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UNIVERSITY OF WALES
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SWANSEA - ABERTAWE

Applied Computing

Wales Institute of Science and Art (WISA)

Network Programmability (ACCB5029)

Network Device Automation using Ansible

In Class Activity

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Task 1:**Objectives**

1. Understand and Configure Ansible.
2. Configure a Networking device (Router) using Ansible.

Task 2:**Objectives**

1. Create this Topology and enable SSH Connectivity
2. Configure Routers and Switches (Networking Devices) in this topology using Ansible

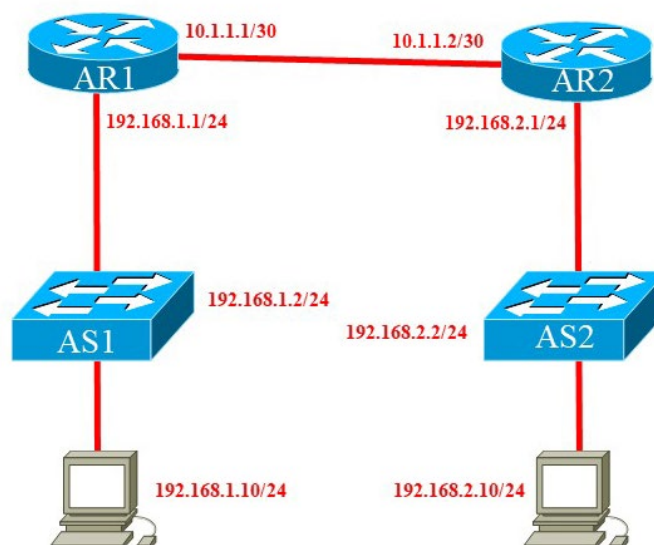
Note:

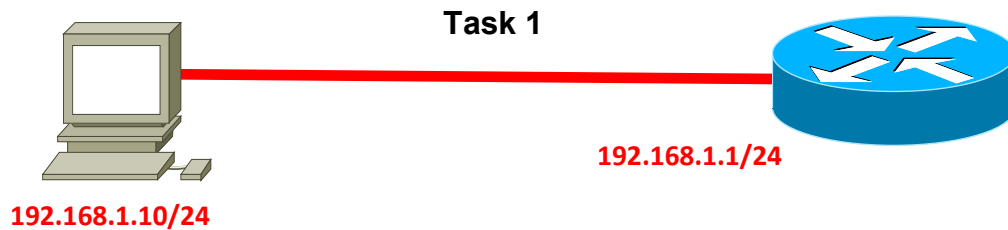
- a. This can be done as a Team Work. Not more than 2 Members in a Team
- b. This work can be used for your Coursework – Implementation Submission

Required Resources

Host computer with Ansible.

2 Cisco Routers and 2 Cisco Switches.





PC 1 is the Ansible Server. R1 is the router that will be Configured via Ansible
(You may use a Router or a Switch for this Task)

Task 1 is done individually. Task 2 can be done as a Team and used for your Coursework – Implementation

1. Setup the Network Topology

- a. Connect the Cables – Make sure you connect appropriate cable
- b. Configure IP Address in the PC – (Not the SOAC Network – The network connecting to the Device)
- c. Connect using Console and configure the IP Address and SSH connection in the router.

```
enable
```

```
configure terminal
```

```
hostname AutomatedR1
```

```
ip domain name accb5029.np
```

```
crypto key generate rsa modulus 1024
```

```
username admin password cisco
```

*# Creating username is very important, as we are using local database
for our VTY line connection.#*

```
line vty 0 4
```

```
login local
```

```
transport input ssh
```

```
ip ssh version 2
```

```
int gi0/0/0
```

```
ip address 192.168.1.1 255.255.255.0
```

```
no shut
```

- d. Ping and Test

- i. Ping from your PC to the router to check the connection.
- ii. SSH from the PC to the router to check the access to the router.

