Open Source Software for Routing
A look at the status of Open Source Software for Routing

Martin Winter
OpenSourceRouting.org
Who is OpenSourceRouting
Quick Overview of what we do and who we are

www.open sourcerouting.org

› Started late summer 2011
› Focus on improving Quagga
› Funded by Companies who like an Open Source Alternative
› Non-Profit Organization
  • Part of ISC (Internet System Consortium)
Important reminder:

Quagga/Bird/... are not complete routers. They are only the Route Engine.

You still need a forwarding plane
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<th>Why look at Open Source for routing, Why now?</th>
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## Reasons why the time is NOW

A few reasons to at least start thinking about Open Source

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<th>Money</th>
<th>Could be much cheaper. You don’t need all the features and all the specialized hardware everywhere.</th>
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<tr>
<td>SDN, Cloud, ..</td>
<td>All the current buzzwords. And most of it started with Open Source – and is designed for it. Does your vendor provide you with the features for new requirements in time?</td>
</tr>
<tr>
<td>Feature 1</td>
<td>✔</td>
</tr>
<tr>
<td>Feature 2</td>
<td>✔</td>
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<td>Feature 3</td>
<td>✔</td>
</tr>
<tr>
<td>Feature 4</td>
<td>✔</td>
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<tr>
<td>Your Features</td>
<td>Missing a feature? Need a special feature to distinguish from the competition? You have access to the source code.</td>
</tr>
<tr>
<td>Support</td>
<td>Not just one company is setting the schedule on what the fix and when you get the software fix. And you are independent on choosing hardware</td>
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## Reasons to wait a bit longer

### Maybe too early?

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<th><strong>Early adoption</strong></th>
<th>It’s not common (yet). The quality may not be at the same level and you have to do your own real testing.</th>
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<td><strong>Support</strong></td>
<td>Limited choices for professional support if you depend on it</td>
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<tr>
<td><strong>Missing features</strong></td>
<td>You may be missing the features you need. Or you don’t have the required performance or interfaces</td>
</tr>
<tr>
<td><strong>Risk</strong></td>
<td>Your business may depend on it. (Testing may reduce the risk here!)</td>
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Reasons for Open Source Software in Routing

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Popular Open Source Software

**Bird**

Bird

http://bird.network.cz/

- Project started 1999
  - Alternative to Quagga
  - Started as seminar project at Charles University, Prague
  - Since 2008 maintained by CZ.NIC Labs

- Started as alternative to Quagga/Zebra

- Fast, efficient
Bird - Features

- **Protocols**
  - RIP, RIPv2, RIPng, OSPFv2, OSPFv3, BGPv4, BGPv6
- **Runs on Linux, FreeBSD, NetBSD, OpenBSD**
- **BGP ROA support (RPKI)**
- **IPv6 Router Advertisement**
- **Powerful configuration and filtering language (!)**
- **Multiple routing tables**

**Missing / Limitations:**
- IPv4 & IPv6 separate daemon
- BGP multiprotocol
- ISIS (IPv4 & IPv6)
Bird – Users

- Bird is currently the most popular Open Source Solution for Route Servers
  - Major use is for BGP processing and announcements
  - No (or very little) use in a router for forwarding or IGP
Popular Open Source Software

OpenBGPd

http://www.openbgpd.org/
OpenBGPd
http://www.openbgpd.org/

- Project started as part of OpenBSD community
  - BSD Licensed
  - Maintained by the BSD community
- Focus on routing for OpenBSD systems

Part of OpenBSD Project
OpenBGPd - Features

Based on Version 4.6

- **Protocols**
  - BGPv4, BGPv6 (OSPF available as part of OpenOSPFd)

- **Runs on** OpenBSD, FreeBSD, OpenBSD, NetBSD, Linux

- **BSD License**

- **Missing / Limitations:**
  - BGP only
  - Mostly BSD focused
  - Limited deployment (less active community)
Popular Open Source Software

Quagga

http://www.quagga.net/
Quagga
http://www.quagga.net/

- Project started as fork of Zebra
  - Open Source Community “owned”
  - Maintained by the community
  - OpenSourceRouting.org supports community with testing & development

- Focus on full routing

But do you know what a Quagga is?

