The Agony and Ecstasy of CI: a war story

Stewart Smith
Percona

Hi!
I work for

PERCONA

Performance Consulting Experts

which is a MySQL support, consulting and development company

Joined May 2011

Director of Software Architecture

Lovely title, have been involved in major overhaul of development
Currently working on doing everything correctly in packaging,
linux distribution inclusion and (again) improving dev practices.

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
moving to more "formal" of these
is net gain, not loss.

Introducing CI

this talk is partly about

CI = Continuous Integration

just in case unclear

Changing development practices

but also very much about
ALWAYS be looking for ways to improve
State of the art in 1997 is not state of the art now.

Existing company

not starting from scratch
Can be easier starting from scratch
Seldom if ever the case.
People always have expectations even if new proj

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 while figure things out

Privately funded company

This is from exp at Percona.
No Venture Capital to blow
Small company achieving big.
no VC or large company budget to be inefficient
work *much* smarter, not harder.
some of our competitors have, in comparison, infinite budgets.

Zero Dev Infrastructure people

nobody dedicated to this.
This is a challenge
Has changed, but initially tough.
There are strategies.

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
Deadline to deliver new point release 30 days after Oracle.
Shipping is a feature.
People bet their company on this product.

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
often enlightening if support > 1 platform

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
The most humbling experience is to have
somebody else try your perfect code.

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.
Never chastise QA or Dev for test failures.
Always look to improve and introduce fewer regressions.

