

# Stephan McTighe

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## Socials

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## Experience

15 Years in IT, with Ops, Engineering and Design

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VCAP DCV Design  
VCP DCV & VCP VMware Cloud  
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# Agenda

What is IaC?

How can Terraform help?

Terraform Components

Deploying and Modifying Virtual Machines

Deploying Port Groups

Deploying Tags & Tag Categories

Assigning Object Permissions

3 Tier Application

What Next?

# What is Infrastructure as Code?

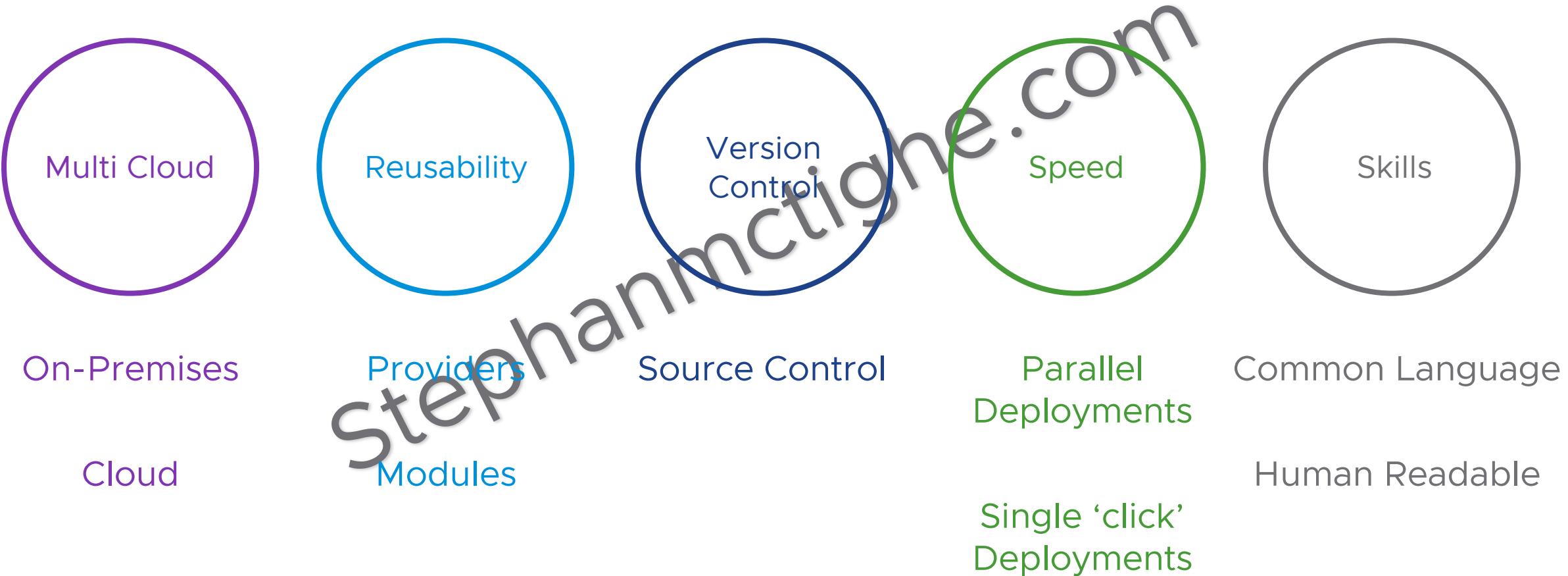
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Infrastructure as Code (IaC) is the managing and provisioning of infrastructure through code instead of through manual processes

