

Challenges in Testing

How OpenSourceRouting tests Quagga

Martin Winter
Feb 10, 2016

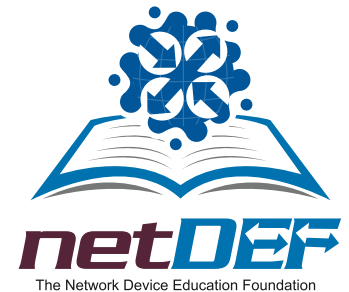
Who is OpenSourceRouting ?



Open Source Routing

► Who is Open Source Routing ?

- www.opensourcerouting.org
- Project by NetDEF (Network Device Education Foundation)
 - www.netdef.org
 - Non-Profit Company based in California
- Working on Quagga Routing



► Who is Martin Winter ?

- Co-Founder of NetDEF
- Focusing on Testing Quagga
- Previously worked for Equipment Vendor & large ISP

What is Quagga ?



► Routing Protocol Stack

- RIP / RIPNG / OSPFv2 / OSPFv3 / ISIS / BGP / PIM
- Running on Linux / FreeBSD / NetBSD / OpenBSD / Solaris
- Used on low-end OpenWRT boxes, physical and virtual software routers, SDN deployments, distributed routers
- Originally derived from Zebra
- GPLv2+ Open Source / “Community” owned & controlled

Quagga Community

How it works today



**No
“Owner”**

No single entity behind Quagga
Large community of “contributors”
Maintainer = person with commit access



**Simple Git
Model**

Main source git on Savannah
Single master branch with development
branch merged into every few months



