



# Challenges in Testing

How OpenSourceRouting tests Quagga

Martin Winter  
Feb 10, 2016

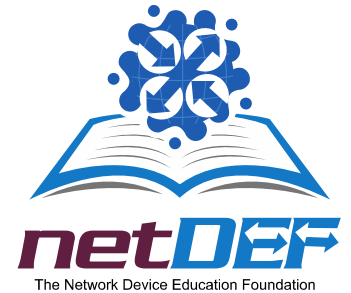
# Who is OpenSourceRouting



## ► Who is Open Source Routing ?

Open Source Routing

- [www.opensourcerouting.org](http://www.opensourcerouting.org)
- Project by NetDEF (Network Device Education Foundation)
  - [www.netdef.org](http://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  
submissi  
ons**

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



# Choosing a CI System



## Jenkins

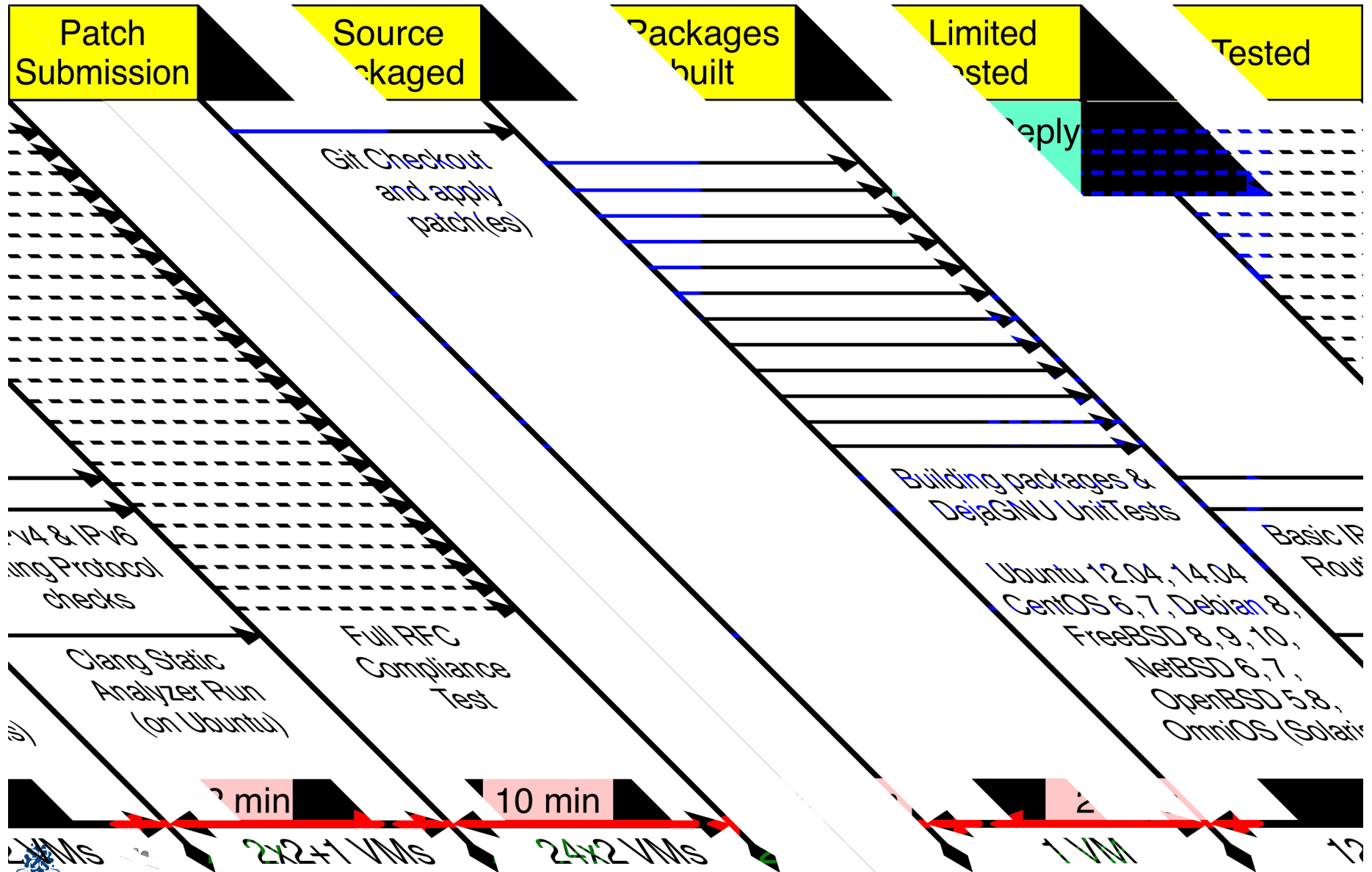


## Travis CI

- ▶ **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



# 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)

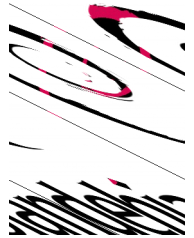
# Building Packages on each OS

Running on parallel VMs

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



ubuntu



FreeBSD®



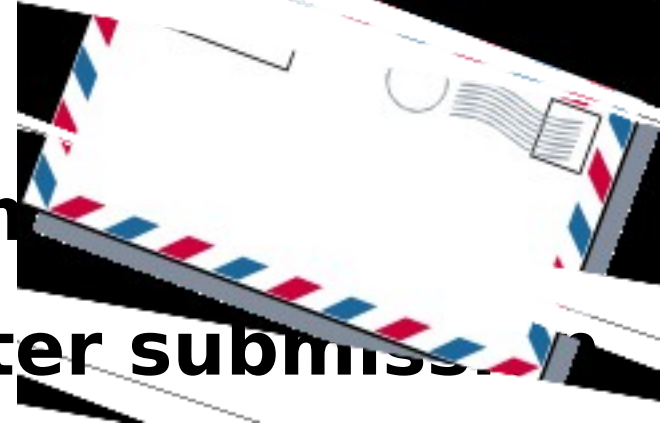
# Basic Protocol checks



- ▶ **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: csystem@netdef.org

To: hardware@lists.opennet.net

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 <csystem@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

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

For more information, see [www.netdef.org](http://www.netdef.org) and [www.opensourcerouting.org](http://www.opensourcerouting.org)

For questions in regards to this CI System, contact Martin Winter, [mwinter@netdef.org](mailto: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



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 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

Building Stage: Successful

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](#)

# Example: Failed Basic Routing Checks

# Run Full RFC Compliance Check

Proceedings of NetDev: The Technical Conference on Linux Networking (February 10-11, 2019, Seville, Spain)



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

# Protocol Fuzzer



- ▶ **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 so 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 Spirer TestCenter**



**Pass/Fail criteria?**

# Contact Us

Proceedings of NetDev 1.1: The Technical Conference on Linux Networking (February 10th-12th 2016, Seville, Spain)

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.opensource-routing.org](http://www.opensource-routing.org)

