

# The Agony and Ecstasy of CI: a war story

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Percona

Hi!  
I work for



PERCONA  
Performance Consulting Experts

which is a MySQL support, consulting and development company

Joined May 2011

Director of Server Development

A quick Q as to what 'Director of Server Development' means:

Q: Am I responsible for \$development\_thing ?

A: Yes.



and this is the story of CI and development process improvements thus far

A war story

Witty titles get more attendees  
not as much of a battle as would think  
helps if org is open to positive changes

# Technical Debt

lack of test suite  
lack of passing test suite  
casual code review

# Introducing CI

partly about

Changing development practices



but also very much about

Existing company

not starting from scratch

Existing development team

releases still have to be made  
some people stuck in ways

Existing products

with customers  
who expect fixes  
no shutdown for months.

Privately funded company



No Venture Capital to blow  
Small company achieving big.  
no VC or large company budget to be inefficient

Zero Dev Infrastructure people

nobody dedicated to this.

Probably a common scenario

so hopefully my advice can help

My new responsibility

Greatly modified from where it was, helping the company grow.

Quick overview of what we build

All FOSS

Percona Server

"branch" of MySQL

we base on the Oracle release, add our own patchset  
performance, usability and managability improvements



Percona XtraBackup

online backup for InnoDB  
compiles/links in lots of InnoDB code (subset of MySQL)  
full and incremental  
people want their backups to work  
(and others)  
but these are our major ones

Why CI?

It has served me well

quest to build better software

MySQL AB

1st CI exp

pushbuild

built after push (only), many trees

helped dig MySQL out of giant hole

5.0 could have been worse

Build trunk



is phase 1 of introducing any CI  
just constantly build and test trunk  
let people see how broken their shit is

Run test suite

it is probably broken  
concurrent runs on same hardware?  
sporadic failures?  
hard to run?  
let people see how broken their shit is

Fix things

Helps if you can make people do it.  
It's a fight. Long term vs short term.  
Win. Be an asshole about it.

Team trees

to scale with people.

NOBODY EVER RAN TRUNK.

not something I recommend

MySQL would merge team work together

then team into trunk

build+test these solved more problems

Drizzle



Discovered a great tool

Hudson

why re-invent the wheel?  
which due to Oracle being ass, is now



# Jenkins

The only reason for Java to exist.



## Jenkins

search

log in

Jenkins

ENABLE AUTO REFRESH

[People](#)[Build History](#)[Project Relationship](#)[Check File Fingerprint](#)[Disk usage](#)

## Build Queue

[percona-server-5.5-randgen-pass »  
BUILD TYPE=randgen,Host=randgen](#)[percona-server-5.1-randgen-pass »  
BUILD TYPE=randgen,Host=randgen](#)

## Build Executor Status

# Master

1 Idle

2 Idle

[i-13793962 \(offline\)](#)[jb10-debian6-64](#)

1 Idle

2 Idle

[jb10-ubuntu-lucid-32](#)

1 Idle

2 Idle

This is the Jenkins system used by Percona.

