CASO PRÁCTICO 2

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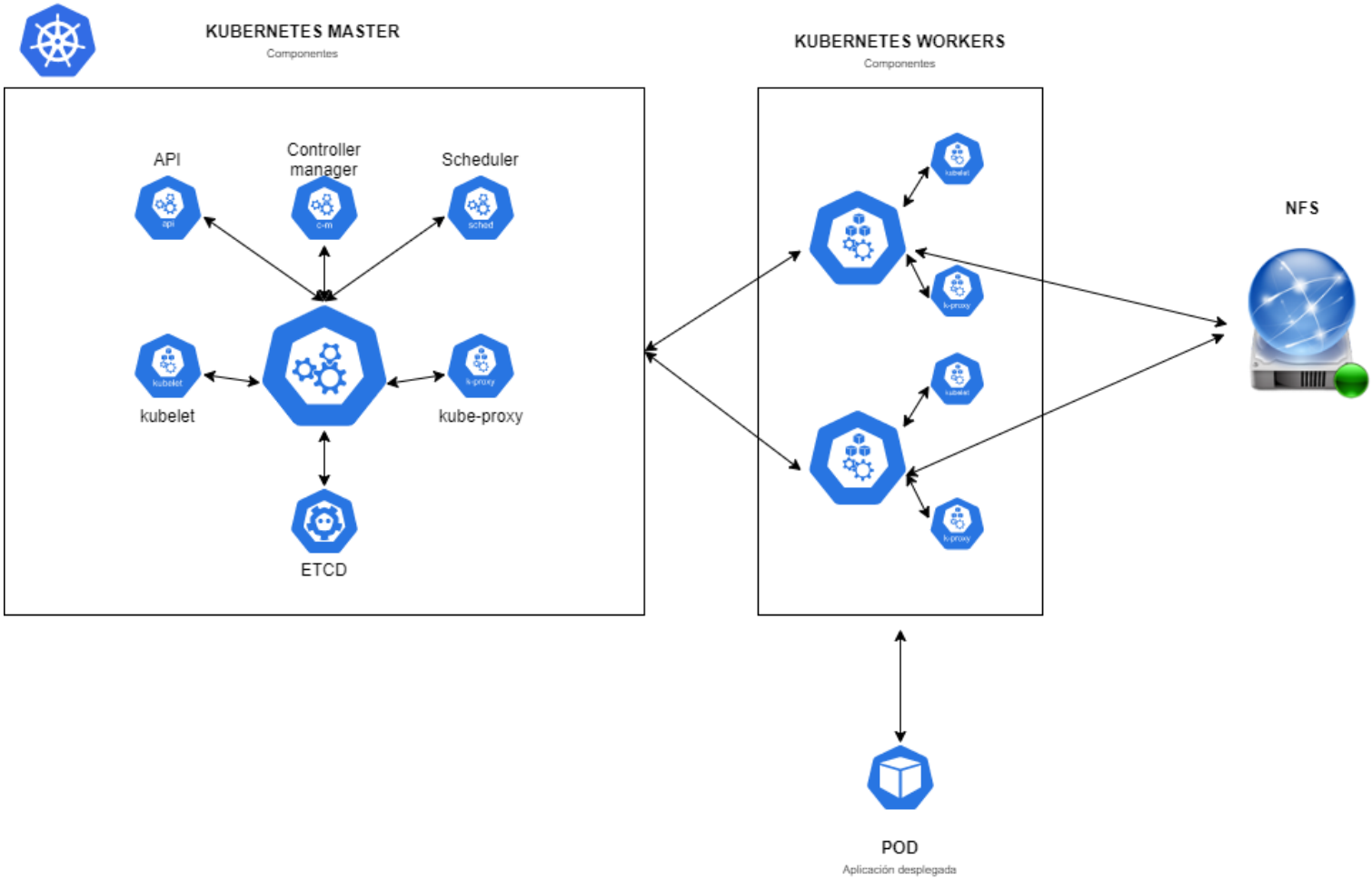
1.- DIAGRAMA


KUBERNETES MASTER
Componentes
API
Controller manager
Scheduler
kubelet
kube-proxy
ETCD
KUBERNETES WORKERS
Componentes
NFS
POD
Aplicación desplegada

2.- DESCRIPCIÓN DE LOS ELEMENTOS

- **Cluster de Kubernetes:** conjunto de nodos que ejecutan aplicaciones containerizadas. En nuestro caso se compone de 4 nodos,
    - **Master**
    - **NFS**
    - **Wokers(2)**

- **Nodo Master:** nodo que ejecuta los principales demonios de un cluster de kubernetes (apiserver, controller-manager y scheduler) Se encarga de mantener el estado deseado de todos los objetos que componen el cluster y los que se generan en la actividad diaria para su explotación.

- **Nodo NFS:** debido a las características de balanceo de contenedores de uno nodo a otro es necesario que todos ellos vean y tengan acceso a los mismos punto de almacenamiento. Para ello se ha desplegado un nodo con un servidor NFS que exportará uno o varios FS para su montaje en los workers y puedan acceder a los mismos recursos en caso de balanceo,

- **Nodos Worker:** un nodo worker ejecuta dos demonios:
    - **kubelet:** utilizado para para la comunicación con el nodo master.
    - **kube-proxy:** proxy-demonio que implementa todos los servicios de red de Kubernetes en cada nodo.

  Estos nodos ejecutan las tareas encomendadas por el master para que el estado deseado coincida con el del cluster en todo momento.

3.- DESCRIPCIÓN DEL DESPLIEGUE

Para el despliegue de la infraestructura se ha utilizado TERRAFORM. El código está compuesto de los siguientes ficheros:

vars.tf: Contiene todas las variables globales que se van a usar en el resto de ficheros.

```
variable "location" {
  type = string
  description = "Region de Azure donde se desplegara la Infraestructura"
  default = "West Europe"
}
variable "vm_size" {
  type = string
  description = "Caracteristicas de Virtual Hardware de la maquina"
  default = "Standard_D1_v2"
}
variable "vms" {
  type = list(string)
  description = "Maquinas virtuales que se crearan para el despliegue de Kubernetes"
  default = ["master","worker01","worker02","nfs"]
}
```

vm.tf: Fichero con la definición de cada VM. Este fichero será utilizado tantas veces como sea necesario como plantilla para el despliegue. A través del label count este fichero será invocado X veces, una por cada máquina de la lista almacenado en vars.tf llamada “vms”.

```
# Definicion de una VM
## Se define el virtual hardware de la misma
## Se asigna la NIC creada anteriormente con sus security rule
## Usuario administrador -> se utiliza la clave privada
## Se define el tipo de disco y su replicacion
### LRS -> Locally Redundant Storage
## Definicion de la imagen a utilizar
## storage account -> almacenamiento de informacion de troubleshooting
resource "azurerm_linux_virtual_machine" "myVM" {
  count                           = length(var.vms)
  name                            = "vm-${var.vms[count.index]}"
  resource_group_name             = azurerm_resource_group.rg.name
  location                        = azurerm_resource_group.rg.location
  size                            = var.vm_size
  admin_username                  = "adminUsername"
  network_interface_ids           = [
azurerm_network_interface.myNic[count.index].id ]
  disable_password_authentication = true
  admin_ssh_key {
    username   = "adminUsername"
    public_key = file("/home/pablo/.ssh/id_rsa.pub")
  }
  os_disk {
    caching              = "ReadWrite"
    storage_account_type = "Standard_LRS"
  }
  plan {
    name      = "centos-8-stream-free"
```

```
    product   = "centos-8-stream-free"
    publisher = "cognosys"
  }
  source_image_reference {
    publisher = "cognosys"
    offer     = "centos-8-stream-free"
    sku       = "centos-8-stream-free"
    version   = "1.2019.0810"
  }
  boot_diagnostics {
    storage_account_uri =
azurerm_storage_account.mystAccount.primary_blob_endpoint
  }


  tags = {
    environment = "CP2"
  }
}
```

