Ansible

Introduction

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What is Ansible?
What can Ansible do?
Ansible Installation
Configuration Management
Deployment

Introduction

Ansible is an open source, a Configuration Management Tool and Deployment tool, maintained by Redhat.

The main components of Ansible are playbooks, configuration management, deployment.

Ansible uses playbooks to deploy, manage, build, test and configure anything from full server environments to custom compiled source code for applications.

Ansible was written in Python.

Ansible Features

Ansible configure machines in an agent-less manner using SSH.
Built on top of Python and hence provides a lot of Python's functionality.
YAML-Based Playbooks
Uses SSH for secure connections.
Follows Push based architecture for sending configurations.

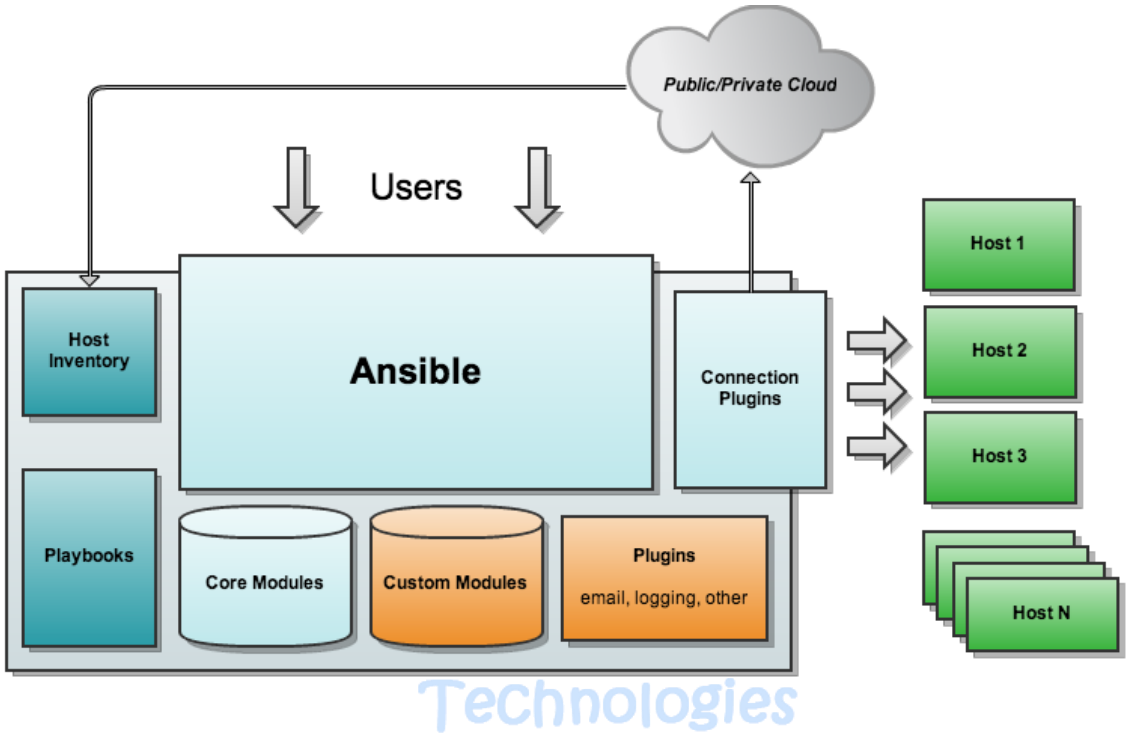
Push Based Vs Pull Based

Tools like Puppet and Chef are pull based.
Agents on the server periodically checks for the configuration information from central server (Master).

Ansible is push based.
Central server pushes the configuration information on target servers.
You control when the changes are made on the servers.

What can Ansible do?
Configuration Management
App Deployment
Continuous Delivery

Ansible Architecture



Inventory file

Ansible's inventory hosts file is used to list and group your servers. Its default location is /etc/ansible/hosts.

See the contents in hosts file as follows.

cat /etc/ansible/hosts (default inventory file path)
#192.168.122.1 ---> This is one of the nodes IP
192.168.122.2

mithuntechnologies.dev.com

In Inventory file you can mention IP address or Hostnames also.

Some important points in Inventory file.
- Comments begin with the '#' character
- Blank lines are ignored
- Groups of hosts are delimited by [header] elements
- You can enter hostnames or ip addresses
- A hostname/ip can be a member of multiple groups
- Ungrouped hosts are specifying before any group headers, like below

Sample Inventory file
We can use '#' for comments in inventory file.

#Blank line are ignored.

#Ungrouped hosts are specifying before any group headers, like below
192.168.122.1
192.168.122.2
mithun-technolopgies.dev.com

[webservers]
#192.168.122.1
192.168.122.2
192.168.122.3

[dbservers]
#mithun-techno.db1.com
#mithun-techno.db2.com
#mithun-techno.db3.com
mithun-techno.db[1:3].com
mithun-techno.db5.com
192.168.122.4

192.168.122.5
192.168.122.6

appservers ansible_host=mithun-techno.appserver1.com ansible_connection=ssh ansible_port=5555

mailservers ansible_host=mithun-techno.mailserver.com ansible_connection=winrm

databseservers ansible_host=mithun-techno.db.com ansible_connection=ssh

Inventory Parameters
ansible_connection=ssh/winrm/localhost
ansible_port=22/5986
ansible_user=root/administrator
ansible_ssh_pass=<<Password for node>>

for localhost

localhost ansible_connection=localhost

If you want to have your Ansible hosts file in another location, then you can set this environment variable:

export ANSIBLE_HOSTS=/root/custom_ansible_hosts

Or you can specify the Ansible hosts location when running commands with the --inventory-file= (or -i) flag:

ansible all --inventory-file=/root/ansible_hosts -m ping

Reference URL: http://docs.ansible.com/ansible/latest/intro_inventory.html

---

Ansible Installation in Redhat Server

Create ansible user in all machines (Ansible server & Host Servers(1,2,3,…N))

1) Create the user `ansible` and set the password on all hosts:

```
# sudo useradd ansible

# sudo passwd ansible
```

2) Make the necessary entry in sudoers file `/etc/` sudoersfor ansible user for password-less sudo access:

```
# visudo

ansible ALL=(ALL) NOPASSWD: ALL
```


3) Make the necessary changes in `sshd_config` file `/etc/ssh/sshd_` config to enable password based authentication:
   Un comment PasswordAuthentication yes and comment PasswordAuthentication no.
   And save the file .
   Then restart sshd service.

```
# vi /etc/ssh/sshd_config

# sudo service sshd restart
```

Install Ansible in Red hat (Ansible Server)

1) SSH to Redhat System & Switch to ansible user

```
$ sudo su ansible
```

2) Install python

```
# sudo yum install python3 -y
```

3) Update python alaternatives

```
# sudo alternatives --set python /usr/bin/python3
```

4) Verify Python Version

```
# python --version
```

5) Install EPEL Repository

```
# sudo dnf install https://dl.fedoraproject.org/pub/epel/epel-release-latest-8.noarch.rpm -y
```

6) Install ansible using Yum

```
# sudo yum -y install ansible
```

7) Verify Ansible version

```
# ansible --version
```


Generate SSH Key ,copy SSH Key(Ansible Server)

1) Now generate SSH key in Ansible Server:

```
$ sudo su ansible

$ ssh-keygen
```

2) Copy it to Host servers as ansible user:
Repeat below command by updating HOST IP for all the HOST Servers.

```
$ ssh-copy-id ansible@<HostIP>
```

Update Host Inventory in Ansible Server to add host servers details.

1) Add Host Server details

```
# vi /etc/ansible/hosts
```

```
# Connect using username and password
#192.168.1.105 ansible_user=ansible ansible_password=password

# Connect using username and pem(Make Sure Have pem file at given path)
#172.31.35.23 ansible_user=ec2-user ansible_ssh_private_key_file=~/aws.pem

# If ssh keys are copied
172.31.35.23
```

2) Use ping module to test Ansible and after successful run you can see the below output.

```
$ ansible all -m ping

172.31.35.23 | SUCCESS => {
    "changed": false,
    "ping": "pong"
}
```


3) Install sshpass in Ansible server if you get below error .

"to use the 'ssh' connection type with passwords, you must install the sshpass program

```
$ sudo yum install -y
http://mirror.centos.org/centos/7/extras/x86_64/Packages/sshpass-1.06-2.el7.x86_64.rpm
```

Ansible AD-HOC Commands

To run any ansible command we will follow below syntax.

ansible [group Name|HostName] -m <<Module Name>> -a <<Command Name>>

Here -m is the module name and -a is the arguments to module.

Example:
ansible all -m shell -a date: It will display date from all host machines.

There are two default groups, **all** and **ungrouped**. **all** contains every host. **ungrouped** contains all hosts that don't have another group

ansible-doc -l: It will display the all the modules available in Ansible.
ansible-doc yum: It will display more information about yum module along with examples.