All	Merge	MySQL	PS 5.1	PS 5.5	PS 5.6	Percona PAM for MySQL	Percona Toolkit	Playback	QA	Releases	XtraBack
S	W	Name ↓	Last Success		Last Failure		Last Duration				
		<a href="#">build-xtradb-cluster-binaries-for-xtrabackup-tests</a>	2 mo 2 days ( <a href="#">#4</a> )		2 mo 12 days ( <a href="#">#2</a> )		3 hr 24 min				
		<a href="#">merge-PP-kickoff</a>	1 mo 13 days ( <a href="#">#12</a> )		1 mo 17 days ( <a href="#">#10</a> )		37 sec				
		<a href="#">merge-PP-push-to-trunk</a>	1 mo 13 days ( <a href="#">#7</a> )		N/A		24 sec				
		<a href="#">merge-PP-staging</a>	1 mo 13 days ( <a href="#">#12</a> )		1 mo 24 days ( <a href="#">#10</a> )		15 min				
		<a href="#">merge-PS-5.1-binaries</a>	2 days 0 hr ( <a href="#">#12</a> )		N/A		20 min				
		<a href="#">merge-PS-5.1-docs-kickoff</a>	4 days 18 hr ( <a href="#">#4</a> )		N/A		39 sec				
		<a href="#">merge-PS-5.1-kickoff</a>	2 days 0 hr ( <a href="#">#26</a> )		26 days ( <a href="#">#21</a> )		45 sec				
		<a href="#">merge-PS-5.1-merge-to-5.5</a>	1 day 22 hr ( <a href="#">#30</a> )		19 days ( <a href="#">#23</a> )		1 min 19 sec				
		<a href="#">merge-PS-5.1-push-to-trunk</a>	1 day 22 hr ( <a href="#">#23</a> )		1 mo 5 days ( <a href="#">#11</a> )		30 sec				
		<a href="#">merge-PS-5.1-staging</a>	2 days 0 hr ( <a href="#">#21</a> )		N/A		1 hr 24 min				
		<a href="#">merge-PS-5.1-staging-sysbench</a>	2 days 0 hr ( <a href="#">#12</a> )		N/A		11 min				

looks something like this

# Free Software



other solutions are often not

- New Job
- People
- Build History
- Project Relationship
- Check File Fingerprint
- Manage Jenkins
- My Views
- Disk usage

Build Queue	
percona-server-5.5-randqen-pass » BUILD_TYPE=randqen,Host=randqen	
percona-server-5.1-randqen-pass » BUILD_TYPE=randqen,Host=randqen	

Build Executor Status	
#	Master
1	Idle
2	Idle
i-13793962 (offline)	
jb10-debian6-64	
1	Idle
2	Idle
jb10-ubuntu-lucid-32	
1	Idle
2	Idle
jb12-centos5-32	
1	Idle
2	Idle
jb12-centos6-32	
1	Idle

Home directory

/var/lib/jenkins

System Message

This is the Jenkins system used by Percona.

Advanced...

# of executors

2

Labels

master

Usage

Utilize this slave as much as possible

Global properties

Environment variables

Tool Locations

JDK

JDK installations

Add JDK

List of JDK Installations on this system

Groovy

Groovy installations

Add Groovy

List of Groovy Installations on this system

Ant

Ant installations

Add Ant

Save

Apply

Flexible Web UI

Buildbot = text config  
Mostly text file config  
great if you're a hacker  
not if you want docs & QA & mgmt easy use  
Web config is a \*plus\*  
Easy to get going  
no special syntax

Easy to install

war file  
apt-get install

Updates Available **Installed** Advanced

Enabled	Name ↓	Version	Previously installed version	Pinned	Uninstall
<input checked="" type="checkbox"/>	<a href="#">Jenkins Mailer Plugin</a>	<a href="#">1.4</a>			
<input checked="" type="checkbox"/>	<a href="#">External Monitor Job Type Plugin</a>	<a href="#">1.1</a>	<a href="#">Downgrade to 1.0</a>	<a href="#">Unpin</a>	
<input checked="" type="checkbox"/>	<a href="#">LDAP Plugin</a>	<a href="#">1.2</a>	<a href="#">Downgrade to 1.1</a>	<a href="#">Unpin</a>	
<input checked="" type="checkbox"/>	<a href="#">pam-auth</a>	<a href="#">1.0</a>			
<input checked="" type="checkbox"/>	<a href="#">ant</a>	<a href="#">1.1</a>			
<input checked="" type="checkbox"/>	<a href="#">javadoc</a>	<a href="#">1.0</a>			
<input checked="" type="checkbox"/>	<a href="#">Jenkins jQuery plugin</a> This allows other plugins to use jQuery in UI.	<a href="#">1.7.2-1</a>	<a href="#">Downgrade to 1.7.2-0</a>		<a href="#">Uninstall</a>
<input checked="" type="checkbox"/>	<a href="#">Jenkins jQuery UI plugin</a> This plugin allows you to use jQuery UI on view descriptions.	<a href="#">1.0.2</a>			<a href="#">Uninstall</a>
<input checked="" type="checkbox"/>	<a href="#">Template Project plugin</a> This plugin lets you use builders, publishers and SCM settings from another project.	<a href="#">1.3</a>	<a href="#">Downgrade to 1.2</a>		<a href="#">Uninstall</a>
<input type="checkbox"/>	<a href="#">Jenkins Terminal Plugin</a> This plugin allows you to execute OS commands.	<a href="#">1.3</a>			<a href="#">Uninstall</a>
<input checked="" type="checkbox"/>	<a href="#">Timestamper</a>	<a href="#">1.5</a>	<a href="#">Downgrade to 1.3.2</a>		<a href="#">Uninstall</a>
	<a href="#">Token Macro Plugin</a>				

