

Deep dive on Ansible collections for network automation

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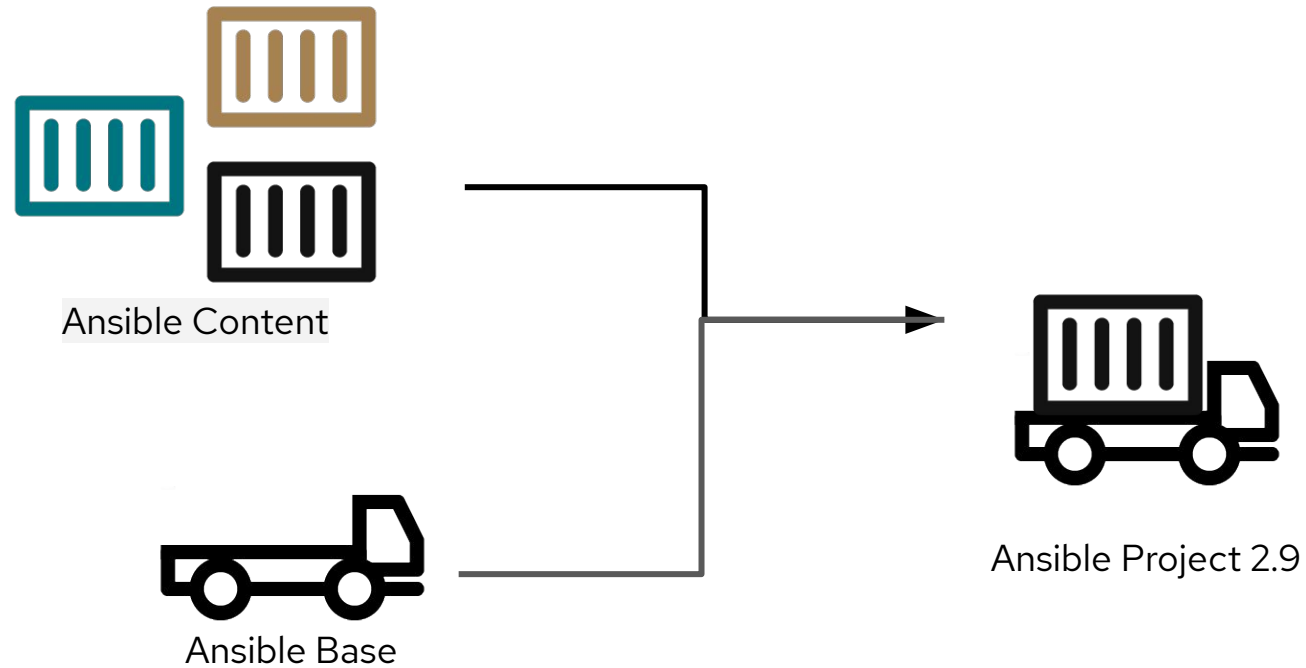
About me

- Works as Principal Software Engineer with Ansible Content Engineering team.
- Software developer with 13+ years of experience
- Worked extensively on network management plane to develop software features for automation and programmability
- Co-organiser of Ansible Pune, India meetup

Agenda

- Why and what is Ansible collection?
- Ansible Network collections
- Network specific Ansible plugins
- Using an existing network collection
- Creating your collections with network specific Ansible plugins
 - terminal
 - cliconf
 - netconf
 - httpapi
- Demo

Why Ansible collection?

