Red Hat
Training and
Certification

Ansible Automation Platform 2.x Webinar

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Version 1.0

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Introduction to Ansible Automation

1. Ansible & Ansible Automation Engine (Past)

1.1. Ansible Infrastructure

The Ansible infrastructure and Ansible Automation consists of multiple components. The initial main foundation of Ansible is the Ansible Automation Engine.

For the most part, Ansible is a declarative automation platform that is considered idempotent meaning that Ansible will only execute tasks and plays if the item needs to be changed/modified. Otherwise, Ansible will skip to the next task or play in a playbook.

Ansible Components

- **Control Node**: System with Ansible installed, contains Ansible inventory files, **ansible.cfg**, and playbooks. This system manages and controls other managed hosts/nodes.
- **Managed Host/Managed Node**: System or node being managed in the Ansible environment. The **Control Node** executes various Ansible modules against these devices.

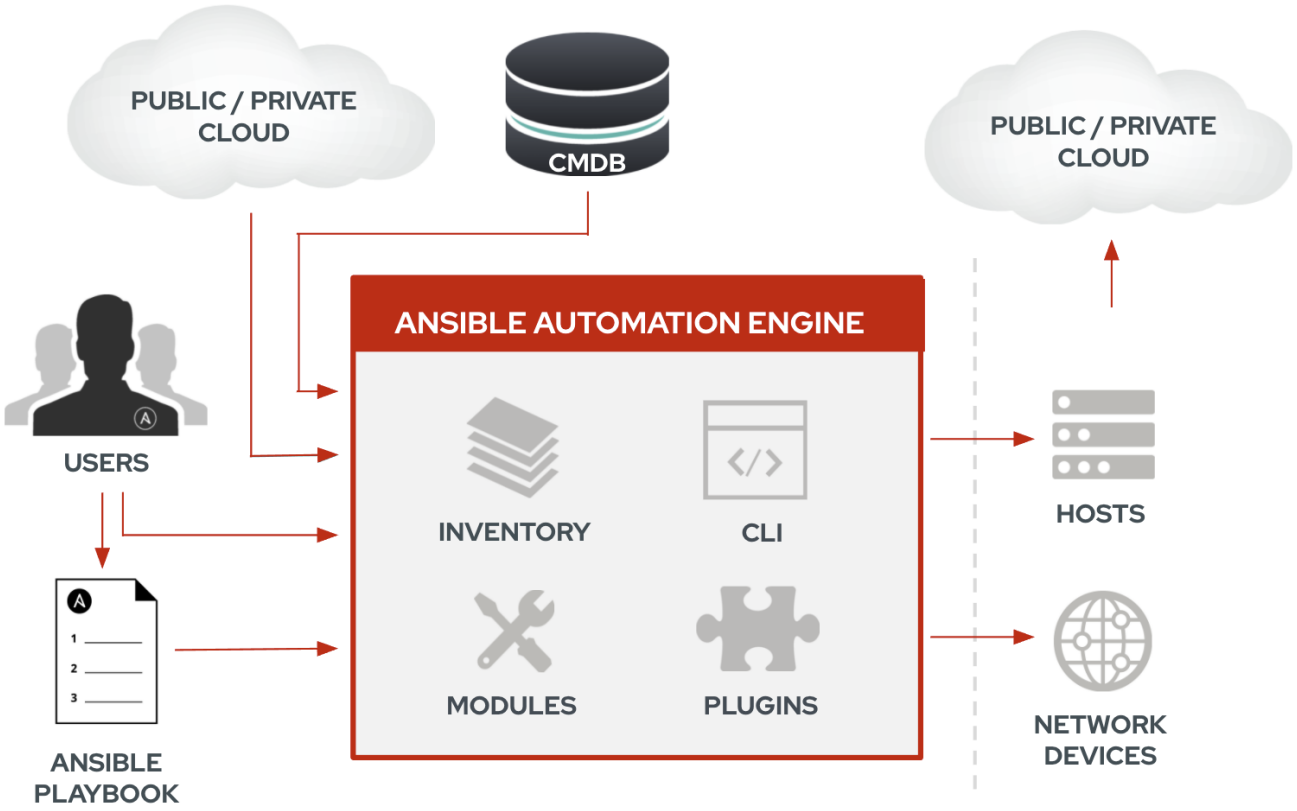

Figure 1. Ansible Automation

Ansible Automation Engine

- Inventory
- Command-Line Interface (CLI)
- Modules (Generally Python/Powershell)
- Plugins

Ansible Automation Engine utilizes the **ansible** command for Ad-Hoc Ansible Automation or the **ansible-playbook** command for running multiple tasks by leveraging and Ansible playbook containing one or more plays consisting of one or more tasks.

1.1.1. Inventory

List of systems in the infrastructure to be managed. Inventories can be static, dynamic, or a combination of both static and dynamic. Ansible also allows inventories to contain variables for the devices being managed. Devices must exist in inventory in order for Ansible to be capable of managing the devices.

1.1.2. Modules

Code utilized by the Ansible core engine which is used to perform a given tasks. Most modules are written in Python for Linux and Powershell for Windows. Modules can extend Ansible automation to multiple platforms simplifying and extending the automation to the entire stack.

Non-Idempotent Modules

There are some Ansible modules that aren't idempotent. Modules such as **commmand**, **shell**, and **raw** to name a few will execute regardless of the state. It is possible to use these modules with logic to make a playbook idempotent, but it is recommended to find an actual Ansible module to perform the task. These modules should be used as a last resort when no other module exists to perform a task.

1.1.3. Plugins

Code utilized by the Ansible core engine which is used to manipulate, transform, or otherwise modify either data in the playbook or items captured by the playbook and modules so that it is adaptable and usable on different platforms.

1.1.4. Playbooks

List of sequential tasks to allowing individual Ansible modules to be executed to perform a sequence of steps in an automation task. Playbooks are written in YAML and are simple easy-to-read steps on the end state of the system.

1.1.5. Ansible Tower

Ansible Tower delivers enterprise management and features to the Ansible family. Through Tower, Ansible can provide the following:

- Role-Based Access Control (RBAC)
- Restful API
- Push button deployment

- Workflows
- Credential and Secret Management
- Integration into SCM systems
- Integration into other management systems for dynamic inventory
- WebUI
- … and more

Ansible Tower allows enterprises to manage their IT environment by providing a centralized web solution to end-users and administrators to perform automation and self-service tasks. :pygments-style: tango :source-highlighter: pygments :icons: font :icons: font

1.2. Ansible Inventory, Ansible Config File, and Ansible Ad-Hoc Commands

1.2.1. Ansible Inventory

Ansible inventories can be either static, dynamic, or a combination of both static and dynamic. The traditional form of the Ansible inventory file is either YAML or INI. Inventory items consist of either individual managed nodes or groups of managed nodes.

Listing 1. Ansible Inventory File **INI** *Format*

```
servera ①
serverb
serverc
serverd

[load_balancers] ②
servere
serverf
```

① Individual managed host/node

② Inventory Group

Converting INI to YAML Inventory

Ansible provides the **ansible-inventory** command that will easily allow the inventory to be transformed from one form to another.

```
ansible-inventory --list -y
```

Listing 2. Ansible Inventory File **YAML** *Format*

```
all:
  children:
    load_balancers: ①
      hosts:
        servere: {}
        serverf: {}
    ungrouped:
      hosts: ②
        servera: {}
        serverb: {}
        serverc: {}
        serverd: {}
```

① Inventory Hosts in a Group

② Individual managed host/node (ungrouped)

1.2.1.1. Inventory Variables

It is possible for Ansible playbooks and Ansible ad-hoc commands to utilize inventory variables. These variables can be defined directly within the static inventory files themselves or those variables can be defined within the directory structure of the project utilizing either project directories or inventory directories.

Keep Inventory Simple and Organized

It is extremely important not to define variables for inventory in multipe locations as variable precedence and variable merging comes into play. It is equally important to devise an inventory strategy on where/how variables will be defined so that the playbooks and automation goals are kept simple and easy to understand and follow.

Listing 3. Sample Inventory File with Variables

```
[app1srv]
appserver01 ansible_host=10.42.0.2 ①
appserver02 ansible_host=10.42.0.3

[web]
node-[1:30] ansible_host=10.42.0.[31:60]

[web:vars] ②
apache_listen_port=8080
apache_root_path=/var/www/mywebdocs/

[all:vars] ③
ansible_user=kev
ansible_ssh_private_key_file=/home/kev/.ssh/id_rsa
```

① Defined variable at a **host** level

② Defined variables at a **group** level

③ Defined variables for all inventory items

1.2.2. Ansible Config

The **ansible.cfg** file controls how the **ansible** and **ansible-playbook** commands are run and interpreted. The configuration file has two (2) main sections that are commonly used, but include other sections as well. For the purpose of understanding how Ansible works, we will examine both the **[defaults]** section and the **[privilege_escalation]** section.

Listing 4. **ansible.cfg** *Defaults Section*

```
[defaults]
inventory = inventory ①
remote_user = devops ②
```

① Specifies which inventory file Ansible will use

② Specifies the remote user to be used by **ansible** or **ansible-playbook** commands.

A perfectly acceptable **ansible.cfg** might only have a [defaults] section specifying the inventory to be used.

Listing 5. **ansible.cfg** *Privilege Escalation Section*

```
[privilege_escalation]
become = False ①
become_method = sudo ②
become_user = root ③
become_ask_pass = False ④
```

① Sets default behavior whether to elevate privileges

② Sets method for privilege escalation

③ Sets username of privileged user

④ Sets option on whether or not user is prompted for password when perfoming privilege escalation.

Ansible Config File Precedence

- **ANSIBLE_CONFIG** - Environment Variable (highest)
- **ansible.cfg** - Config file in current working directory (most common and recommended)
- **~/.ansible.cfg** - Ansible config file in the home directory
- **/etc/ansible/ansible.cfg** - Ansible's installed default location (lowest)

1.2.3. Ansible Ad-Hoc Commands

Ansible Ad-Hoc commands are most often used to quickly perform an automation task using a single Ansible module. These commands can be executed against one or more hosts in the Ansible inventory file.

Table 1. Ansible **Ad-Hoc** *Command Arguments*

Command Argument	Description
-m MODULE_NAME	Module name to execute for the ad-hoc command

Command Argument	Description
-a MODULE_ARGS	Module arguments needed for the ad-hoc command
-b	Runs ad-hoc command as a privileged user
-K	Runs ad-hoc command as a privileged user and requests the **become** password
-e EXTRA_VARS	Provides extra variables as **KEY=VALUE** to be used for the execution of the ad-hoc command

1.2.4. DEMO - Ansible Ad-Hoc Commands

Demonstration and hands-on workshop for Ad-Hoc commands. The demo will utilize the **ping** module to ensure that the **ansible.cfg** and the **inventory** file are correctly setup and working within the Ansible environment.

Example 1. **DEMONSTRATION - Ansible Ping**

1. Change to correct directory

```
[student@workstation ~]$ cd /home/student/Github/AAP_Webinar/Past/ad-hoc
```

2. Run the **ansible** ad-hoc command

```
[student@workstation ad-hoc]$ ansible -m ping all
servere | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/libexec/platform-python"
    },
    "changed": false,
    "ping": "pong"
}
servera | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/libexec/platform-python"
    },
    "changed": false,
    "ping": "pong"
}
serverc | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/libexec/platform-python"
    },
    "changed": false,
    "ping": "pong"
}
serverb | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/libexec/platform-python"
    },
    "changed": false,
    "ping": "pong"
}
serverd | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/libexec/platform-python"
    },
    "changed": false,
    "ping": "pong"
}
serverf | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/libexec/platform-python"
    },
    "changed": false,
    "ping": "pong"
}
```

Checking Sudoers Ability and Setup

Listing 6. Checking **ansible.cfg** *for Ability to* **BECOME** *without* **sudo** *Password*

```
[student@workstation ad-hoc]$ ansible -m ping all --become
```

Listing 7. Checking **ansible.cfg** *for Ability to* **BECOME** *with* **sudo** *and Prompting for Password*

```
[student@workstation ad-hoc]$ ansible -m ping all --become -K
BECOME password:
```

The next demonstration will use the **copy** module to create a user in the managed systems making an entry to the **sudoers** file.

Example 2. **DEMONSTRATION - Ansible Ad-Hoc Command to Create User and Sudoers File**

1. Change to correct directory

```
[student@workstation ~]$ cd /home/student/Github/AAP_Webinar/Past/ad-hoc
```

2. Run the **ansible** commands to create the user and update the **sudoers** file.

   a. Create the user on the remote system.

```
[student@workstation ad-hoc]$ ansible -m user -a 'name=travis uid=1040 comment="Travis Michette" group=wheel' servera -b
servera | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/libexec/platform-python"
    },
    "append": false,
    "changed": false,
    "comment": "Travis Michette",
    "group": 10,
    "home": "/home/travis",
    "move_home": false,
    "name": "travis",
    "shell": "/bin/bash",
    "state": "present",
    "uid": 1040
}
```

   b. Create the user in a **sudoers** file.

```
[student@workstation ad-hoc]$ ansible -m copy -a 'content="travis ALL=(ALL) NOPASSWD:ALL" dest=/etc/sudoers.d/travis' servera
-b
```

3. Test new user and sudo rights

   a. SSH to **servera**

```
[student@workstation ad-hoc]$ ssh travis@servera
```

   b. **sudo** without a password

```
[travis@servera ~]$ sudo -i
[root@servera ~]#
```

1.3. Ansible Playbooks

Ansible playbooks contain one or more tasks to execute against specified inventory nodes. Playbooks consist of one or more play and each play in a playbook consists of one or more tasks. Ansible playbooks and tasks are all about **key:value** pairs and **lists**. Understanding this basic format allows someone developing Ansible to form playbooks that are easier to create,

troubleshoot/debug, and for someone else to understand.

1.3.1. Playbook Basics

An Ansible playbook is written/formatted in YAML so horizontal whitespace is critical and often the most troublesome part of debugging new Ansible playbooks. Playbooks have a general structure for the plays with directives such as: **name**, **hosts**, **vars**, **tasks**, and more. These play-level directives help form a readable structure much like **task-level** directives.

Listing 8. Play Structure Components

```
---
- name: install and start apache ①
  hosts: web ②
  become: yes ③

  tasks: ④
```

① Name of play in playbook

② List of hosts from inventory to execute play against **(required)**

③ Directive to override **ansible.cfg** and elevate privileges

④ Beginning of **tasks** section.

There can be other directives here, but at the most basic playbook, you will generally always see a **hosts** and a **tasks** section.

Naming Plays

It is recommended and considered a best practice to name all plays within a playbook.

The first indentation level in a playbook denoted by **-** is the list of plays and this level will contain the **key:value** pairs that correspond to Ansible playbook directives. Understanding this and developing good habits and standards for indentations allows Ansible users to create playbook skeletons which help tremendously during the development/debugging cycle.

1.3.1.1. Task Structure

A task within a playbook is generally specified similar to a play having a **name** section so that it is easier to debug.

Listing 9. Task Structure and Components

```
tasks:
  - name: httpd package is present ①
     yum: ②
       name: httpd ③
       state: latest ④

  - name: latest index.html file is present ⑤
    template:
      src: files/index.html
      dest: /var/www/html/

  - name: httpd is started ⑥
    service:
      name: httpd
      state: started
```

① Name of first task in playbook

② Name of module to be used in first task in playbook

③ Argument/Option provided to module, in this instance **name** and is ***required*** for the package name in the case of the **yum** module.

④ Argument/Option provided to module, in this instance the **state** describes whether the module will install, update, or remove the package for the **yum** module.

⑤ Name of second task in playbook

⑥ Name of third task in playbook

Naming Tasks

It is recommended and considered a best practice to name all tasks within a playbook. Naming tasks especially helps with debugging issues in playbooks as the Ansible STDOUT will display and record task names.

The second indentation level in a playbook denoted by **-** is generally under the **tasks:** section and contains the list of tasks. This level will contain the **key:value** pairs that correspond to Ansible task directives always starting with the module being used at the same level before going to the third indentation level which are the **key:value** pair options that belong to the module being used in that task.

1.3.2. Running Playbooks

Playbooks can be run just like Ansible **ad-hoc** commands. In order to execute or run a playbook, it is necessary to use the **ansible-playbook** command and specify the playbook. The additional options available for the **ad-hoc** commands such as: **-e**, **-K**, **-b**, and others all still apply and perform the same functions when leveraged with the **ansible-playbook** command.

1.3.3. DEMO - Running Ansible Playbooks

Example 3. DEMONSTRATION - Running Ansible Playbooks

In this demonstration, we will be creating a user on **serverb** using playbooks as opposed to leveraging **ad-hoc** commands.

1. Switch to correct directory

```
[student@workstation ~]$ cd ~/Github/AAP_Webinar/Past/Playbooks
```

2. Examine playbook

```
[student@workstation Playbooks]$ vim playbook.yml

---
- name: Playbook to Create User and Sudoers without Password
  hosts: serverb
  tasks:
    - name: Create User Named Travis
      user:
        name: travis
        uid: 1040
        comment: "Travis Michette"
        group: wheel

    - name: Create User in Sudoers File
      copy:
        content: "travis ALL=(ALL) NOPASSWD:ALL\n"
        dest: /etc/sudoers.d/travis
        validate: /usr/sbin/visudo -csf %s
```

3. Execute and run the playbook

```
[student@workstation Playbooks]$ ansible-playbook playbook.yml -b

PLAY [Playbook to Create User and Sudoers without Password] ***************************

... OUTPUT OMITTED ...
```

4. Test and Verify User

   a. SSH to remote system

```
[student@workstation Playbooks]$ ssh travis@serverb
```

   b. Verify Sudo without Password

```
[travis@serverb ~]$ sudo -i
[root@serverb ~]#
```

Example 4. DEMONSTRATION - Failure of Old Playbook

It is important to constantly test playbooks with the most current and recent versions of Ansible to ensure all modules work as expected and items haven't been deprecated. The following playbook was developed for use with Ansible 2.8 and earlier. The playbook now fails as some of the modules being used have been migrated from Ansible **built-in** modules to Ansible collections. More on this migration and discussion of collections will come in future chapters and sections.

1. Examine Playbook for Website

```
[student@workstation Playbooks]$ cat Website_Past.yml
---
- name: Playbook to Fully Setup and Configure a Webserver
  hosts: servera
  tasks:
    - name: Install Packages for Webserver
      yum:
        name:
          - httpd
          - firewalld
        state: latest

    - name: Create Content for Webserver
      copy:
        content: "I'm an awesome webserver"
        dest: /var/www/html/index.html

    - name: Create Content for Webserver
      copy:
        content: "I'm an awesome webserver"

    - name: Firewall is Enabled
      service:
        name: firewalld
        state: started
        enabled: true

    - name: HTTP Service is Open on Firewall
      firewalld:
        service: http
        state: enabled
        permanent: true
        immediate: yes

    - name: httpd is started
      systemd:
        name: httpd
        state: started
        enabled: true
```

2. Execute the playbook

```
[student@workstation Playbooks]$ ansible-playbook Website_Past.yml
ERROR! couldn't resolve module/action 'firewalld'. This often indicates a misspelling, missing collection, or incorrect module
path. ①

The error appears to be in '/home/student/Github/AAP_Webinar/Past/Playbooks/Website_Past.yml': line 27, column 7, but may
be elsewhere in the file depending on the exact syntax problem.

The offending line appears to be:


    - name: HTTP Service is Open on Firewall
      ^ here
```

① The **firewalld** module is not available. This was moved in AAP 2.x to an Ansible collection and is no longer able to be referenced without the collection and module being installed.

Test Often

As Ansible has changed going into Ansible Automation Platform 2+, many changes have been made. There was a duplication and mapping of several of the modules allowing for existing playbooks to still run correctly, however, at some point modules become completely deprecated, and mappings get removed. It is extremely important to execute old playbooks and test with new versions of Ansible and to look for **deprecation warnings** so that playbooks can be fixed proactively instead of reactively.

1.4. Ansible Roles

Ansible Roles allow Ansible developers to create re-usable code snippets and tasks that can be shared in the form of Ansible Roles. These roles are commonly shared via Ansible Galaxy (https://galaxy.ansible.com/) via Github projects by the role developers. With the new Ansible Automation Platform (AAP) 2.x and beyond roles are also included as part of Ansible Collections which will be covered as part of a later topic.

1.4.1. Ansible Role Overview

Ansible roles are resusable Ansible components that allow common tasks to be repeated/repurposed without needing to re-write or create custom playbooks. Ansible roles work the same way as Ansible Playbooks and tasks except that roles are generally published/shared generically to be used by others to perform a task or set of tasks in automation playbooks.

Roles provide Ansible with a way to load tasks, handlers, and variables from external files. Static files and templates can also be associated and referenced by a role.

Role Benefits

- Roles group content which allows easy sharing of code with others
- Roles can be written that define the essential elements of system type: web server, database server, git repository, or other purpose
- Roles make larger projects more manageable
- Roles can be developed in parallel by different administrators

Table 2. **Ansible role subdirectories**

Subdirectory	Function
defaults	The **main.yml** file in this directory contains the default values of role variables that can be overwritten when the role is used.
files	This directory contains static files that are referenced by role tasks.
handlers	The **main.yml** file in this directory contains the role's handler definitions.
meta	The **main.yml** file in this directory defines information about the role, including author, license, platforms, and optional role dependencies.
tasks	The **main.yml** file in this directory contains the role's task definitions.

Subdirectory	Function
templates	This directory contains Jinja2 templates that are referenced by role tasks.
tests	This directory can contain an inventory and **test.yml** playbook that can be used to test the role.
vars	The **main.yml** file in this directory defines the role's variable values.

Defining Variables and Defaults

- **Role** variables are defined by creating ***var/main.yml*** with name/value pairs in the role directory heirarchy.
- **Default variables** are defined by creating a ***defaults/main.yml*** file with name/value pairs in the role directory heirarchy.

It is best to define a given variable in either ***var/main.yml*** or ***defaults/main.yml*** but not both.

Playbook Roles and Include Statements: http://docs.ansible.com/ansible/playbooks_roles.html

Reference for Roles

There is another workshop with some information on creating and publishing Ansible Roles.

https://github.com/tmichett/LUG/blob/main/Ansible_Roles/Workbook/Ansible.adoc

1.4.2. Using Roles

In order to use Ansible roles, they must first be installed and made available on the Ansible control node utilizing the role.

Listing 10. Installing an Ansible Role

```
$ ansible-galaxy install tmichett.deploy_packages
```

1.4.3. DEMONSTRATION - Using Roles

Example 5. DEMONSTRATION - Using a Role from Ansible Galaxy

1. Change to correct working directory

```
[student@workstation ~]$ cd ~/Github/AAP_Webinar/Past/Roles/
```

2. Install Role from Ansible Galaxy

```
[student@workstation Roles]$ ansible-galaxy install -r roles/requirements.yml -p roles
Starting galaxy role install process
- downloading role 'ansiblize', owned by tmichett
- downloading role from https://github.com/tmichett/Ansiblize/archive/master.tar.gz
- extracting tmichett.ansiblize to /home/student/Github/AAP_Webinar/Past/Roles/roles/tmichett.ansiblize
- tmichett.ansiblize (master) was installed successfully
```

3. Install Collections

```
[student@workstation Roles]$ ansible-galaxy collection install -r collections/requirements.yml -p collections/
Starting galaxy collection install process
[WARNING]: The specified collections path
'/home/student/Github/AAP_Webinar/Past/Roles/collections' is not part of the
configured Ansible collections paths
'/home/student/.ansible/collections:/usr/share/ansible/collections'. The installed
collection won't be picked up in an Ansible run.
Process install dependency map
Starting collection install process
Downloading https://galaxy.ansible.com/download/ansible-posix-1.3.0.tar.gz to /home/student/.ansible/tmp/ansible-local-
37837_73lx2j8/tmpnadbl_rx/ansible-posix-1.3.0-xr73p6ye
Installing 'ansible.posix:1.3.0' to '/home/student/Github/AAP_Webinar/Past/Roles/collections/ansible_collections/ansible/posix'
ansible.posix:1.3.0 was installed successfully
```

Because we are using a newer Ansible version, the regular modules are no longer available so we must install the Ansible Posix collection to use some of the modules in the role.

4. Create/Modify Playbook with Correct Values and Providing Variables for the Role

```
[student@workstation Roles]$ cat Roles_Playbook_Demo.yml
---
- name: Playbook to Fully Setup and Configure a new User with a Role
  hosts: serverc
  vars: ①
    ansible_user_name: travis
    ansible_user_password: redhat
    ssh_key_answer: no
  roles: ②
    - tmichett.ansiblize
```

① Providing required variables for the role

② Providing the role being used

5. Run the playbook with the **ansible-playbook** Command

```
[student@workstation Roles]$ ansible-playbook Roles_Playbook_Demo.yml -b
```

6. Test the results on **serverc**

   a. SSH to ServerC

   ```
   [student@workstation Roles]$ ssh travis@serverc
   ```

   b. Attempt to become root without password

   ```
   [travis@serverc ~]$ sudo -i
   [root@serverc ~]#
   ```

2. Ansible Automation Platform 1.x (Present)

2.1. Ansible Automation Hub

Ansible Automation hub was released so that enterprises could host their own Ansible collections, Ansible execution environments in a disconnected fashion. Ansible Automation Hub provides self-hosted services from Ansible Galaxy as well as services provided by Red Hat's Ansible Automation Hub found at https://console.redhat.com/ansible/ansible-dashboard.

2.1.1. Ansible Automation Platform

Provides curated collections, modules, roles that are supported by Red Hat or Red Hat Partners. The collections, modules, roles, and playbooks downloaded from Red Hat Automation Hub are supported and required an Ansible Automation Platform subscription entitlement. This is different from the unsupported community modules/collections/roles found at Ansible Galaxy (https://galaxy.ansible.com/). :pygments-style: tango :source-highlighter: pygments :icons: font :icons: font

2.2. Ansible Collections

Ansible 2.9 introduced the concept of collections and provided mapping for Ansible modules that were moved into a collection namespace. Ansible 2.9 provided a mapping of the new module locations in collections and this mapping automatically works for existing Ansible playbooks in the initial versions of Ansible Automation Platform.

Ansible Module and Collection Mapping

https://github.com/ansible/ansible/blob/devel/lib/ansible/config/ansible_builtin_runtime.yml

2.2.1. Using Ansible Automation Platform Collections

Collections allowed development of Ansible core components to be separated from module and plug-in development. Upstream Ansible unbundled modules from Ansible core code beginning with Ansible Base (core) 2.10/2.11. Newer versions of Ansible require collections to be installed in order for modules to be available for Ansible. Playbooks should be developed using the FQCNs when referring to modules in tasks. Existing playbooks can be fixed easily to work with collections, but it is better to re-write the playbooks to use the fully-qualified collection name (FCQN).

Downloading Collections

Collections are brought into the entire structure via three ways: Requirements files next to your playbooks describe what collections should be present for the automation-content at hand. Automation controller can read those, or searches to Private Automation hub automatically for needed collections and pull them automatically. There is also a CLI for downloading collections.

2.3. Demonstration - Ansible Collections

Example 6. DEMONSTRATION - Using Ansible Collections

1. Change to the correct working directory

```
[student@workstation ~]$ cd /home/student/Github/AAP_Webinar/Present/Playbooks
```

2. View the Playbook

```
[student@workstation Playbooks]$ vim Website_Present.yml
---
- name: Playbook to Fully Setup and Configure a Webserver
  hosts: servera
  tasks:
    - name: Install Packages for Webserver
      yum:
        name:
          - httpd
          - firewalld
        state: latest

    - name: Create Content for Webserver
      copy:
        content: "I'm an awesome webserver\n"
        dest: /var/www/html/index.html

    - name: Firewall is Enabled
      systemd:
        name: firewalld
        state: started
        enabled: true

    - name: HTTP Service is Open on Firewall
      ansible.posix.firewalld: ①
        service: http
        state: enabled
        permanent: true
        immediate: yes

    - name: httpd is started
      systemd:
        name: httpd
        state: started
        enabled: true
```

① In the newer version of Ansible the **firewalld** module is located in the **ansible.posix.firewalld** collection.

Beginning with Ansible version 2.9 collections contain modules that were previously included as part of Ansible core. Ansible version 2.9.x contains mapping for modules in their collections and Ansible version 2.9 also includes all the collections as part of the Ansible Core distribution. Never versions of Ansible however, don't have the collection mapping nor are the modules and collections pre-installed so it is necessary to install collections.

Ansible Module Mapping: https://github.com/ansible/ansible/blob/devel/lib/ansible/config/ansible_builtin_runtime.yml

3. Install the Ansible Collections

```
[student@workstation Playbooks]$ ansible-galaxy collection install -r collections/requirements.yml -p collections/
```

Since we are using collections, it is very important to install the collections before attempting to run the playbook. Collections are typically installed into the local project directory called **collections** and they are usually listed in a **requirements.yml** file.

4. Execute the playbook with the **ansible-playbook** command

```
[student@workstation Playbooks]$ ansible-playbook Website_Present.yml -b
```

5. Test the Website

```
[student@workstation Playbooks]$ curl servera
I'm an awesome webserver
```

3. Ansible Automation Platform 2.x (Future)

3.1. Introduction to AAP 2.x Components

With Ansible 2.x, many new items have emerged. Ansible can now leverage execution environments which contain Ansible collections, different versions of Ansible, and the correct python versions and modules needed to execute a playbook. Ansible Execution Environments (EEs) allow developers and administrators more flexibility be leveraging a containerized Ansible environment. The use of Ansible EEs from a control node or developer workstation will work exactly the same with Ansible Controller (formerly known as Ansible Tower). Ansible Controller allows Ansible EEs to be assigned to projects, inventories, job templates, and more.

Ansible Private Automation Hub (Automation Hub) allows a self-hosted Ansible Galaxy. The local installation of Ansible Galaxy not only allows collections to be published privately within an organization, but it also provides a container registry for publishing custom Ansible EEs.

Ansible Content Navigator is a new tool that can be used to test and develop Ansible playbooks.

3.1.1. Ansible Content Navigator

The **ansible-navigator** tool replaces and extends the functionality of the **ansible-playbook**, **ansible-inventory**, **ansible-config** commands and more. Ansible Content Navigator allows the Ansible Control Node to be separated from the execution environment as playbooks are now run in a container. This makes it easier to move from development environments to production environments as the execution environment is now a portable container.

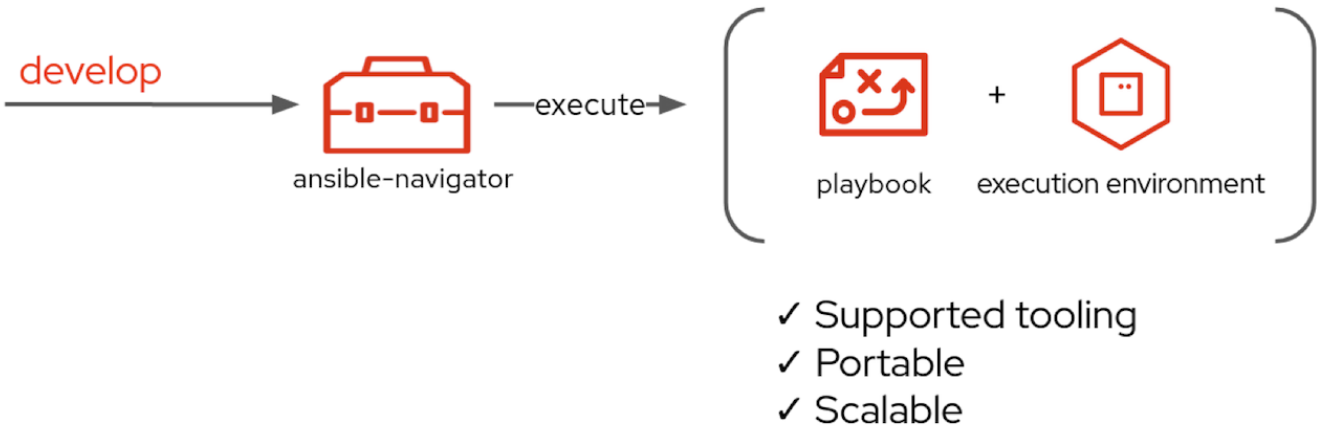

Figure 2. Ansible Content Navigator

Ansible Content Navigator is works very similar to **ansible** and **ansible-playbook** commands as it relies on a configuration file. The **ansible-navigator.yml** file utilizes the **ansible.cfg** file and further provides customizations for configurations on developing, testing, and running playbooks in your Ansible project. Some of the most critical components of Ansible Navigator are the following:

- **ANSIBLE_CONFIG**: Specifies Ansible configuration file to use
- **image**: Specifies Ansible Execution Environment (EE) to be used

Listing 11. **ansible-navigator.yml**

```
---
ansible-navigator:
  execution-environment: ①
    enabled: true
    environment-variables:
      set:
        ANSIBLE_CONFIG: ansible.cfg ②
    image: hub.lab.example.com/ee-29-rhel8:latest ③
  logging:
    level: critical
  mode: stdout ④
```

① Configures Ansible Navigator to use an Execution Environment (EE)

② Specifies where Ansible Navigator and the Ansible EE will receive Ansible configuration settings

③ Specifies Ansible EE to use for Ansible Navigator

④ Specified Mode, in this case, we are using **STDOUT** so that the output will look like it does with the ***ansible-playbook*** command.

