Ansible Workshop - Exercises

Projects

Use your Ansible skills to complete a couple of small projects.

Project - Linux automation

To further enhance your Ansible skills, let's **deploy the Prometheus Node exporter to all nodes in the demo environment**.

Prometheus is a systems and service monitoring system. It collects metrics from configured targets at given intervals, evaluates rule expressions, displays the results, and can trigger alerts when specified conditions are observed.

Prometheus collects metrics from targets by scraping metrics HTTP endpoints. **Node Exporter is a specialized monitoring agent** designed for Prometheus that **collects and exposes detailed system-level metrics from host machines.**

Guide

The overall goal of the project is:

- Create an Ansible project *from scratch*
- Find Ansible modules in the documentation and use them in a playbook
- Download a binary archive from the internet to the managed nodes
- Extract a binary from the archive to an executable location on Linux
- Create a Linux service which runs the node exporter binary
- Use Ansible roles

The playbook runs on your Ansible Control Node (*ansible-1*) and targets all managed nodes (*node1*, *node2* and *node3*). **Only the node exporter should be installed and running as a service**, the actual Prometheus server (where the node exporter would send its metrics to) is **not** part of the project.

```
flowchart LR
    prometheusServer["Prometheus Server<br><img
src='https://raw.githubusercontent.com/prometheus/prometheus/b2e63376da7487c32ae4e2ec45434b0f4d8a
db12/documentation/images/prometheus-logo.svg' /><br><b>Not part of project!</b>"]
    style prometheusServer fill:#bbf,stroke:#f66,stroke-width:2px,color:#fff,stroke-dasharray: 5
5
    controller["Ansible Control Node<br><img
src='https://raw.githubusercontent.com/ansible/logos/628fad53cb2ca88c40e8c934b1cae146d71ffa09/com
munity-marks/Ansible-Community-Mark-Black.svg' /><br>(ansible-1)"]
    nodeExporterNode1["Node Exporter Service"]
    nodeExporterNode2["Node Exporter Service"]
    nodeExporterNode3["Node Exporter Service"]

    controller -- installs --> nodeExporterNode1 -- sends metrics --> prometheusServer
    controller -- installs --> nodeExporterNode2 -- sends metrics --> prometheusServer
    controller -- installs --> nodeExporterNode3 -- sends metrics --> prometheusServer
    subgraph node1 [node1]
    nodeExporterNode1
    end
    subgraph node2 [node2]
    nodeExporterNode2
    end
    subgraph node3 [node3]
    nodeExporterNode3
    end
```

Step 1 - Prepare project

Create a new project folder in your home directory:

```
[student@ansible-1 ~]$ mkdir prometheus_node_exporter
```

Create a **new inventory file**, it should define multiple groups, one for the *test environment*, one for all hosts in the *prod environment* and a *parent* group which targets all hosts.

Group name	Parent group	Description
`prometheus`		This group includes the groups `prometheus_test` and `prometheus_prod`
`prometheus_test`	`prometheus`	Holds `node1` only
`prometheus_prod`	`prometheus`	Holds `node2` **and** `node3`

Take a look at the Ansible inventory documentation, especially on how to create parent/child group relationships.

Create a small Ansible configuration file (`ansible.cfg`) and instruct Ansible to always use the inventory you just created.

For example, you may check your inventory with the `ansible-inventory` CLI utility:

```
[student@ansible-1 ~]$ ansible-inventory --list --yaml
all:
  children:
    prometheus:
      children:
        prometheus_prod:
          hosts:
            node2:
              hostname: node2.example.com
            node3:
              hostname: node3.example.com
        prometheus_test:
          hosts:
            node1:
              hostname: node1.example.com
```

Info

As you can see, no inventory was provided in the CLI call (e.g. with `-i inventory`), but the correct inventory is used.

Now, create a **new playbook file**, it should include a *play* which targets the `prometheus_test` group.

Tip

Do not target the `prometheus` group (yet).
Develop and test your automation against the *test environment* first, once everything is stable, you may target all nodes (**this is done in Step 5**).

