



**Hewlett Packard
Enterprise**

HPE GreenLake for Compute Ops Management bare metal provisioning with Ansible

Living Lab Experience

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Automatic bare metal provisioning with HPE Compute Ops Management and Ansible

A new project, an open-source initiative hosted on [GitHub](#) has been released recently that aims to enhance the integration between HPE GreenLake for Compute Ops Management and Ansible. This endeavor is focused on making it easier to configure, manage and provision bare metal servers at scale.

Automatic bare metal provisioning refers to the process of automatically deploying and configuring physical servers or bare metal machines using automated tools such as Ansible in this project. The goal is to enable quick and easy provisioning of servers managed by HPE GreenLake for Compute Ops Management and enable the long list of benefits of automatic bare metal provisioning.

The initial aim of this project was to focus on server provisioning for the ESXi, RHEL and Windows Server platforms. However, it also aims to provide an overview of the various capabilities of the Compute Ops Management API. The project effectively demonstrates a wide range of COM API interactions, covering everything from initial installation (Day0 operations) through the early stages of active use (Day1) to ongoing maintenance (Day2) with automated firmware updates.

Operations include the capture of server information, the creation of server settings (bios, storage, OS provisioning) the creation of server groups with server settings, the addition of servers to a server group, the launch of firmware updates and the monitoring of task execution and the management of task errors.

In this project, automating the provisioning of operating systems on bare metal servers is made simple and accessible to anyone with basic knowledge of Ansible, HPE Compute Ops Management, and kickstart techniques. While it is generally a complex process that requires a wide range of skills, this project simplifies it with the use of auto-customized kickstarts, auto-generated ISO files and by exploiting the very interesting functions of HPE Compute Ops Management server groups.

Objectives

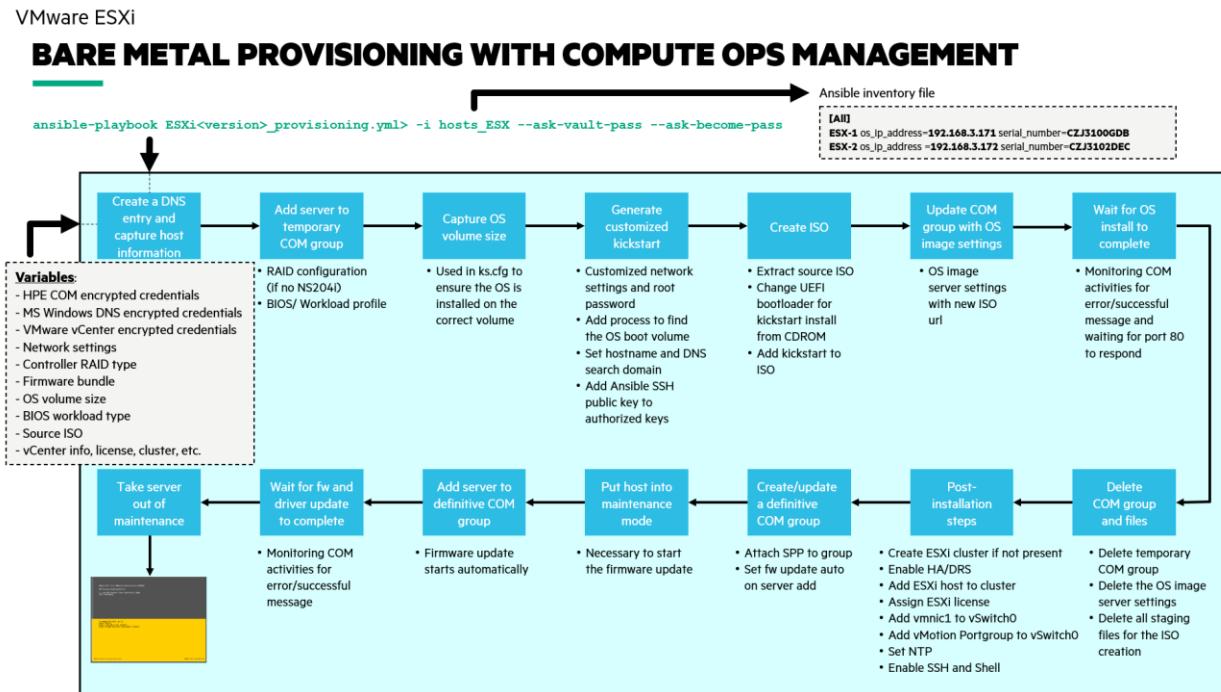
The purpose of this lab is to show you the different steps that are necessary to use this project and ultimately provision a server with VMware ESXi, the main steps are as follows:

1. Configure VS Code and clone the GitHub project repository.
2. Prepare a Rocky Linux VM freshly installed to be the Ansible control node.
3. Set the different variables that will be used by Ansible to configure your server.
4. Run an Ansible playbook to provision one ESXi server in a cluster.
5. Run an Ansible playbook to decommission the ESXi server.



Process flow

The following diagram describes the various process steps and sequences integrated into the ESXi playbook that you will be using in this lab:



Lab Setup Overview

Virtual Machines Configuration:

- Primary Workstation with Windows 11:

Your main point of entry in this lab will be through a virtual machine running Windows 11. Consider this as your jump station, where you'll operate Visual Studio Code.

- Ansible Control Node on Rocky Linux 9.3:

The second virtual machine you'll use is set up with Rocky Linux 9.3. This machine serves as the Ansible Control Node, from which you'll execute Ansible commands and manage various playbooks.

The physical infrastructure hosting these virtual machines and the HPE ProLiant DL160/DL365 servers you'll be using for the bare metal provisioning are in our Houston lab in Texas. These servers are already onboarded to a Compute Ops management instance on the HPE GreenLake platform.

Task 1: Accessing the Lab and setting up your development environment

You'll start by connecting to your designated Windows VM using Remote Desktop Protocol (RDP). You will then use VS Code and clone the GitHub project repository into your development workspace, then link it to the Linux VM by creating an SSH connection which will facilitate direct editing and configuration on the Linux system. Then you'll install and configure all the required components for the project on the Linux VM.

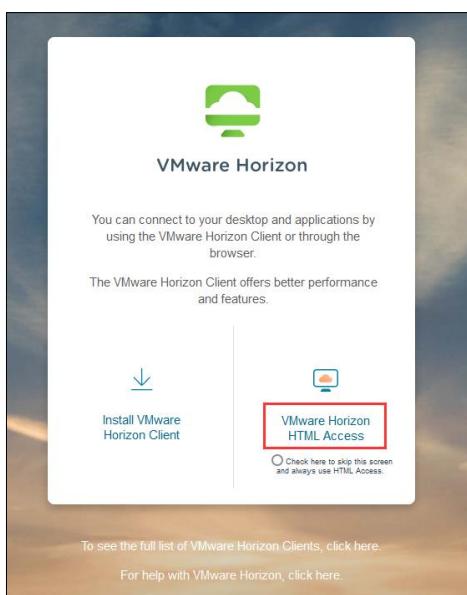
Once this is done, you'll customize the project variables and complete the process by provisioning one of the servers available within our server pool on the HPE GreenLake platform.

Commands that you should copy and paste, or type in your terminal during this lab look like this:

Whoami

Step 1: Connecting to the Lab

- Open a Chrome or similar HTML5 capable browser and navigate to: <https://xx.xx.xx.xx/portal/>
- Choose VMware Horizon HTML Access

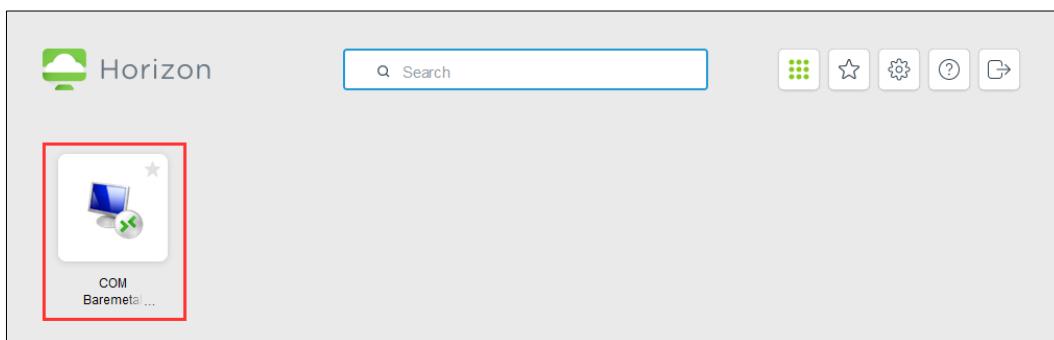


- Login with your provided credentials

Important note: Your credentials and team assignments can be found on the sheet of paper issued to you by your lab supervisor. Please return the sheet to your supervisor when you have completed this lab.

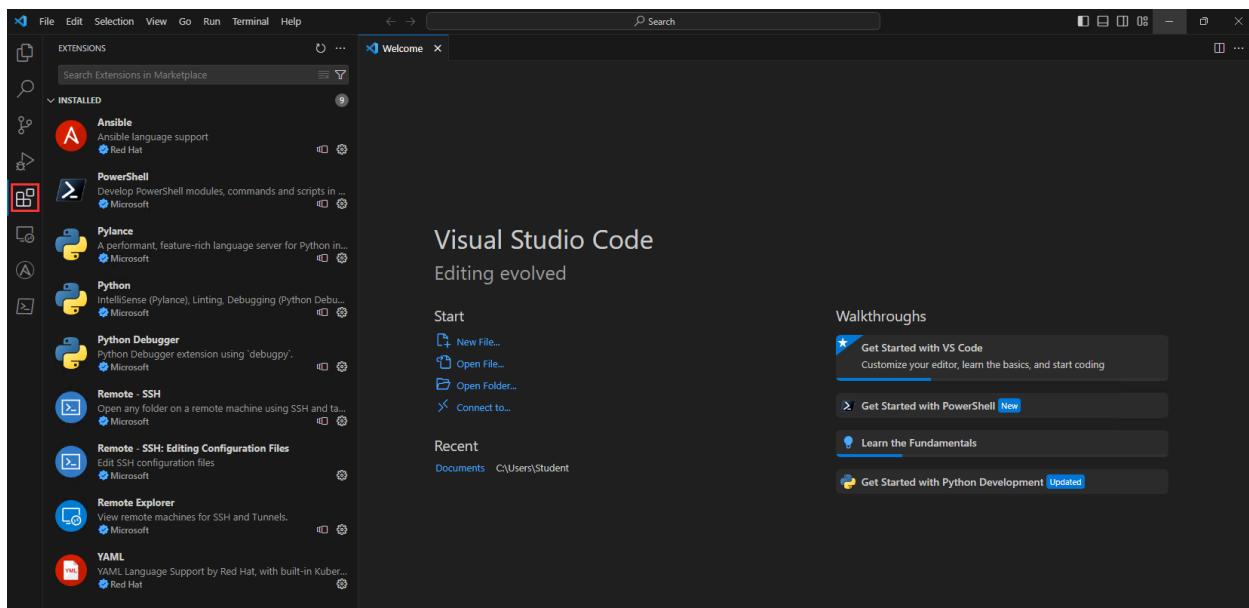
Since Horizon is presenting a remote desktop session inside of your desktop's browser, it may be helpful to hit **F11** at this time to put the browser in full screen mode.

- Click on the RDP icon to launch a remote desktop to your Windows virtual machine:



Step 2: VS Code configuration

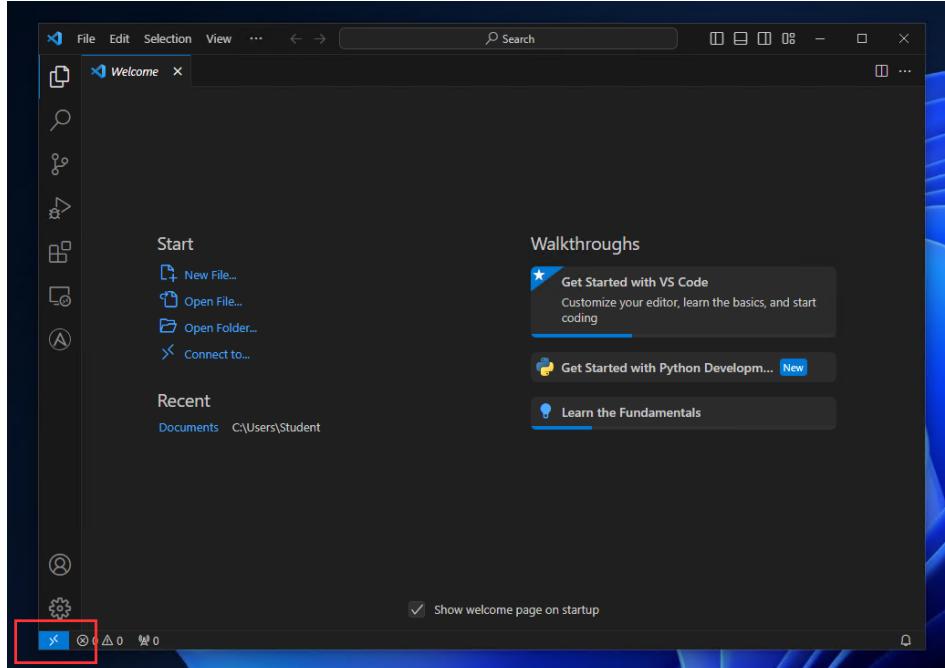
- Open Visual Studio Code (VS Code) using the shortcut on the VM desktop.
- Notice that we already installed a few VS Code extensions, you can find them by clicking on the in **Extensions** icon in the Activity Bar on the side of VS Code:



To start working with our GitHub project, you need at least the following extensions:

- Ansible**: adds language support for Ansible.
- Remote - SSH**: lets you use any remote machine with a SSH server as your development environment. This can greatly simplify development and troubleshooting in a wide variety of situations.

- You can now close the extensions page by clicking on the **Extensions** icon again.
- Next, click on the remote SSH icon in the bottom left-hand corner of VS Code:

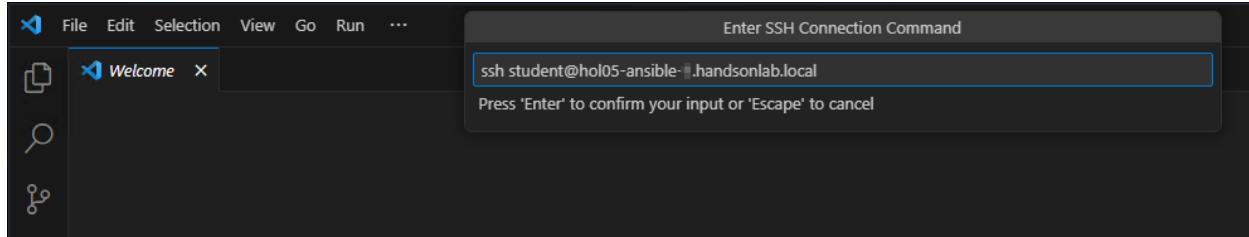


Remote SSH is a feature provided by VS Code that allows users to connect to and interact with a remote machine or server using the Secure Shell (SSH) protocol. This functionality is made available through the extension "Remote - SSH" which has been installed from the VS Code Extensions Marketplace.

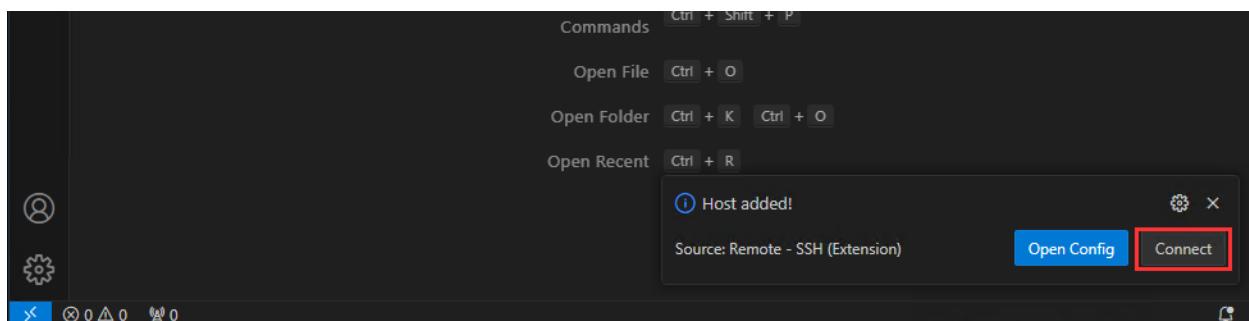
- Select **Connect to Host...**
- Then click on **+Add New SSH Host...**
- Then enter the following SSH command to connect to your designated Linux virtual machine that you'll use as your Ansible Control Node:

```
ssh student@hol05-ansible-x.hansonlab.local
```

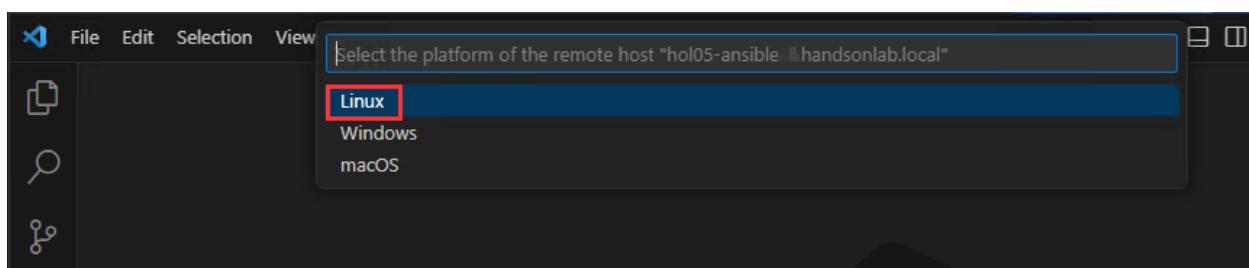
with **x** your team number.



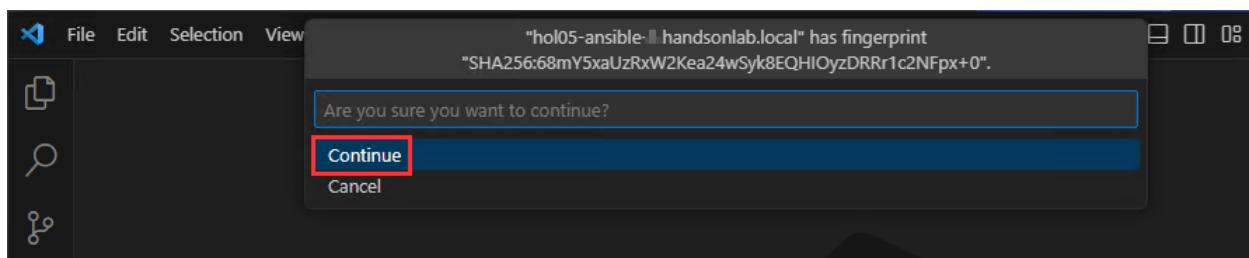
- Then select C:\Users\Student\ssh\config
- Then click on **Connect** from the pop-up window:



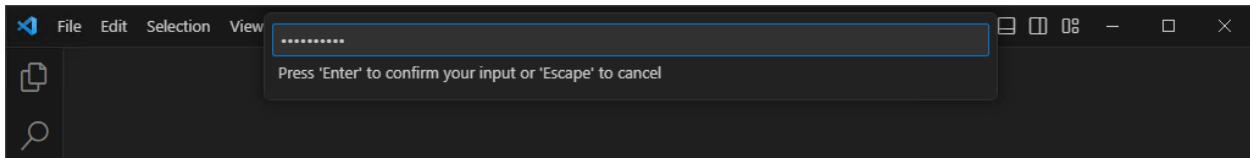
- A new VS Code window opens, select **Linux**:



- Click on **Continue** at the fingerprint message:



- Next enter the password: xxxxxxxx then press Enter:

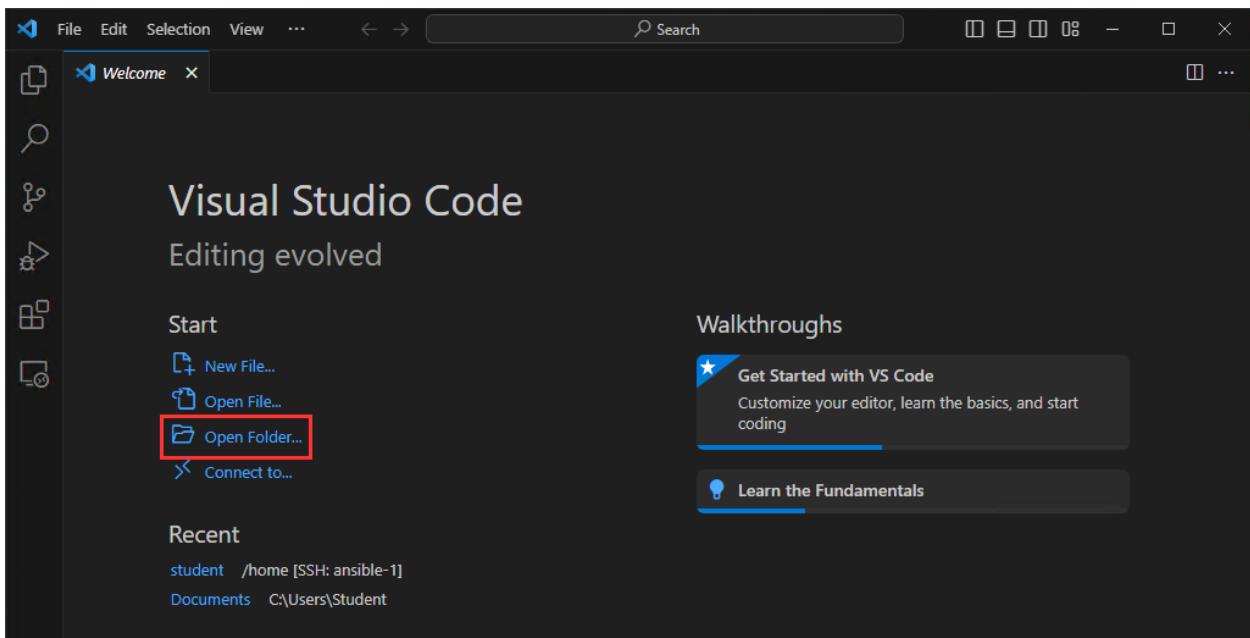


The SSH connection has been established and is displayed on the status bar:

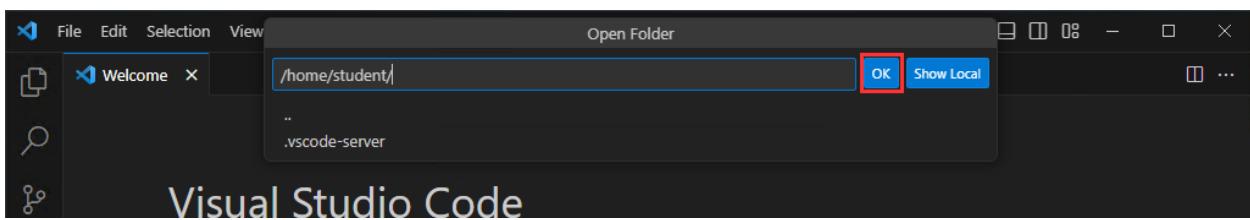


You currently have two instances of VS Code running. Retain the window with the new SSH connection and close the previous one.

