DPDK SUMMIT

May 12-13, 2026 | Stockholm, Sweden

# Grout: two years in

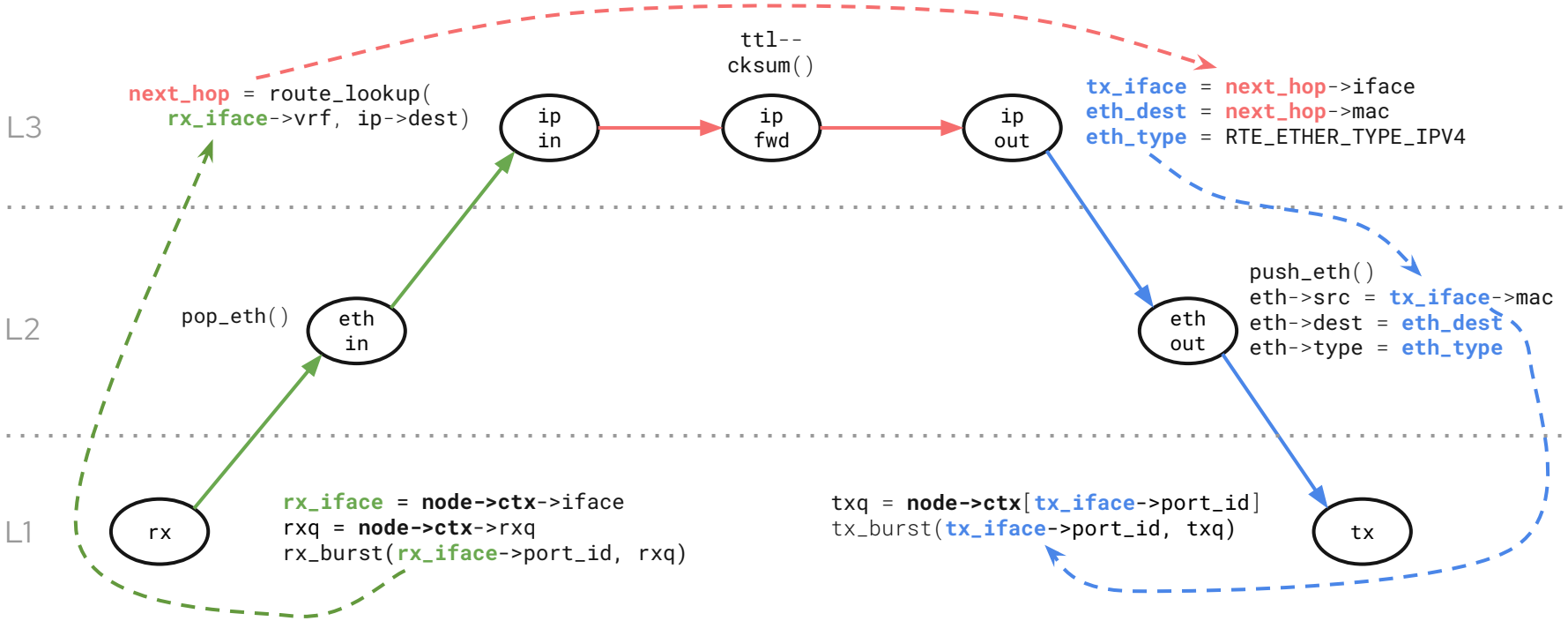
## Building a production-ready DPDK router

