Practical CNI

Introduction to the project and how to get hands dirty with it

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LINUXCON
containercon
CLOUDOPEN
CHINA 2017

A brief introduction

- A runtime independent platform for container networking
- Part of CNCF (well, since May 2017) [1]
- An effort held by multiple entities: CoreOS, Red Hat OpenShift, Apache Mesos, Cloud Foundry, Kubernetes, Kurma and rkt.
- Designed around a minimal specification

CNI

CLOUD NATIVE COMPUTING FOUNDATION

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[1] https://www.cncf.io/blog/2017/05/23/cncf-hosts-container-networking-interface-cni/

The SPEC[1] - and its purpose

- Defines the interactions between “runtimes” and “plugins”
- The interactions are regulated by known fields or by custom fields by following conventions [2]
- The **interactions** are drove by two important definitions:
  - **Container:** in this context, can be considered a synonymous of a linux network namespace, the real unit of definition depends on the **particular runtime implementation**
  - **Network:** refers to a group of entities that are uniquely addressable and can communicate amongst each other, like: network devices, a container, etc..

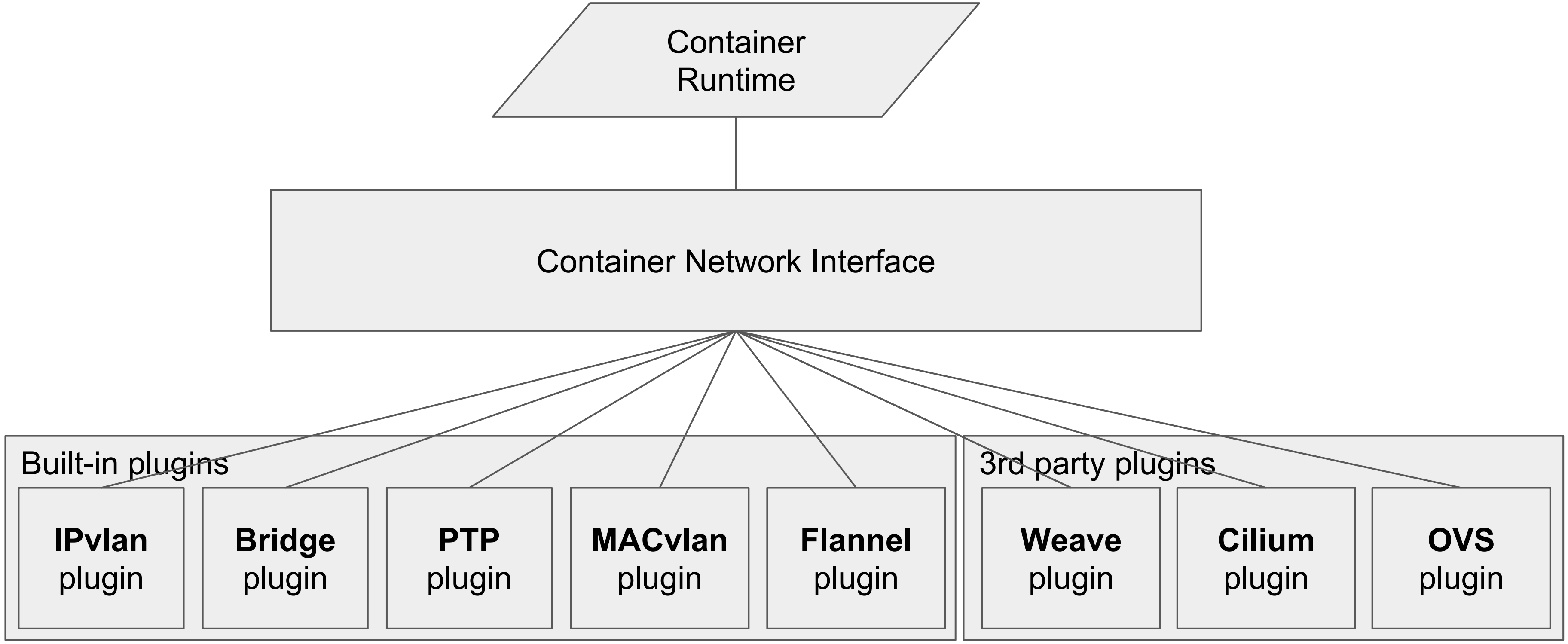
[1] https://github.com/containernetworking/cni/blob/master/SPEC.md
[2] https://github.com/containernetworking/cni/blob/master/CONVENTIONS.md

Wait, Plugins ?