Ping Module
---
ansible all -m ping: It will ping all the servers which you have mentioned in inventory file (/etc/ansible/hosts).
ansible all -m ping -o: It will display the output in single line.

```
[root@localhost ~]# ansible all -m ping
192.168.122.1 | SUCCESS => {
    "changed": false,
    "failed": false,
    "ping": "pong"
}
[root@localhost ~]# ansible all -m ping -o
192.168.122.1 | SUCCESS => {"changed": false, "failed": false, "ping": "pong"}
[root@localhost ~]#
```

Shell Module
---
ansible all -m shell -a 'uptime' : Uptime of all the machines.
Here m means module and -a means argument.
(OR)
ansible all -a 'uptime'


```
[root@localhost ~]# ansible all -m shell -a 'uptime'
192.168.122.1 | SUCCESS | rc=0 >>
 17:15:46 up 22:23,  6 users,  load average: 0.35, 0.22, 0.15

[root@localhost ~]#
```

```
[root@localhost ~]# ansible all -a 'uptime'
192.168.122.1 | SUCCESS | rc=0 >>
 17:17:56 up 22:25,  6 users,  load average: 0.36, 0.21, 0.15

[root@localhost ~]#
```

ansible all -m shell -a 'date' : Date of all machines

```
[root@localhost ~]# ansible all -m shell -a 'date'
192.168.122.1 | SUCCESS | rc=0 >>
Sat Nov 11 17:13:51 IST 2017

[root@localhost ~]#
```

ansible all -m shell -a 'cat /etc/*release' : Redhat release of all the machines.
ansible all -m shell -a 'mount' : Kind of mount on all the machines
ansible all -b -m shell -a 'service sshd status' : Check the service status on all the machines.
ansible all -m shell -a "uname -a" -v

```
[root@localhost ~]# ansible all -m shell -a 'uname -a' -v
Using /etc/ansible/ansible.cfg as config file
192.168.122.1 | SUCCESS | rc=0 >>
Linux localhost.localdomain 3.10.0-693.el7.x86_64 #1 SMP Tue Aug 22 21:09:27 UTC
 2017 x86_64 x86_64 x86_64 GNU/Linux

[root@localhost ~]#
```

ansible dbservers -a "df -h" : Here it will check the disk space use for all the nodes which are from dbservers group.

ansible webservers -a "free -m":

ansible webservers -a "date":

Yum Module
---
ansible all -b -m yum -a "name=vim" : It will install vim package in all node machine which you have menyioned in host inventory file.
ansible localhost -b -m yum -a "name=git" : To install git package in localhost.
ansible all -b -m yum -a "name=httpd state=present" : To install httpd package in all node machines.

Note: Here state=present, is not a mandatory, it is by default.

ansible all -b -m yum -a "name=httpd state=latest" : To update httpd package in all node machines.
ansible all -b -m yum -a "name=httpd state=absent" : To remove httpd package in all node machines.

Service Module
---
ansible all -b -m service -a "name=httpd state=started"
ansible all -b -m service -a "name=httpd state=restarted"

ansible all -b -m service -a "name=httpd state=stopped"

ansible all -s -m service -a 'name=httpd state=started' :

Note: Here -b or -s either option we can use. But -s is deprecated and going to remove in 2.9 version.

rpm -qa | grep httpd : It will check weather httpd package is installed or not.

Uninstall Apache HTTP server using Linux command

---

yum erase httpd httpd-tools apr apr-util -y ---> Execute this command as a root user.

Copy Module

---

ansible all -b -m copy -a "src=mithuntechnologies.txt dest=/tmp/mithuntechnologies.txt"

If any access issue, need to give the sudo access to ansible in all hostmachines(nodes) as follows.

visudo (OR) vim /etc/sudoers --> Execute as a root user. And add below line in sudoers file.

ansible ALL=(ALL) NOPASSWD: ALL

Setup Module

This module is automatically called by playbooks to gather useful variables about remote hosts that can be used in playbooks.
In Playbooks we will use **gather_facts: no** to disable.

ansible all -m setup: It will give all facts about remote hosts.

ansible all -m setup -a 'filter=facter_*': It will gives the all the facts which are started with “facter_”

YAML Ain't Markup Language (OR) Yet Another Markup Language

To Comments we will use # in YAML.

Yaml file extension is .yml or yaml

Key Value Pair

Fruit: Apple
Vegetable: Carrot
Liquid: Water
Meet: Chicken

Note: Need to give the space between ':' and value.

Array/List

Fruits:
- Orange
- Apple
- Banana
- Guava

Vegetables:
- Carrot
- Cauliflower
- Tomoto

Here - dash indicate the element of any array.

Playbooks

Playbook is a single YAML file, containing one or more 'plays' in a list.

Plays are ordered sets of tasks to execute against host servers from your inventory file.

Play defines a set of activities (tasks) to be run on hosts.

Task is an action to be perform on the host.
Examples are a) Execute a command
b) Run a shell script
c) Install a package
d) Shutdown/Restart the hosts.

Playbooks start with the YAML three dashes (---) and end with …

Each play has first hosts, variables, and tasks

FileName: pingServers.yml

```
---
- hosts: all
  gather_facts: no
  remote_user: ansible
  tasks:
    - name: Test connection
      ping:
      remote_user: ansible
...
```

#hosts: The tasks will be executing in specified group of servers.
#name: which is the task name that will appear in your terminal when you run the playbook.

#remote_user: This parameter was formerly called just user. It was renamed in Ansible 1.4 to make it more distinguishable from the user module (used to create users on remote systems).

Remote users can also be defined per task.

Run the playbook Using below command

ansible-playbook <<Playbbok file name>>:
ansible-playbook samplePlayBook.yml: It will run the samplePlayBook.yml playbook.

ansible-playbook samplePlayBook.yml -v: It will run the samplePlayBook.yml playbook in verbose.

ansible-playbook samplePlayBook.yml -vv: It will run the samplePlayBook.yml playbook in double verbose (It will give some more information).

ansible-playbook samplePlayBook.yml -vvv: It will run the samplePlayBook.yml playbook in more verbose.

Note: If any error while running playbook, use -v, -vv or -vvv option to debug the playbook.

ansible-playbook --help: It will provide help on **ansible_playbook** command.

ansible-playbook playbook.yml --syntax-check: It will check the syntax of a playbook.

ansible-playbook playbook.yml --check: It will do in dry run.

ansible-playbook playbook.yml --list-hosts: It will display the which hosts would be affected by a playbook before you run it.

ansible-playbook playbook.yml --step: It execute one-step-at-a-time, confirm each task before running with (N)o/(y)es/(c)ontinue .

FileName: createFilePlaybook.yml

```
---
- hosts: all
  become: true
  tasks:
   - name: Creating a file
     file:
      path: /tmp/mithuntecnoroot.sh
      owner: root
      mode: 0777
      state: touch
...
```

FileName: installHTTPServer.yml

#This playbbok will install HTTP server and will not start the server.

```
---
- hosts: all
  become: true
  tasks:
    - name: Install Apache HTTP server
      yum: name=httpd update_cache=yes state=latest
```

...

FileName: installHTTPServerandStart.yml

```
#This playbbok will install HTTP server and start the server.
---
- hosts: all
  become: true
  tasks:
    - name: Install Apache HTTP server
      yum: name=httpd update_cache=yes state=latest
    - name: Start HTTP Server
      service: name=httpd enabled=yes state=started
...
```

FileName: installHTTPServerWithHandlers.yml

```
#This play book will explains handlers as well.
---
- hosts: all
  become: true
  tasks:
    - name: Install Apache HTTP Server
      yum: name=httpd update_cache=yes state=latest
      notify:
        - Start HTTP Server
  handlers:
    - name: Start HTTP Server
      service:
          name=httpd
          state=restarted
...
```

#become: true: Is used to run commands with privileges, like if we're executing them with sudo.

#name which is the task name that will appear in your terminal when you run the playbook.
In this case, we called it "Install Apache HTTP server"

Note: You can also use become on a particular task instead of the whole play.

Uninstall Apache HTTP server using below command
---
sudo yum erase httpd httpd-tools apr apr-util -y

Nginx HTTP server installation

```
---
- hosts: localhost
  tasks:
        - name: Install nginx server
          yum: name=nginx state=present
          become: true
        - name: Start nginx server
          service: name=nginx enabled=yes state=started
          become: true
...
```

Items that begin with a - are considered list items.