Once your Router is connected via SSH you may not need your console connection.#

- iii. In the Command Prompt: ssh admin@192.168.1.1
- iv. If SSH is not working, Troubleshoot.

2. Configure PC with Ansible

As we are using a Windows PC, we need WSL (Windows Subsystem for Linux) to work with Ansible.

- a. In the Command Prompt, type wsl. (If WSL is not installed, follow this step)

```
Microsoft Windows [Version 10.0.19045.5131]
(c) Microsoft Corporation. All rights reserved.

C:\Users\soac-nk>wsl
Windows Subsystem for Linux has no installed distributions.

Use 'wsl.exe --list --online' to list available distributions
and 'wsl.exe --install <Distro>' to install.

Distributions can also be installed by visiting the Microsoft Store:
https://aka.ms/wslstore
```

- b. In the command prompt, Install WSL.

wsl --install

(Restart if required after installation)

- c. After installing WSL, Open the terminal by typing Wsl in the command prompt. If it is 1st time, you might require to give username and password. Make sure you give your username as user1 and password as user1. *(don't use any other credentials)*

```
Microsoft Windows [Version 10.0.19045.5131]
(c) Microsoft Corporation. All rights reserved.

C:\Users\soac-nk>wsl
Welcome to Ubuntu 24.04.1 LTS (GNU/Linux 5.15.167.4-microsoft-standard-WSL2 x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Tue Nov 26 06:35:28 GMT 2024

System load:  0.0          Processes:            49
Usage of /:   0.3% of 1006.85GB  Users logged in:     0
Memory usage: 1%          IPv4 address for eth0: 172.28.21.107
Swap usage:   0%

This message is shown once a day. To disable it please create the
/home/nitheesh/.hushlogin file.
nitheesh@SC-IQ205-LECT: /mnt/c/Users/soac-nk$
```

- d. Check your User Details

uname -a

- e. Do the basic Packages Installation/Updates

```

sudo apt update
sudo apt install python3-pip -y
sudo apt install software-properties-common python3-pip -y
sudo add-apt-repository ppa:ansible/ansible
sudo apt update
sudo apt install ansible -y
ansible --version
sudo apt install python3-venv -y
python3 -m venv ansible-env
source ansible-env/bin/activate

```

(ansible-env)

pip install ansible

(Note: This installation will take a while depending on the installation)

ansible --version

```

(ansible-env) nitheesh@SC-IQ205-LECT:/mnt/c/Users/soac-nk$ ansible --version
ansible [core 2.18.0]
  config file = /etc/ansible/ansible.cfg
  configured module search path = ['/home/nitheesh/.ansible/plugins/modules', '/usr/share/ansible/plugins/modules']
  ansible python module location = /mnt/c/Users/soac-nk/ansible-env/lib/python3.12/site-packages/ansible
  ansible collection location = /home/nitheesh/.ansible/collections:/usr/share/ansible/collections
  executable location = /mnt/c/Users/soac-nk/ansible-env/bin/ansible
  python version = 3.12.3 (main, Nov  6 2024, 18:32:19) [GCC 13.2.0] (/mnt/c/Users/soac-nk/ansible-env/bin/python3)
  jinja version = 3.1.4
  libyaml = True

```

3. Set your working Folder

It is a best practice to set your working folder for each projects. In case, working as a Team, try to implement CI/CD, Testing and Version Controls as well.

- a. Create a Directory in your Home Folder (I created ar1_basic). You create using your StudentID

```

mkdir ~/ar2025_basic
cd ~/ar2025_basic/
ls
# You don't see any files in the folder

```

4. All Set now. Lets check if your PC can access Router via SSH

```
ssh admin@192.168.1.1
```

```
(ansible-env) nitheesh@cc-10085-lect1:~/ansible_project_1/router-basic$ ssh admin@192.168.1.1
The authenticity of host '192.168.1.1 (192.168.1.1)' can't be established.
RSA key fingerprint is SHA256:Wt3wRnuX3R1j1bcuyCA1iPBPy70j3YoP93lF9dx20.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.1.1' (RSA) to the list of known hosts.
(admin@192.168.1.1) Password:

AutomatedR1>en
Password:
AutomatedR1>
```

