

Workshop

Building Containerlab with cEOS-lab

How to build a lab environment
with Containerlab and cEOS-lab

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CONTAINERlab

Credits and References

Credits to [Roman Dodin](#) and [other cLab contributors](#) for making the world a better place!

This repository is based on many awesome open source repositories and some free/commercial Github features:

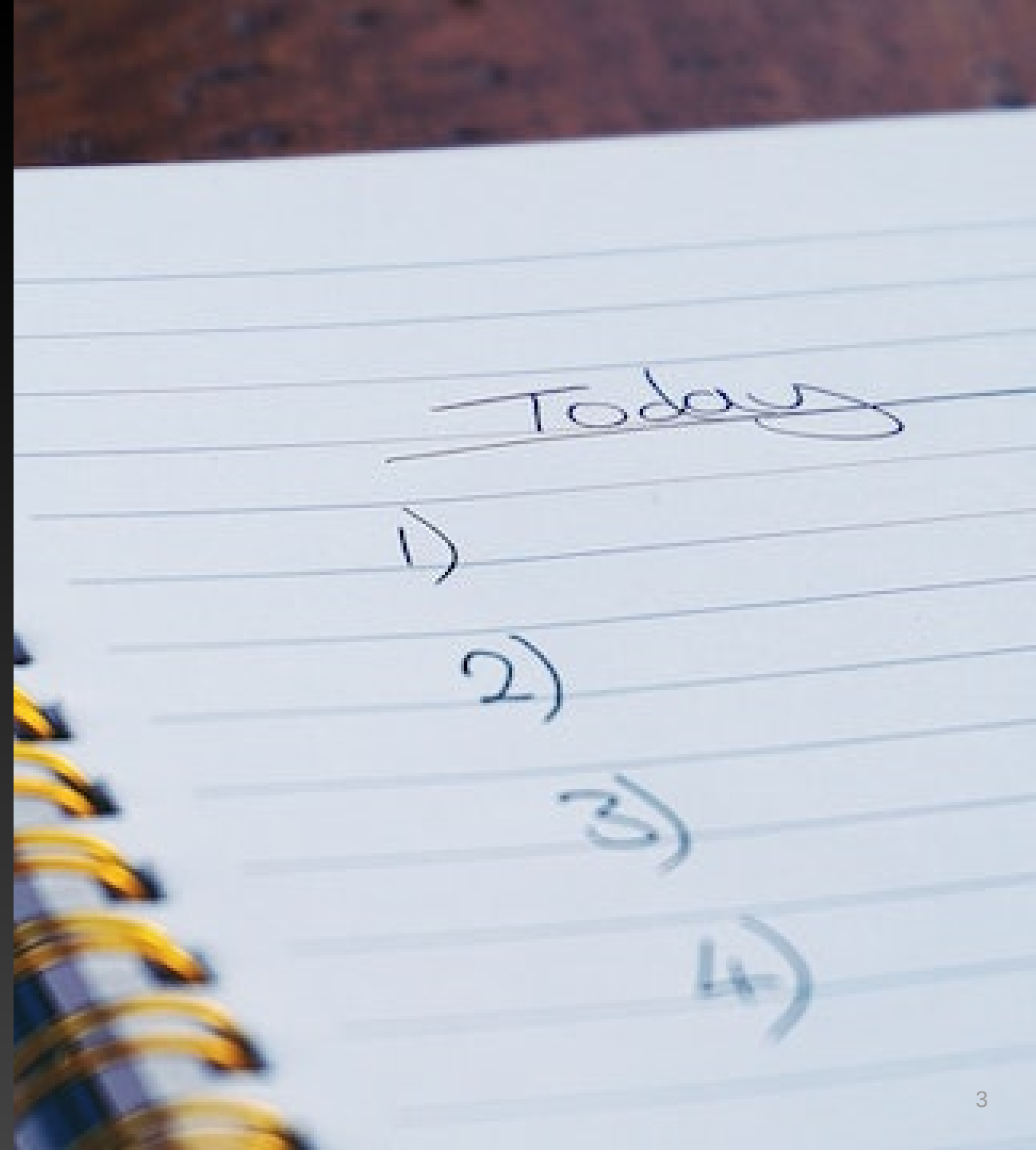
- [Containerlab](#)
- [VS Code](#)
- [DevContainers](#)
- [Marp](#)
- [Excalidraw VS Code Plugin](#)
- [Github Actions](#)
- [Github Pages](#)
- [Github Codespaces](#)
- [Carbon](#)
- And many more...