- Plugins are executables **invoked** by the *container runtime*
- Plugins are **responsible** for:
  - IPAM
  - Connecting **VETH Pairs**
  - Adding necessary network components, like **bridges**

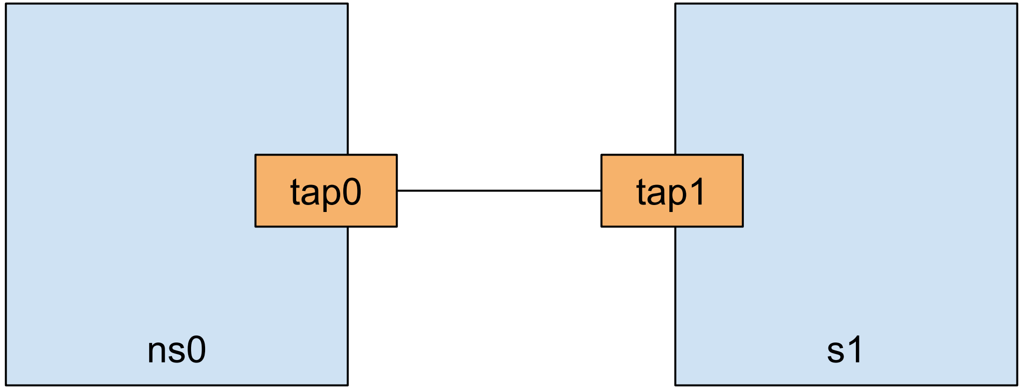
https://github.com/containernetworking/plugins/

CNI Overview



The “ptp” Plugin

```
{
    "name": "mynet",
    "type": "ptp",
    "ipam": {
        "type": "host-local",
        "subnet": "10.1.1.0/24"
    },
    "dns": {
        "nameservers": [ "10.1.1.1", "8.8.8.8" ]
    }
}
```



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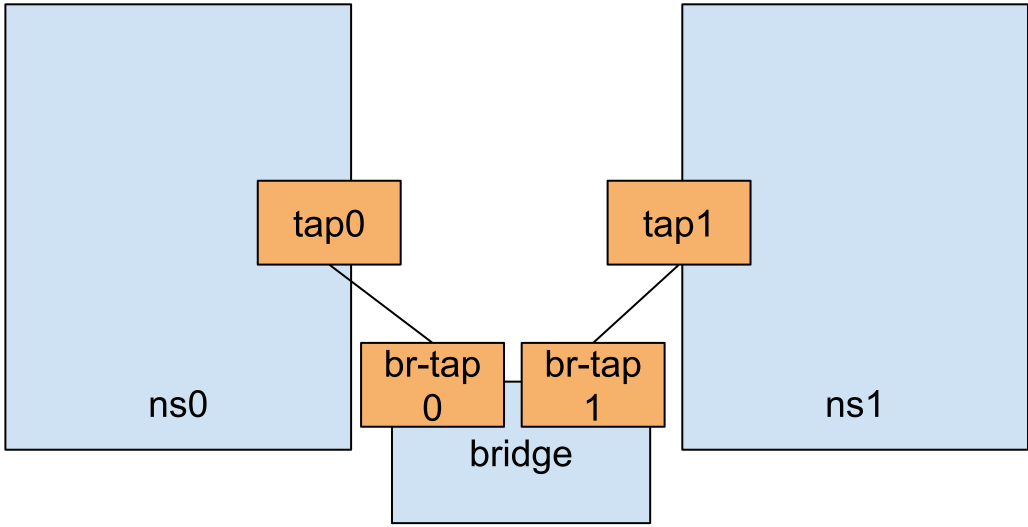
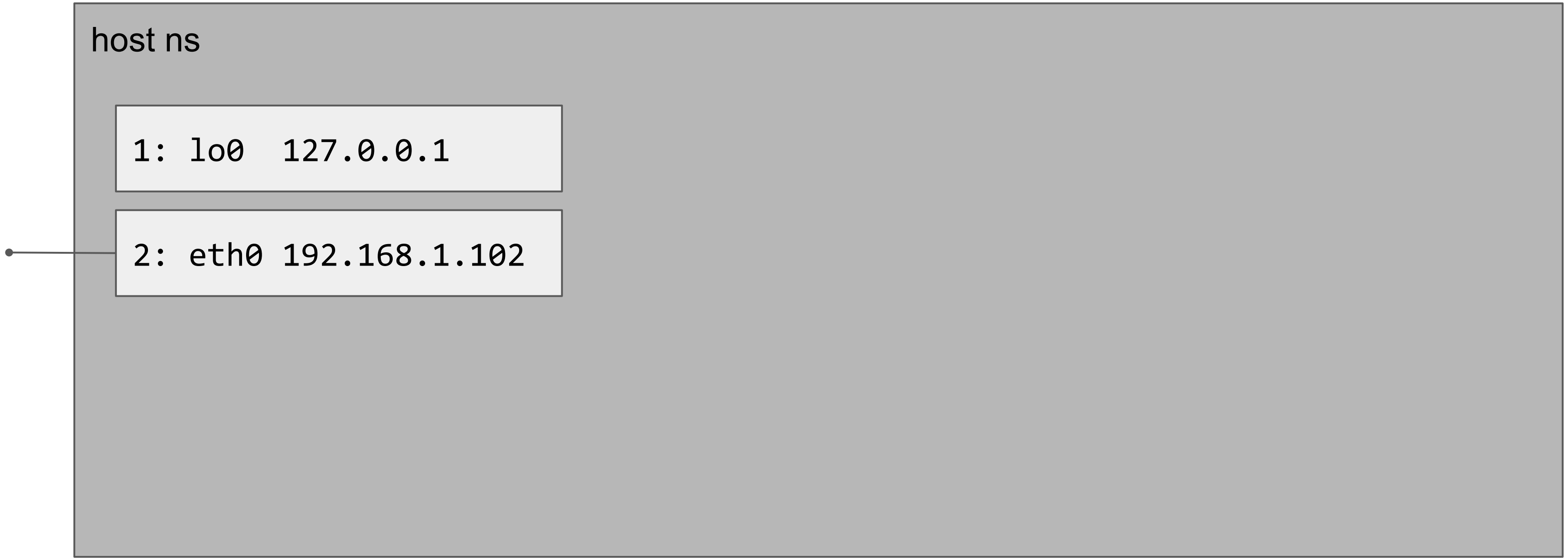
The “bridge” Plugin

```
{
    "name": "imthebestnetever",
    "type": "bridge",
    "bridge": "myawesomebr",
    "isDefaultGateway": true,
    "ipMasq": true,
    "hairpinMode": true,
    "ipam": {
        "type": "host-local",
        "subnet": "10.22.0.0/16"
    }
}
```

