Ansible Foundation Workshop Hands-On Guide

This article is a step-by-step guide for the hands-on session included in the Ansible Foundation Workshop conducted by ESD PSS Infra department. This hands-on session serves to teach you how to write simple Ansible Playbooks. The knowledge gained shall build the foundation necessary to utilise Ansible's various features and modules for complex use cases.

1. Setup Ansible

Ansible can be used to configure any target system that supports the SSH protocol and Python 2/3 library. However, Ansible's control node can only run on Unix OS (Ubuntu, MacOS, Red Hat, etc.). For this workshop, an Ubuntu 18.04 VM with Ansible is already prepared for you.

1.1 (Optional) Install Ansible

To install Ansible on an Ubuntu 18.04 VM, run the following commands as a sudo user:

```
sudo apt-add-repository ppa:ansible/ansible
sudo apt update
sudo apt install ansible
```

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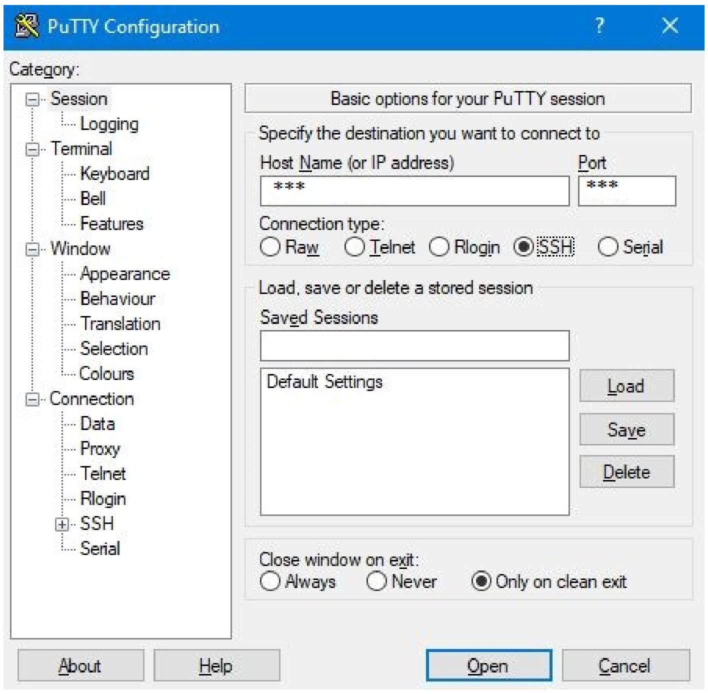
2. Access Ansible Control Node Remotely

2.1 For Windows PC

1. Install software PuTTY

2. Run PuTTY and start a session with the following settings:
    - Host Name: ***
    - Port: ***
    - Connection type: SSH



Specify the destination you want to connect to
Host Name (or IP address): ***
Port: ***
Connection type: Raw Telnet Rlogin [✓ SSH] Serial
Load, save or delete a stored session
Saved Sessions
Default Settings
Close window on exit: Always Never [✓ Only on clean exit]

3. In the Terminal that appears, login using the following credentials (replace 'X' with the number assigned to you):
   - Username: userX
   - Password: userX

2.2 For Ubuntu/Debian PC

1. Access the command console
2. Update Package list

```
sudo apt update
```

3. Install OpenSSH server

```
sudo apt install openssh-server
```

4. SSH to the target VM (replace 'X' with the number assigned to you). Password is the same as the username.

```
ssh userX@<host ip> -p <host port>
```

3. Hands-On Exercises

Before the start of the hands-on exercise, run the following command to create the `ansible-workshop` directory to work in (Replace 'X' with the number assigned to you):

```
mkdir /home/userX/ansible-workshop
cd /home/userX/ansible-workshop
```

3.1 Exercise 1 - Introduction to Ansible

3.1.1 Part One - Basic Introduction

Exercise 1 part 1 will guide the user through some basic scripting in the Ansible environment using the `debug` module which is similar to a printing module. The main intention is to get the user to familiarize with the Ansible environment before proceeding to the next exercise.

1. Create the `playbooks` directory and change your current directory to it.

   ```
   mkdir playbooks
   cd playbooks
   ```

2. Create exercise 1 part one task in `main-script.yaml`

   Edit or create `main-script.yaml` file

   ```
   nano main-script.yaml
   ```

   Add the following task script into `main-script.yaml` (Replace 'X' with the number assigned to you).

   ```
   - name: Exercise 1 Part One - Introduction to Ansible
     hosts:
       targetnodeX

     tasks:
       - name: Print Task 1
         debug:
           msg: "This is Task 1"
       - name: Print Task 2
         debug:
           msg: "This is Task 2"
       - name: Print Task 3
         debug:
           msg: "This is Task 3"
   ```

   Once everything is filled up, save the file by pressing `ctrl-o` then `enter`. Exit the file by pressing `ctrl-x`.