All photos are taken from [Pexels](#) and [Unsplash](#). Excellent free stock photos resources. It's not possible to reference every author individually, but their work is highly appreciated.

Agenda

- Setup Docker on the host
- Install Containerlab and import cEOS-lab image
- Clone this repository and deploy the lab
- Inspect and destroy the lab
- Deploy the lab with a custom startup config
- Make a packet capture
- cLab in a Container
- Possible caveats

This workshop is a step-by-step guide explaining how to build a lab environment with [Containerlab](#) and Arista cEOS-lab. It is focusing on essential and cEOS-lab specific features. Please check [Containerlab documentation](#) for details.



Prerequisites

- This workshop requires:
 - Ubuntu LTS 22.04 or later
 - 8 GB RAM and 4 vCPUs
- Only x86 architecture is supported. It is technically possible to [run Container lab on ARM](#), but there are no network images available for ARM as of Aug 2023.
- You can use [Github Codespaces](#) or [VSCode devcontainer](#) for this workshop. The detailed procedure is described in the appendix.
- The appendix also provides instructions for creating a KVM VM with Ubuntu Cloud Image.
- There is also Vagrant file available in this repository. Use it at your own risk.

Setup Docker on the Host

Check if Docker is already installed. In this case you can skip the steps below.

1. Install Docker on the host. The detailed instructions are available [here](#). You can use one-liner script for that.
2. Add your user to the `docker` group.
3. Logout and login again to apply the changes.
4. Check the Docker version and run `hello-world` container to test functionality.

```
# install Docker
sudo curl -fsSL https://get.docker.com | sh
# add user to the docker group
sudo usermod -aG docker ${USER}
# test docker
docker --version
docker run hello-world
```

Setup Git (Optional)

- Git must be pre-installed. Otherwise you are in a wrong place. Escape! 🐙 🚀
- Setup your name and email address:

```
git config --global user.name "<first-and-2nd-name>"  
git config --global user.email "<your-email>"
```

- Check the current configuration:

```
git config --list
```

Clone this Repository

```
$ cd ${HOME}
$ git clone https://github.com/arista-netdevops-community/building-containerlab-with-ceos.git
Cloning into 'building-containerlab-with-ceos'...
remote: Enumerating objects: 198, done.
remote: Counting objects: 100% (198/198), done.
remote: Compressing objects: 100% (120/120), done.
remote: Total 198 (delta 109), reused 152 (delta 66), pack-reused 0
Receiving objects: 100% (198/198), 1.31 MiB | 6.59 MiB/s, done.
Resolving deltas: 100% (109/109), done.
$ ls | grep ceos
building-containerlab-with-ceos
$ cd building-containerlab-with-ceos
```

Download cEOS-lab Image

1. Login to [Arista Software Download](#) portal. You need to have an account to download the image.
2. Select `EOS > Active Releases > 4.30 > EOS-4.30.2F > cEOS-lab`.
3. Download `cEOS-lab-4.30.2F.tar.xz` image.
4. Upload the image to your lab VM. For example, you can use SFTP to transfer the image:

```
sftp ${REMOTE_USER}@${UBUNTU_VM_IP}:/home/${REMOTE_USER}/${IMAGE_DIR} <<< $'put cEOS-lab-4.30.2F.tar*'
# for example:
# sftp user@10.10.10.11:/home/user/images <<< $'put cEOS-lab-4.30.2F.tar*'
```

NOTE: if you are using Vagrant, add the image to `.gitignored` directory. It will be automatically copied to the VM.

If Github Codespace is used and token is set, the image will be pulled from arista.com automatically.

