Workshop

Building Containerlab with cEOS-lab

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

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```

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:

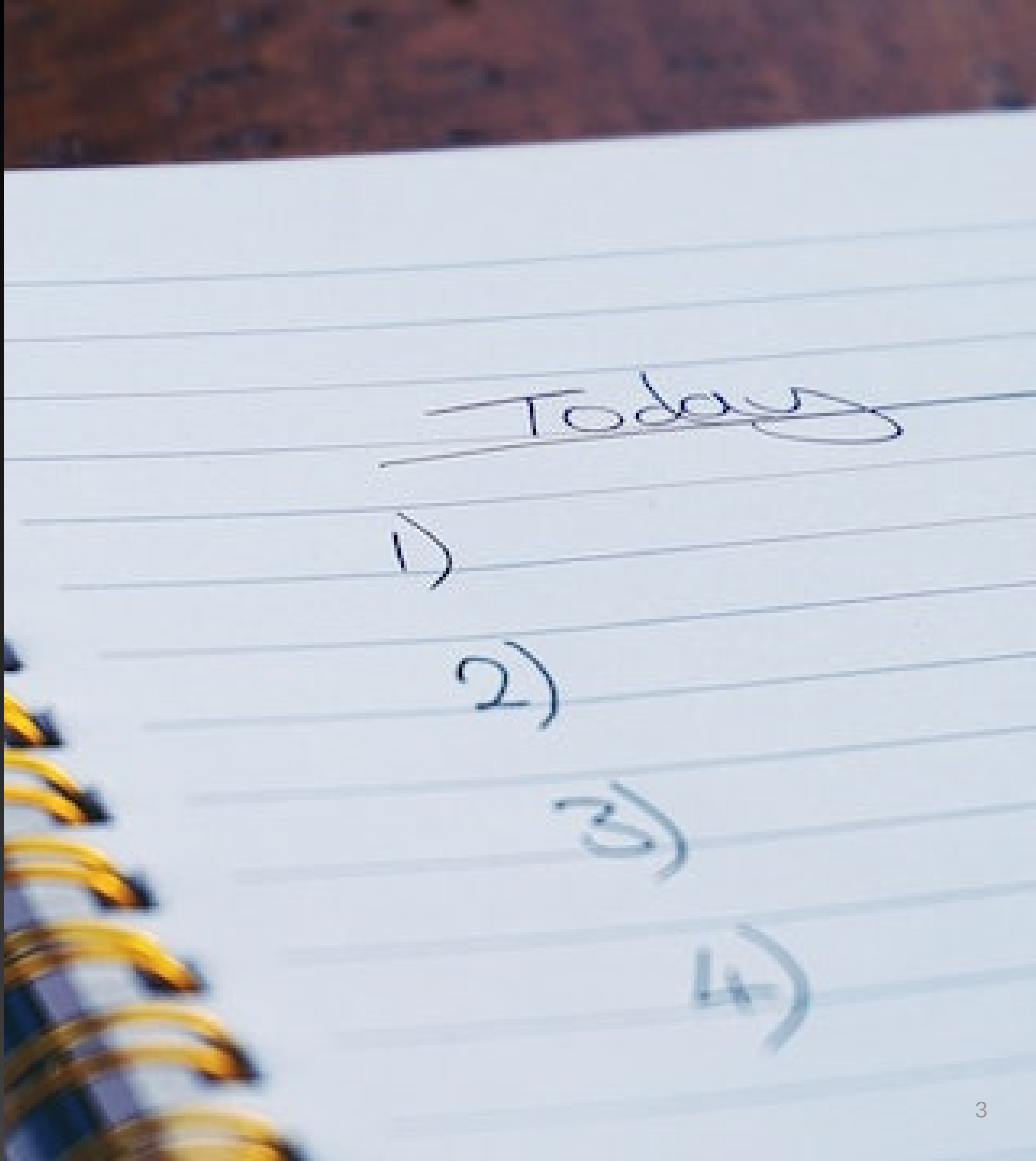
- Containerlab
- VS Code
- DevContainers
- Marp
- Excalidraw VS Code Plugin
- Github Actions
- Github Pages
- Github Codespaces
- Carbon
- And many more...

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 used 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

