www.FRROUTING.org

New Quagga fork with open development and community

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What is FRR ?

(for the not so technical People)

- Open Source (GPLv2+) Routing Stack
- Implements RIP, RIPng, OSPF (v2&v3), ISIS, BGP, PIM, LDP
- Fork of Quagga
- Works on Linux and most BSD based systems
- For use in many Clouds as virtual routers, white box vendors and network providers (full routing stack)

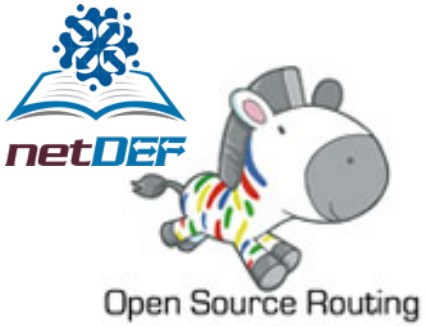
FRR - Why a new fork?

Community Led and Driven

Fast & Open Development

Open Community Model

FRR - Who is behind the Fork?



FRR - What's different?

- Methodical vetting of submissions
- Extensive automated testing of contributions
- Git Pull Requests
- Github centered development
- Elected Maintainers & Steering Committee
- Common Assets held in trust by Linux Foundation

FRR – How to get it

- **Binary package**
  - Snap package available now
    - Snap is a new universal package format – see snapcraft.io
    - FRR 2.0 in stable channel and FRR 3.0 in beta channel
  - Debian / Ubuntu / RedHat packages coming soon
  - Other packages will follow
- **Source**
  - Github (https://github.com/FRRouting/frr)
    - Branch stable/2.0 → Released Version 2.0
    - Branch stable/3.0 → Version 3.0 (upcoming release)
    - Branch master → Latest development (“unstable”)

FRR – Current Stable 2.0

First stable version – out now

BGP

- Performance & Scale fixes
- AddPath Support
- Remote-AS internal/external Support
- BGP Hostname support
- Update Groups
- RFC 5549 (unnumbered) Support
- Nexthop tracking
- 32-bit route-tags

Testing

- Dejagnu unittests changed to pytest
- Topology Tests

Zebra

- MPLS Support IPv4/v6 for static LSPs
- 32-bit route-tags
- Nexthop Tracking
- RFC 5549 (unnumbered) Support

OSPF V2/V3

- OpenBSD Support restored
- 32-but route-tags
- RFC 5549 (unnumbered) Support

LDP (new)

- RFC 5036 (LDP Specification)
- RFC 4447 (Pseudowire Setup and Maintenance using LDP)
- RFC 4762 – (Virtual Private LAN Service (VPLS) using LDP)
- RFC 6720 - The Generalized TTL Security Mechanism (GTSM) for LDP
- RFC 7552 - Updates to LDP for IPv6

Others

- JSON Support
- VRF Lite (Linux VRF device support) for BGP and Zebra
- Snapcraft Packaging

FRR – Next Version 3.0

Upcoming version currently in beta

BGP

- BGP Shutdown Message
- RFC 8092 - Large Communities
- RFC 7432 - Partial support with Ethernet VPN
- Partial support with EVPN RT-5
- IDR Tunnel - Support for VXLAN ext. community (draft-ietf-idr-tunnel-encaps-03#section-3.2.1)
- misc fixes related to IPv6 VPN feature
- support for IPv4/IPv6 VPN Graceful Restart

PIM

- Unnumbered interfaces
- RFC 4611 - Multicast Source Discovery Protocol (MSDP)
- RFC 4601 - Protocol Independent Multicast - Sparse Mode

NHRP (new)

- RFC 2332 - NBMA Next Hop Resolution Protocol (NHRP)
- Linux only, for NBMA-GRE tunnels. No ATM, Not supported on BSD

ISIS

- SPF Backoff

OSPF V3

- RFC 4552 - Authentication/ Confidentiality

Label Manager (new)

- Label Manager to share MPLS Label Space between different daemons.