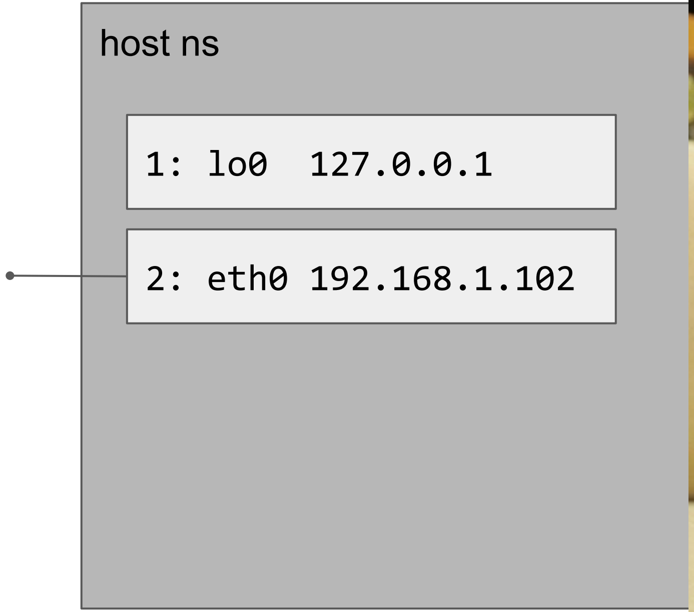


Lifecycle of a CNI Bridge

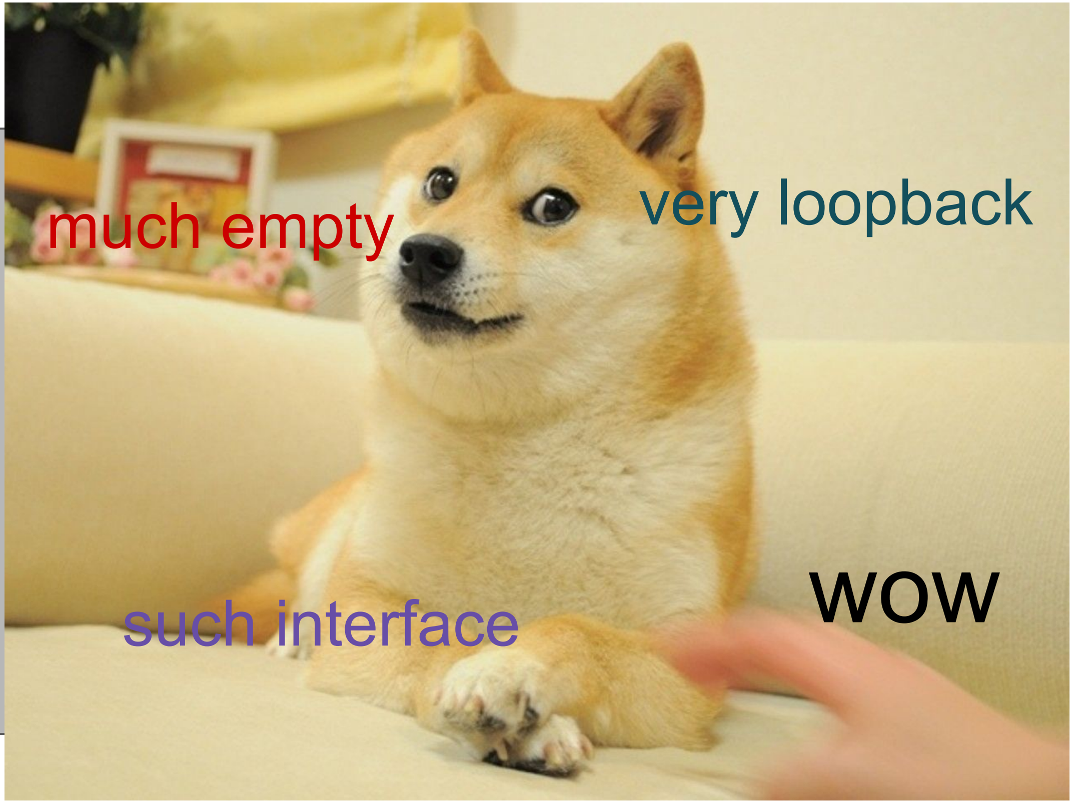


```
1: lo0  127.0.0.1
2: eth0 192.168.1.102
```

