BIRD Internet Routing Daemon
Update, Route Servers

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CZ.NIC, CZ.NIC Labs

- Not just domain registry for .cz
- About 1M domains, 40% DNSSEC signed
- R&D department – CZ.NIC Labs
- Project for the good of the Internet
- DNSSEC Plugin, DANE patrol, Knot DNS, ...
- Check http://labs.nic.cz
BIRD

- Internet Routing Daemon
- BGP, OSPF, RIP
- IPv4, IPv6, dual compilation
- Fast, efficient
- Powerful configuration and **filtering** language – variables, functions; binary trees - quick
- Multiple routing tables, PIPE protocol
- Introduced at NANOG 48
Since NANOG 48 – major additions

- BGP
  - Improved community list matching
  - Extended communities + filtering
  - ROA basic support
  - Secondary route export
  - TTL security
Since NANOG 48 – major additions

- IPv6 Router Advertisement
- “include” configuration option
- Re-configuration timeout
- OSPF NSSA
- Multipath support – OSPF and static
- Protocol templates
- Import/export route limits improved
- More deployments
Deployed at ... (and more)
Re-configuration timeout

bird> configure timeout 20
Reading configuration from /etc/bird.conf
Undo scheduled in 20 s
Reconfiguration in progress
bird> show protocols rip1
name  proto  table  state  since  info
 rip1  RIP    master  down  18:46
bird> >>> Config timeout expired, starting undo
show protocols rip1
name  proto  table  state  since  info
 rip1  RIP    master  up    18:46
.
Re-configuration timeout

bird> configure timeout 20
Reading configuration from /etc/bird.conf
Undo scheduled in 20 s
Reconfiguration in progress
bird> show protocols rip1
name proto table state since info
ripl RIP master down 18:46

bird> configure confirm
Reconfiguration confirmed

bird> show protocols rip1
name proto table state since info
ripl RIP master down 18:46
ROA support

- Support of ROA tables
- Can be dynamically filled (from RPKI or IRR db) using CLI or config file
- ROA can be matched in filters - roa_check()
  - ROA_UNKNOWN
  - ROA_VALID
  - ROA_INVALID

```bash
roa table myroa {
    roa 217.31.192.0/20 max 20 as 25192;
}
```
Route limits

- General protocol option (not just for BGP)
- Number of routes received from or sent to a peer/protocol
- Four types of reaction
  - WARN
  - BLOCK
  - RESTART
  - DISABLE
Protocol templates

template bgp NIXPEERS {
    local as 112;
    export filter bgp_out;
    start delay time 120;
    mrtdump all;
    import limit 50000 action warn;
}

protocol bgp NIXRS1 from NIXPEERS {
    neighbor 91.210.16.1 as 47200;
    import limit 60000 action block;
}
if peeras > 65535 then
{
if (ro,0,peeras) ~ bgp_ext_community then return false;
if (ro,myas,peeras) ~ bgp_ext_community then return true;
if (((ro,0,myas) ~ bgp_ext_community) then return false;
} else {
if (((0,peeras) ~ bgp_community) || ((ro,0,peeras) ~
    bgp_ext_community) then return false;
if (((myas,peeras) ~ bgp_community) || ((ro,myas,peeras) ~
    bgp_ext_community) then return true;
if (((0, myas) ~ bgp_community) || ((ro,0,myas) ~
    bgp_ext_community) then return false;
}
return true;
BTW: IXP - Route filtering problem

- Normally filters match best route only
- If best route is denied no other is exported
- Problem with customers behind two different peering partners if one partner (with better path) is filtered out
- One solution multiple RIBs with PIPE protocol – but consumes a lot of memory (square complexity to # of routes)
Multiple RIBs
Single RIB

- Allow second best route to be exported
- BGP protocol option **secondary**;
- Precondition: routing table sorted *(a little bit slower)*
  - **table master sorted**;
- No PIPE protocol
- To see filtered routes *(1.3.9)*
  - import keep filtered
  - show route filtered
Single RIB

BGP AS 111
Peer 1
R111x1

BGP AS 111
Peer 2
R111x2

BGP AS 333
Peer 3
R333x3

BGP AS 333
Peer 2
R333x2

BGP AS 222
Single peer
R222x1

filters 111

filters 333

filters 222

Master RT
template bgp NIXPEERS {
    local as myas;
    rs client;
    secondary;
    import limit 25000 action disable;
    interpret communities off;
}

table master sorted;

protocol bgp R6881x1 from NIXPEERS {
    neighbor 91.210.16.243 as 6881;
    import filter bgp_in_AS6881;
    export where bgp_out(6881);
}
NIX.CZ route servers

- Two route servers
- BIRD 1.3.8 with single RIB configuration on Linux
- BIRD 1.3.5 with multiple RIBs configuration on FreeBSD
- ~30,000 IPv4 routes (~120 peers)
- ~7,000 IPv6 routes (~100 peers)
- Memory consumption 1/7 IPv4 and 1/4 IPv6
Work in Progress

- Lightweight client (less libraries) - OpenWRT
- BGP Add-path (beta)
- Universal looking glass
- IPv4 and IPv6 integration – 2.0.0
- IS-IS (after integration)

... your feedback is VERY welcome
Universal Looking Glass

- Supports multiple routers
  - BIRD
  - Cisco
  - Juniper
- ... more to come
- Path visualisation
Universal Looking Glass
Conclusion

- BIRD stable and widely deployed
- Many new BIRD features
- Secondary route export can save resources
  - More important for larger deployments
- And look forward to more :-) 
- Check wiki at http://bird.network.cz
- Feedback welcome!
Thank You!

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