3. Create the ansible host file for the task

   ```
   nano inventory.yaml
   ```

   Add your target node hostname/ip address into the file (Replace 'X' with the number assigned to you)

   ```
   targetnodeX
   ```

   or

   ```
   10.0.1.21X
   ```

4. To run the ansible script, use the following command:

   ```
   ansible-playbook -ki inventory.yaml main-script.yaml
   ```

   -k : prompt user to input ssh password

   -i : to pass in the inventory file

3.1.2 Part Two - Introduction to Roles & Tags

Exercise 1 part two will focus on the introduction of `roles` and `tags` module. One of the best practices is to keep the Ansible environment well organised. This can be achieved through the use of `roles` module and file directories to organise all the tasks instead of having all contents inside a single main script. If the project uses alot of tasks, the main script will look very messy and hard to maintain. Using the `roles` module, users can split up all the tasks in the main script into individual roles and store the actual tasks in the `roles` directory, thus keeping the main script neat and tidy.

The `tags` module can be used to provide tagging to each individual role task or the whole task. By default Ansible will run all the tasks inside the main script, however with the use of `tags` module the user can specify which tasks to run instead of all the tasks.

1. Create exercise 1 part two task in `main-script.yaml`

   ```
   nano main-script.yaml
   ```

   Add the following into `main-script.yaml` below exercise 1 part Once task (Replace 'X' with the number assigned to you)

   ```
   - name: Exercise 1 Part two - Introduction to roles & tags
     hosts:
       targetnodeX
     roles:
       - role: task-1
       - role: task-2
       - role: task-3
     tags: ex-1-2
   ```

   Also add in the following tag at the end of exercise 1 part one task (take note of the spacing)

   ```
   tags: ex-1-1
   ```

   Save the `main-script.yaml` file

2. Create the `roles` directory

   ```
   mkdir roles
   ```

3. Create the task folder in the `roles` directory

   ```
   mkdir -p roles/task-1/tasks
   mkdir -p roles/task-2/tasks
   mkdir -p roles/task-3/tasks
   ```

4. Create the `main.yaml` file in the task folder

   ```
   nano roles/task-1/tasks/main.yaml
   ```

   Fill in the `main.yaml` file with the following script

   ```
   - name: Print Task 1
     debug:
       msg: "This is Task 1"
   ```

   Repeat this step for task-2 and task-3, replacing the number as required

5. To run exercise 1 part two task, use the following command:

   ```
   ansible-playbook -ki inventory.yaml main-script.yaml --tags=ex-1-2
   ```

   --tags: run the task with the tag specified

   --skip-tags : skip the task with the tag specified

3.2 Exercise 2 - Using Variables & Loop function

Exercise 2 will focus on the introduction of variables in Ansible tasks and also the `loop` module. This exercise will guide the user through the creation of the variable directory and also the playbook syntax to call for the variables inside tasks. The exercise will also focus on the `loop` module, which is very useful when the user is required to pass in arrays of values into tasks.

1. Create exercise 2 task in `main-script.yaml`

   ```
   nano main-script.yaml
   ```

   Add the following into `main-script.yaml`

   ```
   - name: Exercise 2 - Using Variables & Loop function
     hosts:
       managed_node
     roles:
       - role: single-variable
       - role: multiple-variable
     tags: ex-2
   ```

2. Edit the ansible host file to use group names

   ```
   nano inventory.yaml
   ```

Add your target node hostname/ip address into the file (Replace 'X' with the number assigned to you)
The `[managed_node]` is an arbitrary host group name that collectively represents all the hosts under it

```
[managed_node]
targetnodeX
```

3. Create the variable file

   First create the group variable directory

   ```
   mkdir group_vars
   ```

   Next create the variable file

   ```
   nano group_vars/all.yaml
   ```

   Fill in the `all.yaml` files with the following variables

   ```
   required_package: openssh-server

   install_package:
     - vim
     - python3
     - nginx
   ```

4. Create exercise 2 task folders in the `roles` directory

   ```
   mkdir -p roles/single-variable/tasks
   mkdir -p roles/multiple-variable/tasks
   ```

5. Create the `main.yaml` file for both tasks

   For single-variable task:

   ```
   nano roles/single-variable/tasks/main.yaml
   ```

   Fill in the `main.yaml` file of single-variable task with the following script

   ```
   - name: Printing single variable from group_vars folder
     debug:
       msg: "Required to install '{{required_package}}' module"
   ```

   For multiple-variable task:

   ```
   nano roles/multiple-variable/tasks/main.yaml
   ```

Fill in the `main.yaml` file of multiple-variable task with the following script

```
- name: Printing single variable from group_vars folder
  debug:
    msg: "Please install {{item}} module"
  loop: "{{install_package}}"
```

6. To run exercise 2 task, use the following command:

```
ansible-playbook -ki inventory.yaml main-script.yaml --tags=ex-2
```

3.3 Exercise 3 - Privilege Escalation

Exercise 3 will focus on privilege escalation, which is required to run specific tasks. One such particular task is to install modules/packages on the target node VM. This task will fail if it is run by a normal user with no privileges. This exercise will introduce the `become` module. This module allows the user to become another user of the target node and use that user account to run the tasks. Becoming a sudoer/root user will thus give the necessary privileges for tasks such as module/package installation.