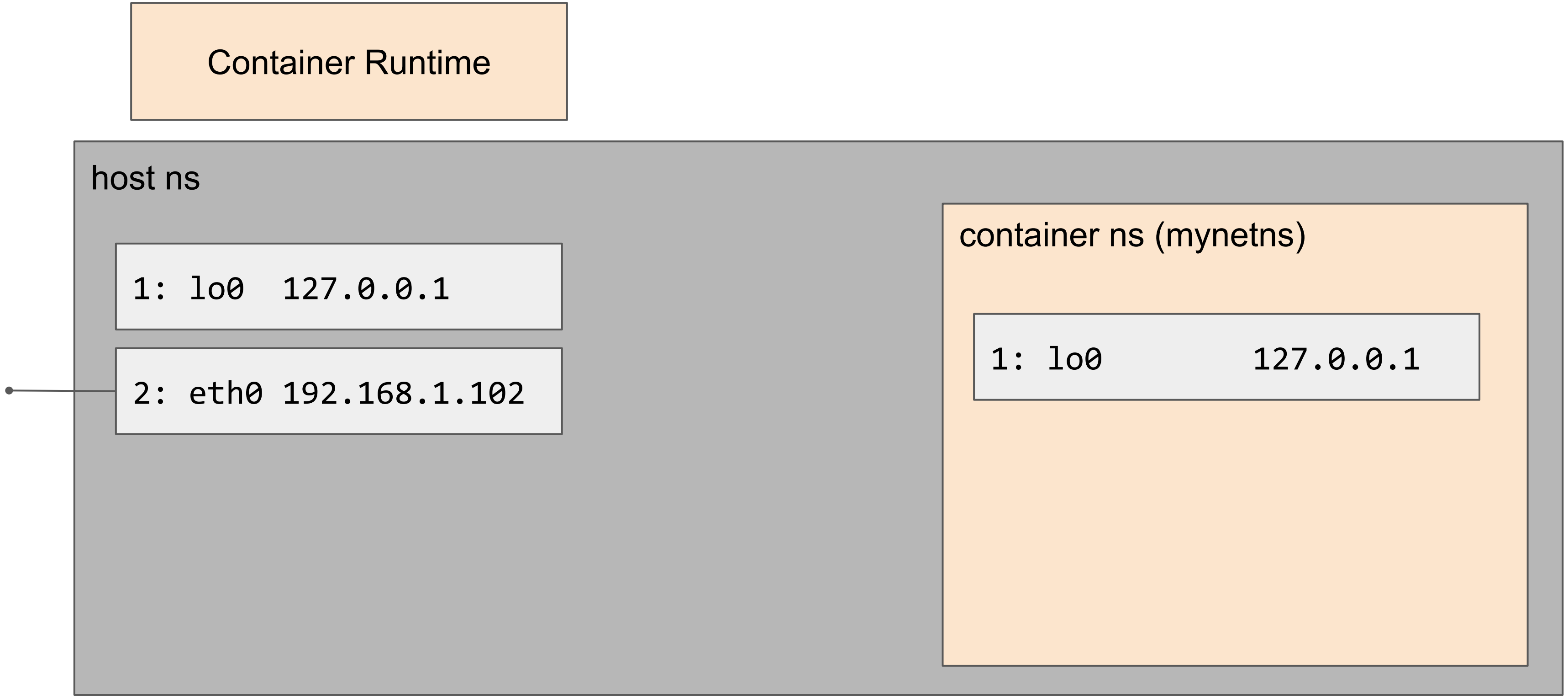
Lifecycle of a CNI Bridge



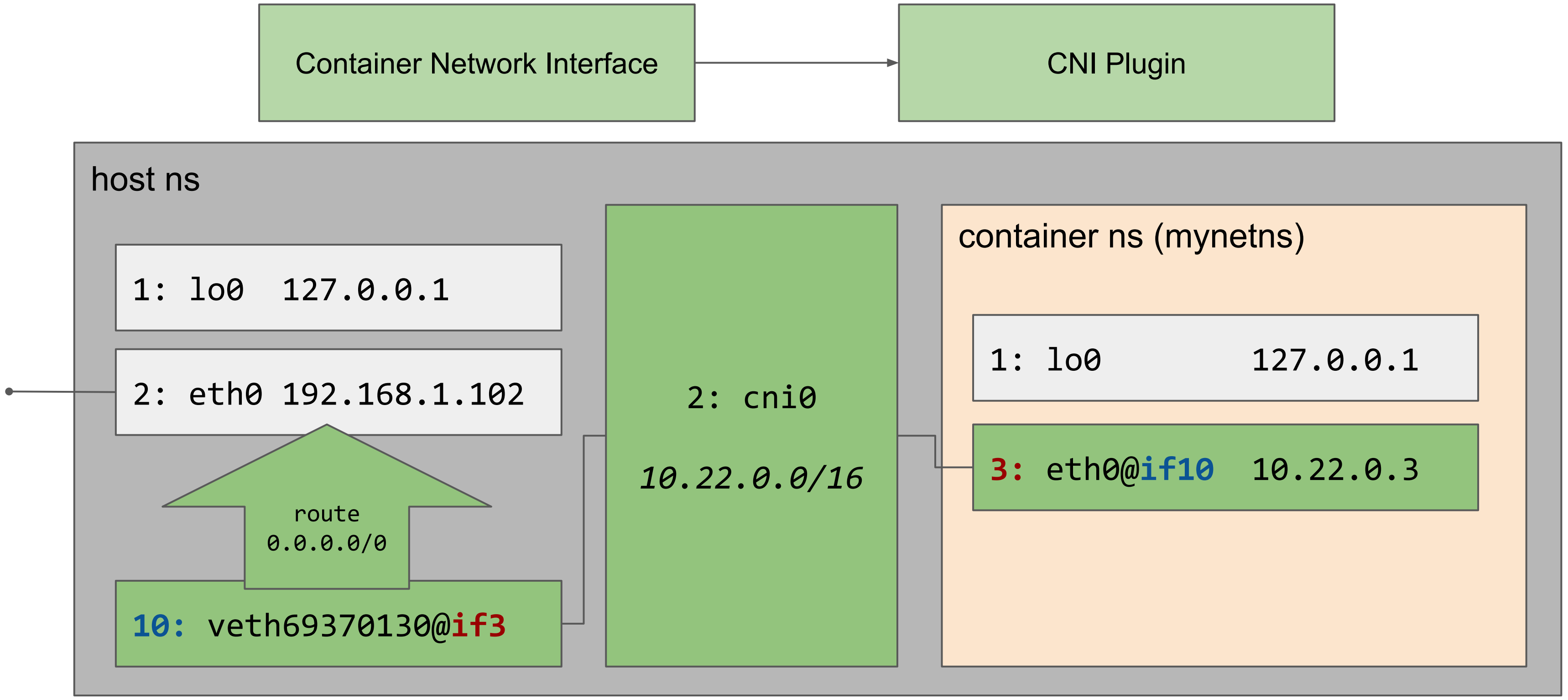
```
1: lo0  127.0.0.1
2: eth0 192.168.1.102
```