Robin Jarry, Red Hat

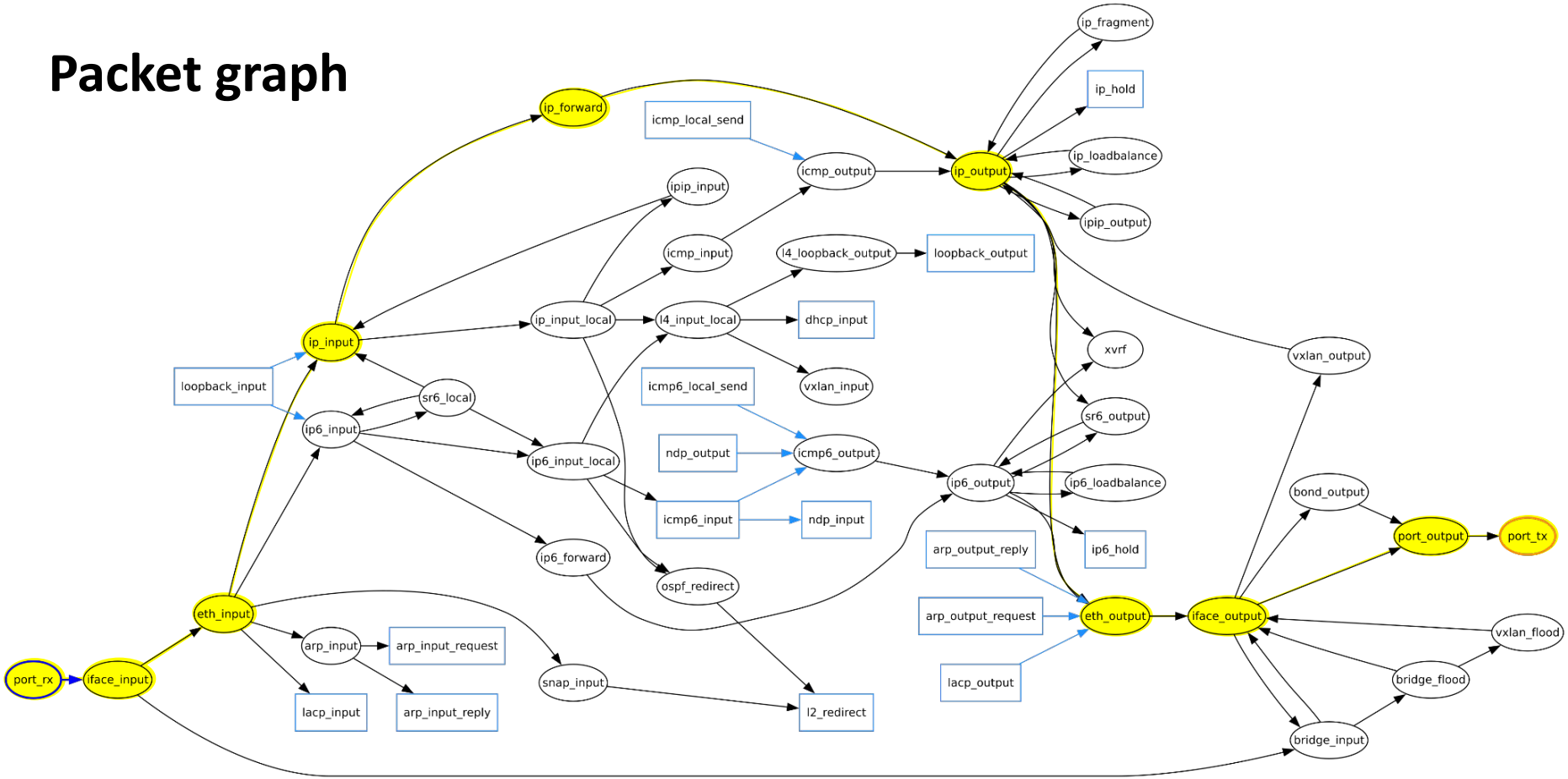
# Grout?

- DPDK-based software router built on `rte_graph`
- Example VNF/CNF
- L3/L4 stack: IPv4, IPv6, VLAN, IPIP, SRv6, NAT, VXLAN/L2 bridging, DHCP, bonding
- Runtime configured via UNIX socket API + CLI (`grcli`)
- FRR dplane plugin for dynamic routing (dedicated talk follows)
- DPDK hosted project, 100% FOSS
- Packaged for Fedora/EPEL: `dnf install grout`