Most **ansible** commands have a corresponding **ansible-navigator** command. The table below provides a mapping for the most commonly used commands.

Table 3. **ansible** *to* **ansible-navigator** *Command Comparisons*

Ansible Command	Automation Content Navigator Subcommands
ansible-config	ansible-navigator config
ansible-doc	ansible-navigator doc

Ansible Command	Automation Content Navigator Subcommands
ansible-inventory	ansible-navigator inventory
ansible-playbook	ansible-navigator run

3.1.2. Ansible Execution Environments

Ansible Execution Environments (EEs) are containers which consist of:

- **Ansible Core**
- **Ansible Content Collections**
- **Python Libraries**
- **Executables**
- Other dependencies for running the playbook

Custom execution environments can be built and created with **ansible-builder**. The process of creating a new Ansible EE depends on if there is a valid Ansible Automation Entitlement associated with your account. If you are using the **free** version of Ansible, base container images **MUST** come from **Quay.IO** as the Red Hat Ansible Execution Environments (EEs) cannot be used or redistributed.

Ansible Execution Environments (EEs) are containers which require:

- **Configugration Files (ansible.cfg**)
- **Inventory**
- **SSH**
    - SSH Keys (requires SSH Agent Service)

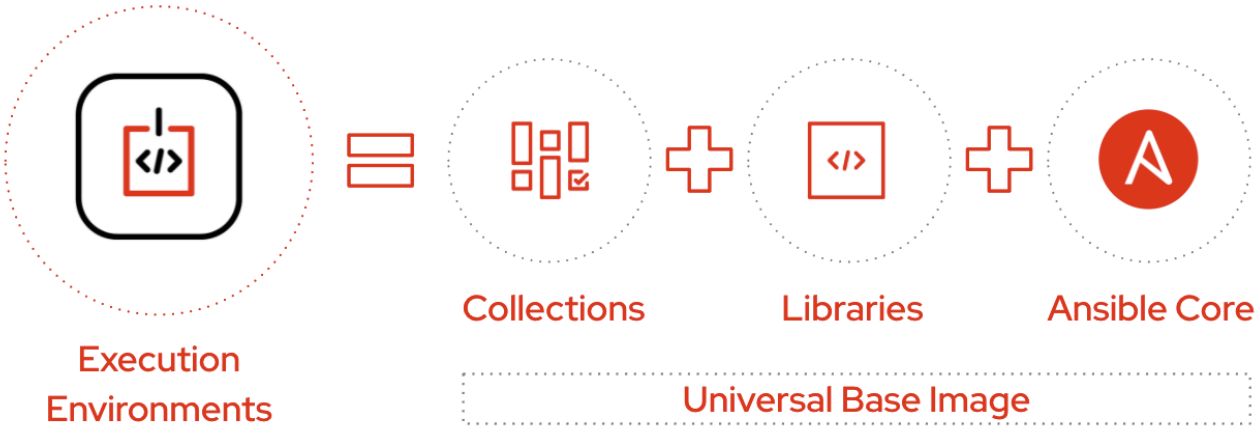

Figure 3. Ansible Execution Environment

Figure 4. Ansible Builder

Default Versions of Ansible and Execution Environments

Ansible Automation Platform 2 provides Ansible Core 2.11 as well as several Red Hat Certified Content Collections providing a similar experience to Ansible 2.9. A benefit of execution environments is that they can be used to run older versions of Ansible. Some of the demos in this webinar will use an Ansible EE based on Ansible 2.9 so that collection mapping is done automatically and older playbooks don't need to be touched.

SSH Keys

SSH Agent is used to allow the SSH keys to pass through to the Ansible Execution Environment (EE) which is a container with all the Ansible and Python components required to run the Ansible Automation tasks.

Listing 12. Passing SSH Keys to Execution Environments

```
[student@workstation ~]$ eval $(ssh-agent)

[student@workstation ~]$ ssh-add ~/.ssh/lab_rsa
```

3.1.3. DEMO - Using Ansible Content Navigator and Ansible Execution Environments

Example 7. DEMO - **Using Ansible Content Navigator and the Ansible 2.9 Execution Environment**

1. Change to correct directory

```
[student@workstation ~]$ cd /home/student/Github/AAP_Webinar/Future/Navigator
```

2. View configuration for Ansible Content Navigator

```
[student@workstation Navigator]$ cat ansible-navigator.yml
---
ansible-navigator:
  execution-environment:
    enabled: true
    environment-variables:
      set:
        ANSIBLE_CONFIG: ansible.cfg ①
    image: hub.lab.example.com/ee-29-rhel8:latest ②
  logging:
    level: critical
  mode: stdout ③
```

① Ensure it is pointing to the project **ansible.cfg**

② Ensure we are using the Ansible EE based on Ansible version 2.9.x for compatibility of existing playbooks (pre-collections).

③ Ensure mode is specified as **stdout** so that the output can easily be viewed from the command-line (CLI).

3. View the playbook

```
[student@workstation Navigator]$ cat Website_Ansible_Past.yml
---
- name: Playbook to Fully Setup and Configure a Webserver
  hosts: servere
  tasks:
    - name: Install Packages for Webserver
      yum:
        name:
          - httpd
          - firewalld
        state: latest

    - name: Create Content for Webserver
      copy:
        content: "I'm an awesome webserver for the NYPD and I know Castle!! \n"
        dest: /var/www/html/index.html

    - name: Firewall is Enabled
      service:
        name: firewalld
        state: started
        enabled: true

    - name: HTTP Service is Open on Firewall
      firewalld:
        service: http
        state: enabled
        permanent: true
        immediate: yes

    - name: httpd is started
      systemd:
        name: httpd
        state: started
        enabled: true
```

4. Setup and ensure SSH keys are shared for the Ansible EE

```
[student@workstation ~]$ eval $(ssh-agent) ①

[student@workstation ~]$ ssh-add ~/.ssh/lab_rsa ②
```

① Starts SSH Agent service

② Loads SSH key to the SSH Agent Service keyring

5. Run the playbook with **ansible-navigator run** Command

```
[student@workstation Navigator]$ ansible-navigator run Website_Ansible_Past.yml -b ①
------------------------------------------------------------------------------
Execution environment image and pull policy overview
------------------------------------------------------------------------------
Execution environment image name:  hub.lab.example.com/ee-29-rhel8:latest

... OUTPUT OMITTED ...

TASK [httpd is started] ********************************************************
changed: [servere]

PLAY RECAP *********************************************************************
servere                    : ok=6    changed=4    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
```

① Specify the **-b** to enable privilege escalation as the **ansible.cfg** and playbook doesn't have escalation already enabled.

6. Verify website is running

```
[student@workstation Navigator]$ curl servere
I'm an awesome webserver for the NYPD and I know Castle!!
```

Example 8. DEMO - **Using Ansible Content Navigator - Interactively**

1. Explore Ansible Navigator

```
[student@workstation Navigator]$ ansible-navigator -m interactive

 0 | ## Welcome
 1 | ------------------------------------------------------------------------------
 2 |
 3 | Some things you can try from here:
 4 | - `:collections`                                        Explore available collec
 5 | - `:config`                                             Explore the current ansi
 6 | - `:doc <plugin>`                                       Review documentation for
 7 | - `:help`                                               Show the main help page
 8 | - `:images`                                             Explore execution enviro

 ... OUTPUT OMITTED ...
```

2. View information on Execution Environment (type **:images**)

```
  NAME                    TAG     EXECUTION ENVIRONMENT     CREATED        SIZE
0 | ee-29-rhel8 (primary)  latest                  True     2 months ago   785 MB
1 | ee-supported-rhel8     2.0                     True     2 months ago   1.07 GB
2 | flamel                 latest                 False     5 weeks ago    1.56 GB
```

3. View the **ee-29-rhel8** EE (as this is the default defined in the configuration file) by typing **0**

```
  EE-29-RHEL8:LATEST (PRIMARY)    DESCRIPTION
0 | Image information              Information collected from image inspection
1 | General information            OS and python version information
2 | Ansible version and collections Information about ansible and ansible collections
3 | Python packages                Information about python and python packages
4 | Operating system packages      Information about operating system packages
5 | Everything                     All image informatio
```

Interactively Viewing Execution Environment Details

Once you've loaded Ansible Content Navigator and the EE, it's possible to view the details of the Ansible versions and collections and any other information about the EE by pressing the corresponding number. To exit the **ansible-navigator** screens, just continue hitting the **ESC** key to exit to the various levels.

4. Run **ansible-navigator** with the **-m interactive** to override the **STDOUT** setting and look at Navigator interactively

```
[student@workstation Navigator]$ ansible-navigator run Website_Ansible_Past.yml -b -m interactive

  PLAY NAME OK CHANGED UNREACHABLFAILED SKIPPED IGNORED IN PROGRESTASK COUNT PROGRESS
0 | Playbook t 2       0          0     0       0       0          1         3
```

5. Hit the **0** to view playbook output for **Play 0**

```
  RESULT HOST    NUMBER CHANGED TASK                          TASK ACTION  DURATION
0 | OK     servere      0   False Gathering Facts               gather_facts       1s
1 | OK     servere      1   False Install Packages for Webserver yum               1s
2 | OK     servere      2   False Create Content for Webserver   copy              0s
3 | OK     servere      3   False Firewall is Enabled            service           0s
4 | OK     servere      4   False HTTP Service is Open on Firewalfirewalld         0s
5 | OK     servere      5   False httpd is started               systemd           0s
```

6. Hit **5** to examine **Task 5** from the playbook

```
PLAY [Playbook to Fully Setup and Configure a Webserver:5] ***************************
TASK [httpd is started] ***************************************************************
OK: [servere]
  0 | ---
  1 | duration: 0.521409
  2 | end: '2022-01-24T19:24:05.870450'
  3 | event_loop: null
  4 | host: serverd
  5 | play: Playbook to Fully Setup and Configure a Webserver
  6 | play_pattern: serverd
  7 | playbook: /home/student/Github/AAP_Webinar/Future/Navigator/Website_Ansible_Past.y
  8 | remote_addr: serverd
  9 | res:
 10 |   _ansible_no_log: false

 ... output omitted ...
```

Interactive Mode Details

When using Ansible Navigator in interactive mode it is possible to get a lot more details regarding each task in the play as well as details on the modules being used and other system settings/configurations.

3.2. Introduction to AAP 2.x - Ansible Automation Hub

The Red Hat AAP 2.x platform provides Ansible Private Automation hub for those with valid subscription entitlements. Private Automation Hub provides two key features:

- Place to publish Collections
- Place to publish Execution Environments

This Private Automation Hub is essentially your local version (private version) of Ansible Galaxy and container registries.

3.2.1. Private Automation Hub

Private automation hub provides an on-site location for publishing collections and Ansible Execution Environments. This provides a centralized location for Automation Controller and for developers using Ansible Navigator to obtain EEs and content collections.

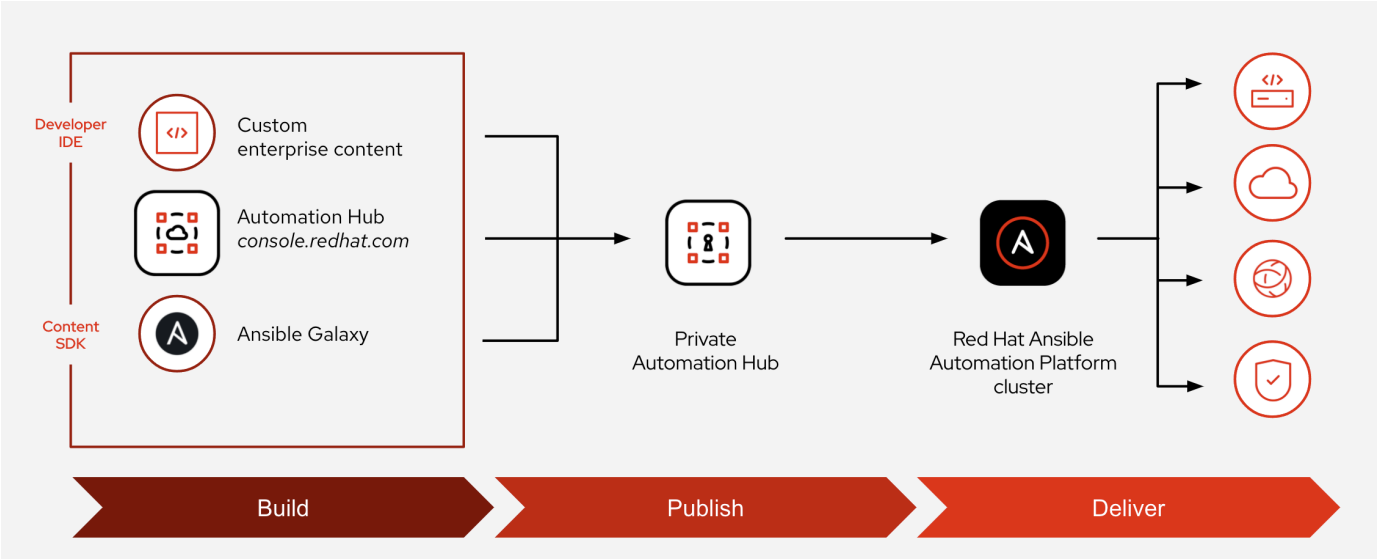

Figure 5. Ansible **Private** *Automation Hub*

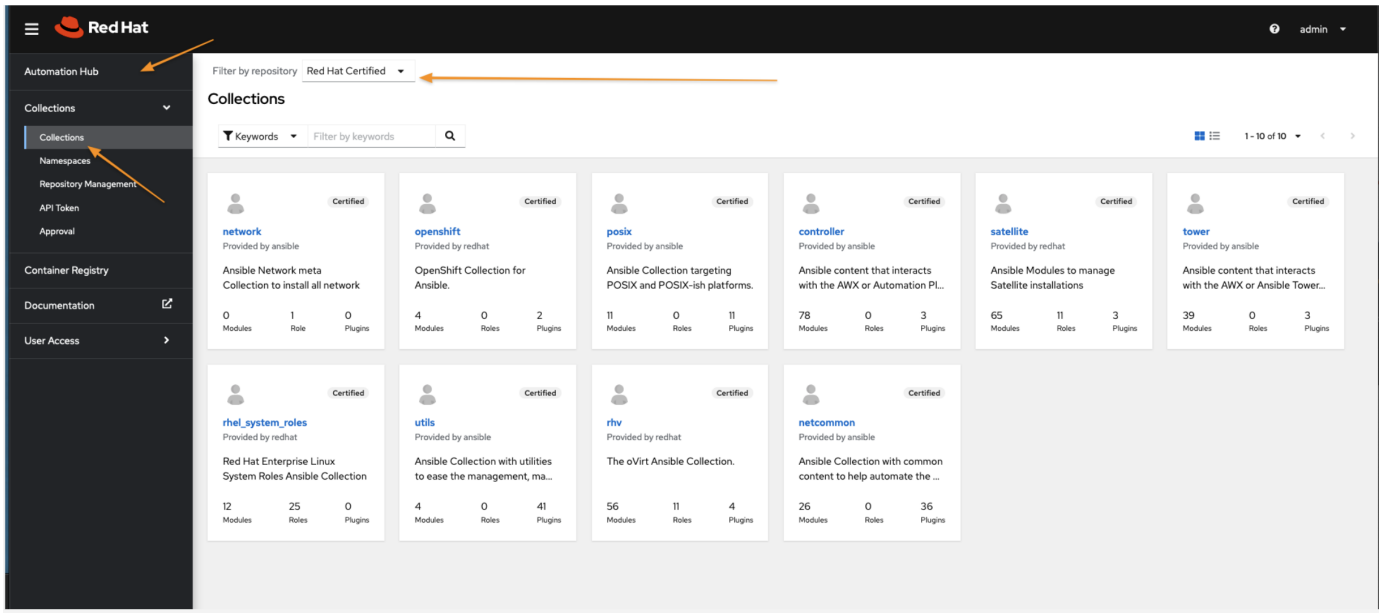

Figure 6. Ansible **Private** *Automation Hub - Collections*

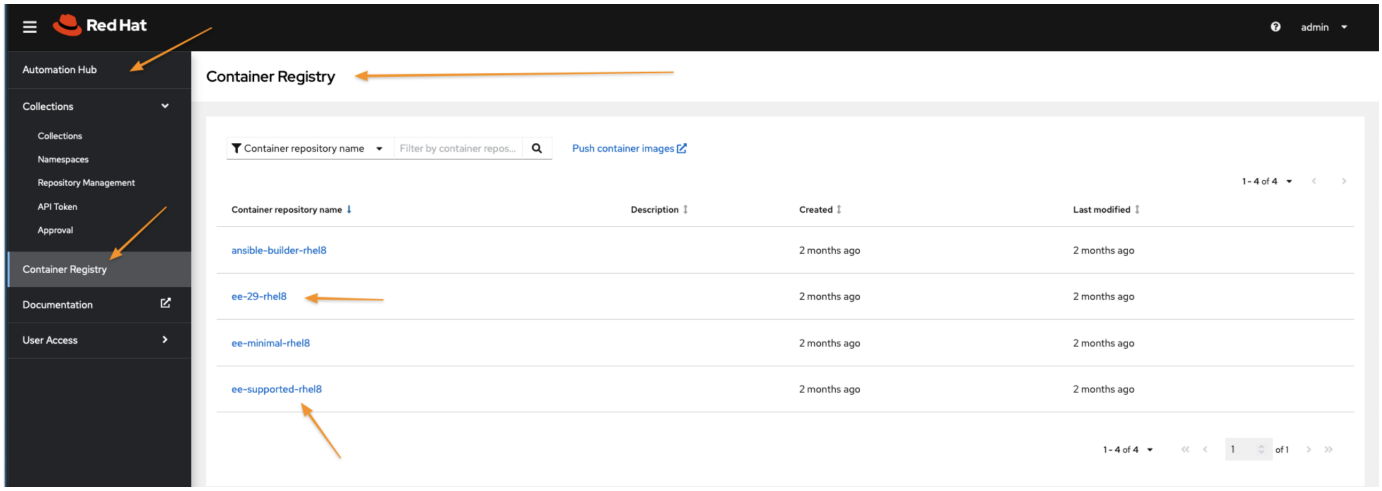

Figure 7. Ansible **Private** *Automation Hub - Container Registry (Execution Environments)*

3.2.2. Custom Execution Environments

Building EEs is rather simple: we provide the tool execution environment builder, the CLI tool ansible-builder for this, which knows how to bring the pieces together in just the right way and create the EE. They can be published on Private Automation hub or in any container registry.

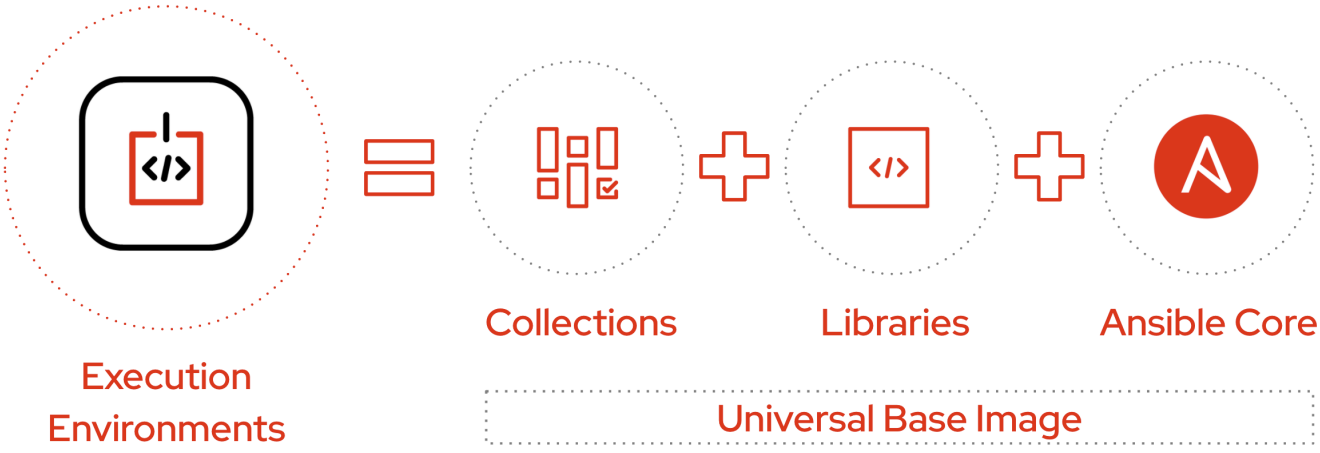

Figure 8. Ansible Execution Environments

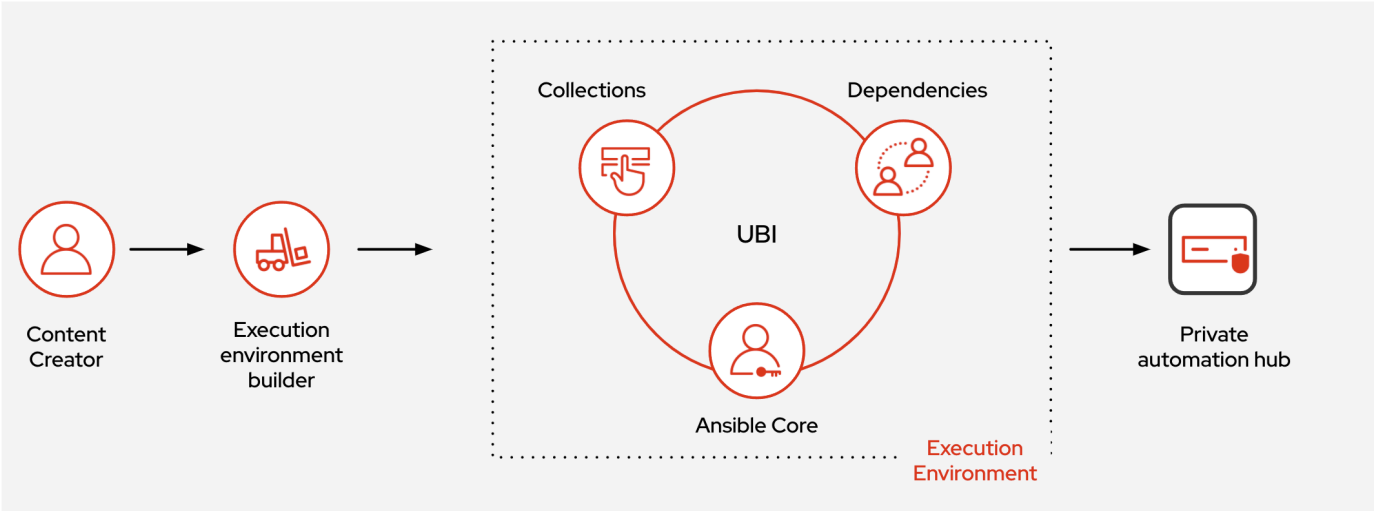

Figure 9. Ansible Execution Environments - Build Process

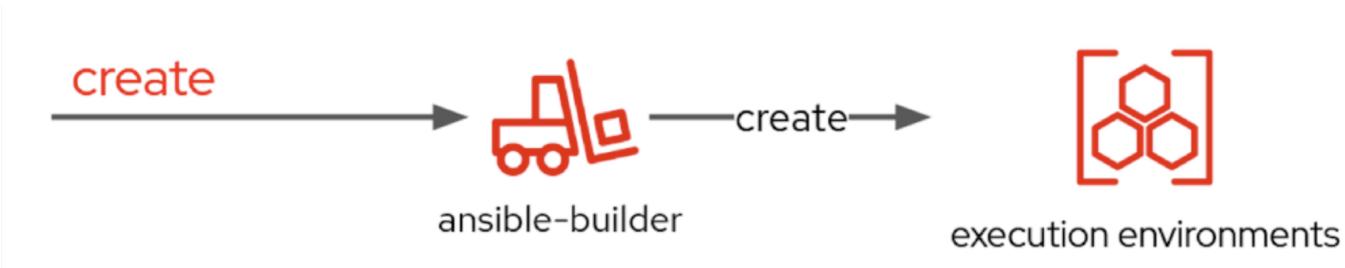

Figure 10. Ansible Execution Environments - **ansible-builder**

Listing 13. **execution-environment.yml** *File to Define Custom EE*

```
---
version: 1
build_arg_defaults:
  EE_BASE_IMAGE: 'hub.lab.example.com/ee-minimal-rhel8:2.0' ①
  EE_BUILDER_IMAGE: 'hub.lab.example.com/ansible-builder-rhel8:2.0' ②
dependencies:
  galaxy: requirements.yml ③
  python: requirements.txt ④
  system: bindep.txt ⑤
```

① Defines base container image to be used for creating the EE

② Defines the builder image to be used for the EE

③ Points to file containing the Collections and Roles to be installed and included in the EE

④ Points to file containing the required Python components to be installed and included in the EE

⑤ Points to file containing the system applications to be installed in the EE

Listing 14. **requirements.yml**

```
---
collections:
  - name: /build/exercise.motd.tar.gz ①
    type: file ②
```

① Defines collections or roles to be included in the container image.

② Defines type of collection or role.

Listing 15. **requirements.txt**

```
# Python dependencies
funmotd ①
```

① Defines Python dependencies needed to be installed on the container image. If multiple Python packages are needed, one package per line is required

Listing 16. **bindep.txt**

```
# System-level dependencies
hostname ①
```

① Defines system packages needed to be installed on the container image. If multiple packages are needed, one package per line is required.

References

- **Ansible Builder Blog**:
  - https://www.ansible.com/blog/introduction-to-ansible-builder
- **Ansible Builder Images**
  - https://blog.networktocode.com/post/ansible-builder-runner-ee/
  - https://quay.io/repository/ansible/ansible-runner?tag=latest&tab=tags

3.2.3. DEMO - Creating a Custom Execution Environment and Publishing to Private Automation Hub

Example 9. DEMO - **Creating a Custom Execution Environment**

1. Switch to correct directory

```
[student@workstation ~]$ cd /home/student/Github/AAP_Webinar/Future/Custom_EE/EE
```

2. Install **ansible-builder**

```
[student@workstation EE]$ sudo yum install -y ansible-builder
```

The **execution-environment.yml**, **requirements.yml**, **requirements.txt**, and **bindep.txt** have already been created to save time. Normally these files would be created by the administrator creating the custom execution environment.

3. View or create the **execution-environment.yml** file

```
[student@workstation EE]$ cat execution-environment.yml
---
version: 1
build_arg_defaults:
  EE_BASE_IMAGE: 'hub.lab.example.com/ee-minimal-rhel8:2.0'
  EE_BUILDER_IMAGE: 'hub.lab.example.com/ansible-builder-rhel8:2.0'
dependencies:
  galaxy: requirements.yml
  python: requirements.txt
  system: bindep.txt
```

4. View or create the **requirements.yml** File

```
[student@workstation EE]$ cat requirements.yml
---
collections:
  - name: /build/exercise.motd.tar.gz
    type: file
```

5. View or create the **requirements.txt** File

```
[student@workstation EE]$ cat requirements.txt
 # Python dependencies
funmotd
```

6. View or create the **bindep.txt** File

```
[student@workstation EE]$ cat bindep.txt
 # System-level dependencies
hostname
```

7. Run the **ansible-builder create** command to create the structure for the build process

```
[student@workstation EE]$ ansible-builder create
Complete! The build context can be found at: /home/student/Github/AAP_Webinar/Future/Custom_EE/EE/context
```

This is necessary so that we can copy the file **exercise.motd.tar.gz** to the correct directory so it will be mounted and available in the container image and build process.

8. View created files and directory structure

```
[student@workstation EE]$ tree context/
context/
├── _build
│   ├── bindep.txt
│   ├── requirements.txt
│   └── requirements.yml
└── Containerfile

1 directory, 4 files
```

9. Copy the **exercise.motd.tar.gz** to the **context/_build** location so it can be mounted properly

```
[student@workstation EE]$ cp collection-files/exercise.motd.tar.gz context/_build/
```

10. Create the **ee-motd-demo** Execution Environment Image

```
[student@workstation EE]$ ansible-builder build -t ee_aap_demo:latest
Running command:
  podman build -f context/Containerfile -t ee_aap_demo:latest context
Complete! The build context can be found at: /home/student/Github/AAP_Webinar/Future/Custom_EE/EE/context
```

11. Verify container image was built using the **podman images** Command

```
[student@workstation EE]$ podman images
REPOSITORY                              TAG     IMAGE ID      CREATED         SIZE
localhost/ee_aap_demo                   latest  3bfe381575fa  6 minutes ago   419 MB
```

Example 10. DEMO - **Using and Testing a Custom Execution Environment**

1. Change to correct directory

```
[student@workstation ~]$ cd /home/student/Github/AAP_Webinar/Future/Custom_EE
```

2. Ensure that **ansible-navigator** is using the correct Ansible Execution Environment

```
[student@workstation Custom_EE]$ cat ansible-navigator.yml
---
ansible-navigator:
  execution-environment:
    enabled: true
    environment-variables:
      set:
        ANSIBLE_CONFIG: ansible.cfg
    image: localhost/ee_aap_demo:latest
  logging:
    level: critical
  mode: stdout
```

3. Create or View Playbook

```
[student@workstation Custom_EE]$ cat Custom_EE_Playbook.yml
---
- name: Playbook to Configure the Message of the Day with a Custom EE
  hosts: servera
  collections:
    - exercise.motd
  roles:
    - name: exercise.motd.banner
```

4. Execute Playbook

```
[student@workstation Custom_EE]$ ansible-navigator run Custom_EE_Playbook.yml -b ①
```

① The **-b** is placed on there to elevate priviliges.

5. Test to see if the MOTD was deployed to the server

```
[student@workstation EE]$ ssh servere
Activate the web console with: systemctl enable --now cockpit.socket

This system is not registered to Red Hat Insights. See https://cloud.redhat.com/
To register this system, run: insights-client --register

================================================================================
================================================================================
==                                                                            ==
==                    This system is managed by Ansible.                      ==
==                                 AAP2.0                                     ==
==                                                                            ==
================================================================================
================================================================================

Last login: Tue Jan 25 16:17:04 2022 from 172.25.250.9
```

Example 11. DEMO - **Publishing a Custom Execution Environment**

1. Change to correct directory

```
[student@workstation ~]$ cd /home/student/Github/AAP_Webinar/Future/Custom_EE
```

Not really needed as we are using the PODMAN commands to push images, but done for consistency.