Lifecycle of a CNI Bridge



Lifecycle of a CNI Bridge



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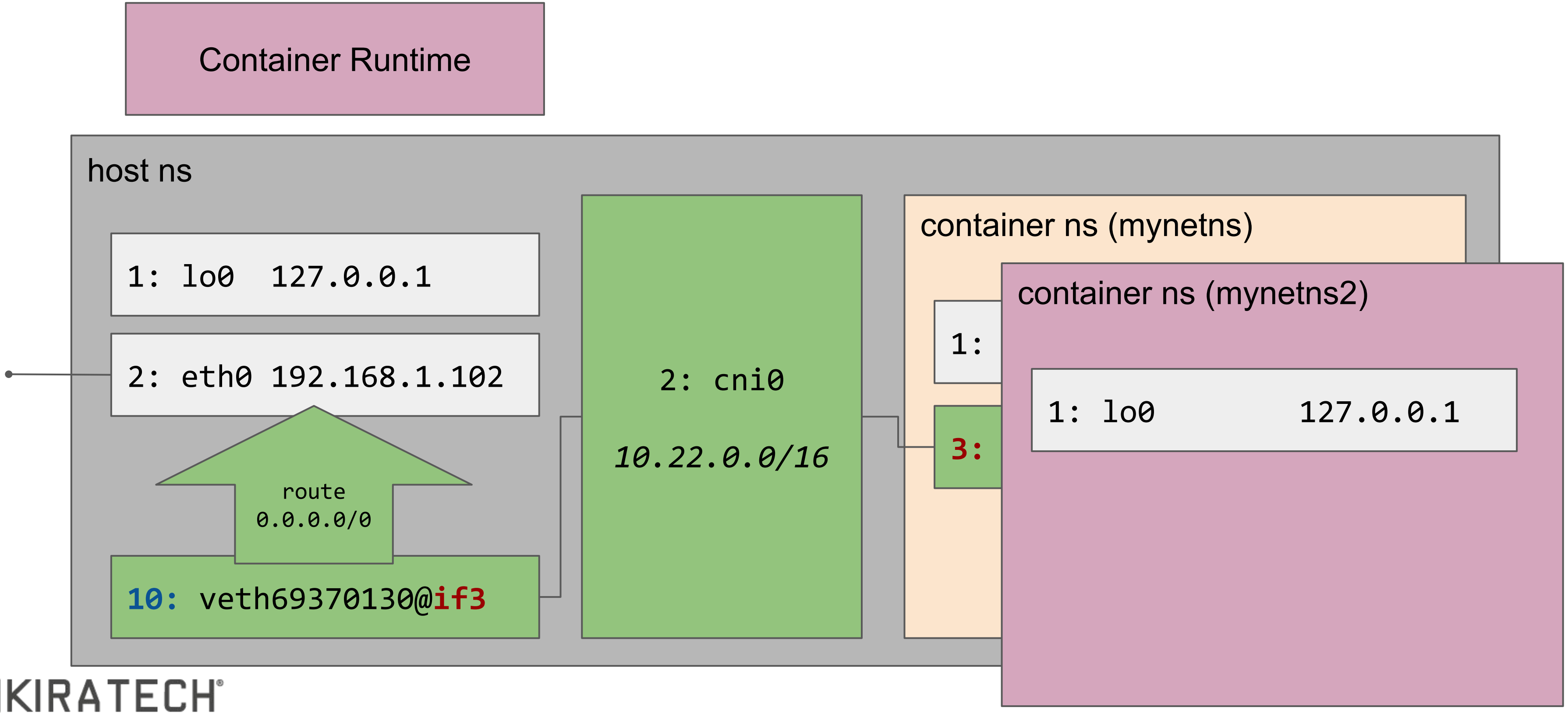
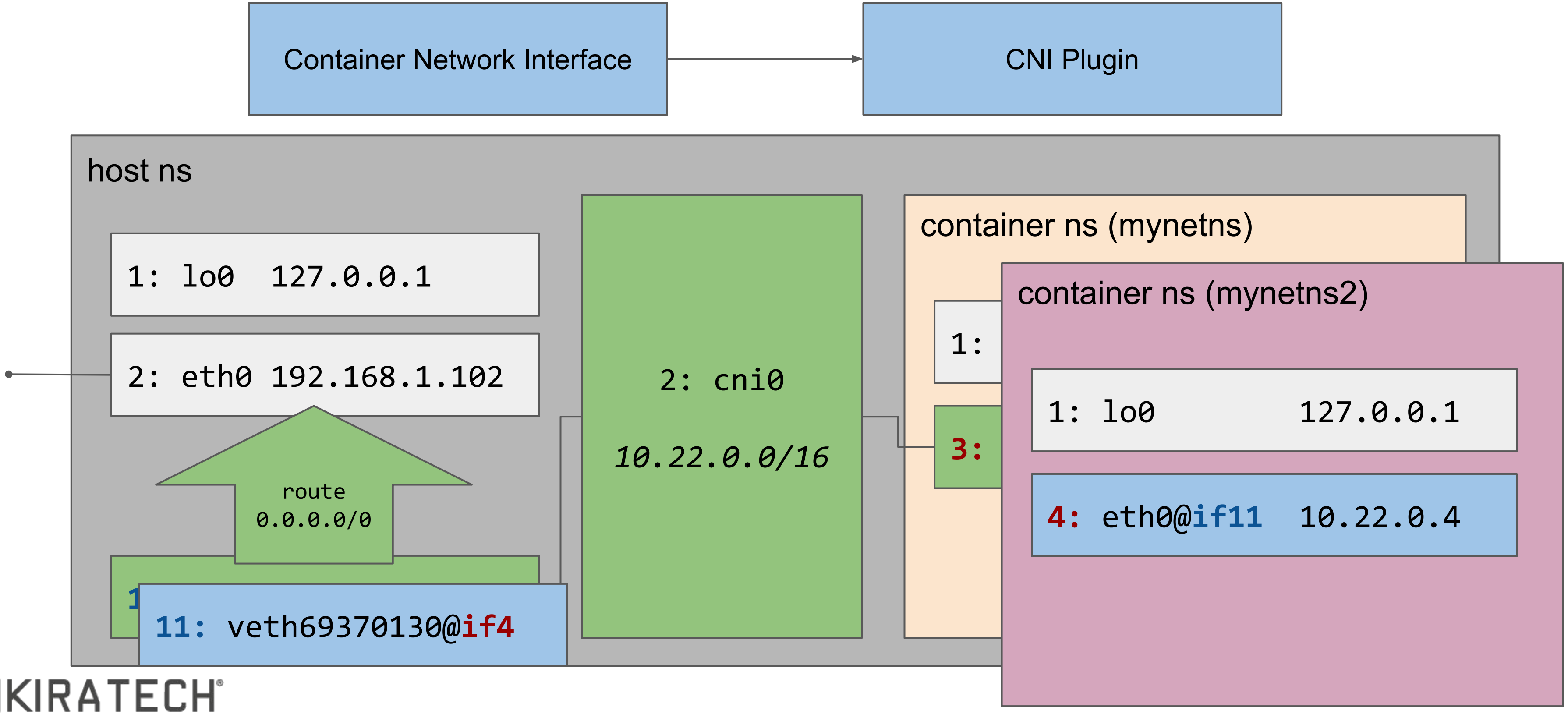
Lifecycle of a CNI Bridge