Plugins

BZR  
SSH Slave

Back to Dashboard

Manage Jenkins

New Node

Configure

Build Queue

percona-server-5.5-randqen-pass »  
BUILD\_TYPE=randqen,Host=randqen

percona-server-5.1-randqen-pass »  
BUILD\_TYPE=randqen,Host=randqen

Build Executor Status

#Master

1Idle

2Idle

ib13793962 (offline)

ib10-debian6-64

1Idle

2Idle

ib10-ubuntu-lucid-32

1Idle

2Idle

ib12-centos5-32

1Idle

2Idle

ib12-centos6-32

1Idle

2Idle

ib12-centos6-64

1Idle

2Idle

ib12-debian6-32

1Idle

2Idle

S	Name ↓	Architecture	Free Disk Space	Free Swap Space	Free Temp Space	Response Time	Clock Difference	
	<a href="#">master</a>	Linux (amd64)	11GB	0MB	11GB	0ms	In sync	
	<a href="#">i-13793962</a>		N/A	N/A	N/A	N/A	N/A	
	<a href="#">ib10-debian6-64</a>	Linux (amd64)	114GB	7584MB	6GB	239ms	4 min 14 sec ahead	
	<a href="#">ib10-ubuntu-lucid-32</a>	Linux (i386)	100GB	8137MB	8GB	237ms	4 min 15 sec ahead	
	<a href="#">ib12-centos5-32</a>	Linux (i386)	86GB	5535MB	86GB	48ms	4 min 37 sec ahead	
	<a href="#">ib12-centos6-32</a>	Linux (i386)	30GB	7871MB	44GB	15ms	4 min 38 sec ahead	
	<a href="#">ib12-centos6-64</a>	Linux (amd64)	64GB	16112MB	44GB	15ms	4 min 37 sec ahead	
	<a href="#">ib12-debian6-32</a>	Linux (i386)	95GB	931MB	4GB	19ms	4 min 37 sec ahead	
	<a href="#">ib13-centos5-64</a>	Linux (amd64)	132GB	1591MB	132GB	159ms	3 min 26 sec ahead	
	<a href="#">ib13-ubuntu-lucid-32</a>	Linux (i386)	138GB	8537MB	138GB	280ms	2 min 35 sec ahead	
	<a href="#">ib1-centos5-32</a>	Linux (i386)	41GB	4932MB	41GB	15ms	31 min behind	
	<a href="#">ib1-centos6-64bit</a>	Linux (amd64)	70GB	3745MB	70GB	14ms	31 min behind	
	<a href="#">ib1-ubuntu-oneiric-32</a>	Linux (i386)	26GB	2365MB	26GB	8ms	23 min behind	
	<a href="#">ib2-ubuntu-lucid-64</a>		N/A	N/A	N/A	N/A	N/A	
	<a href="#">ib2-ubuntu-precise-32</a>	Linux (i386)	163GB	7775MB	163GB	22ms	3 min 48 sec behind	
	<a href="#">ib3-ubuntu-oneiric64</a>	Linux (amd64)	124GB	7700MB	4GB	17ms	4 min 47 sec ahead	
	<a href="#">ib3-ubuntu-precise64</a>	Linux (amd64)	138GB	7654MB	N/A	16ms	4 min 47 sec ahead	
	<a href="#">ib4-centos5-64</a>	Linux (amd64)	72GB	5630MB	72GB	24ms	30 min ahead	



build slaves  
many platforms  
anything that can run Java  
We have ~32

Multi-platform software

Jenkins supports multi level matrix builds.

