**CS4287/5287: Principles of Cloud Computing, Fall 2024**

This folder contains scaffolding needed for the programming assignment #2. Here we provide a skeleton master playbook that you can invoke to provision the entire infrastructure. We use Ansible as the technology. Since it is used to describe the infrastructure, the term used is Infrastructure-as-Code and is part of the DevOps lifecycle.

Ansible commands are to be executed on a controller machine. In our case, it is as simple as our laptop. Ansible can be installed on all platforms. You need Python3 on your controller machine and pip (or pipx). Moreover, you also need some Ansible Galaxy packages on the controller machine.

See <https://docs.ansible.com/ansible/latest/installation_guide/intro_installation.html> for more details on the Ansible installation. Each child playbook will use one or more different Ansible modules to get the corresponding job done. Modern versions of Ansible have moved many of the individual modules needed for various steps into what are known as Ansible Galaxy collections. Please see <https://galaxy.ansible.com/ui/collections/> for a number of collections. Many collections get installed by default such as ansible-core. You many need to install the Openstack collection because we are installing VMs on an OpenStack-managed Cloud called Chameleon.

To run the master (or the step by step playbook), you will need to execute the following command on a shell/command prompt on your controller machine.

**ansible-playbook -i Inventory -e “@variables.yaml” playbook\_master.yaml**

(if you copy-paste the above, some times, a double hyphen gets added. There is a single hyphen before the “I” and “e” above. You can replace master by the step by step playbook if you are trying things one step at a time)

To help you get started, here is a list of modules that you will need in the various child plays. Lookup for any additional capability that you might need. Every module is described in detail with the parameters it takes and examples. You will have to construct the IaC code base of children playbooks accordingly.

**Debugging module (print statements as the play executes):** <https://docs.ansible.com/ansible/latest/collections/ansible/builtin/debug_module.html>

**File module:** <https://docs.ansible.com/ansible/latest/collections/ansible/builtin/file_module.html>

**Copy module:** <https://docs.ansible.com/ansible/latest/collections/ansible/builtin/copy_module.html>

**Apt module (for package installation):** <https://docs.ansible.com/ansible/latest/collections/ansible/builtin/apt_module.html>

(A variety of additional apt related modules might be needed. Please search the latest documentation)

**Pip module (for python package installation):** <https://docs.ansible.com/ansible/latest/collections/ansible/builtin/pip_module.html>

**Module for downloading from web:** <https://docs.ansible.com/ansible/latest/collections/ansible/builtin/get_url_module.html>

**Openstack module (for VM creation):** <https://docs.ansible.com/ansible/latest/collections/openstack/cloud/server_module.html>

(You many need other Openstack modules also; please search the latest documentation)

**Loops in Ansible:** In many cases, you will need looping constructs (e.g., when you are installing multiple apt or pip packages). It makes no sense to add a separate task for each package but rather use a loop. See <https://docs.ansible.com/ansible/latest/playbook_guide/playbooks_loops.html>

**Conditionals in Ansible:** You may need to do some operations under certain conditions. See <https://docs.ansible.com/ansible/latest/playbook_guide/playbooks_conditionals.html>