Lifecycle of a CNI Bridge



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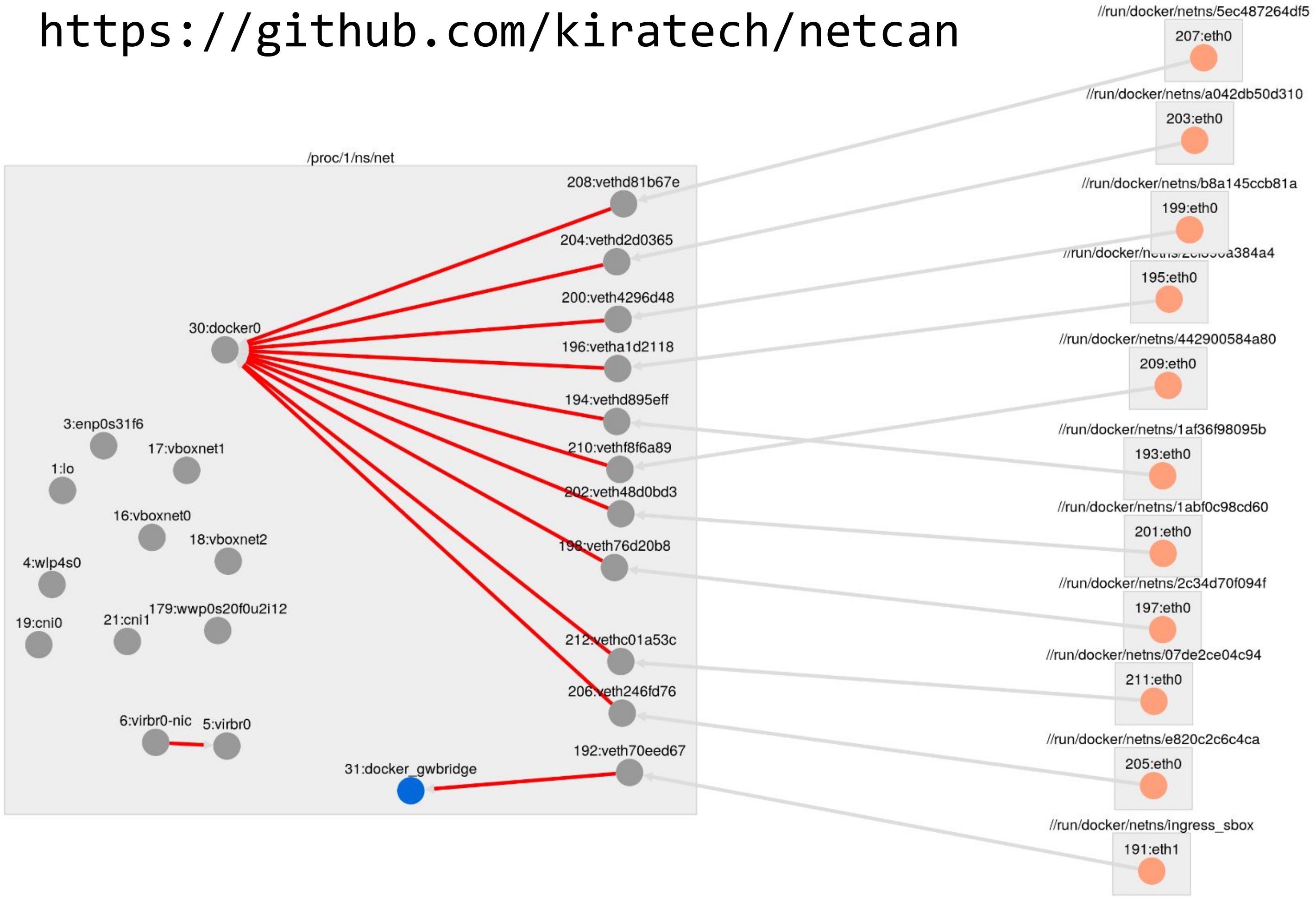
https://github.com/kiratech/netcan



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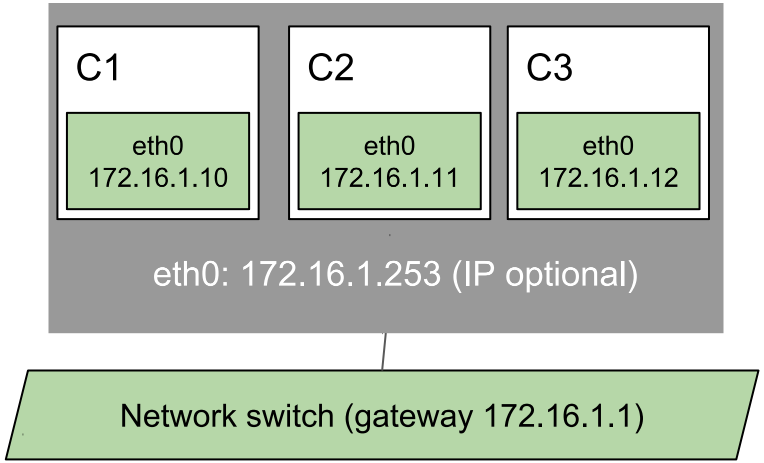
The “IPvlan” Plugin

```
{
    "name": "mynet",
    "type": "ipvlan",
    "master": "eth0",
    "ipam": {
        "type": "host-local",
        "subnet": "10.1.2.0/24",
    }
}
```