security.tf: Definición del security group con todo el tráfico que será permitido a través de las reglas de seguridad.

```
# Definicion de un security group y la definicion del trafico que se permitira con sus
reglas de seguridad (security_group)

resource "azurerm_network_security_group" "mySecGroup" {

  name                = "sshtraffic"

  location            = azurerm_resource_group.rg.location

  resource_group_name = azurerm_resource_group.rg.name


  security_rule {

    name                       = "SSH"

    priority                   = 1001

    direction                  = "Inbound"

    access                     = "Allow"

    protocol                   = "Tcp"

    source_port_range          = "*"

    destination_port_range     = "22"

    source_address_prefix      = "*"

    destination_address_prefix = "*"

  }


  tags = {

    environment = "CP2"

  }

}


# Se asocia el security group a la NIC para permitir el trafico por esa interfaz

resource "azurerm_network_interface_security_group_association"
"mySecGroupAssociation" {

  count                     = length(var.vms)

  network_interface_id      = azurerm_network_interface.myNic[count.index].id

  network_security_group_id = azurerm_network_security_group.mySecGroup.id

}
```

network.tf: Definición de todos los elementos de red necesarios. Desde la red virtual hasta las IPs públicas.

```
# Creacion de red virtual sobre el grupo de recursos
resource "azurerm_virtual_network" "myNet" {
  name                = "kubernetesnet"
  address_space       = ["10.0.0.0/16"]
  location            = azurerm_resource_group.rg.location
  resource_group_name = azurerm_resource_group.rg.name

  tags = {
      environment = "CP2"
  }
}

# Creacion de una subnet dentro de la red virtual creada anteriormente
resource "azurerm_subnet" "mySubnet" {
  name                 = "terraformsubnet"
  resource_group_name  = azurerm_resource_group.rg.name
  virtual_network_name = azurerm_virtual_network.myNet.name
  address_prefixes     = ["10.0.1.0/24"]
}

# Creamos una interfaz de red con sus caracteristicas propias
resource "azurerm_network_interface" "myNic" {
  name                = "vmnic${var.vms[count.index]}"
  count               = length(var.vms)
  location            = azurerm_resource_group.rg.location
  resource_group_name = azurerm_resource_group.rg.name

  ip_configuration {
    name                          = "ipconf${var.vms[count.index]}"
    subnet_id                     = azurerm_subnet.mySubnet.id
    private_ip_address_allocation = "Static"
```

```
    private_ip_address            = "10.0.1.${count.index + 10}"
    public_ip_address_id          = azurerm_public_ip.myPublicIp[count.index].id
  }

  tags = {
      environment = "CP2"
  }
}

# Creacion de zona
resource "azurerm_dns_zone" "kubernetesDomain" {
  name                = "kubernetesdomain.com"
  resource_group_name = azurerm_resource_group.rg.name
}

# Creacion de la IP publica a utilizar por la NIC
resource "azurerm_public_ip" "myPublicIp" {
  name                = "vmip${var.vms[count.index]}"
  count               = length(var.vms)
  location            = azurerm_resource_group.rg.location
  resource_group_name = azurerm_resource_group.rg.name
  allocation_method   = "Static"
  domain_name_label   = "vm-${var.vms[count.index]}"
  sku                 = "Basic"

  tags = {
      environment = "CP2"
  }
}
```

main.tf: En el fichero main se define el proveedor en el cual se desplegará la infraestructura definida en los ficheros trf así como las credenciales necesarias para la conexión. Por último se definen dos objetos, el azurerm_resource_group, grupo de recursos donde se agruparán y almacenarán el resto de objetos que se generen, y un azurerm_storage_account donde se almacenarán todos los objetos de datos de Azure.

```
# Configuracion del provider
terraform {
  required_providers {
    azurerm = {
      source = "hashicorp/azurerm"
      version = "=2.46.1"
    }
  }
}

# Credenciales de conexion del provider a traves del service principal creado
anteriormente
provider "azurerm" {
  features {}
  subscription_id = "d89ae854-96c9-4b68-a01a-d0dbc5667745"
  client_id = "b6c49a44-8b96-44c1-96c1-8807b60e63f5"
  client_secret = "ZdFd.SyH-fs_WE3h2a4PS-.8WKSM4VDyYL"
  tenant_id = "899789dc-202f-44b4-8472-a6d40f9eb440"
}

# Creacion de grupo de recursos
resource "azurerm_resource_group" "rg" {
    name     = "kubernetes_rg"
    location = var.location

    tags = {
        environment = "CP2"
    }
}
```

```
# Creacion de storage account dentro del grupo de recursos anteriormente generado
resource "azurerm_storage_account" "mystAccount" {
    name                     = "studentstorageaccountcp2"
    resource_group_name      = azurerm_resource_group.rg.name
    location                 = azurerm_resource_group.rg.location
    account_tier             = "Standard"
    account_replication_type = "LRS"

    tags = {
        environment = "CP2"
    }
}
```

3.1- DESPLIEGUE DE KUBERNETES

En cuanto al despliegue de kubernetes se utiliza ansible a través de una serie de roles y playbooks. Los roles se implementan a través de una serie de playbooks que los invocan.

Rol: initial_configuration – Implementado por el playbook step_1.yaml

Primer rol que actúa sobre todos los nodos. Configura de manera básica todos los nodos. Se actualizan los sistemas, servicios,…

```
---
# tasks file for initial_configuration
- name: "Sudoers"
  lineinfile:
    path: "/etc/sudoers"
    insertafter: '^root'
    line: 'adminUsername        ALL=(ALL)       NOPASSWD: ALL'
    validate: '/usr/sbin/visudo -cf %s'

- name: "Actualizacion del Sistema al ultimo nivel"
  dnf:
    name: "*"
    state: latest

- name: "Configuramos zona horaria"
  timezone:
    name: Europe/Madrid

- name: "Instalacion paqueteria"
  dnf:
    name:
```

```
      - chrony
      - nfs-utils
      - nfs4-acl-tools
      - wget
      - iproute-tc
    state: present

- name: "Habilitar y arrancar chrony"
  service:
    name: chronyd
    state: started
    enabled: true
    daemon_reload: true

- name: "Habilitar NTP"
  command: timedatectl set-ntp true
  register: rc

- name: "Debug NTP"
  fail:
    msg: "ERROR - Fallo en la configuracion de NTP"
  when: rc.rc != 0

- name: "Desactivar Selinux"
  replace:
    path: /etc/selinux/config
    regexp: '=enforcing'
    replace: '=disabled'
```

```
    backup: yes

- name: "Comprobar necesidad de reinicio"
  command: needs-restarting -r
  register: needs_reboot
  ignore_errors: yes

- name: "Debug NEEDS-RESTARTING"
  debug:
    var: needs_reboot.rc

# async y poll para permitir desengancharse
- name: "Reinicio del Servidor"
  command: shutdown -r now
  async: 30
  poll: 0
  when: needs_reboot.rc == 1

- name: "Cierre de conexion"
  pause:
    seconds: 30
  when: needs_reboot.rc == 1

- name: "PAUSA"
  pause:
    seconds: 60
```

Rol: deploy_nfs – Implementado por el playbook step_2.yaml

Despliega y configura el nfs sobre el nodo master.

```
---
# tasks file for deploy_nfs
- name: "Obtener el disco dado"
  shell: "lsblk | grep 'disk' | grep '{{ disk_gb }}G' | awk '{print $1}'"
  register: disk

- name: "DEBUG - disco"
  debug:
    msg: "DISCO: {{ disk.stdout }}"

- name: "LVG - Creacion de LVG"
  lvg:
    vg: vg_nfs
    pvs: "/dev/{{ disk.stdout }}"

- name: "LVOL - Crear LVOL sobre LVG"
  lvol:
    vg: vg_nfs
    lv: lv_nfs
    size: 5120

- name: "FILESYSTEM | Crear FS sobre el LVOL"
  filesystem:
    fstype: xfs
    dev: /dev/mapper/vg_nfs-lv_nfs
    force: true

- name: "MOUNT | Montar FS"
  mount:
    path: /srv/nfs
    src: /dev/mapper/vg_nfs-lv_nfs
    fstype: xfs
```

```
    state: mounted
    opts: defaults

- name: "Instalacion paqueteria"
  dnf:
    name:
      - net-tools
      - nfs-utils
    state: present

- name: "Habilitar y arrancar nfs-server"
  service:
    name: nfs-server
    state: started
    enabled: true
    daemon_reload: true

- name: "Creacion del fichero exports"
  copy:
    dest: /etc/exports
    content: |
      /srv/nfs  10.0.1.11(rw,sync)
      /srv/nfs  10.0.1.12(rw,sync)
    mode: 0644
    owner: root
    group: root

- name: "Recargar el fichero exports"
  command: "exportfs -r"
  register: exports

- name: "DEBUG - exports"
  fail:
    msg: "DEBUG - Fallo en la recarga del fichero exports"
```

```
  when: exports.rc != 0

- name: "Firewall"
  firewalld:
    zone: dmz
    service: "{{ item }}"
    permanent: yes
    state: enabled
  with_items:
    - nfs
    - rpc-bind
    - mountd

- name: "Recargar servicio firewalld"
  service:
    name: firewalld
    state: restarted
    enabled: true
    daemon_reload: true
```