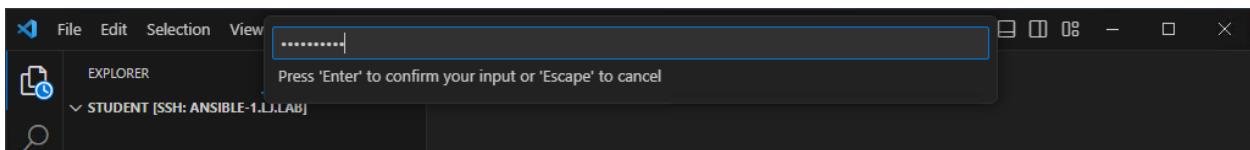
- Next, you can open a folder on the Linux VM, click on Open Folder...



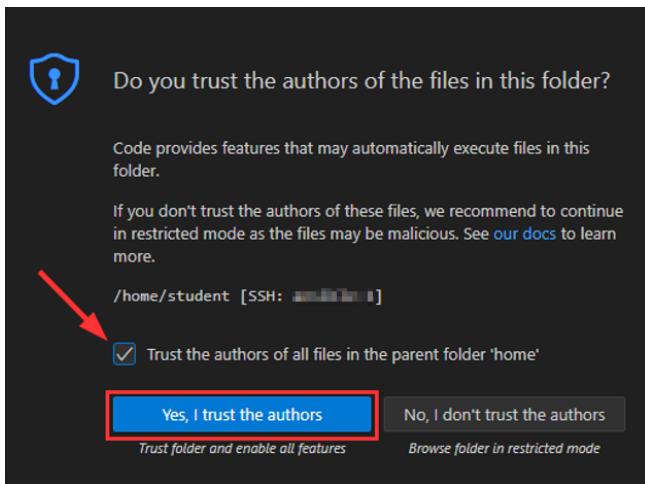
- The default /home/student folder should be proposed, simply click on OK:



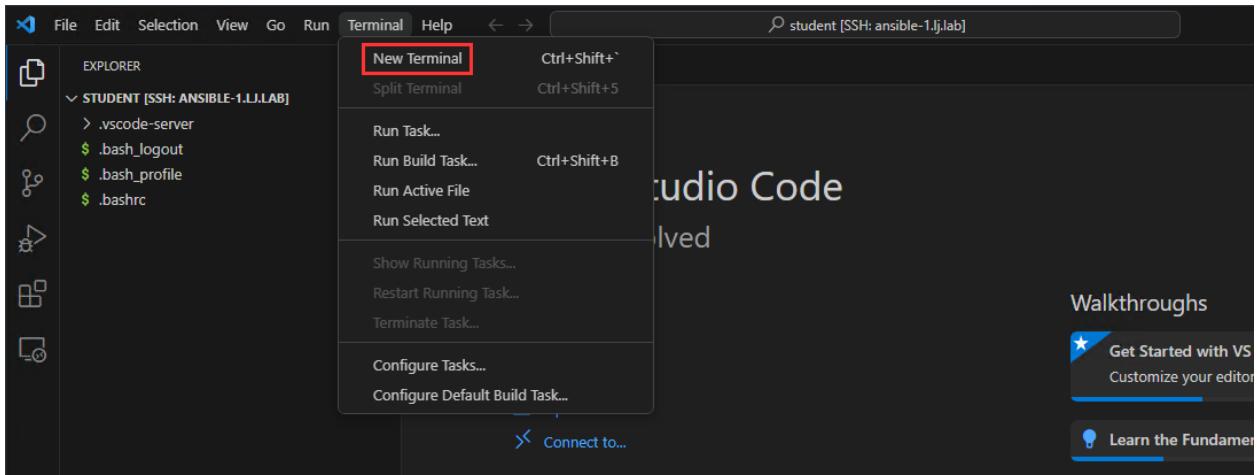
- A new dialogue pops up, you need to re-select Linux and re-enter the xxxxxxx password then press Enter:



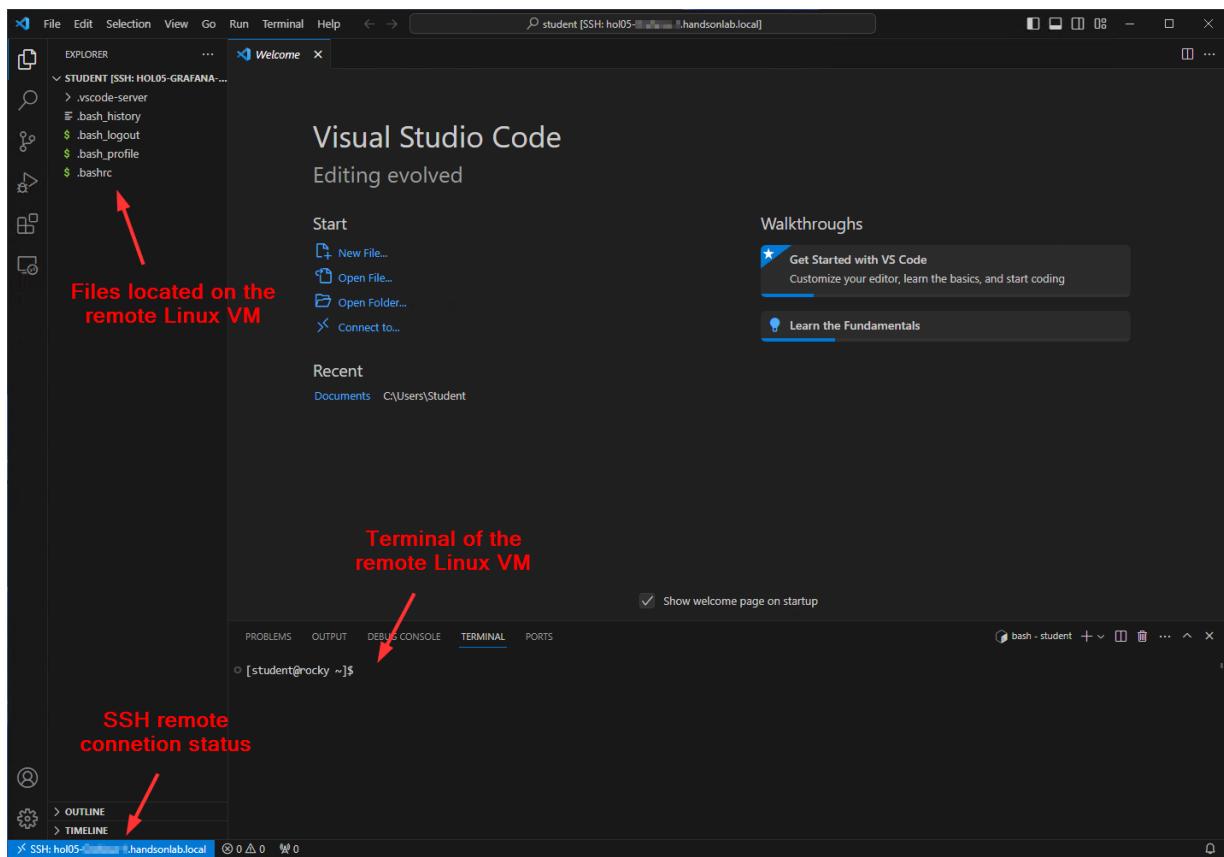
- Once connected, VS Code returns a 'Do you trust the authors of the files in this folder?'. Check the trust the authors option and click Yes, I trust the authors.



- Next, make the Linux terminal visible by clicking on Terminal / New Terminal:



- You should end up with the following workspace:



Step 3: Cloning the HPE-COM-baremetal GitHub repository

To get started with the HPE-COM-baremetal GitHub project on your remote Linux Virtual Machine, you'll need to clone the repository. However, before you can do that, it's essential to ensure that `git` is installed on your VM.

- From the terminal, execute the following command:

```
sudo dnf -y install git
```

- After successfully installing `git`, it is necessary to restart VS Code to enable the integration of `git` within the editor. Upon reopening VS Code, you'll be prompted to re-enter your password for confirmation.
- To clone the [HPE-COM-baremetal](#) GitHub repository, ensure that you're in your home directory (`/home/student`) using `pwd` before proceeding with the cloning process. Once you're in the correct directory, use:

```
git clone https://github.com/jullien1/HPE-COM-baremetal
```

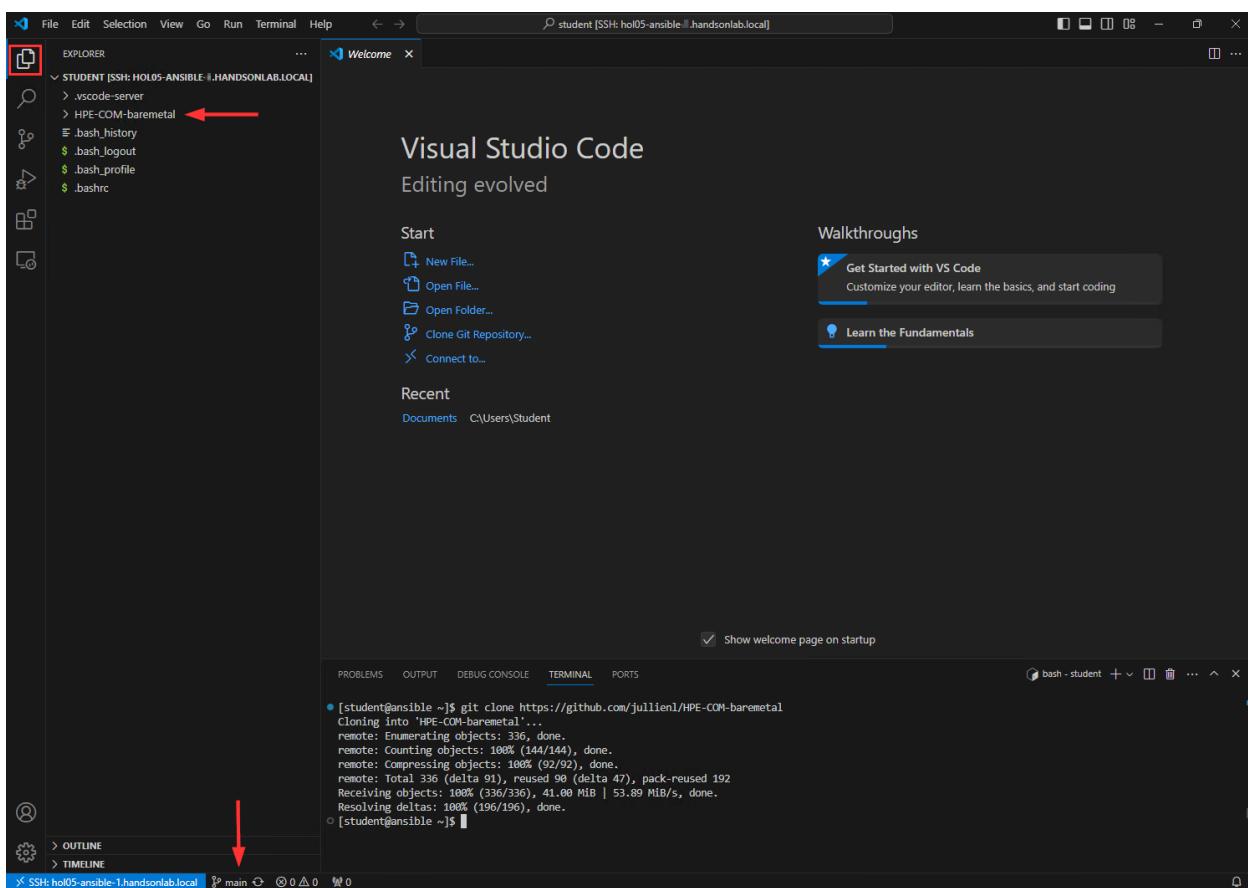
When you perform a clone, you are essentially creating a full-fledged copy of the repository's data, which includes the history of all the changes that have been made to the files and the ability to track future changes.

Two important new elements must now be present in your VS Code workspace:

- A new folder **HPE-COM-baremetal** created in your student home folder—Git clone duplicated all the data the repository contains—the code, branches, tags, and commits.

Note: It may be necessary to open the Explorer view by clicking on the **Explorer** icon in the activity bar.

- The source control branch **main** displayed at the bottom on the **Status** bar—establishes a connection between the remote repository and the newly created local clone. This enables you to sync future updates by pulling in changes or pushing out your own.



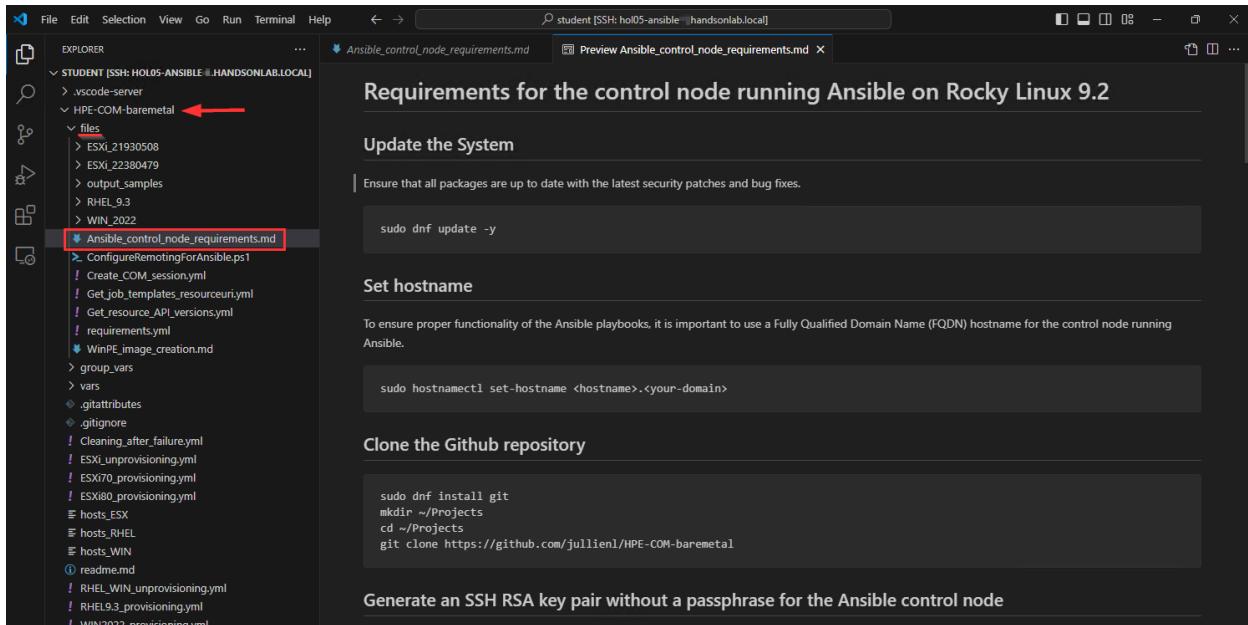
Task 2: Preparation of the Linux Virtual Machine

The preparation of the VM main objective is to turn this out-of-the box Rocky Linux VM, freshly installed as your Ansible control node of this project.

The Ansible control node is the machine where Ansible is installed and from which all tasks and playbooks are executed. It plays several critical roles in an Ansible-managed environment. This machine will also serve as a web server to host the custom ISO images that will be generated, and from which provisioned servers will boot from.

Note: The HPE-COM-baremetal GitHub repository contains a [page](#) that outlines every necessary step for setting up the Ansible control node on Rocky Linux. That same page can also be found in your home directory in **HPE-COM-baremetal/files/Ansible_control_node_requirements.md**

Note: To get a preview of the **Ansible_control_node_requirements.md** markdown file in Visual Studio Code, you can use the keyboard shortcut: **CTRL + SHIFT + V**



```

Requirements for the control node running Ansible on Rocky Linux 9.2

Update the System
Ensure that all packages are up to date with the latest security patches and bug fixes.
sudo dnf update -y

Set hostname
To ensure proper functionality of the Ansible playbooks, it is important to use a Fully Qualified Domain Name (FQDN) hostname for the control node running Ansible.
sudo hostnamectl set-hostname <hostname>.<your-domain>

Clone the Github repository
sudo dnf install git
mkdir ~/Projects
cd ~/Projects
git clone https://github.com/jullien1/HPE-COM-baremetal

Generate an SSH RSA key pair without a passphrase for the Ansible control node

```

The steps you'll carry out in the following section roughly correspond to the various steps described in this file.

Step 1: Set hostname

- To ensure proper functionality of the Ansible playbooks, it is important to use a Fully Qualified Domain Name (FQDN) hostname for the control node running Ansible. Enter:

```
sudo hostnamectl set-hostname hol05-ansible-x.hansonlab.local
```

with **x** your team number.

- At the sudo prompt, enter *********
- You can check the modification using:

```
hostname
```

Step 2: Generate an SSH RSA key pair without a passphrase

SSH public key authentication is mandatory for Ansible to control hosts as it allows Ansible to authenticate with the managed nodes without manually entering passwords, which is essential for automation. So, the next step is to generate an SSH key pair using openssh.

- Openssh is installed by default on Rocky Linux so it is not necessary to install it. Just enter:

```
ssh-keygen -t rsa -f ~/.ssh/id_rsa -N ""
```

- N "" indicates that the passphrase is an empty string i.e., no passphrase. This is to prevent Ansible from asking for the passphrase when running a playbook.

- You can check that your id_rsa private key really doesn't have a passphrase by trying to display the key details with the following command:

```
ssh-keygen -y -f ~/.ssh/id_rsa
```

If there is no passphrase, your public key will be printed out.

Note When you use an SSH private key that is protected by a passphrase, you need to provide a way for Ansible to use that passphrase when it connects to managed nodes. A common method to handle this situation is by using ssh-agent, see <https://stackoverflow.com/questions/50277495/how-to-run-an-ansible-playbook-with-a-passphrase-protected-ssh-private-key>

Caution: Always be cautious with the handling of SSH private keys. Without a passphrase, ensure that they are kept in very secure storage and that permissions are set correctly to prevent unauthorized access (chmod 600 ~/.ssh/id_rsa).

- Read and write for the owner
- No permissions for group
- No permissions for others

Note A new .ssh folder has been created in your home directory, containing both public and private SSH keys.

Step 3: Install ISO creation tools

- Next come the various tools required for ISO creation, which need to be installed. Enter:

```
sudo dnf -y install epel-release
```

The epel-release package contains the Extra Packages for Enterprise Linux (EPEL) repository configuration. The main goal of this extra repository is to provide easy access to packages that are not included in the official repositories of Enterprise Linux distributions.

```
sudo dnf -y install mkisofs
```

mkisofs is a command-line utility that is also used in this project to create ISO 9660 file system images. It is very similar to *genisoimage*, and in fact, *genisoimage* is a fork of *mkisofs* with additional features.

Step 3: Install Ansible and requirements

- Next comes the installation of Ansible and its various requirements. Enter:

```
sudo dnf -y install python3-pip
```

```
pip3 install setuptools-rust wheel
```

Instructs pip—the Python package installer—to install two distinct Python packages: *setuptools-rust* and *wheel*. Each of these packages serves a specific purpose in the Python ecosystem, especially when dealing with the installation of packages that include Rust extensions.

- Then to install Ansible, run:

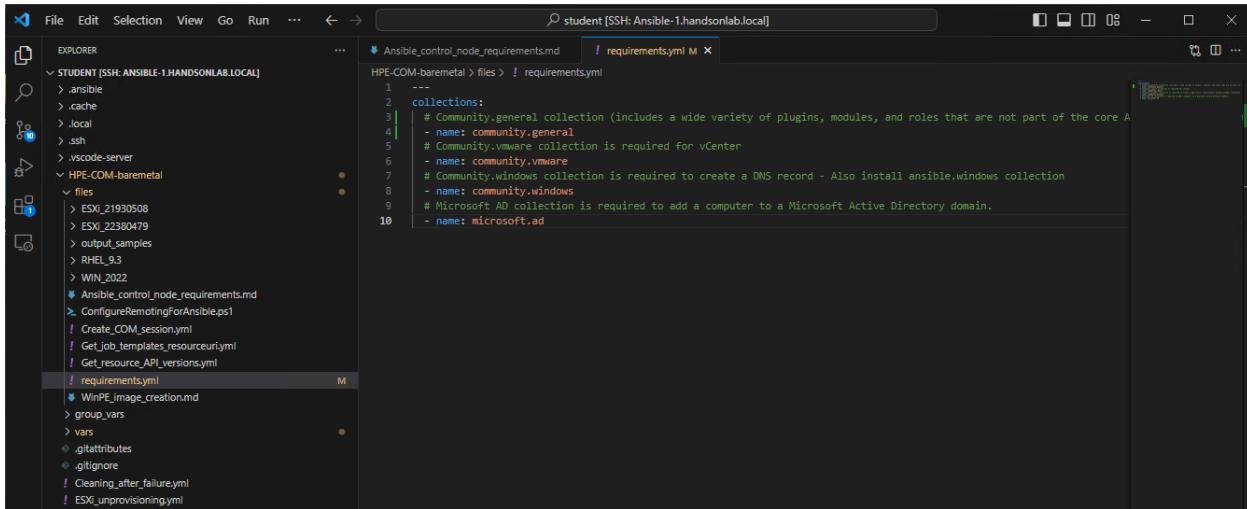
```
pip3 install ansible-core
```

Step 4: Install Ansible Collections

- Next comes the installation of the different Ansible collections that are used in this project, enter:

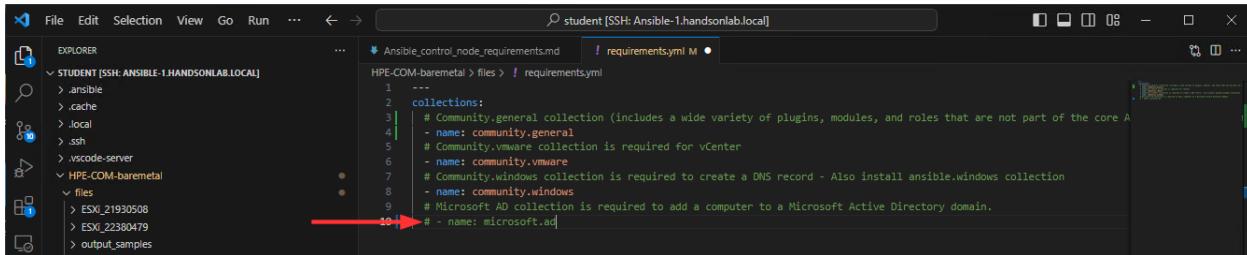
```
cd HPE-COM-baremetal
```

- Next open the file `requirements.yml` located in the `files/` directory.



```
student [SSH: Ansible-1.hands-on-lab.local]
HPE-COM-baremetal > files > requirements.yml M
1 ---
2 collections:
3   - # Community.general collection (includes a wide variety of plugins, modules, and roles that are not part of the core A
4     - name: community.general
5   - # Community.vmware collection is required for vCenter
6     - name: community.vmware
7   - # Community.windows collection is required to create a DNS record - Also install ansible.windows collection
8     - name: community.windows
9   - # Microsoft AD collection is required to add a computer to a Microsoft Active Directory domain.
10    - name: microsoft.ad
```

- This file contains a list of collections to be installed. Optionally, as you are going to provision VMware ESXi only, you can comment out the last line of this file so that the Microsoft.ad collection is not installed (just add a `#` at the beginning of the line or press `CTRL + /`):



```
student [SSH: Ansible-1.hands-on-lab.local]
HPE-COM-baremetal > files > requirements.yml M
1 ---
2 collections:
3   - # Community.general collection (includes a wide variety of plugins, modules, and roles that are not part of the core A
4     - name: community.general
5   - # Community.vmware collection is required for vCenter
6     - name: community.vmware
7   - # Community.windows collection is required to create a DNS record - Also install ansible.windows collection
8     - name: community.windows
9   - # Microsoft AD collection is required to add a computer to a Microsoft Active Directory domain.
10  # - name: microsoft.ad
```

- Once modified, press `CTRL + S` to save the change.