Quagga
Extinct relative of the Zebra
Quagga - Features

- **Protocols**
  - RIP, RIPv2, RIPng, OSPFv2, OSPFv3, ISIS (v4 only), BGPv4, BGPv6, Babel, SNMP

- **Runs on Linux, FreeBSD, NetBSD, OpenBSD, Solaris, and many more**

- **Cisco like CLI**

- **Missing / Limitations:**
  - BGP inefficient for Route Server / many full feeds
  - ISIS (IPv6) (and ISIS IPv4 is not yet useable)
  - Multiple branches of Quagga:
    - Quagga.net (official “Master” branch), Euro-IX, Quagga-RE and more

Based on Version 0.99.21
Quagga – Users

- Some Route Server (smaller ones)
- Used by OpenFlow, SDNs and small router appliances as route processor
- Smaller ISPs (Linux routers with OSPF & BGP)
- Many large Datacenters/CDNs use custom modified versions
- You?
Popular Open Source Software

XORP

http://www.xorp.org/
XORP
http://www.xorp.org/

- Started as “Open Platform for Network Research”
  - Answer of Juniper fans to Quagga
- Goal to be Extensible Open Source Routing Platform
- Focus on good Documentation & clean code
XORP - Features

- **Protocols**
  - RIP, RIPv2, RIPng, OSPFv2, OSPFv3, BGPv4, BGPv6, IGMP, MLD, PIM-SM, OLSR

- ** Runs on Linux, FreeBSD, OpenBSD, NetBSD, DragonFlyBSD, Windows **

- **Juniper like CLI**

- **Written in C++**

- **Forwarding Engine Abstraction (FEA)**

- **Missing / Limitations:**
  - No ISIS
  - Performance not yet evaluated

Based on Version 1.8.5
XORP – Users

- **Pica8 commercial stack based on XORP**
  - Code is closed but it’s announced to be opened up in the future

- **CandelaTech’s testing equipment products are based on XORP**
  - [http://www.candelatech.com](http://www.candelatech.com)

- **Maine School and Library Network is completely served by Xorp based routers**
  - [http://networkmaine.net/msLn/](http://networkmaine.net/msLn/)

- **AI3/SOI IPv6 multicast network for long distance learning project is based on Xorp routers**
  - [http://www.soi.asia](http://www.soi.asia)

- **YOU?**
Highlights Open Source Solutions

My (personally) favorite feature on each solution

**Currently preferred solution for RouteServers**
- **BIRD**
  - BSD License (no GPL limitations)

**Preferred solution for full routing (OSPF & BGP)**
- **Quagga**
  - Clean C++ Source with good developer documentation

**Currently preferred solution for RouteServers**
- **OpenBGPD**
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Quagga Routing Protocols

**BGP IPv4 & IPv6**

Performance bad for large multiple tables
- Euro-IX Branch tries to fix it with threads (work in progress)
- OpenSourceRouting.org trying a few data structure improvements

**OSPFv2**

Reported as robust by many users

Some OSR found open issues with large OSPF network topology changes

**OSPFv3**

Separate (partially cloned from OSPFv2), but behind on fixes as many OSPFv2 bugs never made it to it.
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<td>ISIS</td>
<td>Implemented, but not yet usable (too buggy)</td>
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<td></td>
<td>• ISIS for IPv4 should be ok in 1..2 releases</td>
</tr>
<tr>
<td></td>
<td>• ISIS for IPv6 missing (expected to be done after</td>
</tr>
<tr>
<td></td>
<td>IPv4 implementation is working)</td>
</tr>
<tr>
<td>RIPv1, RIPv2,</td>
<td>Working with no issues</td>
</tr>
<tr>
<td>RIPng</td>
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See [www.opensourcerouting.org/wiki/Testing+Efforts](http://www.opensourcerouting.org/wiki/Testing+Efforts)
Why look at Open Source for routing, Why now?  
Revised Reasons for Open Source Software in Routing

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Our (current) main focus

OpenSourceRouting.org’s main current work (in addition to community)

**ISIS / OSPF**

- Fixing ISIS (IPv4) to get it to a usable state
- OSPF unnumbered interfaces
- IGP Stability fixes

**Data structure changes**

- Trying to improve internal RIB structures
  - (Cleanup and Performance Changes)

**API to Zebra**

- Add API to decouple FIB updates from the OS below and allow forwarding engines to subscribe to direct updates from Zebra
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How you can help
Open Source needs your help. And it will help you.
Allow Open Source to save you money

Please consider supporting the Open Source Routing Movement with time and/or money

**Phase 1**
Spend small amount of your resources (money or manpower) on helping out the Open Source Movement – maybe just 1% of your router budget

**Phase 2**
Huge Improvements in the Open Source Routing Space as more developers and testers will fix it and add the missing features

**Phase 3**
Open Source becomes a possibility in your network for many locations as it gets stable and has the needed features

**Phase 4**
Traditional vendors need to innovate or lower their prices to compete with the Open Source Movement

**Phase 5**
Lower Operational costs thanks to cheaper traditional vendors and savings from using Open Source Code → More money
Thank You - Discussion
The floor is open for discussion – Or contact me afterwards

- Are you using Quagga or another Open Source Routing software?
- What is stopping you from using Open Source Routing Software?
- Experiences?
- Interested in helping out? ($$ and/or Work)

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www.opensourcerouting.org