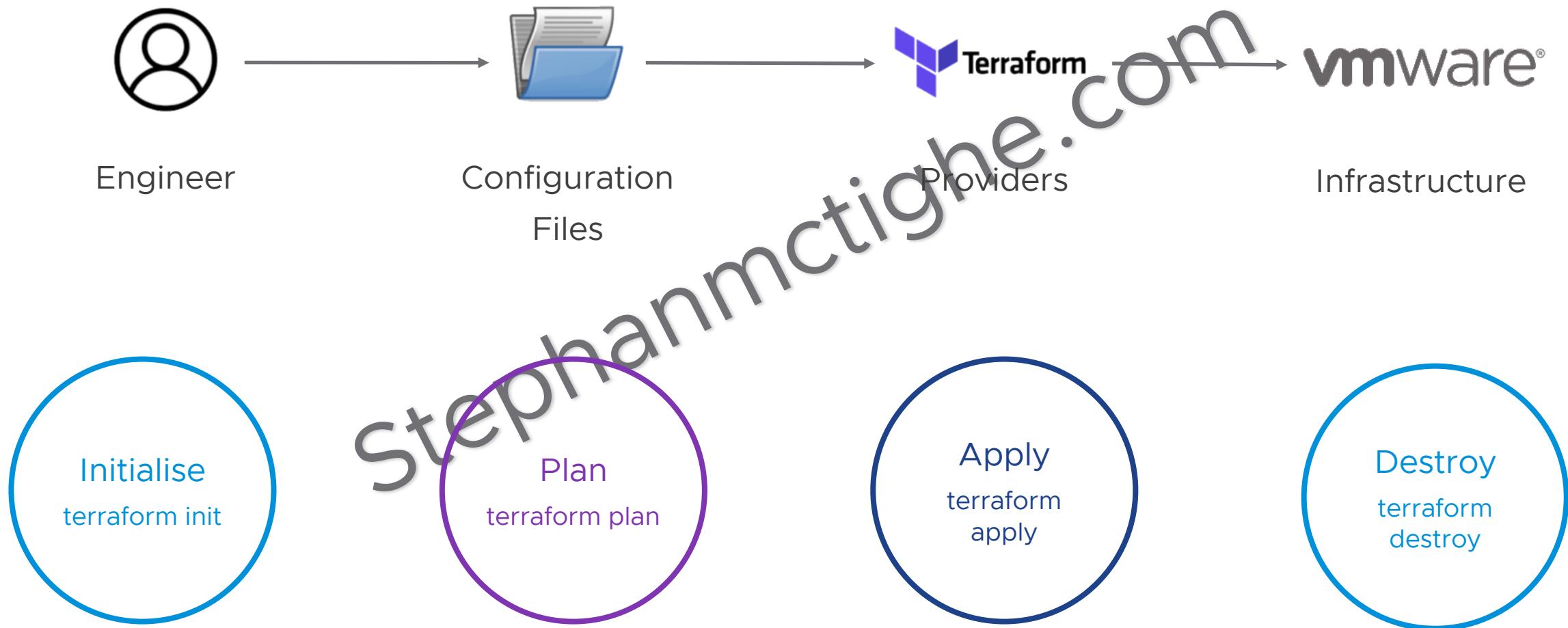
Stephan mctigh



# How can Terraform Help?



# Basic Workflow



# Terraform Components

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# Terraform Components

Executable



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# Terraform Components

## Providers

Providers are plugins that Terraform uses to communicate/interact with an infrastructure platforms via API.

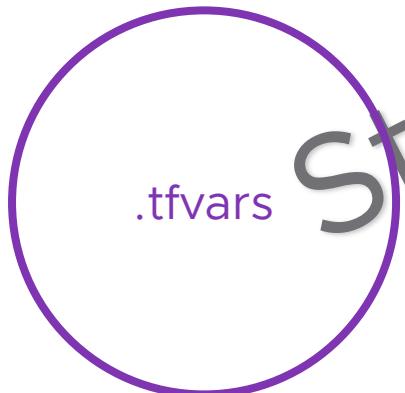
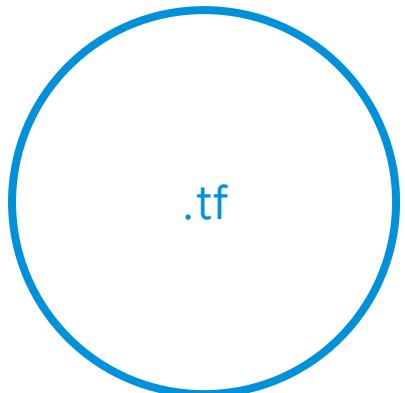


vmware  
OPEN SOURCE



# Terraform Components

## Configuration Files



```
#Datacenter
data "vsphere_datacenter" "datacenter" {
  name = "sfo-m01-dc01"
}

#Datastore
data "vsphere_datastore" "datastore" {
  name      = "sfo-m01-cl01-ds-vsan01"
  datacenter_id = data.vsphere_datacenter.datacenter.id
}

#Cluster
data "vsphere_compute_cluster" "cluster" {
  name      = "sfo-m01-cl01"
  datacenter_id = data.vsphere_datacenter.datacenter.id
}

#PortGroups
data "vsphere_network" "network" {
  name      = "sfo01-m01-cl01-vds01-pg-web"
  datacenter_id = data.vsphere_datacenter.datacenter.id
}

#Content Library
data "vsphere_content_library" "library" {
  name = "Subscribed"
}
```