Back to Dashboard

Status

Changes

Workspace

Build Now

Delete Project

Configure

GNU Compiler Warnings

Bazaar Polling Log

Build History

(trend)

#980 Jan 22, 2013 1:01:24 AM 311KB

#979 Jan 17, 2013 11:25:41 AM 234KB

#978 Jan 17, 2013 1:41:00 AM 437KB

#977 Jan 16, 2013 2:42:40 AM 253KB

#976 Jan 15, 2013 4:24:59 AM 393KB

#975 Jan 14, 2013 8:44:13 AM 572KB

#974 Jan 13, 2013 2:47:43 PM 651KB

#973 Jan 13, 2013 12:11:49 AM 754KB

#972 Jan 11, 2013 11:32:02 PM 949KB

#971 Jan 10, 2013 4:51:49 AM 1MB

#970 Jan 9, 2013 1:32:00 PM 1MB

#969 Jan 2, 2013 9:53:58 AM 289KB

#968 Jan 2, 2013 4:10:52 AM 341KB

#967 Dec 28, 2012 4:50:49 AM 335KB

#966 Dec 17, 2012 2:20:30 PM 403KB

#965 Dec 17, 2012 3:41:20 AM 495KB

#964 Nov 30, 2012 7:57:44 AM 290KB

# Project percona-xtrabackup-2.0

Build and test the main Percona XtraBackup 2.0 branch

edit description

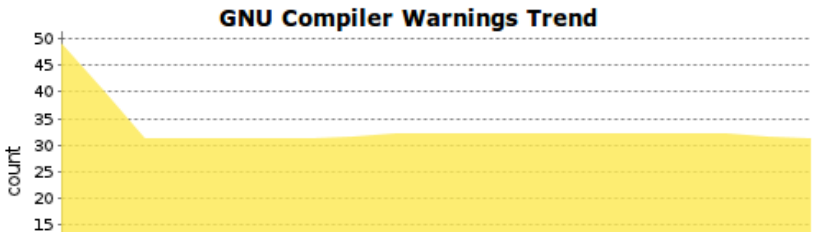
Disable Project

Configuration Matrix		ubuntu-lucid-32bit	ubuntu-lucid-64bit	ubuntu-precise-32bit	ubuntu-precise-64bit	debian6-32	debian6-64	centos5-32	centos5-64	centos6-32	centos6-64
release	innodb50										
	innodb51_builtin										
	innodb51										
	innodb55										
	xtradb51										
	xtradb55										
	galera55										
debug	innodb50										
	innodb51_builtin										
	innodb51										
	innodb55										
	xtradb51										
	xtradb55										
	galera55										



Latest Test Result (110 failures / -1)

Disk Usage: Workspace 12GB, Builds 42MB



our XB build matrix

12 Supported Platforms

$12 * 11 = 132$

12 platforms

7 Innodb release variants (5.1,5.5)

4 Innodb debug variants

Nobody had seen this before. It was a shock.

DDoS

Building XtraBackup is akin to a DDoS attack on build infrastructure

Slaves in Cloud



Dynamically scale out!

We \*HAD\* EC2

this didn't work too well for us  
expensive.

spin up, min 2hrs, infrequent builds, many platforms = costly  
can be a good idea.

# Private Cloud?

MySQL 15 minute install rule.  
Too much fucking around.

# Static VMs with Puppet

this is what we use now  
KVM as VirtualBox is shit  
virt-manager over SSH  
Jenkins connects via SSH  
puppet deploys authorized\_hosts file  
installs correct software.  
even devs ssh keys

Process changes

to help ensure quality  
showing people their code sucks is one thing

# Code Review



Hopefully you do this.

If not, introduce it.

At very least, you know what's going in.