**Email based
submissions**

Code submissions by email to developer list
Code review with discussion on list

Choosing a CI System



Jenkins



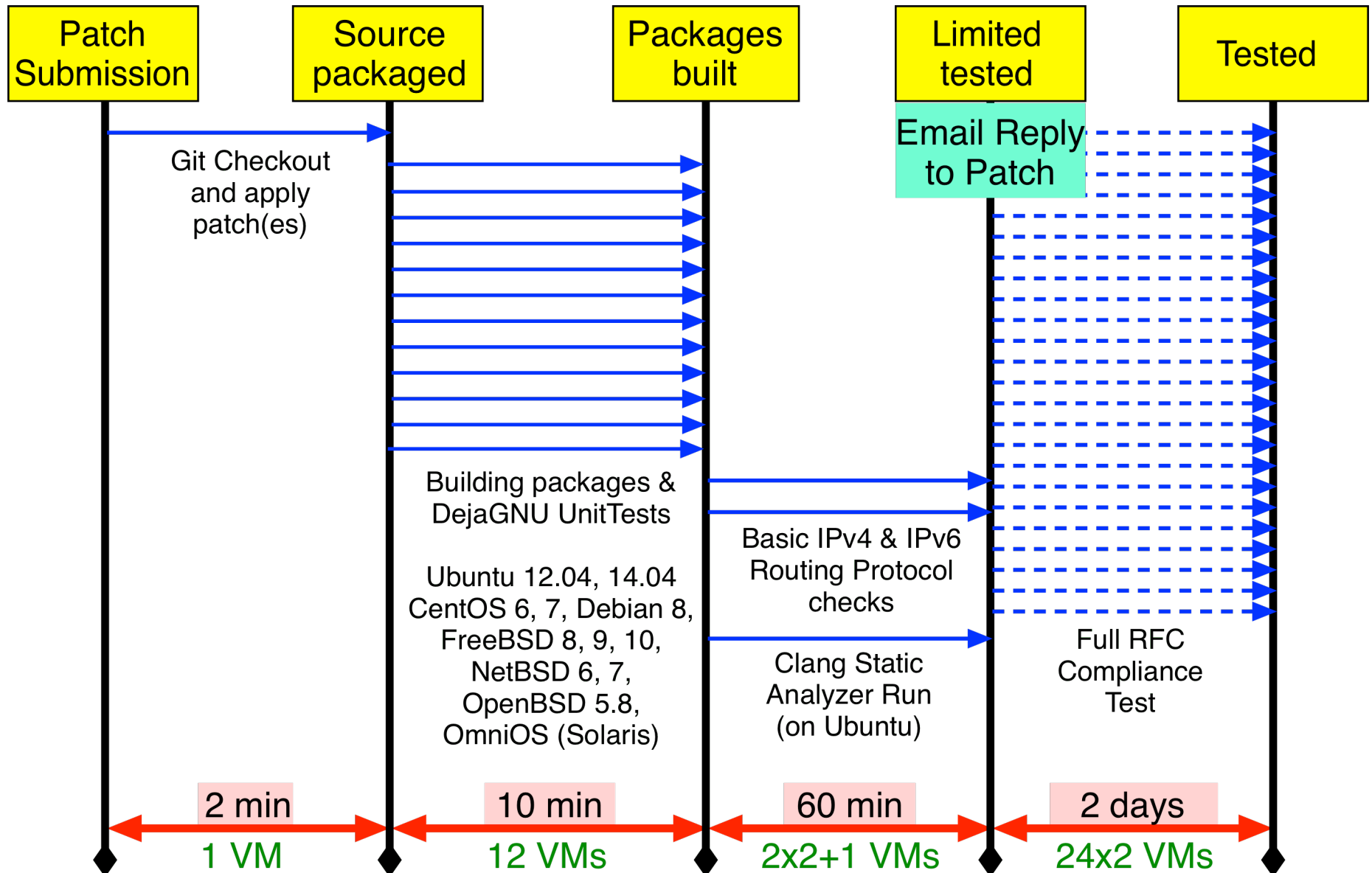
Travis CI

- ▶ **Are all CI systems designed for Linux & Java?**
 - Java clients on agents are NOT cross-platform
 - There are other OS'es than Linux in existence
- ▶ **Stability**
- ▶ **Hosted vs Local**
 - Integrate Dedicated Tester Hardware?
 - Limitations on Parallelization / Runtime?

CI Run Overview



Open Source Routing



Git Checkout / Patching

All starts with new commit submitted

- ▶ **Pull code from Git**

- Which revision / branch?

- ▶ **Add patches**

- Single patch / Series of patches?

- ▶ **Package Source**

- Add Extra Information (Git Rev, Patches, build time etc)

Building Packages on each OS

Running on parallel VMs

- ▶ **Running on VMs – start/shut on demand**
- ▶ **Reset VM to clean snapshot at beginning**
- ▶ **Configure the code**
 - `./configure` – but which choices?
- ▶ **Build (make & make install)**
- ▶ **Run Unittests (DejaGNU [make check])**
- ▶ **Build OS specific packages**
 - Different configuration settings? All features?



ubuntu.



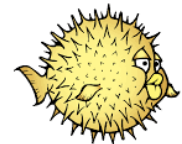
CentOS



debian



FreeBSD®



OpenBSD



Open Source Routing

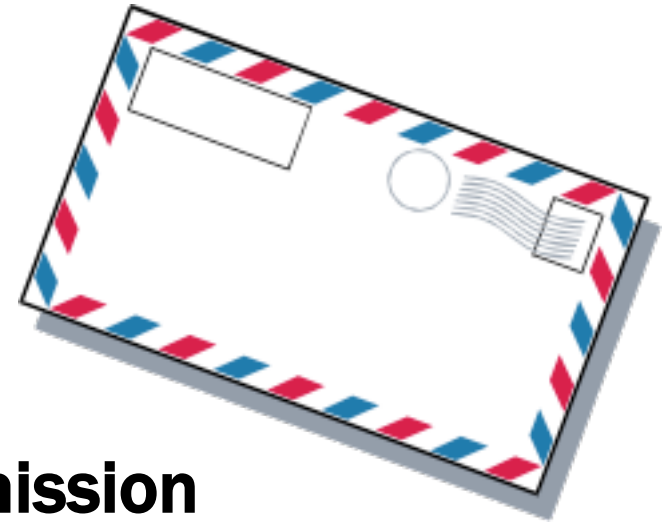
Basic Protocol checks



- ▶ **Use RFC compliance checker for a 2..3 selected checks on each protocol**
 - Just make sure they don't immediately crash
 - Parallel/Serialize? Balance between runtime and required resources (multiple CI runs in parallel possible!)
- ▶ **Rebuild with CLANG**
 - Use Clang Static Analyzer
 - How to translate results into pass/fail ? Diff to previous run?

Automated reply

- ▶ **Sent as reply to Patch email**
- ▶ **Reply approx 1..2 hrs after submission**
 - Earlier if failing at beginning of tests
- ▶ **Parse results into easy email**
 - Assume submitter is first-timer and doesn't know tests
 - Simplify results



Example: Successful submission

From: cisystem@netdef.org

To: sharpd@cumulusnetworks.com

Cc: mwinter@opensourcerouting.org, quagga-dev@lists.quagga.net

Subject: CI Testresult: PASSED (Re: [quagga-dev,14658] config: Remove unused library check)

Date: February 2, 2016 at 7:40 PM

Continuous Integration Result: SUCCESSFUL

Congratulations, this patch passed basic tests

Tested-by: NetDEF CI System <cisystem@netdef.org>

This is an EXPERIMENTAL automated CI system.

For questions and feedback, feel free to email

Martin Winter <mwinter@opensourcerouting.org>.