2. Tag the image with the Podman command to prepare the push to **hub.lab.example.com**

```
[student@workstation EE]$ podman tag localhost/ee_aap_demo:latest hub.lab.example.com/aap-demo:latest
```

3. Push the image to private automation hub

```
[student@workstation EE]$ podman push hub.lab.example.com/aap-demo:latest
Getting image source signatures
Copying blob 38345e1102be done
Copying blob df2b2b67ec7f done
Copying blob fa751636af06 done
Copying blob a65a1b01a4d2 done
Copying blob af092941766c done
Copying blob efebe3fe0d93 done
Copying blob 9c99e40eecd0 done
Copying config 3bfe381575 done
Writing manifest to image destination
Storing signatures
```

Repository Login

It might be necessary to perform a **podman login** for the remote container registry.

Listing 17. **Regsitry Login**

```
podman login hub.lab.example.com
```

4. Login to the Private Automation hub

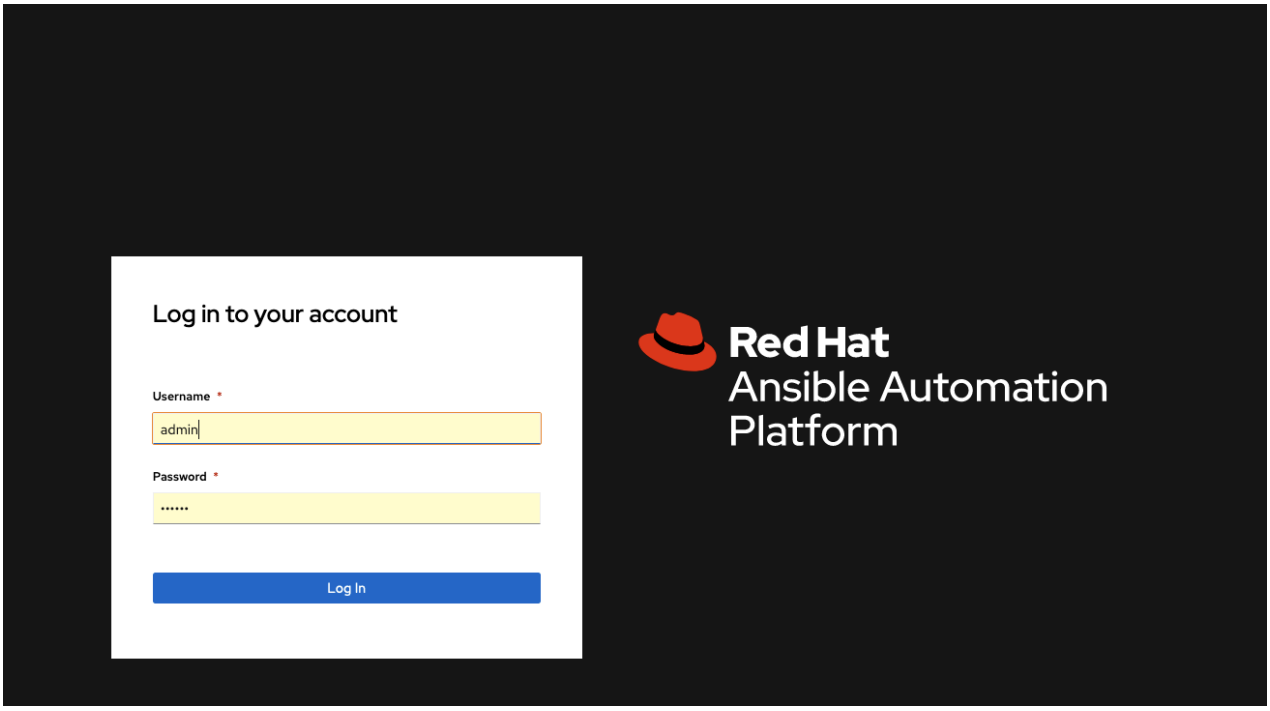

Figure 11. Automation Hub Login

5. Navigate to Container Registry and look for the **aap-demo** Container

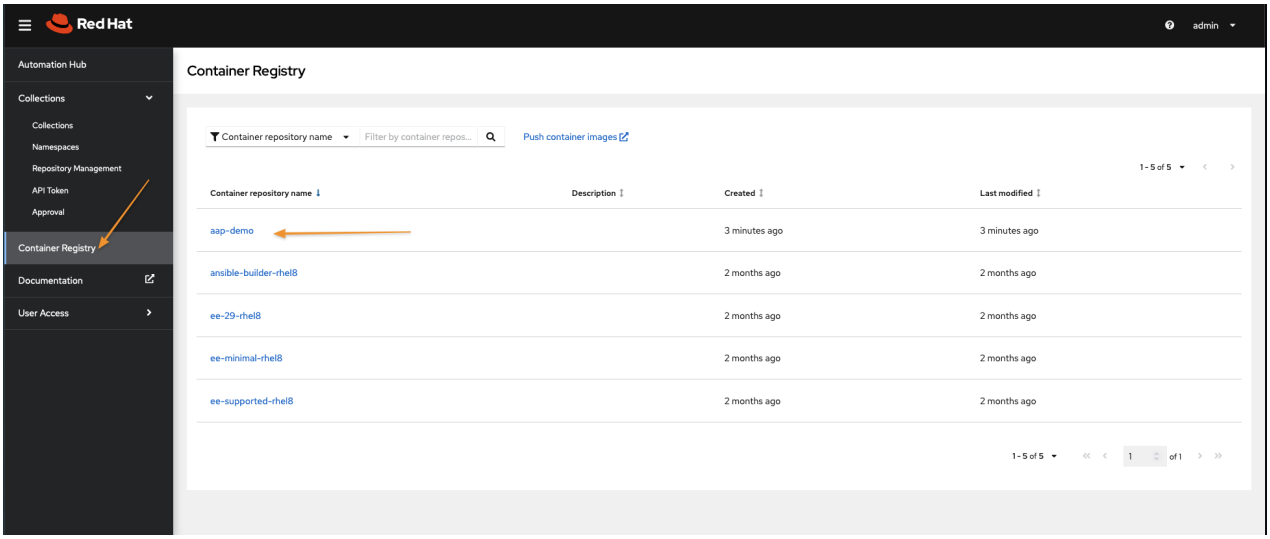

Figure 12. Automation Hub Login

6. Clean up **servere** and show that MOTD has been reset

```
[student@workstation Custom_EE]$ ansible-playbook MOTD_Cleanup.yml

PLAY [Playbook to Cleanup MOTD for Testing Custom EE] **************************************************************

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

TASK [Reset MOTD] **************************************************************************************************
changed: [servere]

PLAY RECAP *********************************************************************************************************
servere                    : ok=2    changed=1    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
```

```
[student@workstation Custom_EE]$ ssh servere
Activate the web console with: systemctl enable --now cockpit.socket

This system is not registered to Red Hat Insights. See https://cloud.redhat.com/
To register this system, run: insights-client --register

I'm the clean MOTD Banner
```

7. Test with the image coming from Private Automation Hub

```
[student@workstation Custom_EE]$  ansible-navigator run --pp always --eei hub.lab.example.com/aap-demo:latest -m stdout
Custom_EE_Playbook.yml -b

------------------------------------------------------------------------
Execution environment image and pull policy overview
------------------------------------------------------------------------
Execution environment image name:  hub.lab.example.com/aap-demo:latest
Execution environment image tag:   latest
Execution environment pull policy: always
Execution environment pull needed: True
------------------------------------------------------------------------
Updating the execution environment
------------------------------------------------------------------------
Trying to pull hub.lab.example.com/aap-demo:latest...
Getting image source signatures
Copying blob 3c9fdae16a64 skipped: already exists
Copying blob 5c4402ce71c4 skipped: already exists
Copying blob 69ebc448681d [--------------------------------------] 0.0b / 0.0b
Copying blob 495ff1ef2828 [--------------------------------------] 0.0b / 0.0b
Copying blob 80be453030cf [--------------------------------------] 0.0b / 0.0b
Copying blob 642d458785a1 [--------------------------------------] 0.0b / 0.0b
Copying blob 00fe5380b165 [--------------------------------------] 0.0b / 40.3MiB
Copying config 3bfe381575 done
Writing manifest to image destination
Storing signatures
3bfe381575fa7606cb745bfe8227d0cbf59b4d91dc7bd7d811a1fcfe28022919

[student@workstation Custom_EE]$
```

3.3. Introduction to AAP 2.x - Ansible Controller (formerly Ansible Tower)

Ansible Controller is the replacement for Ansible Tower which consists of a web-based management interface providing multiple features for system automation. Ansible Controller provides the following:

- WebUI
- Centralized Dashboard
- Centralized Logging/Auditing
- Role-Based Access Control (RBAC)
    - User/Group (Team) Management
- Inventory Management
- Project Management (Integration with Version Control)
- Credential Management
- Workflow and Job Management
- … and more

3.3.1. Organizations, Teams, and RBAC

3.3.1.1. DEMO - Creating Organizations, Teams, and Users

Example 12. DEMONSTRATION - Creating an Organization with Users and Teams

Creating an Organization

1. Login to **Ansible Controller**

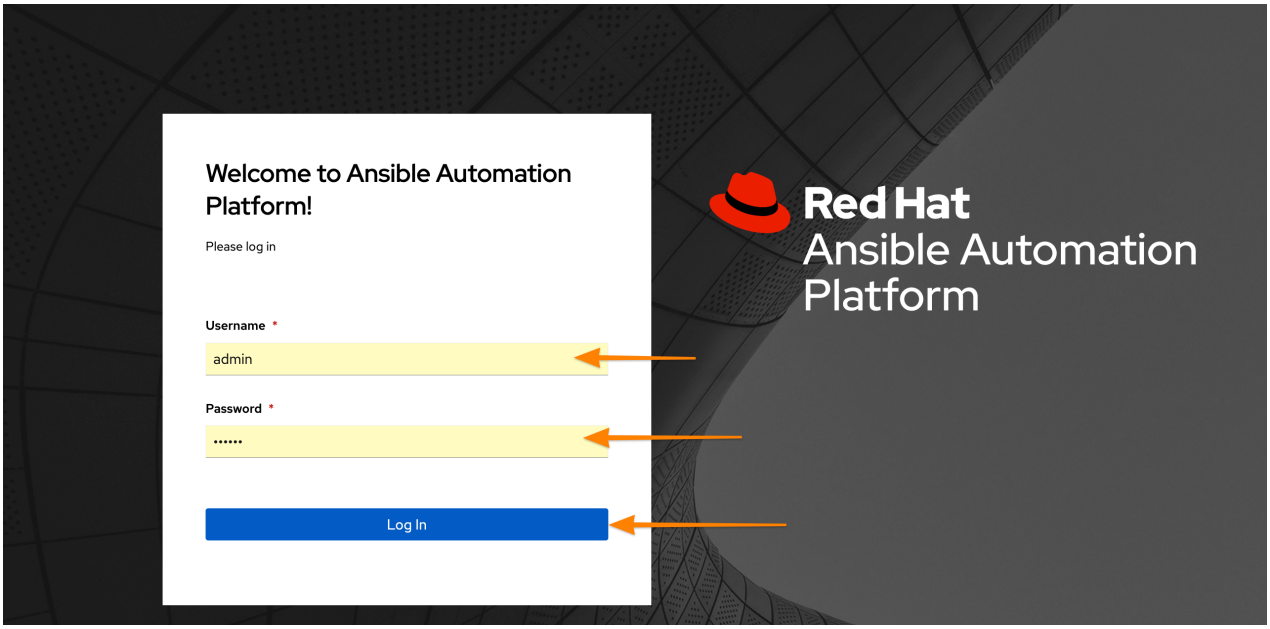

Figure 13. Ansible Controller Login

2. Click **Organizations**

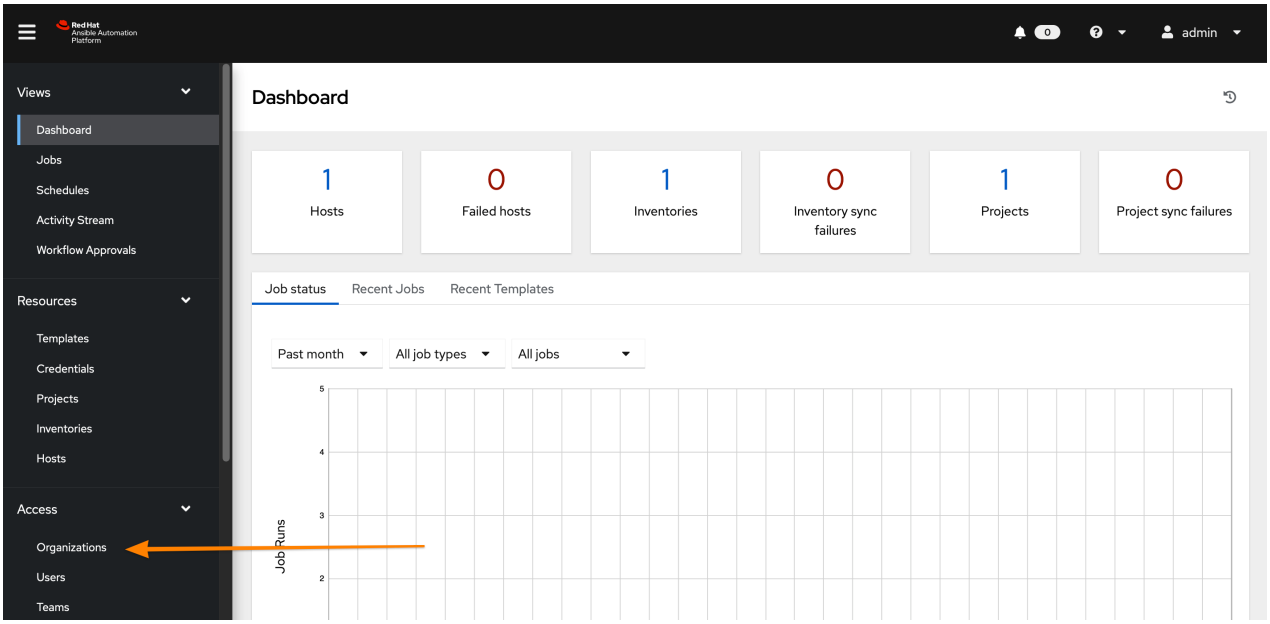

Figure 14. Ansible Controller - **Organizations**

3. Click **Add**

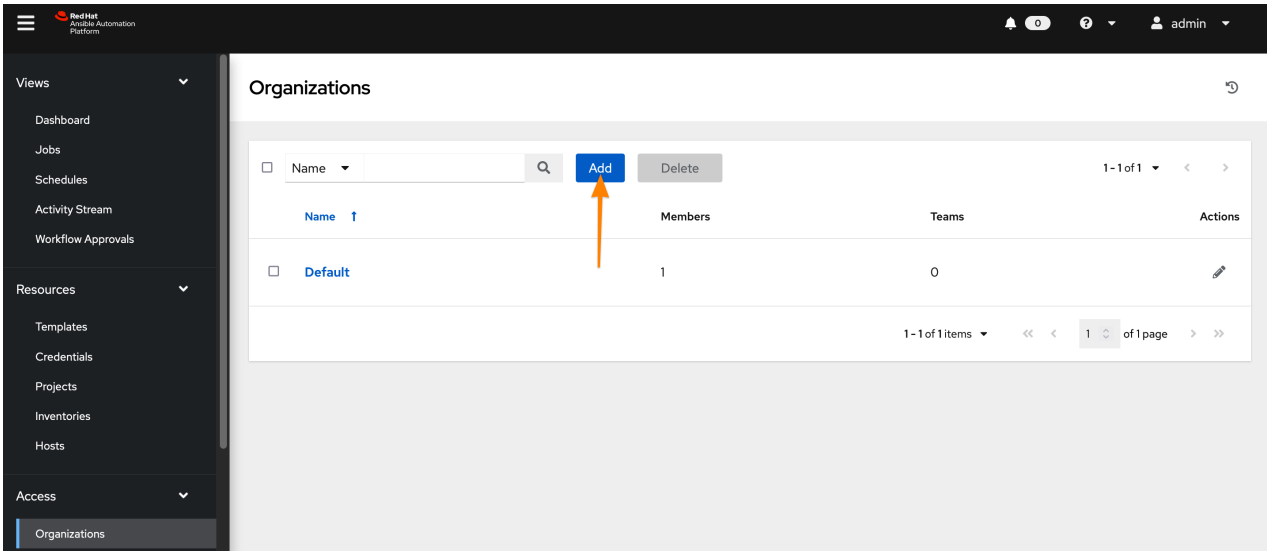

Figure 15. Ansible Controller - **Adding an Organization**

4. Create the new organization with the appropriate details and then click **Save**
    a. **Name**: Required for name of Organization
        i. **NYPD**
    b. **Description**: *Optional but helpful*
        i. **New York Police Department IT**

c. **Execution Environment**: Default execution environment for playbooks, projects, and workflows in the environment.

   i. **Ansible Engine 2.9 execution environment** (*Selected for backwards compatibility*)

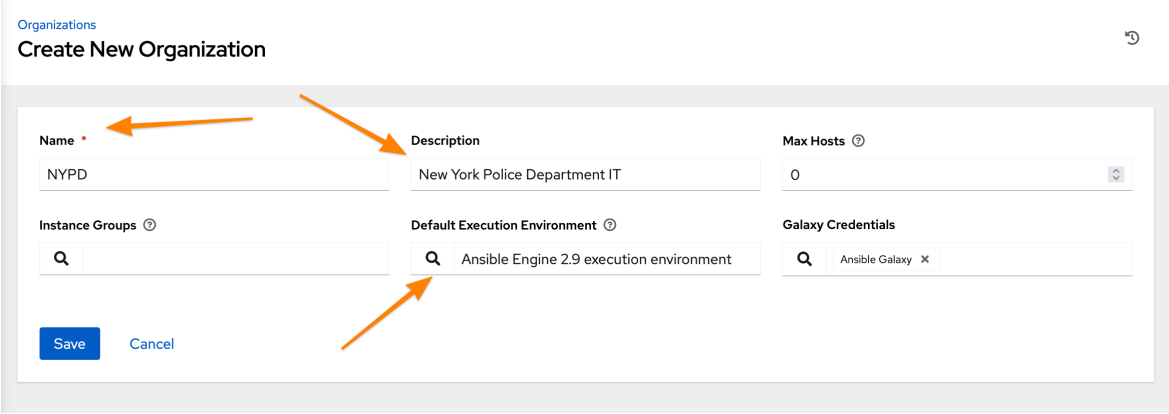

Figure 16. Ansible Controller - **Configuring the Organization**

Default Execution Environment

It is helpful to setup the default execution environment (EE) which will control the running of Ansible playbooks within your Organization. It is possible for individual projects and playbooks to be selectively run with another execution environment, but the default EE will be used if another EE isn't specified.

In the above example, the **Ansible Engine 2.9 execution environment** was selected as it has the best compatibility with older playbooks before the realigned modules and collections. Ansible Engine 2.9 can utilize collections, but also has the mapping for the Ansible modules allowing older playbooks to run without updating to using FQCN.

Creating a Team

1. Click on **Teams**

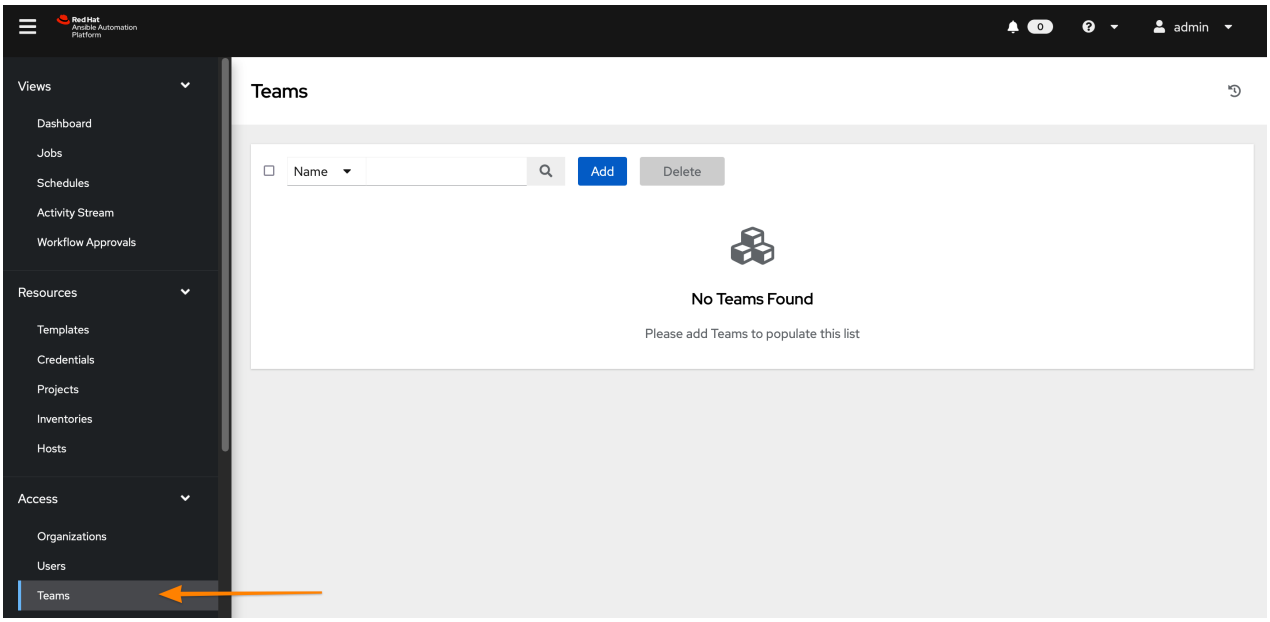

Figure 17. Ansible Controller - **Creating a Team**

2. Click **Add** and fill in appropriate values and then click **Save**
    a. **Name**: Required for name of team
        i. **NYPD System Administrator**
    b. **Organization**: Required to select an existing organization from drop-down
        i. Click magnifying glass and select Organization
            - **NYPD**

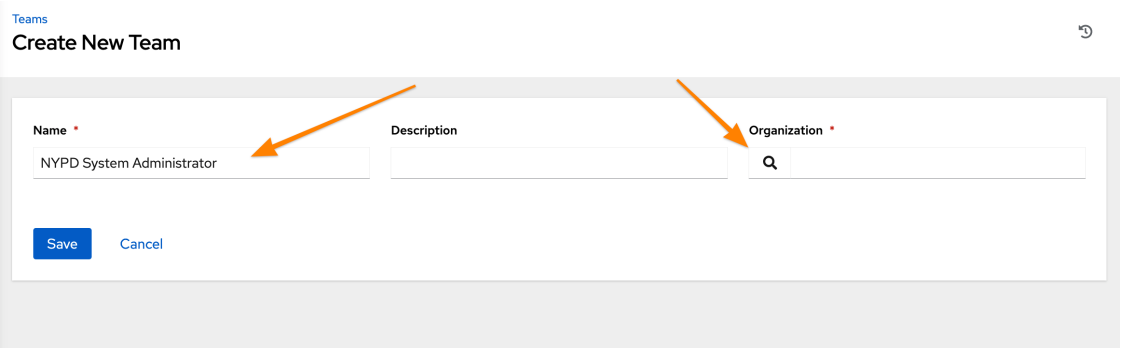

Figure 18. Ansible Controller - **Configuring a Team**

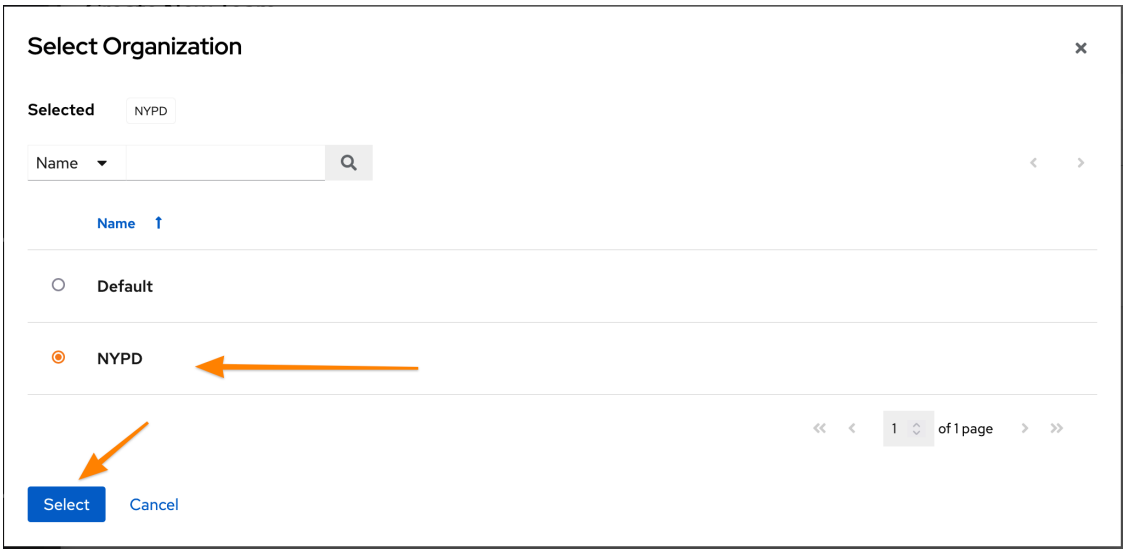

Figure 19. Ansible Controller - **Selecting an Organization**

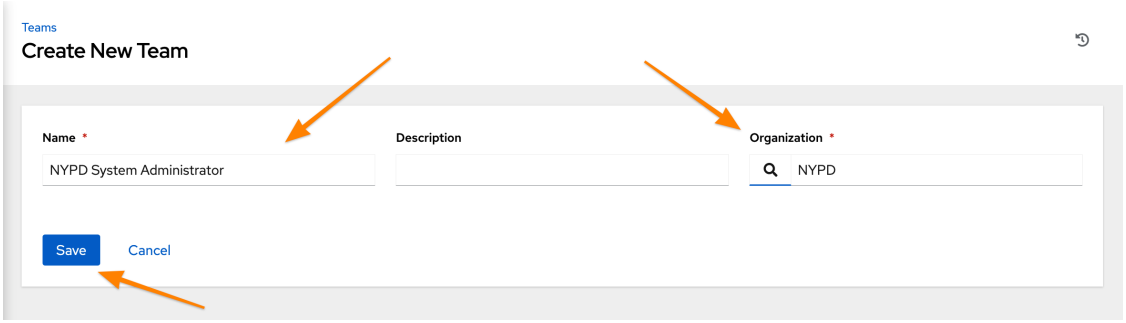

Figure 20. Ansible Controller - **Completing Team Creation**

Creating Users

1. Click **Users**

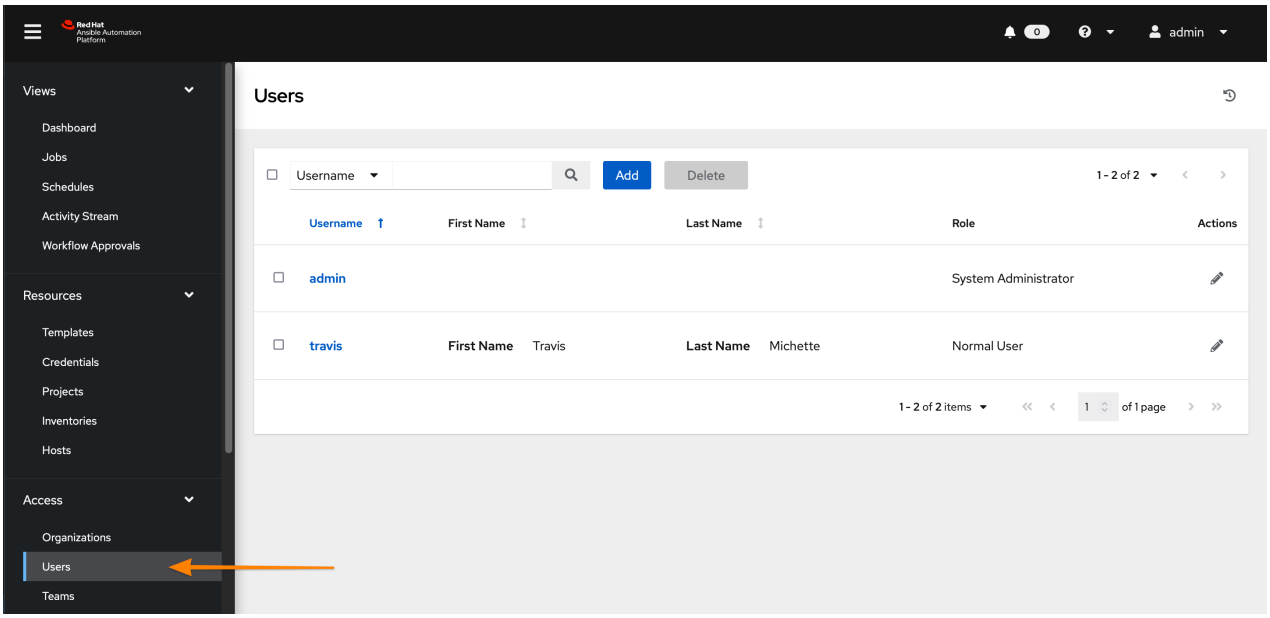

Figure 21. Ansible Controller - **Creating a User**

2. Click **Add** and fill in appropriate information and click **Save**
    a. **Username**: kbeckett
    b. **Email**: kbeckett@nypd.ny.gov
    c. **Password**: redhat
    d. **First Name**: Kate
    e. **Last Name**: Beckett
    f. **Organization**: NYPD
    g. **User Type**: Normal User

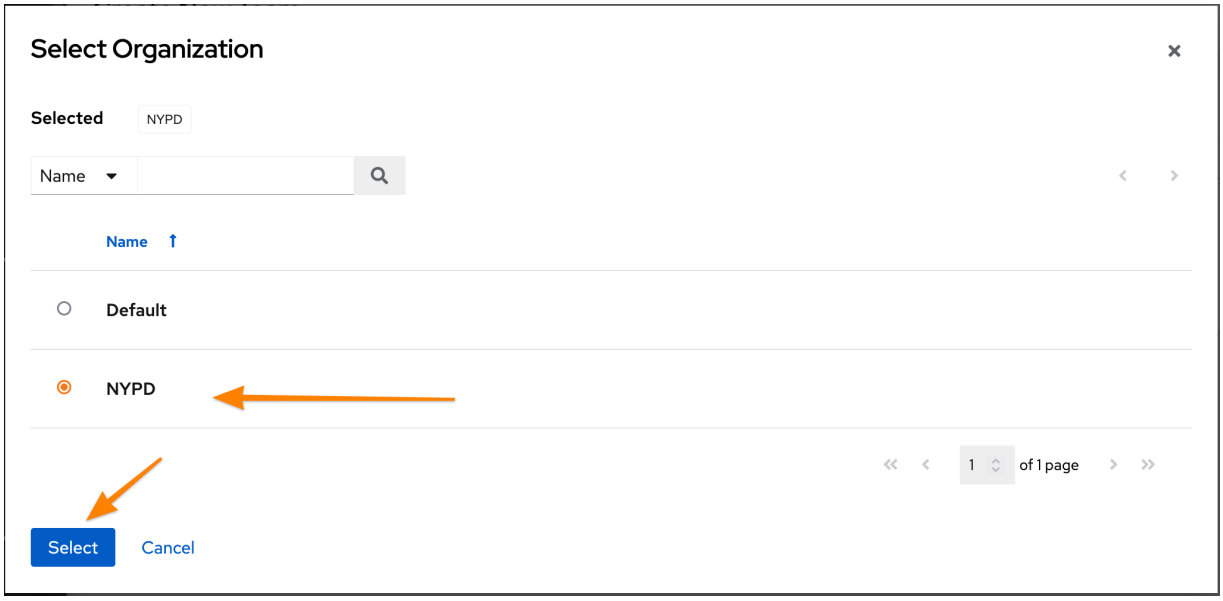

Figure 22. Ansible Controller - **Selecting an Organization**

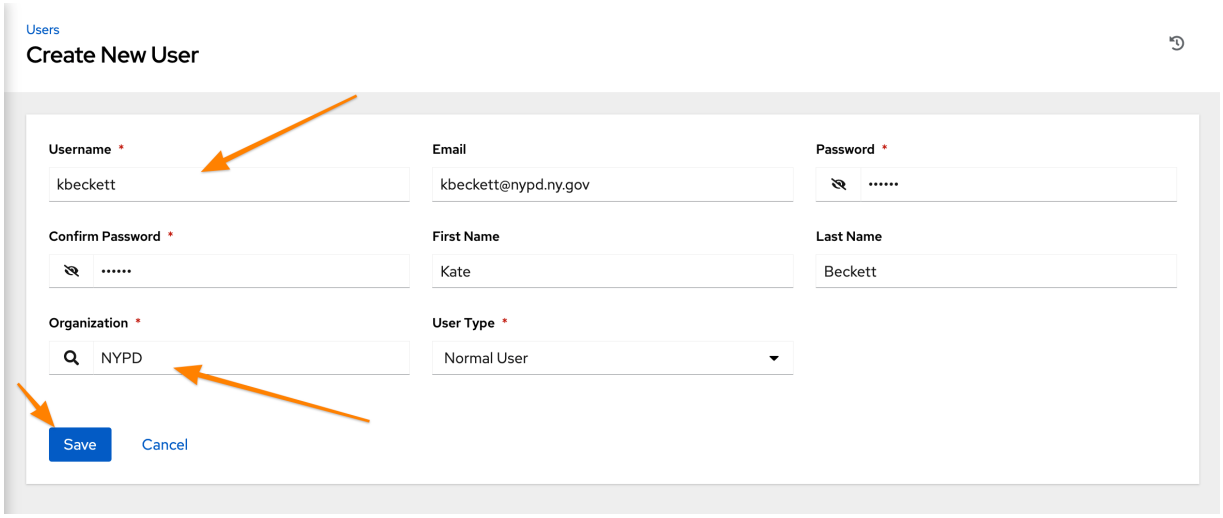

Figure 23. Ansible Controller - **Configuring a User**

Adding a User to a Team

Adding users to a team can be done multiple ways, but in this example, we will be modifying a recently created user and use the **Teams** option on the User **Details** tab.

