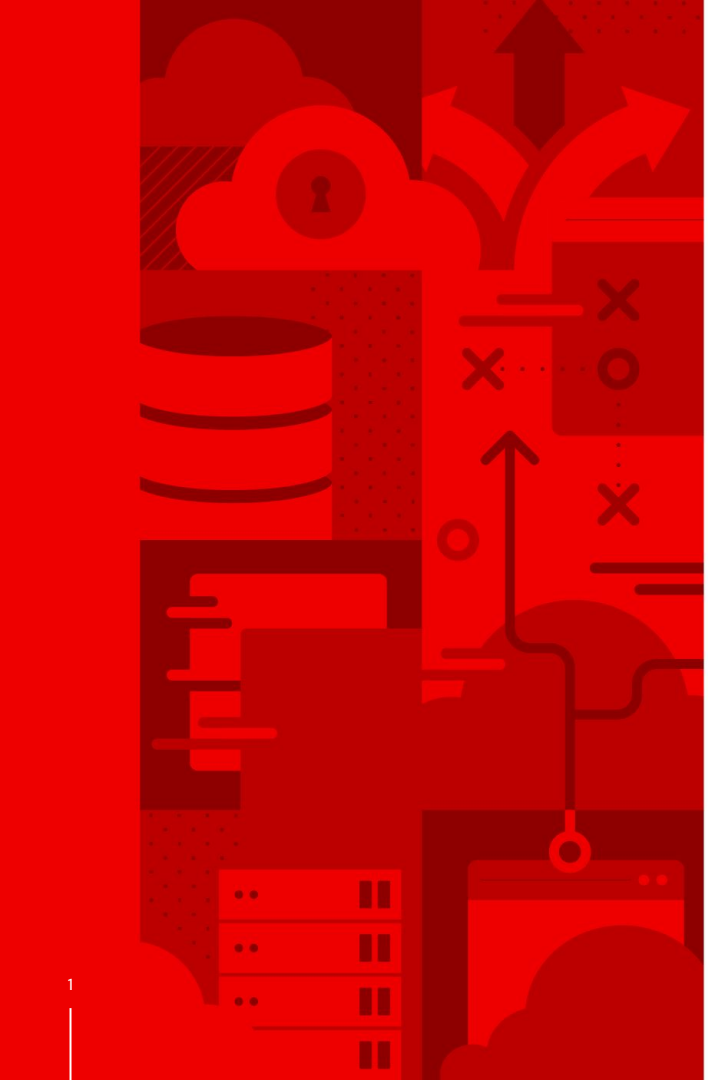

Go BGP or go home

Simplifying KubeVirt ingress with your favorite routing protocol

FOSDEM 2026

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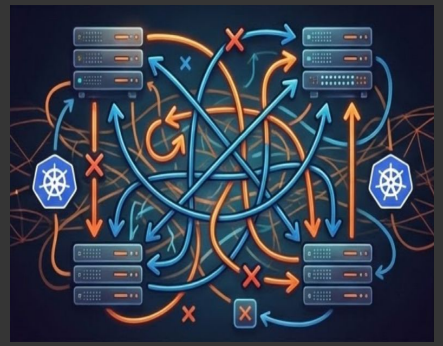
Agenda

- Motivation
- Why BGP ?
- Intro
- Use cases
- Solution
- Demos
- Conclusions

Motivation

Manual route management



NAT complexity

Performance

Industry standard

The protocol that powers the internet, with a rich feature set. Proven to work well at scale.

Policy Control

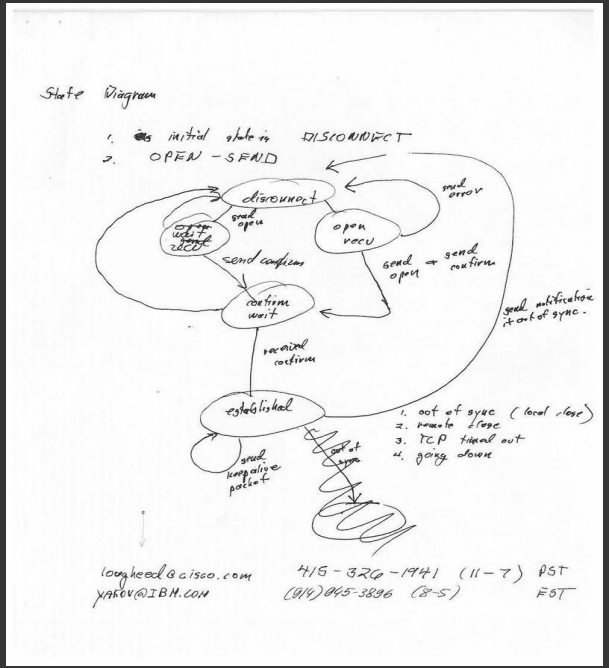
Provides fine-grained control over route propagation using attributes like communities, enabling sophisticated traffic engineering, segmentation, and failover strategies.