1. Create exercise 3 task in `main-script.yaml`

   ```
   nano main-script.yaml
   ```

   Add the following into `main-script.yaml`

   ```
   - name: Exercise 3 - Privilege Escalation
     hosts:
       managed_node
     become: yes

     roles:
       - role: installpackage
     tags: ex-3
   ```

2. Create exercise 3 task folders in the `roles` directory

   ```
   mkdir -p roles/installpackage/tasks
   ```

3. Create the `main.yaml` file

   ```
   nano roles/installpackage/tasks/main.yaml
   ```

   Fill in the `main.yaml` file of installpackage task with the following script

```
- name: Install nginx package
  apt:
    name: "{{item}}"
    state: present
  loop: "{{install_package}}"

- name: Start nginx service
  service:
    name: nginx
    state: started
```

4. To run exercise 3 task, use the following command:

   Run the script to only target the managed node:

   ```
   ansible-playbook -Kki inventory.yaml main-script.yaml --tags=ex-3
   ```

   -K : prompt user to input become password

3.4 Exercise 4 - Target Control

Exercise 4 focuses on target control. This exercise will demonstrate how to specify target nodes for each Ansible task through the setup of the ansible host file and the `hosts` module.

1. Create exercise 4 task in `main-script.yaml`

   ```
   nano main-script.yaml
   ```

   Add the following into `main-script.yaml`

   ```
   - name: Exercise 4 - Target Control, Target only one managed node
     hosts:
       managed_node
     roles:
       - role: get-block-devices
     tags:
       - ex-4
       - ex-4-managed_node

   - name: Exercise 4 - Target Control, Target both the managed node & localhost
     hosts:
       all_node
     roles:
       - role: get-disk-usage
     tags:
       - ex-4
       - ex-4-all_node
   ```

2. Edit the ansible host file to add another group

   ```
   nano inventory.yaml
   ```

Add your target node hostname/ip address into the file (Replace 'X' with the number assigned to you)

```
[managed_node]
targetnodeX

[all_node]
targetnodeX
localhost
```

3. Create the task folders in the `roles` directory

```
mkdir -p roles/get-disk-usage/tasks
mkdir -p roles/get-block-devices/tasks
```

4. Create the `main.yaml` file for both tasks

For get-disk-usage task:

```
nano roles/get-disk-usage/tasks/main.yaml
```

Fill in the `main.yaml` file of get-disk-usage task with the following script

```
- name: Get disk usage data
  shell: "df -h"
  register: DiskUsageData

- name: Print disk usage data
  debug:
    msg: "{{DiskUsageData.stdout_lines}}"
```

For get-block-devices task:

```
nano roles/get-block-devices/tasks/main.yaml
```

Fill in the `main.yaml` file of `get-block-devices` task with the following script

```
- name: Get block devices data
  shell: "lsblk"
  register: BlockDeviceData

- name: Print block devices data
  debug:
    msg: "{{BlockDeviceData.stdout_lines}}"
```

5. To run exercise 4 task, use the following command:

   Run the task to get block devices data from the managed node:

   ```
   ansible-playbook -ki inventory.yaml main-script.yaml --tags=ex-4-managed_node
   ```

   Run the task to get the disk usage data from both the managed node and control node:

   ```
   ansible-playbook -ki inventory.yaml main-script.yaml --tags=ex-4-all_node
   ```

   Run both of the task:

   ```
   ansible-playbook -ki inventory.yaml main-script.yaml --tags=ex-4
   ```

Appendix A

Useful Ubuntu Commands

Change directory to current user's home directory

```
cd ~
```

Change directory to a specific path

```
cd /path/to/directory
```

Change directory to a relative path

```
cd path/to/directory/from/current/directory
```

List down all files and folders in the current directory

```
ls -al
```

List down all files and folders in the specified directory

```
ls -al /path/to/directory
```

Edit file with nano text editor
To save your file when inside the editor: `CTRL` + `o` , then `ENTER`
To exit the editor: `CTRL` + `x`

```
nano your_file_name
```

Access target server remotely through SSH protocol

```
ssh <username>@<target_ip> -p <port_number(default is 22)>
```

Terminate your current user's session

```
exit
```