1. Click on **Teams**

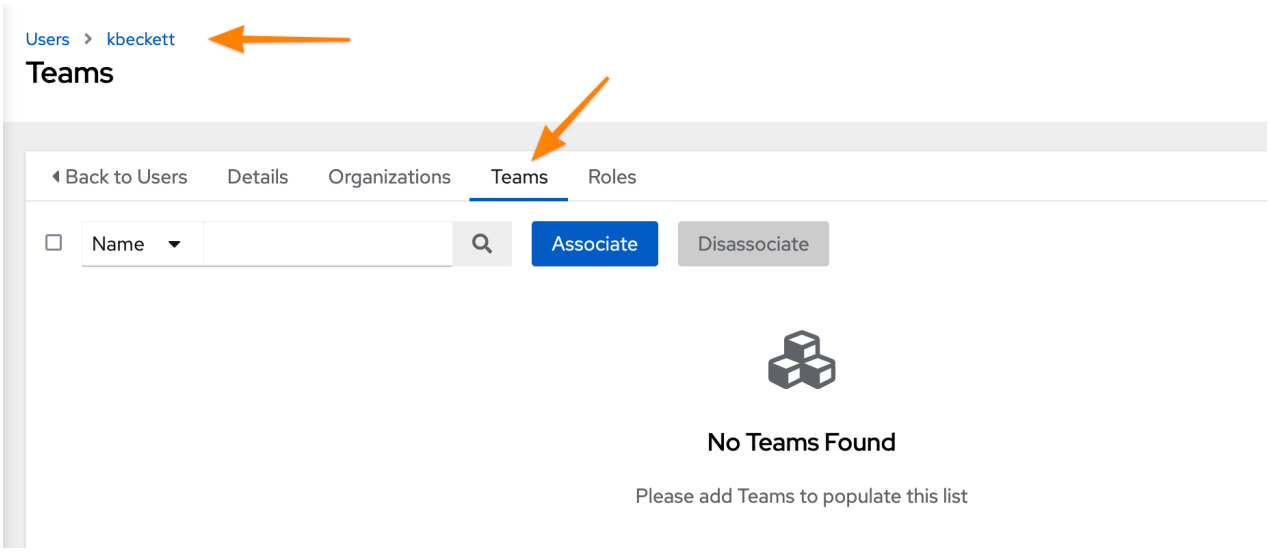

Figure 24. Ansible Controller - **User Teams Menu**

2. Click the **Associate** button to search for and select a team, then click **Save**

   a. **NYPD System Administrator**

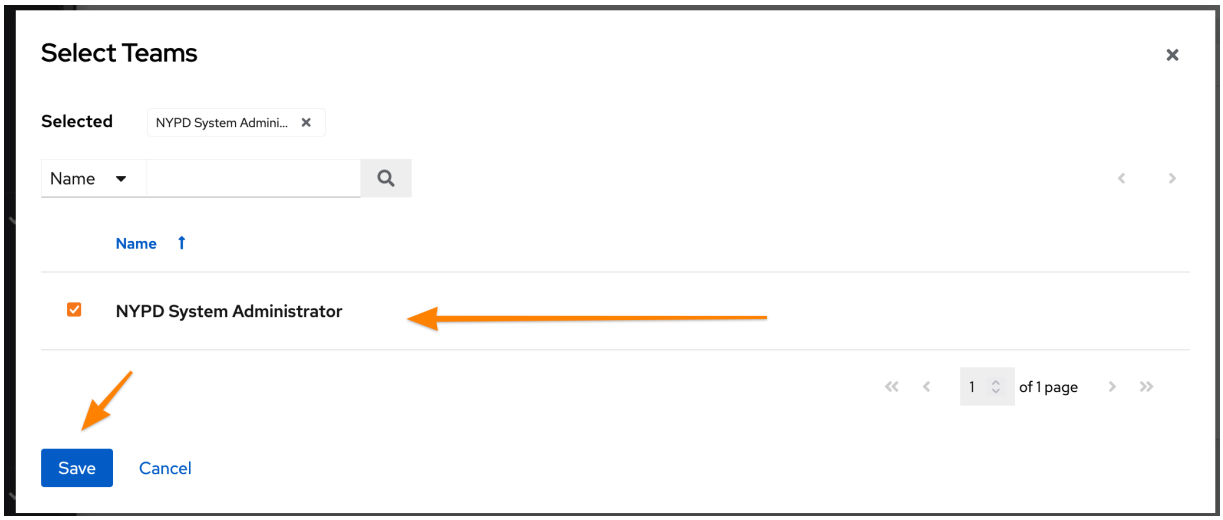

Figure 25. Ansible Controller - **User Team(s) Selection**

3. Verify user was associated with the correct team(s).

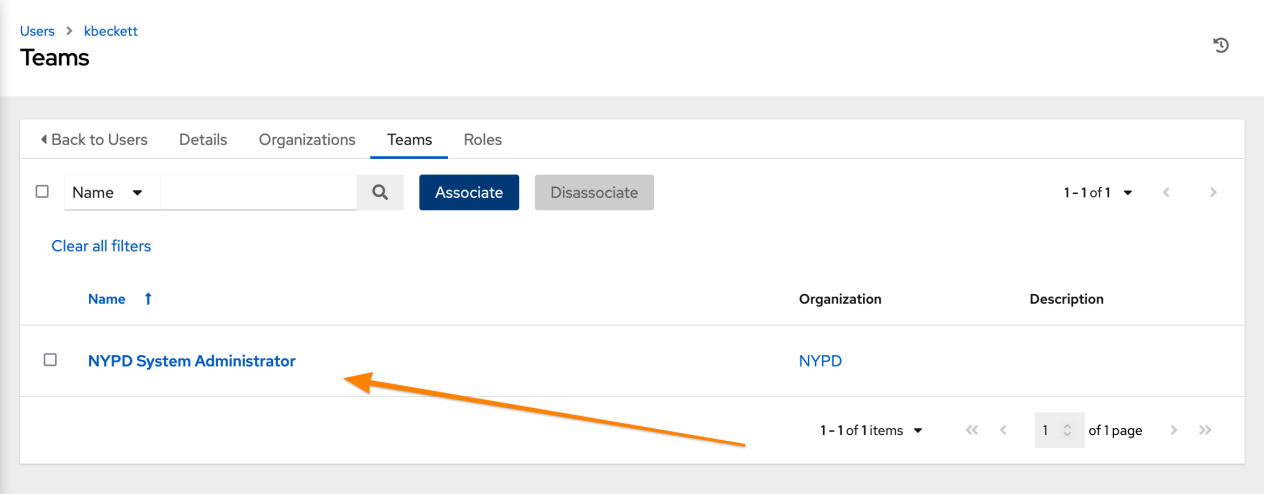

Figure 26. Ansible Controller - **User Team(s) Verification**

Teams

Teams are used to group users together so that RBAC controls can be more easily managed at a group level versus an individual user level. It is still possible to give individual users additional privileges, but teams is the preferred way of permission management.

3.3.2. Inventories and Credentials

3.3.2.1. DEMO - Creating Inventories and Credentials

Example 13. DEMONSTRATION - Creating an Inventories and Credentials

Creating an Iventory

1. Login to **Ansible Controller**

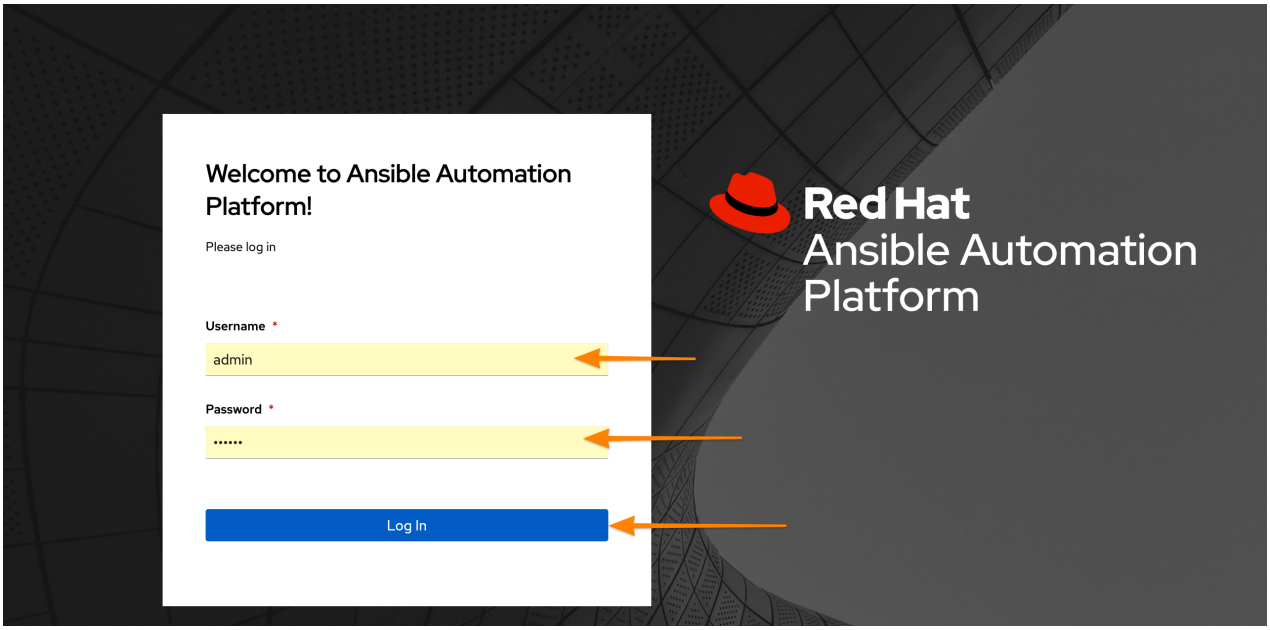

Figure 27. Ansible Controller Login

2. Click **Inventories** and then click **Add** to Add an Inventory

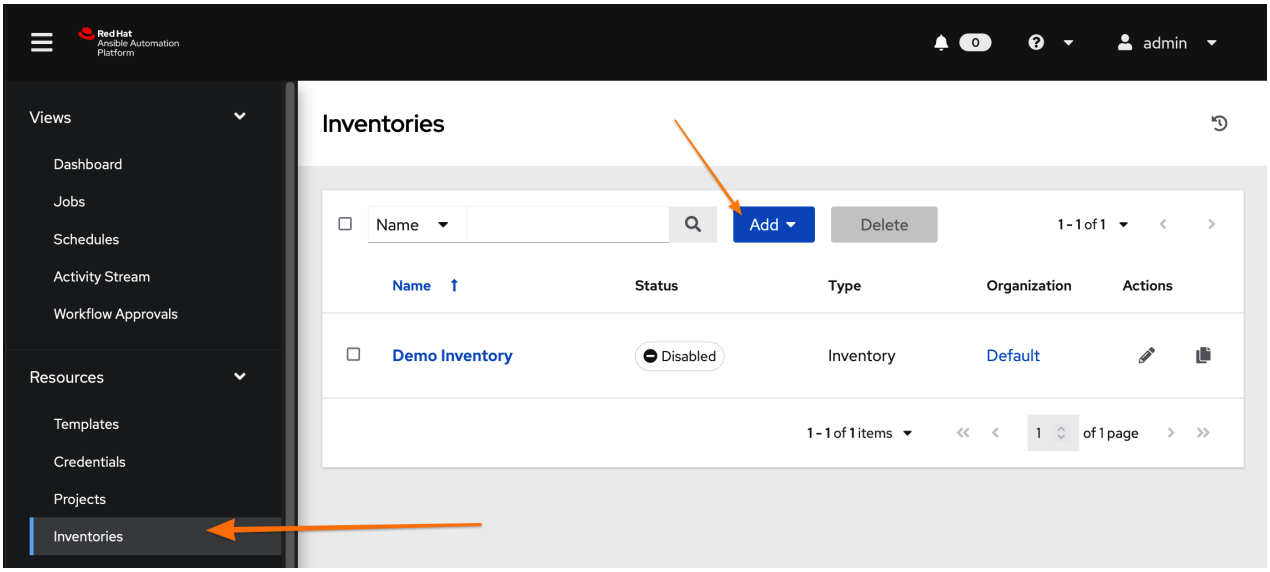

Figure 28. Ansible Controller - Inventory

3. Provide and inventory ***Name*** and ***Organization*** and then click **Save**
   a. **Name**: NYPD Systems
   b. **Organization**: NYPD

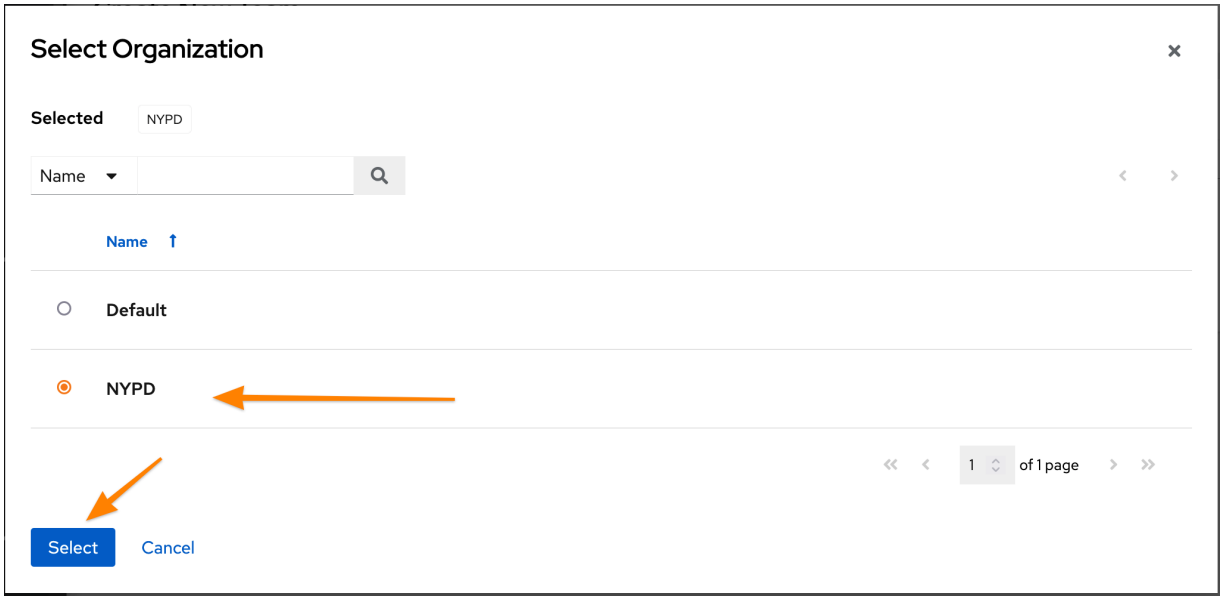

Figure 29. Ansible Controller - **Selecting an Organization**

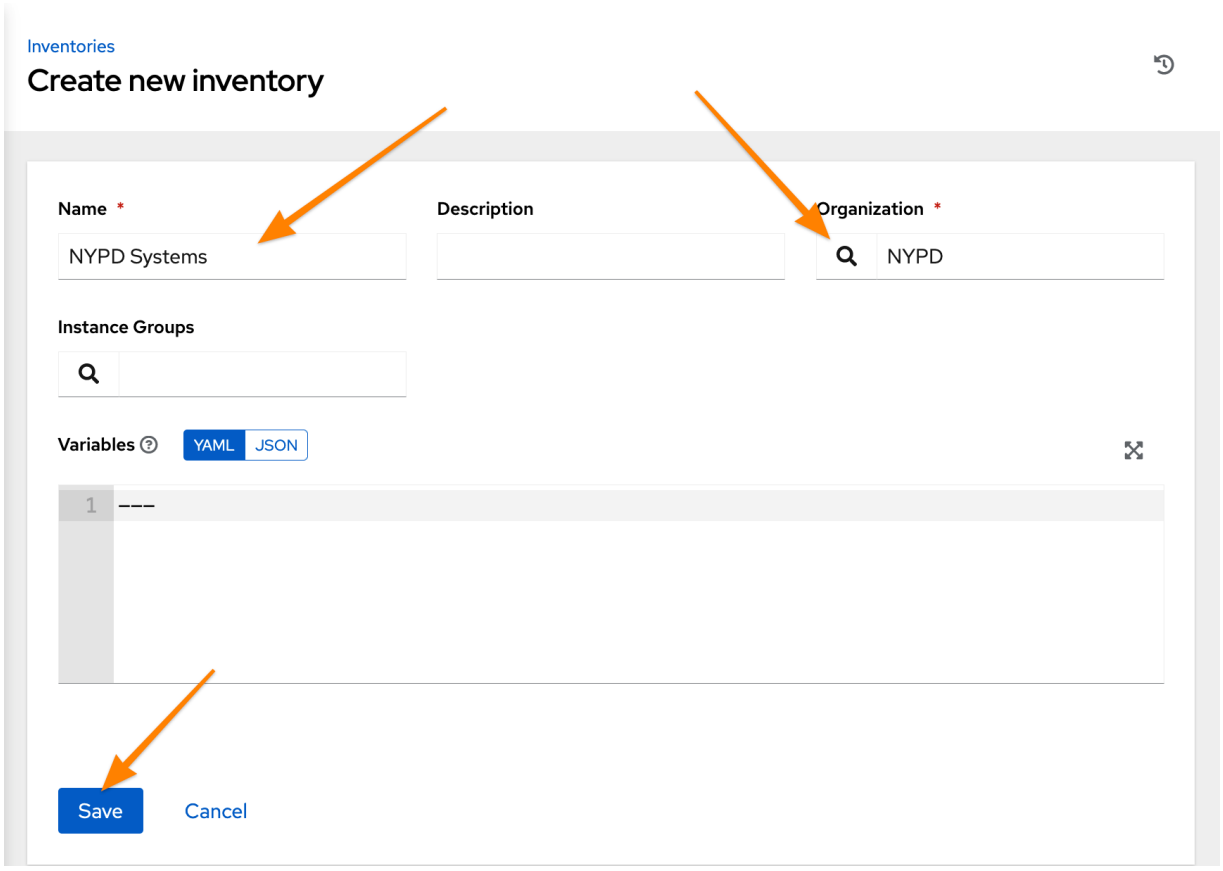

Figure 30. Ansible Controller - New Inventory

4. Add hosts to the inventory by clicking **Hosts** and then click **Add**
    a. **Name**: serverd

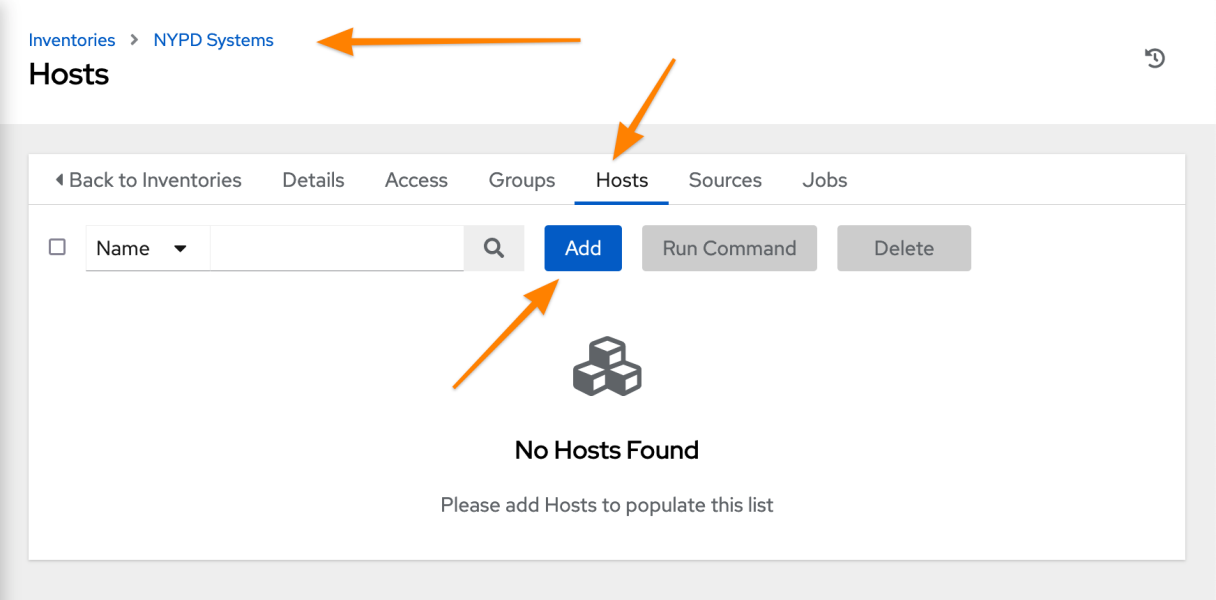

Figure 31. Ansible Controller - Managed Hosts in Inventory

5. Provide the inventory hostname of the host and any host-based variables if desired and click **Save**. Repeat for multiple hosts.

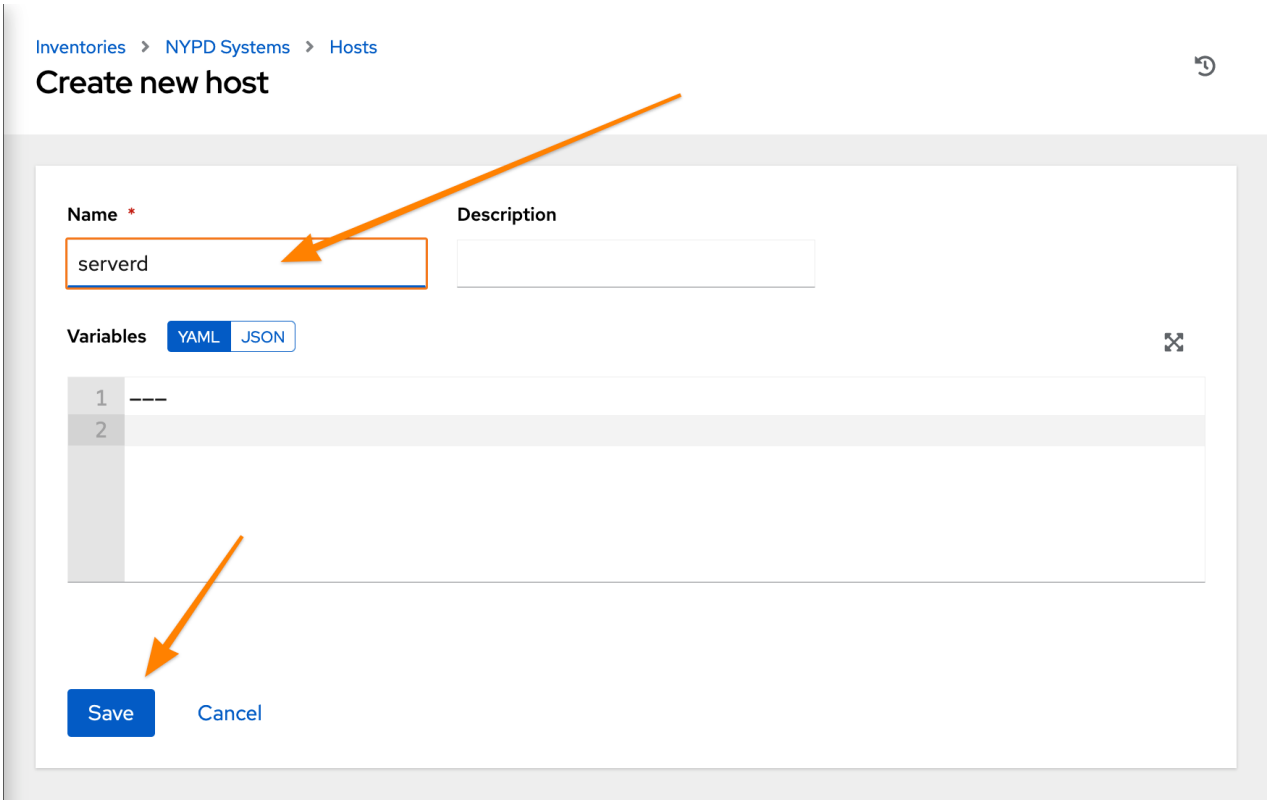

Figure 32. Ansible Controller - Adding a Host to Inventory

Creating Credentials

1. Click **Credentials** and then click **Add** to add a new credential

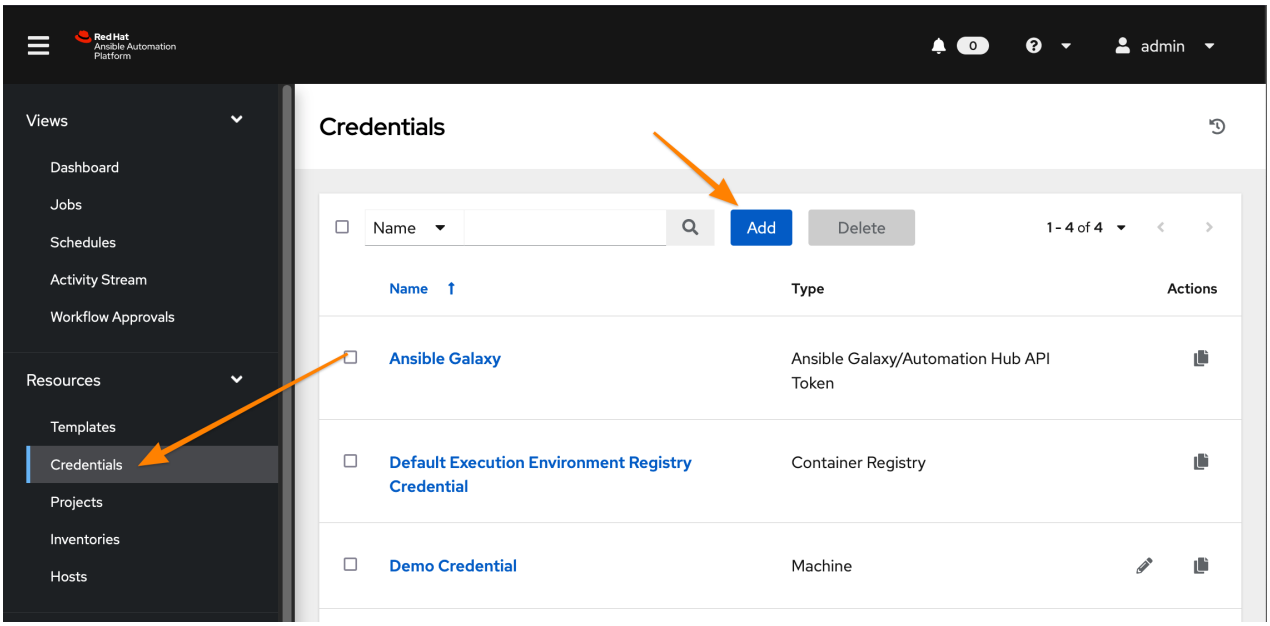

Figure 33. Ansible Controller - Credentials

2. Create the credential specifying the name, type, and bind to organization if desired and click **Save**.
    a. **Name**: NYPD Machine SSH Creds
    b. **Description**: NYPD SSH UN and PW Credential
    c. **Organization**: NYPD
    d. **Username**: devops
    e. **Password**: redhat
    f. **Privilege Escalation Method**: sudo
    g. **Privilege Escalation Username**: root
        - NOTE - SSH credentials are **Machine Credentials**

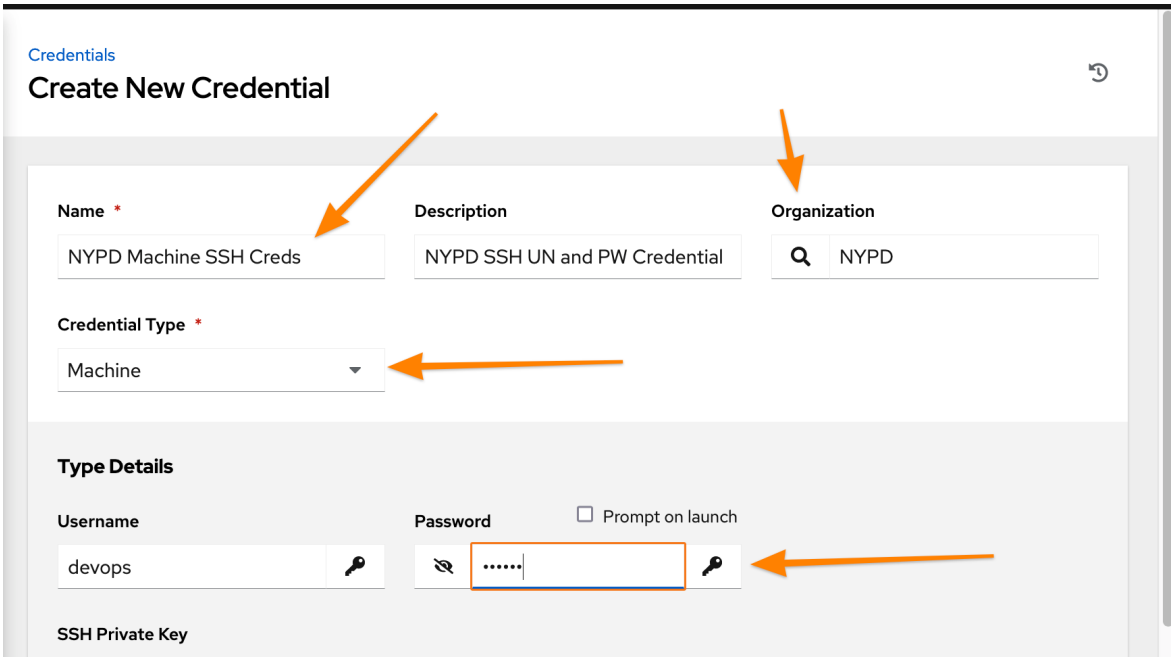

Figure 34. Ansible Controller - Machine Credentials

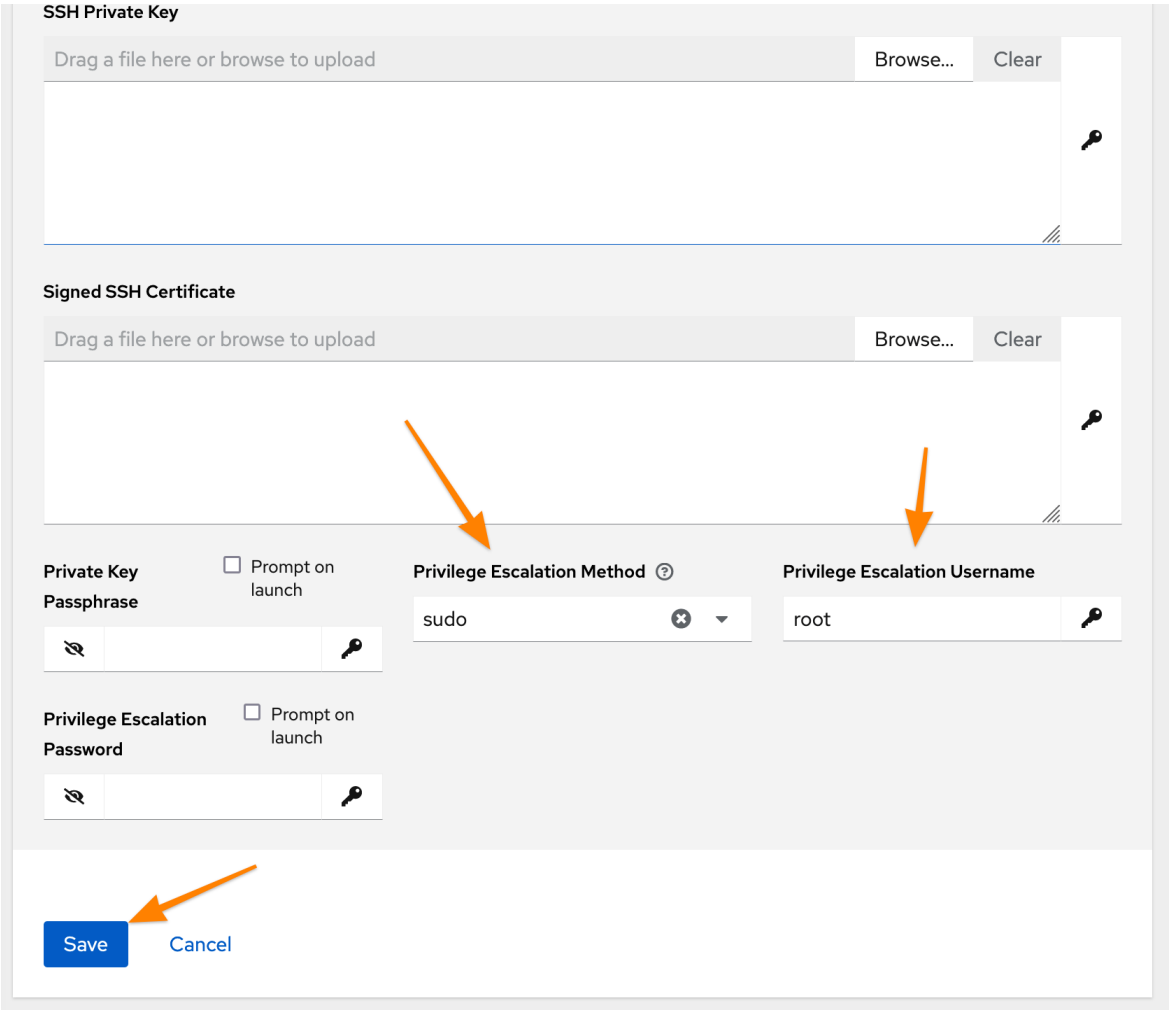

Figure 35. Ansible Controller - Credentials - Privileged User

Privilege Escalation

It is necessary to provide privilege escalation information as with Ansible Controller, this is where the information and configuration must come from for execution environments (EEs).