FileName: playbook1.yml

```
---
   -   hosts: appservers
       tasks :
         - name: Execute the 'date' command
           command: date

         - name: Execute script on server
           script: sample_script.sh

         - name: Install httpd service
           yum:
             name: httpd
             state: present

         - name: Start web server
             service:
             name: httpd
             state: started
```

Handlers

Handlers are special task that run at the end of a play if notified by another task.
If a configuration file gets changed notify a service restart task it needs to run.

```
- hosts: localhost
  become: true
  tasks:
    - name: install httpd
      yum: name=httpd update_cache=yes state=latest
      notify:
        - start httpd
  handlers:
    - name: start httpd
      service:
          name=httpd
          state=restarted
...
```

Loops

```
#This playbbok will install HTTP server,wget and vim package using loops.

---
- hosts: localhost
  become: true
  tasks:
    - name: Install list of packages
      yum: name='{{item}}' state=present
      with_items:
       - httpd
       - wget
       - vim
       - zip
       - unzip
...
```

Note: Loop feature will be removed in version 2.11

Instead of using a loop to supply multiple items and specifying like **name: "{{ item }}"**, use **name: ['httpd', 'wget', 'vim', 'zip, 'unzip']** as follows.

```
---
- hosts: localhost
  become: true
  tasks:
   - name: Install list of packages
     yum:
      name: ['httpd', 'wget', 'vim', 'zip', 'unzip']
...
```

Variables

There are different ways in which you can define variables in Ansible. The simplest way is by using the **vars** section of a playbook. The below example defines a variable name called **package** and it is using in a task called **Install a Package**.

FileName: variables-playbook.yaml

```
---
- hosts: localhost
  become: true
  vars:
     package: vim
  tasks:
     - name: Install a Package
       yum:
         name: "{{package}}"
         state: latest
...
```

Group Variables and Host Variables

You can define custom variables for each group and host that you define in host inventory.
These variables are known as group_vars for groups and host_vars for hosts. Any variables that you define for a host or a group can be used in both playbooks and templates.

Both group_vars and host_vars are defined in their own folders, ‘groups_vars’ and ‘host_vars’, respectively. For group_vars, the file must be named exactly the same as the group.
For host_vars, the file has to be named exactly the same as the host.

Say you have a group ‘appServers’ and you want to define a variable for all of them. Create an empty file first in the group_vars folder in the root of your ansible directory (where you put you playbooks or in ansible home(installation) directory):

group_vars/appServers

Then add a variable to the file:

package=httpd

This makes the variable ‘package’ available to all playbooks that run on this group. I’ll show you how to use these in your playbook in a bit.

Say you have one group appServer you want to execute a certain action in a playbook by using varible defined in group_vars. The following is an action you could use, using a group_var definition:

```
---
- hosts: appServers
  become: true
  tasks:
    - name: Install a Package
      yum:
        name: "{{package}}"
        state: latest
```

You can also do this with host_vars:

host_vars are similar to this. Create a file first:

host_vars/localhost

And add a variable:

package=git

this makes the variable 'package' available to all playbooks that run on this host.

```
---
- hosts: localhost
  become: true
  tasks:
    - name: Install a Package
      yum:
        name: "{{package}}"
        state: latest
```

If group_vars,host_vars has same variable with different values.While play is executed in that host variable value from host_vars will take precedence.

Conditional Statements

The When Statement

Sometimes you will want to skip a particular step on a particular host. This could be something as simple as not installing a certain package if the operating system is a

particular version, or it could be something like performing some cleanup steps if a filesystem is getting full.

This is easy to do in Ansible with the *when* clause, which contains a raw Jinja2 expression without double curly braces

```
tasks:
  - name: "shut down Debian flavored systems"
    command: /sbin/shutdown -t now
    when: ansible_facts['os_family'] == "Debian"
    # note that all variables can be directly in conditionals without double curly braces
```

You can also use parentheses to group conditions:

```
tasks:
  - name: "shut down CentOS 6 and Debian 7 systems"
    command: /sbin/shutdown -t now
    when: (ansible_facts['distribution'] == "CentOS" and
ansible_facts['distribution_major_version'] == "6") or
          (ansible_facts['distribution'] == "Debian" and
ansible_facts['distribution_major_version'] == "7")
```


Multiple conditions that all need to be true (a logical ‘and’) can also be specified as a list:

```
tasks:
  - name: "shut down CentOS 6 systems"
    command: /sbin/shutdown -t now
    when:
      - ansible_facts['distribution'] == "CentOS"
      - ansible_facts['distribution_major_version'] == "6"
```

Tags

Tags are useful to be able to run a specific without running the whole playbook.

We can use tags on play and task level.

```
---
- hosts: localhost
  become: yes
```

```
 tasks:
 - name: Install Apache HTTP server on RedHat Server
   tags:
     - install
   yum:
     name: httpd
     state: present
   when: ansible_os_family == "RedHat"
 - name: Install Apache HTTP server on Ubuntu server
   tags:
     - install
     - start
   apt:
     name: apache2
     state: present
   when: ansible_os_family == "Debian"
 - name: Install Apache HTTP server on CentOS server
   yum:
     name: httpd
     state: present
   when:
     - ansible_facts['distribution'] == "CentOS"
     - ansible_facts['distribution_major_version'] == "7"
 - name: Print the Ansible free memory
   debug:
     msg: "free memory is {{ansible_memory_mb.real.free}}"
```


ansible-playbook sampleplaybook.yaml --list-tags: It will display all available tags in specified playbook.

ansible-playbook sampleplaybook.yml --tags "install,start" : This command will run the tags install and start.

ansible-playbook sampleplaybook.yml --skip-tags "install": This command will skip the tags specified tags, install.

https://docs.ansible.com/ansible/2.4/playbooks_tags.html

Ansible Roles

With more complexity in functionality, it becomes difficult to manage everything in one ansible playbook file. Sharing code among teams become difficult. Ansible Role helps solve these problems. Ansible role is an independent component which allows reuse of common configuration steps. Ansible role has to be used within playbook. Ansible role

is a set of tasks to configure a host to serve a certain purpose like configuring a service. Roles are defined using YAML files with a predefined directory structure.

What is Ansible roles?

1. Ansible roles are consists of many playbooks, which is similar to modules in puppet and cook books in chef. We term the same in ansible as roles.
2. Roles are a way to group multiple tasks together into one container to do the automation in very effective manner with clean directory structures.
3. Roles are set of tasks and additional files for a certain role which allow you to break up the configurations.
4. It can be easily reuse the codes by anyone if the role is suitable to someone.
5. It can be easily modify and will reduce the syntax errors.

Below is a sample playbook codes to deploy Apache web server. Let's convert this playbook codes into Ansible roles.


```
---
- hosts: all
  become: true
  tasks:
  - name: Install httpd Package
    yum: name=httpd update_cache=yes  state=latest
  - name: Copy httpd configuration file
    copy: src=httpd.conf dest=/etc/httpd/conf/httpd.conf
  - name: Copy index.html file
    copy: src=index.html dest=/var/www/html
    notify:
    - restart apache
  - name: Start and Enable httpd service
    service: name=httpd state=restarted enabled=yes
  handlers:
  - name: restart apache
    service: name=httpd state=restarted
```

How do we create Ansible Roles?

To create a Ansible roles, use ansible-galaxy command which has the templates to create it. This will default directories and do the modifications else we need to create each directories and files manually.

Let's take an example to create a role for Apache Web server.

```
# mkdir /etc/ansible/rolesDemo
# ansible-galaxy init /etc/ansible/rolesDemo/apache

    -    apache was created successfully
[ansible@ip-172-13-17-90 ~]#
```

where, ansible-glaxy is the command to create the roles using the templates.

init is to initiliaze the role.

apache is the name of role.

List out the directory created under /etc/ansible/rolesDemo.

Note : if tree command is not working install tree package using package manager.

```
[ansible@ip-172-13-17-90 ~]# tree /etc/ansible/rolesDemo/apache/

/etc/ansible/rolesDemo/apache/

|-- README.md

|-- defaults

|   `-- main.yml

|-- files

|-- handlers

|   `-- main.yml

|-- meta

|   `-- main.yml

|-- tasks
```

```
|  `-- main.yml

|-- templates

|-- tests

|  |-- inventory

|  `-- test.yml

`-- vars

`-- main.yml

8 directories, 8 files

[ansible@ip-172-13-17-90 ~]#
```

We have got the clean directory structure with the ansible-galaxy command. Each directory must contain a main.yml file, which contains the relevant content.

Directory Structure:

A role directory structure contains directories: defaults, vars, tasks, files, templates, meta, handlers. Each directory must contain a main.yml file which contains relevant content. Let's look little closer to each directory.

1. defaults: contains default variables for the role. Variables in default have the lowest priority so they are easy to override.
2. vars: contains variables for the role. Variables in vars have higher priority than variables in defaults directory.
3. tasks: contains the main list of steps to be executed by the role.
4. files: contains files which we want to be copied to the remote host. We don't need to specify a path of resources stored in this directory.
5. templates: contains file template which supports modifications from the role. We use the Jinja2 templating language for creating templates.
6. meta: contains metadata of role like an author, support platforms, dependencies.
7. handlers: contains handlers which can be invoked by "notify" directives and are associated with service.