LDP

- Unnumbered interfaces
- RFC 5561 - LDP Capabilities
- RFC 5918 - LDP 'Typed Wildcard' Forward Equivalence Class (FEC)
- RFC 5919 - Signaling LDP Label Advertisement Completion
- RFC 6667 - LDP 'Typed Wildcard' Forwarding Equivalence Class (FEC) for PWid and Generalized PWid FEC Elements
- RFC 7473 - Controlling State Advertisements of Non-negotiated LDP Applications

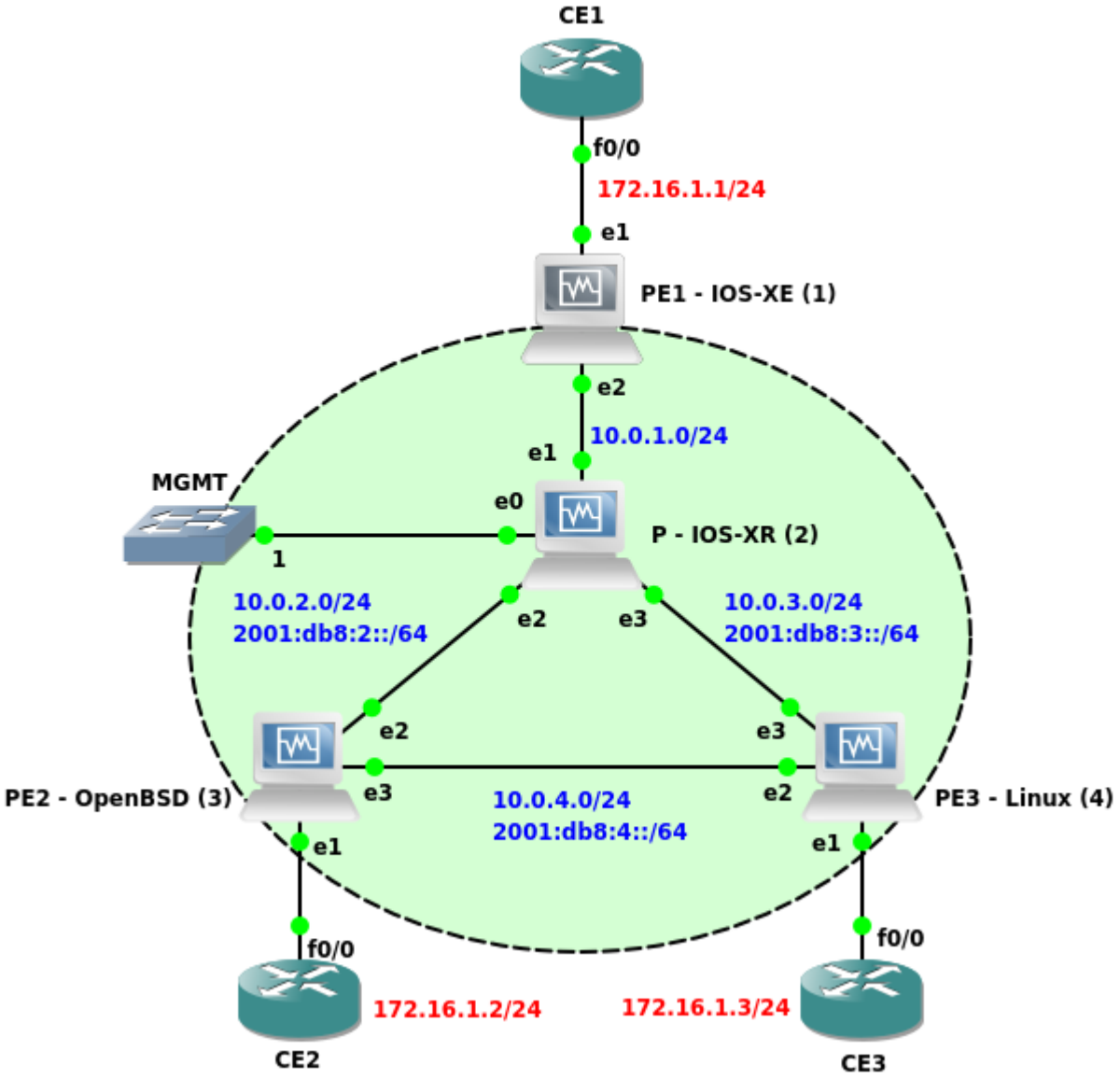
CLI

- Parser rewritten in Bison
- Lexer rewritten in Flex
- Definition grammar overhauled

FRR – LDP

- FRR 2.0 (Current stable release):
  - Static LSP support (IPv4 & IPv6) in Zebra
  - RFC 5036 - LDP Specification
  - RFC 4447 - Pseudowire Setup and Maintenance using LDP
  - RFC 4762 - Virtual Private LAN Service (VPLS) using LDP Signaling
  - RFC 6720 - The Generalized TTL Security Mechanism (GTSM) for LDP
  - RFC 7552 - Updates to LDP for IPv6
- FRR 3.0 (upcoming release)
  - Support for unnumbered interfaces
  - RFC 5561 - LDP Capabilities
  - RFC 5918 - LDP 'Typed Wildcard' Forward Equivalence Class (FEC)
  - RFC 5919 - Signaling LDP Label Advertisement Completion
  - RFC 6667 - LDP 'Typed Wildcard' Forwarding Equivalence Class (FEC) for PWid and Generalized PWid FEC Elements
  - RFC 7473 - Controlling State Advertisements of Non-negotiated LDP Applications

FRR - LDP


CE1
f0/0
172.16.1.1/24
e1