If you can't ssh – Troubleshoot. Don't move forward without successfully accessing router via SSH

Exit from the Router

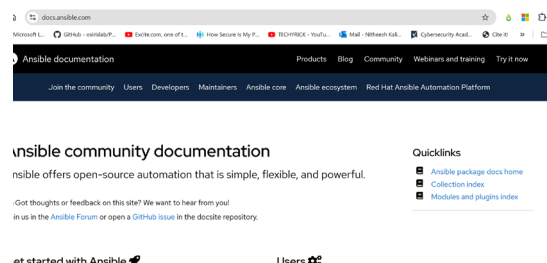
5. Create Host File for Ansible

a. Create a INI File and configure host information

nano inventory.ini

Refer to the Ansible Documentation to create an Inventory File.

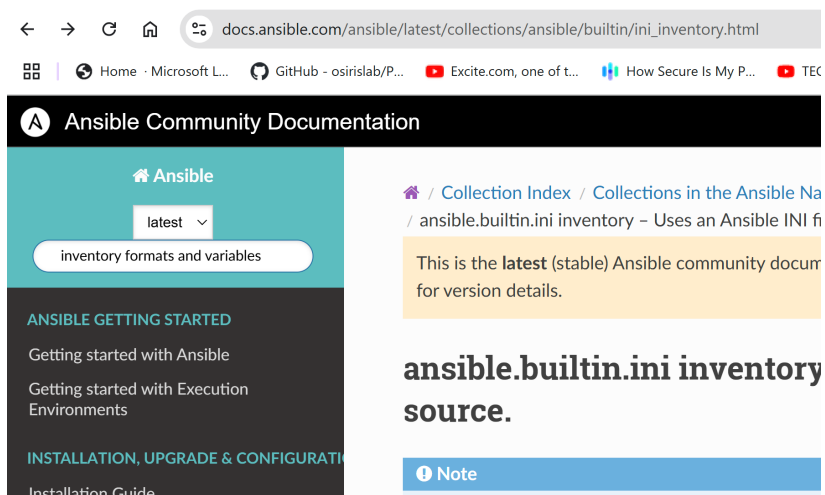
+ <https://docs.ansible.com/>



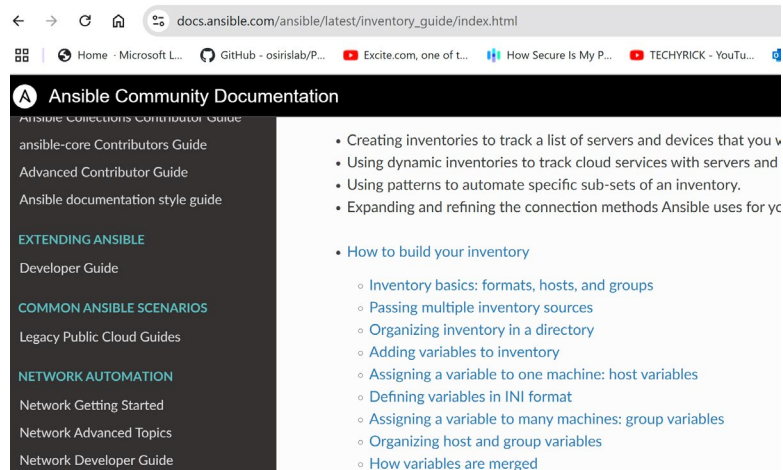
+ Have a look at the resources available.

+ Click on Ansible Package docs home.

○ https://docs.ansible.com/ansible/latest/inventory_guide/index.html



+ Search for Inventory Formats and variables



- + Click on Inventory Basics and refer this to create your Inventory/Host File.
- + You can refer to any ansible documentation to create your automation task.
- + Also, you can use your terminal to refer to documentation
`ansible-doc ios_config`
`# Instead of ios_config you may use any documentation here.`

b. Creating a Inventory Configuration.