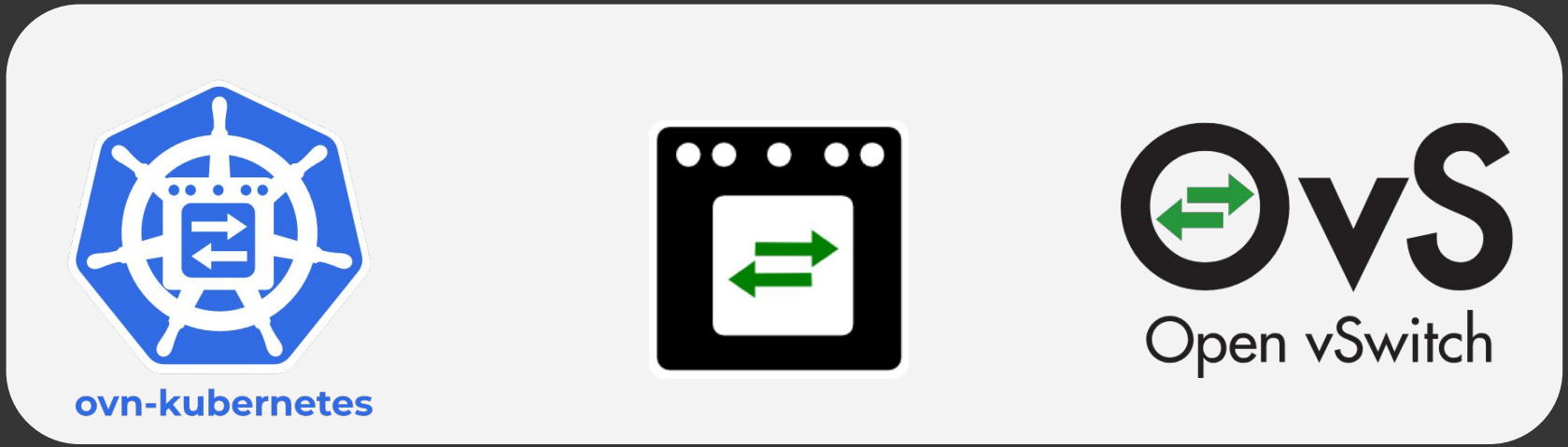
Dynamic route exchange

The cluster can automatically learn from and advertise routes to the provider network, reacting dynamically to network changes.

Border Gateway Protocol

- The “two napkin protocol”
- Sketched out in 1989, on a back of few ketchup stains napkins, during a meal on IETF meeting, by Kirk Lougheed, Len Bosack and Yakov Rekhter.
- Using set of rules it determines the best route for data to travel between different networks (or autonomous systems AS)
- Dynamic routing protocol
- Powers the internet
- IETF standard