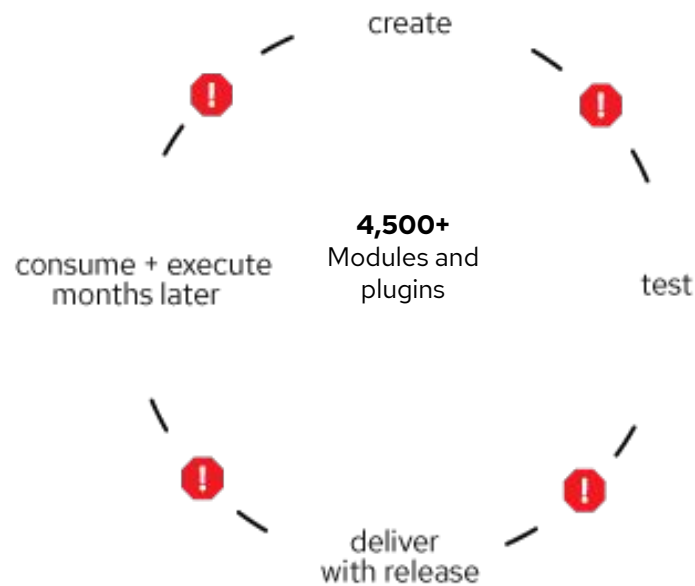


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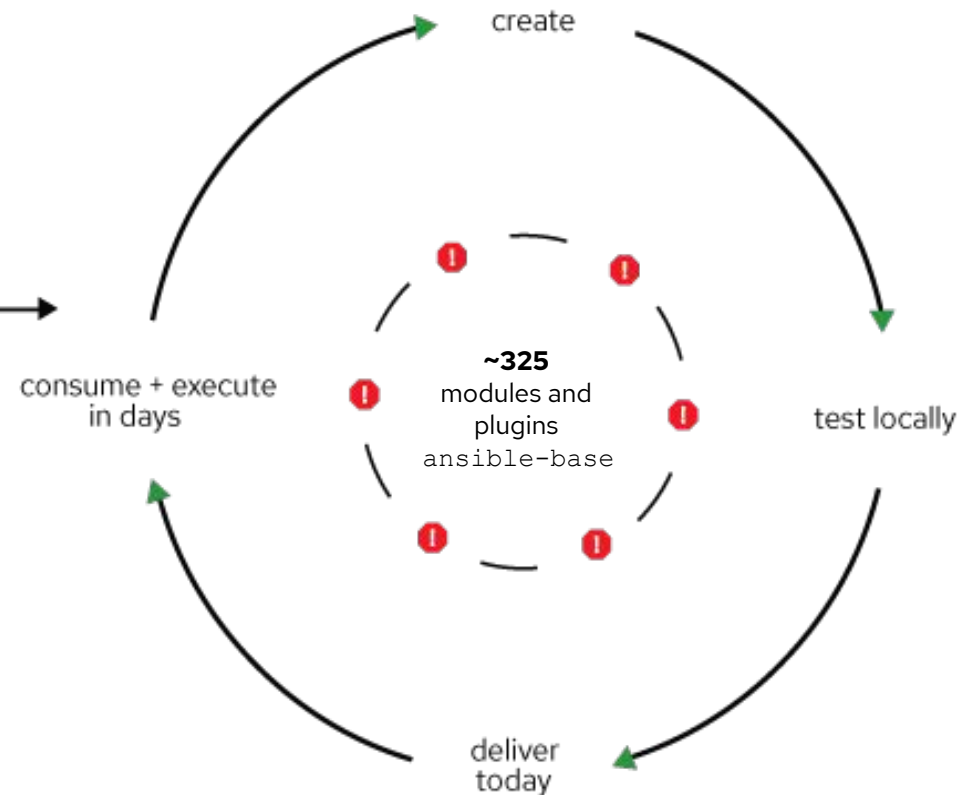
Why Ansible collection?

Separate Ansible from the content



Single monolithic: 3-6 months release cycle

deconstructed model
Ansible
2.9 → 2.10

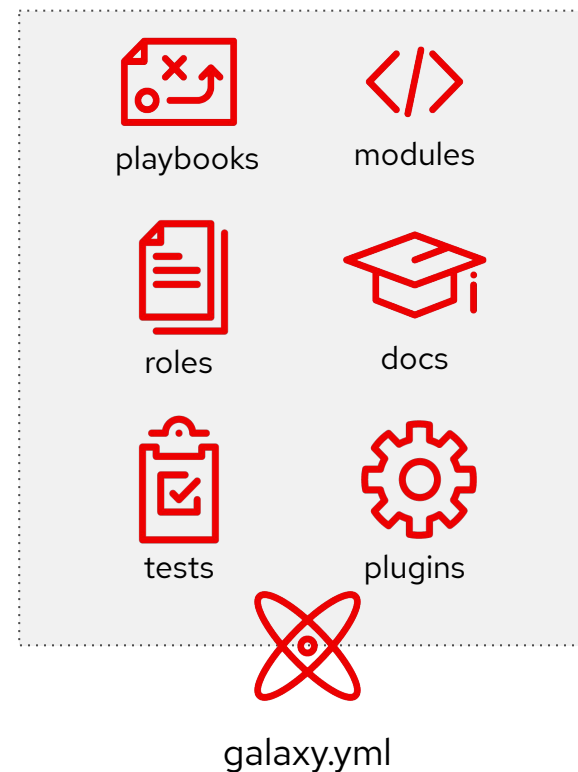


inner circle: slower release cycle (ansible-base)
outer circle: faster release cycle (content in collections)

What is Ansible collection?