- Then run on the terminal:

```
ansible-galaxy collection install -r files/requirements.yml
```

This command uses a yaml file to provide a list of the various collections to be installed.

Step 5: Install VMware collection requirements

- For the VMware collection, there are a few other steps to run, enter:

```
pip3 install --upgrade pip setuptools
pip3 install --upgrade git+https://github.com/vmware/vsphere-automation-sdk-python.git
pip3 install -r
~/ansible/collections/ansible_collections/community/vmware/requirements.txt
```



Step 6: Install Windows collection requirements

An important task to ensure the smooth operation of this project is the pre-creation of DNS records for all hosts that will be provisioned. For this reason, each playbook includes a task to create a DNS record on a Windows DNS server defined in the \vars folder. Ansible uses the Windows Remote Management (WinRM) listener to execute commands remotely on Windows, and for this, the `pywinrm` library must be installed.

- To install the `pywinrm` library, enter:

```
pip3 install pywinrm
```

`pywinrm` is the Python library that allows you to interact with the WinRM service running on the Windows DNS server to perform the DNS record operations.

Step 7: Install json_query filter

The `json_query` filter enables the filtration and transformation of JSON data within Ansible playbooks. This particular filter isn't bundled with the core Ansible package; rather, it comes with the `community.general` collection that has been added through the `requirements.yml` file earlier. However, to function correctly, `json_query` relies on the `jmespath` Python library—an additional dependency that must be installed separately.

- To install the `jmespath` Python library, enter:

```
pip3 install jmespath
```

Step 8: Install nginx web service

You need to set up a web server that will host the customized operating system ISO images from which the server that you'll provision will boot from. To achieve this, you'll be using the Linux VM and Nginx will serve as the web server software.

- To install Nginx, enter:

```
sudo dnf -y install nginx
sudo systemctl enable nginx
sudo systemctl start nginx
sudo firewall-cmd --permanent --add-service=http
sudo firewall-cmd --reload
```

- To enable nginx directory browsing, you must enter:

```
sudo sed -i '0,/server {/s//&\n        autoindex on;/' /etc/nginx/nginx.conf
```

This command is used to modify the nginx configuration file: `/etc/nginx/nginx.conf`. It adds a new line containing `autoindex on;` immediately after the first occurrence of the pattern `server {`. This is the only parameter required to activate directory browsing.

- Then to activate the new configuration, restart nginx using:

```
sudo systemctl restart nginx
```

Note By default, nginx web site is in `/usr/share/nginx/html`.

- To test nginx, open a browser and navigate to `http://hol05-ansible-X.hands-on.lab.local` with `X` your team number. You should get:



HTTP Server Test Page

This page is used to test the proper operation of an HTTP server after it has been installed on a Rocky Linux system. If you can read this page, it means that the software is working correctly.

<p>Just visiting?</p> <p>This website you are visiting is either experiencing problems or could be going through maintenance.</p> <p>If you would like to let the administrators of this website know that you've seen this page instead of the page you're expected, you should send them an email. In general, mail sent to the name "webmaster" and directed to the website's domain should reach the appropriate person.</p> <p>The most common email address to send to is: "webmaster@example.com"</p> <p>Note:</p> <p>The Rocky Linux distribution is a stable and reproducible platform based on the sources of Red Hat Enterprise Linux (RHEL). With this in mind, please understand that:</p> <ul style="list-style-type: none"> • Neither the Rocky Linux Project nor the Rocky Enterprise Software Foundation have anything to do with this website or its content. • The Rocky Linux Project nor the RESF have "hacked" this webserver. This test page is included with the distribution. <p>For more information about Rocky Linux, please visit the Rocky Linux website.</p>	<p>I am the admin, what do I do?</p> <p>You may now add content to the webroot directory for your software.</p> <p>For systems using the Apache Webserver: You can add content to the directory <code>/var/www/html/</code>. Until you do so, people visiting your website will see this page. If you would like this page to not be shown, follow the instructions in: <code>/etc/httpd/conf.d/welcome.conf</code>.</p> <p>For systems using Nginx: You can add your content in a location of your choice and edit the root configuration directive in <code>/etc/nginx/nginx.conf</code>.</p>  
---	--

Step 9: Install rsync

rsync is a utility for efficiently transferring and synchronizing files across computer systems, by using differential data transfer to minimize network usage. It is used in this project to copy ISO image files.

- To install rsync, enter:

```
sudo dnf -y install rsync
```

Step 10: Ensure your Ansible Control node time is correct

The last step only involves a critical verification task, ensuring that your Ansible machine's clock is accurately synchronized. This synchronization is essential for time-sensitive playbook operations, such as task monitoring operations, which use time-based activity filtering. This check must be performed before running any playbook associated with this project. If the time isn't right, these playbooks might not work as expected.

Note: It is highly recommended to use NTP (Network Time protocol) for synchronizing the Ansible Control node's time. Although NTP has been configured for this laboratory environment, it is prudent to perform a verification check to ensure accurate synchronization.

- To check the time, let's first change the time zone for Atlanta:

```
export TZ=America/New_York
```

- Then to get the time, run:

```
date
```

- Make sure the time is correct. If not, ask the instructor for assistance.

This completes the configuration of the Ansible Control Node for VMware ESXi hosts deployment, and we can now move on to the next section.



Task3: Setting up the different variables of the project

The next step is the configuration of the different variables that will be used by this project.

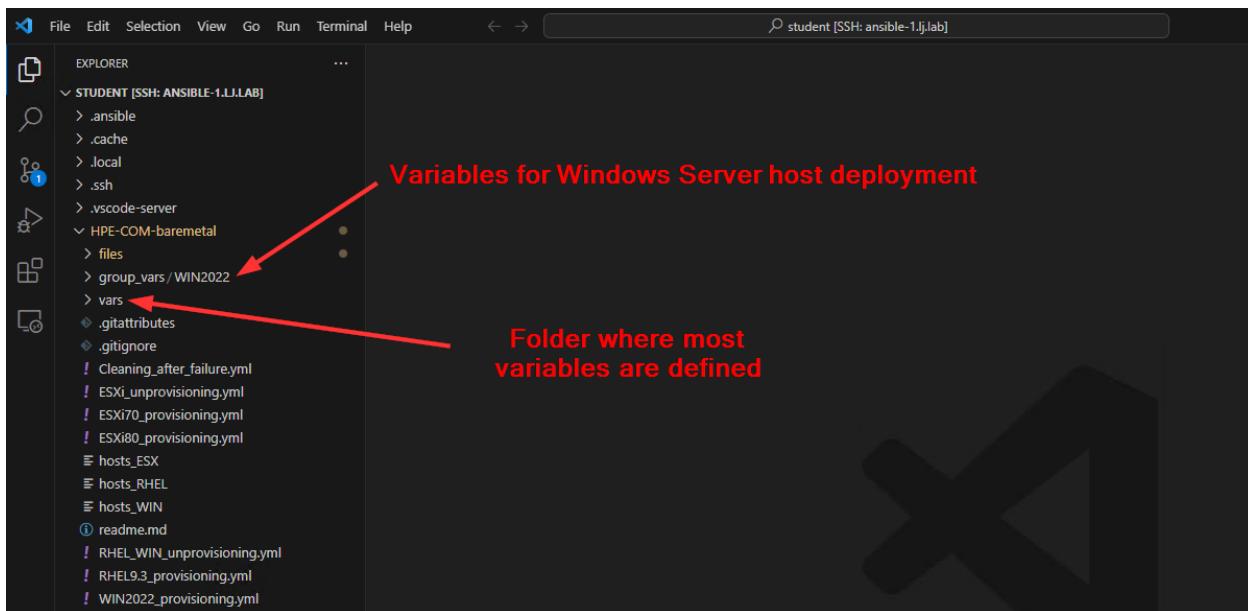
Variables in Ansible are an essential aspect of creating dynamic and reusable playbooks. They allow you to manage configurations and deployments across different environments, hosts, and groups by changing variable values rather than hardcoding information.

There are different types of variables in this project. Here is a list of different types of variables you will encounter in this project:

- **Inventory Variables:** Defined within the inventory file for specific hosts or groups.
- **Playbook Variables:** Specified directly within playbooks or included files and tasks.
- **Host Variables:** Pertaining to individual hosts, often defined within the inventory or host_vars directory.
- **Group Variables:** Applicable to groups of hosts, usually placed within the inventory or group_vars directory.
- **Facts ("ansible_facts"):** Gathered by Ansible from the target machines or from Compute Ops Management, containing any sort of information like network interfaces, IP addresses, disk space, etc.
- **Magic Variables:** Special built-in variables such as `hostvars`, `group_names`, `groups`, `inventory_hostname`, `play_hosts`.

Understanding how and when these variables are used will help you manage this Ansible project effectively, ensuring that they can adapt over time to meet new requirements without significant rework.

Variables are mostly all defined in the `/vars` folder of this project.



You'll find in `vars/` different files where the variables are defined for the different operation systems:

```

File Edit Selection View Go Run Terminal Help
HPE-COM-baremetal > vars > ! ESXi8.0.u2_vars.yml
1 ---
2 # Host information (name, IP and Serial number) is provided by the Ansible inventory 'hosts' file:
3 # ESX-2 os_ip_address=192.168.3.172 serial_number=CZ2311004G
4 # ESX-3 os_ip_address=192.168.3.175 serial_number=CZ2311004H
5
6 #----- Network settings -----
7 gateway: "192.168.1.1"
8 nameserver: "192.168.2.1,192.168.2.3"
9 netmask: "255.255.252.0"
10 domain: "1j.lab"
11
12 #----- VMware vCenter settings -----
13 vcenter_hostname: "vcenter.1j.lab"
14 cluster_name: "DL-Cluster-01" # created if not present
15 datacenter_name: "Hougins"
16
17 #----- kickstart file customization -----
18
19 # Password for root
20 # To generate a hashed password, you can use the following command for SHA512:
21 # > openssl passwd -6
22 # or
23 # > python3 -c 'import crypt,getpass;pw=getpass.getpass();print(crypt.crypt(pw) if (pw==getpass.getpass("Confirm: ")) else exit())'
24 hashed_root_password: "$6$jsCKM/q1rc0zIdi8$b1uUXnQmzv59.CKN01w2wdfEGnigRdFK2T.EpJznpqyKDXR4uYrajcUZQfrkSrtIHWviyc2AMqR409f.I.1741"
25
26 #----- Server settings -----
27
28 # OS boot volume RAID type and size
29 raid_type: RAID1 # Supported RAID types: RAID0, RAID1, RAID5
30 volume_size_in_GB: -1 # It must be a number >0 or -1, where -1 indicates to use the entire disk.
31
32 # BIOS/Workload profile
33 workload_profile_name: "Virtualization - Power Efficient"
34 # Supported workload profiles:
35 # - Virtualization - Max Performance
36 # - Virtualization - Power Efficient
37
38
39
40
41
42

```

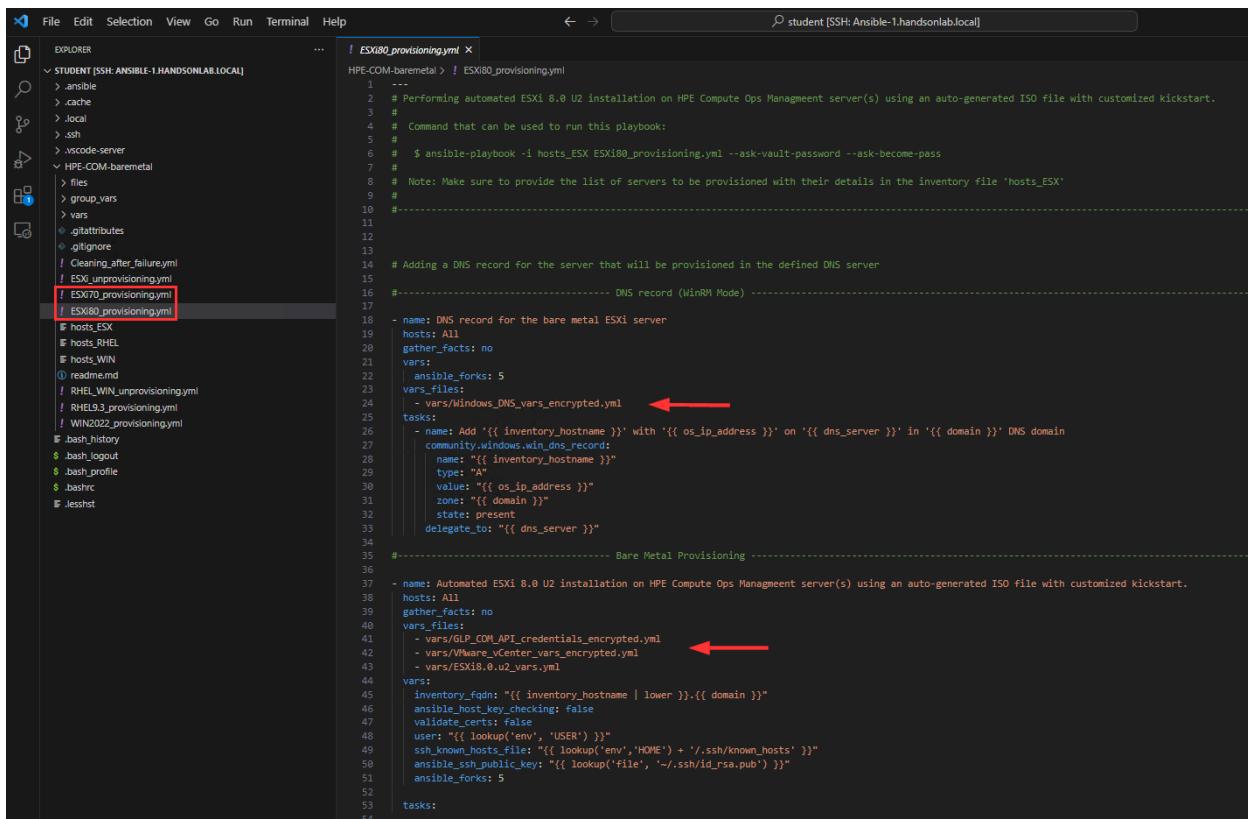
If we focus on VMware ESXi provisioning, we have 4 main variable files, some are in clear text, others are encrypted as they contain sensitive data (i.e. passwords, licenses, etc):

- **ESXi7.0.u2_vars.yml** or **ESXi8.0.u2_vars.yml**: store the various variables necessary to customize the ESXi kickstart, to provision ESXi in a cluster on a vCenter server. Each file corresponds to a ESXi version and includes:
 - Network settings, VMware vCenter settings, Storage settings (OS RAID and size), BIOS/Workload profile
 - Source ISO image to use for the provisioning.
 - Firmware bundle to use to update the server once the provisioning is complete, and update policies to define the downgrade and software and drivers installation policies.
 - Kickstart file settings.
- **GLP_COM_API_credentials_encrypted.yml**: stores the API client credentials that are used to create a session with the HPE GreenLake for Compute Ops Management API. Note that the encrypted file has been generated using the Ansible vault command to secure the credentials. The *GLP_COM_API_credentials_clear.yml* file illustrates the contents of the encrypted file to be supplied.

Note: You will see later in the lab how to encrypt your data with Ansible but if you need to learn more about Ansible vault, see [Protecting sensitive data with Ansible vault](#)

- **VMware_vCenter_vars_encrypted.yml**: stores the VMware vCenter encrypted credentials, the ESXi license to be assigned to the hosts and the password of the ESXi root user. The clear content is illustrated in *VMware_vCenter_vars_clear.yml*
- **Windows_DNS_vars_encrypted.yml**: stores the Windows DNS domain, DNS server name and WinRM information. WinRM is used by Ansible to create DNS records of new provisioned hosts on a Windows DNS server. The clear content is illustrated in *Windows_DNS_vars_clear.yml*.

These variable files are all defined in the main Ansible playbooks `ESXi70_provisioning.yml` and `ESXi80_provisioning.yml` for provisioning VMware ESXi 7 and 8 both located at the root of this project.



```

STUDENT (SSH: ANSIBLE-1.HANDSONLAB.LOCAL) ~ % cd HPE-COM-baremetal
STUDENT (SSH: ANSIBLE-1.HANDSONLAB.LOCAL) ~ % ls
ansible
.cache
.jocal
.ssh
.vscode-server
HPE-COM-baremetal
files
group_vars
vars
  .gitattributes
  .gitignore
  Cleaning_after_failure.yml
  ESXi_unprovisioning.yml
  ESXi70_provisioning.yml
  ESXi80_provisioning.yml
hosts_ESX
hosts_RHEL
hosts_WIN
readme.md
RHEL_WIN_unprovisioning.yml
WIN2022_provisioning.yml
WIN2023_provisioning.yml
.bash_history
.bash_logout
.bash_profile
.bashrc
.jessht
STUDENT (SSH: ANSIBLE-1.HANDSONLAB.LOCAL) ~ % cat ESXi80_provisioning.yml
# Performing automated ESXi 8.0 U2 installation on HPE Compute Ops Management server(s) using an auto-generated ISO file with customized kickstart.
#
# Command that can be used to run this playbook:
#
# $ ansible-playbook -i hosts_ESX ESXi80_provisioning.yml --ask-vault-password --ask-become-pass
#
# Note: Make sure to provide the list of servers to be provisioned with their details in the inventory file 'hosts_ESX'
#
#-----#
# Adding a DNS record for the server that will be provisioned in the defined DNS server
#-----#
#----- DNS record (WinRM Mode) -----
#
- name: DNS record for the bare metal ESXi server
  hosts: All
  gather_facts: no
  vars:
    ansible_forks: 5
  vars_files:
    - vars/Windows_VARS_encrypted.yml ←
  tasks:
    - name: Add '{{ inventory_hostname }}' with '{{ os_ip_address }}' on '{{ dns_server }}' in '{{ domain }}' DNS domain
      community.windows.win_dns_record:
        name: "{{ inventory_hostname }}"
        type: "A"
        value: "{{ os_ip_address }}"
        zone: "{{ domain }}"
        state: present
        delegate_to: "{{ dns_server }}"
  #
  #----- Bare Metal Provisioning -----
  #
- name: Automated ESXi 8.0 U2 installation on HPE Compute Ops Management server(s) using an auto-generated ISO file with customized kickstart.
  hosts: All
  gather_facts: no
  vars_files:
    - vars/GLP_COM_API_credentials_encrypted.yml ←
    - vars/VMware_Vcenter_VARS_encrypted.yml
    - vars/ESXi8.0.u2_VARS.yml
  vars:
    inventory_fqdn: "{{ inventory_hostname | lower }}.{{ domain }}"
    ansible_host_key_checking: false
    validate_certs: False
    user: "{{ lookup('env', 'USER') }}"
    ssh_known_hosts_file: "{{ lookup('env', 'HOME') + '/.ssh/known_hosts' }}"
    ansible_ssh_public_key: "{{ lookup('file', './.ssh/id_rsa.pub') }}"
    ansible_forks: 5
  tasks:

```

For this lab, you need to configure the variables to suit the lab environment and your team number.

Step 1: Set Windows_DNS_vars_encrypted.yml

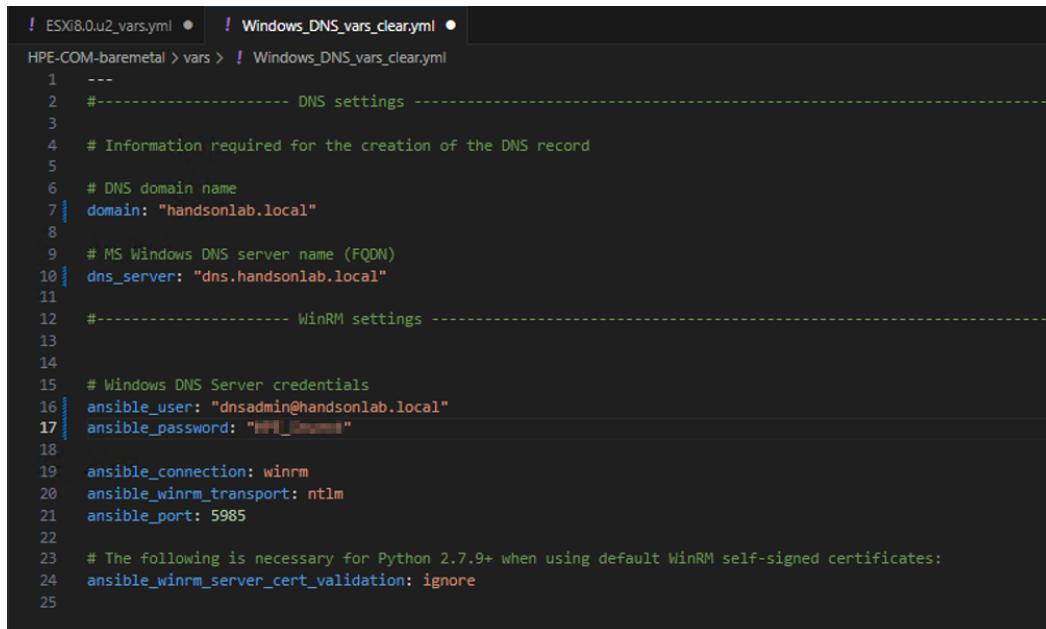
- For the first variable file `vars/Windows_DNS_vars_encrypted.yml` defined in this playbook, you need to generate your own encrypted data as it contains sensitive information. You can use the clear file `vars/Windows_DNS_vars_clear.yml` as a template to create first your clear data. Use the following values:

Variable name	Value
domain	handsonlab.local
dns_server	dns.handsonlab.local
ansible_user	dnsadmin@handsonlab.local
ansible_password	xxxxxxxxxx

Important note: Ensure that your value is consistently enclosed within quotation marks, ensuring there are no spaces between the value and the adjacent opening and closing quotation marks.

Note `dnsadmin@handsonlab.local` is a member of the **Remote Management Users** security group (allows connection to remote Windows DNS server via WinRM) and member of the **DNSAdmins** security group (allows DNS records to be updated).

