Rapidly Deploy NFV with VyOS on Kubernetes

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Agenda

- About Me
- Who are we
- What is VyOS
- How VyOS works with Kubernetes
- Future work
- Demo

About Me

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- VyOS Solution Architect
- EZIO Maintainer
- date@vyos.io

- Speaking Experience: OpenStack Day Taiwan 2016-2017, Open Source Summit North America 2017, ISC High Performance Project Poster 2018, Hong Kong Open Source Conference 2019, OSC Tokyo 2019, COScon '19, TWNOG 4.0, COSCUP 2021, COSCUP 2023, Kubernetes Community Day 2023, OSC Nagoya 2024

Who are we - VyOS Networks

With headquarters in Poway, California, VyOS Networks is a company dedicated to providing an open-source network operating system solution. Its operating system, also named VyOS, is Linux-based and is widely renowned for enabling advanced network functionalities, such as VPNs, firewalls, and various top-notch routing protocols, to be performed on both physical and virtual platforms.

The VyOS operating system has gained traction for being highly customizable, scalable, and suitable for small and large network infrastructures. It is employed across various industries and organizations, including service providers, educational institutions, and enterprises, for various applications like edge, branch, and cloud networking.

What is VyOS

- Open Source network operating system based on Debian
- Runs on x86_64 devices
  - Experimental ARM64 UEFI support
- Provide a powerful set of features for Routing, Firewall, VPN etc
- Get everything from VyOS github page
  - https://github.com/vyos

What is VyOS

- Dynamic Routing: BGP, OSPF, IS-IS
- Tenant Network: BGP EVPN VXLAN, VRF, NAT support
- Stateful firewall based on nftables and conntrack
- Support IPSec, OpenVPN, Wireguard etc, VPN protocols
- Running OCI container to provide more flexibility
    - Suricata container for IDS/IPS mode

You can Deploy VyOS on

- Bare-Metal x86_64 server
- Cloud
  - AWS
  - GCP
  - Azure
  - Oracle Cloud
- VM
  - KVM
  - VMware
  - Xen
  - Hyper-V

How VyOS works with Kubernetes

- We can run VyOS as a VM on Kubernetes
  - Pass through `/dev/kvm`
  - Run Libvirt/QEMU
  - Configure Bridge CNI to provide network
  - Similar to Kubevirt
- Login to Pod and enable virsh console to configure

How to make VyOS as an App on Kubernetes

- Configure VyOS with Serial/KVM Console?
- Configure VyOS with Cloud-init and SSH?
- Is there any way to deploy VyOS configuration with API or anything else?
  - IaC style deployment?
  - Auto sync configuration from other resource?