What is in it?

- Components are well defined, there is a standard for the directory structure
- Requires same standard of documentation that the Ansible Project does
- Scaffolding can be created with Ansible Galaxy command



What is Ansible collection?

Directory Structure

- **docs/**: local documentation for the collection
- **galaxy.yml**: source data for the MANIFEST.json that will be part of the collection package
- **playbooks/**: playbooks reside here
 - **tasks/**: this holds 'task list files' for include_tasks/import_tasks usage
- **plugins/**: all ansible plugins and modules go here, each in its own subdir
 - **modules/**: ansible modules
 - **modules_utils/** util code for modules and other plugins
 - **lookups/**: lookup plugins
 - **filters/**: Jinja2 filter plugins
 - **connection/**: connection plugins required if not using default
- **roles/**: directory for ansible roles
- **tests/**: tests for the collection's content

Where do I get it?

Ansible Galaxy

galaxy.ansible.com

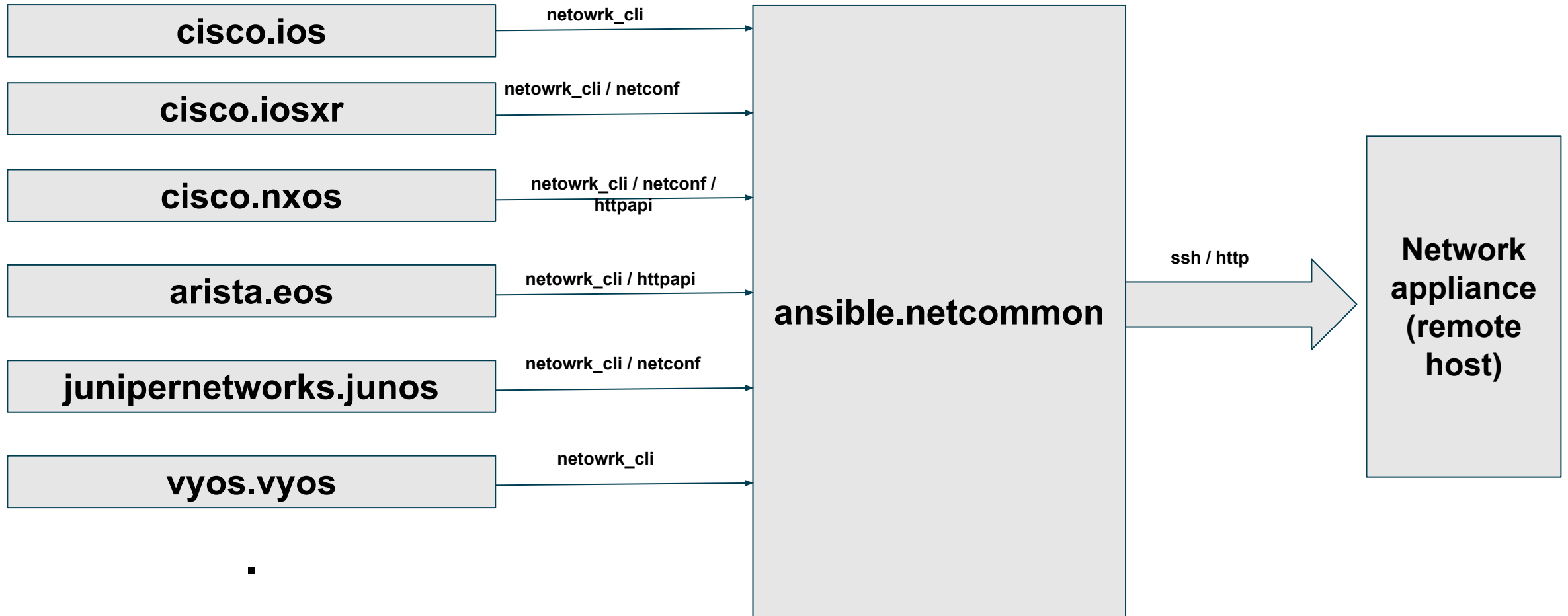
- Community supported
- Extended to leverage Collections framework
- “Latest and greatest”

Ansible Automation Hub

cloud.redhat.com

- Certified, jointly supported by Red Hat and Partner
- Access to advanced analytics
- “Slow and steady”

Ansible network collections



<https://github.com/ansible-collections>

Using an existing network collection

How do I install it?

