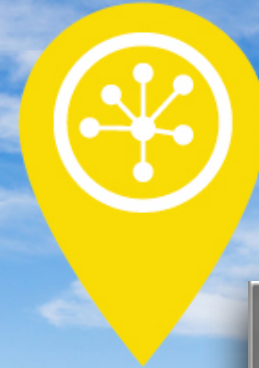


Using Docker and Docker-Compose to create router networks for training

or

Dabbling with Docker



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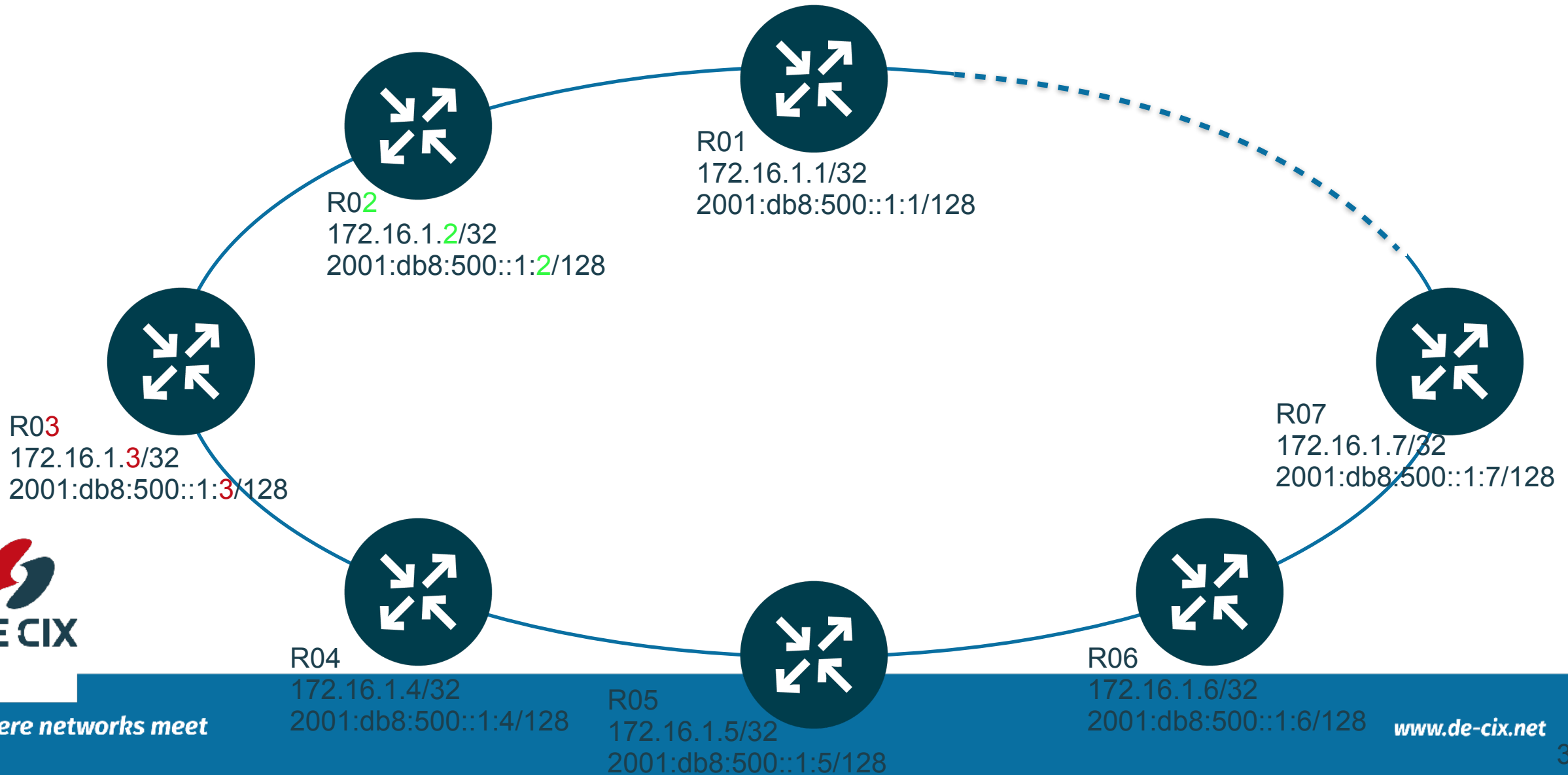