Achieve the following tasks:

- Inventory file created
- All necessary groups created and nodes in correct groups
- Configuration file created which sets the correct inventory source
- Playbook created which target the *test environment*

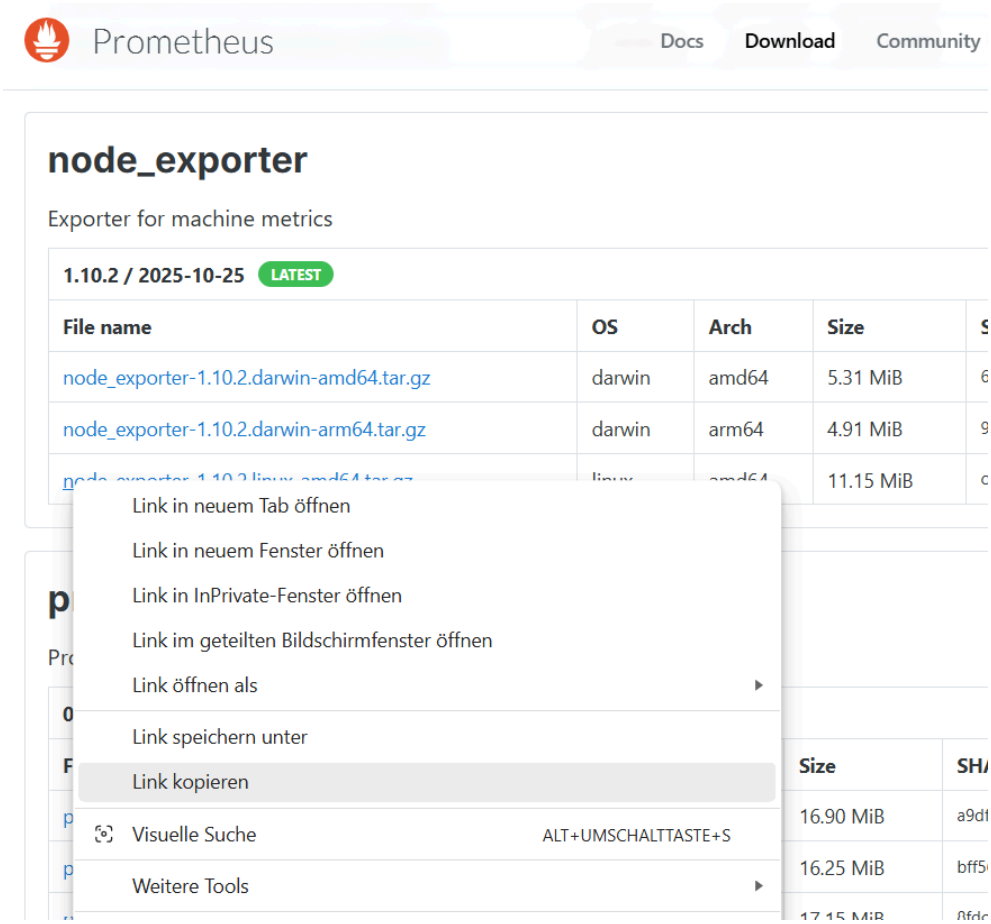
Step 2 - Download and extract Node exporter

The Prometheus Node exporter installation basically follows this guide:

1. Download the Node Exporter tarball (find the latest version tag on the releases page)
2. Extract/unarchive the tarball
3. Run the binary (done in the next step).

Add Ansible Tasks to achieve the first two steps.

The download link can be obtained from the Prometheus Download Page, right-click the tarball with `*linux-amd64.tar.gz` and choose copy link.



The content of the archive looks something like this (here the tarball was downloaded to `/tmp` and extracted):

```
$ ls -l /tmp/node_exporter-1.10.2.linux-amd64/
total 22400
-rw-r--r-- 1 node_exporter 1002    11357 Oct 25 20:10 LICENSE
-rw-r--r-- 1 node_exporter 1002      463 Oct 25 20:10 NOTICE
-rwxr-xr-x 1 node_exporter 1002 22919216 Oct 25 20:06 node_exporter # (1)!
```

1. This is the Node Exporter binary!

As you can see, the tarball was extracted into a folder with the basename of the archive (in the example `node_exporter-1.10.2.linux-amd64`), inside are three files, with the `node_exporter` binary as the most important one.

