

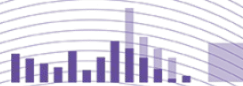
CSNOG 2020

QRATOR
LABS

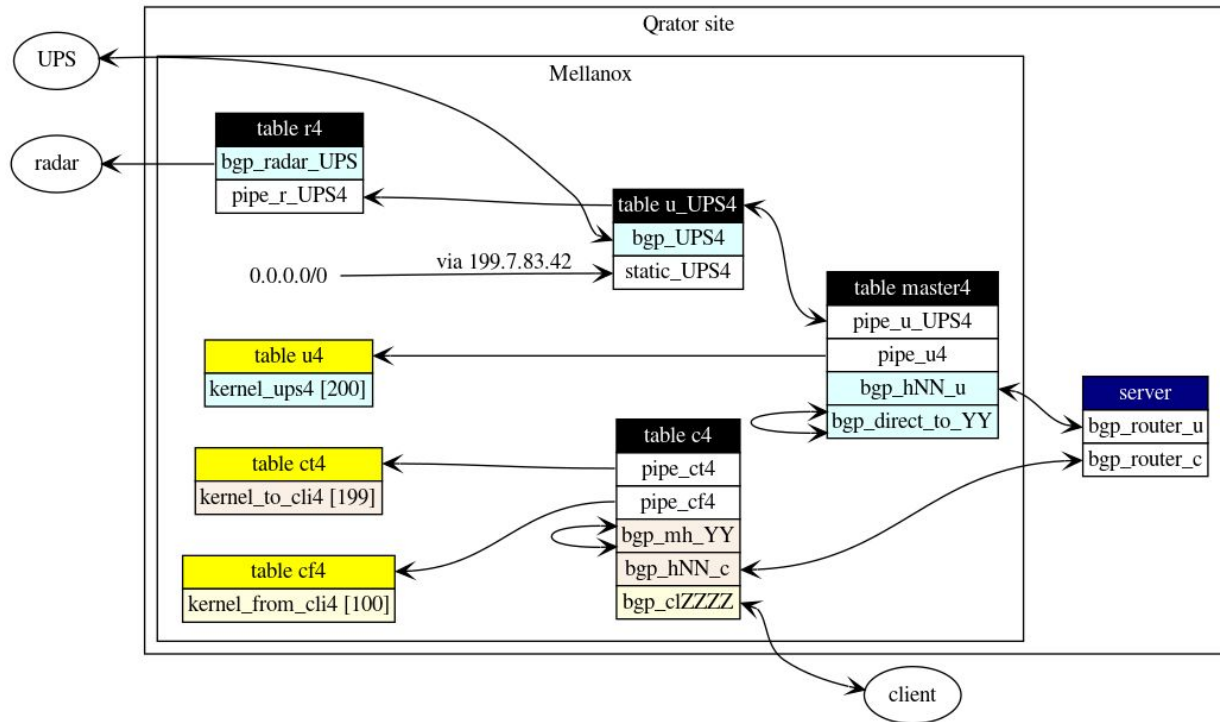
The birdist cookbook*

* BGP version

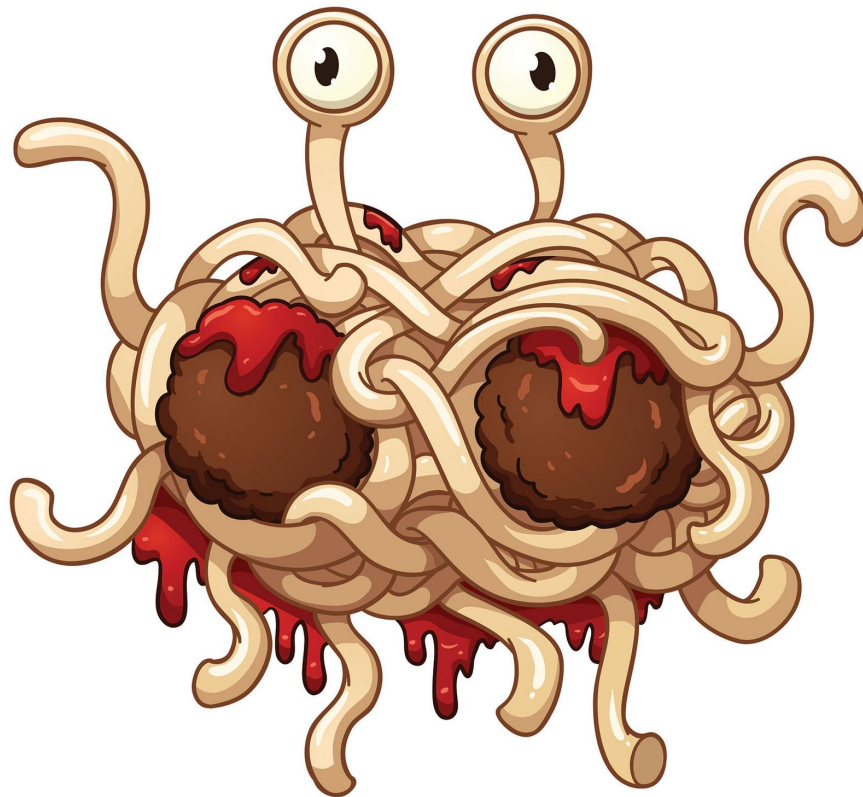
Alexander Zubkov



- Linux
- Servers
- Arista
- Mellanox



- Linux
- Servers
- Arista
- Mellanox



- bird2: VRF, BGP bind, IPv4 & IPv6
- BGP
 - BFD
 - Large communities
 - FlowSpec
- filtering & tables
- Confederations (future use)
- RPKI (future use)

- bird2: VRF, BGP bind, IPv4 & IPv6
- BGP
 - BFD
 - Large communities
 - FlowSpec
- filtering & tables
- Confederations (future use)
- RPKI (future use)



- bird2: VRF, BGP bind, IPv4 & IPv6
- BGP
 - BFD
 - Large communities
 - FlowSpec
- filtering & tables
- Confederations (future use)
- RPKI (future use)

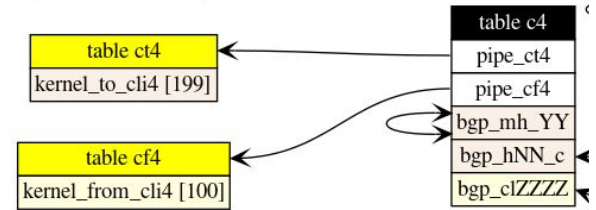


- Single thread: doesn't scale to several cores
- IO loop, blocking IO, timeouts: BGP hold time, etc.

```
Jan 12 15:55:29 budic bird: I/O loop cycle took 9270 ms for 4 events  
Jan 12 15:56:28 budic bird: I/O loop cycle took 9101 ms for 6 events
```

- Config: watchdog warning (5s), watchdog timeout
- Cause: full view, logging (file, syslog)
- Logging via UDP: fire-and-forget
 - <https://static.qrator.net/bird/bird-log-udp.patch>

- Kernel
 - 1 protocol — 1 kernel table
 - 1 protocol — 1 bird table
 - add tables & pipes
 - fixed proto (`krt_source`)