- You can keep the other default values.



```

ESXi8.0.0u2_vars.yml • Windows_DNS_vars_clear.yml •
HPE-COM-baremetal > vars > Windows_DNS_vars_clear.yml
1 ---
2 #----- DNS settings -----
3
4 # Information required for the creation of the DNS record
5
6 # DNS domain name
7 domain: "handsonlab.local"
8
9 # MS Windows DNS server name (FQDN)
10 dns_server: "dns.handsonlab.local"
11
12 #----- WinRM settings -----
13
14
15 # Windows DNS Server credentials
16 ansible_user: "dnsadmin@handsonlab.local"
17 ansible_password: "MFP!_Dvnmmt"
18
19 ansible_connection: winrm
20 ansible_winrm_transport: ntlm
21 ansible_port: 5985
22
23 # The following is necessary for Python 2.7.9+ when using default WinRM self-signed certificates:
24 ansible_winrm_server_cert_validation: ignore
25

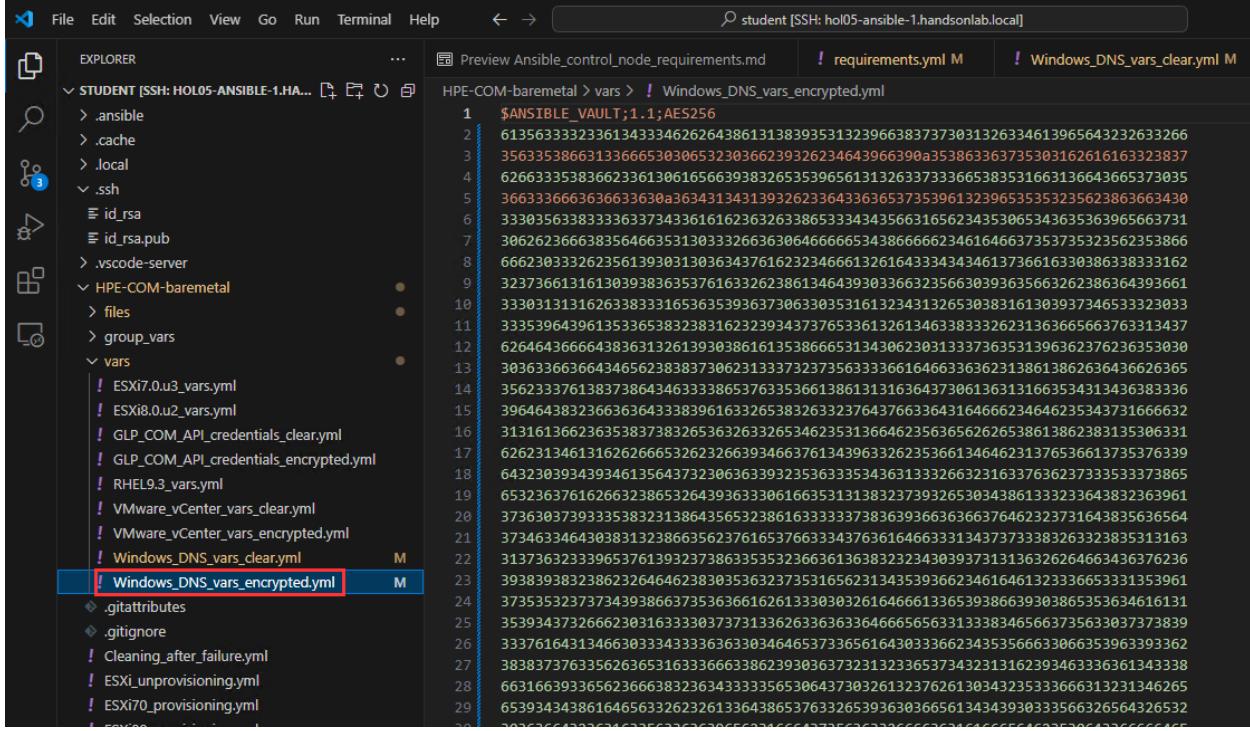
```

- Make sure your changes have been saved by pressing **CTRL + S**.
- Then to generate an encrypted vault file with Ansible, you must use the `ansible-vault` command-line tool that comes bundled with Ansible. From the terminal, run:

```
ansible-vault encrypt vars/Windows_DNS_vars_clear.yml --output
vars/Windows_DNS_vars_encrypted.yml
```



- After running this command, you will be prompted to enter a vault password. Enter a password of your choice. Once you confirm the password, the command will generate a new encrypted file `Windows_DNS_vars_encrypted.yml` with your sensitive data.
- You can click on the new `Windows_DNS_vars_encrypted.yml` file to check that the data is unreadable in VS Code:



The screenshot shows the VS Code interface with the title bar "student [SSH: hol05-ansible-1.hands-on-lab.local]". The left sidebar shows a tree view of files and folders, including ".ansible", ".cache", ".local", ".ssh", ".vscode-server", "HPE-COM-baremetal", and "vars". Inside "vars", there are several files: "ESXi7.0.u3_vars.yml", "ESXi8.0.u2_vars.yml", "GLP_COM_API_credentials_clear.yml", "GLP_COM_API_credentials_encrypted.yml", "RHEL9.3_vars.yml", "VMware_vCenter_vars_clear.yml", "VMware_vCenter_vars_encrypted.yml", "Windows_DNS_vars_clear.yml", and "Windows_DNS_vars_encrypted.yml". The "Windows_DNS_vars_encrypted.yml" file is selected and highlighted with a red border. The main editor area displays the file's content, which is mostly binary data (represented by a series of numbers) due to encryption.

- To check the operation, you can open the encrypted file using:

```
ansible-vault view vars/Windows_DNS_vars_encrypted.yml
```

- At the vault password prompt, enter the password you set previously and check that the contents are correct:

```
[student@ansible HPE-COM-baremetal]$ ansible-vault encrypt vars/Windows_DNS_vars_clear.yml --output vars/Windows_DNS_vars_encrypted.yml
New Vault password:
Confirm New Vault password:
Encryption successful
[student@ansible HPE-COM-baremetal]$ ansible-vault view vars/Windows_DNS_vars_encrypted.yml
Vault password:
-----
#----- DNS settings -----
# Information required for the creation of the DNS record

# DNS domain name
domain: "hands-on-lab.local"

# MS Windows DNS server name (FQDN)
dns_server: "dns.hands-on-lab.local"

#----- WinRM settings -----

# Windows DNS Server credentials
ansible_user: "dnsadmin@hands-on-lab.local"
ansible_password: "*****"
...skipping...
```

Step 2: Set GLP_COM_API_credentials_encrypted.yml

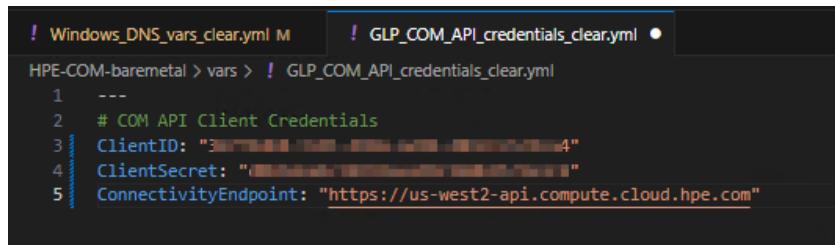
The second variable file defined in this playbook contains the client credentials for the Compute Ops Management API, which are also highly sensitive data and therefore need to be vaulted.

- Open the file `vars/GLP_COM_API_credentials_clear.yml` and use the following values according to your team number:

Variable name	Value
ClientID and ClientSecret	<p>For Team 1 to Team 5: <u>ClientID</u>: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx <u>ClientSecret</u>: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx</p> <p>For Team 6 to Team 10: <u>ClientID</u>: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx <u>ClientSecret</u>: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx</p> <p>For Team 11 to Team 15: <u>ClientID</u>: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx <u>ClientSecret</u>: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx</p> <p>For Team 16 to Team 20: <u>ClientID</u>: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx <u>ClientSecret</u>: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx</p> <p>For Team 21 to Team 25: <u>ClientID</u>: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx <u>ClientSecret</u>: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx</p>
ConnectivityEndpoint	<code>https://us-west2-api.compute.cloud.hpe.com</code>

Note: These API client credentials have been issued by the instructor through the HPE GreenLake platform which are indispensable for enabling this GitHub project's interaction with the COM API.

- Make sure your changes have been saved by pressing **CTRL + S**.



```
! Windows_DNS_vars_clear.yml M ! GLP_COM_API_credentials_clear.yml •
HPE-COM-baremetal > vars > ! GLP_COM_API_credentials_clear.yml
1 ---
2 # COM API Client Credentials
3 ClientID: "xxxxxxxxxxxxxx"
4 ClientSecret: "xxxxxxxxxxxxxx"
5 ConnectivityEndpoint: "https://us-west2-api.compute.cloud.hpe.com"
```

- Then to generate the encrypted vault file, run:

```
ansible-vault encrypt vars/GLP_COM_API_credentials_clear.yml --output
vars/GLP_COM_API_credentials_encrypted.yml
```

Be sure to use the same vault password as before.

Step 3: Set VMware_vCenter_vars_encrypted.yml

The third variable file contains the VMware vCenter sensitive data and must also be vaulted.

- Open vars/VMware_vCenter_vars_clear.yml and use:

Variable name	Value
vcenter_username	administrator@handsonlab.local
vcenter_password	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
esxi_license	Keep it as is! A temporary evaluation license will be assigned automatically.
root_password	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

- Make sure your changes have been saved by pressing CTRL + S.

```
HPE-COM-baremetal > vars > ! VMware_vCenter_vars_clear.yml
1  ---
2
3  # VMware vCenter credentials
4  vcenter_username: "administrator@handsonlab.local"
5  vcenter_password: "██████████"
6
7  # License to be assigned to the ESXi host
8  esxi_license: "*****_*****_*****_*****_*****"
9
10 # ESXi root password:
11 root_password: "██████████"
```

- Then run:

```
ansible-vault encrypt vars/VMware_vCenter_vars_clear.yml --output
vars/VMware_vCenter_vars_encrypted.yml
```

Again, be sure to use the same vault password as earlier.

Step 4: Set ESXi8.0.u2_vars.yml

- Open the last variable file, ESXi8.0.u2_vars.yml.

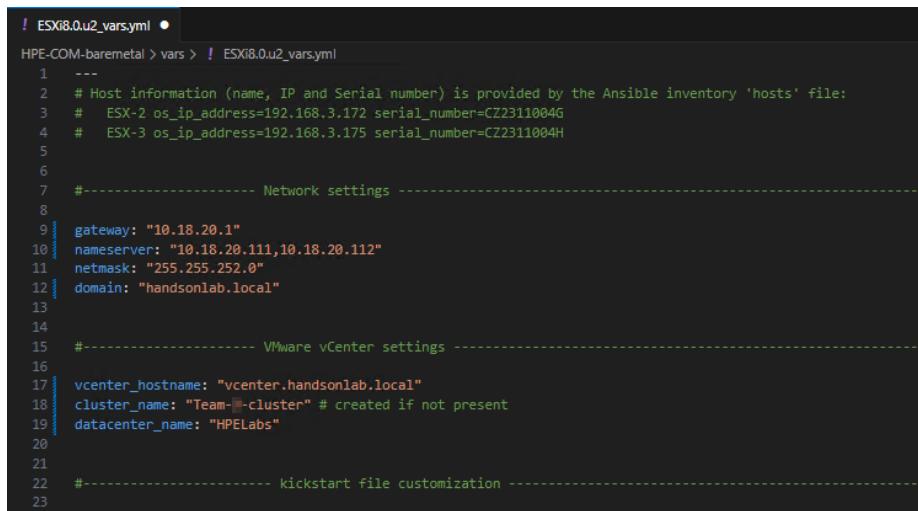
This file contains all settings related to ESXi, HPE GreenLake for Compute Ops Management, the ISO image to use, etc.

- The first part includes the network and VMware vCenter settings:

```
! ESXi8.0.u2_vars.yml •
HPE-COM-baremetal > vars > ! ESXi8.0.u2_vars.yml
1  ---
2  # Host information (name, IP and Serial number) is provided by the Ansible inventory 'hosts' file:
3  #   ESX-2 os_ip_address=192.168.3.172 serial_number=CZ2311084G
4  #   ESX-3 os_ip_address=192.168.3.175 serial_number=CZ2311084H
5
6
7  #----- Network settings -----
8
9  gateway: "192.168.1.1"
10 nameserver: "192.168.2.1,192.168.2.3"
11 netmask: "255.255.252.0"
12 domain: "lj.lab"
13
14 #----- VMware vCenter settings -----
15
16 vcenter_hostname: "vcenter.lj.lab"
17 cluster_name: "DL-Cluster-01" # created if not present
18 datacenter_name: "Mouging"
19
20
21 #----- Kickstart file customization -----
22
23
24 # Password for root
25 # To generate a hashed password, you can use the following command for SHA512:
26 # > openssl passwd -6
```

- Replace those with the following values:

Variable name	Value
gateway	10.18.20.1
nameserver	10.18.20.111,10.18.20.112
netmask	255.255.252.0
domain	handsonlab.local
vcenter_hostname	vcenter.handsonlab.local
cluster_name	Team-X-cluster (with X your team number)
datacenter_name	HPELabs



```

! ESXi8.0.u2_vars.yml
HPE-COM-baremetal > vars > ! ESXi8.0.u2_vars.yml
1 ---
2 # Host information (name, IP and Serial number) is provided by the Ansible inventory 'hosts' file:
3 #   ESX-2 os_ip_address=192.168.3.172 serial_number=CZ2311004G
4 #   ESX-3 os_ip_address=192.168.3.175 serial_number=CZ2311004H
5
6
7 #----- Network settings -----
8
9 gateway: "10.18.20.1"
10 nameserver: "10.18.20.111,10.18.20.112"
11 netmask: "255.255.252.0"
12 domain: "handsonlab.local"
13
14
15 #----- VMware vCenter settings -----
16
17 vcenter_hostname: "vcenter.handsonlab.local"
18 cluster_name: "Team-||-cluster" # created if not present
19 datacenter_name: "HPELabs"
20
21
22 #----- kickstart file customization -----
23

```

- Next, is the ESXi root password that needs to be defined. Hashing the root password here is crucial for security reasons. A plain text root password would pose a significant security risk. If someone were to gain access to your variable file or to the kickstart file where this variable is used, they could easily read and use that plain text password to compromise your system. Hashing obscures the actual password, so even if someone accesses the file, they won't be able to turn that hash back into its original data and eventually connect to the ESXi servers.

Note In Unix-type systems, passwords are stored and managed using their hashed value, which explains why hashing is used in kickstarts.

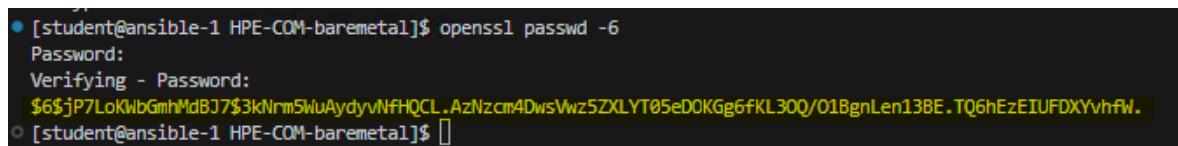
To hash your password, enter from your terminal:

openssl passwd -6

The **-6** option specifies that you want to generate a password using the SHA-512 hashing algorithm, which is currently considered a secure method of creating hashed passwords.

- Then type twice **xxxxxxxxxx**, the ESXi root password that was defined earlier in **VMware_vCenter_vars_encrypted.yml**.
This command returns a long string of characters, this is the hash of your password that will be used by the OS to create the root user.
- Copy the hash string.

Warning: Make sure you select the entire string to avoid any problems connecting to ESXi once the OS has been installed!



```

[student@ansible-1 HPE-COM-baremetal]$ openssl passwd -6
Password:
Verifying - Password:
$6$jP7LoKwbGmhMdBJ7$3kNrml5WuAydyvNfHQCL.AzNzcm4DwsVwz5ZLYT05eDOKGg6fKL3Q0/01BgnLen13BE.TQ6hEzEIUFDXYvhfw.
[student@ansible-1 HPE-COM-baremetal]$

```

Note: To copy a text under a Linux terminal, you generally select the text using your mouse and then right-click.



- And paste it to the `hashed_root_password` variable value in `ESXi8.0.u2_vars.yml`.

```
#----- kickstart file customization -----#
# Password for root
# To generate a hashed password, you can use the following command for SHA512:
# > openssl passwd -6
# or
# > python3 -c 'import crypt,getpass;pw=getpass.getpass();print(crypt.crypt(pw) if (pw==getpass.getpass("Confirm: ")) else exit())'
hashed_root_password: "$6$jP7LoKwbGmhMdBJ7$3kNrM5WuAydyvNfHQCL.AzNzcm4DwsVwz5ZLYT05eDOKg6fKL3Q/01BgnLen13BE.TQ6hEzEIUFDXYvhfw."
```

- Next, you will find sections for the HPE GreenLake for Compute Ops Management parameters, such as the type of RAID you wish to define for the OS volume (RAID 0, 1 or 5), but also the size of the OS volume, the bios workload profile to be defined, the firmware bundles to be used, the name of the server group that will be defined at the end, the firmware downgrade policy and whether you wish to update at the end only the firmware or also the HPE drivers and software:

```
#----- Server settings -----
# OS boot volume RAID type and size
raid_type: RAID1      # Supported RAID types: RAID0, RAID1, RAID5
volume_size_in_GB: -1 # It must be a number >0 or -1, where -1 indicates to use the entire disk.

# BIOS/Workload profile
workload_profile_name: "Virtualization - Power Efficient"
# Supported workload profiles:
# - Virtualization - Max Performance
# - Virtualization - Power Efficient
# - General Peak Frequency Compute
# - General Power Efficient Compute
# - General Throughput Compute
# - Low Latency

#----- COM server group settings -----
# Name of the definitive server group where to place the host at the end of provisioning (created if not already present)
server_group_name: "ESXi_group"
# Name of the firmware server setting to be defined in definitive server group (created if not already present)
firmware_server_setting_name: "ESXi_firmware_baseline"

# Firmware baselines to be defined in the firmware server setting of the definitive server group
# Note: it is mandatory to define at least one firmware baseline for Gen10/Gen10+ servers and one for Gen11 servers.
Gen10_10p_firmware_bundle_name: "2023.09.00.00" # "2023.03.00.00"
Gen10_10p_patch_name_associated_with_firmware_bundle: "2023.09.00.01" # "2023.03.00.03"
Gen11_firmware_bundle_name: "2023.10.00.00" # "2023.04.00.00"
Gen11_patch_name_associated_with_firmware_bundle: "" # "2023.04.00.04"

# Downgrade components policy to match baseline (boolean)
# If "true", any component version higher than the baseline will be downgraded to match the baseline.
firmware_downgrade_policy: true

# Install HPE drivers and software policy in the definitive server group
# If "true", firmware updates will include HPE drivers and software.
install_SWDrivers_policy: false

#----- ISO settings -----
```

- You can keep the same existing values, except for:

Variable name	Value
server_group_name	Team-X-ESXi_group (with X your team number)
firmware_server_setting_name	Team-X-ESXi-firmware-baseline (with X your team number)
Gen10_10p_firmware_bundle_name	2023.03.00.00
Gen10_10p_patch_name_associated_with_firmware_bundle	None, so just put two quotation marks: ""
Gen11_firmware_bundle_name	2023.04.00.00
Gen11_patch_name_associated_with_firmware_bundle	2023.04.00.05
firmware_downgrade_policy	false
install_SWDrivers_policy	False (should already be defined)

Note When dealing with Boolean values, such as `false` or `true`, do not enclose them in quotation marks within Ansible configurations.

```
#----- COM server group settings -----#
# Name of the definitive server group where to place the host at the end of provisioning (created if not already present)
server_group_name: "Team -ESXi_group"
# Name of the firmware server setting to be defined in definitive server group (created if not already present)
firmware_server_setting_name: "Team-ESXi-firmware-baseline"

# Firmware baselines to be defined in the firmware server setting of the definitive server group
# Note: it is mandatory to define at least one firmware baseline for Gen10/Gen10+ servers and one for Gen11 servers.
Gen10_10p_firmware_bundle_name: "2023.09.00.00" # "2023.03.00.00"
Gen10_10p_patch_name_associated_with_firmware_bundle: "" # "2023.03.00.03"
Gen11_firmware_bundle_name: "2023.04.00.00"
Gen11_patch_name_associated_with_firmware_bundle: "2023.04.00.05"

# Downgrade components policy to match baseline (boolean)
# If "true", any component version higher than the baseline will be downgraded to match the baseline.
firmware_downgrade_policy: false

# Install HPE drivers and software policy in the definitive server group
# If "true", firmware updates will include HPE drivers and software.
install_SWDrivers_policy: false
```

- Next is the ISO settings, this section defined the URL where the ESXi 8 ISO image can be found and its name, enter:

Variable name	Value
src_iso_url	http://webserver.handonlab.local/deployment
src_iso_file	It must be the same file as the one already defined, which you can check by browsing the URL above.
src_iso_directory	Keep the same
staging_directory	Keep the same

```
#----- ISO settings -----#
# URL where the ISO image can be found
src_iso_url: "http://webserver.handonlab.local/deployment"
# ISO file name
src_iso_file: "VMware-ESXi-8.0.2-22380479-HPE-802.0.0.11.4.0.14-Sep2023.iso"

# Directory on the Ansible control node where the source ISO will be copied (will be created if not already present).
# Note: You must define a directory in your user home directory using {{ lookup('env','HOME') }}.
src_iso_directory: "{{ lookup('env','HOME') }}/ISOs/esxiisosrc"

# Directory on the Ansible control node to stage all files to build and generate the new ISO image with the custom kickstart (will be
# Note: You must define a directory in your user home directory using {{ lookup('env','HOME') }}.
staging_directory: "{{ lookup('env','HOME') }}/staging

#----- Kickstart file -----#
# Folder located in /files to store the kickstart file
# Recommended to use the template name: ESXi_<build>. (<build> can be found in boot.cfg at the root of the iso)
esxi_build: "ESXi_22380479"

# Name of the kickstart file
kickstart: "ks-esxi8.0u2.sh"
```

- And finally, the kickstart file information, this section defined the location of the ESXi kickstart file. This is the file that is used to automate the installation process of ESXi, and can include directives for installation or upgrade, root password configuration, network settings, disk partitioning, and post-installation scripts..

The kickstart file for ESXi 8.0u2 is in [files/ESXi_22380479](#):

```
$ ls-esxi8.0u2.sh
1 vmaacceptula
2
3 rootpw --iscrypted {{hashed_root_password}}
4
5 %include /tmp/DiskConfig
6
7
8 # Network configuration
9
10 network --device=vmnic0 --bootproto=static --addvmportgroup=1 --ip={{os_ip_address}} --netmask={{netmask}} --gateway={{gateway}} --nameserver={{nameserver}} --hostname={{inventory_hostname}}
11 reboot
12
13 %pre --interpreter=busybox
14
15 # Redirect output to a log file
16 LOGFILE="/tmp/Pre_install.log"
17
18 # Storage configuration - Drive selection and clearing existing partitions using drive size and storage controller type
19
20 # Finding boot volume for the OS installation
21 # Using minimum size difference between the server resource size and the list of disks to identify the correct one
22 SIZEinBytes={{boot_drive_bytes_size}}
23 CONTROLLER="{{Controller_type}}"
24
25
26 echo "CONTROLLER=$CONTROLLER" >> "${LOGFILE}" 2>&1
27
28 if echo "$CONTROLLER" | grep -q "NS2041"; then
29     # echo "The controller is an 'NS2041'" >> "${LOGFILE}" 2>&1
30     INDEX="t"
31 fi
32
33 # if echo "$CONTROLLER" | grep -q "Other"; then
34     # echo "The controller is 'Other'" >> "${LOGFILE}" 2>&1
35     # INDEX="t"
36 fi
```

The kickstart includes some logic to ensure that the target disk for OS installation is correctly identified to avoid data loss or other issues when several volumes are presented to a host. It also includes directives for post-installation scripts, which involve renaming the host and incorporating the Ansible SSH public key into the host's authorized keys file, thereby enabling passwordless SSH authentication by Ansible to ensure a secure and seamless automation of operations.