Make junior devs do it too. Learning exp.  
only senior can ack.

param build

build \*before\* requesting review  
prove that tests pass with trunk+your work  
Text box for bzr URL  
build+test before merge request  
can send any parameter to build

 [Back to Dashboard](#) [Status](#) [Changes](#) [Workspace](#) [Build Now](#) [Delete Project](#) [Configure](#) [GNU Compiler Warnings](#) **Build History** [\(trend\)](#)

	#639	<a href="#">Jan 22, 2013 4:38:27 PM</a>	59KB
	#638	<a href="#">Jan 21, 2013 9:48:12 AM</a>	228KB
	#637	<a href="#">Jan 20, 2013 1:27:27 PM</a>	39KB
	#636	<a href="#">Jan 20, 2013 12:13:19 PM</a>	40KB
	#635	<a href="#">Jan 18, 2013 4:45:19 PM</a>	144KB
	#634	<a href="#">Jan 18, 2013 2:38:37 PM</a>	147KB
	#633	<a href="#">Jan 18, 2013 2:09:51 PM</a>	139KB
	#632	<a href="#">Jan 18, 2013 12:04:40 PM</a>	154KB
	#631	<a href="#">Jan 18, 2013 11:29:44 AM</a>	182KB
	#630	<a href="#">Jan 17, 2013 4:13:19 PM</a>	54KB
	#629	<a href="#">Jan 17, 2013 3:32:22 PM</a>	46KB

## Project percona-server-5.5-param

This build requires parameters:

BZR\_BRANCH

BZR Branch to use

MTR\_ARGS

Extra parameters to pass to mysql-test-run

CMAKE\_EXTRA\_OPTIONS

Extra options for cmake

for PS 5.5



## Related bugs and blueprints:

[Port expand\\_fast\\_index\\_creation to Percona Server 5.6 \(Essential\)](#)

Reviewer	Review Type	Date Requested	Status
Alexey Kopytov		2012-12-14	Approve on 2013-01-09

Review [via email](#): [mp+139747@code.launchpad.net](mailto:mp+139747@code.launchpad.net) [Request a review](#) [Set commit message](#)

## Description of the Change



The port of expand fast index creation patch.

The only significant change is that online/inplace ALTER TABLE API was introduced in MySQL 5.6.

Drop and create keys on temporary table is performed as following.  
Create Alter\_info which describe table changes. As fields of the table are not changed, populate ccreate\_list with field definitions using field==orig\_field. Create Alter\_inplace\_info describing alter operations to be performed. Fill index\_drop\_buffer or index\_add\_buffer respectively. Set ADD\_INDEX/DROP\_INDEX handler flag. Check that operation could be performed online by calling check\_if\_supported\_inplace\_alter. Perform alter operation by calling ha\_prepare\_inplace\_alter\_table, ha\_inplace\_alter\_table, ha\_commit\_inplace\_alter\_table.

<http://jenkins.percona.com/view/PS%205.6/job/percona-server-5.6-param/14/>

[Add a review or comment](#)

and paste in URL to merge request  
or whatever you use for code review.  
OpenStack guys automatically fire off stuff  
this is great, if you have all that tech  
Idea is: bad code doesn't get approved

Staging builds



integrate, test, then push to trunk

ensures trunk always passes.

final review

we did this manually

merge captain param build, then push.

idea: bad code doesn't ever hit trunk.

Gated trunk

Idea is nobody ever pushes directly  
You can actually link benchmark+test runs to merges  
automated audit trail

# Automated Staging

pretty easy to set up.

We have launchpad account

all pushes to trunk are by a bot.

idea: less work for merge captain.

Had for Drizzle, I took too long

don't delay: it's easy.

# Build Triggers

BZR polling  
after another job done  
chain jobs together  
time based  
we bypass full build+test for docs only branches

Auto-deploy documentation



after push to trunk  
build docs  
push to web server

Automate all the things

extended QA

releases

doing pushbutton to release is awesome

custom builds at push of button=awesome

Graph all the things

Arbitrary plots

XML result from benchmark

nightly performance regression tests

staging performance regression tests

# Manual checklists

our release process includes manual steps

inform marketing

ensure docs up to date

inform support/consulting

simple checklist. Many times/year to screw up

Has all this helped?



XB releases: 2010=2, 2011=4, 2012=11

PS releases: sooner, fewer bugs.