`[routers]`

```
192.168.1.1      ansible_user=admin      ansible_password=cisco
ansible_network_os=ios      ansible_connection=network_cli
ansible_become=yes      ansible_become_method=enable
ansible_become_password=cisco123
```

`[rotuers]` - defines a group of hosts named routers.

Groups in Ansible allow you to logically organize your hosts, and you can target the group routers in a playbook.

You specify the IP Address, User Credentials and Privilege Escalation method (enable) in the hosts file/ inventory file.

- c. Once configured, type `Ctrl + O` to save and `Ctrl + X` to exit. You will return to the WSL CLI.

6. Creating your Configurations/ YAML File

Note: # You may use a different editor that supports indentation. Remember YAML requires proper indentation. I am using nano. You may use a different one. Eg:

```
sudo apt install vim
vim --version
vim ~/.vimrc
ls
vim configure_router_basic.yml
In my case, I use nano configure_router_basic.yml
```

a. nano configure_basic_router.yml

- name: Configure Cisco Router Basic Settings

hosts: routers # This is the name you give that is defined for the group in the inventory

gather_facts: no # alternatively, you may give yes to get the system facts

tasks:

- name: Set password length to minimum of 4

ios_config:

lines:

- "security passwords min-length 4"

- name: Set Service Password as Encryption

ios_config:

lines:

- "service password-encryption"

b. Run the Ansible Playbook.

```
ansible-playbook -i inventory.ini configure_basic_router.yml
```

-i here is to say that we are not using the default hosts file. We have created our own inventory file

If you want to check the default hosts file: cat /etc/ansible/hosts

Check your Inventory.ini file:

```
ansible-inventory -i inventory.ini --list
```

Check your all the hosts in your Inventory.ini file is connected:

```
ansible all -m ping -i inventory.ini
```

c. *Your outcome should be:*

```
Required-by:
(ansible-env) nitheesh@SC-IQ205-LECT:~/ansible_project_1_router_basic$ ansible-playbook -i inventory.ini configure_router_basic2.yml

PLAY [Configure Cisco Router Basic Settings] *****

TASK [Set password length to minimum of 4] *****
[WARNING]: ansible-pylibssh not installed, falling back to paramiko
[WARNING]: To ensure idempotency and correct diff the input configuration lines should be similar to how they appear if
present in the running configuration on device
changed: [192.168.1.1]

TASK [Set Service Password as Encryption] *****
changed: [192.168.1.1]

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

7. *To check your understanding, can you add the following to your configuration*

- a. *Add Login Banner*
- b. *MOTD Banner*
- c. *Show version for AR1 (Router)*
- d. *Show IP interface Brief*

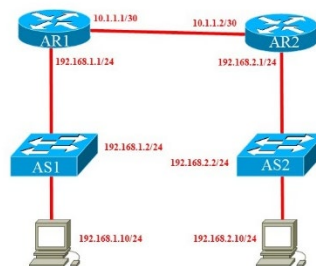
Task 2:

Note:

- This can be done as a Team Work. Not more than 2 Members in a Team
- This work can be used for your Coursework – Implementation Submission

Required Resources

Host computer with Ansible. 2 Cisco Routers and 2 Cisco Switches.



What is expected?

Initial Setup:

- IP Address, SSH, Static Routing.*
- Make sure all the devices ping each other. Don't forget to give VLAN Interface IP and Default Gateway for your Switches*

Automation:

Basic Configurations like Console Configuration, Banners, Show commands, Dynamic Routing (RIP), Password Encryption etc.

If you are submitting this as your Task, try to fit in CI/CD, Version Control, Post your codes in GitHub and give access to your Lecturer.

All the Best!!!

Merry Christmas!!! Happy New Year 2026!!!

End of document. But, a beginning to Network Automation!!! – **Dr. Nitheesh Kaliyamurthy**