There is nothing to modify in this kickstart file as it uses Ansible Jinja2 template variables defined with the `{{ ... }}` syntax for variable substitution. Basically, wherever you see `{{ }}` in this file, it's a place where dynamic content will be inserted (using the variables you have previously set like for `{{hashed_root_password}}`) or some computation based on variables will occur at runtime (like for `{{boot_drive_bytes_size}}` and `{{Controller_type}}` collected from Compute Ops Management during the playbook execution).

```
1 vmaacceptula
2
3 rootpw --iscrypted {{hashed_root_password}}
4
5 %include /tmp/DiskConfig
6
7
8 # Network configuration
9
10 network --device=vmnic0 --bootproto=static --addvmportgroup=1 --ip={{os_ip_address}} --netmask={{netmask}} --gateway={{gateway}} --nameserver={{nameserver}} --hostname={{inventory_hostname}}
11 reboot
12
13 %pre --interpreter=busybox
14
15 # Redirect output to a log file
16 LOGFILE="/tmp/Pre_install.log"
17
18 # Storage configuration - Drive selection and clearing existing partitions using drive size and storage controller type
19
20 # Finding boot volume for the OS installation
21 # Using minimum size difference between the server resource size and the list of disks to identify the correct one
22 SIZEinBytes={{boot_drive_bytes_size}}
23 CONTROLLER="{{Controller_type}}"
24
25
26 echo "CONTROLLER=$CONTROLLER" >> "${LOGFILE}" 2>&1
27
28 if echo "$CONTROLLER" | grep -q "NS2041"; then
29     # echo "The controller is an 'NS2041'" >> "${LOGFILE}" 2>&1
30     INDEX="t"
31 fi
32
33 # if echo "$CONTROLLER" | grep -q "Other"; then
```

- This completes the configuration of the different variables of this project.
- Make sure that all your files are saved, and before moving on to the next section, diligently verify all settings AGAIN. Ignoring this step may lead to provisioning failures that can result in extensive time spent on troubleshooting later.

Note: The most common error is adding spaces between your value and the incoming and closing quotation marks! So ensure this is not the case.

- As a final check, make sure that all your encrypted files contain the correct settings by using:

```
ansible-vault view vars/GLP_COM_API_credentials_encrypted.yml
```

```
ansible-vault view vars/VMware_vCenter_vars_encrypted.yml
```

```
ansible-vault view vars/Windows_DNS_vars_encrypted.yml
```

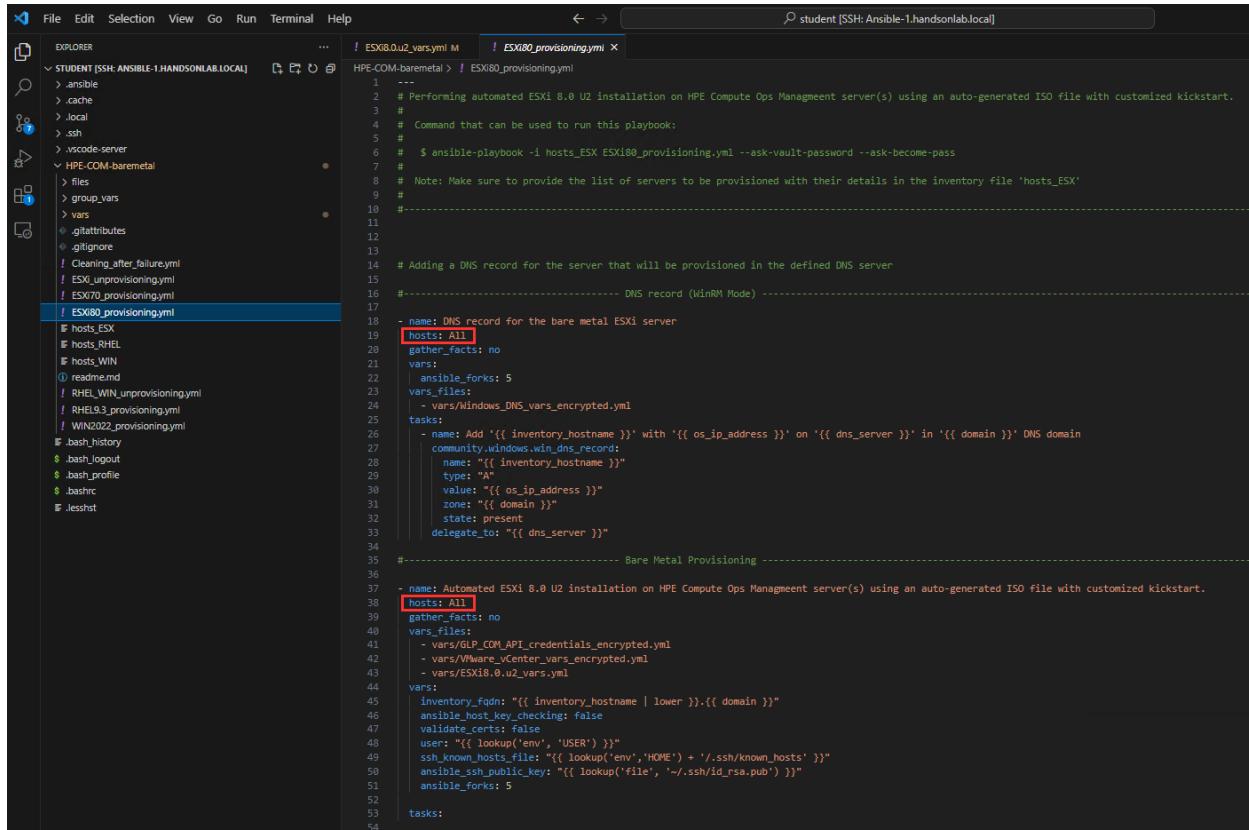
Once everything is checked and correct, you can move on to the next section.

Task 4: Configuration of the inventory file

The playbooks to provision VMware ESXi, Windows Server and RHEL are located at the project's root directory. Two are available for VMware ESXi, one for ESXi 7.0 and one for 8.0.

- Open `ESXi80_provisioning.yml`, the one built for ESXi 8.0.

An Ansible playbook is a YAML file that defines automation tasks in a sequence and specifies the hosts (inventory) on which to run those tasks. Note that in this playbook, `hosts: All` is defined for the first two groups of tasks:



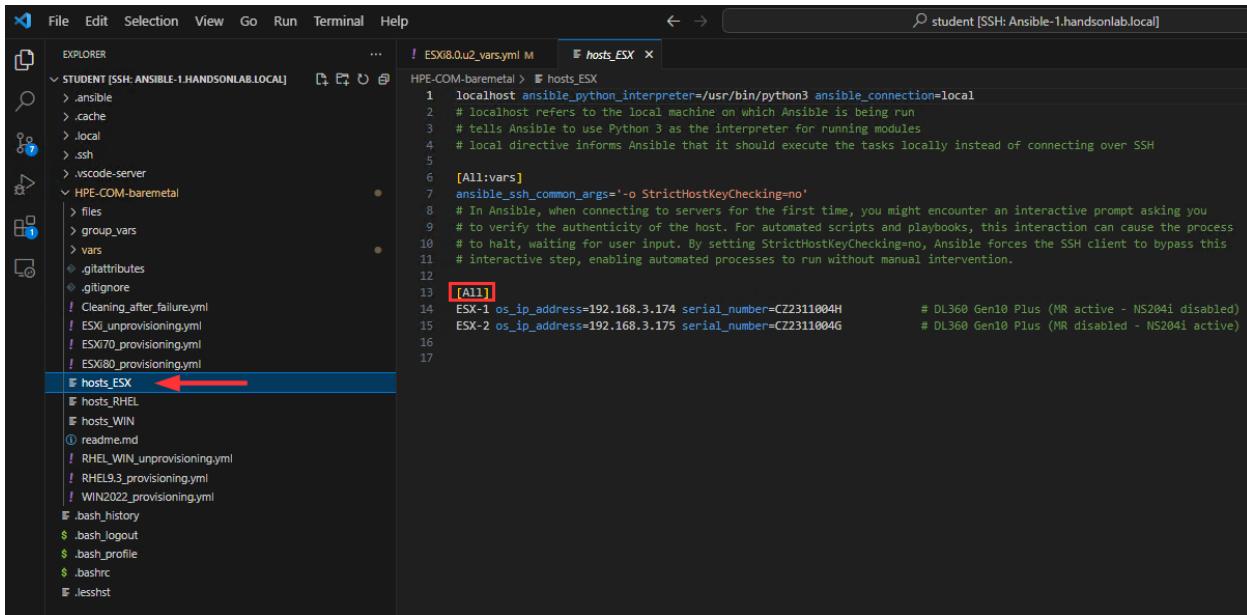
```

File Edit Selection View Go Run Terminal Help
STUDENT (SSH: ANSIBLE-1.HANDSONLAB.LOCAL) ... EXPLORER ESXi80.u2_vars.yml ESXi80_provisioning.yml
HPE-COM-baremetal > | ESXi80_provisioning.yml
1 ---
2 # Performing automated ESXi 8.0 U2 installation on HPE Compute Ops Management server(s) using an auto-generated ISO file with customized kickstart.
3 #
4 # Command that can be used to run this playbook:
5 #
6 # $ ansible-playbook -i hosts_ESX ESXi80_provisioning.yml --ask-vault-password --ask-become-pass
7 #
8 # Note: Make sure to provide the list of servers to be provisioned with their details in the inventory file 'hosts_ESX'
9 #
10 -----
11
12
13
14 # Adding a DNS record for the server that will be provisioned in the defined DNS server
15
16 #----- DNS record (WinRM Mode) -----
17
18 - name: DNS record for the bare metal ESXi server
19 hosts: All
20 gather_facts: no
21 vars:
22   ansible_forks: 5
23   vars_files:
24     - vars/windows_DNS_vars_encrypted.yml
25   tasks:
26     - name: Add '{{ inventory_hostname }}' with '{{ os_ip_address }}' on '{{ dns_server }}' in '{{ domain }}' DNS domain
27       community.windows.win_dns_record:
28         name: "{{ inventory_hostname }}"
29         type: "A"
30         value: "{{ os_ip_address }}"
31         zone: "{{ domain }}"
32         state: present
33         delegate_to: "{{ dns_server }}"
34
35 #----- Bare Metal Provisioning -----
36
37 - name: Automated ESXi 8.0 U2 installation on HPE Compute Ops Management server(s) using an auto-generated ISO file with customized kickstart.
38 hosts: All
39 gather_facts: no
40 vars_files:
41   - vars/GLP_COM_API_credentials_encrypted.yml
42   - vars/vMware_vCenter_vars_encrypted.yml
43   - vars/ESXi8.0.u2_vars.yml
44   vars:
45     inventory_fqdn: "{{ inventory_hostname | lower }}.{{ domain }}"
46     ansible_host_key_checking: False
47     validate_certs: false
48     user: "{{ lookup('env', 'USER') }}"
49     ssh_known_hosts_file: "{{ lookup('env', 'HOME') + '/.ssh/known_hosts' }}"
50     ansible_ssh_public_key: "{{ lookup('file', './ssh/id_rsa.pub') }}"
51     ansible_forks: 5
52
53   tasks:
54

```

This `hosts` attribute specifies the group of hosts or servers on which the playbook tasks should be performed.

- Now, open the `hosts_ESX` inventory file, also found at the root of the project. This file is given as an example for use with the two ESXi provisioning playbooks. You'll notice that the same `All` group is defined:



```

File Edit Selection View Go Run Terminal Help
ESX8.0.u2_vars.yml M hosts_ESX
HPE-COM-baremetal > hosts_ESX
1 localhost ansible_python_interpreter=/usr/bin/python3 ansible_connection=local
2 # localhost refers to the local machine on which Ansible is being run
3 # tells Ansible to use Python 3 as the interpreter for running modules
4 # local directive informs Ansible that it should execute the tasks locally instead of connecting over SSH
5
6 [All:vars]
7 ansible_ssh_common_args='-o StrictHostKeyChecking=no'
8 # In Ansible, when connecting to servers for the first time, you might encounter an interactive prompt asking you
9 # to verify the authenticity of the host. For automated scripts and playbooks, this interaction can cause the process
10 # to halt, waiting for user input. By setting StrictHostKeyChecking=no, Ansible forces the SSH client to bypass this
11 # interactive step, enabling automated processes to run without manual intervention.
12
13 [ESX]
14 ESX-1 os_ip_address=192.168.3.174 serial_number=CZ2311004H # DL360 Gen10 Plus (MR active - NS204i disabled)
15 ESX-2 os_ip_address=192.168.3.175 serial_number=CZ2311004G # DL360 Gen10 Plus (MR disabled - NS204i active)
16
17

```

Ansible utilizes inventory files to list and organize the servers that Ansible will manage. These files provide Ansible with information regarding accessible machines, as well as any relevant variables specific to groups or individual hosts.

Within the scope of this project, we leverage these inventory files to specify the target servers for deployment.

- So, the next step of the lab is to modify this inventory file example with information about the target server you're going to provision. Only three parameters are required:
 - Hostname** –the OS hostname that will be configured (cautious: it is not the FQDN!).
 - IP address** –the IP address that will be assigned to the operating system.
 - Serial number** –the serial number of the server to be provisioned.
- For the hostname, the first parameter of the line, enter: **ESX-TeamX** (with X your team number)

- For `os_ip_address`, use the following table to carefully select the IP address assigned to your team:

Team	IP address
Team1	10.18.21.140
Team2	10.18.21.141
Team3	10.18.21.142
Team4	10.18.21.143
Team5	10.18.21.144
Team6	10.18.21.145
Team7	10.18.21.146
Team8	10.18.21.147
Team9	10.18.21.148
Team10	10.18.21.149
Team11	10.18.21.150
Team12	10.18.21.151
Team13	10.18.21.152
Team14	10.18.21.153
Team15	10.18.21.154
Team16	10.18.21.155
Team17	10.18.21.156
Team18	10.18.21.157
Team19	10.18.21.158
Team20	10.18.21.159
Team21	10.18.21.160
Team22	10.18.21.161
Team23	10.18.21.162
Team24	10.18.21.163
Team25	10.18.21.164



- For **serial_number**, use the following table to carefully select the serial number of the server assigned to your team:

Team	Serial number
Team1	2M294600DF
Team2	2M294600BG
Team3	2M294600DH
Team4	2M2946009Z
Team5	2M294600B0
Team6	2M294600B1
Team7	2M294600DJ
Team8	2M294600DG
Team9	2M294600CP
Team10	2M294600BH
Team11	2M294600D6
Team12	2M294600DC
Team13	2M294600BJ
Team14	2M294600C4
Team15	2M294600HJ
Team16	2M293800KC
Team17	MXQ3500KS4
Team18	MXQ3500KS3
Team19	MXQ3500KRY
Team20	MXQ3500KS0
Team21	MXQ3500KS9
Team22	MXQ3500KS2
Team23	MXQ3500KS1
Team24	MXQ3500KRZ
Team25	MXQ3500KS7

- Copy the serial number and paste it to the inventory file.

- Then delete the second target server available in this inventory example, as we want you to deploy just one server. You should end up with the following content:

```
HPE-COM-baremetal > hosts_ESX
 1 # Inventory file example for ESXi provisioning
 2 #
 3 # Modify this inventory example file with information about the target servers you want to provision.
 4 # Only three parameters are required:
 5 #   * Hostname: the OS hostname that will be configured (cautious: it is not the FQDN!).
 6 #   * os_ip_address: the IP address that will be assigned to the operating system.
 7 #   * serial_number: the serial number of the server to be provisioned (found in COM).
 8
 9 localhost ansible_python_interpreter=/usr/bin/python3 ansible_connection=local
10 # localhost refers to the local machine on which Ansible is being run
11 # tells Ansible to use Python 3 as the interpreter for running modules
12 # local directive informs Ansible that it should execute the tasks locally instead of connecting over SSH
13
14 [All:vars]
15 ansible_ssh_common_args='-o StrictHostKeyChecking=no'
16 # In Ansible, when connecting to servers for the first time, you might encounter an interactive prompt asking you
17 # to verify the authenticity of the host. For automated scripts and playbooks, this interaction can cause the process
18 # to halt, waiting for user input. By setting StrictHostKeyChecking=no, Ansible forces the SSH client to bypass this
19 # interactive step, enabling automated processes to run without manual intervention.
20
21 [All]
22 ESX-Team os_ip_address=10.18.21.1 serial_number=2M 0DF
23
24
```

- If all is as above, save your file using CTRL + S

Congratulations! You have successfully completed the configuration phase. You may now proceed to the connection to the HPE GreenLake platform.

Task 5: Playbook execution

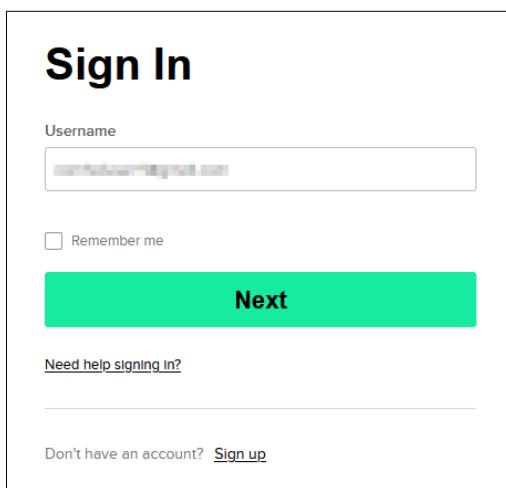
Everything is now prepared for the initiation of the provisioning process. I would characterize the upcoming step as "un jeu d'enfant," a French idiom, or in English, "a piece of cake." This suggests that the more challenging portion is behind you, and what's ahead should be straightforward and effortless. However, this smooth provisioning hinges on the accuracy of your parameters—if there's an oversight or error in the setup, you'll likely notice it promptly.

Step 1: Connection to the HPE GreenLake platform

Before we start the provisioning, let's get ready to track the progress of the different tasks on the HPE GreenLake platform.

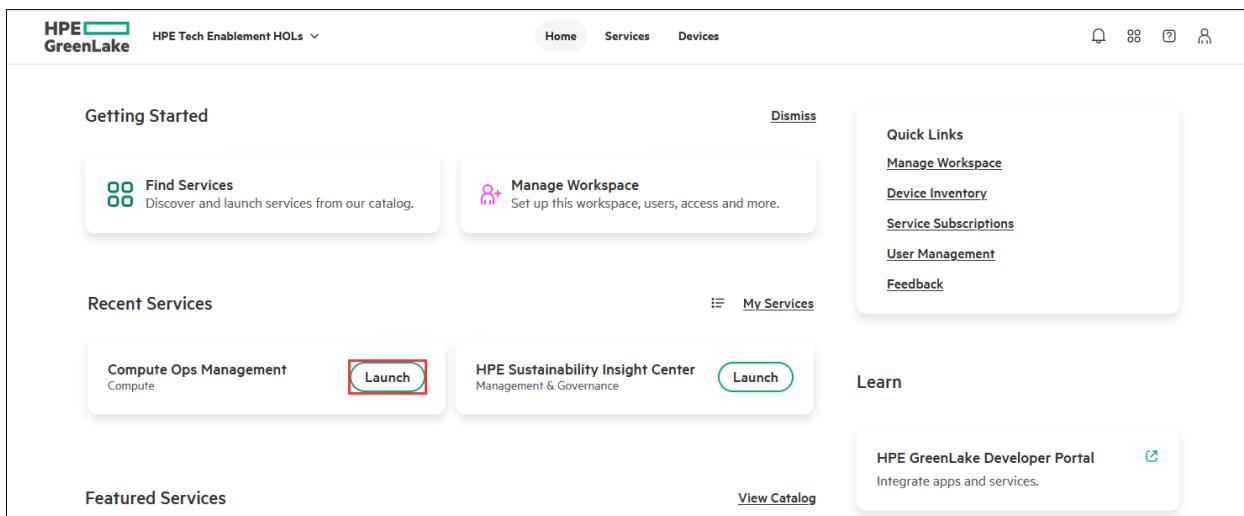
- Open a browser and go to <https://common.cloud.hpe.com>
- Login with your provided credentials

Important note: Your credentials and team assignments can be found on the sheet of paper issued to you by your lab supervisor. Please return the sheet to your supervisor when you have completed this lab.



The image shows the 'Sign In' page of the HPE GreenLake platform. It features a large 'Sign In' header at the top. Below it is a 'Username' input field containing 'student@hpe.com'. There is a 'Remember me' checkbox followed by a 'Next' button in a green box. Below the button is a link 'Need help signing in?'. At the bottom, there is a link 'Don't have an account? [Sign up](#)'.

- Then click on Compute Ops Management:



The image shows the 'Home' page of the HPE GreenLake platform. At the top, there is a navigation bar with 'Home', 'Services', and 'Devices'. On the left, there is a 'Getting Started' section with 'Find Services' and 'Manage Workspace' options. In the center, there is a 'Recent Services' section featuring 'Compute Ops Management' (with a red box around the 'Launch' button) and 'HPE Sustainability Insight Center' (with a 'Launch' button). On the right, there is a 'Learn' section with the 'HPE GreenLake Developer Portal' (with a 'View Catalog' button). A 'Quick Links' sidebar on the right includes links to 'Manage Workspace', 'Device Inventory', 'Service Subscriptions', 'User Management', and 'Feedback'.

- Next, click on Servers, then in the search tool, input the serial number of the server allocated to your team:

HPE GreenLake

Compute Ops Management Overview **Servers** Manage Firmware Reports Activity

< Overview

Servers - 26

0 Critical 25 Ok 0 Unknown 1 Disabled

Needs attention

1 Not connected 0 Not activated 0 Require subscription 0 Expired subscription

1 item

<input type="checkbox"/>	Status	Name	Serial	State	Baseline	Group	Power	Tags	Model
<input type="checkbox"/>	●	com-team11.holen...	2M294600D6	Connected	--	--	Off	1	ProLiant DL160 Gen10

- Then click on the server's name.

Note: All servers to be provisioned must be connected to the HPE GreenLake platform (i.e. the status must be "connected"). Their power status can be "on" or "off" and attached to a group or not.

Step 2: Executing the Ansible playbook

You are now ready to proceed with the provisioning process.

- Return to the VS Code terminal.
 - To provision every host listed within the [All] group of your inventory—even though you currently have only one, but the concept remains the same—you need to execute just a single command:

```
ansible-playbook ESXi80_provisioning.yml -i hosts_ESX --ask-vault-pass --ask-become-pass
```

This command initiates the Ansible playbook named *ESXi80_provisioning.yml*. This playbook contains a series of tasks that will be executed on the hosts specified in the *hosts_ESX* inventory file.

The `--ask-vault-pass` flag prompts the user to enter the password for decrypting your Ansible Vault-protected files. The `--ask-become-pass` flag requests the user to input the privilege escalation (become) password which is required if the playbook needs elevated permissions to run certain tasks on the target hosts.