Rol: common_tasks – Implementado por el playbook step_3.yaml

Rol encargado de aplicar una configuración común a todos los nodos.

```
---
# tasks file for common_tasks
- name: "Creacion fichero hosts"
  copy:
    dest: /etc/hosts
    content: |
      10.0.1.10 vm-master vm-master.kubernetes-domain.com
      10.0.1.20 vm-nfs vm-nfs.kubernetes-domain.com
      10.0.1.30 vm-worker01 vm-worker01.kubernetes-domain.com
      10.0.1.40 vm-worker02 vm-worker02.kubernetes-domain.com
    mode: 0644
    owner: root
    group: root


- name: "Aseguramos servicio firewalld"
  service:
    name: firewalld
    state: started
    enabled: true
    daemon_reload: true


- name: "Habilitar transparent masquerading"
  shell: "modprobe br_netfilter && firewall-cmd --add-masquerade --permanent &&
firewall-cmd --reload"
  register: transparent


- name: "DEBUG - transparent masquerading"
  fail:
    msg: "DEBUG - Se ha producido un fallo a la hora de habilitar transparent
masquerading"
  when: transparent.rc != 0
```

```
- name: "Creacion fichero k8s.conf"
  copy:
    dest: /etc/sysctl.d/k8s.conf
    content: |
      net.bridge.bridge-nf-call-ip6tables = 1
      net.bridge.bridge-nf-call-iptables = 1
    mode: 0644
    owner: root
    group: root

- name: "Fichero k8s.conf"
  sysctl:
    name: "{{ item }}"
    value: '1'
    sysctl_file: /etc/sysctl.d/k8s.conf
    reload: true
  with_items:
    - net.bridge.bridge-nf-call-ip6tables
    - net.bridge.bridge-nf-call-iptables

- name: "Desactivamos la SWAP"
  command: swapoff -a
  register: swap

- name: "DEBUG - SWAP"
  fail:
    msg: "DEBUG - Se ha producido un fallo a la hora de deshabilitar la SWAP"
  when: swap.rc != 0

- name: "Eliminamos la SWAP del fichero /etc/fstab"
  replace:
    path: /etc/fstab
    regexp: '^(\s*)([^#\n]+\s+)(\w+\s+)swap(\s+.*)$'
    replace: '#\1\2\3swap\4'
```

```
    backup: true


- name: "Repositorio de docker"

  shell: "dnf config-manager --add-
repo=https://download.docker.com/linux/centos/docker-ce.repo"

  register: repo_add


- name: "DEBUG - Repositorio Docker"

  fail:

    msg: "DEBUG - Se ha producido un fallo a la hora de habilitar el repositorio de
docker"

  when: repo_add.rc != 0


- name: "Instalacion de paqueteria docker"

  dnf:

    name: docker-ce

    state: latest


- name: "Arrancar y habilitar docker"

  service:

    name: docker

    state: started

    enabled: true

    daemon_reload: true


- name: "Repositorio de kubernetes"

  yum_repository:

    name: kubernetes

    description: Kubernetes repo

    baseurl: https://packages.cloud.google.com/yum/repos/kubernetes-el7-x86_64

    gpgcheck: true

    enabled: true

    repo_gpgcheck: true

    gpgkey: https://packages.cloud.google.com/yum/doc/yum-key.gpg
https://packages.cloud.google.com/yum/doc/rpm-package-key.gpg
```

```
    exclude: kubelet kubeadm kubectl

- name: "Instalacion kubernetes"
  dnf:
    name: "{{ item }}"
    state: present
    disable_excludes: kubernetes
  with_items:
   - kubelet
   - kubeadm
   - kubectl

- name: "Arrancar y habilitar kubelet"
  service:
    name: kubelet
    state: started
    enabled: true
    daemon_reload: true
```

Rol: configure master – Implementado por el playbook step_4.yaml

Rol encargado de aplicar una configuración especifica al nodo master y desplegar kubernetes.

```
---
# tasks file for configure_master
- name: "PUERTOS - Configuracion del firewall"
  firewalld:
    port: "{{ item }}"
    permanent: true
    state: enabled
  with_items:
    - 6443/tcp
    - 2379-2380/tcp
    - 10250/tcp
    - 10251/tcp
    - 10252/tcp
    - 10255/tcp
  become: true

- name: "IP DOCKER - Captura del a IP de la interfaz de docker"
  shell: "/sbin/ifconfig eth0 | awk -F ' *|:' '/inet /{print $3}'"
  register: docker_ip
  become: true

- name: "DEBUG - IP DOCKER"
  debug:
    var: docker_ip

- name: "REGLAS - Configuracion del firewall"
  firewalld:
    rich_rule: "{{ item }}"
    permanent: true
    state: enabled
  with_items:
    - "rule family=ipv4 source address=10.0.1.11/32 accept"
```

```
    - "rule family=ipv4 source address=10.0.1.12/32 accept"
    - 'rule family=ipv4 source address={{ docker_ip.stdout }}/16 accept'
  become: true

# Reiniciamos servicio para que capture los cambios
- name: "FIREWALLD"
  service:
    name: firewalld
    state: reloaded
  become: true

- name: "Pull de las imagenes de kubernetes"
  command: "kubeadm config images pull"
  register: images_pull
  become: true

- name: "DEBUG - pull imagenes de kubernetes"
  fail:
    msg: "ERROR - Se produjo un error en el pull de las imagenes"
  when: images_pull.rc != 0

- name: "Despliegue de Kubernetes"
  command: "kubeadm init --pod-network-cidr 192.169.0.0/16"
  register: kube_output
  become: true

- name: "OUTPUT - comando kubeadm"
  local_action: copy content={{ kube_output }} dest=/home/pablo/ansible/kubeadm.txt

- name: "DEBUG - despliegue de kubernetes"
  fail:
    msg: "ERROR - Se produjo un error en el despliegue de kubernetes"
  when: kube_output.rc != 0
```

```
- name: "Insertamos el path de kubeconfig"
  lineinfile:
    path: /root/.bash_profile
    line: "export KUBECONFIG=/etc/kubernetes/admin.conf"
  become: true

- name: "Generar el path /root/.kube"
  file:
    path: /root/.kube
    state: directory
    owner: root
    group: root
  become: true

- name: "Copiar fichero de configuracion al path de root"
  copy:
    src: /etc/kubernetes/admin.conf
    dest: /root/.kube/config
    remote_src: yes
    owner: root
    group: root
  become: true

- name: "Testing del comando kubectl"
  command: "kubectl get nodes"
  register: kubectl_test
  become: true

- name: "DEBUG - testing del comando kubectl"
  fail:
    msg: "ERROR - Se ha producido un error en el testing del kubectl"
  when: kubectl_test.rc != 0
```

Playbook: step_5.yaml

Configuracion previa y despliegue de la SDN de AZURE.

```
---
- name: "Paso 5 - Tareas de post-configuracion"
  hosts: master,workers
  become: true
  tasks:
    - name: "PUERTOS - Apertura de puertos para la SDN"
      firewalld:
        port: "{{ item }}"
        permanent: true
        state: enabled
      with_items:
        - 8285/udp
        - 8472/udp

    - name: "FIREWALD - Reinicio"
      service:
        name: firewalld
        state: restarted

- name: "Paso 6 - Despliegue SDN"
  hosts: master
  become: true
  tasks:
    - name: "SDN - Despliegue desde fichero"
      command: "kubectl apply -f https://docs.projectcalico.org/manifests/canal.yaml"
      register: kubectl_sdn

    - name: "DEBUG - SDN calico"
      fail:
        msg: "ERROR - Se ha producido un error en el despliegue de la SDN"
    when: kubectl_sdn.rc != 0
```