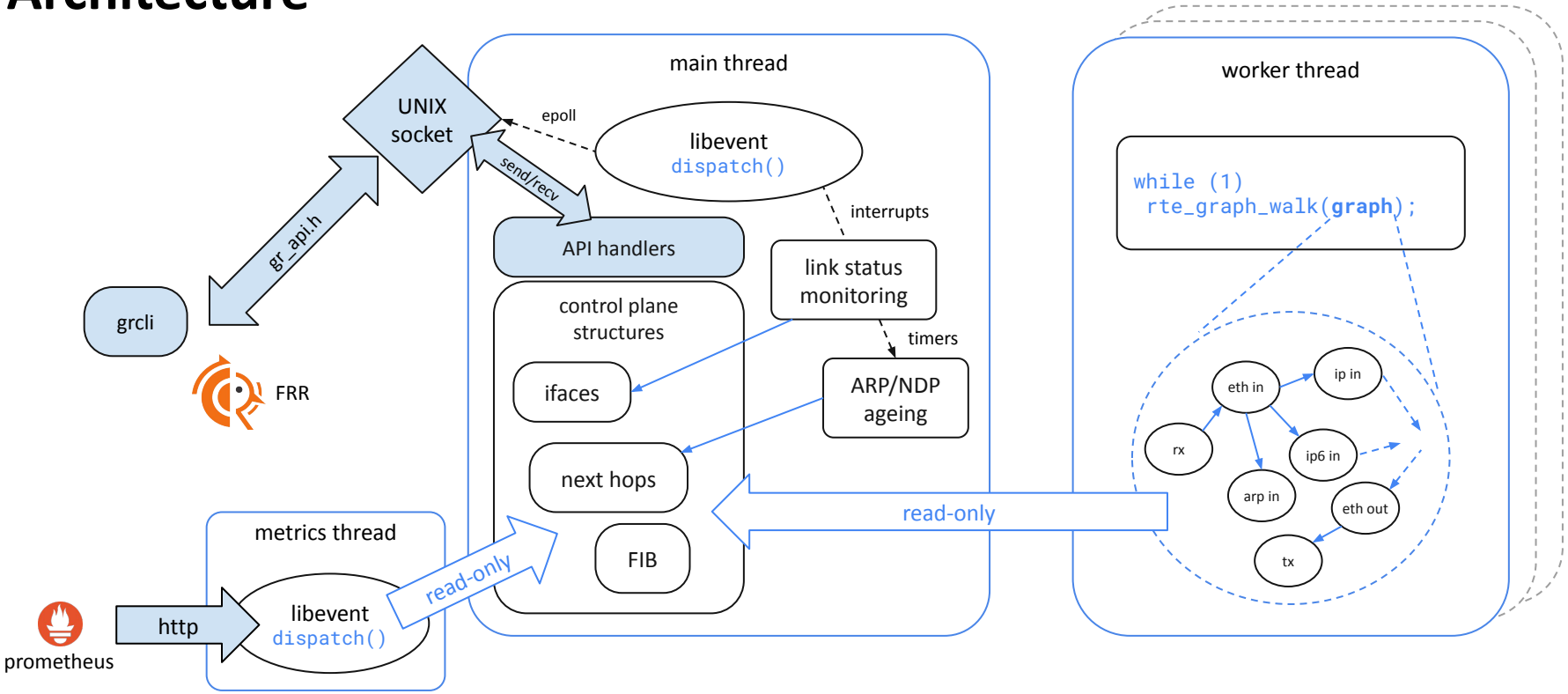
# Packet flow explained



# Packet graph



# Architecture



# From test tool to production router

**OpenPERouter** — moves BGP/EVPN termination from TOR switches to compute nodes; uses grout as its DPDK dataplane

**C**ell **S**ite **R**outer migration — telco operator moving from Linux kernel forwarding to grout with **SRv6** (work in progress)

**D-Lake** — French cloud and network provider, testing grout as a production software router for customers and its own needs (transit router at the edge)

*« Grout bridges FRR and DPDK natively – no state translation, no kernel spying. Much cleaner than existing alternatives. » – Guillaume Barrot, CEO, D-Lake*

# D-Lake: community partner

**D-Lake** is a French cloud and telecom operator running European and international backbones with MPLS network services.

- Hosting upstream CI/testing infrastructure on real hardware
- Contributing MPLS dataplane support, driven by their own production needs


