ContainerLab

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$whoami

- Freelance Consultant
- started with Linux when it shipped on 35 3.5" disks
- IPv6, Networking, Automation, Monitoring
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ContainerLab

Containerlab provides a CLI for orchestrating and managing container-based networking labs. It starts the containers, builds a virtual wiring between them to create lab topologies of users choice and manages labs life cycle.

- https://containerlab.dev/
- https://github.com/srl-labs/containerlab

Other Products for virtual labs

- EVE-NG
- GNS3
- Cisco Modelinglab
- (Juniper vLabs)

Containerlab Overview

- written in GO
- Using text files to define lab topologies
- Focus on Network Operating Systems
- Multi-vendor
- Good documentation
- many lab topologies included
- can run on your Notebook

Platforms - Container

- Nokia SR Linux
- Arista cEOS
- Cisco XRd
- SONiC
- Juniper cRPD
- Cumulus VX
- Keysight IXIA-C
- RARE/freeRtr
- Ostinato
- Probably any other Docker Image

Platforms - VMs

- Nokia virtual SR OS (vSim/VSR)
- Juniper vMX
- Juniper vQFX
- Juniper vSRX
- Juniper vJunos-router
- Juniper vJunos-switch
- Juniper vJunos-evolved
- Cisco IOS XRv9k
- Cisco Catalyst 9000v
- Cisco Nexus 9000v
- Cisco c8000v
- Cisco CSR 1000v
- Cisco FTDv
- Dell FTOS10v
- Arista vEOS
- Palo Alto PAN
- IPInfusion OcNOS
- Check Point Cloudguard
- Fortinet Fortigate
- Aruba AOS-CX
- Huawei VRP
- OpenBSD
- FreeBSD
- SONIC

Platforms - Getting the images

Some images

- can just be installed from public docker registries
- need a user account (e.g. Arista, Juniper)
- may even cost money and are only available if you are a relay big customer

Container? VM?

- Both
- VMs are containerized via a fork of vrnetlab

> Vrnetlab packages a regular VM inside a container and makes it runnable as if it was a container image.

creating a container from an VM image (Demo)

```
~/vrnetlab/vsrx # cp ~/junos-vsrx3-x86-64-23.2R2.21.qcow2 .
~/vrnetlab/vsrx # make
for IMAGE in junos-vsrx3-x86-64-23.2R2.21.qcow2; do
[...]
```

Resources?

- Whatever the image needs, example:

> XRv9k node is a resource hungry image. As of XRv9k 7.2.1 version the minimum resources should be set to 2vcpu/14GB. To be safe the defaults used in containerlab are 2vCPU/16G RAM.
> Image may take 25 minutes to fully boot, be patient.

Containerlab - Installation

- Package (rpm/deb)
- curl ... | bash
- from source

Basic Topology (I)

```yaml
name: demo1

topology:
  nodes:
    router:
      kind: linux
      image: frrouting/frr:v7.5.1
    srl:
      kind: srl
      image: ghcr.io/nokia/srlinux

  links:
    - endpoints: ["router:eth1", "srl:e1-1"]
```

Basic Topology (II)

```
name: srl01

topology:
  kinds:
    srl:
      type: ixrd3
      image: ghcr.io/nokia/srlinux
  nodes:
    srl:
      kind: srl
```

Configuring a device (I)

- manual
- config Management
- via topology file

Configuring a device (II)

```
nodes:
    router:
      kind: linux
      image: frrouting/frr:v7.5.1
      binds:
        - router1/daemons:/etc/frr/daemons
        - router1/frr.conf:/etc/frr/frr.conf
    srl:
      kind: srl
      image: ghcr.io/nokia/srlinux
      startup-config: srl2.cfg
```

Accessing the “device”

Depends on what you are using:

- ssh clab-example
- docker exec -it clab-demo-ceos1 Cli
- ...

Topology options

- prefix: Adds a prefix of the lab name
- kinds: Grouping nodes
- nodes: Our devices
- links: Connection between nodes

```
topology:
  kinds:
    debian:
        type: linux
        image: debian:latest
  nodes:
     deb1:
       kind: debian
     deb2:
       kind: debian
  links:
     - endpoints: ["deb1:eth1","deb2:eth1"]
```

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Node options

- type
- group
- image
- license
- startup config
- binds
- ports
- labels
- mgmt_ipv6 / mgmt_ipv4
- [...]

Management Network

- Default prefix: clab
- IPv4: subnet 172.20.20.0/24, gateway 172.20.20.1
- IPv6: subnet 3fff:172:20:20::/64, gateway 3fff:172:20:20::1

“DNS”

```
# cat /etc/hosts
[...]
###### CLAB-ceos-START ######
172.20.20.4 clab-ceos-ceos1
172.20.20.5 clab-ceos-ceos2
3fff:172:20:20::4   clab-ceos-ceos1
3fff:172:20:20::5   clab-ceos-ceos2
###### CLAB-ceos-END ######
```

Working with clab

- clab is a sym-link to containerlab
- create a topology file with $EDITOR
- deploy topolgy: **clab deploy -t demo.yml**
- work with you lab
- save config changes: **clab save**
- visualize topology: **clab graph**
- destroy topology: **clab destroy**

Captruing Traffic

- Local:

```
# ip netns exec clab-quickstart-srl tcpdump -nni e1-1
```

- Remote:

```
# ssh $containerlab_host_address \
    "ip netns exec $lab_node_name tcpdump -U -nni $if_name -w -" | \
    wireshark -k -i -
```

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Generate a Clos topology

```
$clab gen -n clos --kind ceos --image ceos:4.29.2F --nodes 8,4,2   > clos.yml
```

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Demo time