


# Using Terraform and Ansible to provision a HPC Cluster

Rik Kisnah

[rikesh@gmail.com](mailto:rikesh@gmail.com)

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# Agenda

- Introduction
- Terraform and Ansible in the DevOps World
- HPC in the Cloud
- The love triangle – Terraform, Ansible and HPC
- Demo

# Introduction

- Principal Engineer with more than ten years in Cloud Industry (Systems engineering/QA/Automation)
- *Disclaimer: I am here in a personal capacity. I don't represent or speak behalf of current or previous employers*
- Based in Seattle
- Avid reader of books and listener to audio ( I read about 2-4 books per month)
- Favorite programming language is Python

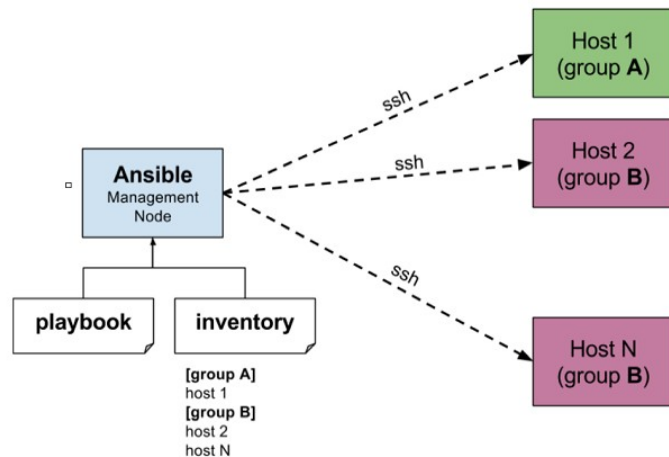
# Terraform

- Terraform is a infrastructure as code
- A hashicorp product which supports multiple cloud vendors
  - Oracle, AWS, Azure etc
  - <https://www.terraform.io/intro/index.html>
- Example of a simple snippet to launch a host

```
resource "oci_core_instance" "ubuntu_instance" {
  # Required
  availability_domain = data.oci_identity_availability_domains.ads.availability_domains[0].name
  compartment_id = "<compartment-ocid>"
  shape = "VM.Standard.E2.1"
  source_details {
    source_id = "<source-ocid>"
    source_type = "image"
  }
  # Optional
  display_name = "<your-ubuntu-instance-name>"
  create_vnic_details {
    assign_public_ip = true
    subnet_id = "<subnet-ocid>"
  }
  metadata = {
    ssh_authorized_keys = file("<ssh-public-key-path>")
  }
  preserve_boot_volume = false
}
```

# Ansible

- Open Source redhat project that automates provisioning without the use of external agents (it uses SSH)



```
- name: Playbook
hosts: webservers
become: yes
become_user: root
tasks:
  - name: ensure apache is at the latest version
    yum:
      name: httpd
      state: latest
  - name: ensure apache is running
    service:
      name: httpd
      state: started
```

**1 Name of Playbook**  
**2 HostGroup Name**  
**3 Sudo (or) run as different user setting**  
**4 Tasks**

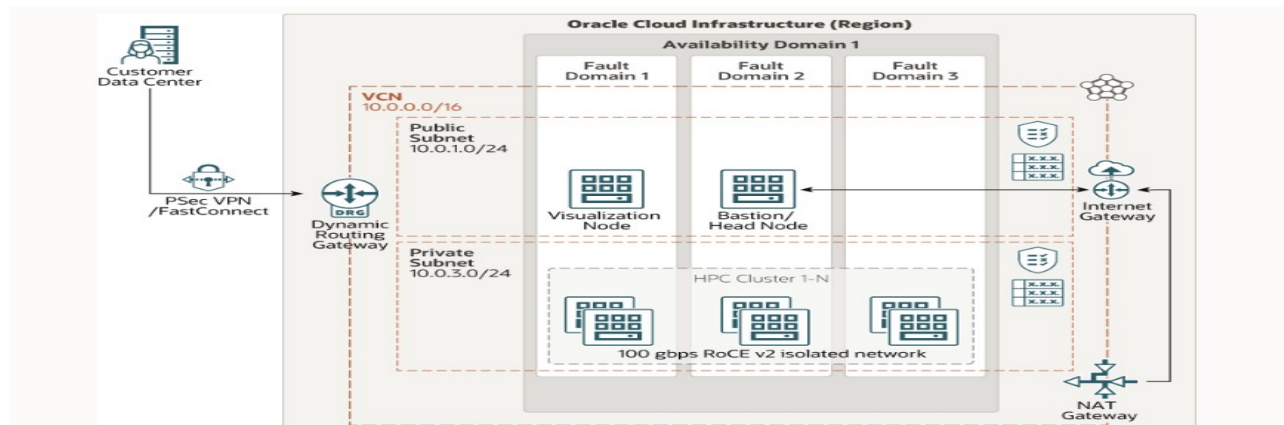
# HPC in the cloud

- High Power Computing is ability to process huge amount of data in a short span of time (uses in AI/ML/Big Data industries)
- Vendors or on premise solutions configures hosts with special NICs (RDMA) or network (infiniband) to optimize latency
- HPC Cloud providers provides multiple implementations – Infiniband(Azure), ROCEv1, ROCEv2 (OCI) .Uses RDMA NICs for networking (Mellanox)
- Great whitepaper on HPC and RDMA

<https://www.open-mpi.org/papers/euro-pvmmpi-2006-hpc-protocols/euro-pvmmpi-2006-hpc-protocols.pdf>

# Example of HPC cloud provider

- <https://www.oracle.com/cloud/hpc/>
- <https://docs.oracle.com/en/solutions/deploy-hpc-on-oci/index.html#GUID-FB8F3DC8-CA7B-47CE-85F6-426CE92B74A7>
- Provides a clusters of HPC host with and without GPUs on fast RDMA network



# Terraform+Ansible=Cluster

- Use Terraform to launch the cluster and a bastion
- Use Terraform to set up ansible roles on the bastion
- Use roles to set up the cluster in the the network
- Set up packages / NFS / Slurm / NICs etc
- Open source solution:

<https://github.com/oracle-quickstart/oci-hpc>



# Demo

- Show how to launch a cluster with the TF and Ansible
- Ping a host on the RDMA network

# Q&A