- At the prompt for the vault password, enter your vault password defined earlier. For the BECOME (sudo) password, enter: xxxxxxxx
 - Once the playbook starts up, the various tasks are executed and displayed in the terminal window. And since this can sometimes happen very quickly, you can always scroll up to see the tasks you've missed.

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS python3 - HPE-COM-baremetal + □ 🌐 ... ×

○ [student@ansible-1 HPE-COM-baremetal]$ ansible-playbook -i hosts_ESX ESXi80_provisioning.yml --vault-password-file pass.txt --become-password-file pass.txt

PLAY [DNS record for the bare metal ESXi server] ****
TASK [Add 'ESX-Team1' with '10.18.21.140' on 'dns.handsontlab.local' in 'handsontlab.local' DNS domain] ****
ok: [ESX-Team1 -> dns.handsontlab.local]

PLAY [Automated ESXi 8.0 U2 installation on HPE Compute Ops Management server(s) using an auto-generated ISO file with customized kickstart.] ****
TASK [Gather subset facts on localhost] ****
ok: [ESX-Team1 -> localhost]

TASK [Capture the start time (will be used later to filter COM activities and get the runtime of the playbook)] ****
ok: [ESX-Team1]

TASK [debug] ****
ok: [ESX-Team1] => {
    "start_time": "2024-02-06T16:48:34Z"
}

TASK [Create HPE Compute Ops Management session] ****
ok: [ESX-Team1 -> localhost]

TASK [Set variable access_token for the bearer token] ****
ok: [ESX-Team1]

TASK [Capture resource API versions from the COM API reference] ****
ok: [ESX-Team1 -> localhost]

TASK [Set a variable for the COM API reference content] ****
ok: [ESX-Team1]

TASK [Set a variable for items property of the COM API reference content] ****
ok: [ESX-Team1]

TASK [Set variables for each API version] ****
ok: [ESX-Team1] => (item=Variable set: webhooks_API_version = v1beta1)
ok: [ESX-Team1] => (item=Variable set: user_preferences_API_version = v1beta1)
ok: [ESX-Team1] => (item=Variable set: servers_API_version = v1beta2)
ok: [ESX-Team1] => (item=Variable set: server_settings_API_version = v1beta1)
ok: [ESX-Team1] => (item=Variable set: schedules_API_version = v1beta2)
ok: [ESX-Team1] => (item=Variable set: reports_API_version = v1beta1)
ok: [ESX-Team1] => (item=Variable set: reports_API_version = v1beta2)
ok: [ESX-Team1] => (item=Variable set: metrics_configurations_API_version = v1beta1)
ok: [ESX-Team1] => (item=Variable set: jobs_API_version = v1beta2)
ok: [ESX-Team1] => (item=Variable set: jobs_API_version = v1beta3)
ok: [ESX-Team1] => (item=Variable set: job_templates_API_version = v1beta2)
ok: [ESX-Team1] => (item=Variable set: groups_API_version = v1beta2)
ok: [ESX-Team1] => (item=Variable set: firmware_bundles_API_version = v1beta2)
ok: [ESX-Team1] => (item=Variable set: filters_API_version = v1beta1)
ok: [ESX-Team1] => (item=Variable set: external_services_API_version = v1beta1)
ok: [ESX-Team1] => (item=Variable set: activities_API_version = v1beta2)

TASK [Capture all job templates] ****
```

Step 3: Monitoring task progress

To efficiently monitor the progress of your playbook tasks, you can switch back and forth between VS Code and the Compute Ops Management interface.

- In Compute Ops Management, you can mainly focus on the **State** attribute value on the server page to track job progress, and you can also check the activity panel on the right for more granular details:

The screenshot shows the HPE GreenLake Compute Ops Management interface. On the left, a sidebar lists 'Compute Ops Management', 'Overview', 'Servers', 'Manage', 'Firmware', 'Reports', and 'Activity'. The 'Servers' tab is selected, showing a list of servers including 'ESX-Team1.handsontlab.local'. A red box highlights the 'State' field in the server details table, which shows 'OS image installation in progress'. To the right, a 'Recent server activity' panel displays two sections: 'Server OS Installation' and 'Server automatic configuration'. Red arrows point from the 'OS image installation in progress' message in the activity panel to the 'OS image installation in progress' status in the server details table, and from the 'Configuration complete' message in the activity panel to the 'Configuration complete' status in the server details table.

Status	Ok	
State	OS image installation in progress	
Group	ESX-Team1_server_group	
Model	ProLiant DL160 Gen10	
Serial number	2M294600DF	
UUID	39383738-3037-4D32-3239-343630304446	
ILO IP address	10.18.22.151	Remote console
ILO hostname	ILO2M294600DF.hol.enablement.local	Remote console
Baseline	SPP 2023.09.00.00 (12 Sep 2023)	
Product ID	878970-B21	
Power	On	
LED Indicator	Off	
Operating system	VMware ESXi 8.0.2 Build-22380479 Update 2	
Subscription	Enhanced tier	expires on September 10, 2028

Recent server activity

Server OS Installation
Operating system image installation is in progress
Note: Operating system setting OS_Image_ESXi8.0.0.u2_for_ESX-Team1 has been initiated on the server. Use the iLO remote console to track the installation progress
2/6/2024 5:51:26 PM

Server automatic configuration
Automatic configuration of server is complete
Note: Server group ESX-Team1_server_group policies were applied.
Refer to the individual server activity entries for details.
Configuration complete:
BIOS/Workload profile: Virtualization - Power Efficient
2/6/2024 5:49:38 PM

- One of the first steps is to detect the server's storage controller and disk size. This is a very important step in the installation process in the kickstart file to determine the target disk for the operating system installation:

```

TASK [Set controller type if disk found and when no NS204i and no SR/MR controller with disk available found] ****
ok: [ESX-Team1] => {item=never}

TASK [Exit when no NS204i and no SR/MR controller and no other controller with disks are found] ****
skipping: [ESX-Team1]

TASK [Set a variable for the name of the storage controller found] ****
ok: [ESX-Team1]

TASK [debug] ****
ok: [ESX-Team1] => {
    "msg": "Storage controller found: 'SATA Storage System' with '2' drives"
}

TASK [Set controller type when no NS204i and no SR/MR controller with disk available found] ****
ok: [ESX-Team1]

TASK [Set a controller type variable for kickstart creation when an NS204i is present] ****
skipping: [ESX-Team1]

TASK [Set a controller type variable for kickstart creation when there is no NS204i but an SR/MR controller is present.] ****
skipping: [ESX-Team1]

TASK [debug] ****
ok: [ESX-Team1] => {
    "msg": "Controller type found that will be used by kickstart: Local"
}

TASK [Check if server settings 'RAID1' already exist] ****
skipping: [ESX-Team1]

TASK [Create internal storage configuration using 'RAID1' with a volume size of '-1' GB for the OS boot volume when it does not exist] ****
skipping: [ESX-Team1]

TASK [Result of the 'RAID1' creation task] ****
skipping: [ESX-Team1]

```

- A temporary server group is then created in Compute Ops Management to configure server storage and bios:

The screenshot shows the HPE GreenLake Compute Ops Management interface. The top navigation bar includes links for Compute Ops Management, Overview, Servers, Manage, Firmware, Reports, Activity, Announcements (with a red notification dot), Documentation, and a user profile icon. The main content area is titled 'Servers' and shows the details for the server 'ESX-Team1.handsonlab.local'. The 'Details' tab is selected, displaying various server specifications such as Status (Ok), State (Background task in progress), Group (highlighted in red as 'ESX-Team1_server_group'), Model (ProLiant DL160 Gen10), Serial number (2M294600DF), UUID (39383738-3037-4D32-3239-343630304446), iLO IP address (10.18.22.151), iLO hostname (ILO2M294600DF.holenablement.local), Baseline (SPP 2023.09.00.00 (12 Sep 2023)), Product ID (878970-B21), Power (Off), LED indicator (Off), Operating system (VMware ESXi 8.0.2 Build-22380479 Update 2), Subscription (Enhanced tier, expires on September 10, 2028), Platform (ProLiant), and Auto iLO firmware update (Enabled). To the right of the details, a 'Recent server activity' section lists several events: 'BIOS settings' (Apply BIOS settings successful, BIOS settings are already configured as requested, 2/7/2024 9:10:34 AM), 'BIOS settings' (Apply BIOS settings in progress, 2/7/2024 9:10:32 AM), 'Server automatic configuration' (Automatic configuration of server in progress, Note: Server group ESX-Team1_server_group policies are being applied, Configuration in progress: BIOS/Workload profile: Virtualization - Power Efficient, 2/7/2024 9:10:32 AM), 'Group updated' (Server 2M294600DF added to group, 2/7/2024 9:10:32 AM), and 'Power off' (Successfully powered off, 2/7/2024 9:03:54 AM). A 'Health' section is also visible at the bottom left.

- If you go to the server group information, you'll only see the bios settings (and no storage settings) because the DL160/DL365 server you're using is not equipped with RAID storage controllers:

The screenshot shows the HPE GreenLake Compute Ops Management interface. At the top, there's a navigation bar with links for Compute Ops Management, Overview, Servers, Manage, Firmware, Reports, Activity, Announcements (with 1 notification), Documentation, and a user profile icon.

The main content area displays a server group named "ESX-Team1_server_group". It shows "1 server" and includes sections for Details, Health, Scheduled actions, Firmware compliance, Server settings, Group policies, and Recent group activity.

Details

- Group status: Ok
- Description: Temporary server group for ESXi installation on server 'ESX-Team1'
- Job state: No active job in progress

Health

Critical	0 servers
Warning	0 servers
Normal	1 server
Unknown	0 servers
Disabled	0 servers

Scheduled actions

No actions have been scheduled.

Firmware compliance

Firmware baseline not set.

Server settings

BIOS/Workload profile: Virtualization - Power Efficient

Group policies

BIOS/Workload profile

Policy	Setting
Auto apply BIOS setting when server is added to the group	Enabled

Recent group activity

- Server automatic configuration**
ESX-Team1.hands-on-lab.local automatic configuration is complete
2/7/2024 9:11:02 AM
- BIOS settings**
ESX-Team1.hands-on-lab.local Apply BIOS settings successful, BIOS settings are already configured as requested
2/7/2024 9:10:34 AM
- BIOS settings**
ESX-Team1.hands-on-lab.local Apply BIOS settings in progress
2/7/2024 9:10:32 AM
- Server automatic configuration**
ESX-Team1.hands-on-lab.local automatic configuration in progress
2/7/2024 9:10:32 AM
- Group updated**
Server 2M294600DF added to group ESX-Team1_server_group
2/7/2024 9:10:32 AM
- Group created**
Group ESX-Team1_server_group created in Compute Ops Management
2/7/2024 9:10:29 AM
- Server power**
ESX-Team1.hands-on-lab.local powered off
2/7/2024 9:03:33 AM
- Server LED indicator**
ESX-Team1.hands-on-lab.local LED indicator off
2/6/2024 7:46:42 PM
- Server health**
ESX-Team1.hands-on-lab.local healthy

- Once the server bios configuration is complete, the next lengthy task to appear in the VS Code terminal is the installation of the operating system image:

```

TASK [Set variables for the id and the resourceUri of the OS Image configuration 'OS_Image_ESXi8.0.u2_for_ESX-Team1' just updated] ****
skipping: [ESX-Team1]

TASK [debug] ****
ok: [ESX-Team1] => {
    "OS_image_server_setting_resourceuri": "/compute-ops/v1beta1/server-settings/600e06ab-d472-42f0-9386-e24c394ca61c"
}

TASK [debug] ****
ok: [ESX-Team1] => {
    "OS_image_server_setting_id": "600e06ab-d472-42f0-9386-e24c394ca61c"
}

TASK [Update temporary group 'ESX-Team1_server_group' to add OS image installation settings with NS204i] ****
ok: [ESX-Team1 -> localhost]

TASK [Display response of the group 'ESX-Team1_server_group' update request with NS204i] ****
ok: [ESX-Team1] => {
    "server_group_result.msg": "OK (1625 bytes)"
}

TASK [Update temporary group 'ESX-Team1_server_group' to add OS image installation settings with storage controller (without NS204i)] ****
skipping: [ESX-Team1]

TASK [Display response of the group 'ESX-Team1_server_group' update request with storage controller] ****
skipping: [ESX-Team1]

TASK [Start OS image installation in group 'ESX-Team1_server_group'] ****
ok: [ESX-Team1 -> localhost]

TASK [Display response of the OS image installation request in group 'ESX-Team1_server_group'] ****
ok: [ESX-Team1] => {
    "group_os_installation_result.msg": "OK (958 bytes)"
}

TASK [Wait for the OS image installation of server '2M294600DF' to complete] ****
FAILED - RETRYING: [ESX-Team1 -> localhost]: Wait for the OS image installation of server '2M294600DF' to complete (60 retries left).
FAILED - RETRYING: [ESX-Team1 -> localhost]: Wait for the OS image installation of server '2M294600DF' to complete (59 retries left).
FAILED - RETRYING: [ESX-Team1 -> localhost]: Wait for the OS image installation of server '2M294600DF' to complete (58 retries left).
FAILED - RETRYING: [ESX-Team1 -> localhost]: Wait for the OS image installation of server '2M294600DF' to complete (57 retries left).
FAILED - RETRYING: [ESX-Team1 -> localhost]: Wait for the OS image installation of server '2M294600DF' to complete (56 retries left).
FAILED - RETRYING: [ESX-Team1 -> localhost]: Wait for the OS image installation of server '2M294600DF' to complete (55 retries left).

```

- If you look in Compute Ops Management, the server group has been updated with a new server parameter, an operating system image:

Firmware compliance	ESX-Team1.hands-on-lab.local Apply BIOS settings in progress 2/7/2024 9:10:32 AM
Firmware baseline not set	
Server settings	Server automatic configuration ESX-Team1.hands-on-lab.local automatic configuration in progress 2/7/2024 9:10:32 AM
BIOS/Workload profile Virtualization - Power Efficient	Group updated Server 2M294600DF added to group ESX-Team1_server_group 2/7/2024 9:10:32 AM
Operating system image OS_Image_ESXi8.0.u2_for_ESX-Team1	Group created
Group policies	

- You can click on this operating system image to see the settings that have been applied:

The screenshot shows the 'Compute Ops Management' interface. In the top navigation bar, 'Compute Ops Management' is selected. Below it, the page title is 'OS_Image_ESXi8.0.u2_for_ESX-Team1'. On the left, there's a 'Details' section with fields like 'Description' (--), 'Used by' (1 server group), 'Category' (Operating system image), and 'Type' (User defined). On the right, a 'Recent settings activity' box shows a 'Setting created' event: 'OS.Image_ESXi8.0.u2_for_ESX-Team1 created in Compute Ops Management' on '2/7/2024 9:11:47 AM'. At the bottom, under 'Operating system image setting', there's a table with rows for 'Operating system' (VMware ESXi), 'Media type' (Single image containing OS and unattended installation file), and 'OS image URL' (http://ansible-1.hands-on-lab.local/isos/ESX-Team1.iso), which is also highlighted with a red box.

- This image is located on your Ansible Control Node nginx web server. You can open a browser and visit the URL <http://hol05-ansible-X.hands-on-lab.local/isos> with X your team number and check that the file is present:

The screenshot shows a browser window displaying the contents of the '/isos/' directory. The URL is 'http://hol05-ansible-X.hands-on-lab.local/isos'. The page title is 'Index of /isos/'. It lists a single file, 'ESX-Team1.iso', with the following details: '06-Feb-2024 17:57' and '702312448'.

- Depending on the server model you are using, the server storage information task can take several minutes. Please be patient!

< Servers

com-team23.hol.enablement.local

Details

Status	Ok
State	Retrieving server storage information in progress
iLO security status	At risk
Group	ESX-Team1_server_group
Model	ProLiant DL365 Gen11
Serial number	MXQ3500KS1
UUID	37363650-3937-584D-5133-3530304B5331
iLO IP address	10.18.22.173
iLO hostname	ILOMXQ3500KS1.hol.enablement.local
Baseline	Patch 2023.04.00.05 + SPP 2023.04.00.00 (10 Sep 2023)
Product ID	P66779-B21
Power	On
UID indicator	Blinking

- To visually confirm that the server is booting from the ISO image and initiating the installation of ESXi, you can use the iLO remote console. Go back to your server's page and click on the **Remote console** link:

HPE GreenLake

Compute Ops Management Overview Servers Manage Firmware Reports Activity Announcements 1 Documentation

< Servers

ESX-Team1.handsonlab.local

Actions ▾

Details

Status	Ok
State	OS image installation in progress
Group	ESX-Team1_server_group
Model	ProLiant DL160 Gen10
Serial number	2M294600DF
UUID	39383738-3037-4D32-3239-343630304446
iLO IP address	10.18.22.151
iLO hostname	ILO2M294600DF.hol.enablement.local
Baseline	SPP 2023.09.00.00 (12 Sep 2023)
Product ID	878970-B21
Power	On
LED indicator	Off
Operating system	VMware ESXi 8.0.2 Build-22380479 Update 2
Subscription	Enhanced tier expires on September 10, 2028
Platform	ProLiant
Auto iLO firmware update	Enabled

Recent server activity

Server OS Installation
Operating system image installation is in progress
Note: Operating system setting OS_Image_ESXi8.0.0.2_for_ESX-Team1 has been initiated on the server. Use the iLO remote console to track the installation progress
2/6/2024 5:51:26 PM

Server automatic configuration
Automatic configuration of server is complete
Note: Server group ESX-Team1_server_group policies were applied.
Refer to the individual server activity entries for details.
Configuration complete:
BIOS/Workload profile: Virtualization - Power Efficient
2/6/2024 5:49:38 PM

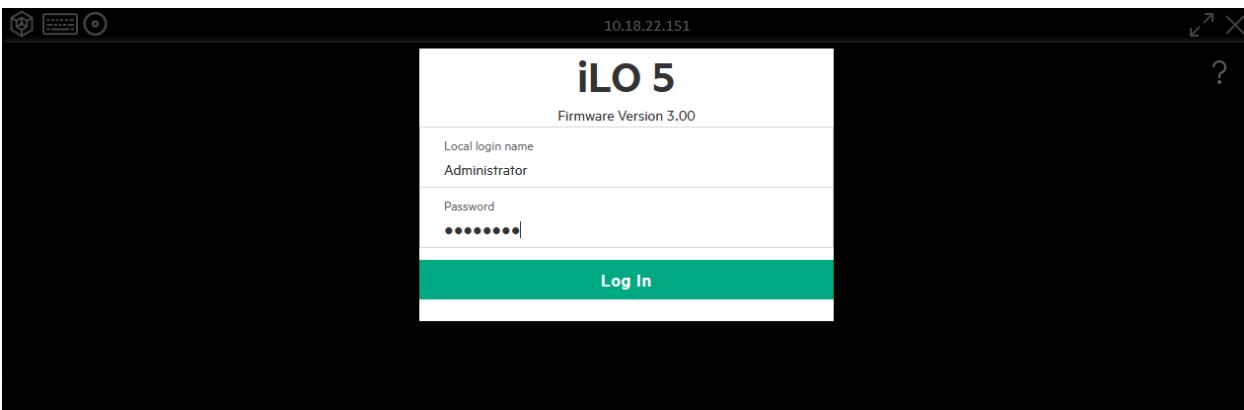
BIOS settings
Apply BIOS settings successful, BIOS settings are already configured as requested
2/6/2024 5:49:09 PM

Note If you are unable to open the remote console page, right-click on the Remote console link on the Compute Ops Management page and click **Copy Link**. Then open a new browser tab and paste the iLO remote console link, which should allow you to access the iLO console.

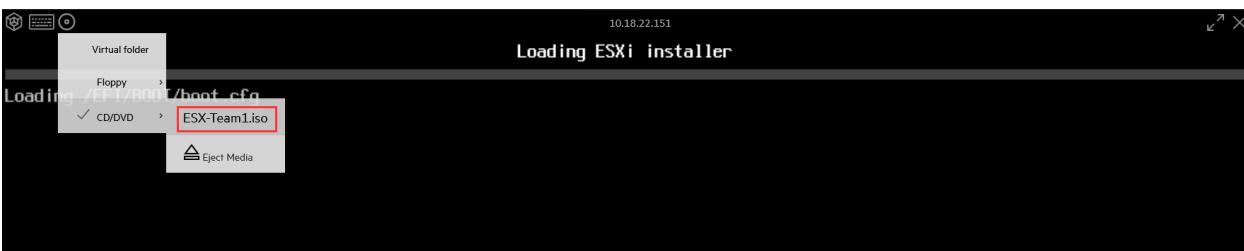
The screenshot shows a table of system information. A context menu is open over the 'Remote console' link in the 'Actions' column. The menu items are: Open Link in New Tab, Open Link in New Window, Open Link in New Private Window, Bookmark Link..., Save Link As..., Save Link to Pocket, **Copy Link**, Copy Link Without Site Tracking, Search Google for "Remote console", Inspect (Q), and Open Link in Chrome. The 'Copy Link' option is highlighted with a red box and a red number '2'.

UUID	39383738-3037-4D32-3239-343630304446
iLO IP address	10.18.22.151
iLO hostname	ILO2M294600DF.hol.enablement.local
Baseline	SPP 2023.09.00.00 (12 Sep 2023)
Product ID	878970-B21
Power	On
LED indicator	Off
Operating system	VMware ESXi 8.0.2 Build-22380479 Update 2
Subscription	Enhanced tier expires on September 10, 2028
Platform	ProLiant
Auto iLO firmware update	Enabled

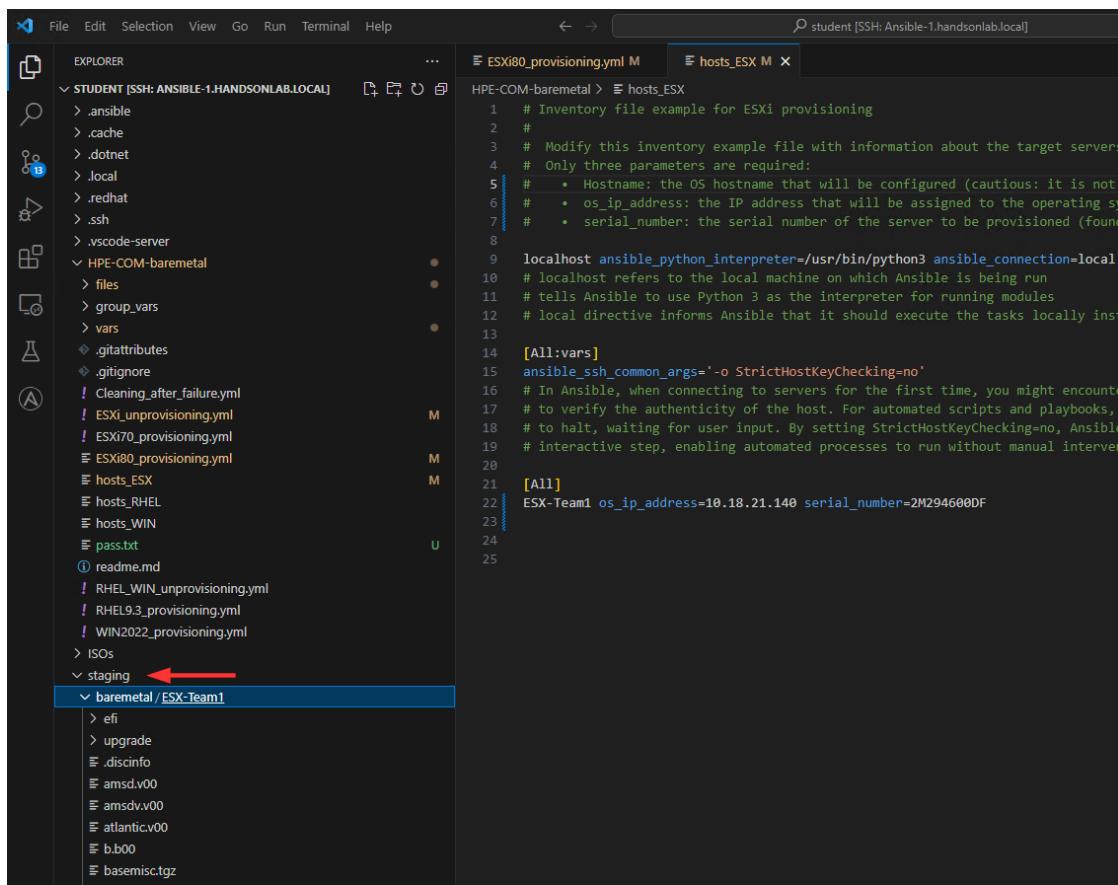
- For the login name and password, use: Administrator / xxxxxxxxxxxx



- When the operating system installation will start, the iLO virtual media will be configured by Compute Ops Management to boot once from the ISO image that Ansible generated with the custom kickstart.



- The content used to produce this image has been temporarily saved in the **staging/baremetal/ESX-TeamX** folder:



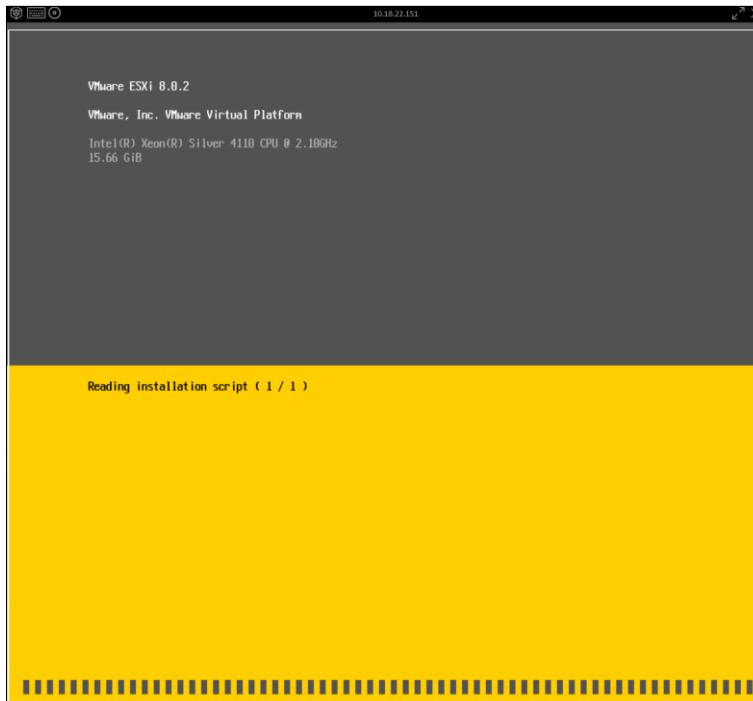
```