Sense of improvement

More developers

2586 Jobs

including matrix jobs

36,049 builds

we expire most builds

3.7GB java process

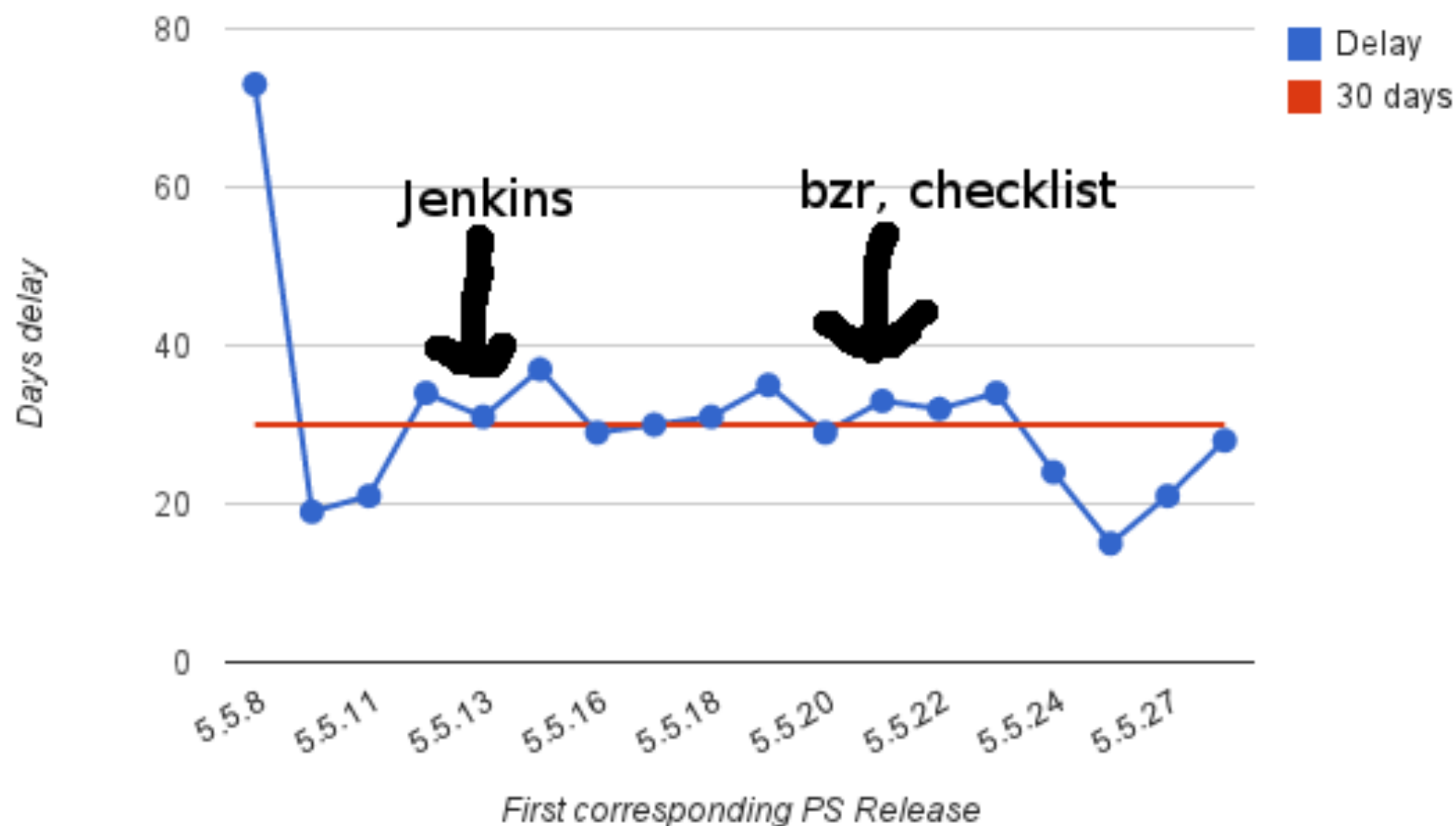