The Task

- Create a router lab for BGP trainings
 - Does not really matter what router
- Number of participants is unknown - up to 20
- Training routers should interact with each other
- Participants should only need a web browser
- Training network should run on a server somewhere **or local**
- **Fast** and **easy** switching between experiments



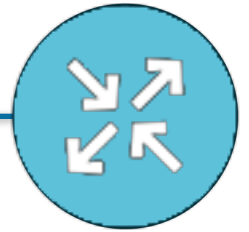
Experiments 1: iBGP



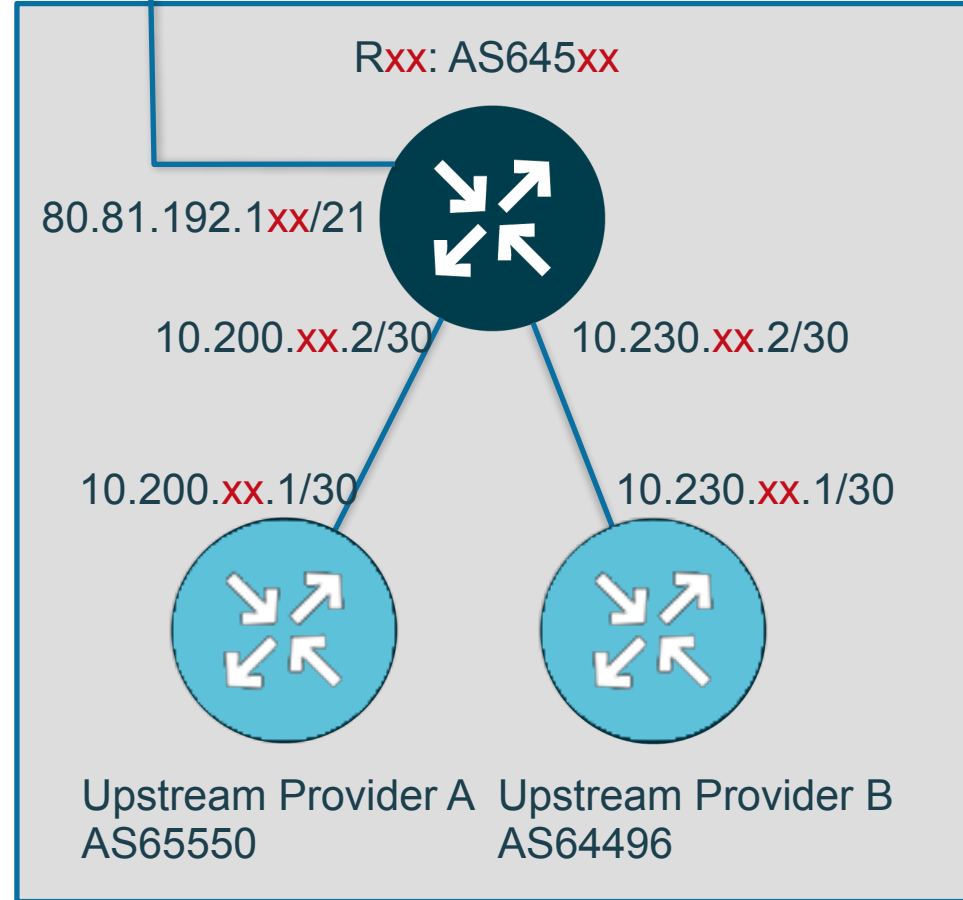
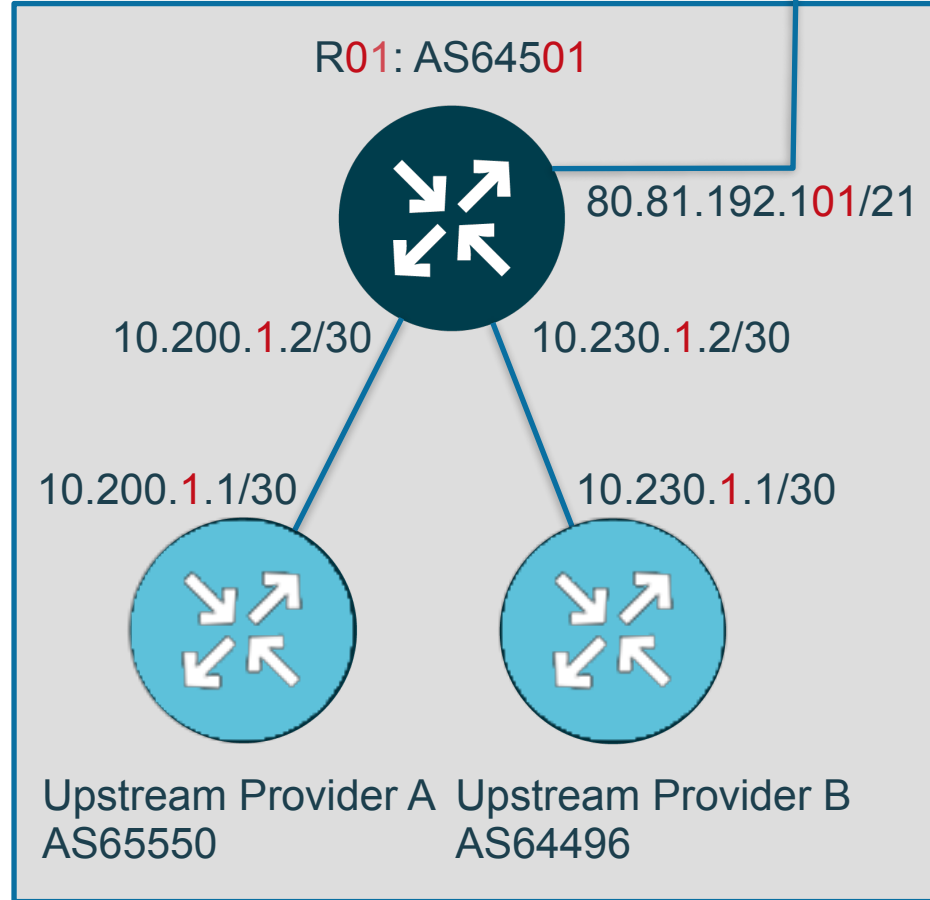
Experiment 2: eBGP - IPv4