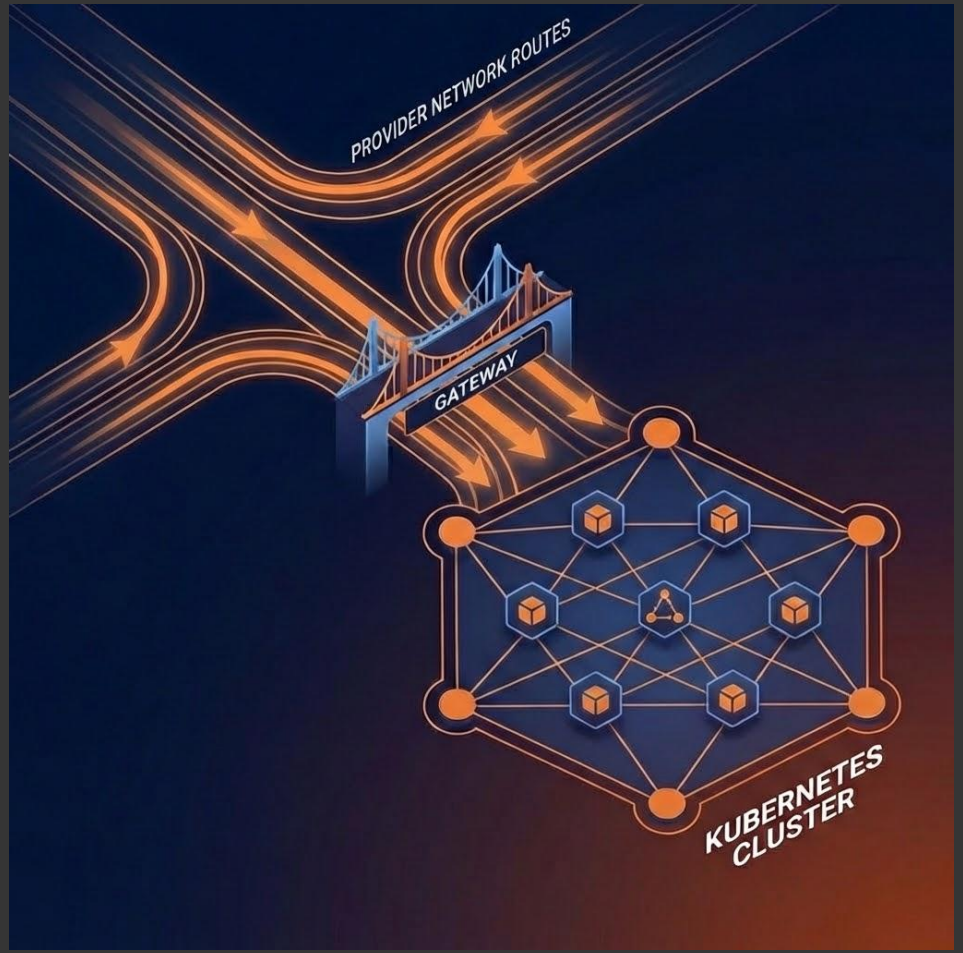
- OVN-Kubernetes is a networking platform for Kubernetes, CNCF project
- Open Virtual Networking (OVN) and Open vSwitch (OVS) at its core
- Support KubeVirt VMs
- Default network provider in OpenShift

- FRRouting open-source, routing protocols suite including BGP
- FRR-k8s integrates FRR router with Kubernetes cluster.
- OVN-Kubernetes integrate with FRR-k8s, enable connecting cluster default and user-defined networks to other networks over BGP.

- 1 FRR instance per node (via FRR-K8S pod)
  - Runs BGP receiving and advertising routes
- FRRConfiguration CRD enable controlling receive / advertise routes.