3.3.3. Projects and Job Templates

3.3.3.1. DEMO - Projects and Job Templates

Example 14. DEMONSTRATION - Creating an Projects and Job Templates

Automatically Setup SCM/Git Credentials before Proceeding

You must run a playbook to setup the **git** credentials so that there are SCM credentials loaded into Ansible Controller prior to completing this demo. This also assumes that the **ssh_ID_key** has been copied to **/tmp/github_id**. The playbook and names may need to be modified for your user.

1. Go to the **Setup** Resources Directory

```
[student@workstation ~]$ cd /home/student/Github/AAP_Webinar/Future/Setup
```

1. Execute the **Setup_Controller.yml** Playbook to create the Git Credentials

```
[student@workstation Setup]$ ansible-playbook Setup_Controller.yml

PLAY [Playbook to Configure Controller with SCM Credentials] ************************

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

TASK [Create a valid SCM credential for Travis's Github] *****************************
[WARNING]: You are using the awx version of this collection but connecting to Red Hat
Ansible Automation Platform ①
changed: [localhost]

PLAY RECAP *********************************************************************
localhost                  : ok=2    changed=1    unreachable=0    failed=0    skipped=0    rescued=0
ignored=0
```

① A warning is generated as we are using the public AWX collection to manage controller instead of the supported collection from Red Hat Automation Hub

Creating a Project

1. Login to **Ansible Controller**

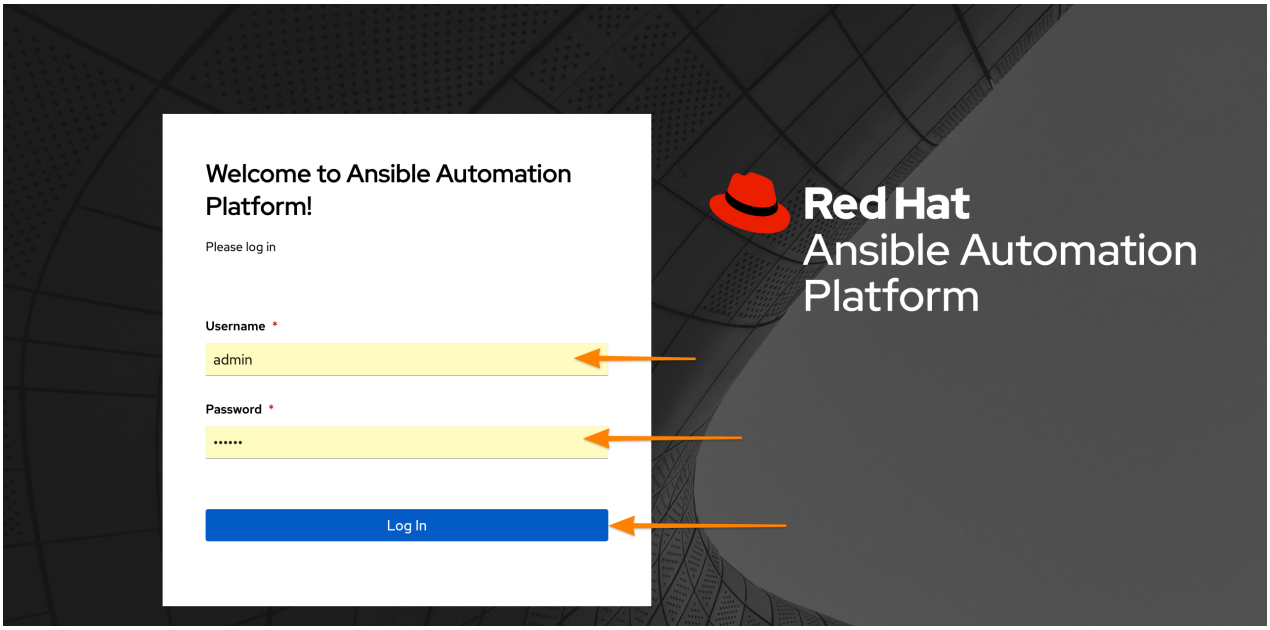

Figure 36. Ansible Controller Login

2. Click **Projects** and then click **Add** to Add a Project

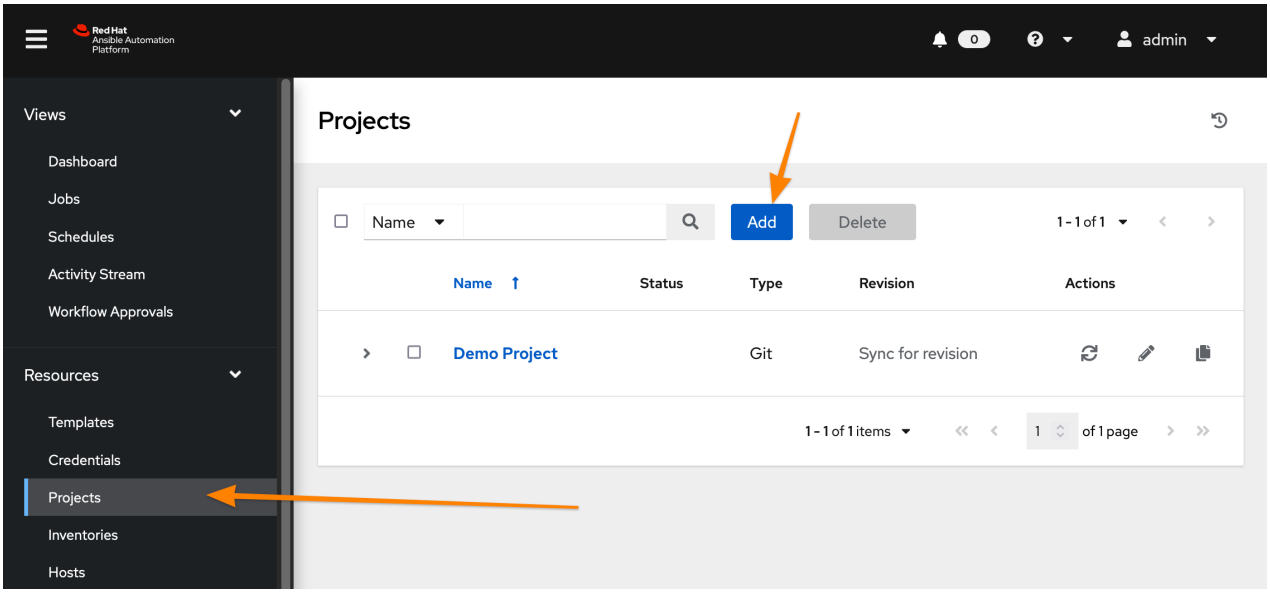

Figure 37. Ansible Controller - Projects

3. Create a New Project with a Name, Organization and Source Control Credential
    - **Name**: NYPD Webserver
    - **Organization**: NYPD
    - **Source Control Credential Type**: Git

- Source Control URL: git@github.com:tmichett/AAP_Webinar.git
- **Source Control Credential**: Travis Github

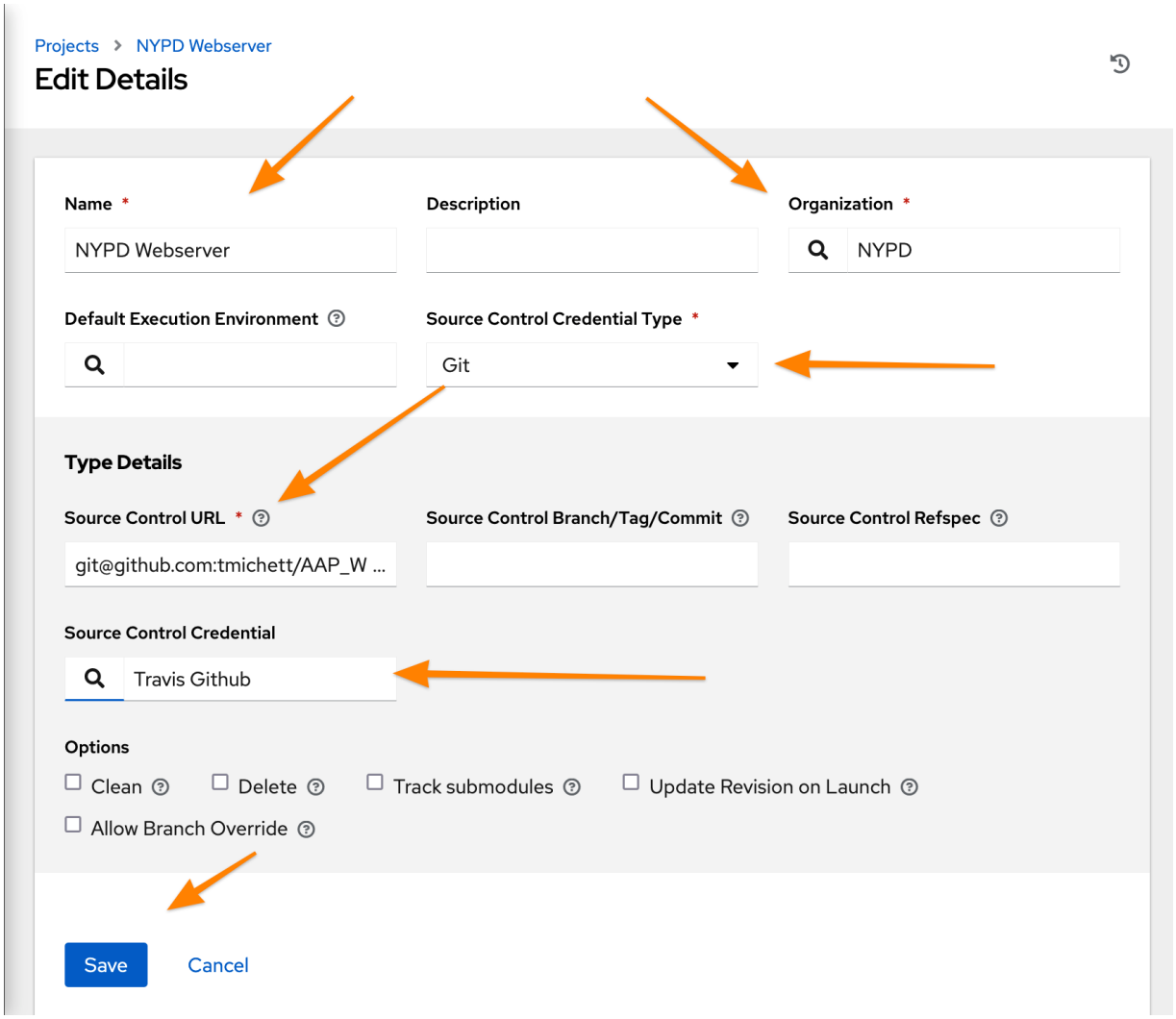

Figure 38. Ansible Controller - Creating Project from Github Source

After clicking **Save** it will initiate the first sync of the project resources. Wait for the sync to complete successfully.

Creating a Job Template

1. Click **Templates** and then click **Add** to Add (*Add job template) to create a job template.

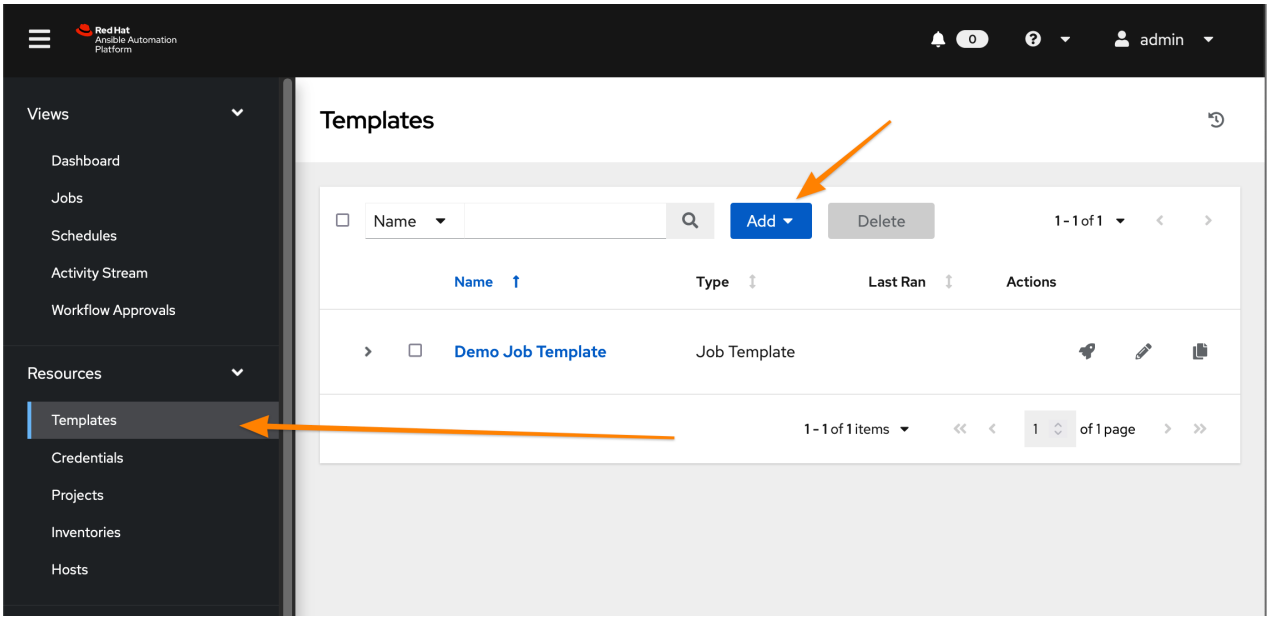

Figure 39. Ansible Controller - Job Templates

2. Create the new job template and then click **Save**
    - Provide a name
        - **Name**: NYPD Webserver Deploy
    - Provide job type (**run**)
    - Provide **Inventory**
        - **Inventory**: NYPD Systems
    - Provide **Project**
        - **Project**: NYPD Webserver
    - Select **Playbook**
        - **Playbook**: Future/NYPD/Website_Ansible_Past.yml
    - Select **Credentials**
        - **Credentials**: NYPD Machine SSH Creds
    - Select **Privilege Escalation** option

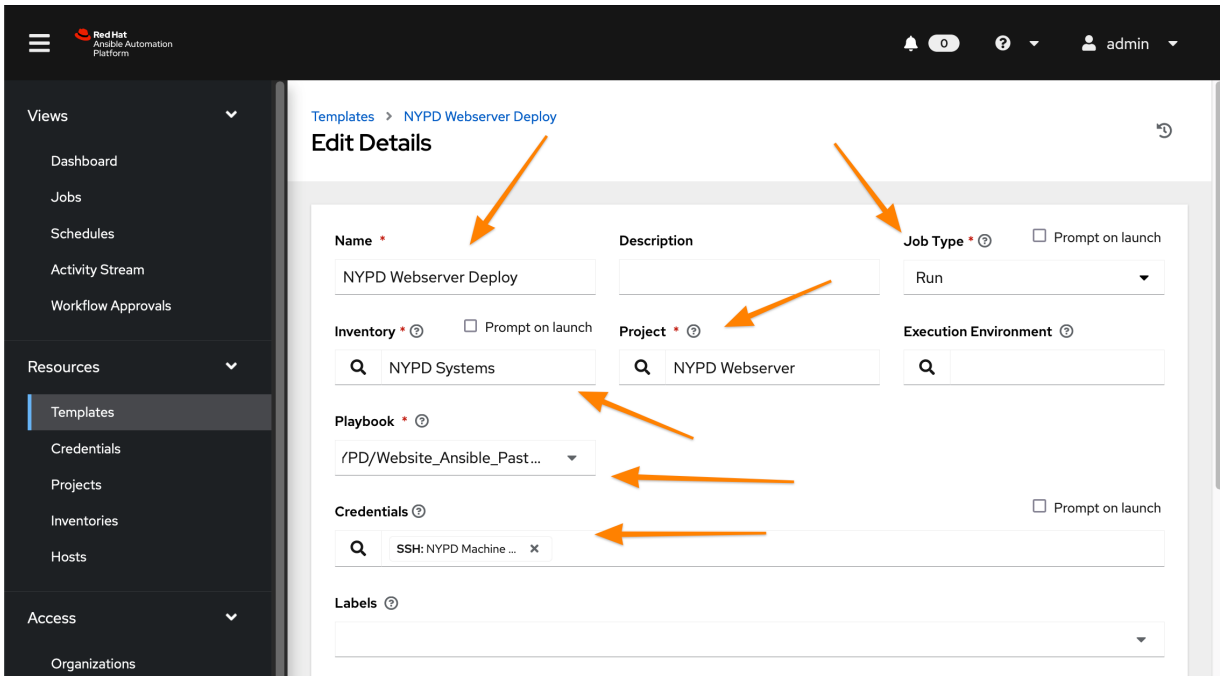

Figure 40. Ansible Controller - Job Template Details

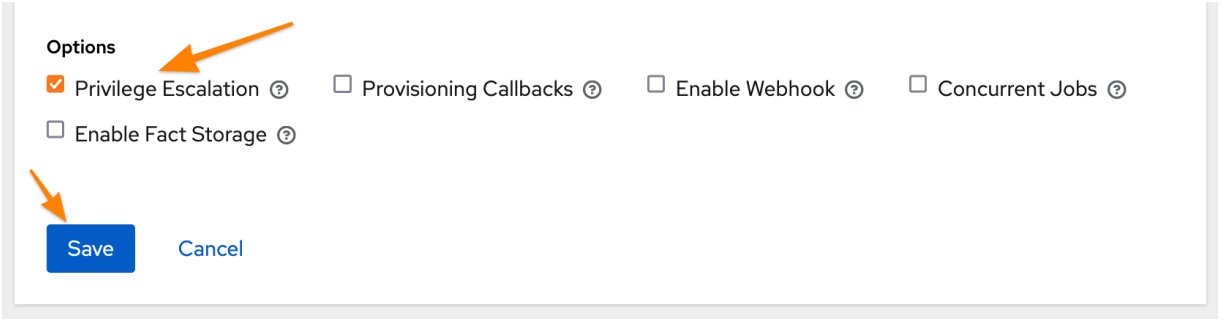

Figure 41. Ansible Controller - Job Template Details cont.

Privilege Escalation

It is important to know what the playbook does and whether it requires privilege escalation. A proper playbook might already have this defined, but it also allows you to assign it to the job from this menu.

3. Launch the job by clicking **Launch**

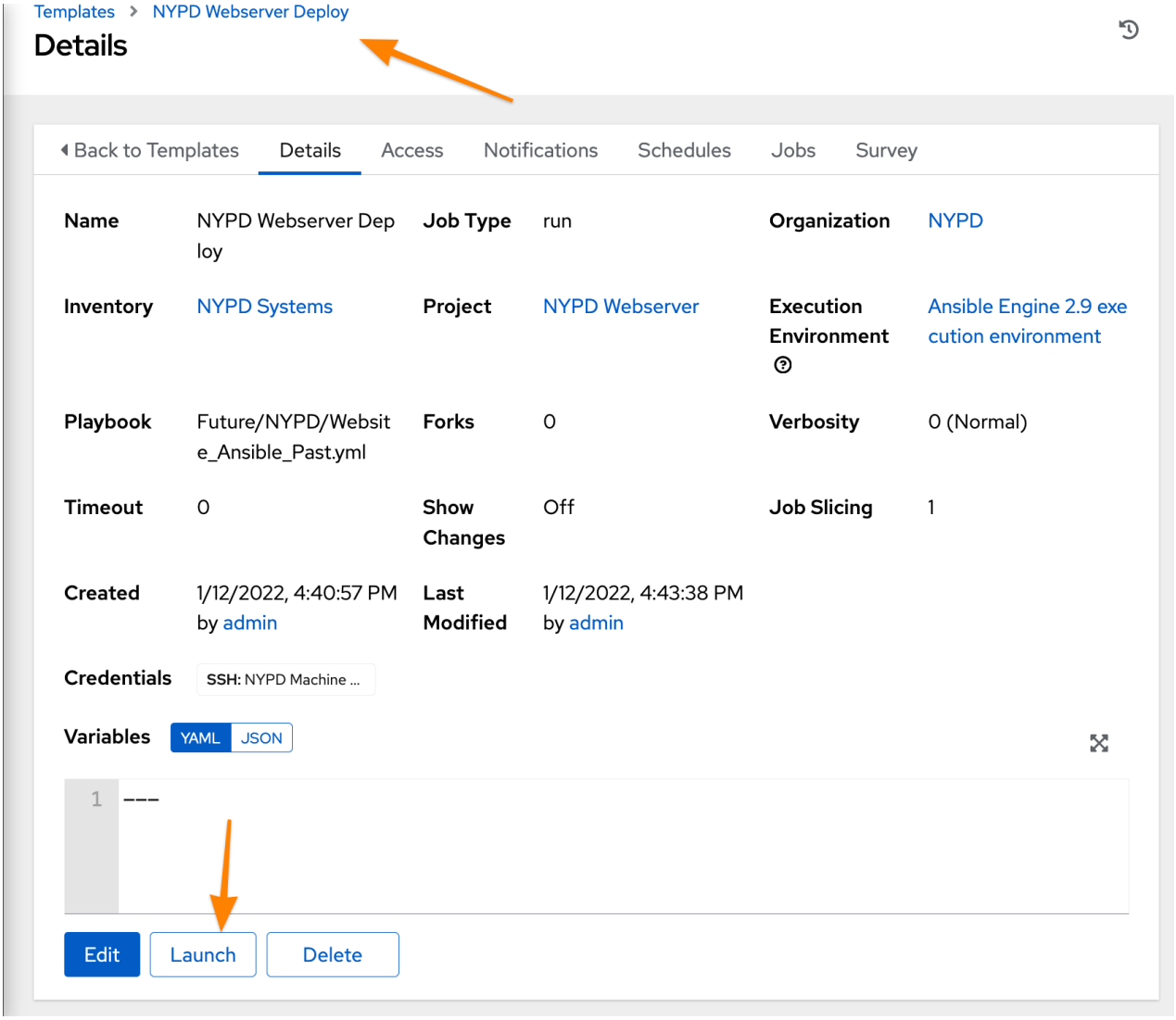

Figure 42. Ansible Controller - Job Template Launch

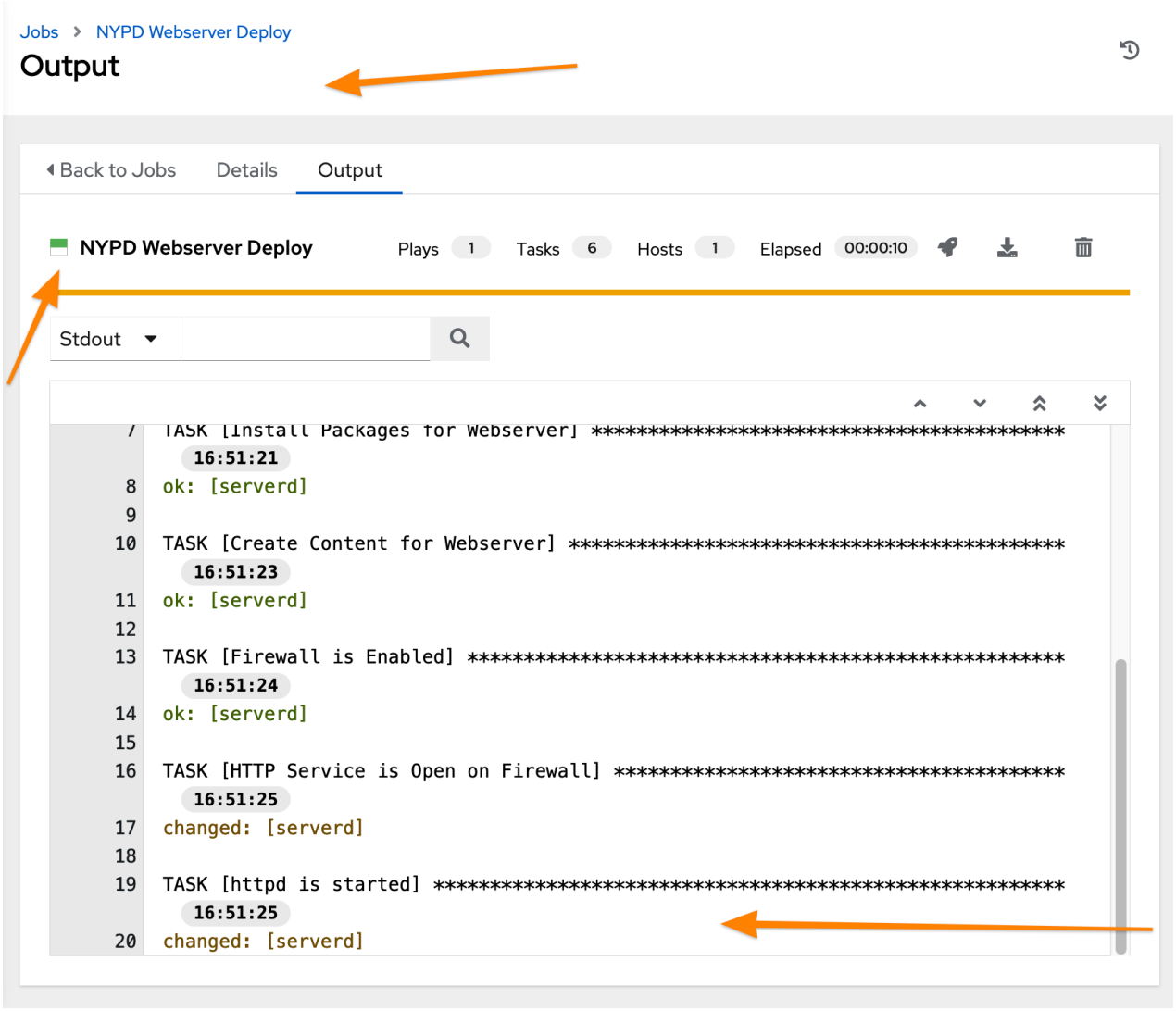

Figure 43. Ansible Controller - Job Results Output Verification

4. Verify webserver is running and accessible.

```
[student@workstation ~]$ curl serverd
I'm an awesome webserver for the NYPD and I know Castle!!
```

3.3.4. Workflows

In order to create job workflows, projects and existing job templates must already be created before they can be put together as a job workflow template.

3.3.4.1. DEMO - Creating Job Workflows

Setup Required

Before beginning this demo or exercise, it is necessary to run the **setup** playbooks.

1. Switch to correct directory

```
[student@workstation ~]$ cd /home/student/Github/AAP_Webinar/Future/Setup
```

2. Run the **Setup_All.yml** playbook

```
[student@workstation Setup]$ ansible-playbook Setup_All.yml

... OUTPUT OMITTED ...
```

It is also necessary to synchronize the Project Inventory Source

1. Click **Inventories**
2. Click **NYPD Web Workflow**
3. Click **Sources**
4. Click the **Synchronize** action to synchronize the **NYPD Project Inventory** source
    - Wait for status to be **Green** meaning synchronization was successful
5. Click **Hosts** to verify inventory was imported

This allows steps to be skipped and it is possible to jump to the **Creating a Job Workflow Template** instructions - Starting with **STEP 5**

Example 15. DEMONSTRATION - Job Workflow Templates

For this demonstration, it will be necessary to create two new **Job Templates** that will be linked together in a **Job Workflow Template**. We will be leveraging the already created project **NYPD Webserver** for existing playbooks and inventories. We will also create a dynamic inventory based on imported inventory from the project.