C1
eth0
172.16.1.10
C2
eth0
172.16.1.11
C3
eth0
172.16.1.12
eth0: 172.16.1.253 (IP optional)
Network switch (gateway 172.16.1.1)

And you will need at least a PTP too, since IPvlan does not allows you to connect to the host otherwise

https://github.com/torvalds/linux/tree/master/drivers/net/ipvlan
https://github.com/containernetworking/cni/blob/master/Documentation/ipvlan.md
https://lwn.net/Articles/620087/

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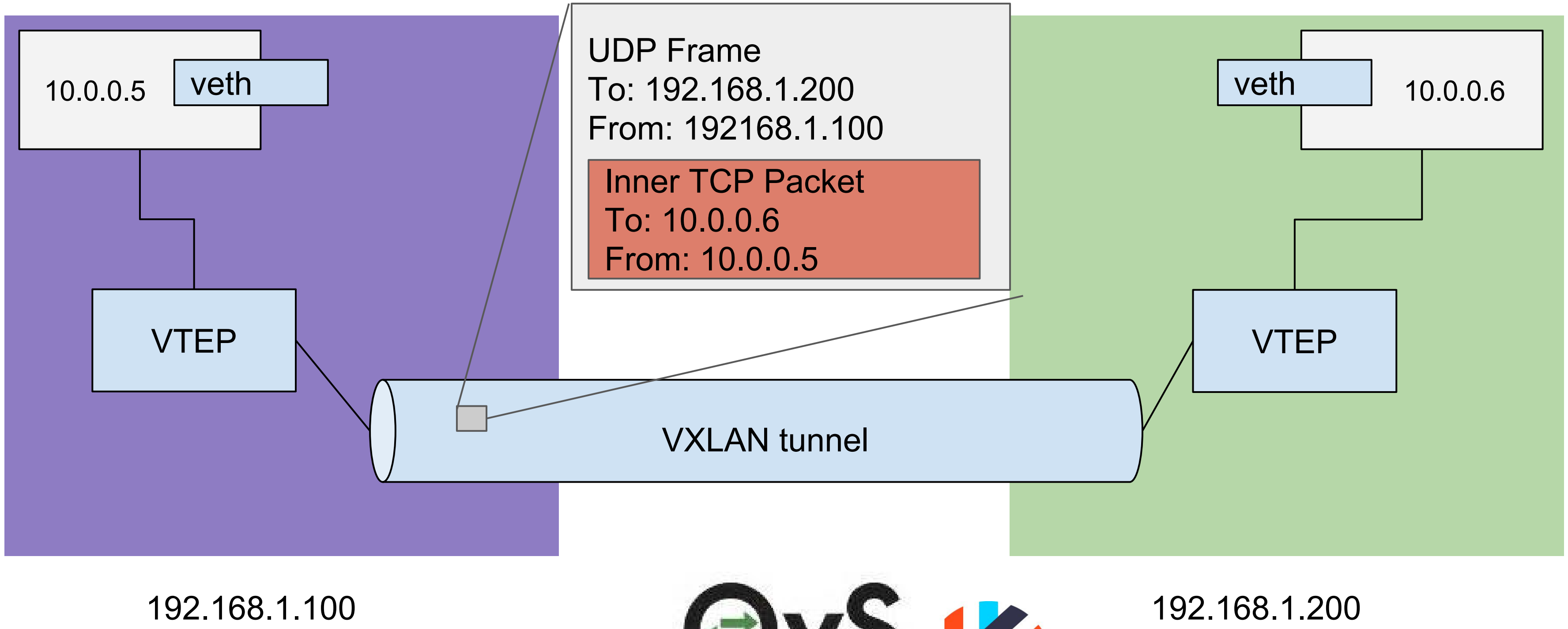
Overlay networking



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flannel Open vSwitch

OVN

- L2/L3 network virtualization for Open vSwitch
- Integrated with Container Orchestrators [1]
- Integrated with hypervisors (KVM, XEN, Hyper-V)
- Integrated with OpenStack
- Integrated DHCP
- Integrated QoS
- Trunking
- Scalable
- Multiple overlay technologies (Geneve, STT and VXLAN)
- Means hybrid networks between infrastructures (hybrid / cloud) and different virtualization technologies (OS Level: containers and Full: Virtual machines)

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[1] https://github.com/openvswitch/ovn-kubernetes
http://openvswitch.org/support/dist-docs/ovn-architecture.7.html

Thank you!

Find me on

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