Playbook: step_6.yaml

Despliegue de un ingress controller en el nodo master

```
---
- name: "Paso 5 - Tareas de post-configuracion"
  hosts: master,workers
  become: true
  tasks:
    - name: "PUERTOS - Apertura de puertos para la SDN"
      firewalld:
        port: "{{ item }}"
        permanent: true
        state: enabled
      with_items:
        - 8285/udp
        - 8472/udp

    - name: "FIREWALD - Reinicio"
      service:
        name: firewalld
        state: restarted

- name: "Paso 6 - Despliegue SDN"
  hosts: master
  become: true
  tasks:
    - name: "SDN - Despliegue desde fichero"
      command: "kubectl apply -f https://docs.projectcalico.org/manifests/canal.yaml"
      register: kubectl_sdn

    - name: "DEBUG - SDN calico"
      fail:
        msg: "ERROR - Se ha producido un error en el despliegue de la SDN"
      when: kubectl_sdn.rc != 0
```

Playbook: step_7.yaml

Creación de usuario no admin para la gestión del cluster de kubernetes.

```
---
- name: "Paso 7 - Creacion usuario no administrador"
  hosts: master
  become: true
  tasks:

    - name: "GRUPO - No admin"
      user:
        name: kubeadmin
        state: present

    - name: "USUARIO - No admin"
      user:
        name: kubeadmin
        group: kubeadmin
        shell: /bin/bash
        home: /home/kubeadmin

    - name: "PATH -  /home/kubeadmin/.kube"
      file:
        path: /home/kubeadmin/.kube
        state: directory
        owner: kubeadmin
        group: kubeadmin

    - name: "CONF - Copiar fichero de configuracion de kubernetes"
      copy:
        src: /etc/kubernetes/admin.conf
        dest: /home/kubeadmin/.kube/config
        remote_src: yes
        owner: kubeadmin
        group: kubeadmin
```

```
- name: "SUDOERS - Permisos a usuario no admin"
  copy:
    dest: "/etc/sudoers.d/kubeadmin"
    content: |
      ALL            ALL = (ALL) NOPASSWD: ALL
    owner: root
    group: root
```

Playbook: mount_nfs.yaml

Montaje del FS exportado por el nodo master en los workers.

```
---
- name: "Montaje de exports"
  hosts: all
  become: true
  tasks:


    - name: Mount an NFS volume
      mount:
        src: 10.0.1.10:/srv/nfs
        path: /srv/nfs
        opts: rw,sync,hard,intr
        state: mounted
        fstype: nfs
```

Playbook: wait_for.yaml

Diseñado para esperar a que un nodo este alive tras un reinicio o una perdida de conectividad tras realizar una acción sobre el mismo.

```
---
- hosts: all
  gather_facts: false
  tasks:


    - name: "Comprobar disponibilidad del Servidor"
      local_action: wait_for host={{ inventory_hostname }} port=22
        state=started delay=30 timeout=300
      retries: 60
      delay: 20
```

Playbook: terraform.yaml

Despliegue y destrucción de la infraestructura con terraform.

```
---
- hosts: 127.0.0.1
  connection: local
  gather_facts: false
  tasks:


    - name: "TERRAFORM - Destruccion de la infraestrucura."
      shell: "terraform destroy -auto-approve=true"
      register: terraform_destroy_rc
      args:
        chdir: "{{ terraform_path }}"
      tags:
      - terraform_destroy


    - name: "TERRAFORM - DEBUG - Destruccion de la infraestrucura."
      fail:
        msg: "TERRAFORM - Se ha producido un error a la hora de destruir la
infraestructura con terraform."
      when: terraform_destroy_rc.rc!= 0
      tags:
      - terraform_destroy


    - name: "TERRAFORM - Despliegue de la infraestrucura."
      shell: "terraform apply -auto-approve=true"
      register: terraform_apply_rc
      args:
        chdir: "{{ terraform_path }}"
      tags:
      - terraform_apply


    - name: "TERRAFORM - DEBUG - Despliegue de la infraestrucura."
      fail:
```

```
        msg: "TERRAFORM - Se ha producido un error en el despliegue de la
infraestructura con terraform."
      when: terraform_apply_rc.rc != 0
      tags:
      - terraform_apply
```

Playbook: step_8.yaml

Despliegue de una aplicación httpd básica

```
---
# tasks file for deploy_apache
- name: "KUBERNETES - Crear deployment"
  shell: "kubectl create deployment httpd-test --image=httpd:latest"
  register: kube_deploy

- name: "KUBERNETES - Debug - Crear deployment"
  fail:
    msg: "KUBERNETES - Se ha producido un error en el proceso de generacion de un
deployment"
  when: kube_deploy.rc != 0

- name: "KUBERNETES - Exponer deployment a traves del puerto 80"
  shell: "kubectl expose deployment httpd --type=NodePort --port=80"
  register: kube_expose

- name: "KUBERNETES - Debug - Exponer deployment a traves del puerto 80"
  fail:
    msg: "KUBERNETES - Se ha producido un error a la hora de exponer el httpd por el
puerto 80"
  when: kube_expose.rc != 0

- name: "KUBERNETES - Escalar el deployment"
  shell: "kubectl scale deployment --replicas=2 httpd-test"
  register: kube_scale

- name: "KUBERNETES - Debug - Escalar el deployment"
```

```
fail:
  msg: "KUBERNETES - Se ha producido un error a la hora de escalar el deployment"
when: kube_scale.rc != 0
```

4.- DESPLIEGUE

Descripción del proceso de despliegue. Pasos para poder desplegar toda la infraestructura:

Se ha generado un script llamando **“deploy.sh”** al cual se le han de pasar los siguientes argumentos:

- **-d** <DISK_GB> // **--disk** <DISK_GB>

El script bash tiene la capacidad de desplegar la infraestructura de ansible a través de un playbook de ansible. De igual manera el mismo playbook puede usarse de manera independiente para destruirla en caso de que fuera necesario.

- *ansible-playbook /home/pablo/playbooks/terraform.yaml --tags terraform_destroy -e "terraform_path=/home/pablo/trf/multiple_vm_deployment"*

Ejemplo de ejecución del script:

- *bash deploy.sh --disk “10”*
- *bash deploy.sh -d “10”*

Ejemplo de salida del script:

```
DEBUG -    -- DEBUG -- Desplegando infraestuctura con terraform.


[WARNING]: No inventory was parsed, only implicit localhost is available

[WARNING]: provided hosts list is empty, only localhost is available. Note that the
implicit localhost does not match 'all'


PLAY [127.0.0.1]
*********************************************************************************
*********************************************************************************
*********************************************


TASK [TERRAFORM - Despliegue de la infraestrucura.]
*********************************************************************************
*********************************************************************************
*************

changed: [127.0.0.1]
```

```
TASK [TERRAFORM - DEBUG - Despliegue de la infraestrucura.]
*******************************************************************************
*******************************************************************************
*****

skipping: [127.0.0.1]


PLAY RECAP
*******************************************************************************
*******************************************************************************
**************************************************

127.0.0.1                  : ok=1    changed=1    unreachable=0    failed=0
skipped=1    rescued=0    ignored=0



SUCCESS -    -- SUCCESS -- ANSIBLE - Despliegue de la infraestructura con terraform
realizado con exito.



DEBUG -    -- DEBUG -- Tamanio de disco seleccionado: 10G



DEBUG -    -- DEBUG -- Otorgando nuevo disco al nodo master para despliegue del nfs...



SUCCESS -    -- SUCCESS -- Proceso para el nuevo disco para el nodo nfs finalizado con
exito.



DEBUG -    -- DEBUG -- ANSIBLE - Configuracion inicial de los futuros nodos de
kubernetes...



PLAY [Paso 1 - Configuracion inicial]
*******************************************************************************
*******************************************************************************
**************************


TASK [Gathering Facts]
*******************************************************************************
*******************************************************************************
****************************************

ok: [vm-worker01.westeurope.cloudapp.azure.com]

ok: [vm-worker02.westeurope.cloudapp.azure.com]
```

```
ok: [vm-master.westeurope.cloudapp.azure.com]


TASK [debug]
*******************************************************************************
*******************************************************************************
************************************************

ok: [vm-master.westeurope.cloudapp.azure.com] => {

    "msg": "DEBUG - Iniciando la configuracion inicial basica."

}

ok: [vm-worker01.westeurope.cloudapp.azure.com] => {

    "msg": "DEBUG - Iniciando la configuracion inicial basica."

}

ok: [vm-worker02.westeurope.cloudapp.azure.com] => {

    "msg": "DEBUG - Iniciando la configuracion inicial basica."

}


TASK [initial_configuration : Sudoers]
*******************************************************************************
*******************************************************************************
*************************

changed: [vm-master.westeurope.cloudapp.azure.com]

changed: [vm-worker01.westeurope.cloudapp.azure.com]

changed: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [initial_configuration : Actualizacion del Sistema al ultimo nivel]
*******************************************************************************
*******************************************************************************


changed: [vm-master.westeurope.cloudapp.azure.com]

changed: [vm-worker01.westeurope.cloudapp.azure.com]

changed: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [initial_configuration : Configuramos zona horaria]
*******************************************************************************
*******************************************************************************
********

changed: [vm-worker01.westeurope.cloudapp.azure.com]

changed: [vm-worker02.westeurope.cloudapp.azure.com]

changed: [vm-master.westeurope.cloudapp.azure.com]
```

```
TASK [initial_configuration : Instalacion paqueteria]
*********************************************************************************
*********************************************************************************
***********

changed: [vm-master.westeurope.cloudapp.azure.com]

changed: [vm-worker01.westeurope.cloudapp.azure.com]

changed: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [initial_configuration : Habilitar y arrancar chrony]
*********************************************************************************
*********************************************************************************
******

ok: [vm-master.westeurope.cloudapp.azure.com]

ok: [vm-worker01.westeurope.cloudapp.azure.com]

ok: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [initial_configuration : Habilitar NTP]
*********************************************************************************
*********************************************************************************
********************

changed: [vm-worker01.westeurope.cloudapp.azure.com]

changed: [vm-worker02.westeurope.cloudapp.azure.com]

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [initial_configuration : Debug NTP]
*********************************************************************************
*********************************************************************************
************************

skipping: [vm-master.westeurope.cloudapp.azure.com]

skipping: [vm-worker01.westeurope.cloudapp.azure.com]

skipping: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [initial_configuration : Desactivar Selinux]
*********************************************************************************
*********************************************************************************
***************

changed: [vm-worker01.westeurope.cloudapp.azure.com]

changed: [vm-master.westeurope.cloudapp.azure.com]

changed: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [initial_configuration : Comprobar necesidad de reinicio]
*********************************************************************************
```

```
**********************************************************************************
**

changed: [vm-worker01.westeurope.cloudapp.azure.com]

fatal: [vm-master.westeurope.cloudapp.azure.com]: FAILED! => {"changed": true, "cmd":
["needs-restarting", "-r"], "delta": "0:00:00.828172", "end": "2021-07-17
17:49:45.307805", "msg": "non-zero return code", "rc": 1, "start": "2021-07-17
17:49:44.479633", "stderr": "", "stderr_lines": [], "stdout": "Core libraries or
services have been updated since boot-up:\n  * dbus\n  * dbus-daemon\n  * glibc\n  *
kernel\n  * linux-firmware\n  * systemd\n\nReboot is required to fully utilize these
updates.\nMore information: https://access.redhat.com/solutions/27943",
"stdout_lines": ["Core libraries or services have been updated since boot-up:", "  *
dbus", "  * dbus-daemon", "  * glibc", "  * kernel", "  * linux-firmware", "  *
systemd", "", "Reboot is required to fully utilize these updates.", "More information:
https://access.redhat.com/solutions/27943"]}

...ignoring

changed: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [initial_configuration : Debug NEEDS-RESTARTING]
**********************************************************************************
**********************************************************************************
***********

ok: [vm-master.westeurope.cloudapp.azure.com] => {

    "needs_reboot.rc": "1"

}

ok: [vm-worker01.westeurope.cloudapp.azure.com] => {

    "needs_reboot.rc": "0"

}

ok: [vm-worker02.westeurope.cloudapp.azure.com] => {

    "needs_reboot.rc": "0"

}


TASK [initial_configuration : Reinicio del Servidor]
**********************************************************************************
**********************************************************************************
************

skipping: [vm-worker01.westeurope.cloudapp.azure.com]

skipping: [vm-worker02.westeurope.cloudapp.azure.com]

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [initial_configuration : Cierre de conexion]
**********************************************************************************
**********************************************************************************
***************

Pausing for 30 seconds
```

```
(ctrl+C then 'C' = continue early, ctrl+C then 'A' = abort)

ok: [vm-master.westeurope.cloudapp.azure.com]


TASK [initial_configuration : PAUSA]
*******************************************************************************************
*******************************************************************************************
****************************

Pausing for 60 seconds

(ctrl+C then 'C' = continue early, ctrl+C then 'A' = abort)

ok: [vm-master.westeurope.cloudapp.azure.com]


TASK [debug]
*******************************************************************************************
*******************************************************************************************
*************************************************


ok: [vm-master.westeurope.cloudapp.azure.com] => {

    "msg": "DEBUG - Configuracion inicial finalizada."

}

ok: [vm-worker01.westeurope.cloudapp.azure.com] => {

    "msg": "DEBUG - Configuracion inicial finalizada."

}

ok: [vm-worker02.westeurope.cloudapp.azure.com] => {

    "msg": "DEBUG - Configuracion inicial finalizada."

}


PLAY RECAP
*******************************************************************************************
*******************************************************************************************
*************************************************

vm-master.westeurope.cloudapp.azure.com : ok=15   changed=8    unreachable=0
failed=0    skipped=1    rescued=0    ignored=1

vm-worker01.westeurope.cloudapp.azure.com : ok=12   changed=7    unreachable=0
failed=0    skipped=2    rescued=0    ignored=0

vm-worker02.westeurope.cloudapp.azure.com : ok=12   changed=7    unreachable=0
failed=0    skipped=2    rescued=0    ignored=0



SUCCESS -    -- SUCCESS -- ANSIBLE - Configuracion inicial en todos los nodos
realizada con exito.
```

```
DEBUG -    -- DEBUG -- ANSIBLE - Esperando a la disponibilidad de los nodos despues
del reinicio...



PLAY [all]
*********************************************************************************
*********************************************************************************
*************************************************

TASK [Comprobar disponibilidad del Servidor]
*********************************************************************************
*********************************************************************************
********************

ok: [vm-worker01.westeurope.cloudapp.azure.com]

ok: [vm-master.westeurope.cloudapp.azure.com]

ok: [vm-worker02.westeurope.cloudapp.azure.com]

PLAY RECAP
*********************************************************************************
*********************************************************************************
*************************************************

vm-master.westeurope.cloudapp.azure.com : ok=1    changed=0    unreachable=0
failed=0    skipped=0    rescued=0    ignored=0

vm-worker01.westeurope.cloudapp.azure.com : ok=1    changed=0    unreachable=0
failed=0    skipped=0    rescued=0    ignored=0

vm-worker02.westeurope.cloudapp.azure.com : ok=1    changed=0    unreachable=0
failed=0    skipped=0    rescued=0    ignored=0



SUCCESS -    -- SUCCESS -- ANSIBLE - Nodos disponibles tras su actualizacion y
posterior reinicio.



DEBUG -    -- DEBUG -- ANSIBLE - Desplegando nodo nfs...


[DEPRECATION WARNING]: The firewalld module has been moved to the ansible.posix
collection. This feature will be removed from community.general in version 2.0.0.
Deprecation warnings can be disabled by setting deprecation_warnings=False

 in ansible.cfg.
```

```
PLAY [Paso 2 - Despliegue NFS]
*********************************************************************************
*********************************************************************************
*********************************


TASK [Gathering Facts]
*********************************************************************************
*********************************************************************************
*****************************************

ok: [vm-master.westeurope.cloudapp.azure.com]


TASK [debug]
*********************************************************************************
*********************************************************************************
************************************************

ok: [vm-master.westeurope.cloudapp.azure.com] => {

    "msg": "DEBUG - Iniciando el despliegue del servidor NfS."

}


TASK [deploy_nfs : Obtener el disco dado]
*********************************************************************************
*********************************************************************************
***********************

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [deploy_nfs : DEBUG - disco]
*********************************************************************************
*********************************************************************************
*******************************

ok: [vm-master.westeurope.cloudapp.azure.com] => {

    "msg": "DISCO: sdc"

}


TASK [deploy_nfs : LVG - Creacion de LVG]
*********************************************************************************
*********************************************************************************
***********************

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [deploy_nfs : LVOL - Crear LVOL sobre LVG]
*********************************************************************************
*********************************************************************************
*****************

[WARNING]: The value "5120" (type int) was converted to "'5120'" (type string). If
this does not look like what you expect, quote the entire value to ensure it does not
change.
```

```
changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [deploy_nfs : FILESYSTEM | Crear FS sobre el LVOL]
*********************************************************************************
*********************************************************************************
*********

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [deploy_nfs : MOUNT | Montar FS]
*********************************************************************************
*********************************************************************************
**************************

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [deploy_nfs : Instalacion paqueteria]