PE1 - IOS-XE (1)
e2
10.0.1.0/24
e1
MGMT
e0
P - IOS-XR (2)
1
10.0.2.0/24
2001:db8:2::/64
e2
e3
10.0.3.0/24
2001:db8:3::/64
e2
e3
PE2 - OpenBSD (3)
e3
10.0.4.0/24
2001:db8:4::/64
e2
PE3 - Linux (4)
e1
e1
f0/0
f0/0
172.16.1.2/24
172.16.1.3/24
CE2
CE3

FRR - LDP

```
mpls ldp
 router-id 3.3.3.3
 dual-stack cisco-interop
 neighbor 1.1.1.1 password frrouting
 neighbor 2.2.2.2 password frrouting
 neighbor 4.4.4.4 password frrouting
 !
 address-family ipv4
  discovery transport-address 3.3.3.3
  label local advertise explicit-null
  !
  interface em3
  !
  interface em2
  !
 !
 address-family ipv6
  discovery transport-address 3:3:3::3
  ttl-security disable
  !
  interface em3
  !
  interface em2
  !
 !
!
l2vpn ENG type vpls
 bridge br0
 member interface em1
 !
 member pseudowire mpw0
  neighbor lsr-id 1.1.1.1
  pw-id 100
 !
 member pseudowire mpw1
  neighbor lsr-id 4.4.4.4
  neighbor address 4:4:4::4
  pw-id 100
 !
!
```

FRR - LDP

1. Requires Linux Kernel 4.5 or later (or OpenBSD)
2. (Linux) Enable IPv4/v6 forwarding:

```
sysctl -w net.ipv4.ip_forward=1
sysctl -w net.ipv6.conf.all.forwarding=1
```

3. (Linux) Enable MPLS forwarding:

```
modprobe mpls-router
modprobe mpls-iptunnel
echo 100000 > /proc/sys/net/mpls/platform_labels
echo 1 > /proc/sys/net/mpls/conf/eth1/input
echo 1 > /proc/sys/net/mpls/conf/eth2/input
```