which is easy

Jenkins does scale



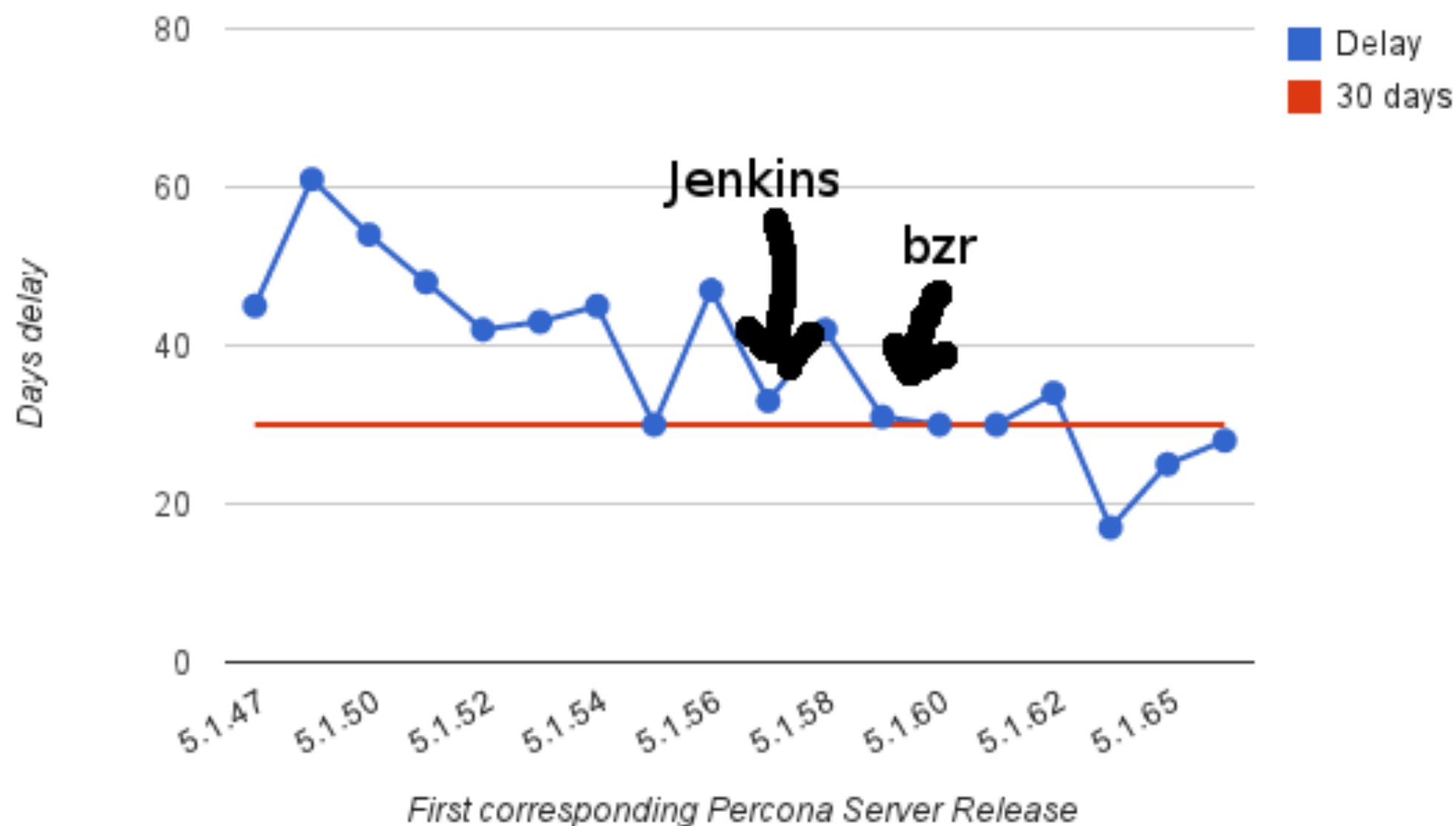
at least until you start hiring dev automation people