*********************************************************************************
*********************************************************************************
**********************

ok: [vm-master.westeurope.cloudapp.azure.com]


TASK [deploy_nfs : Habilitar y arrancar nfs-server]
*********************************************************************************
*********************************************************************************
*************

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [deploy_nfs : Creacion del fichero exports]
*********************************************************************************
*********************************************************************************
****************

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [deploy_nfs : Recargar el fichero exports]
*********************************************************************************
*********************************************************************************
*****************

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [deploy_nfs : DEBUG - exports]
*********************************************************************************
*********************************************************************************
*****************************

skipping: [vm-master.westeurope.cloudapp.azure.com]
```

```
TASK [deploy_nfs : Firewall]
*********************************************************************************
*********************************************************************************
**********************************

changed: [vm-master.westeurope.cloudapp.azure.com] => (item=nfs)

changed: [vm-master.westeurope.cloudapp.azure.com] => (item=rpc-bind)

changed: [vm-master.westeurope.cloudapp.azure.com] => (item=mountd)


TASK [deploy_nfs : Recargar servicio firewalld]
*********************************************************************************
*********************************************************************************
*****************

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [debug]
*********************************************************************************
*********************************************************************************
**************************************************

ok: [vm-master.westeurope.cloudapp.azure.com] => {

    "msg": "DEBUG - Despliegue del servidor nfs finalizado."

}


PLAY RECAP
*********************************************************************************
*********************************************************************************
**************************************************

vm-master.westeurope.cloudapp.azure.com : ok=15   changed=10   unreachable=0
failed=0    skipped=1    rescued=0    ignored=0



SUCCESS -    -- SUCCESS -- ANSIBLE - Nodo NFS desplegado con exito.



DEBUG -    -- DEBUG -- ANSIBLE - Postconfiguracion comun sobre los nodos master y
workers...



PLAY [Paso 3 - Tareas de configuracion comunes]
*********************************************************************************
*********************************************************************************
*****************
```

```
TASK [Gathering Facts]
*********************************************************************************
*********************************************************************************
***************************************

ok: [vm-master.westeurope.cloudapp.azure.com]

ok: [vm-worker01.westeurope.cloudapp.azure.com]

ok: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [debug]
*********************************************************************************
*********************************************************************************
*************************************************

ok: [vm-master.westeurope.cloudapp.azure.com] => {

    "msg": "DEBUG - Iniciando la configuracion comun en todos los nodos."

}

ok: [vm-worker01.westeurope.cloudapp.azure.com] => {

    "msg": "DEBUG - Iniciando la configuracion comun en todos los nodos."

}

ok: [vm-worker02.westeurope.cloudapp.azure.com] => {

    "msg": "DEBUG - Iniciando la configuracion comun en todos los nodos."

}


TASK [common_tasks : Creacion fichero hosts]
*********************************************************************************
*********************************************************************************
********************

changed: [vm-worker01.westeurope.cloudapp.azure.com]

changed: [vm-master.westeurope.cloudapp.azure.com]

changed: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [common_tasks : Aseguramos servicio firewalld]
*********************************************************************************
*********************************************************************************
*************

ok: [vm-master.westeurope.cloudapp.azure.com]

changed: [vm-worker01.westeurope.cloudapp.azure.com]

changed: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [common_tasks : Habilitar transparent masquerading]
*********************************************************************************
*********************************************************************************
********
```

```
changed: [vm-worker01.westeurope.cloudapp.azure.com]

changed: [vm-master.westeurope.cloudapp.azure.com]

changed: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [common_tasks : DEBUG - transparent masquerading]
*******************************************************************************
*******************************************************************************
**********

skipping: [vm-master.westeurope.cloudapp.azure.com]

skipping: [vm-worker01.westeurope.cloudapp.azure.com]

skipping: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [common_tasks : Creacion fichero k8s.conf]
*******************************************************************************
*******************************************************************************
*****************

changed: [vm-master.westeurope.cloudapp.azure.com]

changed: [vm-worker01.westeurope.cloudapp.azure.com]

changed: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [common_tasks : Fichero k8s.conf]
*******************************************************************************
*******************************************************************************
*************************

ok: [vm-master.westeurope.cloudapp.azure.com] => (item=net.bridge.bridge-nf-call-
ip6tables)

ok: [vm-worker01.westeurope.cloudapp.azure.com] => (item=net.bridge.bridge-nf-call-
ip6tables)

ok: [vm-worker02.westeurope.cloudapp.azure.com] => (item=net.bridge.bridge-nf-call-
ip6tables)

ok: [vm-master.westeurope.cloudapp.azure.com] => (item=net.bridge.bridge-nf-call-
iptables)

ok: [vm-worker02.westeurope.cloudapp.azure.com] => (item=net.bridge.bridge-nf-call-
iptables)

ok: [vm-worker01.westeurope.cloudapp.azure.com] => (item=net.bridge.bridge-nf-call-
iptables)


TASK [common_tasks : Desactivamos la SWAP]
*******************************************************************************
*******************************************************************************
**********************

changed: [vm-master.westeurope.cloudapp.azure.com]

changed: [vm-worker01.westeurope.cloudapp.azure.com]
```

```
changed: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [common_tasks : DEBUG - SWAP]
*********************************************************************************
*********************************************************************************
*****************************

skipping: [vm-master.westeurope.cloudapp.azure.com]

skipping: [vm-worker01.westeurope.cloudapp.azure.com]

skipping: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [common_tasks : Eliminamos la SWAP del fichero /etc/fstab]
*********************************************************************************
*********************************************************************************
*

ok: [vm-master.westeurope.cloudapp.azure.com]

ok: [vm-worker01.westeurope.cloudapp.azure.com]

ok: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [common_tasks : Repositorio de docker]
*********************************************************************************
*********************************************************************************
**********************

[WARNING]: Consider using the dnf module rather than running 'dnf'.  If you need to
use command because dnf is insufficient you can add 'warn: false' to this command task
or set 'command_warnings=False' in ansible.cfg to get rid of this

message.

changed: [vm-master.westeurope.cloudapp.azure.com]

changed: [vm-worker01.westeurope.cloudapp.azure.com]

changed: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [common_tasks : DEBUG - Repositorio Docker]
*********************************************************************************
*********************************************************************************
****************

skipping: [vm-master.westeurope.cloudapp.azure.com]

skipping: [vm-worker01.westeurope.cloudapp.azure.com]

skipping: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [common_tasks : Instalacion de paqueteria docker]
*********************************************************************************
*********************************************************************************
**********

changed: [vm-master.westeurope.cloudapp.azure.com]
```

```
changed: [vm-worker01.westeurope.cloudapp.azure.com]

changed: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [common_tasks : Arrancar y habilitar docker]
*************************************************************************************
*************************************************************************************
***************

changed: [vm-worker01.westeurope.cloudapp.azure.com]

changed: [vm-master.westeurope.cloudapp.azure.com]

changed: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [common_tasks : Repositorio de kubernetes]
*************************************************************************************
*************************************************************************************
*****************

changed: [vm-worker01.westeurope.cloudapp.azure.com]

changed: [vm-master.westeurope.cloudapp.azure.com]

changed: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [common_tasks : Instalacion kubernetes]
*************************************************************************************
*************************************************************************************
********************

[DEPRECATION WARNING]: Invoking "dnf" only once while using a loop via squash_actions
is deprecated. Instead of using a loop to supply multiple items and specifying `name:
"{{ item }}"`, please use `name: ['kubelet', 'kubeadm',

'kubectl']` and remove the loop. This feature will be removed from ansible-base in
version 2.11. Deprecation warnings can be disabled by setting
deprecation_warnings=False in ansible.cfg.

[DEPRECATION WARNING]: Invoking "dnf" only once while using a loop via squash_actions
is deprecated. Instead of using a loop to supply multiple items and specifying `name:
"{{ item }}"`, please use `name: ['kubelet', 'kubeadm',

'kubectl']` and remove the loop. This feature will be removed from ansible-base in
version 2.11. Deprecation warnings can be disabled by setting
deprecation_warnings=False in ansible.cfg.

[DEPRECATION WARNING]: Invoking "dnf" only once while using a loop via squash_actions
is deprecated. Instead of using a loop to supply multiple items and specifying `name:
"{{ item }}"`, please use `name: ['kubelet', 'kubeadm',

'kubectl']` and remove the loop. This feature will be removed from ansible-base in
version 2.11. Deprecation warnings can be disabled by setting
deprecation_warnings=False in ansible.cfg.

changed: [vm-master.westeurope.cloudapp.azure.com] => (item=['kubelet', 'kubeadm',
'kubectl'])

changed: [vm-worker01.westeurope.cloudapp.azure.com] => (item=['kubelet', 'kubeadm',
'kubectl'])
```

```
changed: [vm-worker02.westeurope.cloudapp.azure.com] => (item=['kubelet', 'kubeadm',
'kubectl'])


TASK [common_tasks : Arrancar y habilitar kubelet]
*********************************************************************************
*********************************************************************************
**************

changed: [vm-master.westeurope.cloudapp.azure.com]

changed: [vm-worker01.westeurope.cloudapp.azure.com]

changed: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [debug]
*********************************************************************************
*********************************************************************************
************************************************

ok: [vm-master.westeurope.cloudapp.azure.com] => {

    "msg": "DEBUG - Tareas de configuracion comunes finalizada."

}

ok: [vm-worker01.westeurope.cloudapp.azure.com] => {

    "msg": "DEBUG - Tareas de configuracion comunes finalizada."

}

ok: [vm-worker02.westeurope.cloudapp.azure.com] => {

    "msg": "DEBUG - Tareas de configuracion comunes finalizada."

}


PLAY RECAP
*********************************************************************************
*********************************************************************************
************************************************

vm-master.westeurope.cloudapp.azure.com : ok=16   changed=10   unreachable=0
failed=0    skipped=3    rescued=0    ignored=0

vm-worker01.westeurope.cloudapp.azure.com : ok=16   changed=11   unreachable=0
failed=0    skipped=3    rescued=0    ignored=0

vm-worker02.westeurope.cloudapp.azure.com : ok=16   changed=11   unreachable=0
failed=0    skipped=3    rescued=0    ignored=0



SUCCESS -    -- SUCCESS -- ANSIBLE - Postconfiguracion de los nodos master y workers
realizado con exito.
```

```
DEBUG -    -- DEBUG -- ANSIBLE - Configurando y desplegando el cluster de kuberntes
sobre el nodo master...


[DEPRECATION WARNING]: The firewalld module has been moved to the ansible.posix
collection. This feature will be removed from community.general in version 2.0.0.
Deprecation warnings can be disabled by setting deprecation_warnings=False

 in ansible.cfg.


PLAY [Paso 4 - Tareas de configuracion y despliegue de kubernetes en el master]
*********************************************************************************
*********************************************************************


TASK [Gathering Facts]
*********************************************************************************
*********************************************************************************
****************************************

ok: [vm-master.westeurope.cloudapp.azure.com]


TASK [debug]
*********************************************************************************
*********************************************************************************
**************************************************

ok: [vm-master.westeurope.cloudapp.azure.com] => {