Full configuration example doc:
https://github.com/FRRouting/frr/blob/master/doc/ldpd-basic-test-setup.md

FRR - PIM

- RFC 4601 - Protocol Independent Multicast - Sparse Mode
  - RFC 4611 - Multicast Source Discovery Protocol (MSDP)
  - SPT failover
  - ECMP
  - SSM Ranges
- Unnumbered interfaces
  - IPv6 link-local
  - RA advertisements to detect neighbor

```
auto swp1
iface swp1
        address 172.30.1.1/30
        address 2001:DB8:1::1/64

auto swp2
iface swp2
        address 172.30.1.5/30
        address 2001:DB8:2::1/64
```

```
auto swp1
iface swp1

auto swp2
iface swp2
```

FRR - MPLS SR

- RFC 3107 - Carrying Label Information in BGP-4
  - 4379, Detecting MPLS Data Plane Failures
  - 3443, TTL Processing in MPLS Networks

- Usage w/ Linux VRF & MPLS
- Multi-tenancy in DCs
- No need for L2 overlays

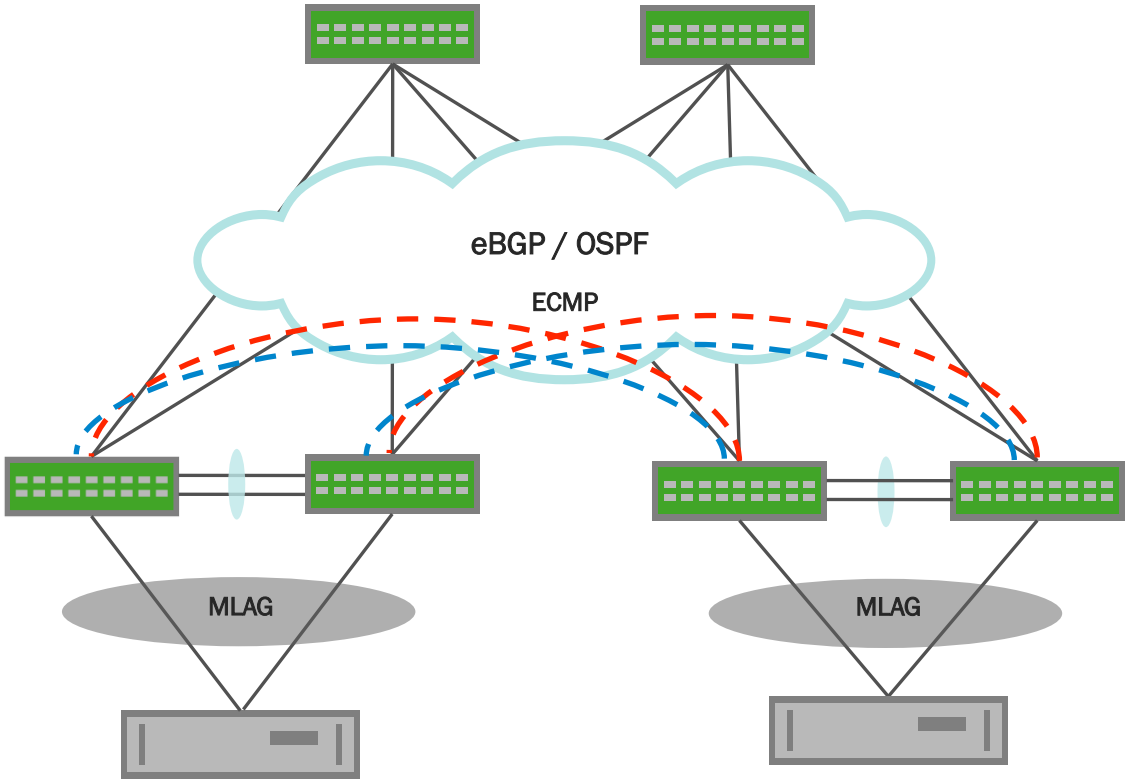
FRR - EVPN - VxLAN

- Type 2, 3 and 5 support
  - RFC7432
  - draft-ietf-bess-evpn-overlay
  - draft-ietf-bess-evpn-inter-subnet-forwarding
  - draft-ietf-bess-evpn-prefix-advertisement
- Mixed L2 / L3 overlay
- ~ Post 3.0 code merge