Achieve the following tasks:

- Module(s) identified to download und unarchive tarball
- Tarball is downloaded and unarchived on the managed node (via Ansible)

Step 3 - Create Linux Service for Node exporter

The Node Exporter should run as a Linux SystemD service under the user `prometheus_metrics`. **The username value should be provided as a variable**, define the variable at a location of your choice.

Add a task that creates the user (using the variable), the user should not be able to login (shell should be set to `/sbin/nologin`), a home directory is also not necessary. Use the appropriate parameters of the module.

The following (**incomplete**) service file is missing the *user* and *group* (the same as the value for the *user*). Use it as a *template* and add the missing variables. **The service file should be present at `/etc/systemd/system/node-exporter.service` on the managed node**, use an appropriate module to transfer the file to the managed node.

```
[Unit]
Description=Node Exporter
Wants=network-online.target
After=network-online.target

[Service]
User=
Group=
# Fallback when environment file does not exist
# Fallback when environment file does not exist
Environment=OPTIONS=
EnvironmentFile=-/etc/sysconfig/node_exporter
ExecStart=/usr/local/bin/node_exporter --web.systemd-socket $OPTIONS

[Install]
WantedBy=multi-user.target
```

The service file expects the binary at `/usr/local/bin/node_exporter` (see `ExecStart` parameter), **add a task which moves/copies the binary to the desired location. The binary must belong to the service user** (use the variable) **and be executable** (use `0755` permissions).

The Node Exporter exposes the metrics on Port 9100, you can check this by cURLing the `/metrics` endpoint. Run an ad-hoc command against the managed node with the argument `curl http://localhost:9100/metrics | grep node_`. The command uses a *pipe*, choose the correct module(!), the default module `command` does not support this! Expect an output like this:

```
node1 | CHANGED | rc=0 >>
# HELP node_arp_entries ARP entries by device
# TYPE node_arp_entries gauge
node_arp_entries{device="tap0"} 2
# HELP node_boot_time_seconds Node boot time, in unixtime.
# TYPE node_boot_time_seconds gauge
node_boot_time_seconds 1.772612313e+09
# HELP node_context_switches_total Total number of context switches.
# TYPE node_context_switches_total counter
node_context_switches_total 5.9358839e+07
# HELP node_cooling_device_cur_state Current throttle state of the cooling device
# TYPE node_cooling_device_cur_state gauge
node_cooling_device_cur_state{name="0",type="Processor"} 0
...
```

- User created without home directory and login shell
- Service File present under `/etc/systemd/system/node-exporter.service`
- Node Exporter binary present under `/usr/local/bin`
- Playbook runs successful
- Node exporter service is running and exporting metrics

Step 4 - Re-format project to role structure

All Ansible projects should use the role structure, if your project does not already uses it, now is the time to rearrange your content.
Create a `roles` folder and an appropriately named sub-folder for the node exporter deployment with all necessary folder and files.
Change your playbook to use your role, e.g.:

```
---
# This is the main Playbook for the 'Prometheus Node Exporter Deployment' Project

- name: Deploy Prometheus Node Exporter on all managed nodes
  hosts: prometheus
  roles:
    - node_exporter
```

Make sure everything works by executing your playbook again.

> **Tip**
>
> **Your playbook should target the `prometheus` group now.**
> If you created the tasks in *idempotent* manner, you should see green Ok states on node1 and yellow Changed states for node2 and node3.

As a nice to have, your role should use **multiple** tasks files, otherwise you'll only copy the playbook tasks into the tasks file of the role.

> **Success**
>
> Create two additional task files (next to the `main.yml`), one for the download and extraction tasks and another one which sets up and starts the node exporter service.

The `main.yml` tasks file should only import the two other task file.

Achieve the following tasks:

- Project uses Ansible role structure
- Playbook references role and targets the `prometheus` group
- Playbook runs successful

Optional, but recommended:

- Role uses multiple tasks files

Step 5 - Bonus: Upload project to Github

Create a new project in your personal Github account and commit your Ansible project.

Step 6 - Bonus: Run your project within AAP

Create a new project in AAP, reference your node exporter project from Github as the code source. Create a template and run your playbook.