# Design choices that paid off

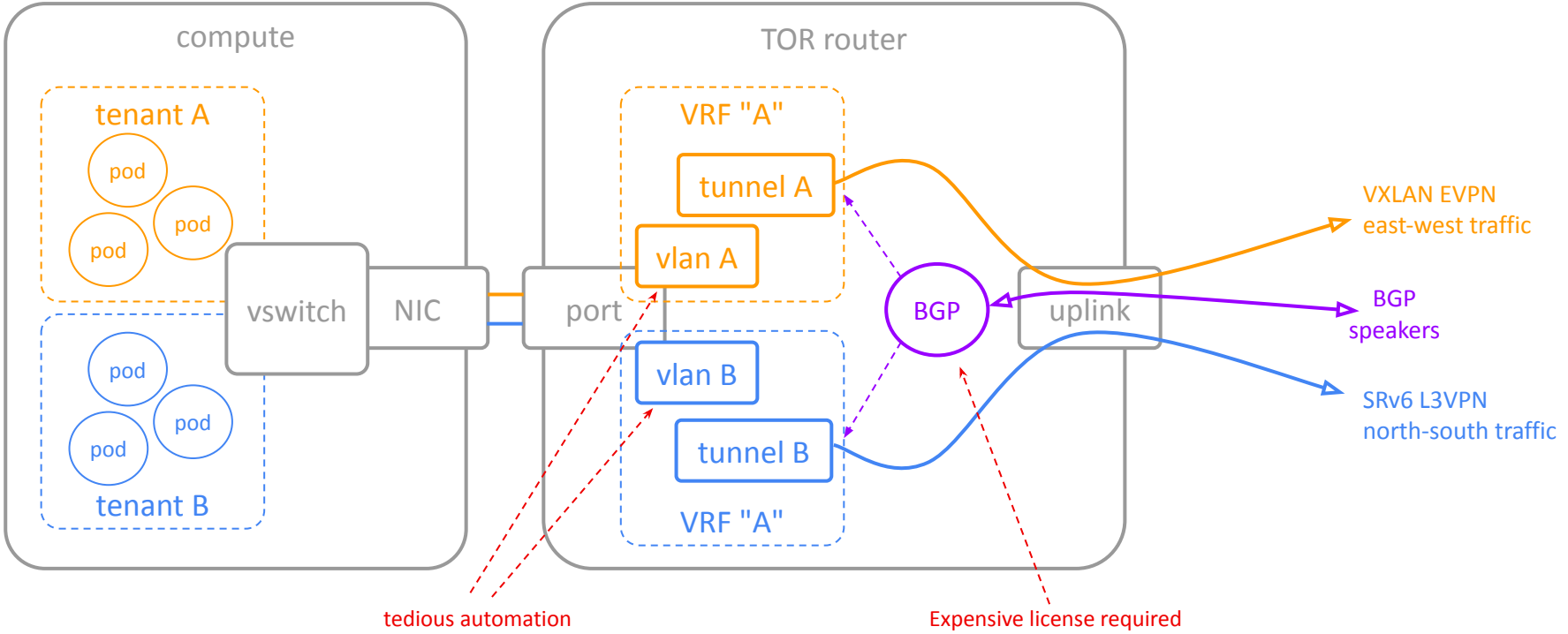
- Functional **correctness first**, performance second
  *Get the protocol right, then optimize the hot path.*
- Strict OSI **layer separation** in graph nodes
  *This is what makes grout extensible.*
- RCU everywhere, lock-free datapath
  *All shared structures protected with DPDK QSBR RCU.*
- ***Zero*** Linux synchronization
  *Direct FRR control plane wasn't trivial but opens new doors.*