File Edit Selection View Go Run Terminal Help
EXPLORER
STUDENT [SSH: ANSIBLE-1.HANDSONLAB.LOCAL]
> .ansible
> .cache
> .dotnet
> .local
> .redhat
> ssh
> vscode-server
HPE-COM-baremetal
> files
> group_vars
> vars
> .gitattributes
> .gitignore
Cleaning_after_failure.yml
ESXi_unprovisioning.yml
ESXi70_provisioning.yml
ESXi80_provisioning.yml
hosts_ESX
hosts_RHEL
hosts_WIN
pass.txt
readme.md
RHEL_WIN_unprovisioning.yml
RHEL93_provisioning.yml
WIN2022_provisioning.yml
> ISOs
staging
baremetal /ESX-Team1
> efi
> upgrade
> .discinfo
> amsd.v00
> amsdv.v00
> atlantic.v00
> b.b00
> basemisc.tgz

student [SSH: Ansible-1.handonlab.local]
HPE-COM-baremetal > hosts_ESX
# Inventory file example for ESXi provisioning
#
# Modify this inventory example file with information about the target servers
# Only three parameters are required:
#   - Hostname: the OS hostname that will be configured (cautious: it is not
#   - os_ip_address: the IP address that will be assigned to the operating system
#   - serial_number: the serial number of the server to be provisioned (found
localhost ansible_python_interpreter=/usr/bin/python3 ansible_connection=local
# localhost refers to the local machine on which Ansible is being run
# tells Ansible to use Python 3 as the interpreter for running modules
# local directive informs Ansible that it should execute the tasks locally instead
[All:vars]
ansible_ssh_common_args='--StrictHostKeyChecking=no'
# In Ansible, when connecting to servers for the first time, you might encounter
# to verify the authenticity of the host. For automated scripts and playbooks,
# to halt, waiting for user input. By setting StrictHostKeyChecking=no, Ansible
# interactive step, enabling automated processes to run without manual intervention
[All]
ESX-Team1 os_ip_address=10.18.21.140 serial_number=2M294600DF

```

- The ESXi installation script (i.e. kickstart file) is read during installation:



- You can check its contents by opening the KS.CFG file in this folder:

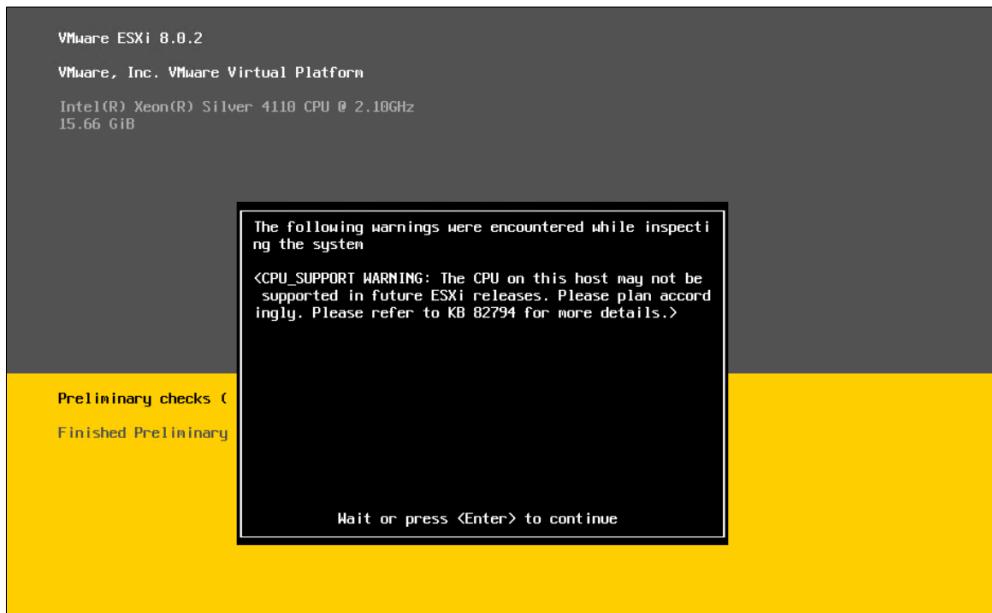
```

1 vmaccepteula
2
3 rootpw --iscrypted $6$hK1WIdn5vPzBylI$vOctylCrLo20ardr57/ca4zT6wPGGM6TFBs1cQZElwaz8m5WzdfHOP59jw7548vtaBboRcMeGU92N8uAXhSRX8
4
5 %include /tmp/DiskConfig
6
7 # Network configuration
8
9 network --device=vmmic0 --bootproto=static --addvmportgroup=1 --ip=10.18.21.140 --netmask=255.255.252.0 --gateway=10.18.20.1 --nameserver=10.18.
10 reboot
11
12 %pre --interpreter=busybox
13
14
15 # Redirect output to a log file
16 LOGFILE="/tmp/Pre_install.log"
17
18 # Storage configuration - Drive selection and clearing existing partitions using drive size and storage controller type
19
20 # Finding boot volume for the OS installation
21 # Using minimum size difference between the server resource size and the list of disks to identify the correct one
22 SIZEInBytes=0
23 CONTROLLER="Local" ←
24
25
26 echo "CONTROLLER=$CONTROLLER" >> "${LOGFILE}" 2>&1
27
28 if echo "$CONTROLLER" | grep -q "NS2041"; then
29     # echo "The controller is an 'NS2041'" >> "${LOGFILE}" 2>&1
30     INDEX="t**"
31 fi
32
33 if echo "$CONTROLLER" | grep -q "SR"; then
34     # echo "The controller is an 'SR controller'" >> "${LOGFILE}" 2>&1
35     INDEX="n**"
36 fi

```

Note that variable substitutions have taken place during the process.

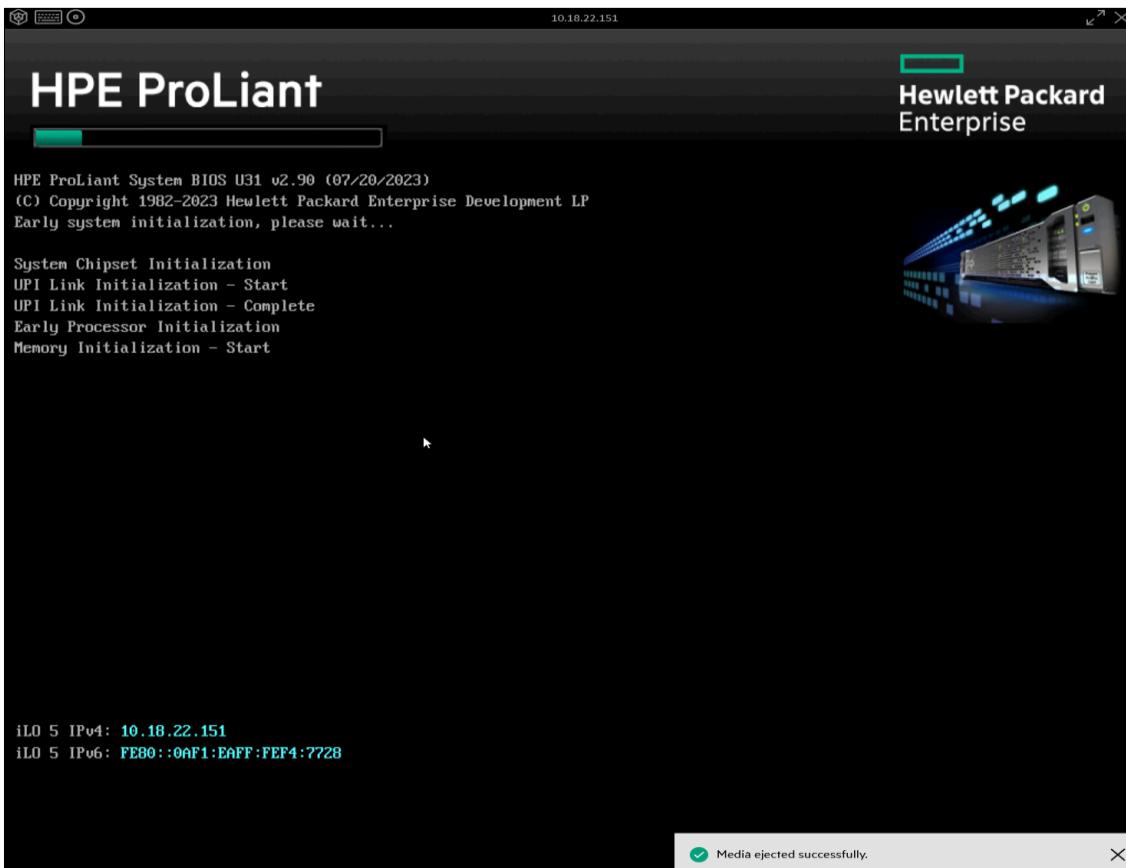
- Later during the ESXi installation, the following warning message regarding processor support can be displayed on the ESXi console. You can ignore this message, as it will not stop the installation:



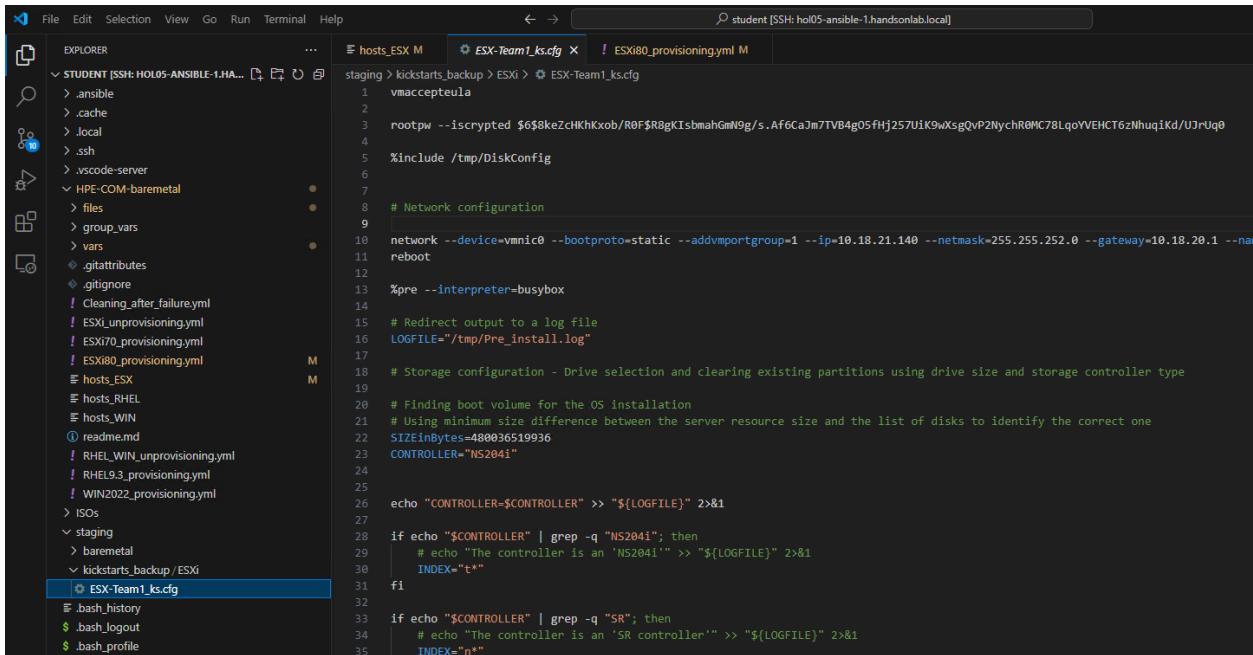
- Once ESXi has been installed successfully, the server reboots:



- And the iLO virtual media is ejected automatically:



- Next the playbook performs several post-installation steps. Firstly, a bit of cleaning will be done. All your files in the staging folder will be deleted. However, the kickstart file is preserved for record-keeping purposes. You'll find the archived kickstart file in `staging/kickstarts_backup/ESXi`.



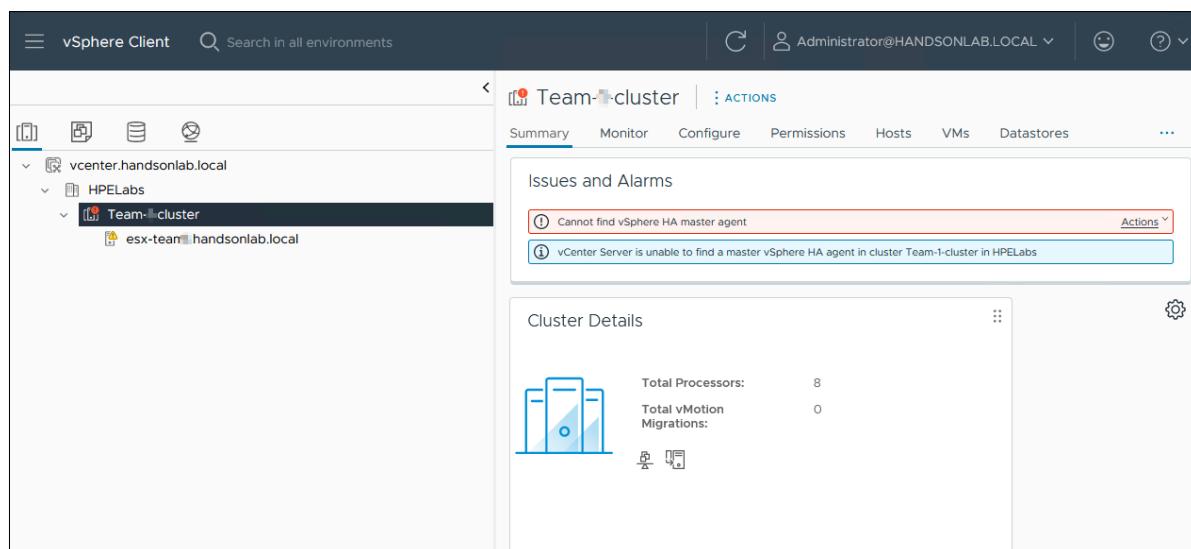
The screenshot shows a terminal window with two tabs open: `hosts_ESX M` and `ESX-Team1_ks.cfg x`. The left pane displays a file tree for a student's SSH session on host `hol05-ansible-1.hands-on-lab.local`. The right pane shows the content of the `ESX-Team1_ks.cfg` playbook, which includes configuration for disk management, network setup, and storage.

```

staging > kickstarts_backup > ESXi > ESX-Team1_ks.cfg
1 vmacceptpeula
2
3 rootpw --inscripted $6$8keZcHKhKxb/R0F$R8gKIsbmahGmN9g/s.Af6CaJm7TVB4g05fHj257U1K9wXsgQvP2NyChR0MC78LqoYVEHCT6zNhquq1Kd/UJrUq0
4
5 %include /tmp/DiskConfig
6
7
8 # Network configuration
9
10 network --device=vmnic0 --bootproto=static --addvmportgroup=1 --ip=10.18.21.140 --netmask=255.255.252.0 --gateway=10.18.20.1 --name=reboot
11
12 %pre --interpreter=busybox
13
14 # Redirect output to a log file
15 LOGFILE="/tmp/Pre_install.log"
16
17 # Storage configuration - Drive selection and clearing existing partitions using drive size and storage controller type
18
19
20 # Finding boot volume for the OS installation
21 # Using minimum size difference between the server resource size and the list of disks to identify the correct one
22 SIZEinBytes=480036519936
23 CONTROLLER="NS204i"
24
25 echo "CONTROLLER=$CONTROLLER" > "${LOGFILE}" 2>&1
26
27 if echo "$CONTROLLER" | grep -q "NS204i"; then
28     # echo "The controller is an 'NS204i'" >> "${LOGFILE}" 2>&1
29     INDEX="t"
30 fi
31
32 if echo "$CONTROLLER" | grep -q "SR"; then
33     # echo "The controller is an 'SR controller'" >> "${LOGFILE}" 2>&1
34     INDEX="n"
35

```

- Secondly, as we are using ESXi, there are certain post-installation tasks involving VMware vCenter such as creating and configuring the ESXi cluster, connecting the ESXi host to the cluster, configuring the ESXi host (i.e. power management, NTP, SSH, Shell and vSwitch are configured) and enabling maintenance mode to prepare the host for firmware updates.
- You can monitor the progress of these tasks in VMware vCenter using:
 - URL: <https://vcenter.hands-on-lab.local/ui>
 - User: administrator@hands-on-lab.local
 - Password:xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
- Make sure you open the cluster created by your playbook named **Team-X-cluster** (with X your team number):



- Thirdly, a firmware update task is executed. This step is particularly important, as we want the server's firmware to be up to date before we put it into production.

This is the second long-running task to appear in the VS Code terminal. The firmware update task is initiated by a Compute Ops Management group's firmware update job:

```

TASK [Set fact for the list of server IDs member of the definitive server group (first host only)] ****
ok: [ESX-Team1]

TASK [Display the server IDs found (first host only)] ****
ok: [ESX-Team1] => {
    "server_ids": [
        "878970-B21+2M294600DF"
    ]
}

TASK [Create HPE Compute Ops Management session] ****
ok: [ESX-Team1 -> localhost]

TASK [Set variable access_token for the bearer token] ****
ok: [ESX-Team1]

TASK [Start a group firmware update job using the defined firmware baseline (first host only)] ****
ok: [ESX-Team1 -> localhost]

TASK [Display response of the group firmware update job (first host only)] ****
ok: [ESX-Team1] => {
    "group_firmware_update_job.msg": "OK (1078 bytes)"
}

TASK [Capture the resourceUri of the group firmware update job (first host only)] ****
ok: [ESX-Team1]

TASK [Display the group firmware update job resource uri (first host only)] ****
ok: [ESX-Team1] => {
    "group_firmware_update_job_resourceUri": "/compute-ops/vibeta3/jobs/cdfa6a8b-0412-42a6-8cef-52f67198d984"
}