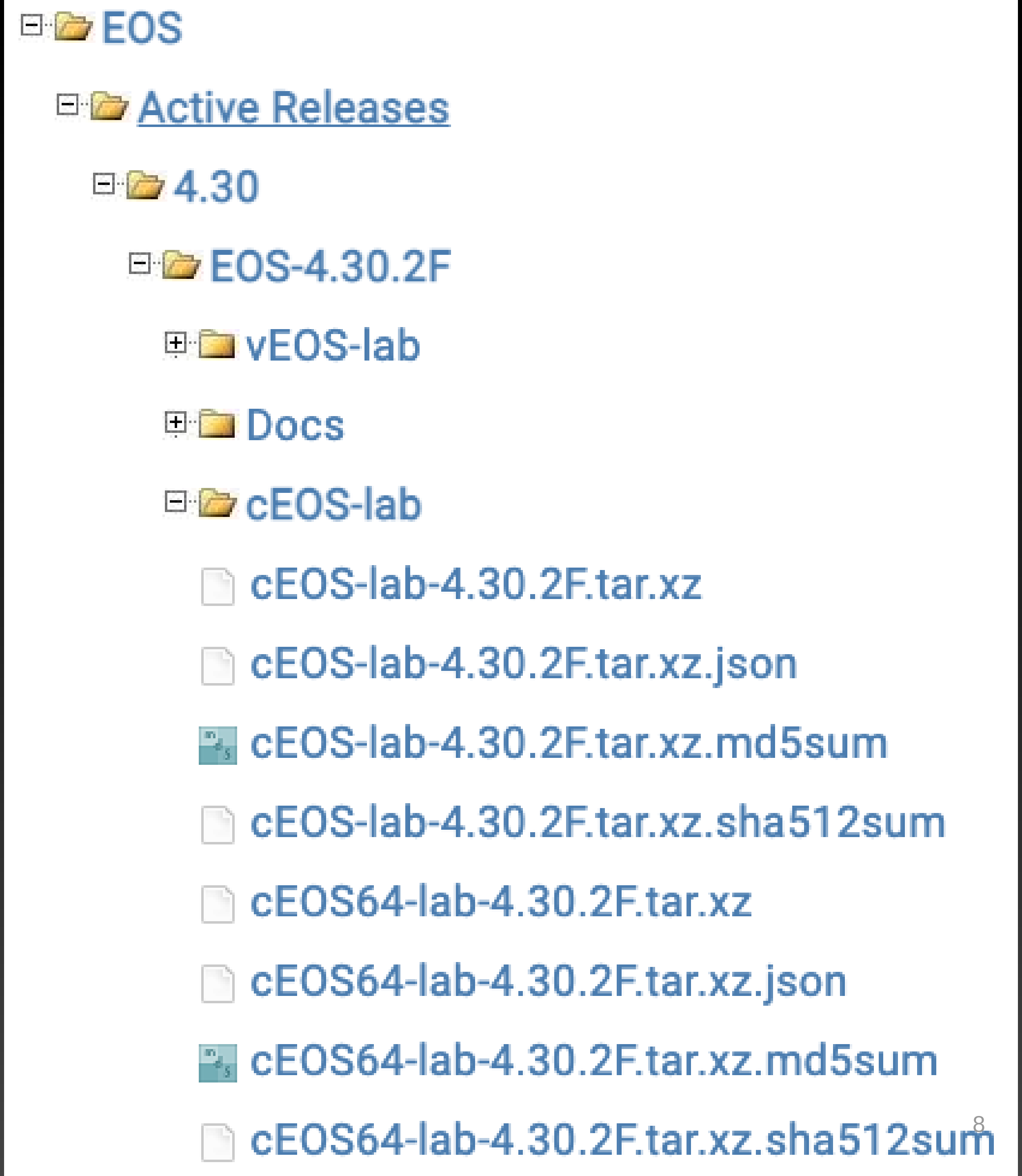
```
$ cd ${HOME}
$ git clone https://github.com/arista-netdevops-community/building-containerlab-with-ceos.git
Cloning into 'building-containerlab-with-ceos'...
remote: Enumerating objects: 198, done.
remote: Counting objects: 100% (198/198), done.
remote: Compressing objects: 100% (120/120), done.
remote: 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.

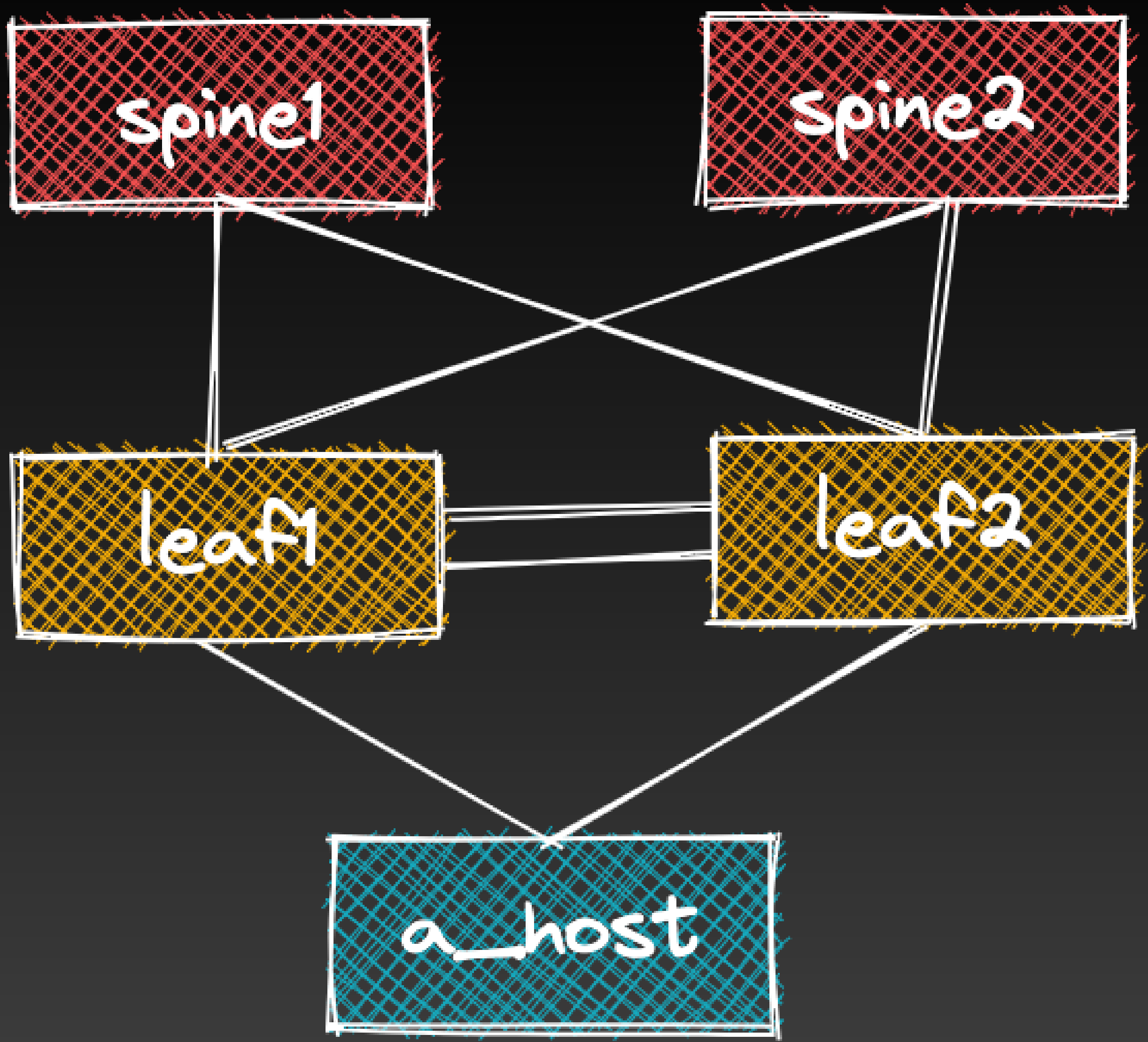
Deploy The Lab

- 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 - 1

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-ambassadors_clab-a_host | 436eb12b6ebc | ceos-lab:latest | ceos | running | 192.168.123.100/24 | N/A          |
| 2 | clab-ambassadors_clab-leaf1  | 780403a150a9 | ceos-lab:latest | ceos | running | 192.168.123.21/24  | N/A          |
| 3 | clab-ambassadors_clab-leaf2  | 79dba4526c6b | ceos-lab:latest | ceos | running | 192.168.123.22/24  | N/A          |
| 4 | clab-ambassadors_clab-spine1 | af3b97f141fa | ceos-lab:latest | ceos | running | 192.168.123.11/24  | N/A          |
| 5 | clab-ambassadors_clab-spine2 | 1655913706d5 | 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 ambassadors_default_cfg.clab.yml`.

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