First, move on to the Ansible roles directory and start editing the yml files.

cd /etc/ansible/rolesDemo/apache

1. defaults

Edit main.yml available in the defaults folder to define the default variables.

base_httpd_listen_port: 80

2. Tasks

Edit main.yml available in the tasks folder to define the tasks to be executed.

vi tasks/main.yml

```
---
- name: Install httpd Package
yum: name=httpd state=latest
- name: Copy httpd configuration file
template: src=httpd.conf.j2 dest=/etc/httpd/conf/httpd.conf
- name: Copy index.html file
copy: src=index.html dest=/var/www/html
notify:
- restart apache
```

3. Templates

Copy the required files (httpd.conf.j2) to the templates directory.

4. Files

Copy the required files (index.html) to the files directory.

5. Handlers

Edit handlers main.yml to restart the server when there is a change. Because we have already defined it in the tasks with notify option. Use the same name "restart apache" within the main.yml file as below.

```
-    name: restart apache

  service: name=httpd state=restarted
```

6. Meta

Edit meta main.yml to add the information about the roles like author, descriptions, license, platforms supported.

```
[ansible@ip-172-13-17-90 ]# cat meta/main.yml

galaxy_info:
author: MithunTechnologies.net
description: Apache Webserver Role
company: MithunTechnologies.net
```

We have got all the required files for Apache roles. Let's apply this role into the ansible playbook "site.yml" as below to deploy it on the client nodes.


```
cat /etc/ansible/rolesDemo/site.yml ---

-    hosts: appServers
     roles:
-    apache
```

sWe have defined this changes should be run only on appServers, you can also use "all" if need. Specify the role name as "apache", also if you have created multiple roles, you can use the below format to add it.

```
-    apache
-    common
```

Let's verify for syntax errors:

[ansible@ip-172-13-17-90]# ansible-playbook /etc/ansible/rolesDemo/site.yml --syntax-check

playbook: /etc/ansible/rolesDemo/site.yml

If No errors found. Let move on to deploy the roles.

[ansible@ip-172-13-17-90]# ansible-playbook /etc/ansible/rolesDemo/site.yml

Source Code can be downloaded from git hub here

Ansible Vault

A typical Ansible setup will involve needing some sort of secret to fully setup a server or application.Common types of "secret" include passwords, SSH keys, SSL certificates, API tokens and anything else you don't want the public to see.
Since it's common to store Ansible configurations in version control, we need a way to store secrets securely.
Ansible Vault is the answer to this. Ansible Vault can encrypt anything inside of a YAML file, using a password of your choice.

Using Ansible Vault

A typical use of Ansible Vault is to encrypt variable files. Vault can encrypt any YAML file, but the most common files to encrypt are:

1. Files within the group_vars directory.
2. A role's defaults/main.yml file
3. A role's vars/main.yml file.
4. Any other file used to store variables.

Let's see how to use Ansible Vault with some variable files.
Let's take below host inventory file we have defined host details along with username & password to connect to the host. If you observe password is visible to everyone. As per standards we should not expose passwords to everyone.

```
[ansible@ip-172-31-21-155 project]$ cat hosts
172.31.29.109 ansible_user=ansible ansible_ssh_pass=DevOps@2018
```

We have two options to here.

- Encrypt complete host inventory file using ansible vault. But this is not suggestable as we are encrypting complete file to encrypt password.
- Create group variables or host variables file and encrypt using ansible vault. And refer variable in host inventory from group/host variables file.

Step1: Create group variables for all groups.

```
[ansible@ip-172-31-21-155 project]$ mkdir group_vars
[ansible@ip-172-31-21-155 project]$ vi group_vars/all.yml
```

Add your password (Key value pair) in group variables yml

```
[ansible@ip-172-31-21-155 project]$ cat group_vars/all.yml
ansible_pwd: DevOps@2018
[ansible@ip-172-31-21-155 project]$
```

Step 2: Encrypt existing group variables yml file using ansible vault.

The typical use case is to have a normal, plaintext variable file that we want to encrypt. Using
ansible-vault, we can encrypt this and define the password needed to later decrypt it:

```
[ansible@ip-172-31-21-155 project]$ ansible-vault encrypt group_vars/all.yml
New Vault password:
Confirm New Vault password:
Encryption successful
[ansible@ip-172-31-21-155 project]$
```

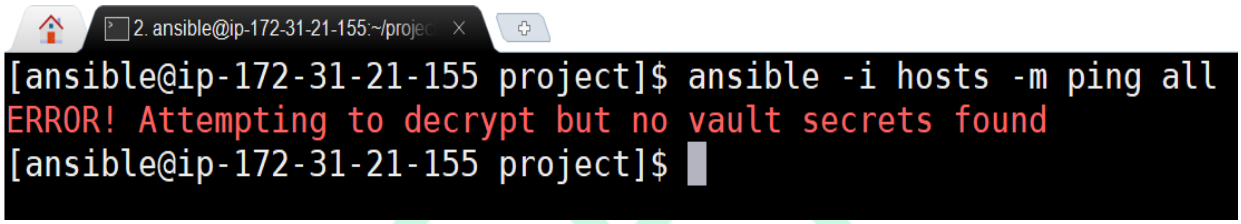
If see the content the complete file is encrypted. Content is not in human readable format.

```
[ansible@ip-172-31-21-155 project]$ cat group_vars/all.yml
$ANSIBLE_VAULT;1.1;AES256
36306339363662323338336335313861633862653937386538343938306238636531383364616363
66636235363535363034616331363561663030623864646 60a39303437366362316564393261656 2
66613364623731656665306163626432303762643833663961306661356134333831643231613163
37313864653565316 50a32386334616438326133636430323461653134333339663239306131373 3
65323466633261653261646664353161653233643633303136376463393634633361
[ansible@ip-172-31-21-155 project]$
```

Step 3:
Update your host inventory to refer password from group_vars/all.yml file make sure you use the same key name which you defined in group_vars/all.yml.

```
[ansible@ip-172-31-21-155 project]$ cat hosts
172.31.29.109 ansible_user=ansible ansible_ssh_pass={{ansible_pwd}}
[ansible@ip-172-31-21-155 project]$
```

Step 4: Execute ansible adhoc command ping to test the connectivity.



We will get error since we are referring password from group_vars/all.yml which is encrypted using vault. So, while executing play book or adhoc commands we must pass ansible vault password what ever
You have typed in while encrypting.

Use below command to execute.

```
[ansible@ip-172-31-21-155 project]$ ansible -i hosts -m ping all --ask-vault-pass
Vault password:
172.31.29.109 | SUCCESS => {
    "changed": false,
    "ping": "pong"
}
[ansible@ip-172-31-21-155 project]$
```

Go through below to know more about other ansible vault commands or options.

Encrypting an Existing File

The typical use case is to have a normal, plaintext variable file that we want to encrypt. Using
ansible-vault, we can encrypt this and define the password needed to later decrypt it:

```
# Encrypt a role's defaults/main.yml file
ansible-vault encrypt defaults/main.yml

        New Vault password:
> Confirm New Vault password:
> Encryption successful
```

The ansible-vault command will prompt you for a password twice (a second time to confirm the first). Once that's done, the file will be encrypted! If you edit the file directly, you'll just see encrypted text. It looks something like this:

```
$ANSIBLE_VAULT;1.1;AES256
653262333637316636316461343065633532366533386464333438383734373734303764616339
333338323337346535313132323763653836336131643138 0a643336643862663739623631616530
353563616264346530663166613738633133623961626463653431666462316531653033431636139
623036616436313834 0a356631633930323032653466626531383261613539633365366631623238
323966376238666331353632313466643037303532306234396336663866623464323631643934 38
336536663730643262333733373839343163353038623138383839666231346462303463303031 36
663332323630623038373335333031303862383231656236323462393835383434376634373737 30
35666532333065383439
```

Creating an Encrypted File

If you are creating a new file instead of encrypting an existing one, you can use the create
command:

```
ansible-vault create defaults/secrets.yml
> New Vault password:
> Confirm New Vault password:
```

Editing a File

Once you encrypt a file, you can only edit the file by using ansible-vault again (unless there's an editor out there that can integrate with Vault to let you edit in the IDE?!). Here's how to edit that file after it's been encrypted:

```
 ansible-vault edit defaults/main.yml
> Vault password:
```

This will ask for the password used to encrypt the file.

```
You'll lose your data if you lose your password!
```


Since we're running these commands in the CLI, this will open the file in a terminal-based app. This usually means your default editor as defined the EDITOR environment variable, if that is set:

```
echo $EDITOR
> vim
```

My EDITOR environment variable isn't set, but my default is Vim. To use Nano instead of Vim, you can set that variable while running Vault:

```
EDITOR=nano ansible-vault edit defaults/main.yml
```

