BIRD, MPLS and EVPN

BIRD applicability in MPLS and EVPN deployment

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CZ DOMAIN REGISTRY

- BIRD Internet Routing Daemon
- Routing protocols BGP, OSPF, RIP, Babel, and BFD
- IPv4 and IPv6 support
- Linux and BSD kernel support
- Free and open source software (GPL)

Multiprotocol Label Switching (MPLS)

- Traffic encapsulated and labeled
- Forwarding based on label
- Label may change at each hop
- Decapsulated at egress

MPLS - features

- Allows fine-grained traffic engineering
- Handles L3VPNs, L2VPNs, . . .
- Possibly faster lookups (?)
- Separation of data and control traffic
- More complicated administration
- Needs dynamic label distribution
- LDP, RSVP-TE, BGP

MPLS in BIRD

- Introduced in BIRD 2.14
- Dynamic label allocation
- IP / MPLS route twins
- BGP only, no LDP or RSVP-TE
- But you can use EBGP as your IGP!
- L3VPNs with BGP signalling

MPLS in BIRD - detailed

- MPLS domains and ranges
- MPLS tables and channels
- MPLS route attributes
- Labeling policies
- Next-hop label stack

MPLS in BIRD - import

- IP route is received
- Import filter is applied
- Label is assigned
- If new label is allocated,
  twin MPLS route is produced

EBGP as your IGP

- Private ASN for each router
- Connect them with single-hop EBGP sessions
- Export direct routes
- BFD for faster failure detection
- AIGP for better metrics
- RFC 7938 - Use of BGP for Routing in Large-Scale Data Centers

https://gitlab.nic.cz/labs/bird-tools/-/tree/master/netlab/cf-mpls-bgp

BGP/MPLS L3VPNs

- Multiple tables of private IP routes in VRFs
- Common table of VPN routes with route distinguishers
- Connected by ‘l3vpn’ protocols
- Controlled by route target BGP communities
- VPN routes propagated by BGP
- RFC 4364

https://gitlab.nic.cz/labs/bird-tools/-/tree/master/netlab/cf-mpls-bgp-l3vpn

Ethernet VPN (EVPN)

- I.e. distributed bridge
- BGP signalling
- BGP for MAC propagation
- Encapsulated to MPLS / NVGRE / VXLAN / …

EVPN in BIRD

- Ethernet and EVPN route types
- New ‘bridge’ protocol to sync ethernet tables with Linux bridge devices
- VLAN-aware bridge support
- VXLAN encapsulation support
- EVPN BGP SAFI to propagate EVPN routes
- BIRD filtering support for EVPN routes
- Ethernet and EVPN tables connected by ‘evpn’ protocol

EVPN in BIRD - limitations

- Still work in progress
- Many rough edges
- No MPLS encapsulation
- No MAC mobility
- No multihoming functions

EVPN in BIRD - example

```
eth table etab2;

protocol static {
        eth { table etab2; };
        route 12:d7:ed:f4:86:7c vlan 100 via "eth2";
        route 16:5a:34:28:51:35 vlan 200 via "eth3";
}

protocol bridge {
        eth { table etab2; export all; };
        bridge device "sw2";
        vlan filtering;
};
```

EVPN in BIRD - example

```
evpn table evpntab;

protocol evpn {
        eth { table etab2; };
        evpn { };

        rd 1:12;
        route target (rt, 1, 2);
        tunnel device "vxlan2";
        router address 10.1.1.1;
        vni 12;
};
```

Questions?

https://labs.nic.cz/
https://bird.network.cz/