Creating a Project-Based Inventory Source

1. Login to **Ansible Controller**

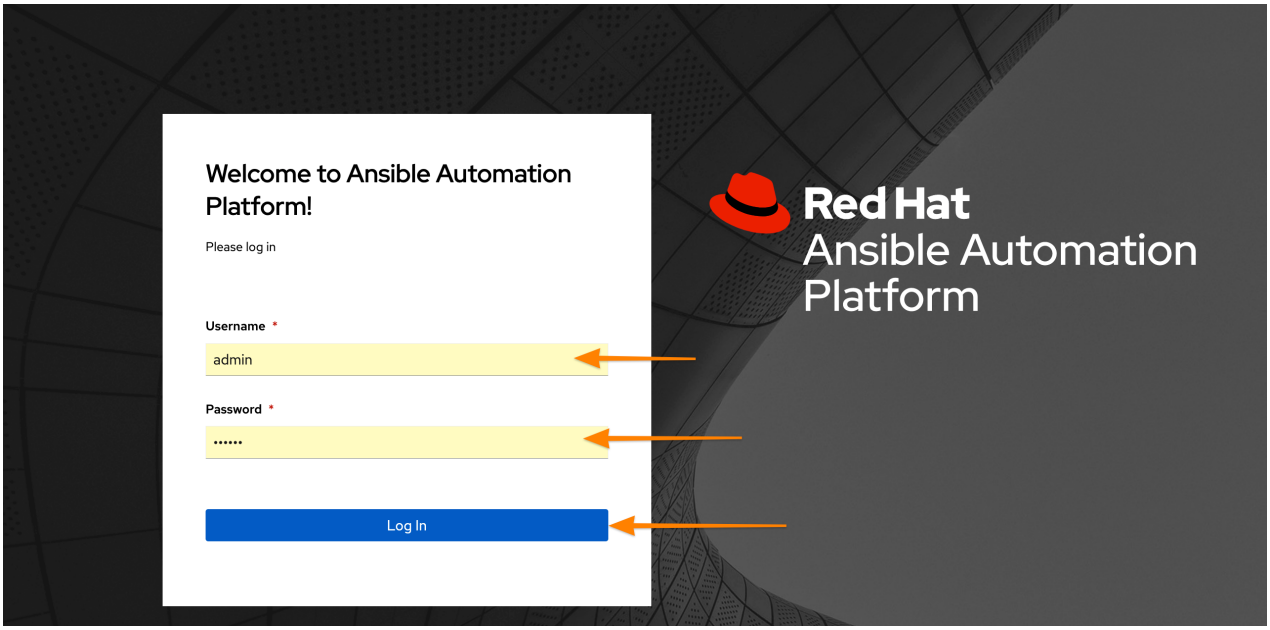

Figure 44. Ansible Controller Login

2. Click **Inventories** and then click **Add**

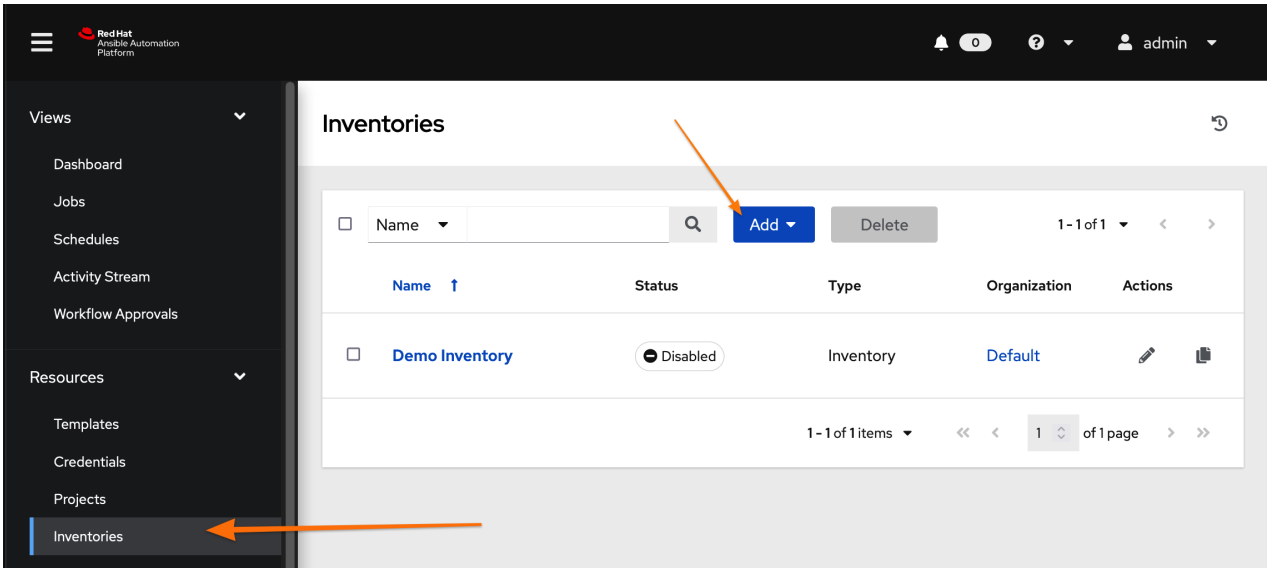

Figure 45. Ansible Controller - Inventory

3. Assign a **Name** and **Organization** to the Inventory and then click **Save**

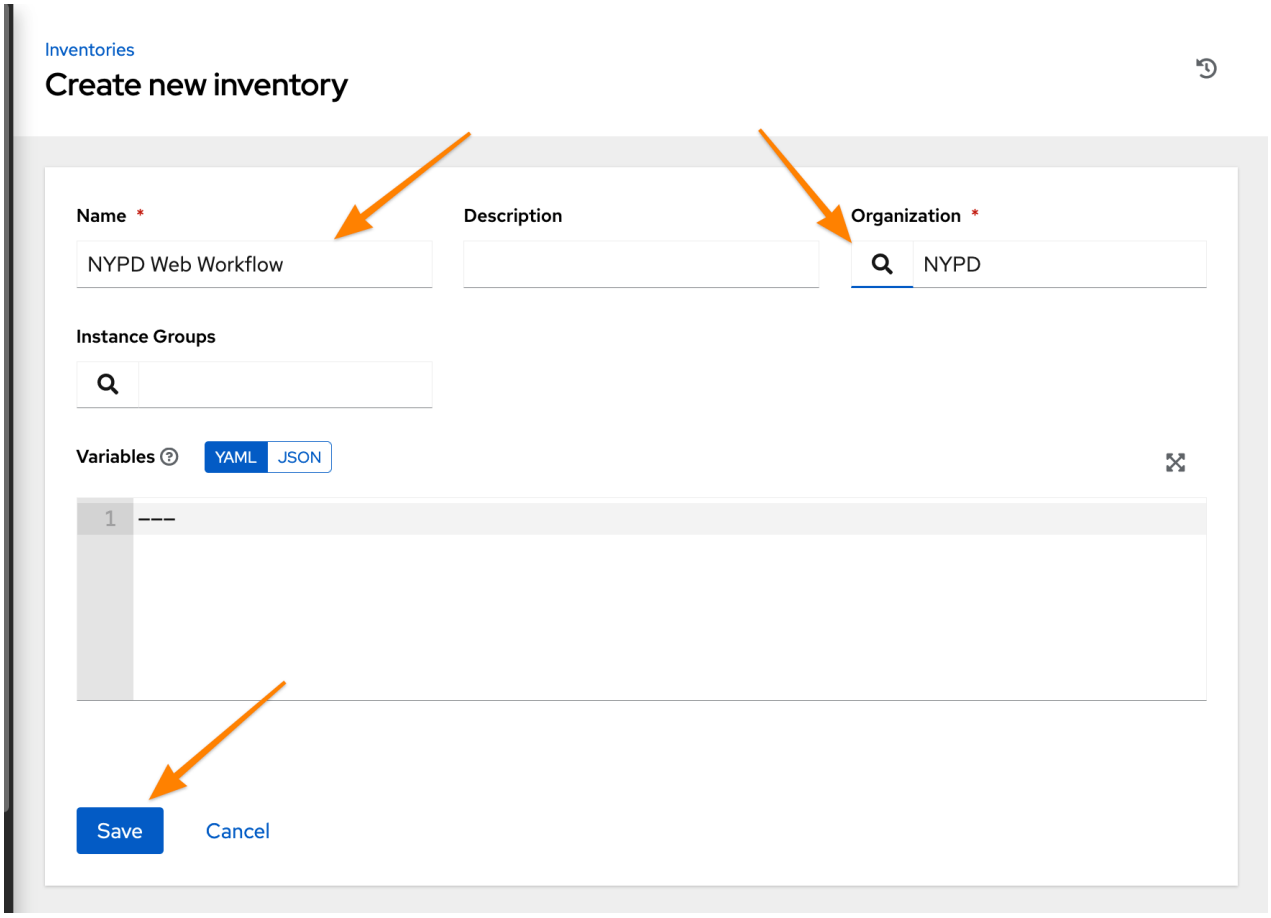

Figure 46. Ansible Controller - Inventory Creation

4. Click **Sources** to create an inventory source

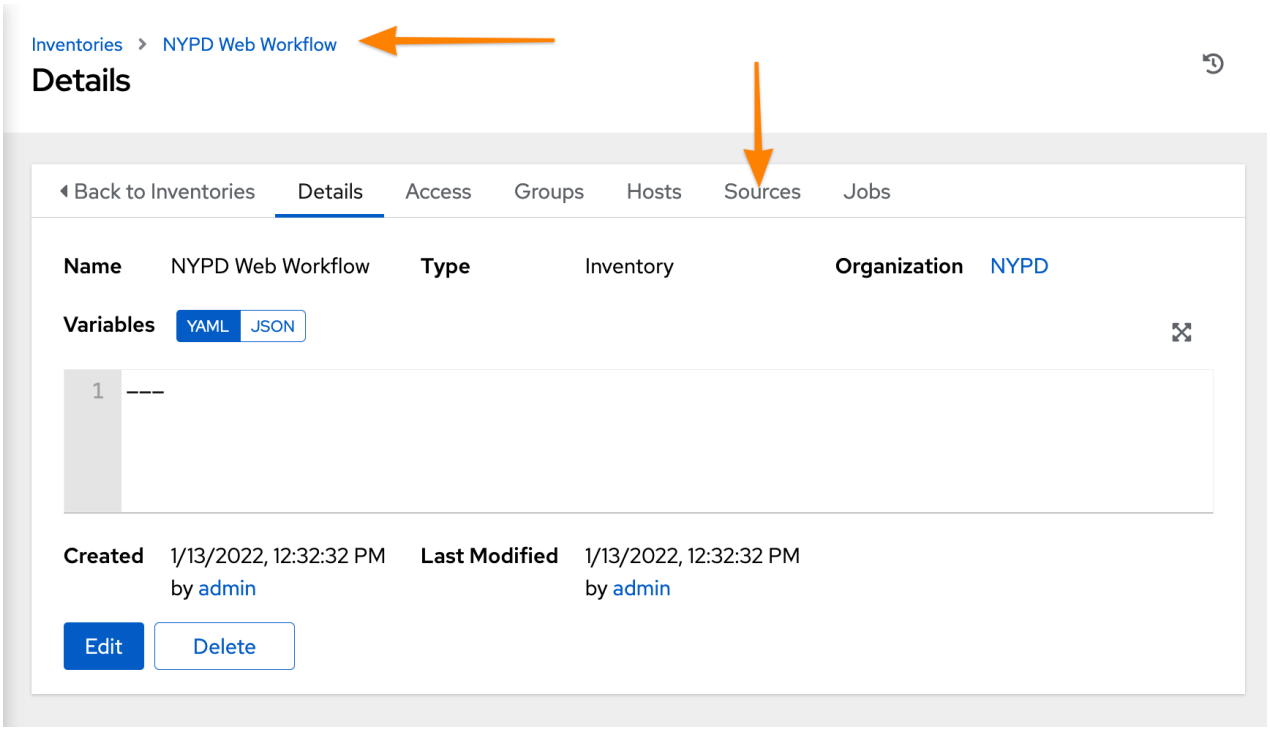

Figure 47. Ansible Controller - Inventory Sources

5. Click **Add** to add an inventory source

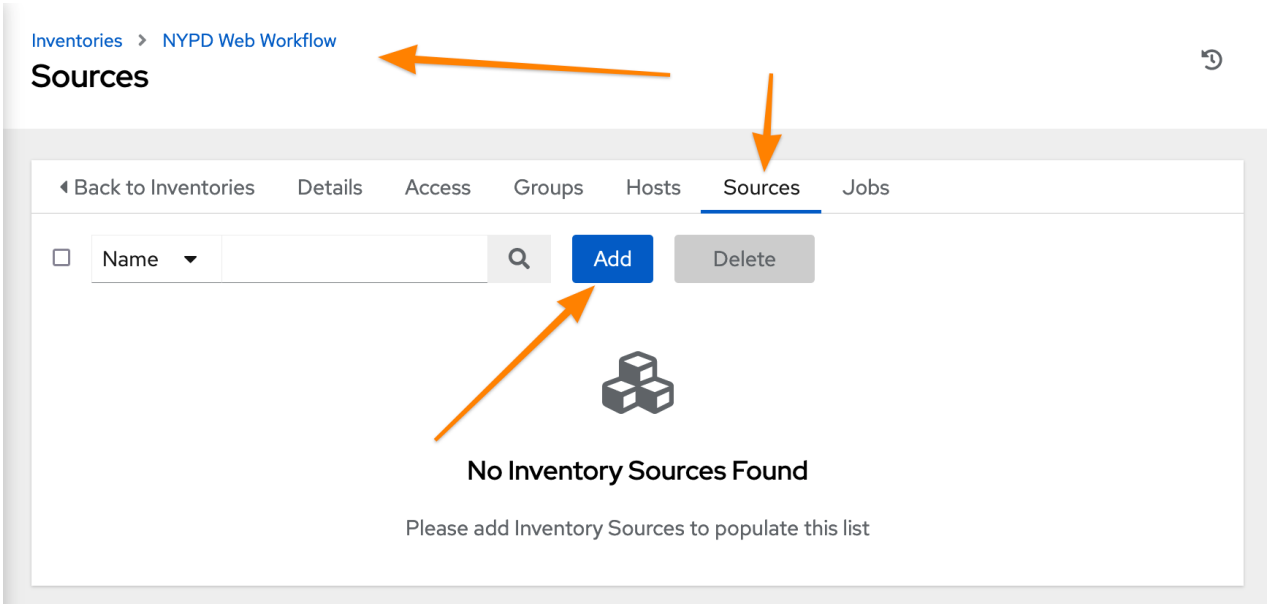

Figure 48. Ansible Controller - Adding Inventory Sources

6. Provide a **Name** and choose **Sourced from a Project** as source and click **Save**

a. Select the **Project** and **Inventory file**

b. Check **Update on launch**

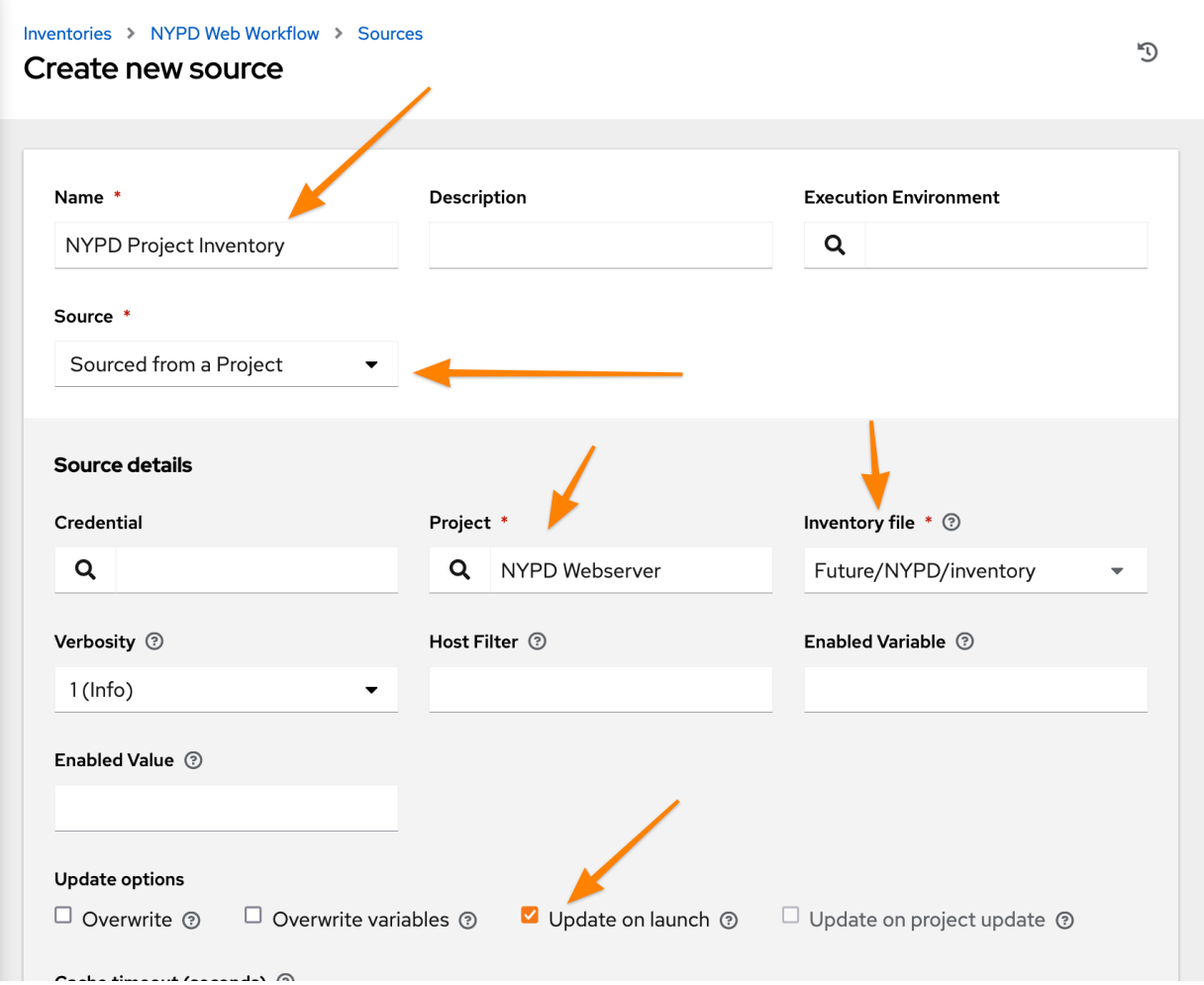

Figure 49. Ansible Controller - Configuring Inventory Sources

7. Click **Sync** to perform a synchronization

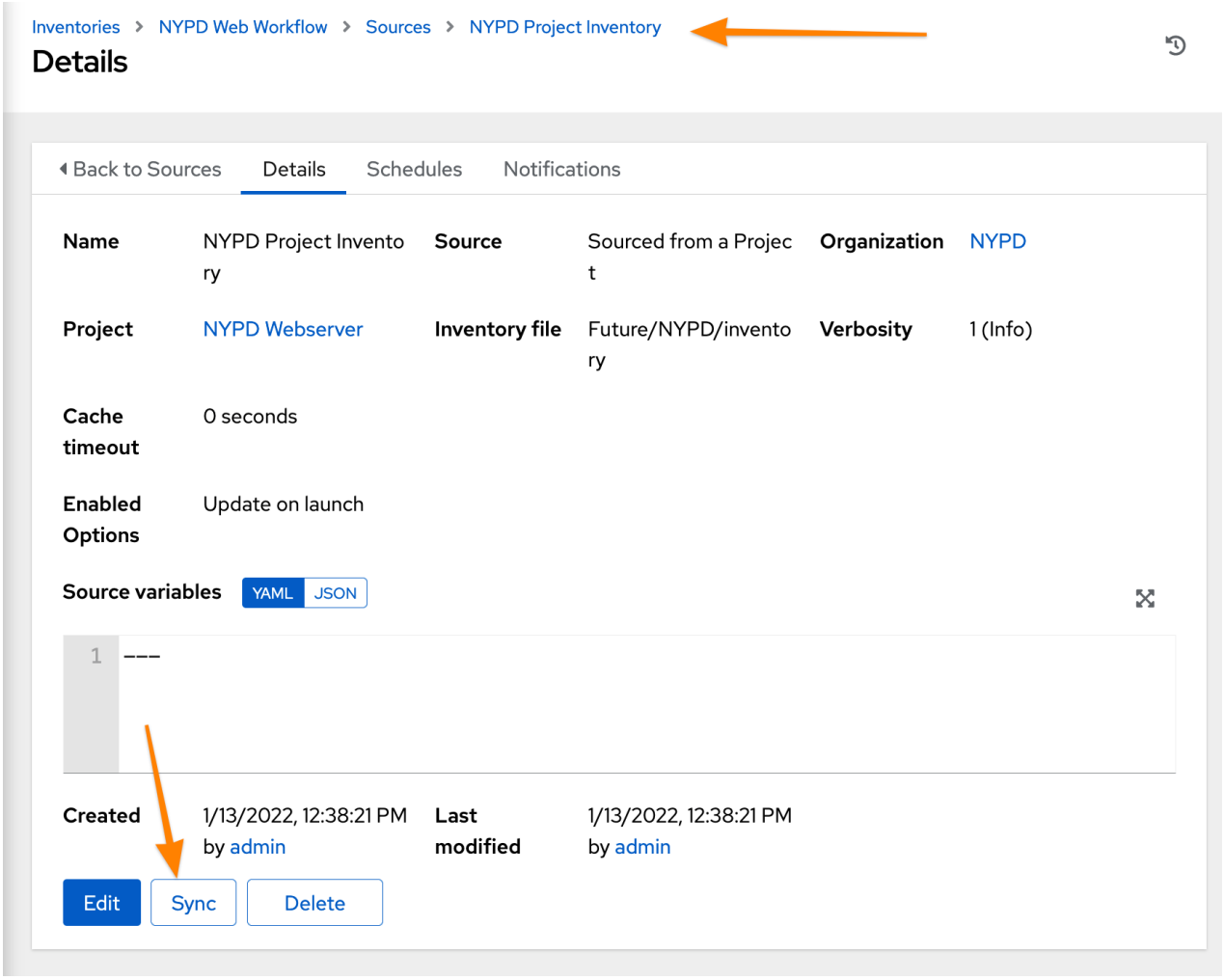

Figure 50. Ansible Controller - Synchronizing Inventory Sources

8. Click **Inventories** to verify the inventory and select **NYPD Web Workflow**

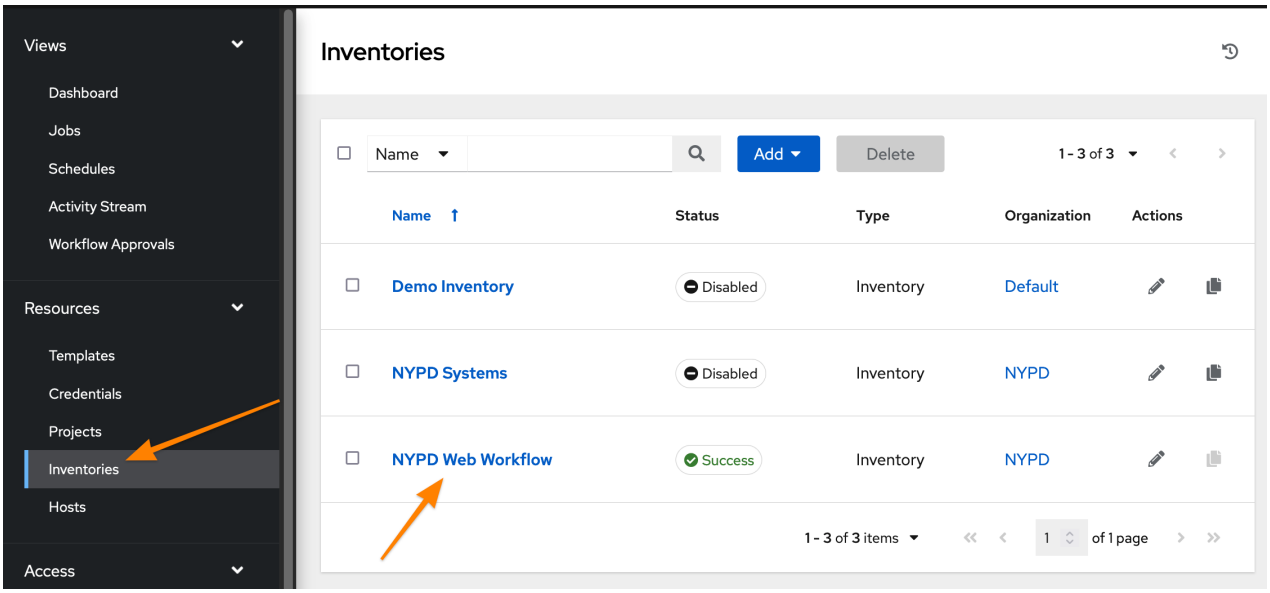

Figure 51. Ansible Controller - Verifying Inventory Sources

9. Click **Hosts** to view hosts

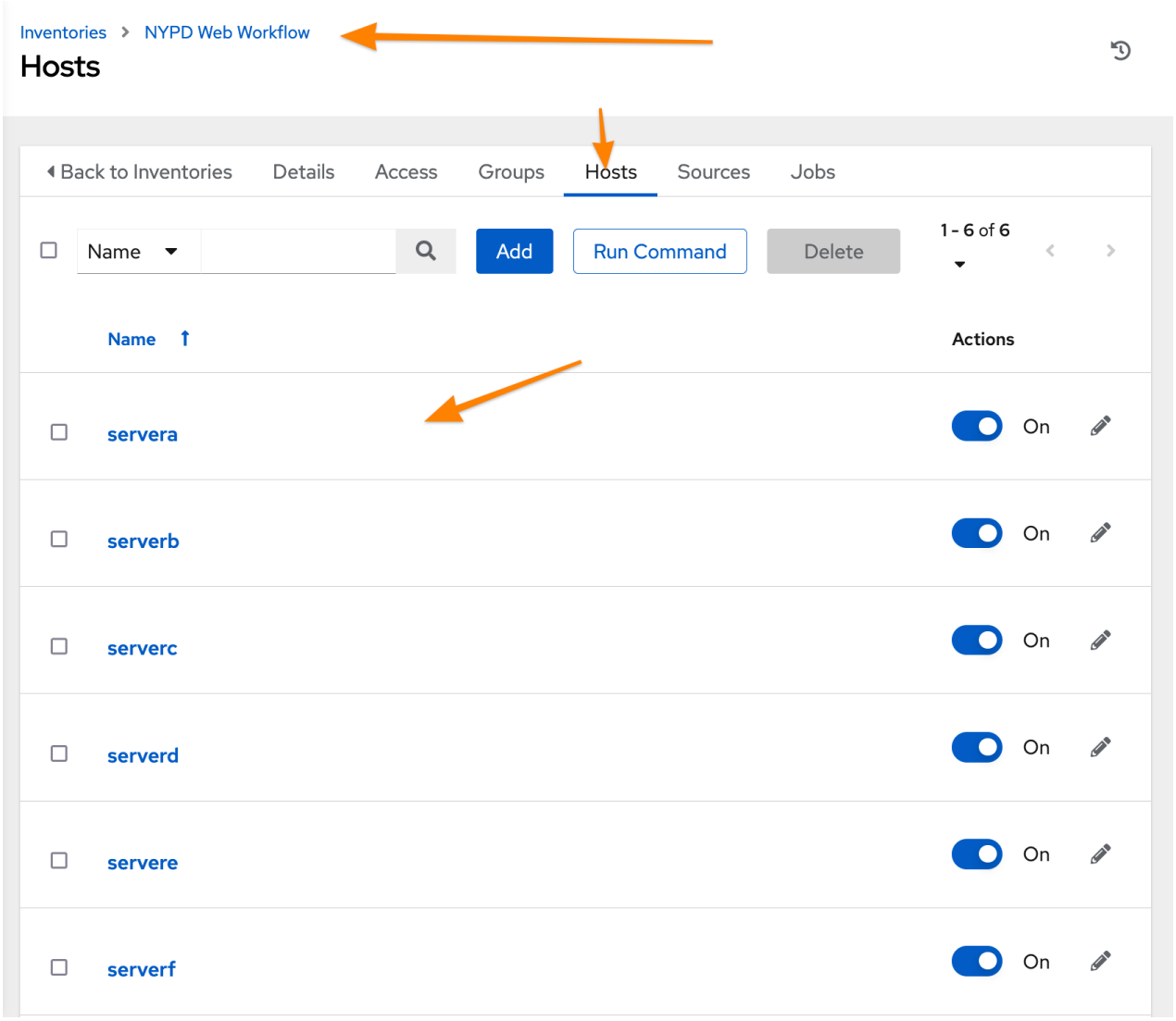

Figure 52. Ansible Controller - Verifying Inventory Hosts from Project

10. Click **Groups** to view host groups
    a. Click on a group name to see hosts in group and click **Hosts**

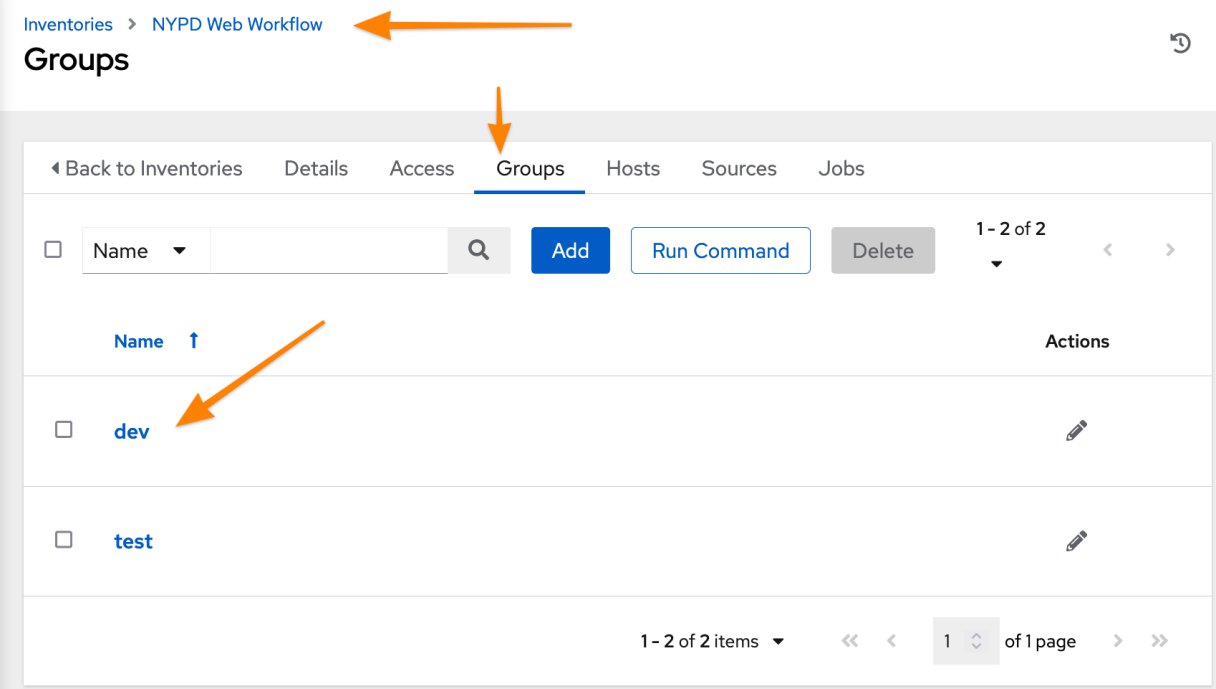

Figure 53. Ansible Controller - Verifying Inventory Group from Project

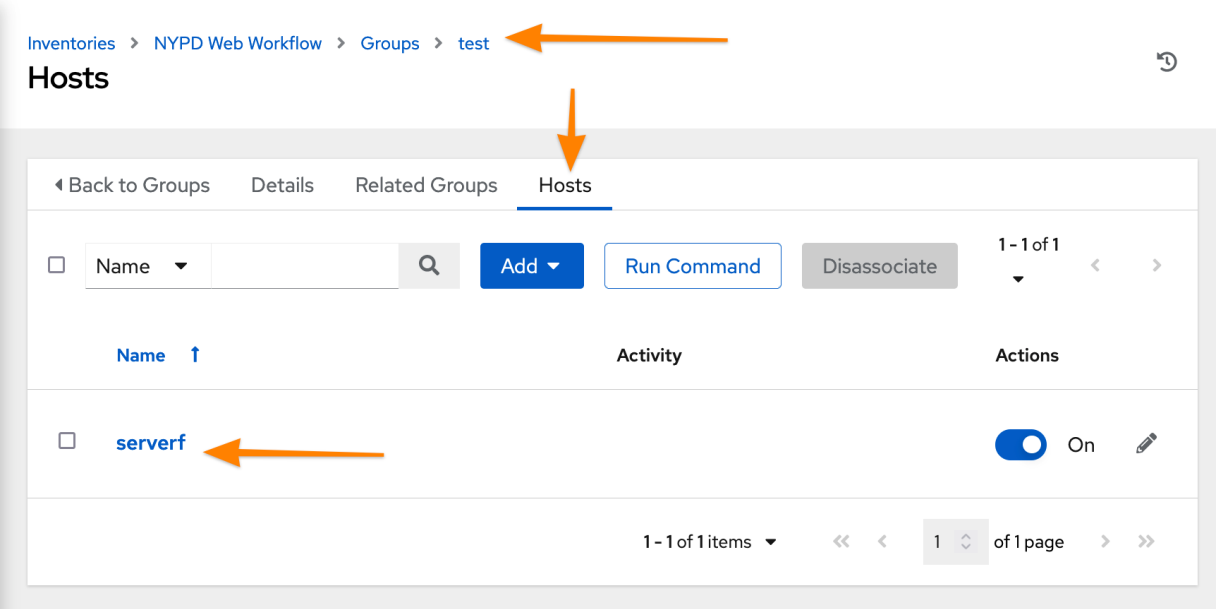

Figure 54. Ansible Controller - Verifying Inventory Group **(Hosts)** *from Project*

Project Based Inventory

The above example shows how to create a dynamic inventory that is sourced from a project. This would can be done to ensure that you have the same inventory and host systems as the developers. It is not 100% necessary to have inventory in the projects, but some people prefer to keep host inventory in projects and this is a great method in keeping developer inventory in sync with what is stored in Ansible Controller.