Decrypting a File

You can decrypt a file to get it back to plaintext as well:

```
ansible-vault decrypt defaults/main.yml
> Vault password:
```

Encrypting Specific Variables

You don't have to encrypt a whole file! This is nice to track changes better in git, where you don't have an entire file changing for just a small change (even just opening an encrypted file will change the encrypted hash).

ansible-vault encrypt_string <secretvalume> --name <secrentname>

The most basic use case is to just run it interactively on the CLI to get the properly formatted YAML as output:

```
ansible-vault encrypt_string
> New Vault password:
> Confirm New Vault password:
> Reading plaintext input from stdin. (ctrl-d to end input)
> this is a plaintext string
> !vault |
>          $ANSIBLE_VAULT;1.1;AES256
> 393937666637616533373864366364663965313532613832376135313565313439306631336238 39
> 343661383430326461303862343230383739326166323364 0a36363334333762306561316630636 3
> 373361323634623861383435353462643330616561346366313261646430353134333938316161 31
> 363561356537393931 0a316132313764356432333366396533663965333316233653866343232333 34
```

That string could be used in a variable file like so (as variable some string):

```
---
some_string: !vault |
    $ANSIBLE_VAULT;1.1;AES256

393937666637616533373864366364663965313532613832376135313565313439306631
33623839

343661383430326461303862343230383739326166323364 0a3636333433376230656131
66306363

373361323634623861383435353462643330616561346366313261646430353134333933
831616131
```


You can do this in one line also:

```
ansible-vault encrypt_string 'this is a plaintext string' --name
'some_string'
> New Vault password:
> Confirm New Vault password:
> some_string: !vault |
>           $ANSIBLE_VAULT;1.1;AES256
> 343962326431333230346663353139396338653565343030643962386439393433376263
30666164
```

```
> 623130306137366632626438653866656437376266333231 0a32393862623936376334363
638353264
> 646462666633613866333863316561633534386230336266333666643035363961363533
834336364
> 636330353230326564 0a396264616562663963653034376462613035383333373437653
362616566
>           3531
> Encryption successful
```

The output can be copied/pasted or appended into an existing YAML file!

Running Ansible with Encrypted Variables

If your roles or playbooks reference encrypted variables, you need to have given Ansible the password to decrypt them. You can do this in two ways:
Ask for Vault Password

Have Ansible ask for the vault password as a prompt:


```
ansible-playbook --ask-vault-pass -i inventory_file some_playabook.yml
```

Using the --ask-vault-pass flag will instruct Ansible to ask for the vault password so it can decrypt the variable files correctly.
Use a Vault File

Another handy thing you can do is store a vault password in a file and use that. This is handy for automation.
To do so, first create a file with a password:

```
echo "secret_password" > vault_password
```

Then you can reference that file with the --vault-password-file flag. This flag can be used with any ansible-playbook or ansible-vault command to pre-define the password, so you do not get a prompt:

```
# When creating/editing/encrypting/decrypting/rekeying a file:
ansible-vault --vault-password-file=vault_password create
defaults/foo.yml
ansible-vault --vault-password-file=vault_password edit
defaults/foo.yml

# When running ansible playbooks
ansible-playbook --vault-password-file=vault_password -i inventory_file
some_playabook.yml
```

Issues

There are only a few issues to really worry about:

- If you lose your password, you lose your data. One common way to make this more manageable is to use a shared password manager.
- If you're tracking your Ansible roles in git, you'll notice that even opening an encrypted file (and not changing it) will change the file; Merely opening a file means a new git commit. This is an annoying result of how the encryption is done when opening (decrypting) and closing (re-encrypting) a file for editing. This can be mitigated by encrypting only specific variables within a file as shown above.

Ansible Modules

setup module
file
pause
yum and apt
service
copy
ping

service
command
debug
template

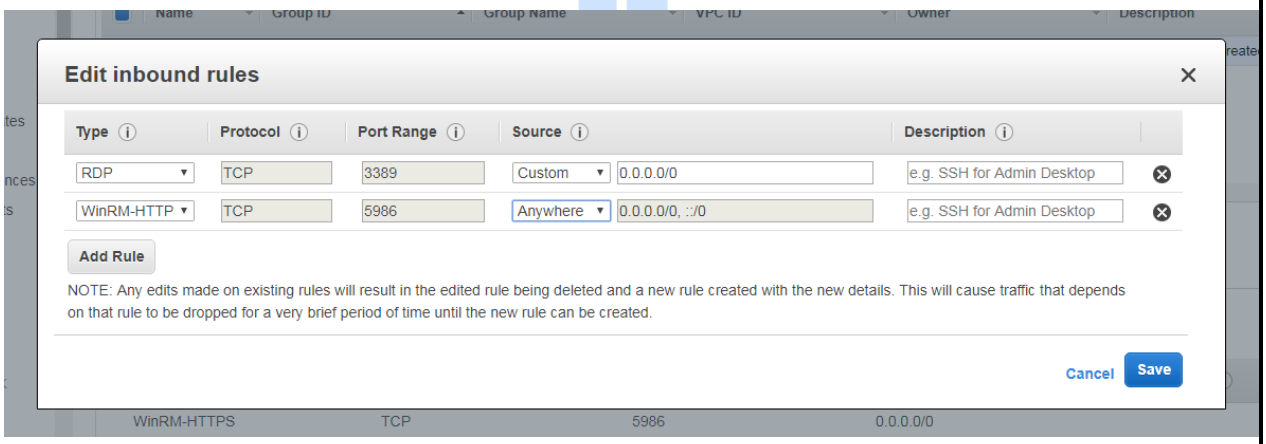
uri
user
assert
System
Commands
Database
Cloud
Windows