QEMU Guest Agent
True Out-of-Band Management

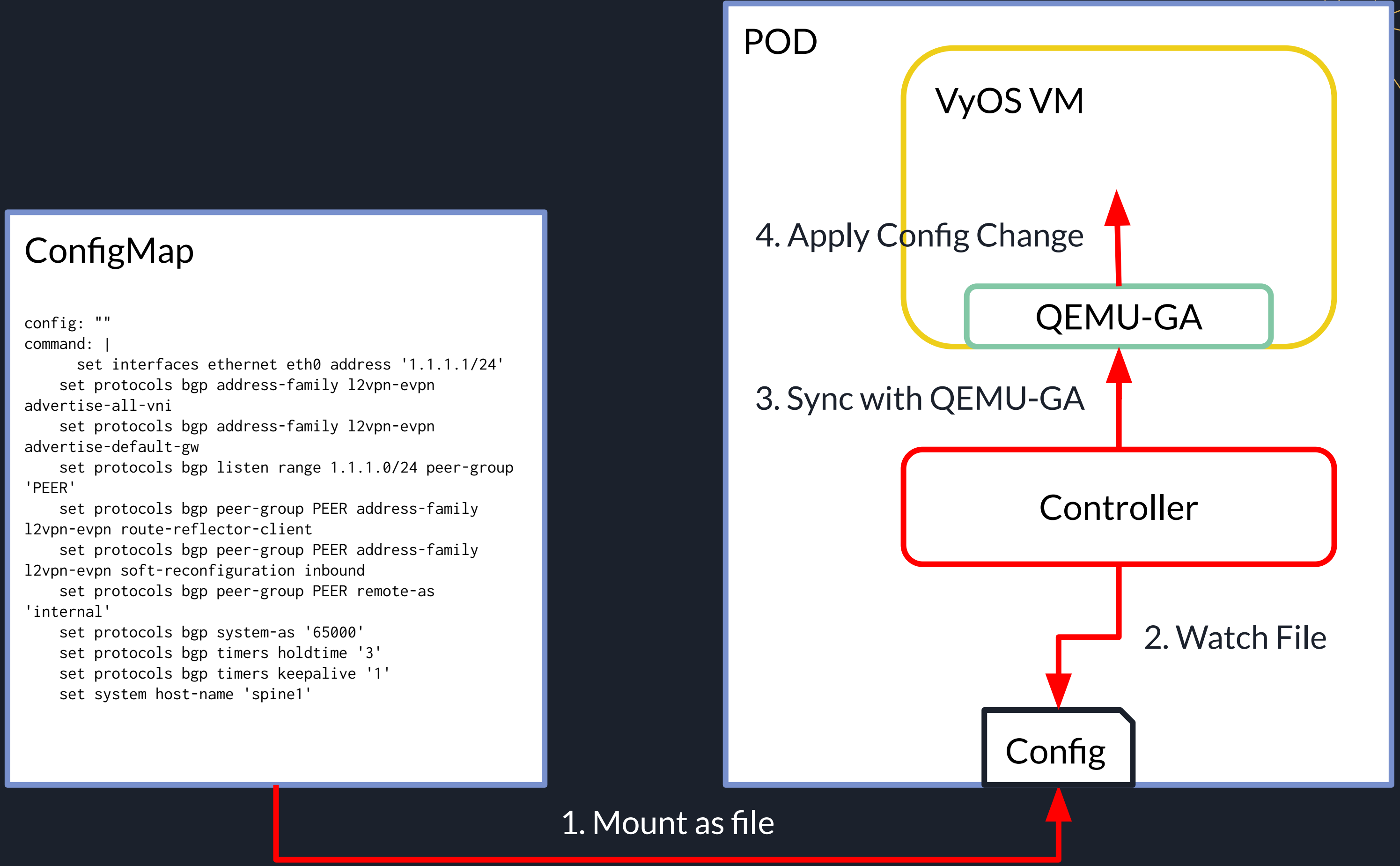
- No need any OOB network
- Read/Write/Execute file in the VM on demand
  - https://qemu-project.gitlab.io/qemu/interop/qemu-ga-ref.html

- What can we do next?
- How to use QEMU-GA for VyOS?