```
clab@ubuntu:~/emea-ambassadors-containerlab-aug-2022$ cat /etc/hosts | grep clab-
###### CLAB-ambassadors_clab-START ######
192.168.123.12  clab-ambassadors_clab-spine2
192.168.123.22  clab-ambassadors_clab-leaf2
192.168.123.11  clab-ambassadors_clab-spine1
192.168.123.21  clab-ambassadors_clab-leaf1
192.168.123.100 clab-ambassadors_clab-a_host
###### CLAB-ambassadors_clab-END ######
```

Inspect the Lab - 2

You can also list containers using docker command:

```
clab@ubuntu:~$ docker container ls
CONTAINER ID   IMAGE             COMMAND                  CREATED             STATUS              PORTS     NAMES
edbc03859477   ceos-lab:latest   "bash -c '/mnt/flash…"   About an hour ago   Up About an hour              clab-ambassadors_clab-spine2
c4cd010b2318   ceos-lab:latest   "bash -c '/mnt/flash…"   About an hour ago   Up About an hour              clab-ambassadors_clab-leaf2
29250cd4881e   ceos-lab:latest   "bash -c '/mnt/flash…"   About an hour ago   Up About an hour              clab-ambassadors_clab-spine1
32c576fcf575   ceos-lab:latest   "bash -c '/mnt/flash…"   About an hour ago   Up About an hour              clab-ambassadors_clab-leaf1
4d25882a1a08   ceos-lab:latest   "bash -c '/mnt/flash…"   About an hour ago   Up About an hour              clab-ambassadors_clab-a_host
```