Ansible Playbook (Linux – Windows) using Winrm

1. Install winrm in Linux server

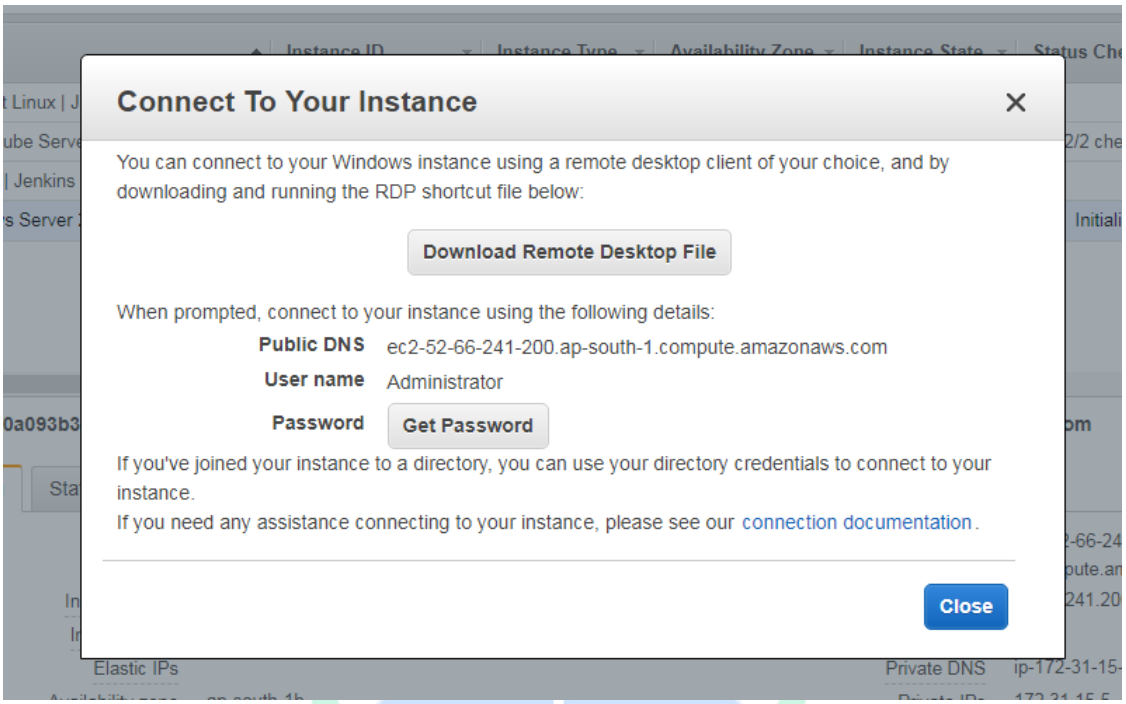
   sudo pip3 install pywinrm

2. Create a Windows Server 2019 Instance in AWS
3. Open Winrm-https port in security groups

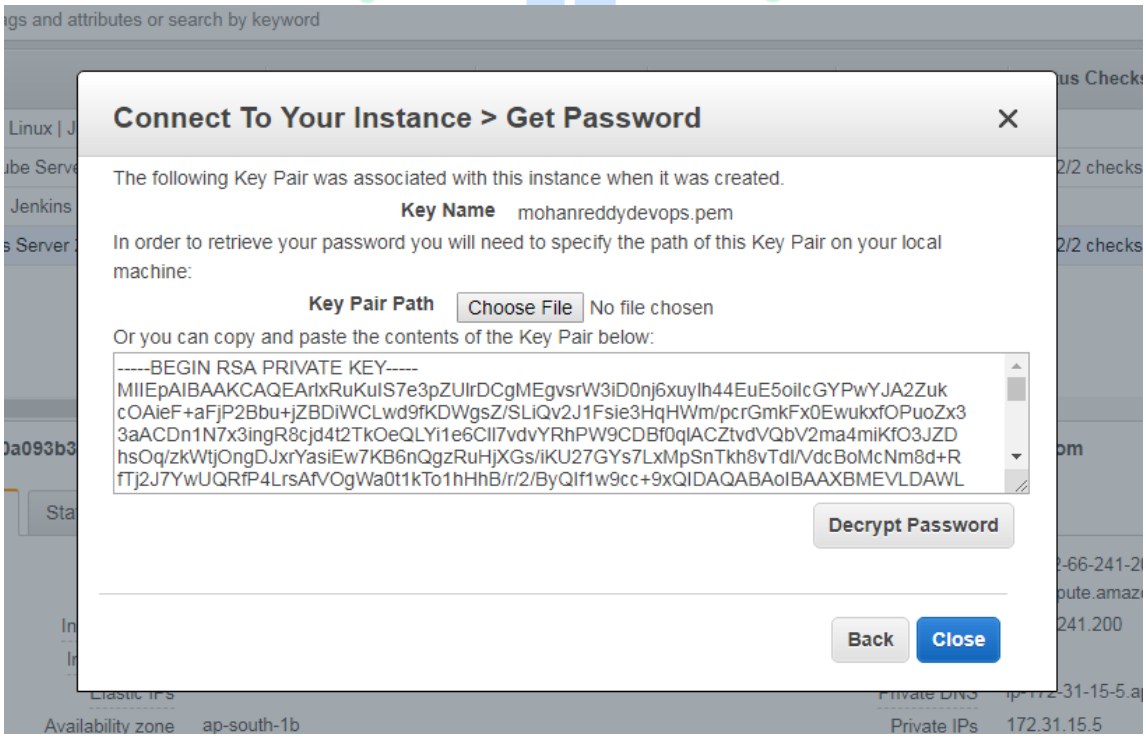


4. Login to Windows Server using Remote Desktop tool

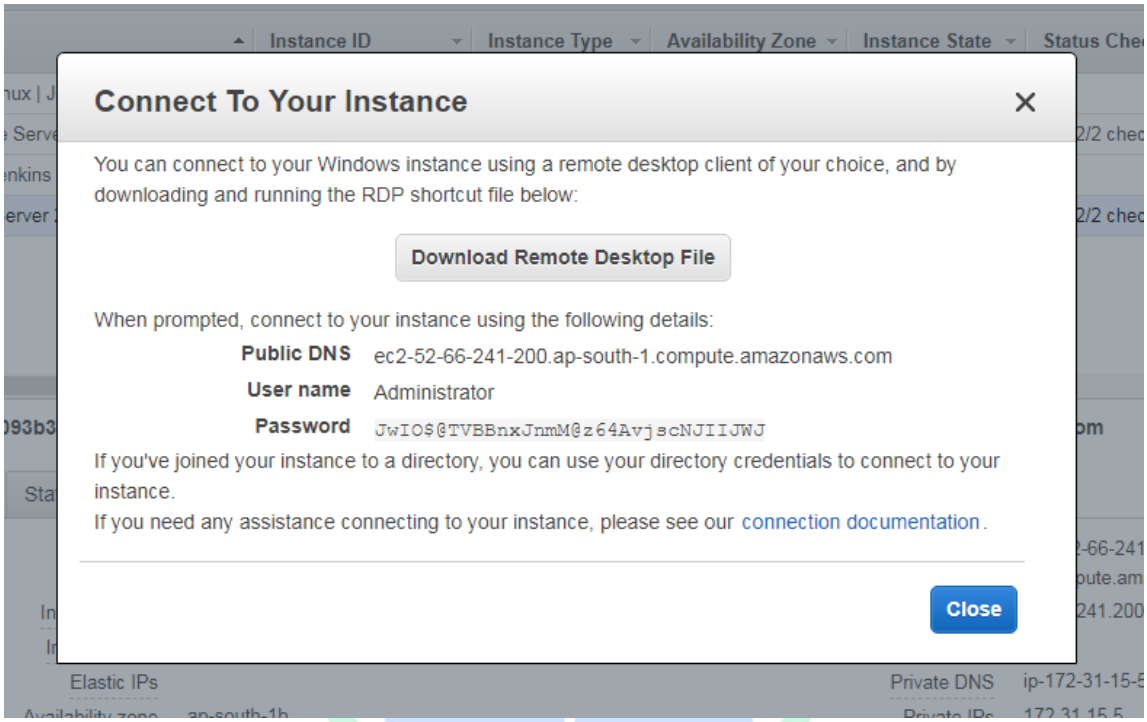
   Connect -> Click Get Password



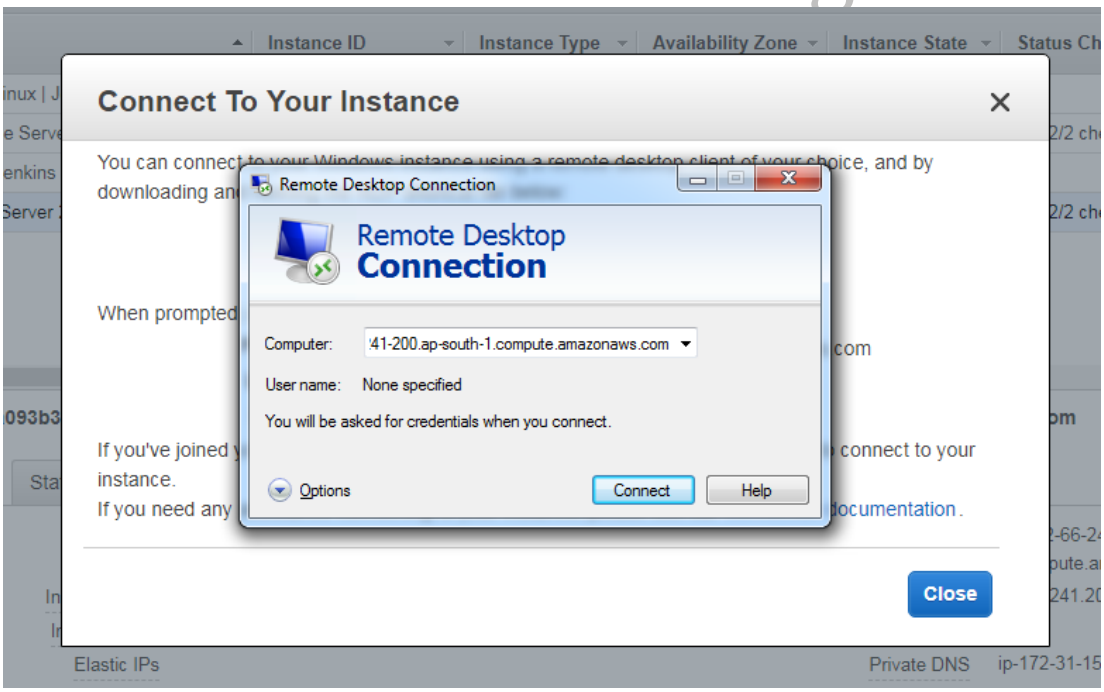
Click -> Choose File & select your AWS pem file & Click Decrypt Password