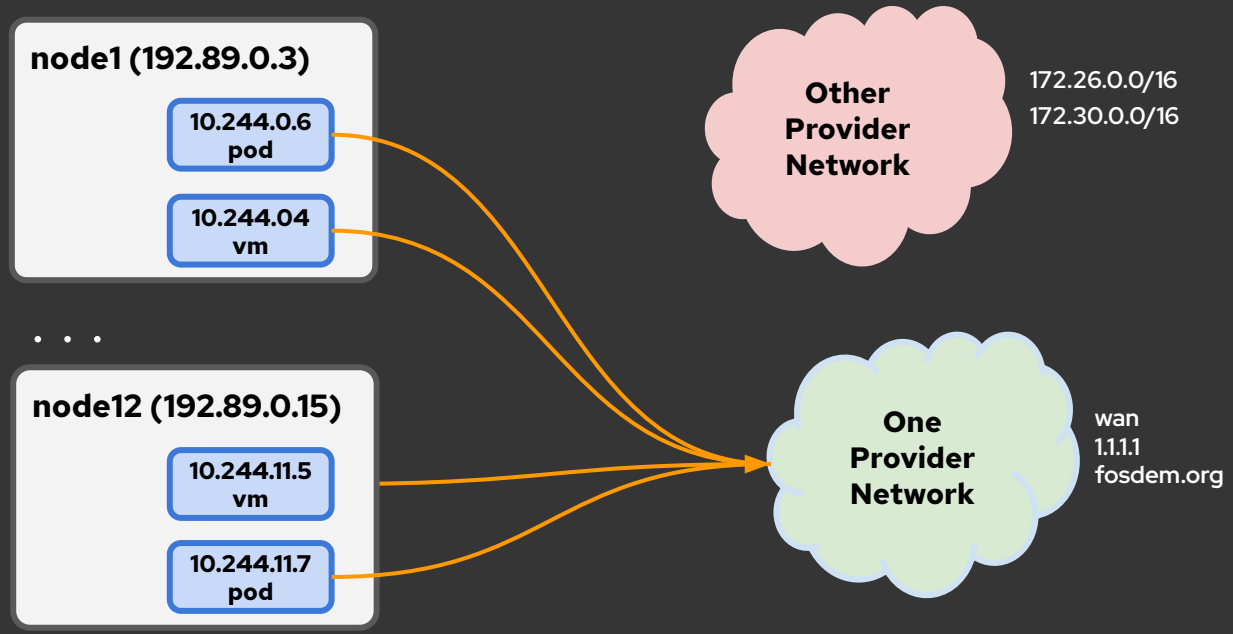
Use cases

Getting access to provider networks



Import provider network routes into cluster network

Use BGP to import routes from the provider network