# Terraform Components

## State Files



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```
"resources": [
  {
    "mode": "data",
    "type": "vsphere_datacenter",
    "name": "datacenter",
    "provider": "provider[\"registry.terraform.io/hashicorp/vsphere\"]",
    "instances": [
      {
        "schema_version": 0,
        "attributes": {
          "id": "datacenter-3",
          "name": "sfo-m01-dc01"
        },
        "sensitive_attributes": []
      }
    ]
  }
],
```



# Deploying & Modifying VM's

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File Edit Selection View Go Run Terminal Help 011-deploy-vm.tf - git-repo - Visual Studio Code [Administrator] 🔍

EXPLORER

GIT-REPO

- presentations
- .terraform
- environment
- > test
- vmug-uk-usercon-2022
- > 01-deploy-and-modify
- 011-deploy-vm.tf
- > 02-deploy-port-groups
- > 03-deploy-tags
- > 04-permissions
- > 05-application-abc
- .gitignore
- README.md
- README.md

011-deploy-vm.tf

```
39
40 #Resources
41 resource "vsphere_virtual_machine" "vm" {
42   name          = "vm-01"
43   resource_pool_id = data.vsphere_compute_cluster.cluster.resource_pool_id
44   datastore_id    = data.vsphere_datastore.datastore.id
45
46   num_cpus        = "1"
47   num_cores_per_socket = "1"
48   memory          = "2048"
49   guest_id        = "vmwarePhoton64Guest"
50   firmware         = "efi"
51   hardware_version = 19
52   network_interface {
53     network_id      = data.vsphere_network.network.id
54     adapter_type    = "vmxnet3"
55   }
56   clone {
57     template_uuid = data.vsphere_content_library_item.template.id
58     timeout        = 60
59     customize {
60       timeout = 30
61       linux_options {
62         host_name = "vm-01"
63         domain    = "corp.local"
64       }
65     }
66   }
67 }
```

PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE

PS C:\DATA\git-repo\presentations\vmug-uk-usercon-2022\01-deploy-and-modify> t

vSphere - sfo-m01-cl01 - VMs VMware NSX | Login 🔍 Paused Update

iMacros CloudBuilder SDDC Manager NSX 01

vSphere Client Q Administrator@VSPHERE.LOCAL

sfo-m01-cl01 ACTIONS

Summary Monitor Configure Permissions Hosts VMs Datastores Networks Updates

Virtual Machines VM Templates vApps Filter

EXPORT

No items found

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Name	State	Status	Provisioned Space	Used Space	Host
nsx01	Powered ...	Normal	600.63 GB	181.23 GB	6.7%
nsx02	Powered ...	Normal	600.66 GB	179.2 GB	5.5%
nsx01c	Powered ...	Normal	600.67 GB	174.88 GB	6.2%
sddc01	Powered ...	Normal	1.61 TB	123.55 GB	143.0%
vc-l-01a	Powered ...	Normal	1.39 TB	151.47 GB	1.24%
vCLS-2f6edc8d-666d-4996-9...	Powered ...	Normal	4.61 GB	1.95 GB	0 H%
vCLS-49e9fdb-675-49cd-8...	Powered ...	Normal	2.2 GB	812.24 MB	0 H%
vCLS-74e89dce-9f04-4b12-9...	Powered ...	Normal	4.59 GB	1.91 GB	0 H%

# Deploying Port Groups

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The image shows a dual-monitor setup. The left monitor displays a Visual Studio Code (VS Code) interface. In the center-left, there's a file tree under 'GIT-REPO' with a selected file '021-deploy-port-groups.tf'. The main area of VS Code shows the following Terraform code:

```
1 #Providers
2 provider "vsphere" {
3     vsphere_server = "vc-l-01a.corp.local"
4     user           = "administrator@vsphere.local"
5     password       = "VMware1!"
6     allow_unverified_ssl = "true"
7 }
8
9 #Resources
10 data "vsphere_datacenter" "datacenter" {
11     name = "sfo-m01-dc01"
12 }
13 data "vsphere_distributed_virtual_switch" "vds" {
14     name          = "sfo-m01-cl01-vds01"
15     datacenter_id = data.vsphere_datacenter.datacenter.id
16 }
17 resource "vsphere_distributed_port_group" "pg101" {
18     name          = "sfo01-m01-cl01-vds01-pg-app"
19     distributed_virtual_switch_uuid = data.vsphere_distributed_virtual_switch.id
20     vlan_id       = 101
21 }
22 resource "vsphere_distributed_port_group" "pg102" {
23     name          = "sfo01-m01-cl01-vds01-pg-db"
24     distributed_virtual_switch_uuid = data.vsphere_distributed_virtual_switch.id
25     vlan_id       = 102
26 }
```

The bottom of the VS Code window shows tabs for PROBLEMS, OUTPUT, TERMINAL, and DEBUG CONSOLE. The TERMINAL tab is active, showing a PowerShell prompt (PS) at C:\DATA\git-repo\presentations\vmug-uk-usercon-2022\02-deploy-port-groups>.

The right monitor displays the vSphere Client interface. The title bar says 'vSphere - sfo-m01-cl01-vds01 - VMware NSX | Login'. A message at the top states: 'Not secure | https://vc-l-01a.corp.local/ui/app/dvs:nav=n/urn:vmomi:VmwareDistributedVirtualSwitch:dvs-10:3ab31589-71a5-49c4-9...'. Below this, it says 'This vCenter Server is managed by SDDC Manager (sddc01.corp.local). Making modifications directly in vCenter Server may break SDDC Manager workflows. PL...'.

The main pane shows the 'sfo-m01-cl01-vds01' distributed virtual switch configuration. It lists several port groups: 'sfo-m01-cl01-vds-DVUplinks-10', 'sfo01-m01-cl01-vds01-pg-mgmt', 'sfo01-m01-cl01-vds01-pg-motion', 'sfo01-m01-cl01-vds01-pg-vsphere', and 'sfo01-m01-cl01-vds01-pg-web'. The 'Switch Details' section shows the manufacturer as 'VMware, Inc.' and version as '7.0.3'. The 'Features' section is empty. The 'Custom Attributes' section also has no items.

At the bottom of the vSphere Client window, there are tabs for 'Recent Tasks' and 'Alarms'. The 'Recent Tasks' tab is active, showing a table with columns: Task Name, Target, Status, Details, Initiator, Queued For, and Start Time. The table is currently empty, displaying the message 'No items found'.

# Deploying Tags & Tag Categories

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File Edit Selection View Go Run Terminal Help git-repo - Visual Studio Code [Administrator]

vSphere - Tags VMware NSX | Login

EXPLORER GIT-REPO presentations .terraform environment test vmug-uk-usercon-2022 01-deploy-and-modify 02-deploy-port-groups 03-deploy-tags 031-tag-categories.tf 032-tags.tf 033-providers.tf 034-vars.tfvars 04-permissions 05-application-abc .gitignore README.md README.md

Show All Commands Ctrl + Shift + P Go to File Ctrl + P Find in Files Ctrl + Shift + F Start Debugging F5 Toggle Terminal Ctrl +

TERMINAL DEBUG CONSOLE pwsh + x

PS C:\DATA\git-repo\presentations\vmug-uk-usercon-2022\03-deploy-tags>

vSphere Client Tags & Custom Attributes Tags Custom Attributes TAGS CATEGORIES NEW EDIT DELETE ADD PERMISSION Tag Name Category Description No items found

Recent Tasks Alarms Task Name Target Status Details Initiator Queued For Start Time No items found

All More Tasks

Paused Update

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# Assigning Object Permissions

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File Edit Selection View Go Run Terminal Help 041-object-permissions.tf - git-repo - Visual Studio Code [Administrator]

EXPLORER

GIT-REPO

- presentations
- .terraform
- environment
- > test
- vmug-uk-usercon-2022
- > 01-deploy-and-modify
- > 02-deploy-port-groups
- > 03-deploy-tags
- > 04-permissions
- 041-object-permissions.tf
- 042-variables.tf
- 043-providers.tf
- 044-vars.fvars
- > 05-application-abc
- .gitignore
- README.md
- README.md

041-object-permissions.tf

```
presentations > vmug-uk-usercon-2022 > 04-permissions > 041-object-permissions.tf > data "vsphere_role" "administrator"
  name = var.vsphere_datacenter
}

data "vsphere_virtual_machine" "vm" {
  name      = var.virtual_machine_name
  datacenter_id = data.vsphere_datacenter.dc.id
}