Copy -> Public DNS, User Name & Password

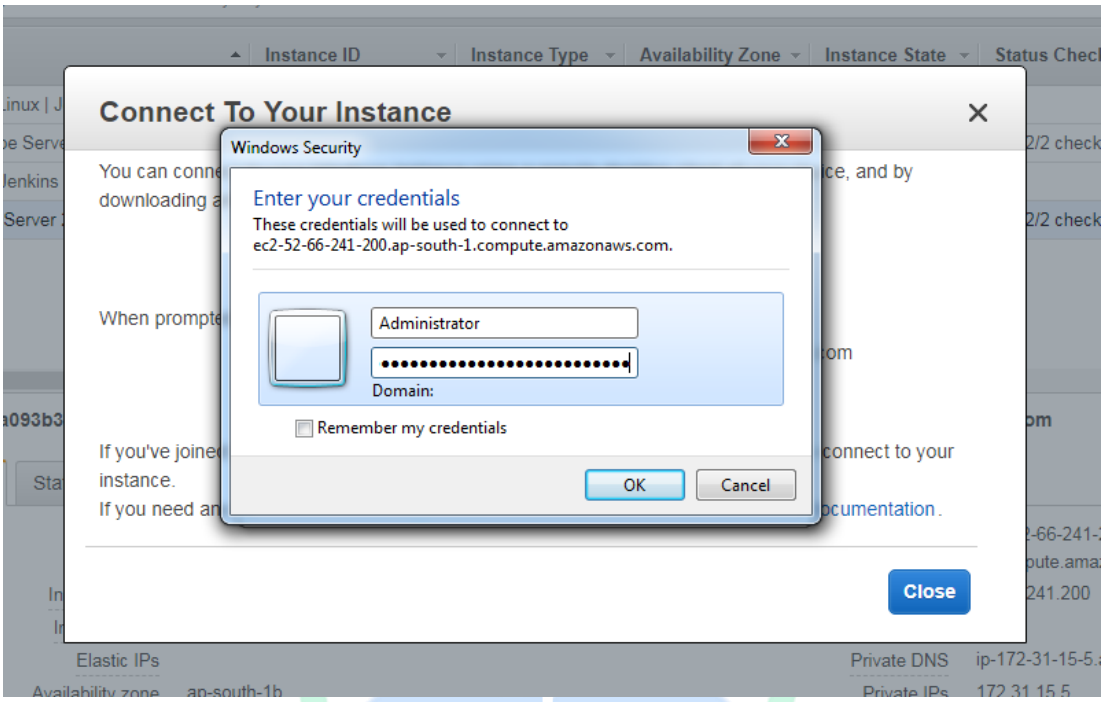


Open Remote Desktop Connection –> Paste Public DNS in place of Computer & Click -> Connect

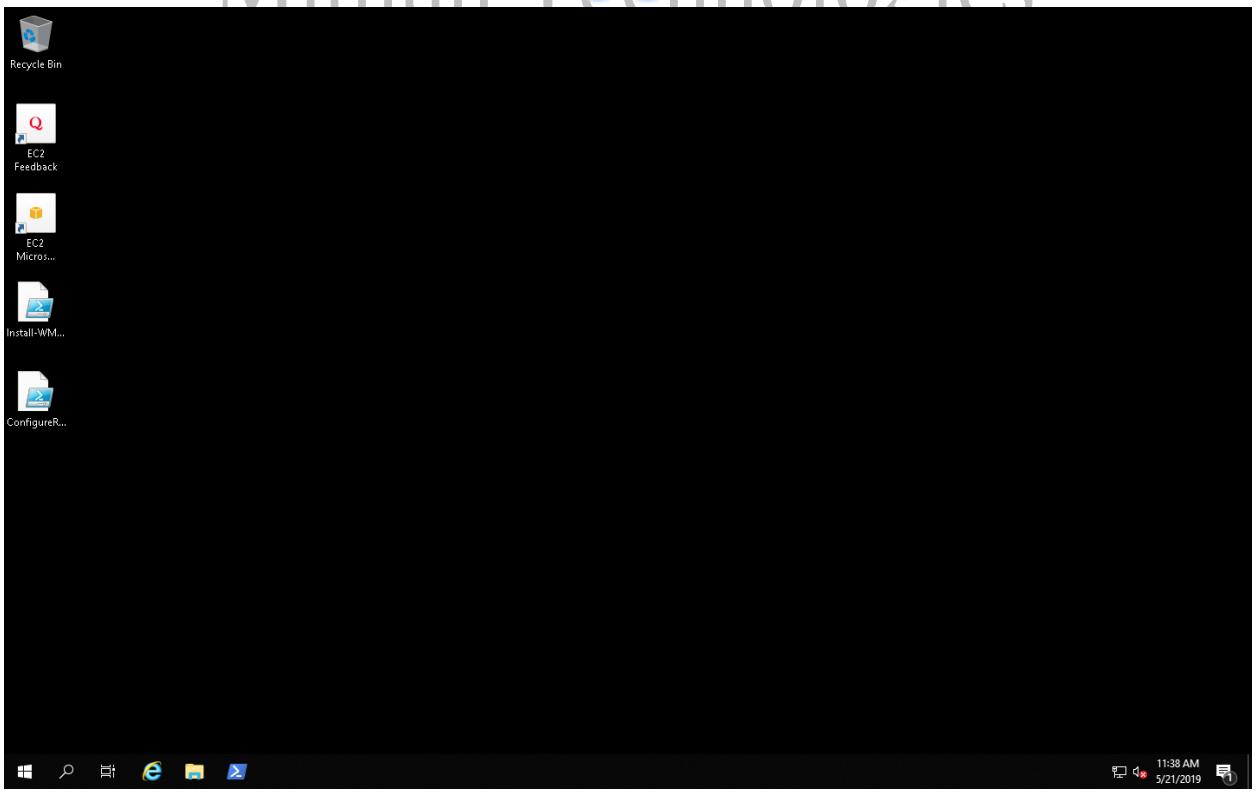


Provide Username & Password and Click -> OK

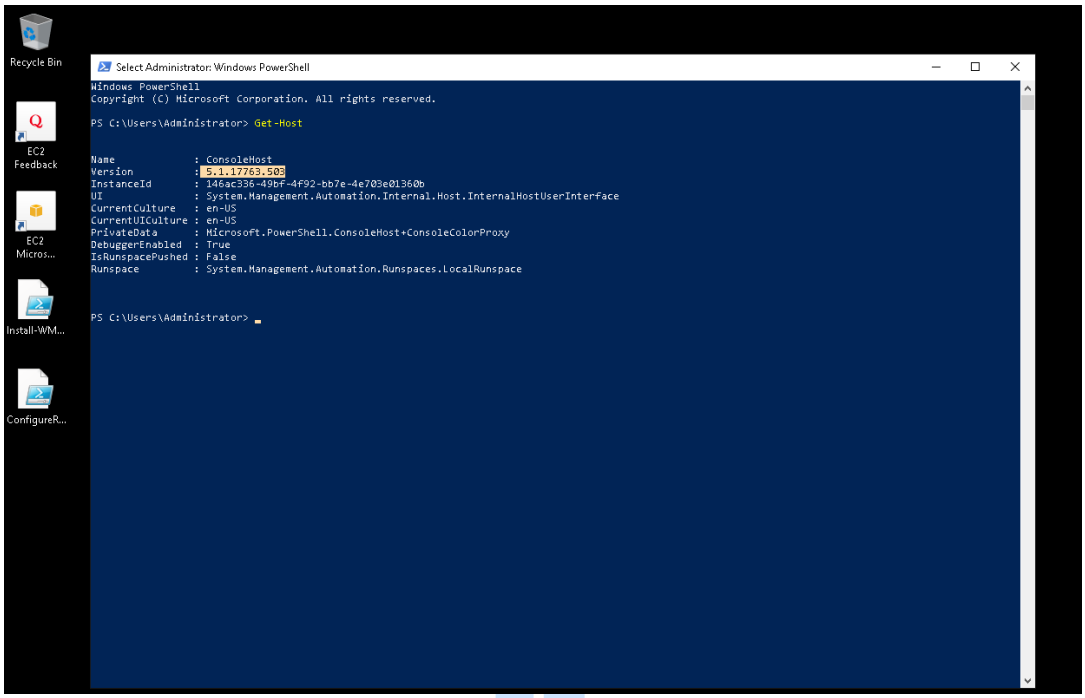
Now Remote Desktop will connect to the Windows Server 2019



Windows Server 2019 Connected



5. Open Windows Powershell and Check for version. It is above 3.0, so we can configure winrm now (use Get-Host command to check version)



6. Configure Winrm

6.1 Winrm Memory Hotfix

Goto this link

https://github.com/jborean93/ansible-windows/blob/master/scripts/Install-WMF3Hotfix.ps1

Copy the code and save it in Windows Server Machine Desktop as Install-WMF3Hotfix.ps1

Open Windows Powershell and go to Desktop (cd ~/.Desktop)

Execute the following command

```
powershell.exe -ExecutionPolicy ByPass -File Install-WMF3Hotfix.ps1 -Verbose
```

6.2 Winrm Setup

Got to this link

https://github.com/ansible/ansible/blob/devel/examples/scripts/ConfigureRemotingForAnsible.ps1

Copy the code and save it in Windows Server Machine Desktop as

ConfigureRemotingForAnsible.ps1

Open Windows Powershell and go to Desktop (cd ~/.Desktop)