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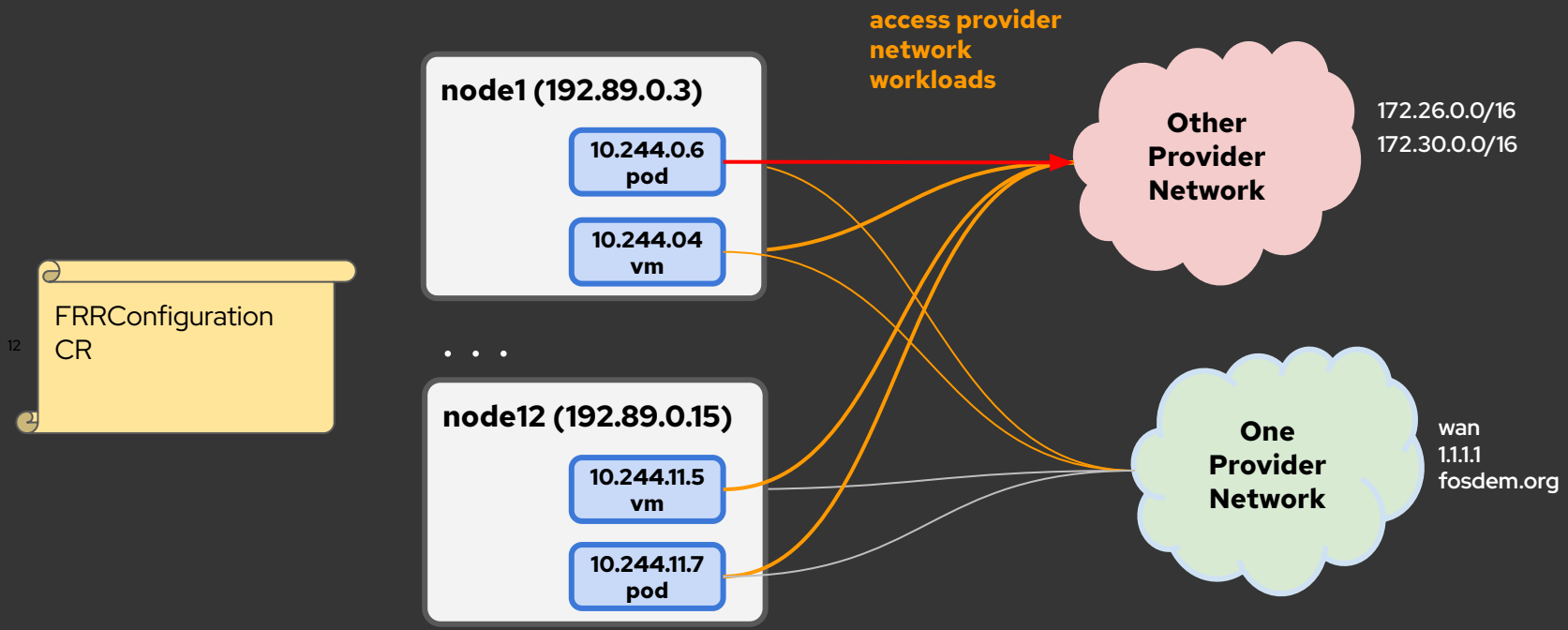
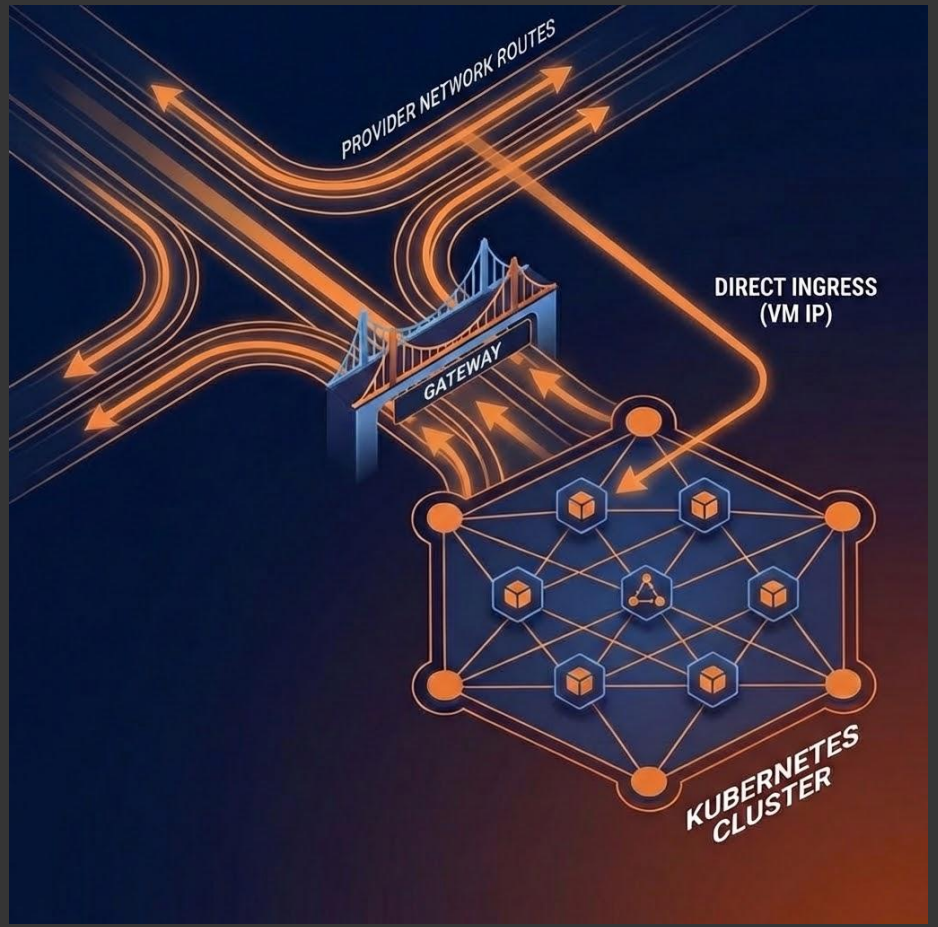
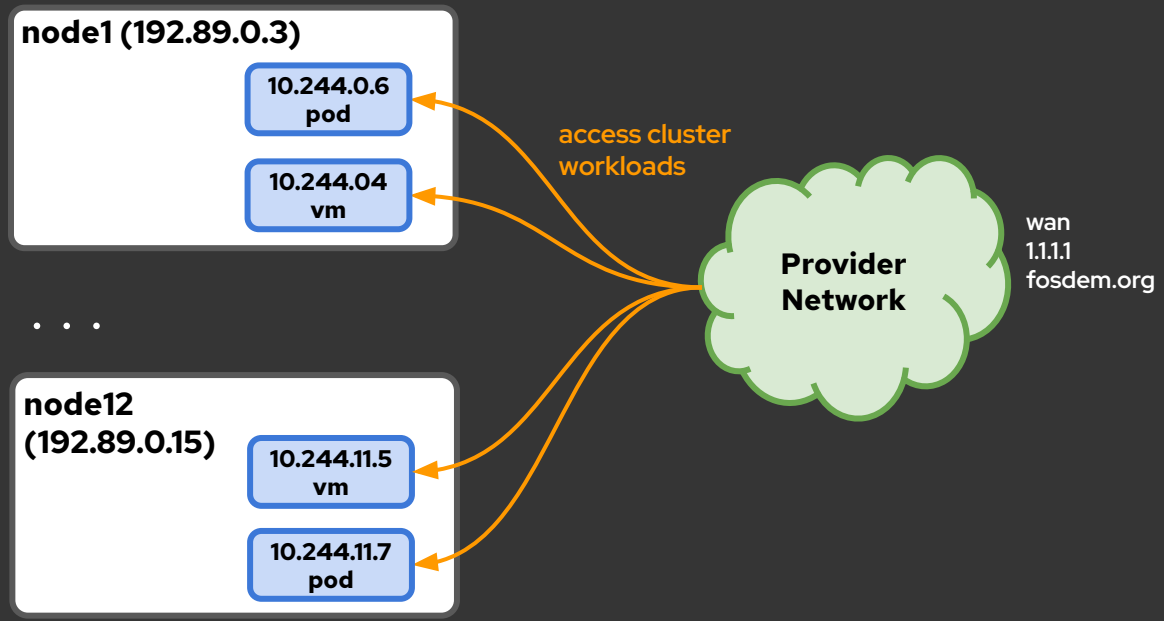