Install an Ansible Collection:

```
ansible-galaxy collection install cisco.ios
```

This installs (by default) into:

```
~/.ansible/collections/ansible_collections
```

Using an existing network collection (example)

Platform agnostic modules using **ansible.netcommon.network_cli** connection plugin

```
----
- hosts: ios
  vars:
    ansible_connection: ansible.netcommon.network_cli
    ansible_network_os: cisco.ios.ios

  tasks:
    - name: run operational mode command
      ansible.netcommon.cli_command:
        command: show version
      register: result

    - name: run configuration mode command
      ansible.netcommon.cli_config:
        config: "{{ item }}"
      loop:
        - interface GigabitEthernet1/0/11
        - shutdown
      register: result
```

- Platform collection implements **cliconf** and **terminal** plugins (more on this in later slides) to work with network_cli connection type

Using an existing network collection (example)

Platform specific modules using **ansible.netcommon.network_cli** connection plugin

```
----
- hosts: ios
  vars:
    ansible_connection: ansible.netcommon.network_cli
    ansible_network_os: cisco.ios.ios

  tasks:
    - name: Merge interface configuration
      cisco.ios.ios_interfaces:
        config:
          - name: GigabitEthernet0/2
            description: Configured by Ansible
            enabled: true
        state: merged
      register: result
```

- Platform collection implements **cliconf** and **terminal** plugins (more on this in later slides) to work with network_cli connection type

Creating your own collection

Create an Ansible Collection:

```
ansible-galaxy collection init myorg.nos
```

```
$ tree myorg
```

```
myorg
```

```
└── nos
```

```
    ├── docs
```

```
    ├── galaxy.yml
```

```
    ├── plugins
```

```
        └── README.md
```

```
    ├── README.md
```

```
    └── roles
```

Ansible network specific plugins

- **terminal plugin:**
 - Should be implemented for the platform collection to work with *ansible.netcommon.network_cli* connection type.
 - This plugin controls the terminal parameters of the host after remote login is successful for eg. privilege escalation

Ansible network specific plugins

```
$cat myorg/nos/plugins/terminal/nos.py
```

```
class TerminalModule(TerminalBase):  
    terminal_stdout_re = [...]  
    terminal_stderr_re = [...]  
  
    def on_open_shell(self):...  
  
    def on_become(self, passwd=None):...  
  
    def on_unbecome(self):...
```

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Ansible network specific plugins

- **cliconf plugin:**
 - Should be implemented for the platform collection to work with *ansible.netcommon.network_cli* connection type.
 - This plugin abstracts low level command execution calls within the connection plugin and expose set to API's to the module code

Ansible network specific plugins

```
$cat myorg/nos/plugins/cliCONF/nos.py
```

```
from ansible.plugins.cliCONF import CliCONFBase, enable_mode
```

```
class CliCONF(CliCONFBase):
```

```
    @enable_mode
```

```
    def get_CONFIG(self, source='running', flags=None, format=None):...
```

```
    @enable_mode
```

```
    def edit_CONFIG(self, candidate=None, commit=True, replace=None, comment=None):...
```

```
1 def get_diff(self, candidate=None, running=None, diff_match='line', diff_ignore_lines=None, path=None, diff_replace='line'):
```

```
    def get(self, command=None, prompt=None, answer=None, sendonly=False, output=None, newline=True, check_all=False):...
```

```
    def get_device_info(self):...
```

```
    def get_capabilities(self):...
```

```
    def run_commands(self, commands=None, check_rc=True):...
```

Ansible network specific plugins

- **netconf plugin:**

- Should be implemented for the platform collection to work with ***ansible.netcommon.netconf*** connection to support vendor specific netconf RPC's.
- For example in case of junos the proprietary RPC methods are implemented in ***"junipernetworks/junos/plugins/netconf/junos.py"*** and value of ***"ansible_network_os"*** is set the name of the netconf plugin file, that is ***"junipernetworks.junos.junos"*** in this case.
- If the network device support standard netconf (RFC 6241) operation like "get", "get-config", "edit-config" etc set the value of ***"ansible_network_os"*** to ***"ansible.netcommon.default"***
- ***"ansible.netcommon.netconf_get"***, ***"ansible.netcommon.netconf_config"*** and ***"ansible.netcommon.netconf_rpc"*** modules can be used to talk to netconf enable remote host.