EOS

Active Releases

4.30

EOS-4.30.2F

vEOS-lab

Docs

cEOS-lab

`cEOS-lab-4.30.2F.tar.xz`

`cEOS-lab-4.30.2F.tar.xz.json`

`cEOS-lab-4.30.2F.tar.xz.md5sum`

`cEOS-lab-4.30.2F.tar.xz.sha512sum`

`cEOS64-lab-4.30.2F.tar.xz`

`cEOS64-lab-4.30.2F.tar.xz.json`

`cEOS64-lab-4.30.2F.tar.xz.md5sum`

`cEOS64-lab-4.30.2F.tar.xz.sha512sum`

Import cEOS-lab Image

1. Go to the directory with the uploaded image and import the image:

```
docker import cEOS-lab-4.30.2F.tar.xz ceos-lab:4.30.2F
```

NOTE: you can also import the image with the tag latest to allow quick "upgrade" of those lab where specific version is not required: `docker tag ceos-lab:4.30.2F ceos-lab:latest`

2. Confirm that the image was imported successfully:

```
$ docker image ls
```

REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
ceos-lab	4.30.2F	21b540a4a343	45 minutes ago	1.95GB
ceos-lab	latest	21b540a4a343	45 minutes ago	1.95GB
hello-world	latest	b038788ddb22	3 months ago	9.14kB

Install Containerlab

- It's just a one-liner:

```
bash -c "$(curl -sL https://get.containerlab.dev)"
```

- Refer to the [Containerlab quick start documentation](#) for the details.