## Percona Server 5.5 delay



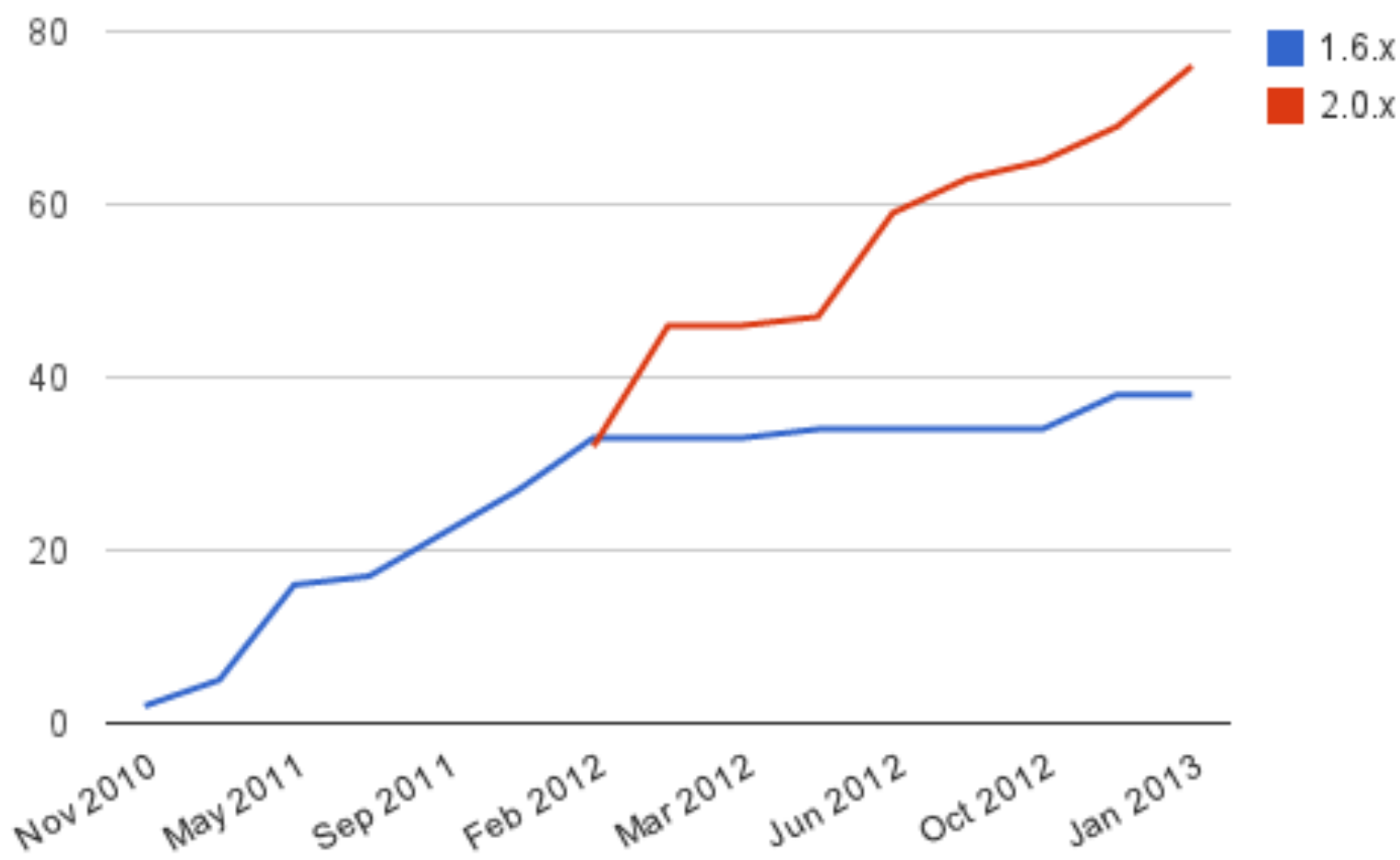
has helped, at same time improving quality

## Percona Server 5.1 Delay



much more visible with 5.1 version (longer history)

## Percona XtraBackup tests 1.6vs2.0 over time



from zero to hero.  
people file bugs now.

Yes, it helps.



where COUNT(devs) > 0

FIN