Expose cluster network outside



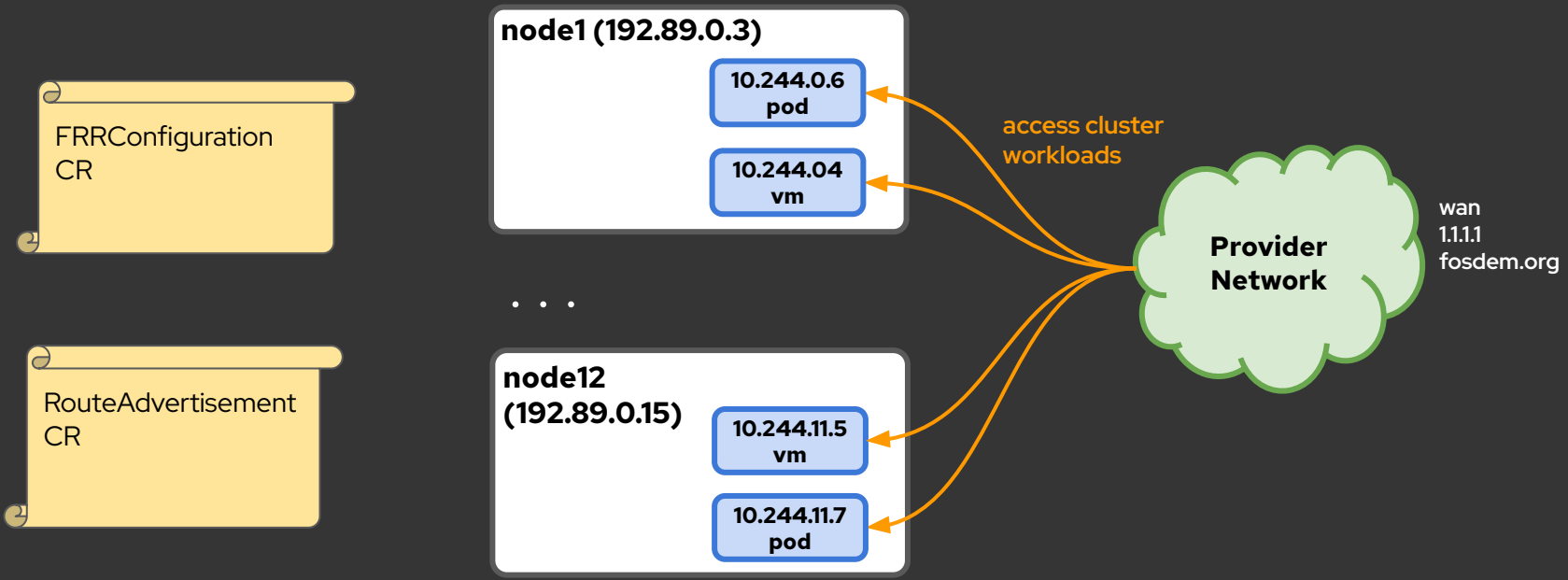
Export cluster network routes to provider network