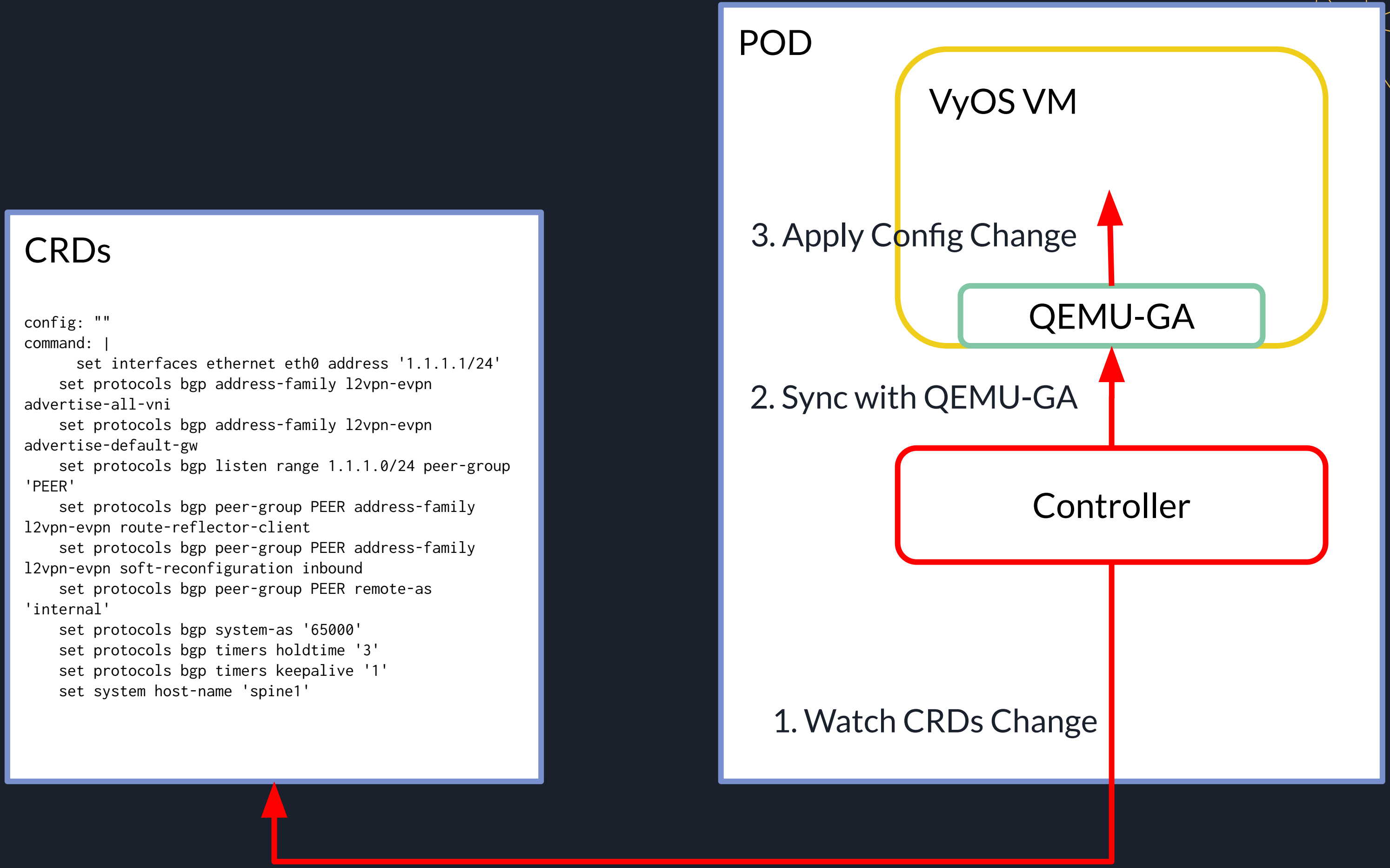
VyOS on Kubernetes

- Watch CRDs, ConfigMap, or files change
- Write configurations into VyOS with qemu-ga
- Execute scripts to load all configurations

- We got a VyOS App on Kubernetes to provide NFV
- https://github.com/tjjh89017/vyos-on-k8s



```
config: ""
command: |
      set interfaces ethernet eth0 address '1.1.1.1/24'
    set protocols bgp address-family l2vpn-evpn
advertise-all-vni
    set protocols bgp address-family l2vpn-evpn
advertise-default-gw
    set protocols bgp listen range 1.1.1.0/24 peer-group
'PEER'
    set protocols bgp peer-group PEER address-family
l2vpn-evpn route-reflector-client
    set protocols bgp peer-group PEER address-family
l2vpn-evpn soft-reconfiguration inbound
    set protocols bgp peer-group PEER remote-as
'internal'
    set protocols bgp system-as '65000'
    set protocols bgp timers holdtime '3'
    set protocols bgp timers keepalive '1'
    set system host-name 'spine1'
```



CRDs

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What can we do for the business?