# Feature list: what's new since 2025?

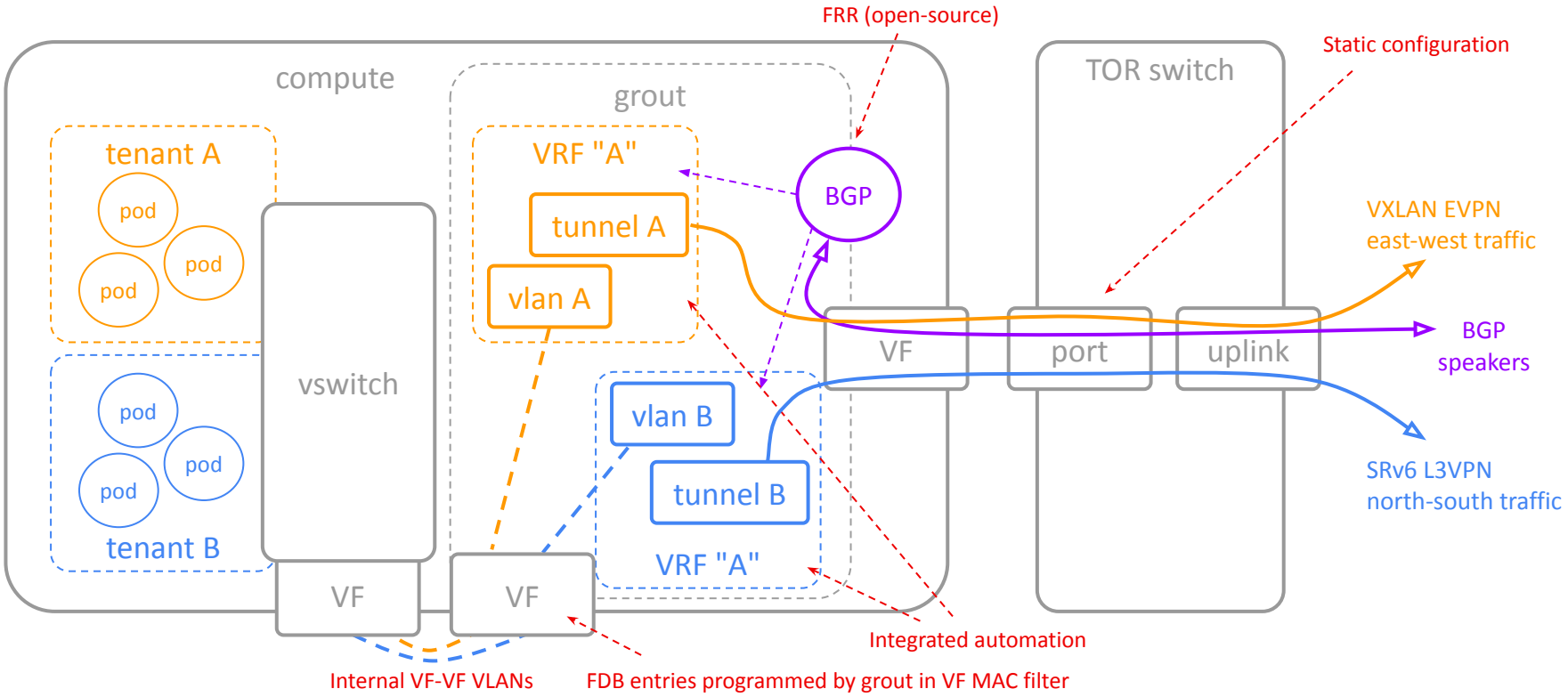
| L2 | L3 | L4 |
|---|---|---|
| Bonding<br>Bridging, FDB/learning<br>VXLAN EVPN | IPv4 fragmentation<br>Basic ECMP<br>SRv6 Compressed SID | Stateless DNAT44<br>Stateful SNAT44<br>DHCP client |

| CLI / API | Control Plane | FRR sync |
|---|---|---|
| JSON support<br>Streaming responses<br>API versioning | Named VRF interfaces<br>Linux local traffic<br>OpenMetrics exporter | Out of tree plugin<br>Total kernel bypass |

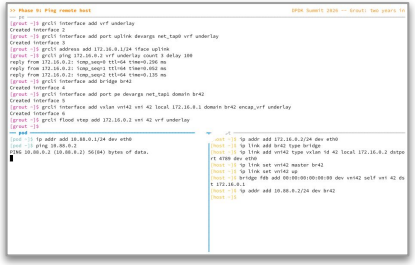
# Use case: PE router for distributed tenants