TASK [Wait for the group firmware update job to complete (first host only)] ****
FAILED - RETRYING: [ESX-Team1 -> localhost]: Wait for the group firmware update job to complete (first host only) (600 retries left).
FAILED - RETRYING: [ESX-Team1 -> localhost]: Wait for the group firmware update job to complete (first host only) (599 retries left).
FAILED - RETRYING: [ESX-Team1 -> localhost]: Wait for the group firmware update job to complete (first host only) (598 retries left).

```

Note: The firmware update job can be carried out quickly if your server is already up to date.

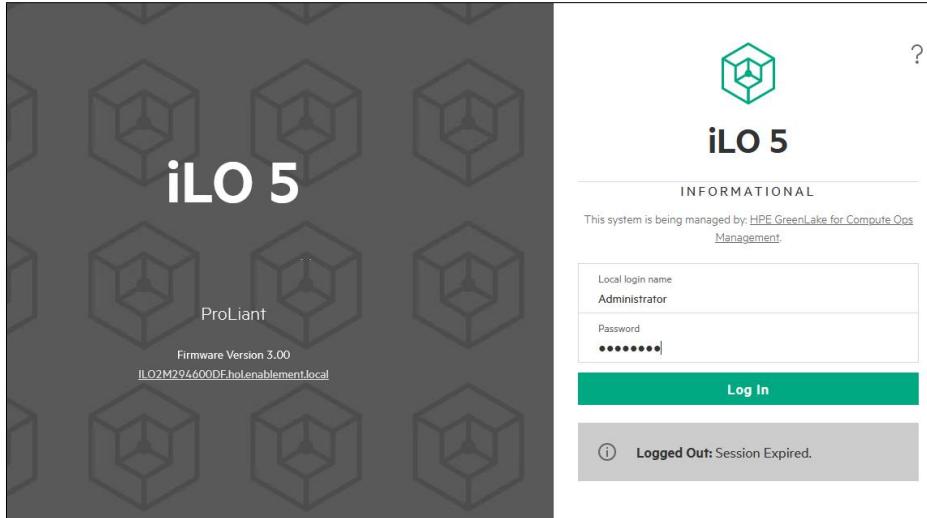
- In Compute Ops Management, the progress of the firmware update is displayed:

Details		Recent server activity
Status	Ok	Firmware update
State	Firmware update in progress - 52% complete	Firmware update in progress
Group	Team-1-ESXi_group	Note: The server firmware update to baseline Patch 2023.09.00.01 + SPP 2023.09.00.00 (03 Nov 2023) requires a server reboot and will cause a service disruption. The firmware will be staged and then the server will be rebooted to activate the firmware. Staging the firmware update is in progress.
Model	ProLiant DL160 Gen10	2/6/2024 2:01:27 PM
Serial number	2M294600DF	
UUID	39383738-3037-4D32-3239-343630304446	
iLO IP address	10.18.22.151	Group updated
iLO hostname	IL02M294600DF.holenalement.local	Server 2M294600DF added to group
Baseline	Patch 2023.09.00.01 + SPP 2023.09.00.00 (03 Nov 2023)	2/6/2024 2:00:12 PM
Product ID	878970-B21	
Power	On	Server LED Indicator
LED Indicator	Blinking	LED indicator off
Operating system	VMware ESXi 8.0.2 Build-22380479 Update 2	2/6/2024 1:01:42 PM
Subscription	Enhanced tier	Server health
Platform	ProLiant	Network health changed to OK
Auto iLO firmware update	Enabled	2/6/2024 12:36:48 PM
		Server OS Installation

- But you can also visit the iLO web interface to get more information about the packages that will be installed (if any). Click on the iLO IP address on the server page:

The screenshot shows the HPE GreenLake Compute Ops Management interface. The top navigation bar includes 'Compute Ops Management', 'Overview', 'Servers', 'Manage', 'Firmware', 'Reports', 'Activity', 'Announcements' (with a red notification dot), 'Documentation', and a user icon. Below the navigation is a breadcrumb trail: '< Servers' and 'ESX-Team1.handsontlab.local'. The main content area displays server details for 'ESX-Team1.handsontlab.local'. The 'Details' section lists various server specifications, including Status (Ok), State (Firmware update in progress - 52% complete), Group (Team-1-ESXi_group), Model (ProLiant DL160 Gen10), Serial number (2M294600DF), UUID (39383738-3037-4D32-3239-343630304446), ILO IP address (10.18.22.151), ILO hostname (IL02M294600DF.hol.enablement.local), Baseline (Patch 2023.09.00.01 + SPP 2023.09.00.00 (03 Nov 2023)), Product ID (878970-B21), Power (On), LED Indicator (Blinking), Operating system (VMware ESXi 8.0.2 Build-22380479 Update 2), Subscription (Enhanced tier, expires on September 10, 2028), Platform (ProLiant), and Auto iLO firmware update (Enabled). To the right of the details is a 'Recent server activity' panel listing a 'Firmware update' entry (status: in progress, note: requires a server reboot, date: 2/6/2024 2:01:27 PM), a 'Group updated' entry (status: completed, date: 2/6/2024 2:00:12 PM), a 'Server LED Indicator' entry (status: off, date: 2/6/2024 1:01:42 PM), a 'Server health' entry (status: OK, date: 2/6/2024 12:36:48 PM), and a 'Server OS Installation' entry.

- For the login name and password, use again: **Administrator / xxxxxxxxxxx**



- Then go to the Installation Queue menu in Firmware & OS Software:

The screenshot shows the HPE GreenLake iLO interface. On the left, there's a sidebar with various menu items like System Information, Firmware & OS Software (which has a red box around it), iLO Federation, Remote Console & Media, Power & Thermal, Performance, iLO Dedicated Network Port, iLO Shared Network Port, Remote Support, Administration, Security, Management, and Lifecycle Management. The main area is titled 'Firmware & OS Software - Installation Queue'. It shows a table with four rows of tasks. The first task is 'Wait Task' with state 'Pending'. The second task is 'FW for HPE Integrated Lights-Out 5' with state 'Pending'. The third task is 'HPE Intel Online Firmware Upgrade Utility Linux x86_64 for HPE' with state 'Pending'. The fourth task is 'Server Reset Task 846930886' with state 'Pending'. Each row has columns for State, Name, Starts, and Expires. There are edit and delete icons for each row. At the bottom left is a 'Remove all' button.

The various packages that are about to be installed are listed on this page. Note that server reset tasks may also be listed for firmware activation.

- These packages are defined by the bundle assigned to the new server group. Go back to the Compute Ops Management interface, and open the **Team-X-ESXi_group** in the server page:

The screenshot shows the Compute Ops Management interface under the 'Servers' section. The server is named 'ESX-Team1.handonlab.local'. In the 'Details' section, the 'Group' field is highlighted with a red box and shows 'Team-1-ESXi_group'. Other details include Status (Ok), State (Firmware update in progress - 52% complete), Model (ProLiant DL160 Gen10), Serial number (2M294600DF), UUID (39383738-3037-4D32-3239-343630304446), ILO IP address (10.18.22.151), ILO hostname (IL02M294600DF.holenablement.local), Baseline (Patch 2023.09.00.01 + SPP 2023.09.00.00 (03 Nov 2023)), Product ID (878970-B21), Power (On), LED Indicator (Blinking), Operating system (VMware ESXi 8.0.2 Build-22380479 Update 2), Subscription (Enhanced tier, expires on September 10, 2028), Platform (ProLiant), and Auto iLO firmware update (Enabled). To the right, there's a 'Recent server activity' section with entries for a firmware update, group update, server LED indicator, and server health.

This newly established group is the ultimate configuration resource for your ESXi production servers. The previous group, which contained the OS image settings with a customized kickstart, has been removed following the completion of the OS installation process.

The creation of this new group ensures uniformity across all ESX host members by standardizing the firmware baseline and enforcing consistent BIOS/workload profile settings. This consolidation guarantees that all hosts adhere to the same operational standards, streamlining management and minimizing variability in your server environment.

- If you scroll down to the **Server** settings section, you will notice the firmware baseline with the group policies that have been applied:

Server settings

Firmware	<u>Team-1-ESXi-firmware-baseline</u>
BIOS/Workload profile	<u>Virtualization - Power Efficient</u>

Group policies

Policy	Setting
Downgrade components to match baseline	Enabled
Auto apply firmware baseline when server is added to the group	Disabled

BIOS/Workload profile

Policy	Setting
Auto apply BIOS setting when server is added to the group	Disabled

Automate adding servers

Automate adding servers	Disabled
-------------------------	----------

- You can open the **Team-X-ESXi-firmware-baseline** settings to access details of the firmware package:

Team-1-ESXi-firmware-baseline

Details

Description	Firmware baseline for ESXi 8.0.u2
Used by	<u>1 server group</u>
Category	Firmware
Type	User defined

Firmware settings

Platform generation	Baseline reference	Base SPP	Hotfix bundle
Gen10/+	Patch 2023.09.00.01 + SPP 2023.09.00.00 (03 Nov 2023)	2023.09.00.00	2023.09.00.01
Gen11	SPP 2023.10.00.00 (06 Nov 2023)	2023.10.00.00	--

- Once the firmware update task has been completed, a job results report is provided in the terminal, together with a report on firmware update activity:

```

TASK [Display the group firmware update job result (first host only)] ****
ok: [ESX-Team1] => {
    "msg": [
        "State: COMPLETE",
        "ResultCode: SUCCESS",
        "Status: Complete"
    ]
}

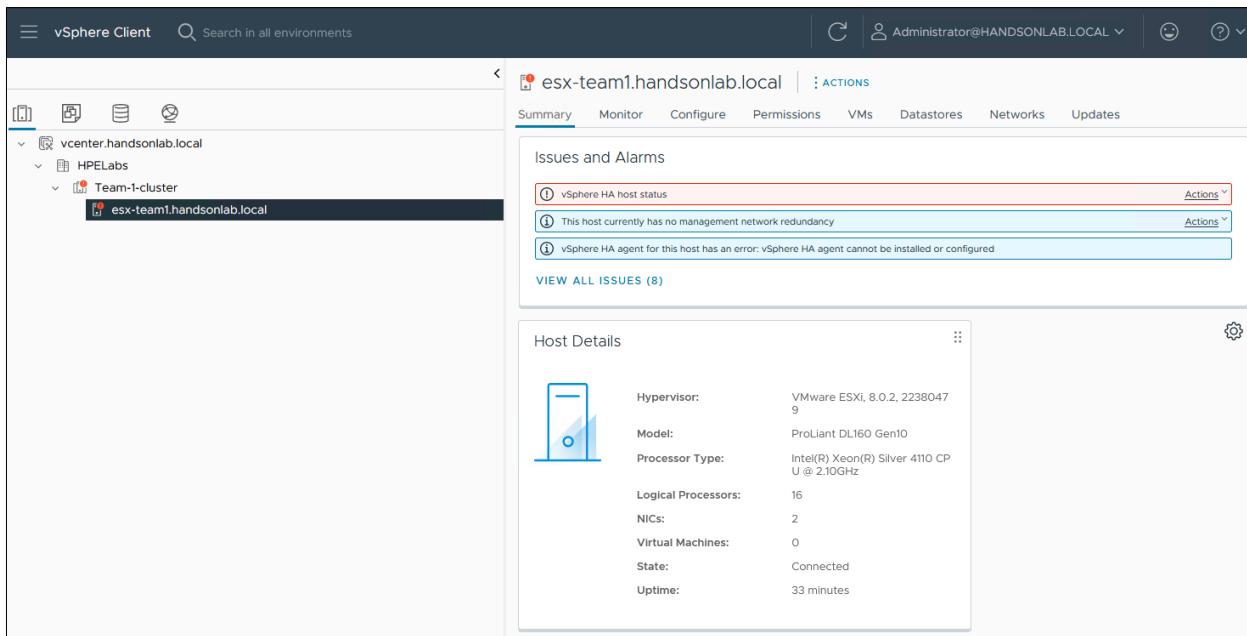
TASK [Get the latest activity of server '2M294600DF'] ****
ok: [ESX-Team1 -> localhost]

TASK [Extract items containing 'Firmware update'] ****
ok: [ESX-Team1]

TASK [Display the firmware update activity status when successful] ****
ok: [ESX-Team1] => {
    "msg": [
        "Message: Firmware update successful",
        "",
        "***Note:** The server firmware is already up to date with specified baseline Patch 2023.09.00.01 + SPP 2023.09.00.00 (03 Nov 2023). The specified baseline has been set for the server.",
        ""
    ]
}

```

- In vCenter, the host is taken out of maintenance:



Note: Several errors should be displayed concerning HA because you only have one host in your cluster and concerning management network redundancy because only one NIC is connected to the server.

- In Compute Ops Management, the task is shown as complete:

The screenshot shows the HPE GreenLake Compute Ops Management interface. At the top, there's a navigation bar with links for Compute Ops Management, Overview, Servers, Manage, Firmware, Reports, Activity, Announcements (with 1 notification), Documentation, and a user profile icon. Below the navigation bar, the page title is "ESX-Team1.handsontlab.local". On the left, there's a "Details" section listing various server parameters like Status (Ok), State (Firmware update complete), Group (Team-1-ESXi_group), Model (ProLiant DL160 Gen10), and more. To the right, there's a "Recent server activity" section with entries for Firmware update, Group updated, Server health, and Server OS Installation, each with a timestamp and a note about its status.

- A final status of the entire installation is then displayed by the playbook:

```

TASK [Get runtime] *****
ok: [ESX-Team1]

TASK [Status of the OS installation with the firmware update with HPE drivers and software] *****
skipping: [ESX-Team1]

TASK [Status of the OS installation with the firmware update without HPE drivers and software] *****
ok: [ESX-Team1] => {
    "msg": [
        "ESX-Team1.handsontlab.local installation and firmware update completed successfully!",
        "OS is configured and running and added to the vCenter cluster 'Team-1-cluster'",
        "To SSH to the new host from Ansible control node, use: ssh root@ESX-Team1.handsontlab.local",
        "The provisioning task took 0:32:00."
    ]
}

TASK [Status of the OS installation with firmware update failure] *****
skipping: [ESX-Team1]

PLAY RECAP *****
ESX-Team1 : ok=147  changed=25  unreachable=0  failed=0  skipped=75  rescued=0  ignored=1

```

- Once the server provisioning is complete, you'll be able to access the ESXi CLI (enabled during the playbook execution) from the Ansible Control node using its SSH public key for password-less entry by utilizing:

```
ssh root@ESX-TeamX.handonlab.local
```

with X your team number.

```
[student@ansible HPE-COM-baremetal]$ ssh root@ESX-TeamX.handonlab.local
The authenticity of host 'esx-team1.handonlab.local (10.18.21.140)' can't be established.
ECDSA key fingerprint is SHA256:SRaKwzvRjZ3rVTdeWSsVMkthhcEdVvpCDtLU9jW99yc.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'esx-team1.handonlab.local' (ECDSA) to the list of known hosts.
The time and date of this login have been sent to the system logs.

WARNING:
All commands run on the ESXi shell are logged and may be included in
support bundles. Do not provide passwords directly on the command line.
Most tools can prompt for secrets or accept them from standard input.

VMware offers powerful and supported automation tools. Please
see https://developer.vmware.com for details.

The ESXi Shell can be disabled by an administrative user. See the
vSphere Security documentation for more information.
[root@ESX-Team1:~] ]
```

- Type exit to leave the ESXi CLI and return to the Rocky Linux terminal.

Congratulations on achieving this milestone! If you're reading this, it signifies that the installation has concluded. Your ESXi is now fully operational for production use, seamlessly integrated into a cluster. It is currently running the most up-to-date firmware versions as specified in your ESXi production group within Compute Ops Management, ensuring optimal performance and reliability.

Step 4: Decommissioning the ESX Host

For those looking to reverse the process, decommissioning your ESX host can be a critical part of managing your server lifecycle. Whether you're aiming to change the server role or update the server to a new OS version, decommissioning can be efficient and secure without disrupting the existing infrastructure.

- To do this, a different playbook is available at the root of the project:

The screenshot shows the VS Code interface with the following details:

- File Explorer:** Shows the project structure under "STUDENT [SSH: ANSIBLE-1.HANDSONLAB.LOCAL]". The "ESXi_unprovisioning.yml" file is highlighted with a red arrow pointing to its icon.
- Code Editor:** Displays the content of the "ESXi_unprovisioning.yml" file. The file contains Ansible playbooks for unprovisioning ESXi hosts, including commands for maintenance mode, server removal, and host key removal.

```
student [SSH: Ansible-1.handsonlab.local]
EXPLORER
STUDENT [SSH: ANSIBLE-1.HANDSONLAB.LOCAL]
  > ansible
  > .cache
  > .dotnet
  > local
  > redhat
  > ssh
  > vscode
  > vscode-server
HPE-COM-baremetal
  > files
  > group_vars
  > vars
    & .gitattributes
    & .gitignore
    ! Cleaning_after_failure.yml
  ! ESXi_unprovisioning.yml
  ! ESXi70_provisioning.yml
  ! ESXi80_provisioning.yml
  ! hosts_ESX
  ! hosts_RHEL
  ! hosts_WIN

CODE EDITOR
ESXi80_provisioning.yml M hosts_ESX M ESXi_unprovisioning.yml M
HPE-COM-baremetal > ESXi_unprovisioning.yml
1   ---
2   #  Playbook for server unprovisioning:
3   #      - Put the ESXi server into maintenance mode
4   #      - Remove the server from vCenter
5   #      - Remove the server from any COM server group
6   #      - Power off the server
7   #      - Remove the host SSH key from .ssh/known_hosts on the Ansible control node
8   #      - Remove the DNS record
9   #
10  # Commands that can be used to run this playbook:
11  #
12  # $ ansible-playbook -i "C2Z3i1004G," ESXi1_unprovisioning.yml --ask-vault-password
13  # or
14  # $ ansible-playbook -i "C2Z3i1004G,C2Z3i1004H" ESXi1_unprovisioning.yml --ask-vault-password
15  #
16  #####
17  #
18  -
19  - name: Deleting provisioned compute module(s)
20  hosts: all
21  gather_facts: no
22  vars_files:
23    - vars/ESXi80.0.u2.vars.yml
```

Note: Given the inherent risks associated with decommissioning servers, it is crucial to implement stringent precautions.

- To initiate the decommission process using this playbook, you must supply a list of server serial numbers targeted for shutdown. For your specific ESX host decommissioning, you can execute the command below:

```
ansible-playbook -i "<Your server serial number>" ESXi_unprovisioning.yml --ask-vault-password
```

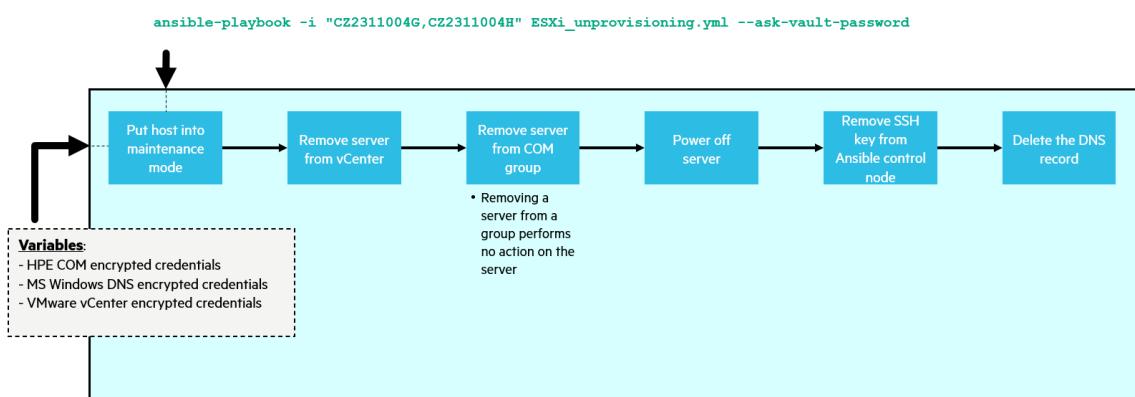
Important: Be sure to enter the server serial number assigned to your team!

Remember: It's crucial to include a comma following the serial number; this is mandatory even if you're entering just one serial number. Additionally, there's no need to use sudo or the BECOME privilege escalation for this un-provisioning operation.

- At the prompt for the vault password, type the vault password you defined earlier to encrypt your sensitive variables.
 - The un-provisioning process flow is much lighter than for provisioning:

VMware ESXi

BARE METAL UNPROVISIONING WITH COMPUTE OPS MANAGEMENT



- You can track the progress of tasks on the terminal, vCenter and Compute Ops Management.

- The final state of your server in Compute Ops Management is 'Power off complete', and the server should no longer have an assigned group:

Compute Ops Management

Servers

ESX-Team1.handsonlab.local

Details

Status	Ok	
State	Power off complete	
Group	--	
Model	ProLiant DL160 Gen10	
Serial number	2M294600DF	
UUID	39383738-3037-4D32-3239-343630304446	
iLO IP address	10.18.22.151	Remote console
iLO hostname	ILO2M294600DF.hol.enablement.local	Remote console
Baseline	SPP 2023.09.00.00 (12 Sep 2023)	
Product ID	878970-B21	
Power	Off	
LED indicator	Off	
Operating system	VMware ESXi 8.0.2 Build-22380479 Update 2	
Subscription	Enhanced tier	expires on September 10, 2028
Platform	ProLiant	
Auto iLO firmware update	Enabled	

Recent server activity

- Power off**
Successfully powered off
2/7/2024 12:38:15 PM
- Server power**
Powered off
2/7/2024 12:38:15 PM
- Power off**
Power off in progress
2/7/2024 12:37:59 PM
- Group updated**
Server 2M294600DF removed from group
2/7/2024 12:37:43 PM
- Server LED indicator**
LED indicator off
2/7/2024 11:49:22 AM
- Firmware update**
Firmware update successful
Note: The server firmware is already up to date with specified baseline Patch 2023.09.00.01 +

- Your server is now ready for the next provisioning.

This concludes the lab.

Summary

During this lab, you've gained firsthand understanding of automatic bare metal provisioning by utilizing Ansible alongside HPE GreenLake for Compute Ops Management and kickstart methods. The practical experience should have illustrated the significant benefits of integrating Compute Ops management with tools like Ansible—minimizing manual tasks, accelerating configuration, and promoting uniformity, productivity, and scalability within your data center operations through automation and swift resource reassignment.

If you encounter any questions, opinions, or problems during your own testing, it's highly recommended that you report them on the project's issues page on GitHub. This can help improve the project and potentially benefit other users who may be facing similar issues.

In this lab you have provisioned only one server, if you want to watch a video where parallel provisioning is demonstrated, see:
https://www.youtube.com/watch?v=ySgROdd_Bw

This project also includes playbooks for provisioning Red Hat Enterprise Linux and Windows Server with the same seamless experience and speed. But that's outside the scope of this lab and if you want to find out more, you can watch the following videos:

- Efficient Bare Metal Provisioning for RHEL 9.3 with HPE Compute Ops Management and Ansible:
https://www.youtube.com/watch?v=6_o8yB4cvag
- Efficient Bare Metal Provisioning for Windows Server with HPE Compute Ops Management and Ansible:
<https://www.youtube.com/watch?v=A6RD6nlAFmw>

Want more?

- Various sample scripts for the Compute Ops Management API, including Ansible playbooks, PowerShell and Python scripts, are available [here](#).
- An [API collection for Postman](#) is accessible online and offers developers the opportunity to interact with a variety of HPE APIs. These include APIs for HPE GreenLake for Compute Ops Management, HPE OneView, HPE iLO, HPE OneView Global Dashboard, among others.
- Back home, you can head to the HPE Demonstration Portal and request a time slot (<https://hpedemoportal.ext.hpe.com/>)
- Request a 90-day Compute Ops Management evaluation (<https://www.hpe.com/us/en/compute/management-software.html?dmodal=modal-edba#>)
- Learn more about the HPE GreenLake Developer portal at <https://developer.greenlake.hpe.com/>
- Discover the HPE Developer community at <https://developer.hpe.com/>

LEARN MORE AT
hpe.com/us/en/greenlake.html



Appendix 1

Ansible Control Node configuration

- Command that you must modify then copy and paste into your terminal window and run:

```
sudo hostnamectl set-hostname hol05-ansible-X.hands-on-lab.local  
(make sure you change X with your team number)
```

- Commands that you can copy and paste into your terminal window and execute at once:

```
sudo dnf -y install git  
git clone https://github.com/jullien1/HPE-COM-baremetal  
cd HPE-COM-baremetal/  
ssh-keygen -t rsa -f ~/.ssh/id_rsa -N ""  
sudo dnf -y install epel-release  
sudo dnf -y install mkisofs  
sudo dnf -y install python3-pip  
pip3 install setuptools-rust wheel  
pip3 install ansible-core  
ansible-galaxy collection install -r files/requirements.yml  
pip3 install --upgrade pip setuptools  
pip3 install --upgrade git+https://github.com/vmware/vsphere-automation-sdk-python.git  
pip3 install -r  
~/ ansible/collections/ansible_collections/community/vmware/requirements.txt  
pip3 install --upgrade git+https://github.com/vmware/vsphere-automation-sdk-python.git  
pip3 install pywinrm  
pip3 install jmespath  
sudo dnf -y install nginx  
sudo systemctl enable nginx  
sudo systemctl start nginx  
sudo firewall-cmd --permanent --add-service=http  
sudo firewall-cmd --reload  
sudo sed -i '0,/server {/s//&\n        autoindex on;/' /etc/nginx/nginx.conf  
sudo systemctl restart nginx  
sudo dnf -y install rsync
```