README FIRST

If you ran the lab scripts and Ansible playbook in the before you begin section, it is possible to skip to **STEP 5** of the **Creating a Job Workflow Template** steps. The playbook created the inventory and the intermediate Job Templates so the focus is creation of a Job Workflow. This has been done to save time for the demonstration and prevents the need to manually create new inventories and job templates.

Creating a Job Workflow Template

1. Login to **Ansible Controller**

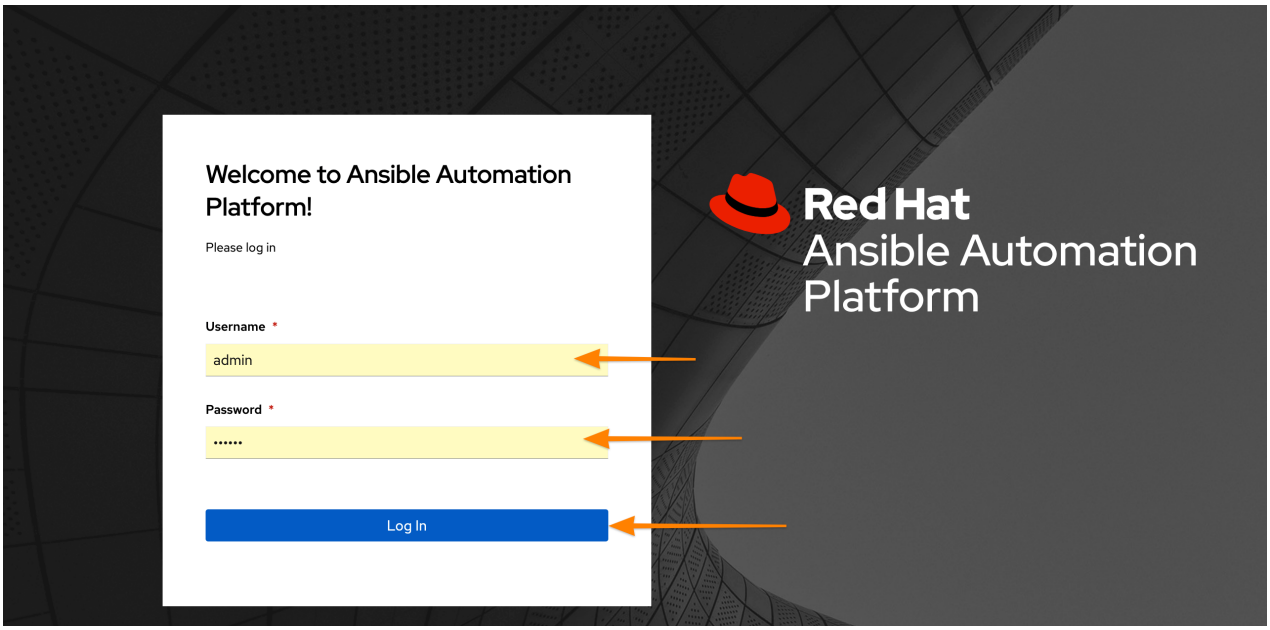

Figure 55. Ansible Controller Login

2. Click **Templates** and then click **Add** and **(Add job template)** to create a new Job Template

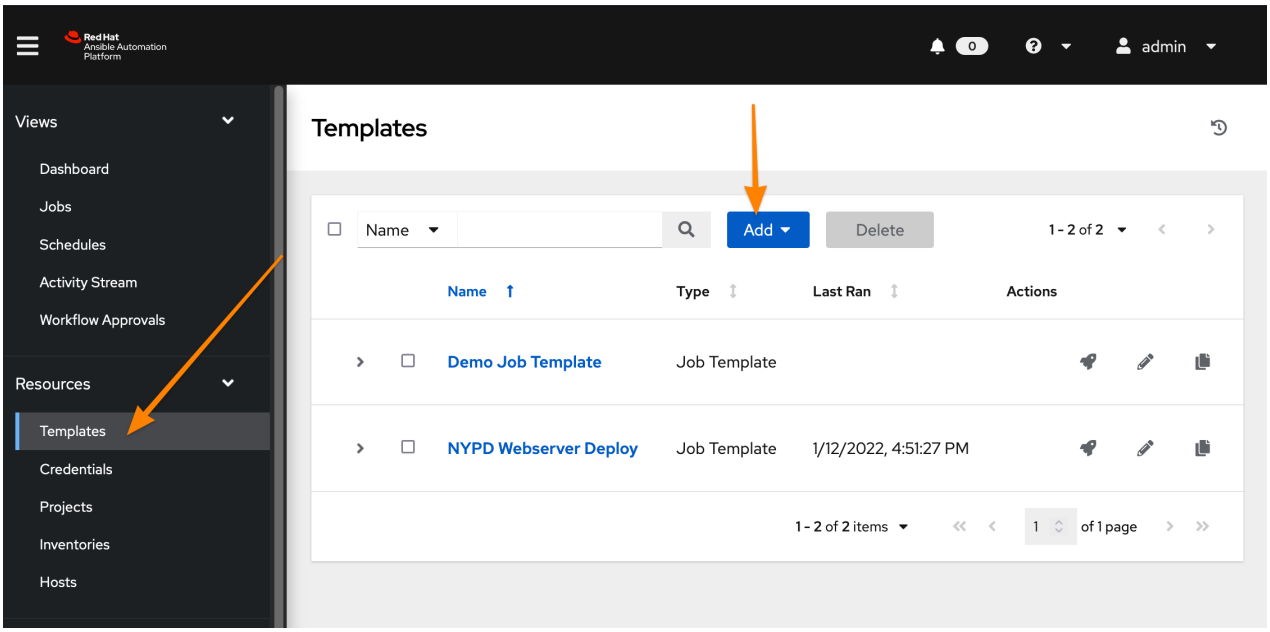

Figure 56. Ansible Controller - Job Templates

3. Complete the form for the NYPD Dev Webserver and click **Save**
    a. **Name**: *NYPD Dev Webserver*
    b. **Job Type**: *run*
    c. **Inventory**: *NYPD Web Workflow*
    d. **Project**: *NYPD Webserver*
    e. **Playbook**: *Future/NYPD/NYPD_Web_Workflow.yml*
    f. **Credentials**: *NYPD Machine SSH Creds*
    g. **Variables**: *inv_host_var: servere*
    h. **Privilege Escalation**: *Checked*

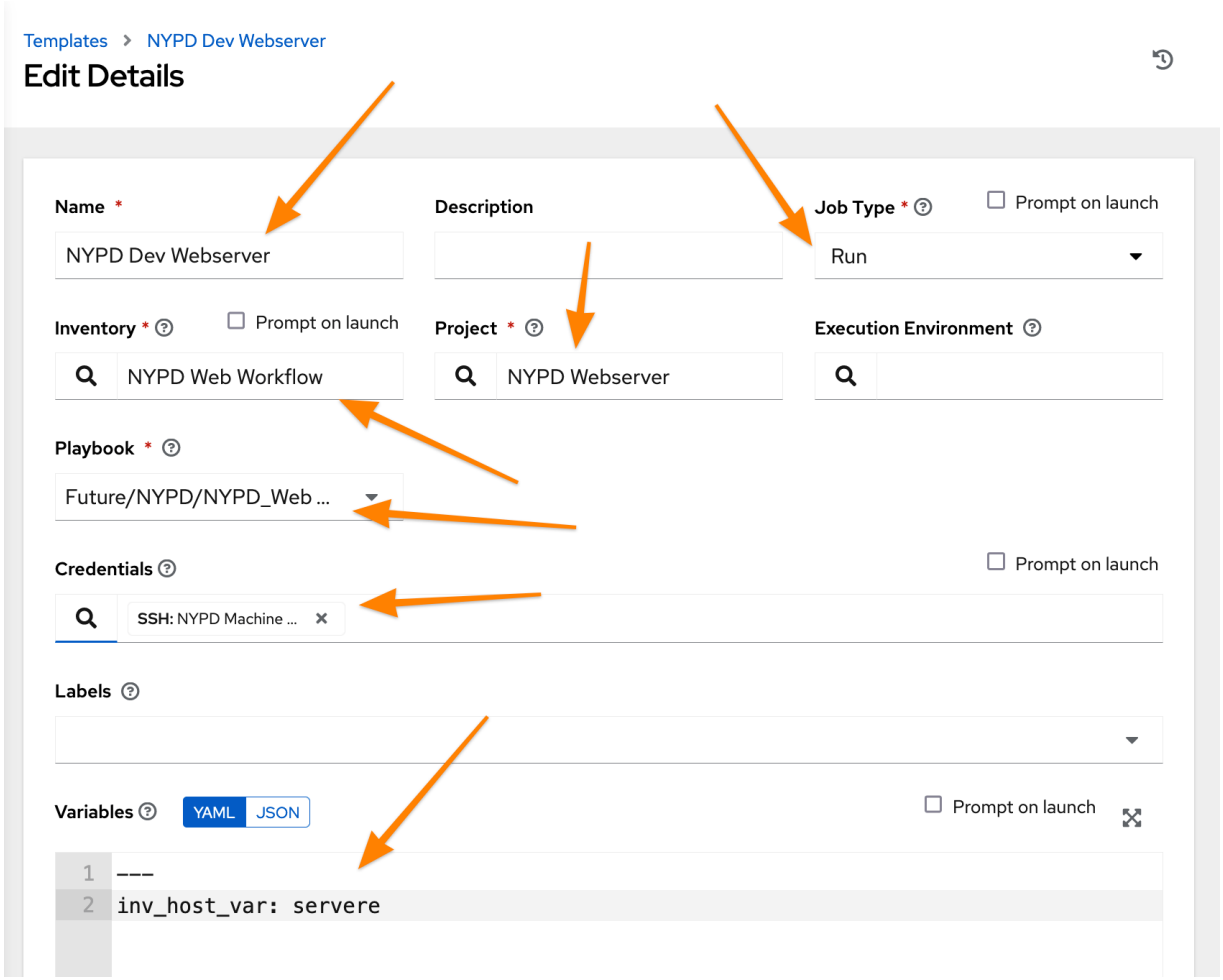

Figure 57. Ansible Controller - Job Template Parameters

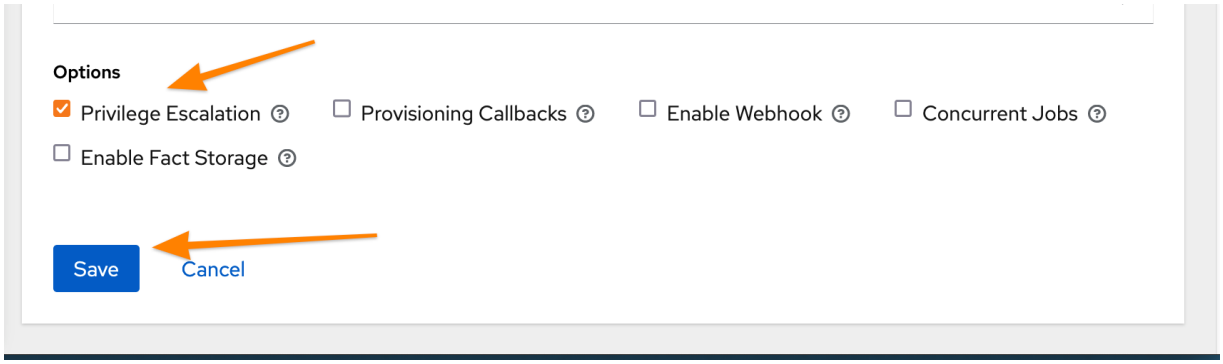

Figure 58. Ansible Controller - Job Template Parameters cont.

4. Create a new Job template using steps above with the following values.
    a. **Name**: *NYPD Test Webserver*
    b. **Job Type**: *run*

c. **Inventory**: *NYPD Web Workflow*

d. **Project**: *NYPD Webserver*

e. **Playbook**: *Future/NYPD/NYPD_Web_Workflow.yml*

f. **Credentials**: *NYPD Machine SSH Creds*

g. **Variables**: *inv_host_var: serverf*

h. **Privilege Escalation**: *Checked*

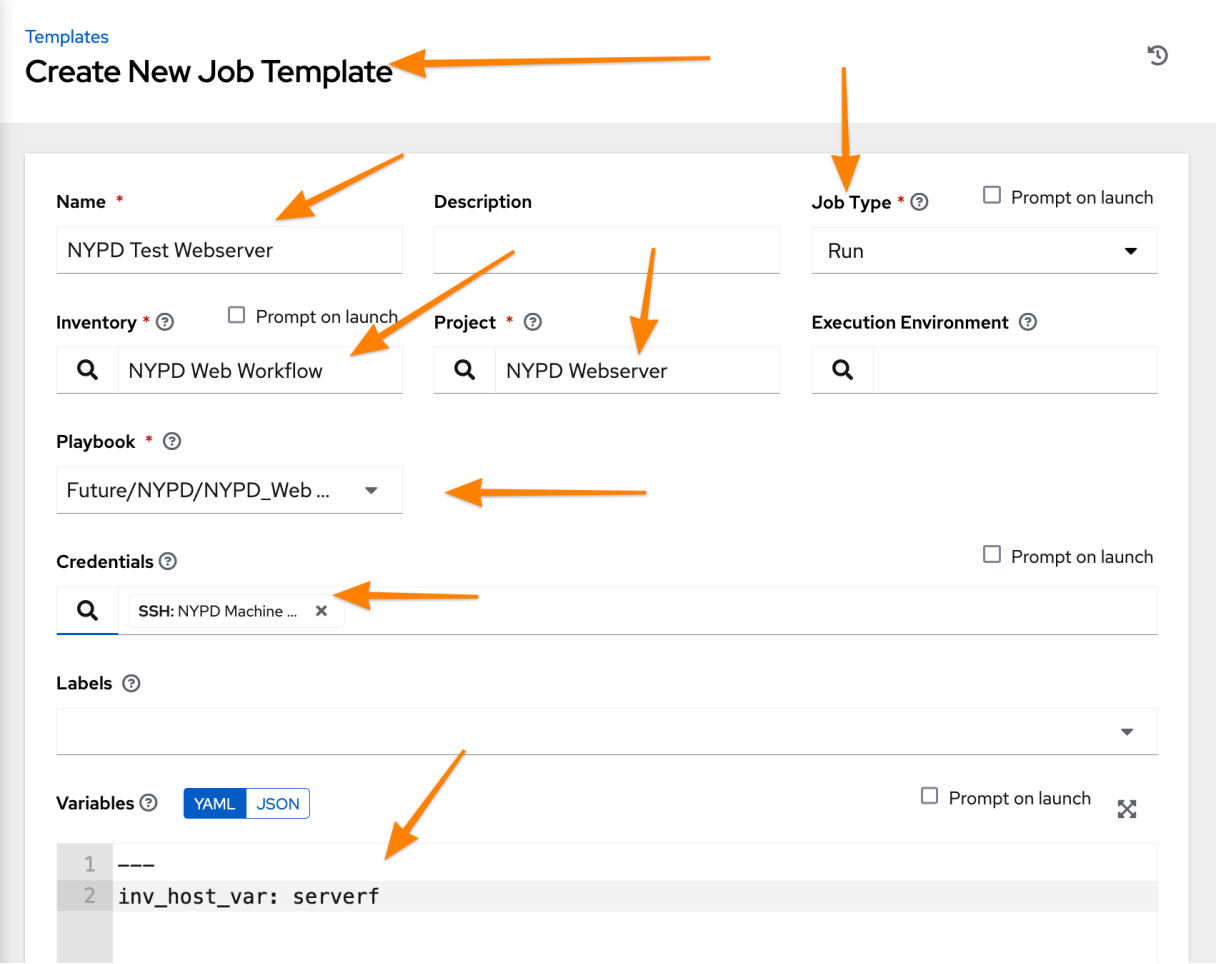

Figure 59. Ansible Controller - Job Template Parameters for NYPD Test Webserver

5. Click **Templates** then click **Add** and select **Add workflow template**

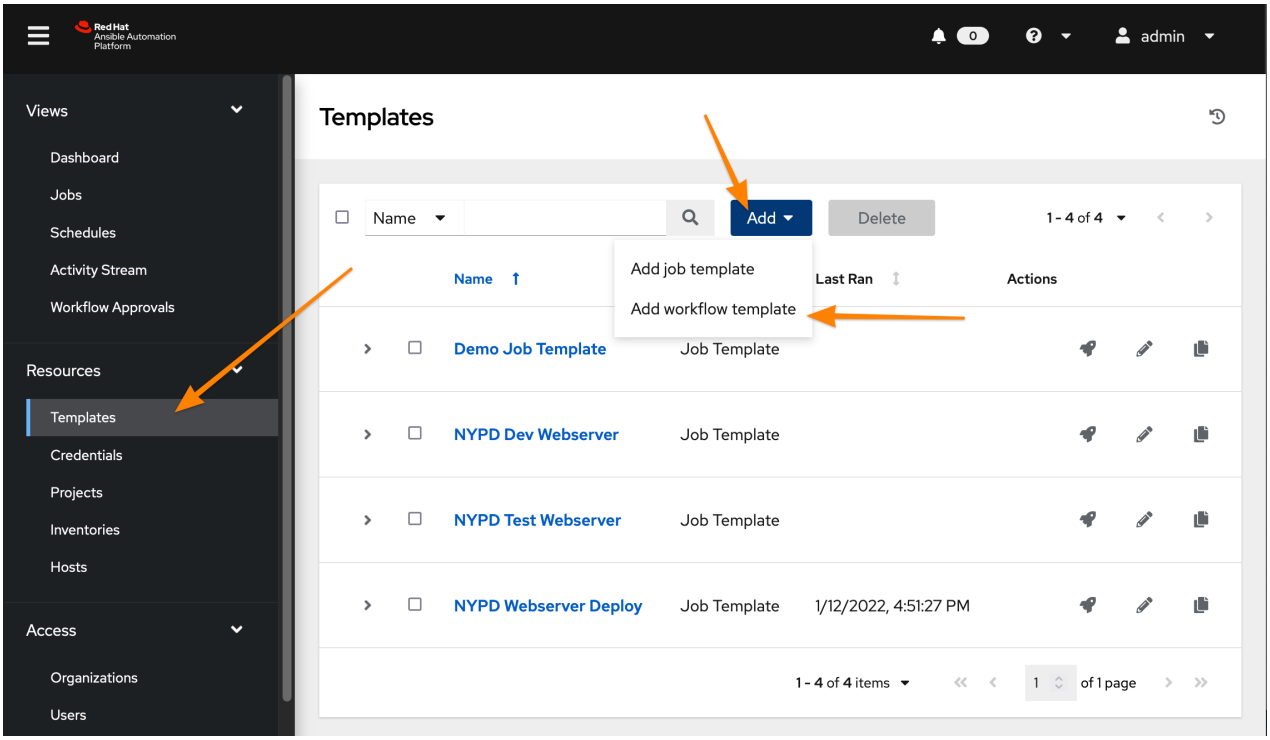

Figure 60. Ansible Controller - Job Workflow Template

6. Provide a **Name** and select the appropriate items
    a. **Name**: NYPD DevOps Workflow
    b. **Description**: Deploy systems to Dev and Test
    c. **Inventory**: *Leave Blank* (Will use inventory specified for Job Templates)
    d. **Organization**: *NYPD*

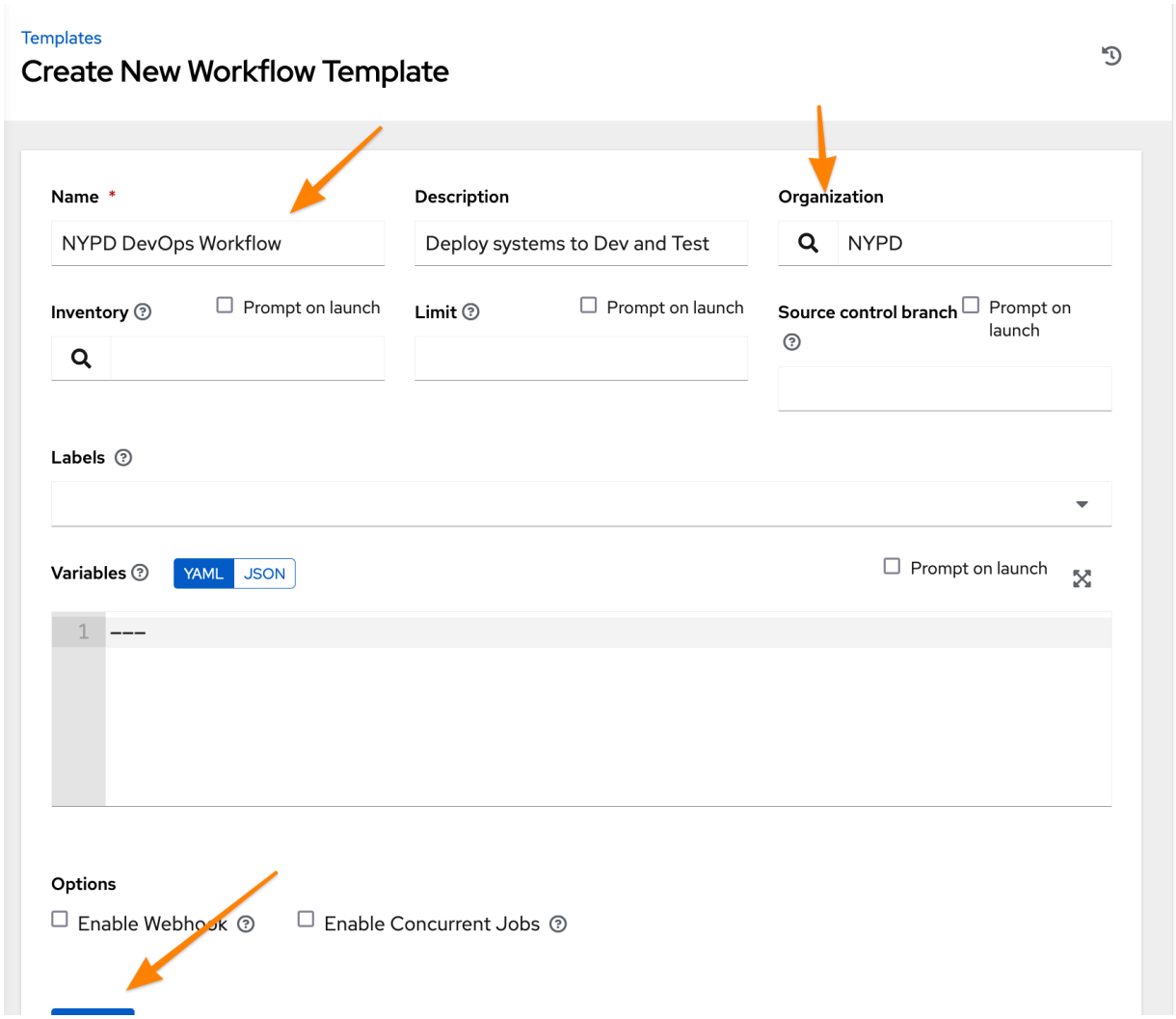

Figure 61. Ansible Controller - Job Workflow Template Details

7. The **Workflow Visualizer** will open and click **Start** to define first task in workflow

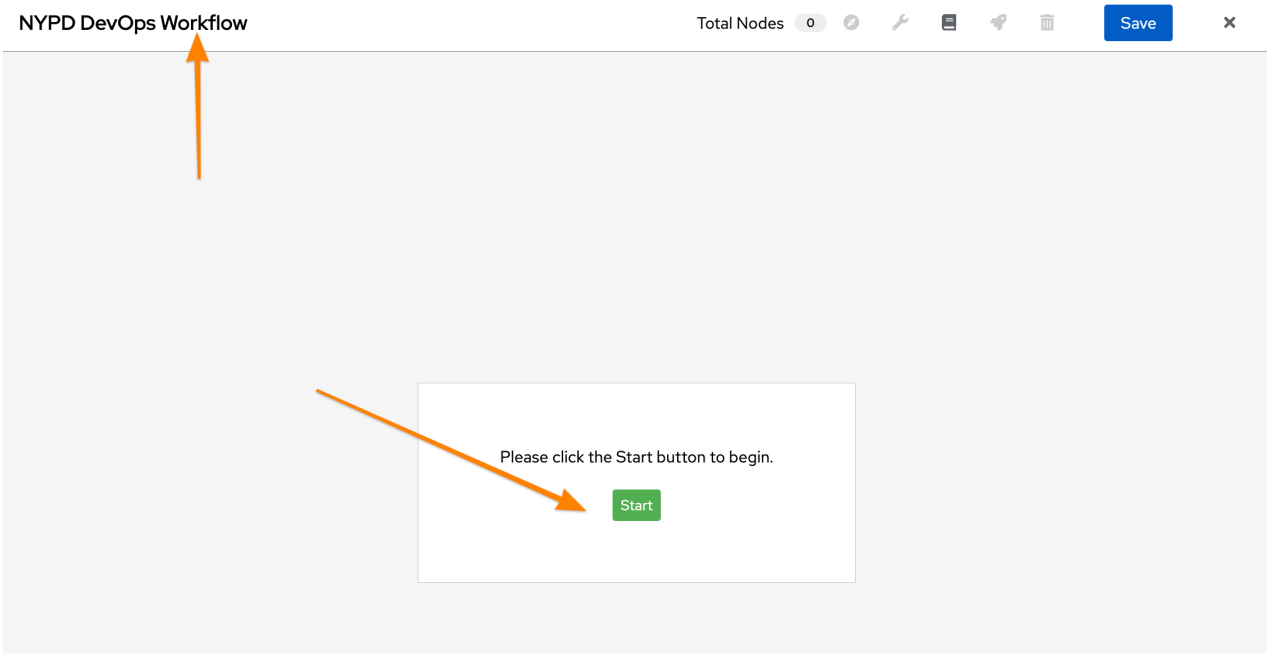

Figure 62. Ansible Controller - Job Workflow Visualizer

8. Start by selecting **Node Type** of **Project Sync** and select the **NYPD Webserver** Project then click **Save**

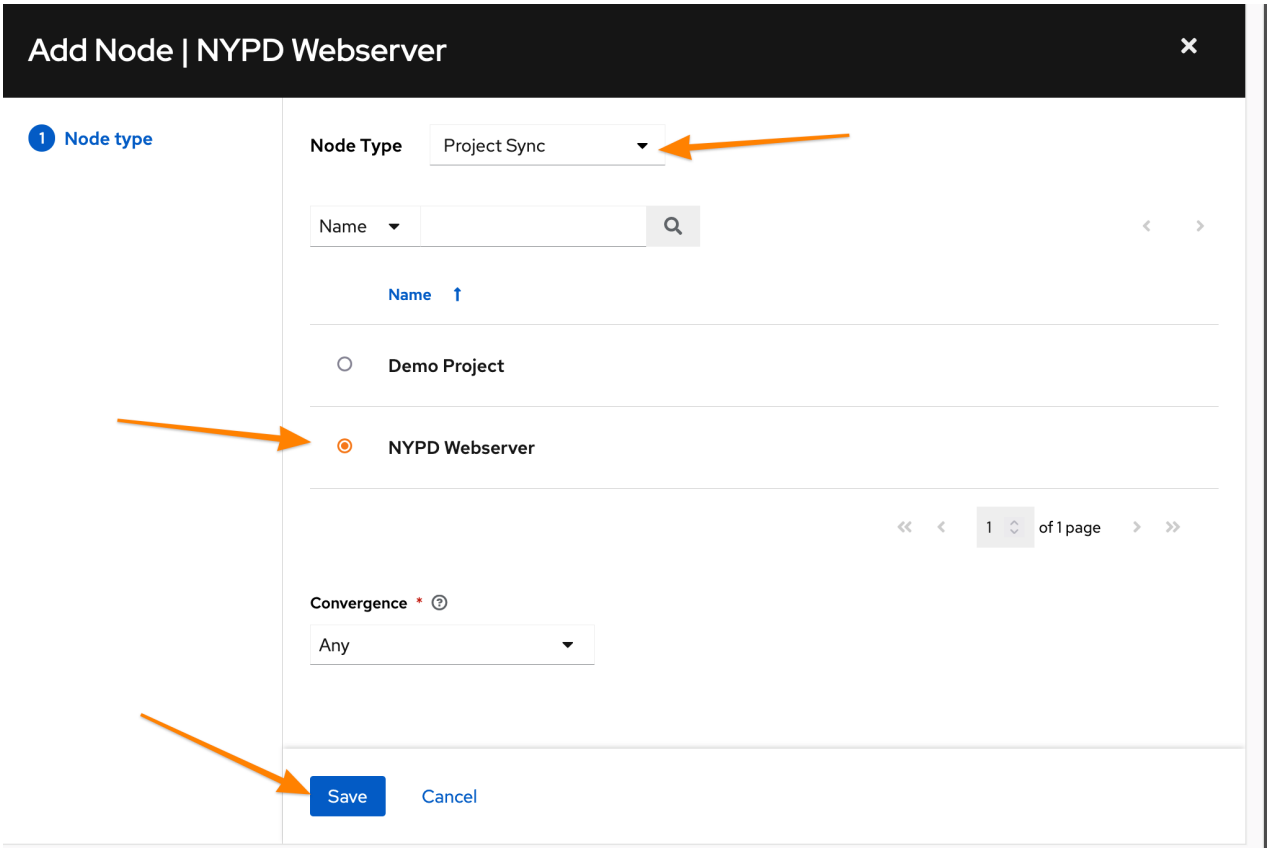

Figure 63. Ansible Controller - Job Workflow Task #1 Synchronize Project Data

9. Add Step #2 to run on **Success** by selecting the NYPD Webserver Project and clicking the **+**.
   a. Select **Run** and **On Success** then click **Next**
   b. Select **Node Type** to be **Job Template** and select the **NYPD Dev Webserver** then click **Save**