 - <https://bird.network.cz/pipermail/bird-users/2020-June/014620.html>



default via 192.0.2.1 dev eth0 proto bird metric 32

- **configure** → protocol state from config
 - sync admin state to config
 - patch: **configure soft** keeps protocol state
 - <https://static.qrator.net/bird/bird-keep-state.patch>
- **strict bind**: no address → down
 - <https://bird.network.cz/pipermail/bird-users/2020-January/014138.html>

```
bgp_01  BGP  ---  down  12:09:31.264  Error: No listening socket
```

- Linux: IP_FREEBIND
- <https://static.qrator.net/bird/bird-nonlocal-bind-1-io.patch>
- <https://static.qrator.net/bird/bird-nonlocal-bind-2-bgp-always.patch>

- same neighbor address
- only 1 session active

```
bgp_radar_ntt BGP    ---      start  2020-06-30  Idle      BGP Error: Hold timer expired
bgp_radar_pccw BGP    ---      up     2020-06-30  Established
```

- no solution yet

- bird does not force on import
 - use filter
 - bgp-enforce-first-as (v2.0.8)
- export prepend (bird1 → bird2)
 - export filter (after → before prepend)
 - rs client (v2.0.3), before rs client → rs client only
 - <https://bird.network.cz/pipermail/bird-users/2017-December/011774.htm>
<https://bird.network.cz/pipermail/bird-users/2018-September/012751.html>
<https://bird.network.cz/pipermail/bird-users/2018-November/012853.html>
<https://bird.network.cz/pipermail/bird-users/2019-March/013200.html>