Peering LAN: 80.81.192.0/21

80.81.192.1/21



Peer
AS286



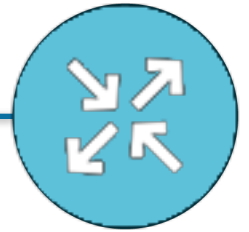
.....

.....

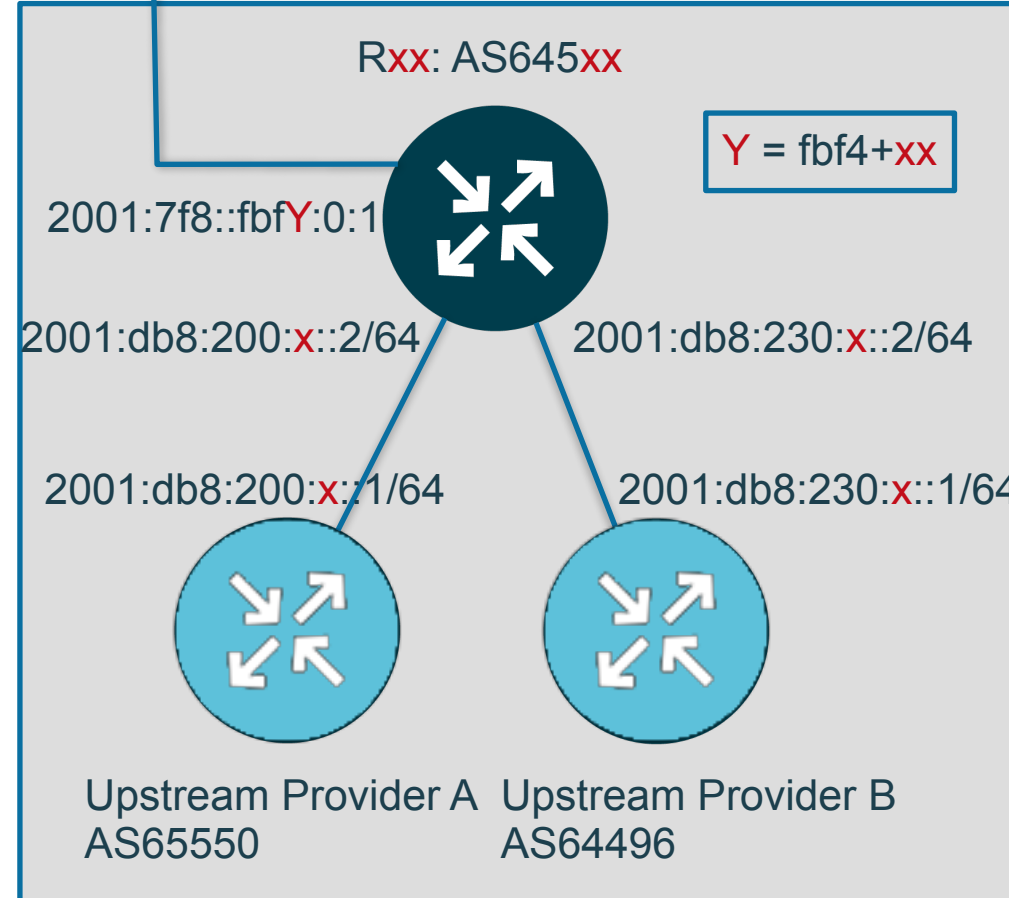
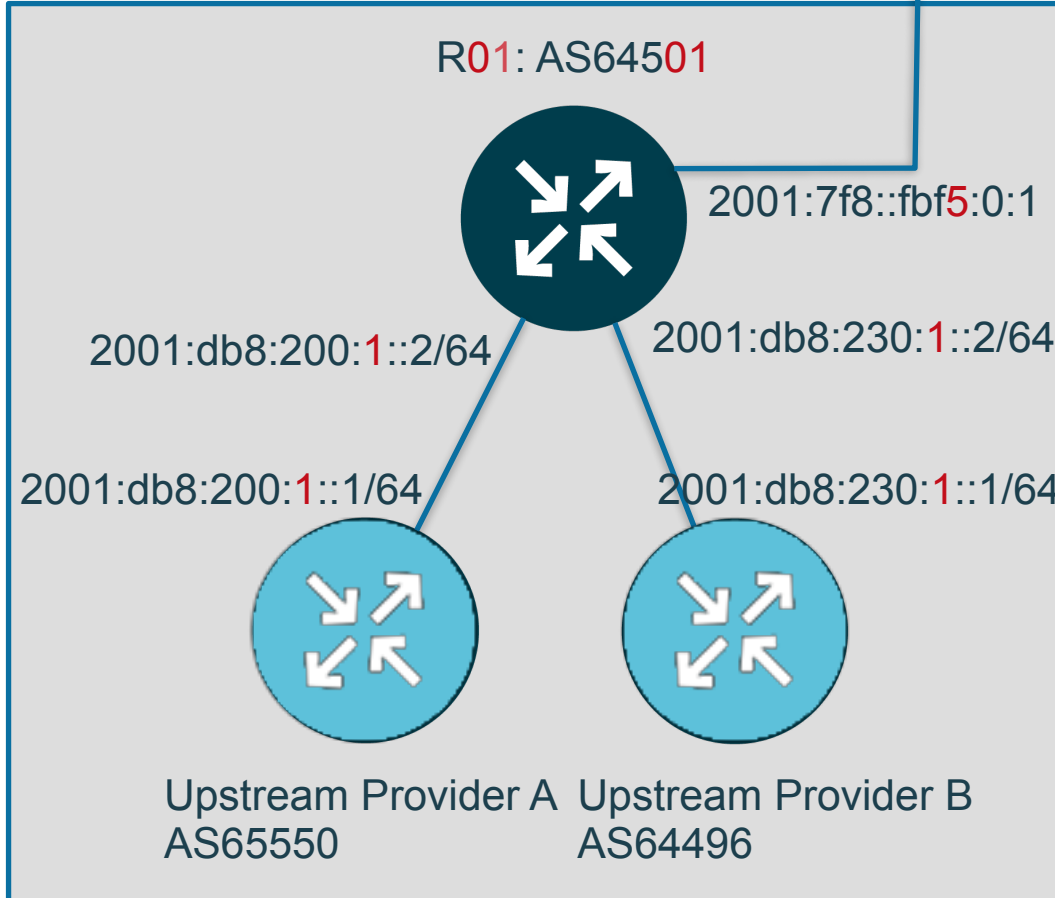
Experiment 2: eBGP - IPv6