FRR - EVPN - VxLAN

L2 EVPN overlay

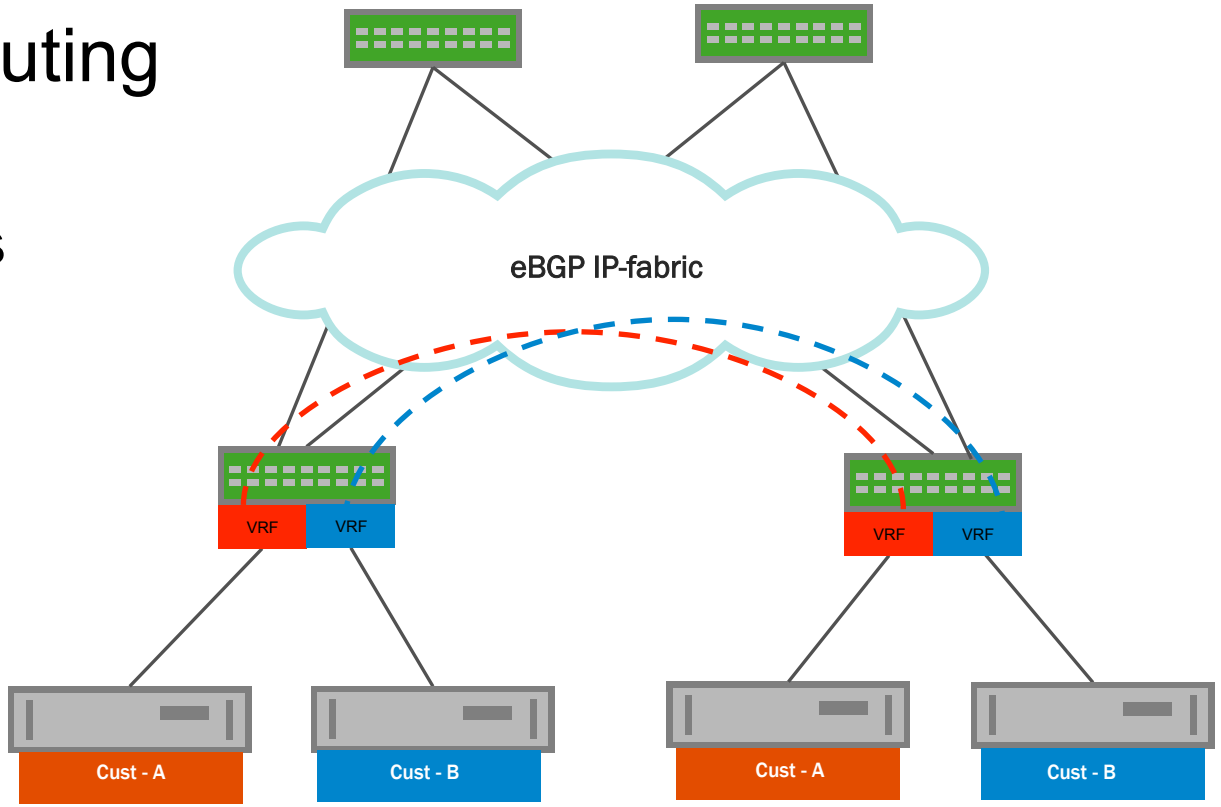
- Type2 & Type3
- BUM traffic w/ HER
- VxLAN encapsulation
- EVPN Controlplane