    "msg": "DEBUG - Iniciando la configuracion y despliegue de kubernetes en el
master."

}


TASK [configure_master : PUERTOS - Configuracion del firewall]
*********************************************************************************
*********************************************************************************
**

changed: [vm-master.westeurope.cloudapp.azure.com] => (item=6443/tcp)

changed: [vm-master.westeurope.cloudapp.azure.com] => (item=2379-2380/tcp)

changed: [vm-master.westeurope.cloudapp.azure.com] => (item=10250/tcp)

changed: [vm-master.westeurope.cloudapp.azure.com] => (item=10251/tcp)

changed: [vm-master.westeurope.cloudapp.azure.com] => (item=10252/tcp)

changed: [vm-master.westeurope.cloudapp.azure.com] => (item=10255/tcp)


TASK [configure_master : IP DOCKER - Captura del a IP de la interfaz de docker]
*********************************************************************************
*****************************************************************

changed: [vm-master.westeurope.cloudapp.azure.com]
```

```
TASK [configure_master : DEBUG - IP DOCKER]
*********************************************************************************
*********************************************************************************
*********************

ok: [vm-master.westeurope.cloudapp.azure.com] => {

    "docker_ip": {

        "changed": true,

        "cmd": "/sbin/ifconfig eth0 | awk -F ' *|:' '/inet /{print $3}'",

        "delta": "0:00:00.054750",

        "end": "2021-07-17 17:55:38.063213",

        "failed": false,

        "rc": 0,

        "start": "2021-07-17 17:55:38.008463",

        "stderr": "",

        "stderr_lines": [],

        "stdout": "10.0.1.10",

        "stdout_lines": [

            "10.0.1.10"

        ]

    }

}


TASK [configure_master : REGLAS - Configuracion del firewall]
*********************************************************************************
*********************************************************************************
***

changed: [vm-master.westeurope.cloudapp.azure.com] => (item=rule family=ipv4 source
address=10.0.1.11/32 accept)

changed: [vm-master.westeurope.cloudapp.azure.com] => (item=rule family=ipv4 source
address=10.0.1.12/32 accept)

changed: [vm-master.westeurope.cloudapp.azure.com] => (item=rule family=ipv4 source
address=10.0.1.10/16 accept)


TASK [configure_master : FIREWALLD]
*********************************************************************************
*********************************************************************************
****************************

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [configure_master : Pull de las imagenes de kubernetes]
*********************************************************************************
```

```
*********************************************************************************
****

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [configure_master : DEBUG - pull imagenes de kubernetes]
*********************************************************************************
*********************************************************************************
***

skipping: [vm-master.westeurope.cloudapp.azure.com]


TASK [configure_master : Despliegue de Kubernetes]
*********************************************************************************
*********************************************************************************
**************

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [configure_master : OUTPUT - comando kubeadm]
*********************************************************************************
*********************************************************************************
**************

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [configure_master : DEBUG - despliegue de kubernetes]
*********************************************************************************
*********************************************************************************
******

skipping: [vm-master.westeurope.cloudapp.azure.com]


TASK [configure_master : Insertamos el path de kubeconfig]
*********************************************************************************
*********************************************************************************
******

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [configure_master : Generar el path /root/.kube]
*********************************************************************************
*********************************************************************************
***********

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [configure_master : Copiar fichero de configuracion al path de root]
*********************************************************************************
*************************************************************************

changed: [vm-master.westeurope.cloudapp.azure.com]
```

```
TASK [configure_master : Testing del comando kubectl]
*********************************************************************************
*********************************************************************************
***********

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [configure_master : DEBUG - testing del comando kubectl]
*********************************************************************************
*********************************************************************************
***

skipping: [vm-master.westeurope.cloudapp.azure.com]


TASK [debug]
*********************************************************************************
*********************************************************************************
**************************************************

ok: [vm-master.westeurope.cloudapp.azure.com] => {

    "msg": "DEBUG - Tareas de configuracion y despliegue de kubernetes en el master."

}


PLAY RECAP
*********************************************************************************
*********************************************************************************
**************************************************

vm-master.westeurope.cloudapp.azure.com : ok=15   changed=11   unreachable=0
failed=0    skipped=3    rescued=0    ignored=0




SUCCESS -    -- SUCCESS -- ANSIBLE - Configuracion y despliegue del cluster de
kubernetes realizado con exito.




DEBUG -    -- DEBUG -- ANSIBLE - Desplegando SDN azure...


[DEPRECATION WARNING]: The firewalld module has been moved to the ansible.posix
collection. This feature will be removed from community.general in version 2.0.0.
Deprecation warnings can be disabled by setting deprecation_warnings=False

 in ansible.cfg.


PLAY [Paso 5 - Tareas de post-configuracion]
*********************************************************************************
*********************************************************************************
********************
```

```
TASK [Gathering Facts]
*********************************************************************************
*********************************************************************************
***************************************

ok: [vm-master.westeurope.cloudapp.azure.com]


TASK [PUERTOS - Apertura de puertos para la SDN]
*********************************************************************************
*********************************************************************************
****************

changed: [vm-master.westeurope.cloudapp.azure.com] => (item=8285/udp)

changed: [vm-master.westeurope.cloudapp.azure.com] => (item=8472/udp)


TASK [FIREWALD - Reinicio]
*********************************************************************************
*********************************************************************************
***********************************

changed: [vm-master.westeurope.cloudapp.azure.com]


PLAY [Paso 6 - Despliegue SDN]
*********************************************************************************
*********************************************************************************
*********************************


TASK [Gathering Facts]
*********************************************************************************
*********************************************************************************
***************************************

ok: [vm-master.westeurope.cloudapp.azure.com]


TASK [SDN - Despliegue desde fichero]
*********************************************************************************
*********************************************************************************
**************************

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [DEBUG - SDN calico]
*********************************************************************************
*********************************************************************************
***************************************

skipping: [vm-master.westeurope.cloudapp.azure.com]


PLAY RECAP
*********************************************************************************
*********************************************************************************
*************************************************
```

```
vm-master.westeurope.cloudapp.azure.com : ok=5    changed=3    unreachable=0
failed=0    skipped=1    rescued=0    ignored=0



SUCCESS -    -- SUCCESS -- ANSIBLE - SDN de azure desplegada con exito.



DEBUG -    -- DEBUG -- ANSIBLE - Postconfiguracion y despliegue del ingress
controller...



PLAY [Paso 6 - Despliegue de ingress controller.]
*********************************************************************************
*********************************************************************************
***************

TASK [Gathering Facts]
*********************************************************************************
*********************************************************************************
****************************************

ok: [vm-master.westeurope.cloudapp.azure.com]

TASK [INGRESS CONTROLLER - Despliegue desde fichero]
*********************************************************************************
*********************************************************************************
************

changed: [vm-master.westeurope.cloudapp.azure.com]

TASK [DEBUG - INGRESS CONTROLLER]
*********************************************************************************
*********************************************************************************
******************************

skipping: [vm-master.westeurope.cloudapp.azure.com]

PLAY RECAP
*********************************************************************************
*********************************************************************************
**************************************************

vm-master.westeurope.cloudapp.azure.com : ok=2    changed=1    unreachable=0
failed=0    skipped=1    rescued=0    ignored=0



SUCCESS -    -- SUCCESS -- ANSIBLE - Postconfigurando y despliegue del ingress
controller realizado con exito.
```

```
DEBUG -    -- DEBUG -- ANSIBLE - Creacion de usuario no-admin para la gestion del
cluster de kubernetes...



PLAY [Paso 7 - Creacion usuario no administrador]
*********************************************************************************
*********************************************************************************
***************

TASK [Gathering Facts]
*********************************************************************************
*********************************************************************************
****************************************

ok: [vm-master.westeurope.cloudapp.azure.com]


TASK [GRUPO - No admin]
*********************************************************************************
*********************************************************************************
****************************************

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [USUARIO - No admin]
*********************************************************************************
*********************************************************************************
****************************************

ok: [vm-master.westeurope.cloudapp.azure.com]


TASK [PATH -  /home/kubeadmin/.kube]
*********************************************************************************
*********************************************************************************
****************************

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [CONF - Copiar fichero de configuracion de kubernetes]
*********************************************************************************
*********************************************************************************
*****

changed: [vm-master.westeurope.cloudapp.azure.com]


TASK [SUDOERS - Permisos a usuario no admin]
*********************************************************************************
*********************************************************************************
********************
```

```
changed: [vm-master.westeurope.cloudapp.azure.com]


PLAY RECAP
*********************************************************************************
*********************************************************************************
*************************************************

vm-master.westeurope.cloudapp.azure.com : ok=6    changed=4    unreachable=0
failed=0    skipped=0    rescued=0    ignored=0



SUCCESS -    -- SUCCESS -- ANSIBLE - Usuario no-admin generado con exito.



DEBUG -    -- DEBUG -- ANSIBLE - Montando NFS...



PLAY [Montaje de exports]
*********************************************************************************
*********************************************************************************
***************************************

TASK [Gathering Facts]
*********************************************************************************
*********************************************************************************
*****************************************

ok: [vm-worker01.westeurope.cloudapp.azure.com]

ok: [vm-worker02.westeurope.cloudapp.azure.com]


TASK [Mount an NFS volume]
*********************************************************************************
*********************************************************************************
***********************************

changed: [vm-worker01.westeurope.cloudapp.azure.com]

changed: [vm-worker02.westeurope.cloudapp.azure.com]


PLAY RECAP
*********************************************************************************
*********************************************************************************
*************************************************

vm-worker01.westeurope.cloudapp.azure.com : ok=2    changed=1    unreachable=0
failed=0    skipped=0    rescued=0    ignored=0

vm-worker02.westeurope.cloudapp.azure.com : ok=2    changed=1    unreachable=0
failed=0    skipped=0    rescued=0    ignored=0
```

```
SUCCESS -    -- SUCCESS -- ANSIBLE - NFS montados con exito.


SUCCESS -    -- SUCCESS -- Kubernetes desplegado con exito
```