Patches applied :

Patchwork 1811: <http://patchwork.quagga.net/patch/1811>

[quagga-dev,14658] config: Remove unused library check

Tested on top of Git : eae18d1 (as of 20151209.135437 UTC)

CI System Testrun URL: <https://ci1.netdef.org/browse/QUAGGA-QPWORK-231/>

Regards,

NetDEF/OpenSourceRouting Continuous Integration (CI) System

OpenSourceRouting.org is a project of the Network Device Education Foundation,

For more information, see www.netdef.org and www.opensourcerouting.org

For questions in regards to this CI System, contact Martin Winter, mwinter@netdef.org



From: cisystem@netdef.org

To: timo.teras@iki.fi

Cc: mwinter@opensourcerouting.org, quagga-dev@lists.quagga.net

Subject: CI Testresult: FAILED (Re: [quagga-dev,14376,v3] lib, zebra: unify link layer type and hardware address handling)

Date: December 26, 2015 at 2:20 AM

Continuous Integration Result: FAILED

See below for issues.

This is an EXPERIMENTAL automated CI system.

For questions and feedback, feel free to email

Martin Winter <mwinter@opensourcerouting.org>.

Patches applied :

Patchwork 1741: <http://patchwork.quagga.net/patch/1741>

[quagga-dev,14376,v3] lib, zebra: unify link layer type and hardware address handling

Tested on top of Git : eae18d1 (as of 20151209.135437 UTC)

CI System Testrun URL: <https://ci1.netdef.org/browse/QUAGGA-QPWORK-204/>

Get source and apply patch from patchwork: Successful

Building Stage: Failed

CentOS7 amd64 build: Successful

Debian8 amd64 build: Successful

Ubuntu1204 amd64 build: Successful

CentOS6 amd64 build: Successful

Ubuntu1404 amd64 build: Successful

Make failed for FreeBSD10 amd64 build: (see full log in attachment freebsd10_amd64_make.log)

CC rthread_sysctl.o

CC kernel_socket.o

kernel_socket.c:1127:41: error: no member named 'sdl' in 'struct interface'

gate = (union sockunion *) & ifp->sdl;

~~~~ ^

1 error generated.

\*\*\* Error code 1

Stop.

make[2]: stopped in /usr/home/ci/cibuild.204/quagga-source/zebra

Make failed for NetBSD6 amd64 build: (see full log in attachment netbsd6\_amd64\_make.log)

CC kernel\_socket.o

# Example: Failed compilation



# Example: Failed Basic Routing Checks

Continuous Integration Result: FAILED

See below for issues.

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For questions and feedback, feel free to email

Martin Winter <mwinter@opensourcerouting.org>.

Patches applied :

Patchwork 1808: <http://patchwork.quagga.net/patch/1808>

[quagga-dev,14647] perfect cmd table

Tested on top of Git : eae18d1 (as of 20151209.135437 UTC)

CI System Testrun URL: <https://ci1.netdef.org/browse/QUAGGA-QPWORK-228/>

Get source and apply patch from patchwork: Successful

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Building Stage: Successful

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Basic Tests: Failed

-----

Ipv6 protocols: Successful

Static analyzer (clang): Successful

RFC Compliance Test ANVL-BGP4-4.1 failing:

Test Summary

An UPDATE message MAY simultaneously advertise a feasible route and withdraw multiple unfeasible routes from service.

Test Reference

RFC4271, Sect. 4.3, p 15,

UPDATE Message Format

Test Classification

MAY

Test ANVL-BGP4-4.1: !FAILED!

Received unexpected IP packet

External peer <PEER-AS2-A> incorrectly received IP packet forwarded by DUT

# Run Full RFC Compliance Check



- ▶ **More than just compliance**
  - Heavy interaction with CLI -> Good CLI Tester as well
- ▶ **Requires between 3 and 30 hours per protocol**
- ▶ **Multiple runs required to find inconsistent results**
- ▶ **Feed all results, logs, pcaps into DB**
- ▶ **Create PDF report** see <https://www.opensourcerouting.org/compliance-test-results/>
- ▶ **Run against commercial/other products to compare**
  - (but not publishing results from commercial equipment)
- ▶ **How to translate to pass/fail Overall?**

# Protocol Fuzzer



SPS-8000

- ▶ **Hardware – 4 parallel tests only**
  - No open source solution available
- ▶ **Slow. Single pass of BGP takes ~1..2 weeks runtime**
  - For single configuration, when no errors are found
- ▶ **How to publish results?**
  - All pass: boring
  - Some fail: Security issue, open CVE first?

# Scale / Performance tests

- ▶ **DUT Hardware needs consistency to compare**
  - Anyone having success running performance/scale tests on VMs?
- ▶ **Expensive Equipment (+ Power + Automation)**
- ▶ **Spin-up/down on demand and automatically building topology with “patchpanels” is painful**
  - Ie Using old Cisco 4948 for patchpanel (cheaper than OpenFlow switches)
- ▶ **Using Ixia IxNetwork and Spirent TestCenter**
- ▶ **Pass/Fail criteria?**





# Contact Us

Questions?

Comments?

Want to discuss?

Want to Sponsor?

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Network Device Education Foundation (NetDEF)

[www.netdef.org](http://www.netdef.org) / [www.opensourcerouting.org](http://www.opensourcerouting.org)