Execute the following command

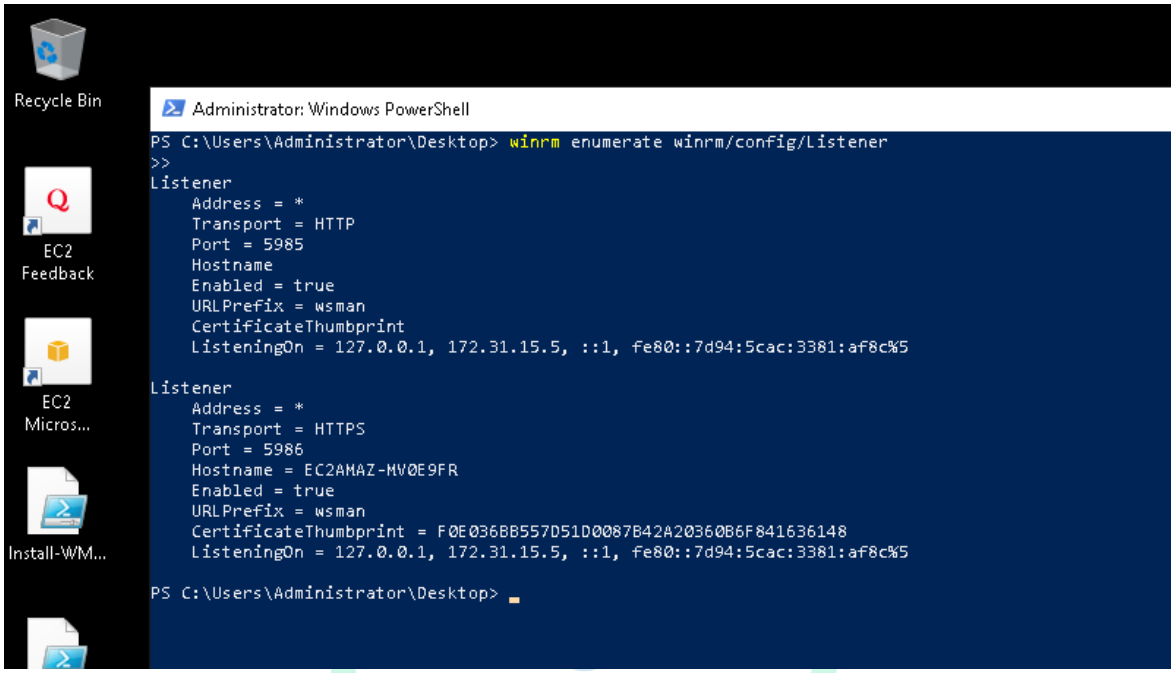
```
powershell.exe -ExecutionPolicy ByPass -File ConfigureRemotingForAnsible.ps1
```


6.3 Winrm Listener

Execute this command in Powershell to know about the winrm listener port details

```
winrm enumerate winrm/config/Listener
```

Winrm uses Port 5986 for HTTPS & 5985 for HTTP



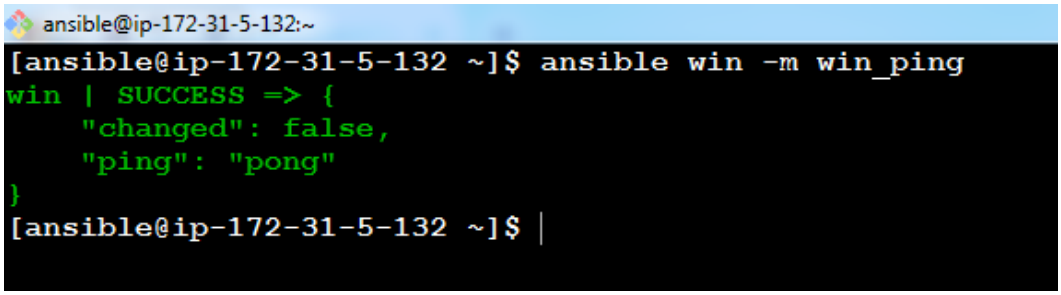
7. Configure Windows Host in Ansible Server in /etc/ansible/hosts

```
[windowsServers]
PRIVATE IP ansible_password=PASSWORD ansible_connection=winrm
ansible_port=5986 ansible_user=Administrator
ansible_winrm_server_cert_validation=ignore
```

(Note: Replace PRIVATEIP & PASSWORD with your Windows Server 2019 Instance Credentials)

8. Ping Windows Server using the command

```
ansible windowsServers -m win_ping
```



9. Write a playbook to Install Git & Notepad++ in Windows Server 2019

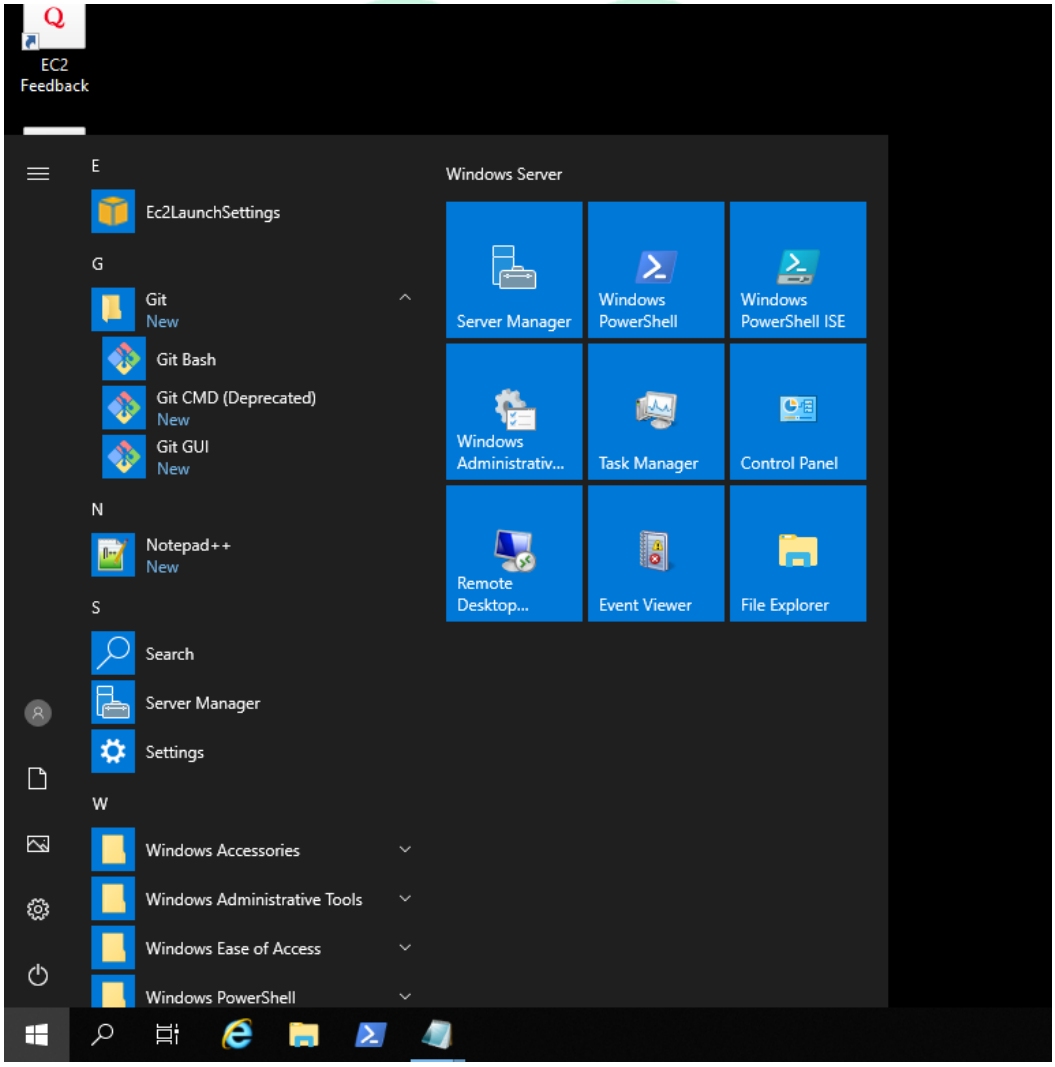
```
- hosts: windowsServers
  tasks:
   - name: Install git
     win_chocolatey:
      name: git
      state: present

   - name: Install notepad++
     win_chocolatey:
      name: notepadplusplus
      state: present
```


10. Execute Playbook to install Git and Notepad++ in Windows Server 2019

```
ansible-playbook   win.yml
```

```
ansible@ip-172-31-5-132:~/ansible-playbooks-master
[ansible@ip-172-31-5-132 ansible-playbooks-master]$ ansible-playbook win.yml

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

TASK [Gathering Facts] *********************************************************
ok: [win]

TASK [Install git] *************************************************************
ok: [win]

TASK [Install notepad++] *******************************************************
changed: [win]

PLAY RECAP *********************************************************************
win                        : ok=3    changed=1    unreachable=0    failed=0

[ansible@ip-172-31-5-132 ansible-playbooks-master]$
```

11 . Check the Installed Git & Notepad++ in Windows Server 2019



Resources

http://www.yamllint.com/
https://valdhaus.co/writings/ansible-mac-osx/
http://binarynature.blogspot.in/2016/01/install-ansible-on-os-x-el-capitan_30.html