Use BGP to advertise routes of workloads inside the cluster to outside



Export cluster network routes to provider network

Use BGP to advertise routes of workloads inside the cluster to outside



Implementation

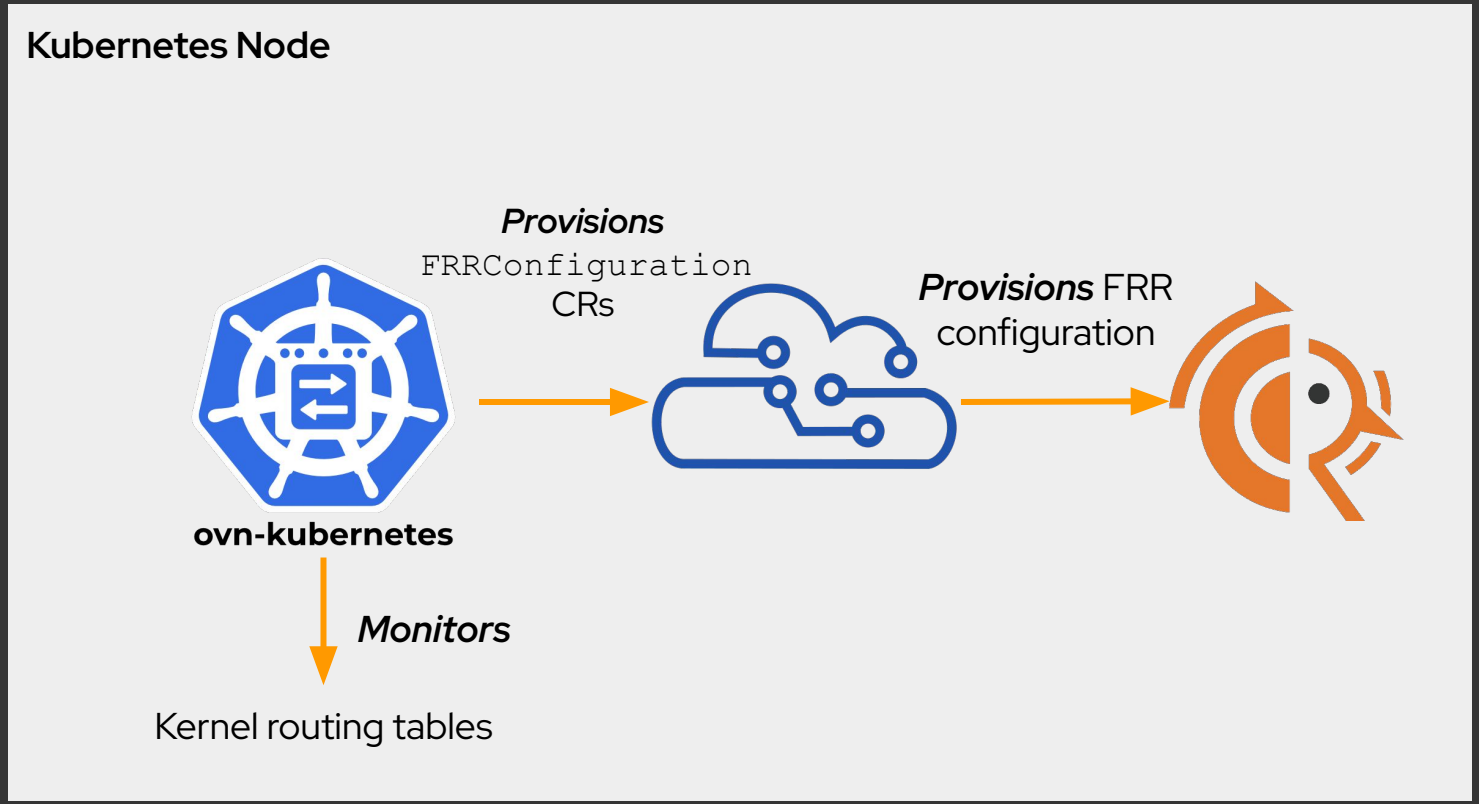
API

`FRRConfiguration`

- Who are my neighbors ?
- What is my AS number ?
- What are my neighbors' AS numbers ?
- Which nodes should consume this configuration ?

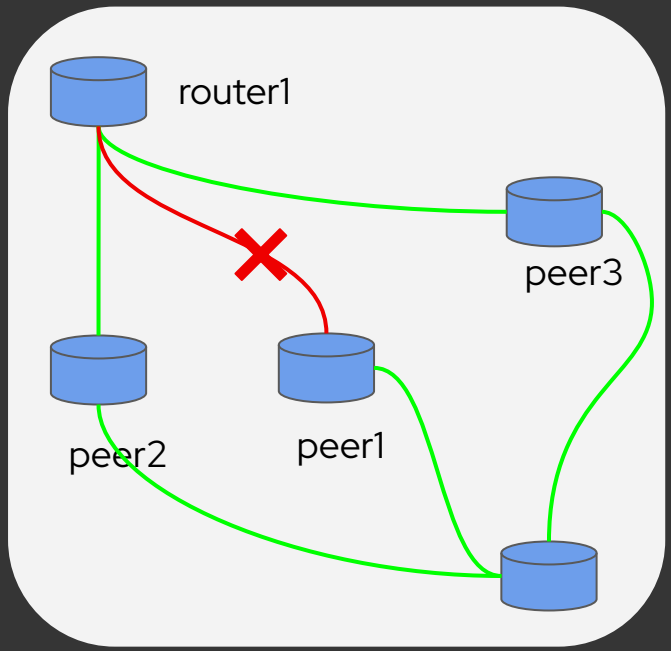
`RouteAdvertisements`

- Which internal networks ?
  - Pod network, user-defined networks
- Which **`FRRConfiguration`** should be used ?