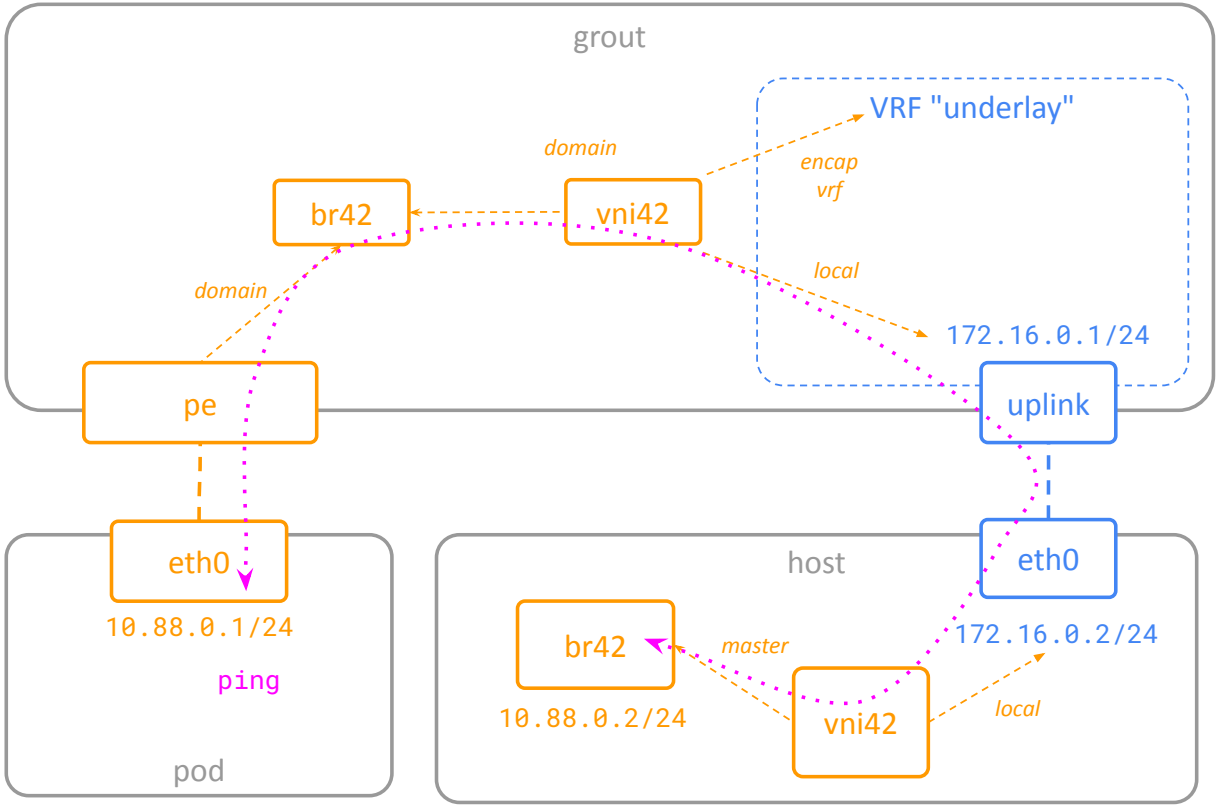
# Use case: PE router for distributed tenants



# Demo



https://asciinema.org/a/rNCUdB2TLboYVmTJ



# Datapath performance

Xeon(R) Silver 4316 CPU @ 2.30GHz -- E810-XXV 2x25G -- grout `v0.15`

| Profile | 1c/2t | 2c/4t | 4c/8t |
|---|---|---|---|
| **IPv4 forward** (2 routes) | 12.2M pkt/s | 23.7M pkt/s | 48.4M pkt/s |
| **IPv6 forward** (2 routes) | 11.9M pkt/s | 23.7M pkt/s | 48.0M pkt/s |
| **SRv6 encap/decap** (2 routes) | 8.5M pkt/s | 16.6M pkt/s | 34.0M pkt/s |
| **IPv4 + IPv6** (1000 flows/routes, 128 nexthops) | 10.1M pkt/s | 19.9M pkt/s | 39.5M pkt/s |

# Roadmap

| Work In Progress | Short Term (Q4 2026) | Long Term |
|---|---|---|
| VXLAN L3VPN | SRv6 DT2/DX2 | ACL / firewall |
| ARP/NDP rate limiting | SRv6 EVPN(L2) via FRR | BGP FlowSpec |
| ARP/NDP suppression | Port mirroring (ERSPAN) | IPsec |
| Packet capture via shmem | Targeted optimizations | ECMP consistent hash |
| Libpcap plugin | QoS / traffic pacing | StrongSwan plugin |
| | MPLS | Partial offload (TBD) |
| | | <your ideas here> |

# Why Contribute to grout

- It is an actual community project where contributors shape the direction.
  - Grout feeds **fixes back to DPDK upstream** (graph, fib, hash, bpf).
- For NIC/silicon vendors:
  - Grout exercises DPDK in **real L3/L4/tunnel scenarios**. testpmd can't find the bugs grout finds.
  - Test your hardware, add it to CI. Partial offload is the next frontier
- For companies with internal DPDK apps:
  - If you maintain a custom forwarding plane, Grout might replace part of it.
  - Contribute the delta you need, maintain less internally.
  - NB: Grout is designed to be good at **L3 forwarding**. It will not fit all use cases.

# How to Get Started

```
git clone https://github.com/DPDK/grout
make
make -j`nproc` smoke-tests   # 30 sec, runs on your laptop
```

Contributions accepted as GitHub PRs or mailing list patches.

https://github.com/DPDK/grout/blob/main/CONTRIBUTING.md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# Thank You / Questions

https://github.com/DPDK/grout
grout@dpdk.org
#grout @ dpdkproject.slack.com

What do YOU want to do with Grout? Let's talk about it.
Stay for the next talk on FRR integration.
Come find me to discuss hardware offload, use cases, or anything else.