- Rapidly deploy VyOS and Configuration for your service
  - Provide VPN accounts rapidly and easily
- Easily manage and maintain the VyOS instance
  - Kubernetes will auto heal your deployment
- Auto a High Quality HA with Kubernetes
  - Use Node Affinity to auto schedule the service to different nodes
- IaC for network configuration
  - Use ConfigMap or CRDs to configure all your network settings
  - You only need to generate the configurations for your system

DEMO

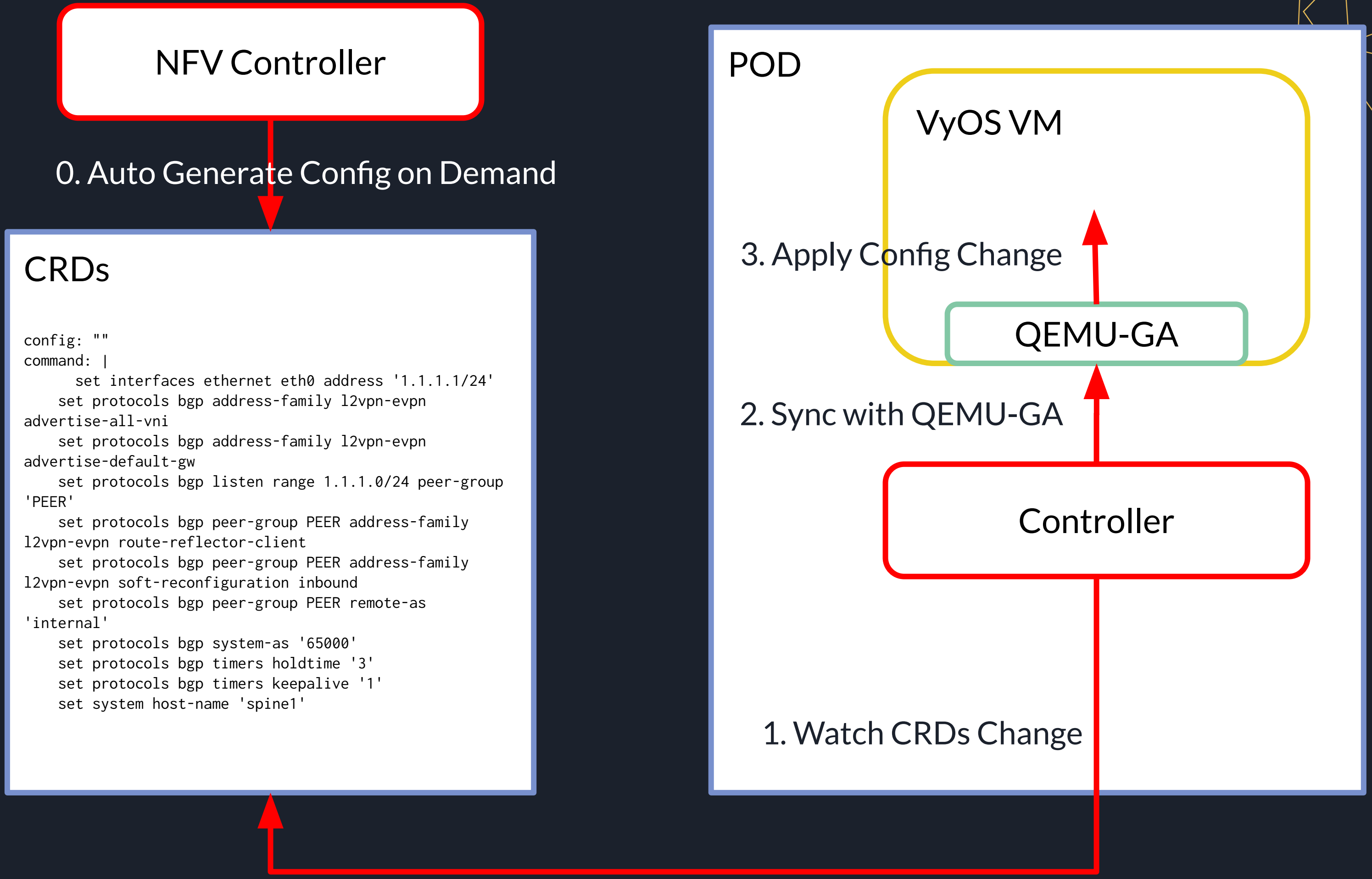
- Construct Tenant Network with VyOS
- Using BGP EVPN VXLAN

DEMO

- Deploy VPN server on Kubernetes

Future Work

- Kubernetes Controller based
  - CRDs to deploy and sync VyOS configuration
  - True VyOS App
- Sidecar Controller with Kubevirt
  - Enjoy Kubevirt VM feature with config sync



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