Kubernetes Node
Provisions
FRRConfiguration
CRs
Provisions FRR
configuration
ovn-kubernetes
Monitors
Kernel routing tables

Failover with Bidirectional Forwarding Detection (BFD)

- BFD is protocol for detecting faulty link between two devices (switches or routers).
- Utilized by BGP to detect broken links and converge to alternative ones.
- Ensure rapid failover and high availability, which is essential to minimize workloads downtime.



Demo

Script for reproducing this demo:
https://github.com/maiqueb/fosdem2026-bgp/blob/main/scripts/import-provider-routes-bgp.sh
Asciinema link: https://tinyurl.com/3en4svbp

Script for reproducing this demo:
https://github.com/maiqueb/fosdem2026-bgp/blob/main/scripts/export-cluster-networks-bgp.sh
Asciinema link: https://tinyurl.com/43a4xkct

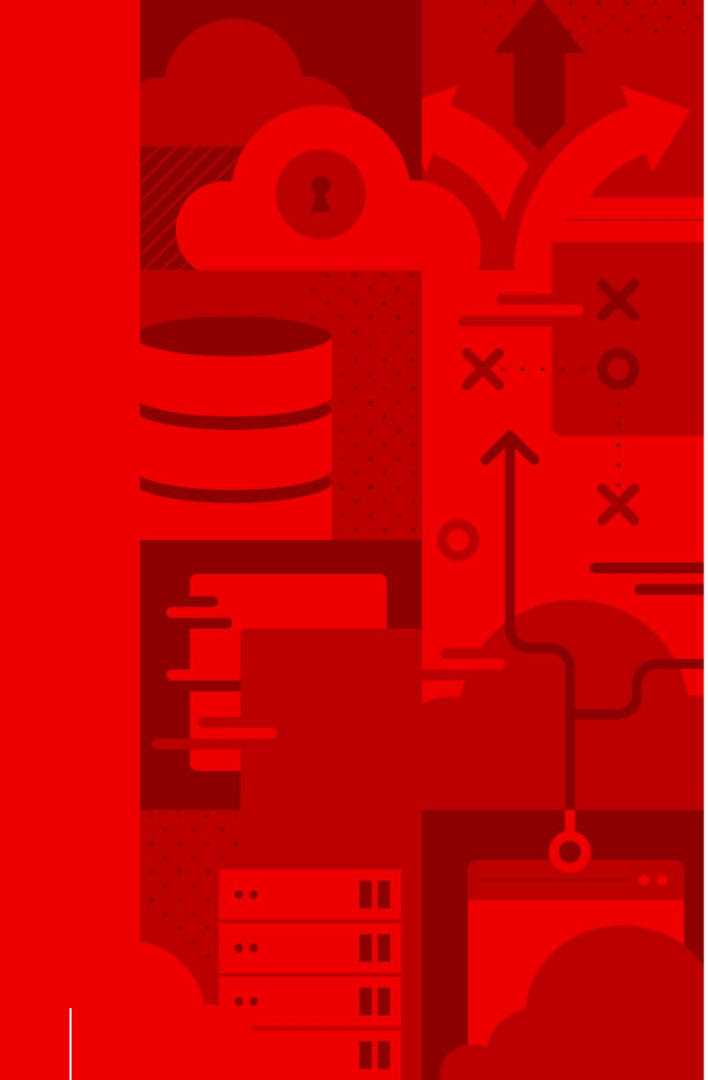
Conclusions

- FRR-K8s & OVN-Kubernetes enable connecting workloads over BGP
- Dynamic integration with external provider networks
  - Simplify the admin's job
  - Statically configured routes vs routing protocol
- Provides ingress into a VM using it's IP
  - This feature is very sought after
  - No NAT

the end ...

Resources

- BGP intro https://www.youtube.com/watch?v=A1KXPpqlNZ4
- https://www.iana.org/
- FRR, FRR-K8S, FRR-K8S API docs
- OVN-Kubernetes, OVN, OVS
- OVN-Kubernetes BGP integration docs



Thank you !

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