Peering LAN: 2001:7f8::/64

2001:7f8::1



Peer
AS286



.....

.....

Options

→GNS3

- Great network emulation environment

- All kind of devices possible

- Resource hungry

→A farm of Raspberry Pis (I actually tried)

→Virtualization

- Is full virtualization really needed? (no)

→Router

- do I really need Cisco, Juniper, etc.? (no)

Have you heard about Docker? (yes, of course)

- Lightweight virtualization
- Automation using Docker-Compose
- Build upon existing work
 - A dockerfile for **frrouting** already existed (thank you!)
 - Just add **ttyd** for web-access (that was easy)
 - And IPv6 (this was the hardest task)

Dockerfile for frrouting

```
# HEADER
FROM          frrouting/frr
LABEL maintainer="wolfgang.tremmel@de-cix.net"

# Install FRRouting
RUN           apk update \
              && apk upgrade \
              && apk add supervisor \
              ttyd \
              && rm -rf /var/cache/apk/*

# Supervisord
ADD           daemons /etc/frr/daemons
ADD           daemons.conf /etc/frr/daemons.conf
ADD           supervisord.conf /etc/supervisord.conf
ADD           shutdown-admin-interface /bin/shutdown-admin-interface
ADD           rc.local /etc/rc.local

# Configuration files
VOLUME /etc/frr

# Expose ports
EXPOSE 23 80 179

# Command
ENTRYPOINT ["/usr/bin/supervisord", "-c", "/etc/supervisord.conf"]
```


Using docker-compose

- Create these files for experiments automatically:
 - docker-compose for docker containers and networks
 - router configs for each container (each router has its sub-directory)
 - solution files for each container
 - exabgp.conf to feed containers with BGP sessions
 - scripts for remote-control containers

```
./create-docker-compose -n 15 > docker-compose.yml  
docker-compose up &  
exabgp exabgp.conf &
```

Auto-created Docker- compose

```
version: '2.1'
services:
  r01:
    image: wtremmel/frr:latest
    hostname: r01
    container_name: r01
    sysctls:
      net.ipv6.conf.all.disable_ipv6: 0
      net.ipv6.conf.all.forwarding: 1
    cap_add:
      - ALL
    expose:
      - "179"
    ports:
      - "9001:80"
      - "2001:23"
    volumes:
      - ./config/r01:/etc/frr
    networks:
      admin:
        upstreamA01:
          ipv4_address: 10.200.1.2
          ipv6_address: 2001:DB8:200:1::2
        upstreamB01:
          ipv4_address: 10.230.1.2
          ipv6_address: 2001:DB8:230:1::2
      peering:
        ipv4_address: 80.81.192.101
        ipv6_address: 2001:7F8::fbf5:0:1
```

Download links

- FRRouting: <https://frrouting.org>
- ttyd: <https://tsl0922.github.io/ttyd/>
- Docker Image: wtremmel/frr-latest
 - <https://cloud.docker.com/repository/docker/wtremmel/frr>
- Training environment:
 - `git clone https://decix-academy@bitbucket.org/decix-academy/dockerbgp.git`
- BGP training videos:
 - <https://www.de-cix.net/en/about-de-cix/academy/videos-and-webinars>