FRR - EVPN – Multi Tenancy 1

EVPN Segment routing

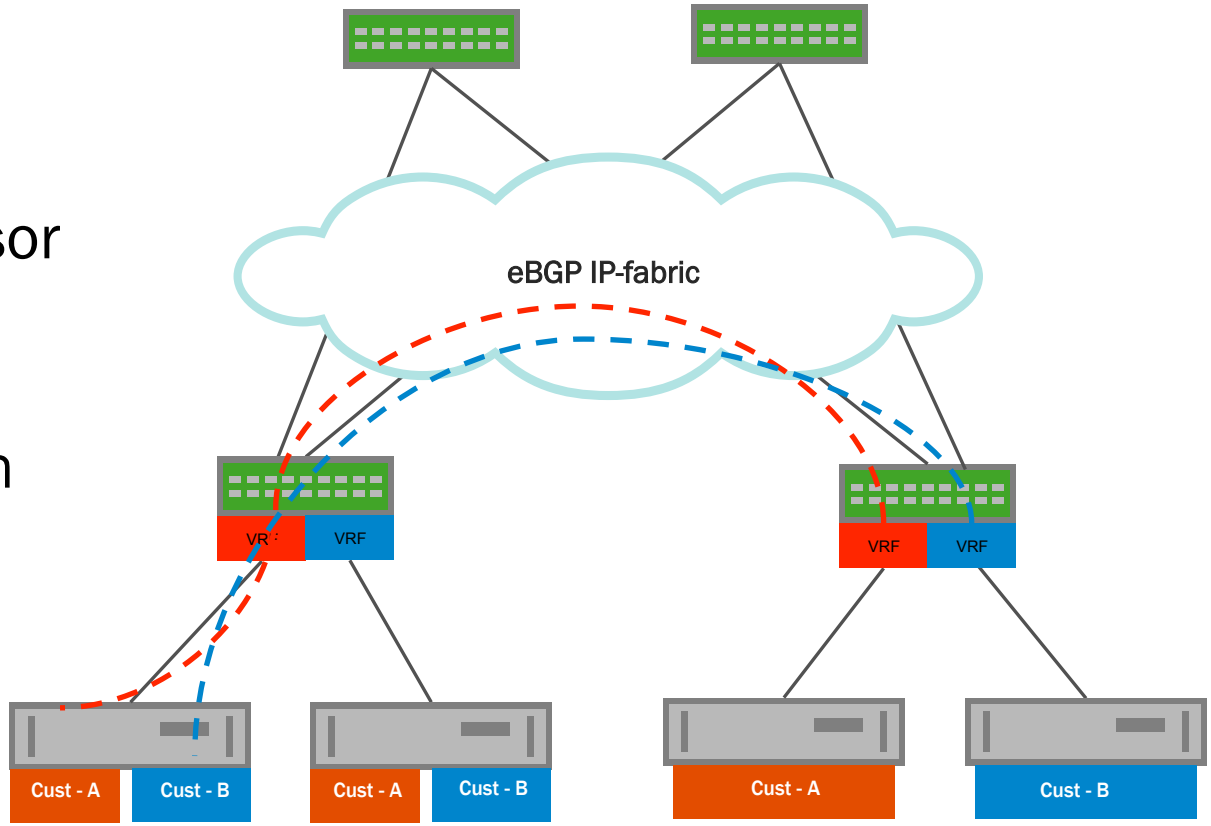
- VRFs
- Overlapping subnets
- Security boundaries
- L3VNI
- EVPN Type-5



FRR - EVPN – Multi Tenancy 2

Overlay to the host

- VTEP on the Hypervisor
- VM to bare metal
- VM tenant separation



FRR - Links

- **Website**
  - http://www.frrouting.org
- **Github**
  - http://github.com/frrouting/frr.git
- **Issue Tracker**
  - https://github.com/frrouting/frr/issues
- **New feature list, test results etc (until web is up)**
  - https://github.com/frrouting/frr/wiki