- Route selection: localpref, ASPATH, ...

```
192.0.2.0/24      unicast [bgp_direct 2020-06-19] * (100) [AS64500i]
via 192.168.20.254 on vlan20
BGP.as_path: 64500
BGP.next_hop: 100.64.20.254
BGP.local_pref: 140
                unreachable [bgp_mh 2020-08-25 from 192.168.0.7] (100) [AS64500i]
BGP.as_path: 64511 64510 64500
BGP.next_hop: 100.64.21.254
BGP.local_pref: 150
```



- Set gw attribute to some stub

- BGP, static
- only 1 level of recursion
 - <https://bird.network.cz/pipermail/bird-users/2019-September/013820.html>
 - <https://bird.network.cz/pipermail/bird-users/2020-March/014297.html>
- iBGP (default multihop) is recursive
 - gateway direct (direct sessions only)
 - no visible difference

```
<WARN> Next hop address 198.51.100.3 resolvable through recursive route for 198.51.100.0/24
```

- no multipath

```
protocol static {
    route 192.0.2.0/24 recursive 198.51.100.3;
}
```

```
198.51.100.0/24      unicast [bgp1 18:51:06.896 from 192.168.0.2] * (100) [i]
via 203.0.113.5 on vlan10
Type: BGP univ
BGP.origin: IGP
BGP.as_path:
BGP.next_hop: 203.0.113.5
BGP.local_pref: 100
192.0.2.0/24        unreachable [static1 18:45:15.336] * (200)
Type: static univ
```



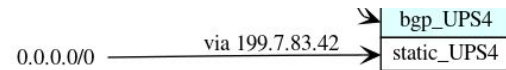
```
198.51.100.0/24      unicast [bgp1 18:52:07.294 from 192.168.0.2] * (100) [i]
via 203.0.113.5 on vlan10
Type: BGP univ
BGP.origin: IGP
BGP.as_path:
BGP.next_hop: 203.0.113.5
BGP.local_pref: 100
192.0.2.0/24        unicast [static1 18:45:15.336] * (200)
via 203.0.113.5 on vlan10
Type: static univ
```



- no aggregation



- no aggregation
- imitate: static recursive
 - filter unreachable
 - no original attributes

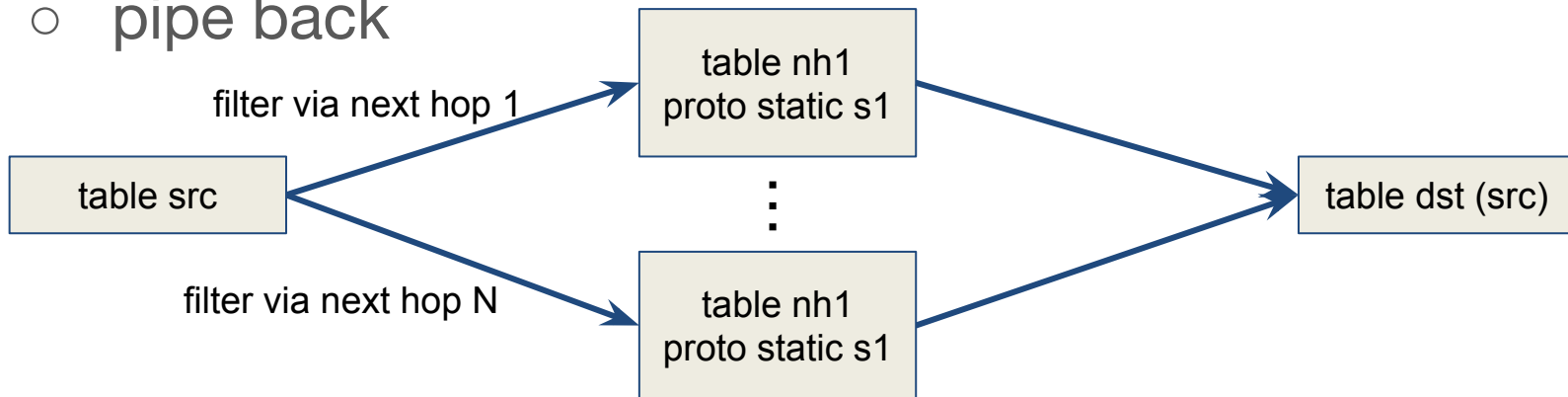


```
protocol static static_UPS4 {  
    route 0.0.0.0/0 recursive 199.7.83.42 { ... };  
}
```