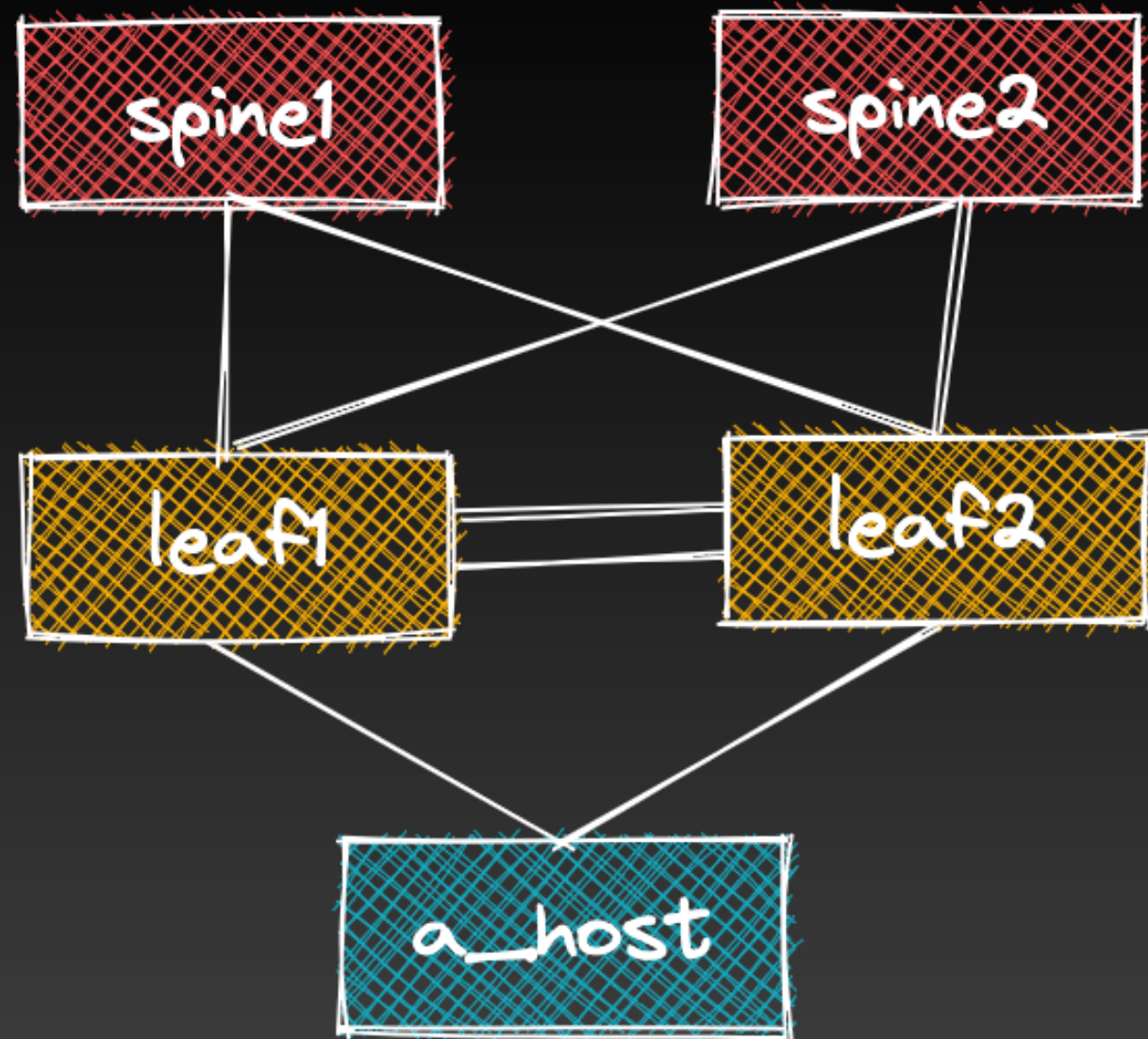
Deploy The Lab

- Inspect `default_cfg.clab.yml` and deploy the lab:

```
sudo containerlab deploy --debug --topo default_cfg.clab.yml
```

- This command will deploy Containerlab with the default EOS configuration provided by Containerlab. The `--debug` flag is optional, but provides additional information while Containerlab is starting.

NOTE: If there is a single `.clab.yml` file in the current directory, it is possible to use `sudo containerlab deploy` command without specifying the topology file. As we have multiple files in the directory, we must specify the topology explicitly.



Inspect the Lab

Once the lab is ready, you'll see a table with the list of deployed containers, their host names and management IPs:

#	Name	Container ID	Image	Kind	State	IPv4 Address	IPv6 Address
1	clab-ceos-lab-a_host	421665f3e67f	ceos-lab:latest	ceos	running	192.168.123.100/24	N/A
2	clab-ceos-lab-leaf1	a7f7c80aa90f	ceos-lab:latest	ceos	running	192.168.123.21/24	N/A
3	clab-ceos-lab-leaf2	142ab91f0ceb	ceos-lab:latest	ceos	running	192.168.123.22/24	N/A
4	clab-ceos-lab-spine1	22464060dcf8	ceos-lab:latest	ceos	running	192.168.123.11/24	N/A
5	clab-ceos-lab-spine2	3f53d1de7add	ceos-lab:latest	ceos	running	192.168.123.12/24	N/A

You can call the table again any time with `sudo clab inspect -t default_cfg.clab.yml`.

Containerlab creates corresponding entries in the `/etc/hosts` file as well:

```
$ cat /etc/hosts | grep -i clab-
##### CLAB-ceos-lab-START #####
192.168.123.22 clab-ceos-lab-leaf2
192.168.123.11 clab-ceos-lab-spine1
192.168.123.12 clab-ceos-lab-spine2
192.168.123.100 clab-ceos-lab-a_host
192.168.123.21 clab-ceos-lab-leaf1
##### CLAB-ceos-lab-END #####
```

You can also list containers using docker command:

```
$ docker container ls
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS        PORTS        NAMES
22464060dcf8   ceos-lab:latest "bash -c '/mnt/flash..." 5 minutes ago  Up 5 minutes                clab-ceos-lab-spine1
3f53d1de7add   ceos-lab:latest "bash -c '/mnt/flash..." 5 minutes ago  Up 5 minutes                clab-ceos-lab-spine2
a7f7c80aa90f   ceos-lab:latest "bash -c '/mnt/flash..." 5 minutes ago  Up 5 minutes                clab-ceos-lab-leaf1
421665f3e67f   ceos-lab:latest "bash -c '/mnt/flash..." 5 minutes ago  Up 5 minutes                clab-ceos-lab-a_host
142ab91f0ceb   ceos-lab:latest "bash -c '/mnt/flash..." 5 minutes ago  Up 5 minutes                clab-ceos-lab-leaf2
```

Access cEOS-lab CLI

There are few options to access cEOS-lab CLI:

- SSH to the container. For ex.:

```
# the default login is `admin` and password is `admin`  
ssh admin@clab-ceos-lab-leaf1
```

- Connect to the "console" using Docker command. For ex.: `docker exec -it clab-ceos-lab-leaf1 cli`

NOTE: `docker exec -it clab-ceos-lab-leaf1 bash` allows to connect directly to the switch shell.

Execute few command to confirm that cEOS-lab is functioning:

- `show version`
- `show lldp neighbors`
- `show running-config`