5.- APLICACIÓN

Breve descripción de la aplicación para una evaluación del correcto despliegue y funcionamiento de la misma:

He desplegado httpd sobre kubernetes con un playbook básico de ansible pero por falta de tiempo no he podido comprobar su correcto funcionamiento.

6.- PROBLEMAS Y SOLUCIONES

En este apartado se describen todos los problemas encontrados durante la realización de la práctica:

PROBLEMA: Problemas con el inventario de ansible. Las VM recién creadas no generan un DNS válido.

SOLUCIÓN: se recurrió a la documentación oficial de terraform. El módulo **azurerm_public_ip** posee una etiqueta, **domain_name_label** que es la encargada de generar un DNS público para la IP pública que se está creando.

PROBLEMA: No hay conexión con el repositorio público de Docker a pesar de llegar a la ip pública.

SOLUCIÓN: URL del repositorio errónea. Tras consulta en el foro, el profesor me corrige la URL.

PROBLEMA: Falla el precheck del despliegue de kubernetes. Numero de CPU insuficiente en nodo master.

SOLUCIÓN: Se cambia el tamaño de la maquina master a Standar_D2_v2

PROBLEMA: Al cambiar el nodo master a Standar_D2_v2 nos salta un error por limitación de cuenta.

SOLUCIÓN: Se soluciona desplegando 3 nodos en vez de 4, en el cual el nodo master hace de nodo NFS.

7.- LICENCIA

LICENCIA ESCOGIDA: **GNU GPL v3.**

MOTIVOS: este repositorio y todo el código que contiene debe ser distribuido con la licencia GNU GPL v3 la cual obliga a distribuir todo el código fuente si también se desea distribuir el software. Pero la parte por la cual he escogido este tipo de licencia, es por la protección que otorga ante la apropiación de este código por parte de otros sacando un provecho de ello. Este tipo de licencias de software libres me son atractivas por el carácter de desarrollo de esta clase de proyectos, de los cuales terceras personas se pueden aprovechar y a la vez, los autores, ver mejorado la calidad de su propio desarrollo inicial a través de mejoras en el código, nuevos aportes y corrección de errores.

8.- URL DEL REPOSITORIO