data "vsphere_role" "administrator" {
  label = var.administrator_role
}

#Resources
resource "vsphere_role" "custom" {
  name      = var.custom_role
  role_privileges = [
    "VirtualMachine.Interact.AnswerQuestion",
    "VirtualMachine.Interact.ConsoleInteract",
    "VirtualMachine.Interact.DeviceConnection",
    "VirtualMachine.Interact.PowerOff",
    "VirtualMachine.Interact.PowerOn",
    "VirtualMachine.Interact.Reset",
    "VirtualMachine.Interact.SetCDMedia",
    "VirtualMachine.Interact.SetFloppyMedia",
    "VirtualMachine.Interact.Suspend",
  ]
}
```

PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE

PS C:\DATA\git-repo\presentations\vmug-uk-usercon-2022\04-permissions>

vSphere - Roles x VMware NSX | Login x +

Not secure | https://vc-l-01a.corp.local/ui/app/admin/roles

iMacros CloudBuilder SDDC Manager NSX 01

vSphere Client Q

Administration

Access Control

Roles

Global Permissions

Licensing

Licenses

Solutions

Client Plugins

vCenter Server Extensions

Deployment

System Configuration

Customer Experience Improvement Program

Client Configuration

Support

Upload File to Service Request

Single Sign On

Users and Groups

Configuration

Certificates

Certificate Management

Administrator

Read-only

No access

Auto UpdateUser

Clone of Read-only

Content library administrator (sample)

Content Library Registry administrator (sample)

Datastore consumer (sample)

Network administrator (sample)

No cryptography administrator

No Trusted Infrastructure administrator

NSOperatorController

NSX Administrator

NSX Auditor

NSX VI Administrator

Resource pool administrator (sample)

SupervisorService Cluster Operator

SupervisorService Operator

SupervisorService RootFolder Operator

SyncUsers

Tagging Admin

Trusted Infrastructure administrator

vCLSAdmin

vSphere Client Recent Tasks Alarms

Task Name Target Status Details Initiator Queued For

Power On virtual machine	vm-01	Completed	VSPHERE.LOCAL\Administrator	17 ms
Customize virtual machine guest OS	vm-01	Completed	VSPHERE.LOCAL\Administrator	13 ms
Upgrade VM compatibility	vm-01	Completed	VSPHERE.LOCAL\Administrator	13 ms
Reconfigure virtual machine	vm-01	Completed	VSPHERE.LOCAL\Administrator	13 ms
Transfer file(s)	esx-01a.corp.local	Completed	VSPHERE.LOCAL\vpwdx-extensi...	12 ms
Fetch Content of a library Item	PhotonOS3.0_OVA	Completed	vSphere Local\vpwdx-extensi...	80 ms

All More Tasks

Administrator@VSPHERE LOCAL

vSphere Client

Administrator@VSPHERE LOCAL

vCenter Server: vc-l-01a.corp.local

DESCRIPTION USAGE PRIVILEGES

Defined In User/Group

vc-l-01a.corp.local VSPHERE.LOCAL\vpwdx-extension-84711671-a50f-49d4-8535-9a9e-000000000000

vc-l-01a.corp.local VSPHERE.LOCAL\vpwdx-84711671-a50f-49d4-8535-9a9e-000000000000

vc-l-01a.corp.local VSPHERE.LOCAL\svc-nsx01-vc-l-01a

vc-l-01a.corp.local VSPHERE.LOCAL\Administrator

vc-l-01a.corp.local VSPHERE.LOCAL\Administrator

vc-l-01a.corp.local VSPHERE.LOCAL\SDDCAdmins

vc-l-01a.corp.local VSPHERE.LOCAL\Administrators

7 items

# 3 Tier Application

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The image shows a dual-monitor setup. The left monitor displays a Visual Studio Code interface with a dark theme. In the center-left panel, there's a tree view labeled "GIT-REPO" containing several Terraform configuration files and other files like ".gitignore" and "README.md". Below this is a code editor showing a Terraform script named "051-main.tf". The script defines resources such as datacenters, datastores, clusters, content libraries, and templates. The right side of the VS Code interface has tabs for "PROBLEMS", "OUTPUT", "TERMINAL", and "DEBUG CONSOLE". The "TERMINAL" tab is active, showing a PowerShell prompt at the bottom: "PS C:\DATA\git-repo\presentations\vmug-uk-usercon-2022\05-application-abc> h". The bottom status bar indicates the file is 23 lines long, 21 columns wide, uses 2 spaces, and is in UTF-8 encoding.

The right monitor displays the vSphere NSX-T management interface. The URL is <https://nsx01.corp.local/nsx/#/app/networks/load-balancing/home/virtual-servers>. The interface has a top navigation bar with "NSX" and "Paused" status. It features a sidebar with sections like "Home", "Networking", "Security", "Inventory", "Plan & Troubleshoot", and "System". Under "Networking", "Load Balancing" is selected, showing sub-sections like "Network Overview", "Virtual Servers", "Server Pools", "Profiles", and "Monitors". A central table titled "ADD VIRTUAL SERVER" lists columns for Name, IP Address, Ports, Type, Load Balancer, Server Pool, Status, and Alarms. A message "Virtual Servers not found" is displayed. On the far right, there are filter and search options.

What Next?

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# Going Further...



# Questions?



# Thank You