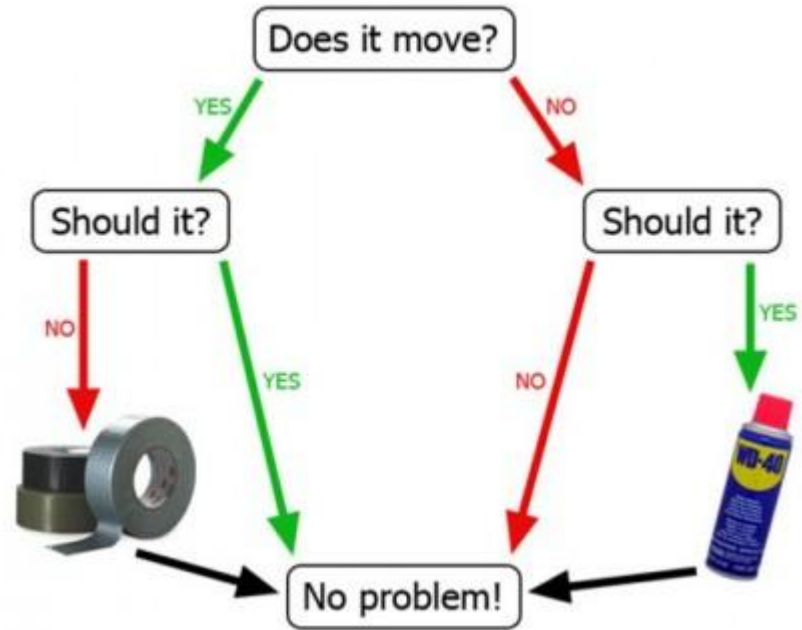
```
protocol static signal {  
    route 100.64.5.1/32 recursive 0.0.0.0;  
}
```

- default: single route
- kernel
 - merge paths
 - best + equivalent
- bgp
 - add paths
 - all routes

- recursive: only best
- static: imitate again
 - pipe to several tables
 - add static to each
 - pipe back



- recursive: only best
- static: imitate again
 - pipe to several tables
 - add static to each
 - pipe back



- switchdev: like a server
- map switch → Linux
 - VRF
- no offload
 - dev route
 - ipv4 route with ipv6 gw
- fixed stuff: VRF, BFD

- Linux, but proprietary
- userspace → data plane
 - kernel (multipath problems)
 - SDK
 - eAPI (cli over HTTP/JSON)
- protocol arista (SDK), bird 1.6
- bird2 → bird 1.6 → SDK
- bird2 → arista (BGP as an API)

```
router bgp 64500
  distance bgp 32 32 32
  bgp transport listen-port 8179
  maximum-paths 32
  neighbor 127.0.0.2 remote-as 64500
  neighbor 127.0.0.2 transport remote-port 179
  neighbor 127.0.0.2 ebgp-multihop 1
  neighbor 127.0.0.2 additional-paths receive
  neighbor 127.0.0.2 route-map none out
  neighbor 127.0.0.2 maximum-routes 100000
  !
  address-family ipv4
    neighbor 127.0.0.2 activate
    neighbor 127.0.0.2 additional-paths receive
  !
```

Arista

```
protocol bgp {
  strict bind yes;
  neighbor 127.0.0.1 port 8179 as 64500;
  local 127.0.0.2 as 64500;
  multihop 1;
  rr client;
  ipv4 {
    next hop keep;
    add paths tx;
    export filter to_dataplane;
    import none;
  };
}
```

Bird

- netns
- several bird daemons
- route exchange?

- netns
- several bird daemons
- route exchange?
- BGP over unix socket
 - haproxy: inet → unix



- netns
- several bird daemons
- route exchange?
- BGP over unix socket
 - haproxy: inet → unix

```
protocol bgp {  
    strict bind yes;  
    neighbor 127.0.0.111 port 8888;  
    neighbor as 64500;  
    local 127.0.0.1 as 64500;  
    multihop 1;  
}
```

Bird

```
listen bgp-to  
    bind 127.0.0.111:8888  
    server vrf unix@/var/run/bgp-to-vrf.sock  
listen bgp-from  
    bind /var/run/bgp-from-vrf.sock  
    server vrf 127.0.0.1:179 source 127.0.0.111
```

haproxy

- Bird mailing list: https://bird.network.cz/?m_list
- My contacts
 - Alexander Zubkov
 - green@qrator.net