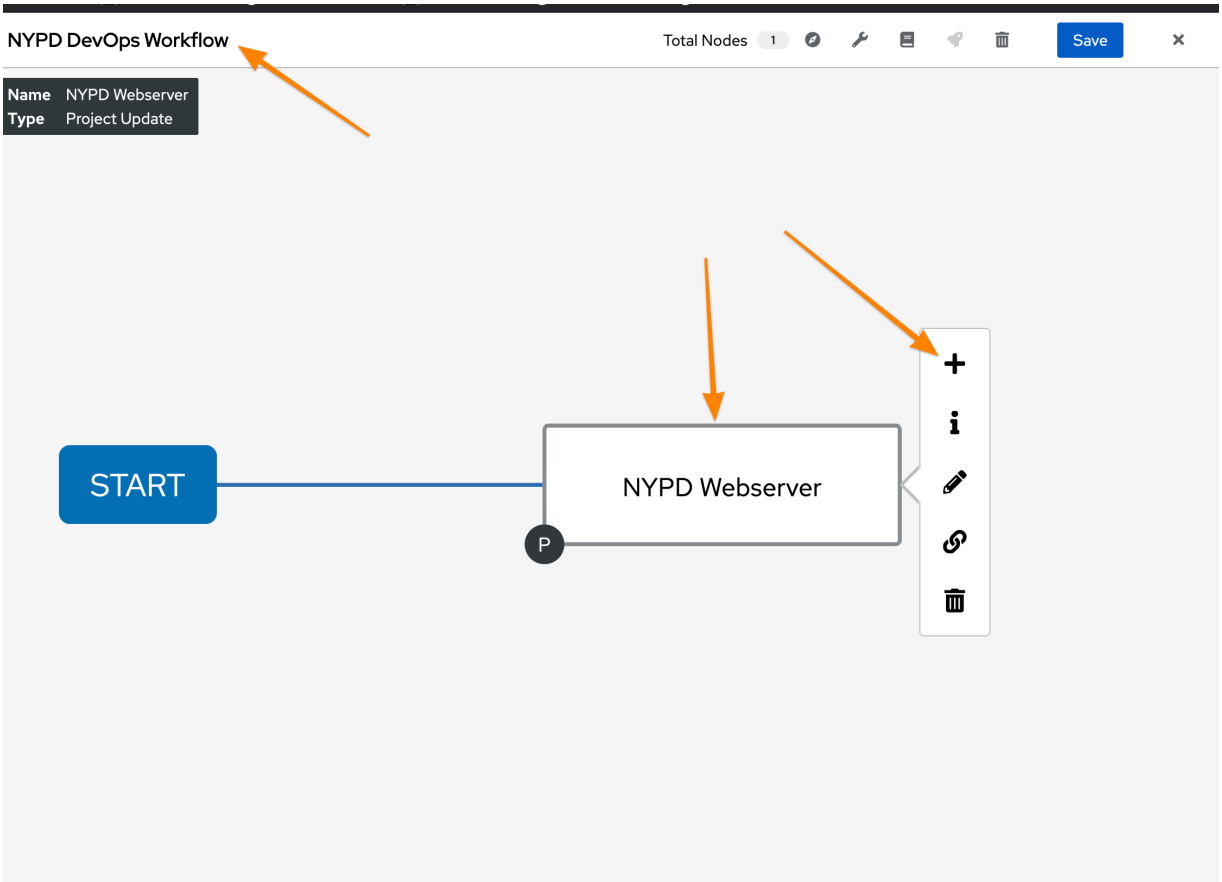

Figure 64. Ansible Controller - Job Workflow Task #2 Launch Development Job

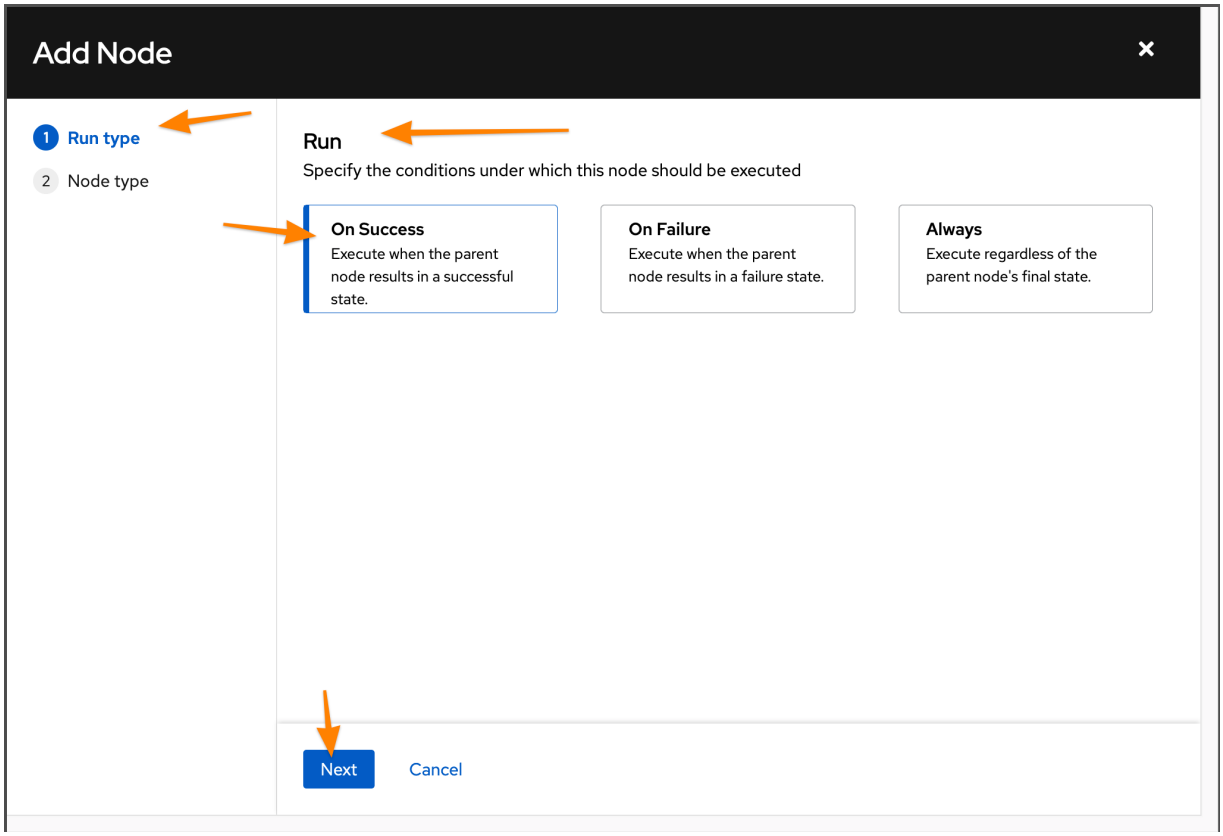

Figure 65. Ansible Controller - Job Workflow Task #2 Selecting Job Run Parameters

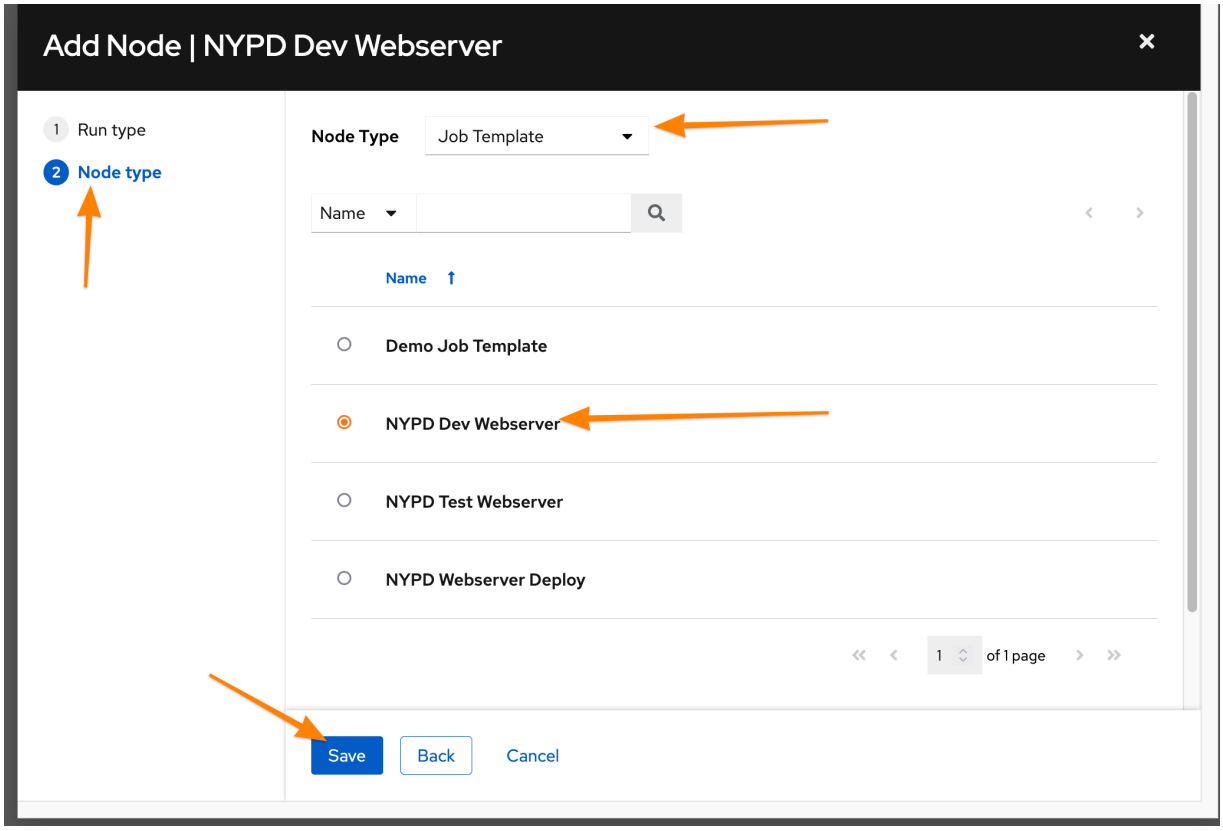

Figure 66. Ansible Controller - Job Workflow Task #2 Selecting Job Template to Run

10. Add Step #3 to run on **Success** by selecting the NYPD Webserver Project and clicking the **+**.
    a. Select **Run** and **On Success** then click **Next**
    b. Select **Node Type** to be **Job Template** and select the **NYPD Test Webserver** then click **Save**

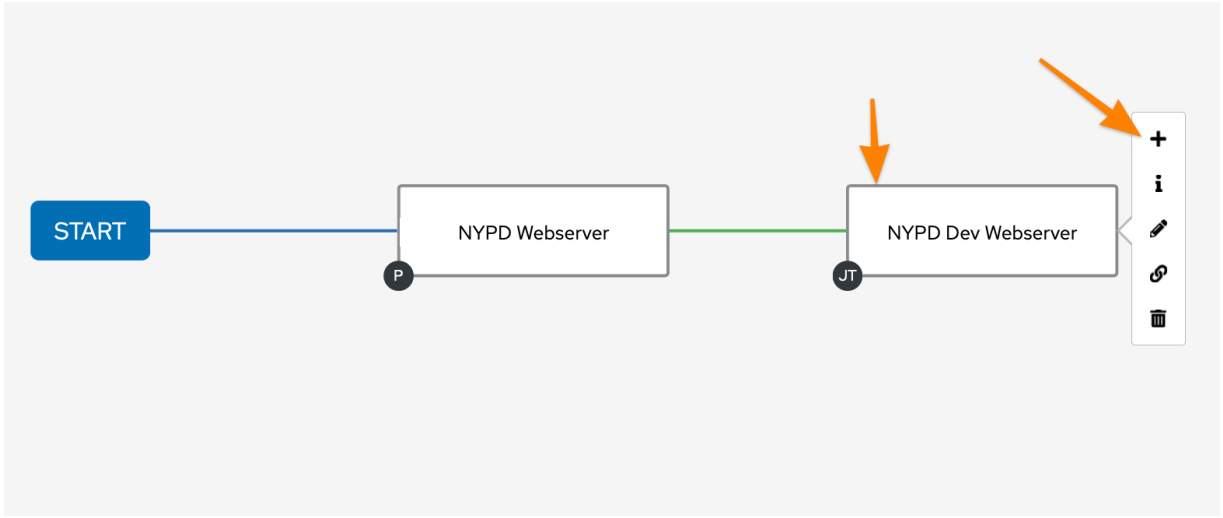

Figure 67. Ansible Controller - Job Workflow Task #3 Launch Development Job

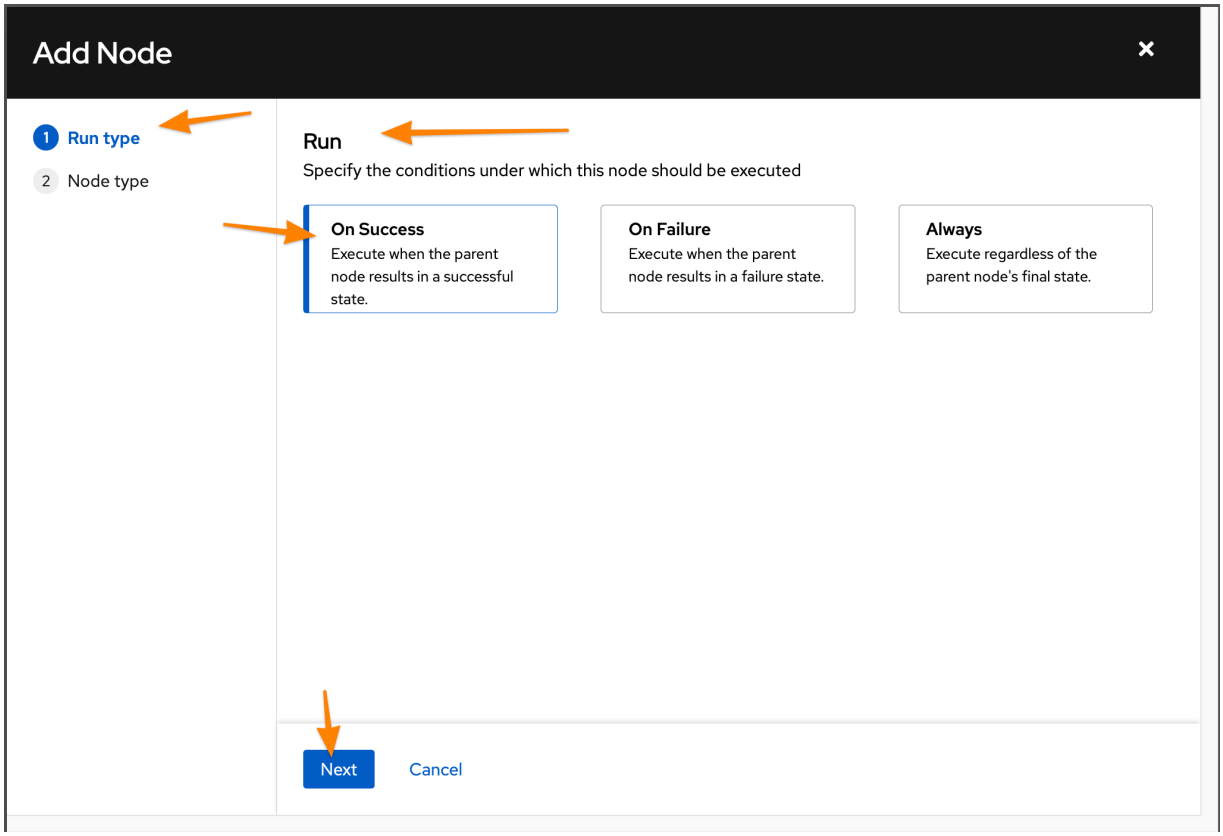

Figure 68. Ansible Controller - Job Workflow Task #3 Selecting Job Run Parameters

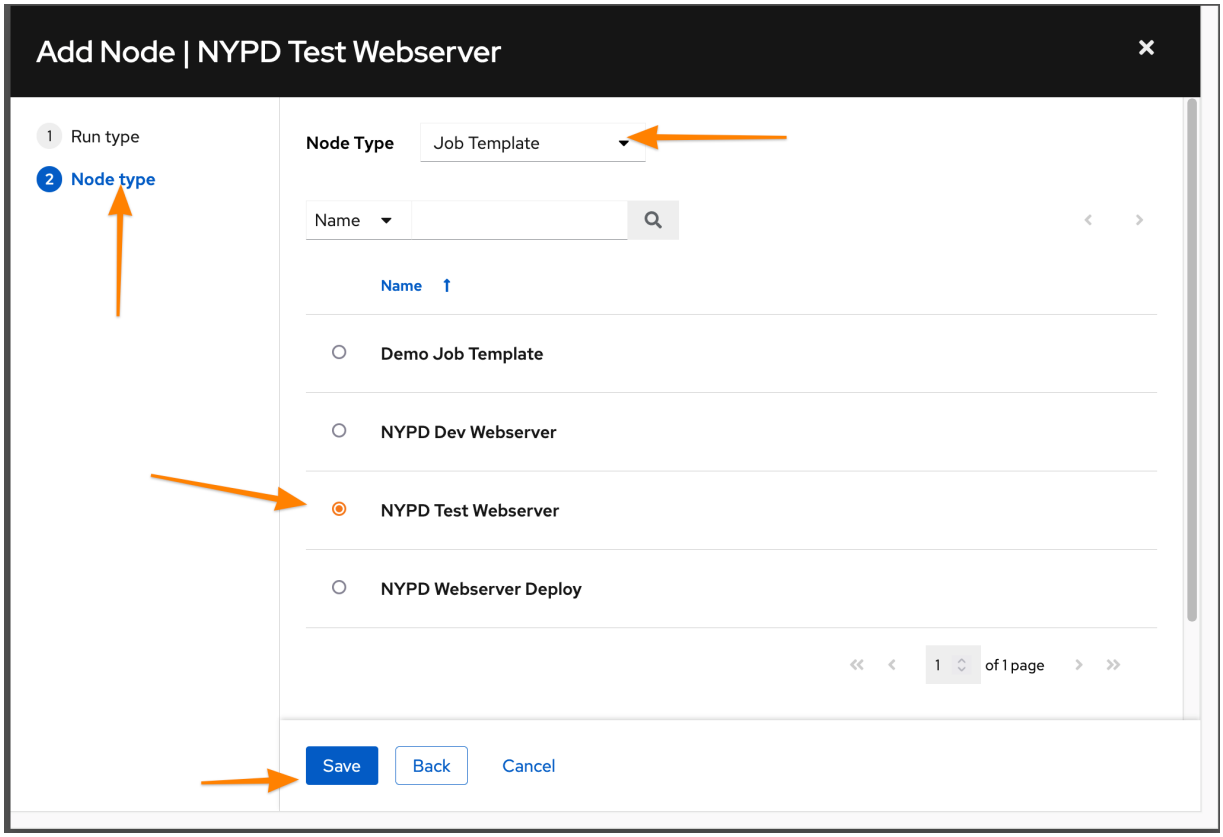

Figure 69. Ansible Controller - Job Workflow Task #3 Selecting Job Template to Run

11. View the complete Job Workflow and click **Save** when done adding steps

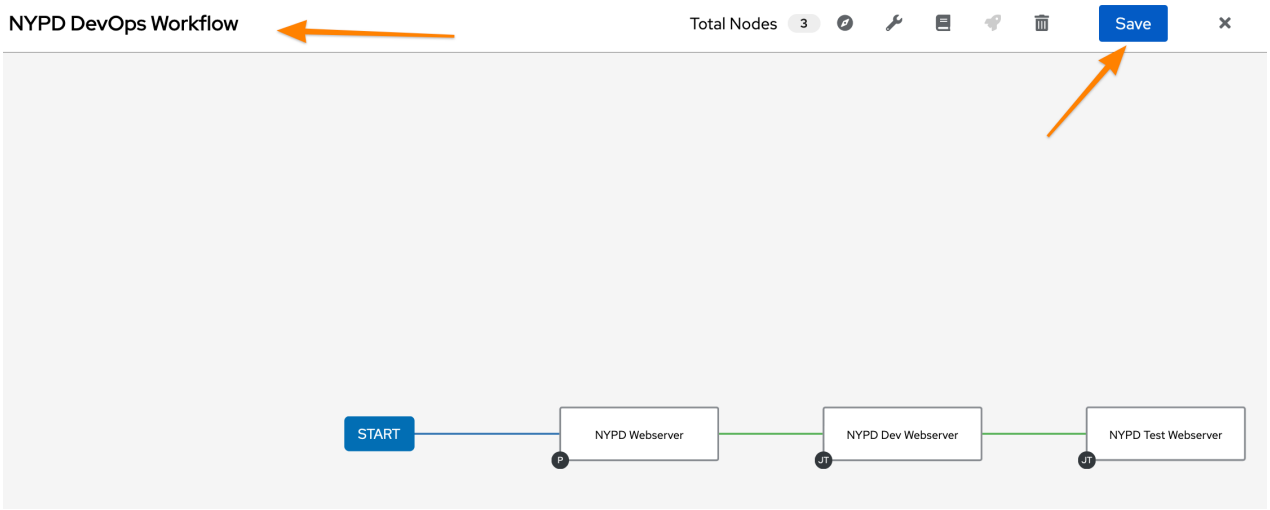

Figure 70. Ansible Controller - Job Workflow Complete Overview

Job Workflows - **Success**, **Failure**, *and* **Always**

It is important to architect workflows properly. In this example, we defined the **SUCCESS** path. In general, you will most likely have failure paths to cleanup environments from failed workflows. This has been left out based on time.

12. Launch job workflow to test by clicking **Launch**

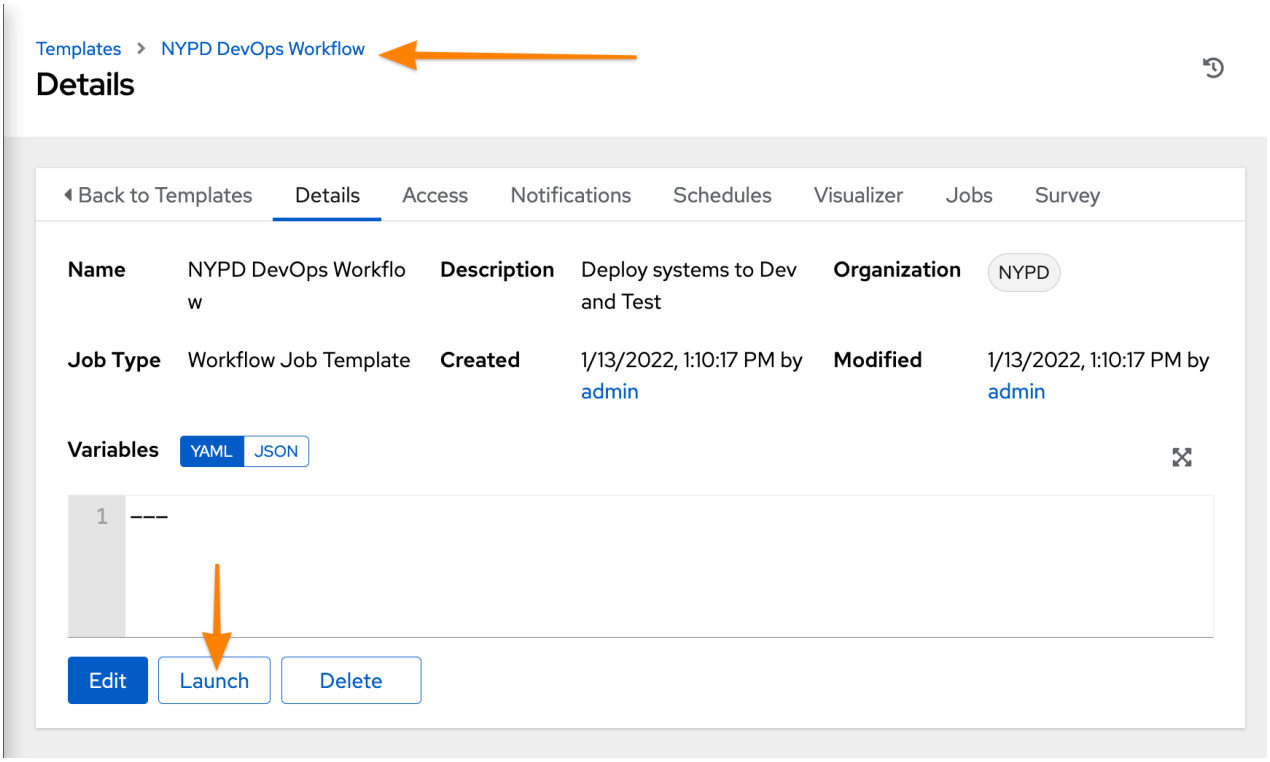

Figure 71. Ansible Controller - Job Workflow Launching

13. View workflow output

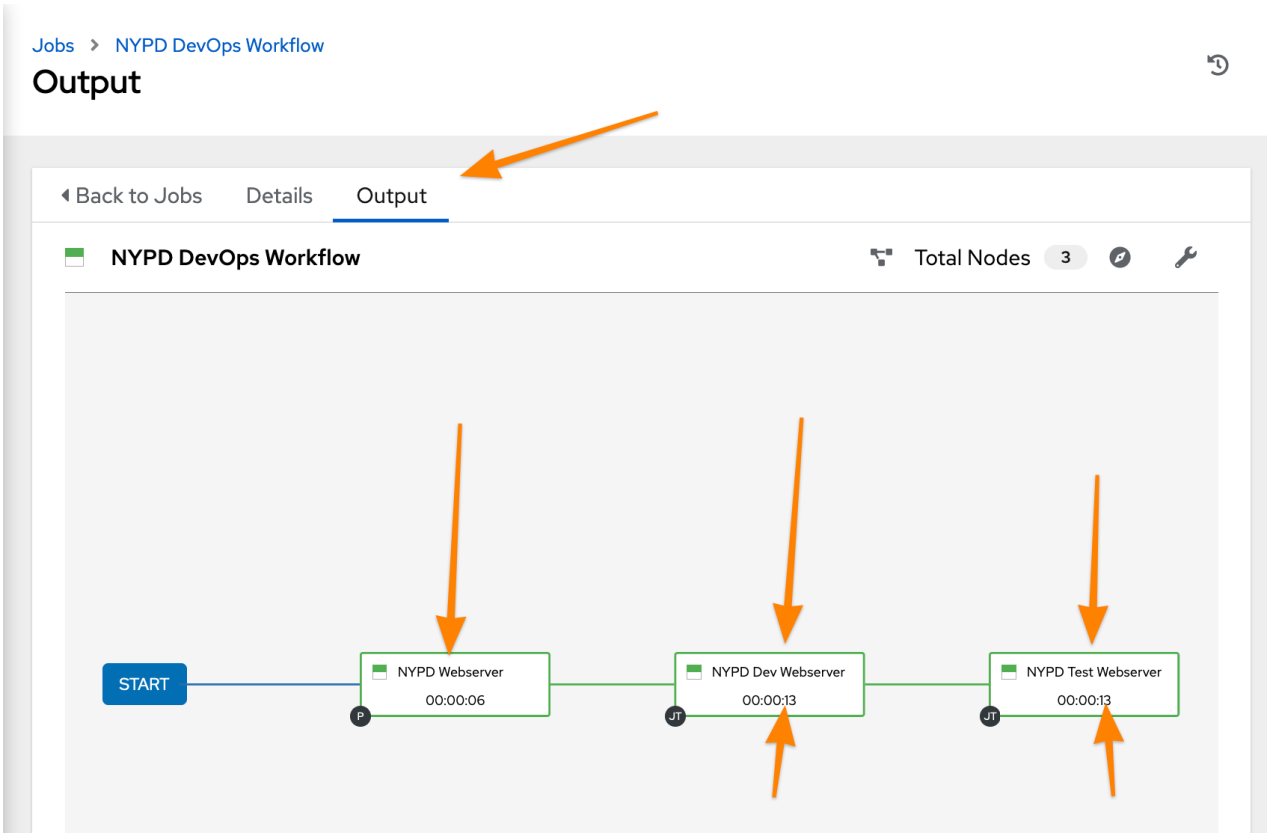

Figure 72. Ansible Controller - Job Workflow Output

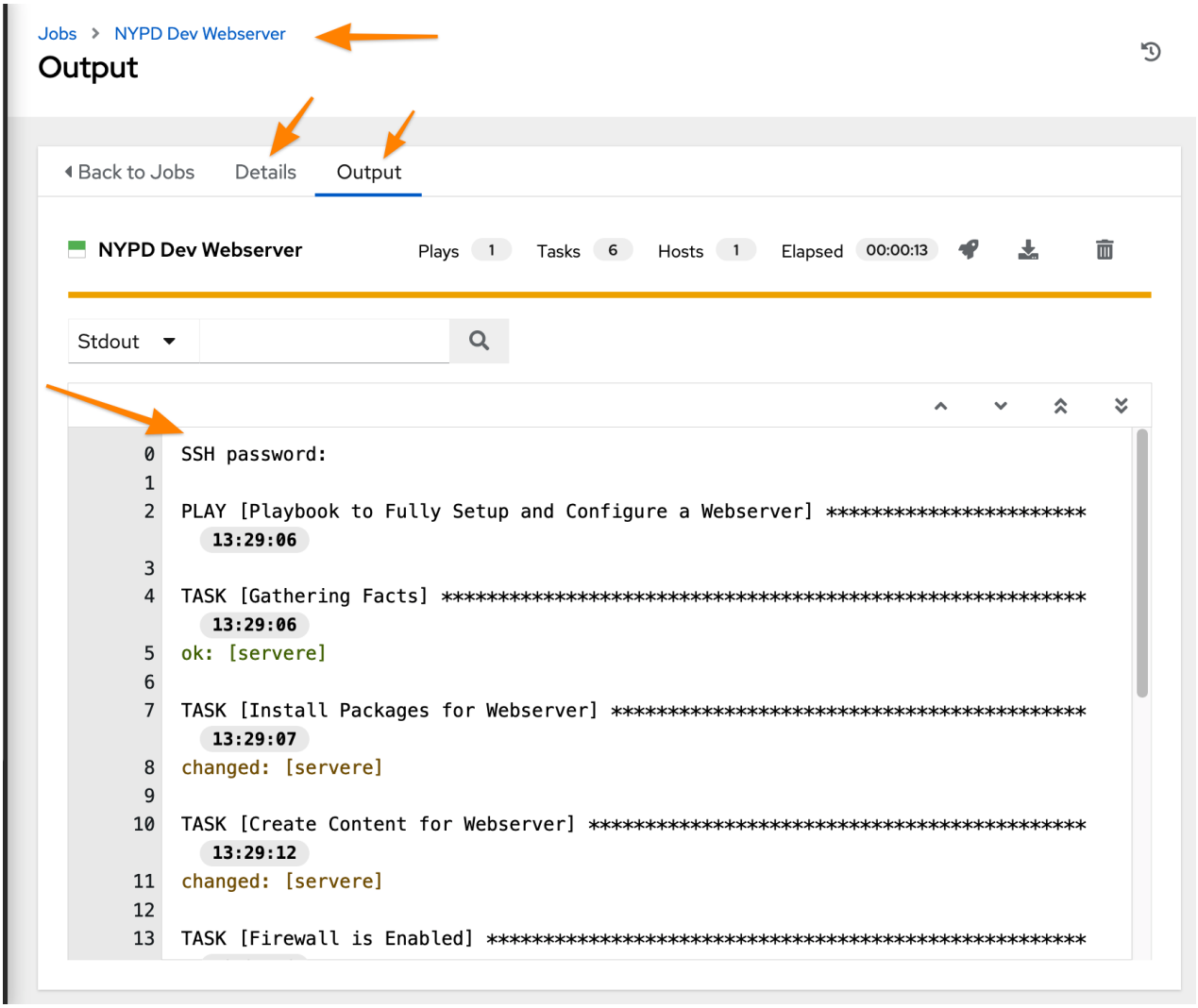

Figure 73. Ansible Controller - Job Workflow Output - Details for Job Template

14. Test from workstation

Listing 18. **Dev Server** *test*

```
[student@workstation ~]$ curl servere
I'm an awesome webserver for the NYPD and I know Castle!!
```

Listing 19. **Test Server** *test*

```
[student@workstation ~]$ curl serverf
I'm an awesome webserver for the NYPD and I know Castle!!
```