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Ansible network specific plugins

```
$cat ansible/nos/plugins/netconf/nos.py
```

```
from ansible.plugins.netconf import NetconfBase
```

```
class Netconf(NetconfBase):
```

```
    def load_configuration(self, format='xml', action='merge',  
                           target='candidate', config=None):...
```

```
    def compare_configuration(self, rollback=0):...
```

```
    def reboot(self):...
```

Ansible network specific plugins

```
$cat ansible/lib/ansible/plugins/netconf/__init__.py
```

```
from ansible.plugins import AnsiblePlugin
class NetconfBase(AnsiblePlugin):
    def get_config(self, source=None, filter=None):...
    def get(self, filter=None, with_defaults=None):...
    def edit_config(self, config=None, format='xml', target='candidate',
                    default_operation=None, test_option=None, error_option=None):...
    def validate(self, source='candidate'):...
    def copy_config(self, source, target):...
    def lock(self, target="candidate"):...
    def unlock(self, target="candidate"):...
    def discard_changes(self):...
    def commit(self, confirmed=False, timeout=None, persist=None):...
    def get_schema(self, identifier=None, version=None, format=None):...
    def delete_config(self, target):...
    def get_capabilities(self):...
```

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Ansible network specific plugins

- **httpapi plugin:**
 - Should be implemented for the platform collection to work with ***ansible.netcommon.httpapi*** connection.
 - Can be implemented for remote host that supports http and not specific for networking
 - A well-constructed httpapi plugin should take in structured data and return structured data.

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Ansible network specific plugins

```
$cat myorg/nos/plugins/httpapi/nos.py
```

```
class HttpApi(HttpApiBase):
    def __init__(self, connection):...

    def set_become(self, become_context):...

    def login(self, username, password):...

    def logout(self):...

    def update_auth(self, response, response_text):...

    def handle_httperror(self, exc):...

    def send_request(self, data, **message_kwargs):...
```

Creating your own collection

```
$tree myorg/  
myorg/  
|-- nos  
|   |-- README.md  
|   |-- docs  
|   |-- galaxy.yml  
|   |-- plugins  
|       |-- README.md  
|       |-- cliconf  
|       |   |-- nos.py  
|       |-- httpapi  
|       |   |-- nos.py  
|       |-- netconf  
|       |   |-- nos.py  
|       |-- terminal  
|       |   |-- nos.py  
|-- roles
```


Building and installing your own collection

Building an Ansible Collection:

```
[user@rhel8 ~]$ cd /home/user/myorg/nos
```

```
[user@rhel8 ~]$ ansible-galaxy collection build  
Created collection for myorg.nos at  
/home/user/myorg/nos/myorg-nos-1.0.0.tar.gz
```

Install Ansible Collection from local file:

```
[user@rhel8 ~]$ ansible-galaxy collection install myorg-nos-1.0.0.tar.gz  
myorg-nos-1.0.0.tar.gz  
Process install dependency map  
Starting collection install process  
Installing 'myorg-nos:1.0.0' to  
'/home/student1/.ansible/collections/ansible_collections/myorg/nos'
```


Use you new content

Platform agnostic modules using **ansible.netcommon.network_cli** connection plugin

```
- hosts: nos_hosts
  vars:
    ansible_connection: ansible.netcommon.network_cli
    ansible_network_os: myorg.nos.nos

tasks:
- name: run operational mode command
  ansible.netcommon.cli_command:
    command: show version
  register: result
```

Publishing collection to ansible galaxy

```
[user@rhel8 ~]$ $ansible-galaxy collection publish  
myorg-nos-1.0.0.tar.gz --token <API-token from ansible-galaxy>
```

Demo

Questions?

Thank you!