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

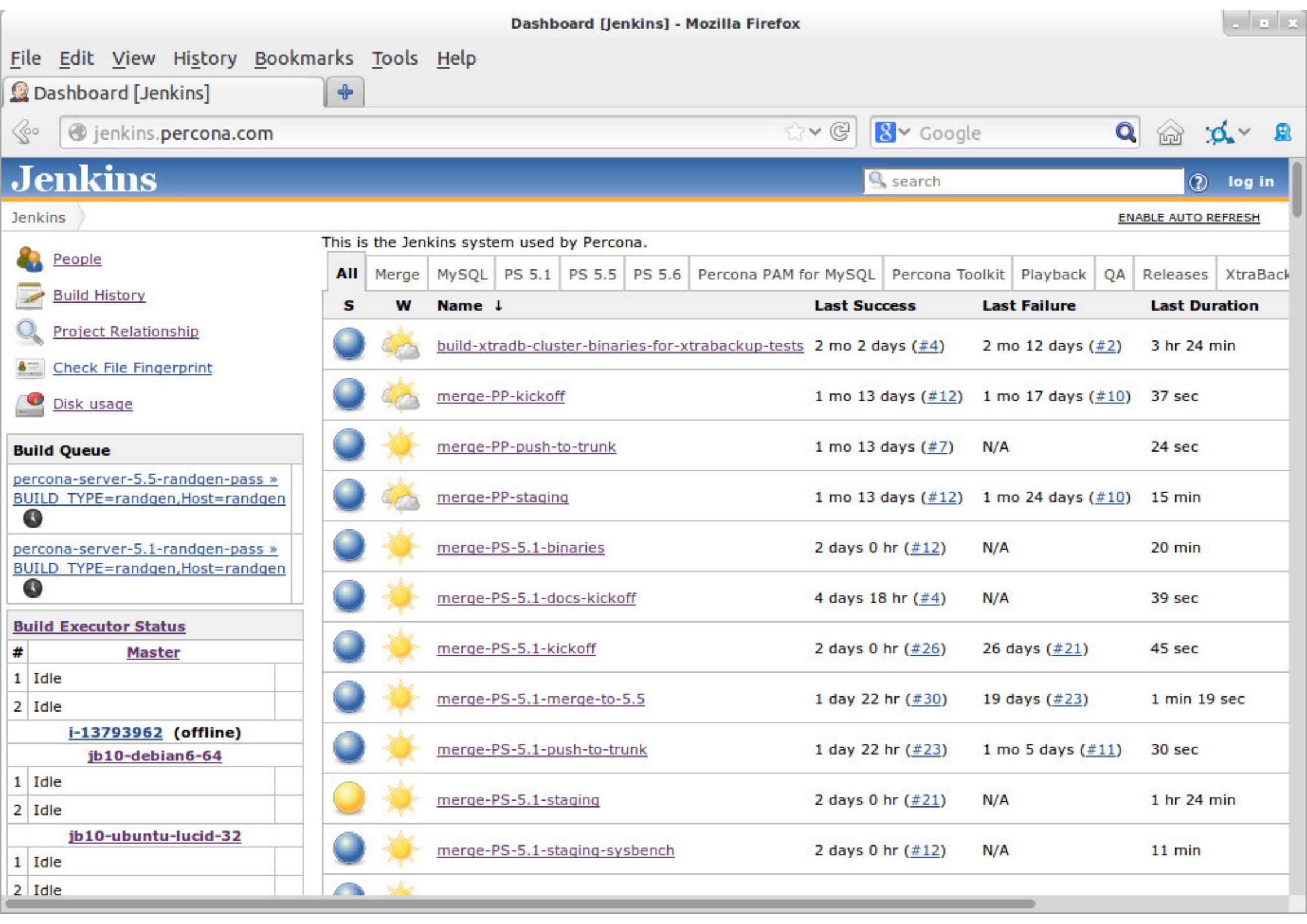
Discovered a great tool

Hudson

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

Jenkins

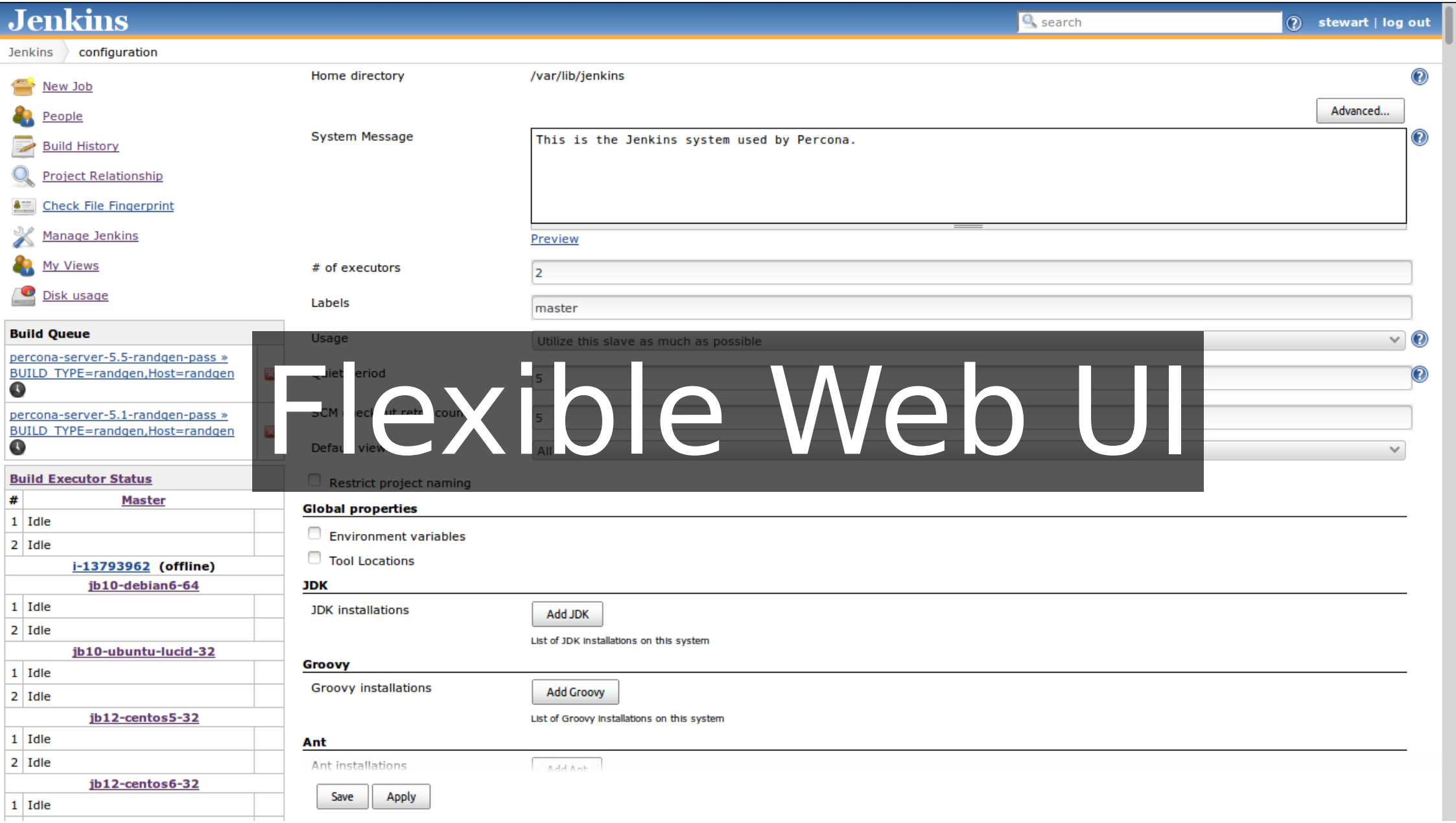
The only reason for Java to exist.


Dashboard [Jenkins] - Mozilla Firefox
File Edit View History Bookmarks Tools Help
Dashboard [Jenkins]
jenkins.percona.com
Google
Jenkins
search
log in
Jenkins
ENABLE AUTO REFRESH
This is the Jenkins system used by Percona.
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
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
build-xtradb-cluster-binaries-for-xtrabackup-tests 2 mo 2 days (#4) 2 mo 12 days (#2) 3 hr 24 min
merge-PP-kickoff 1 mo 13 days (#12) 1 mo 17 days (#10) 37 sec
merge-PP-push-to-trunk 1 mo 13 days (#7) N/A 24 sec
merge-PP-staging 1 mo 13 days (#12) 1 mo 24 days (#10) 15 min
merge-PS-5.1-binaries 2 days 0 hr (#12) N/A 20 min
merge-PS-5.1-docs-kickoff 4 days 18 hr (#4) N/A 39 sec
merge-PS-5.1-kickoff 2 days 0 hr (#26) 26 days (#21) 45 sec
merge-PS-5.1-merge-to-5.5 1 day 22 hr (#30) 19 days (#23) 1 min 19 sec
merge-PS-5.1-push-to-trunk 1 day 22 hr (#23) 1 mo 5 days (#11) 30 sec
merge-PS-5.1-staging 2 days 0 hr (#21) N/A 1 hr 24 min
merge-PS-5.1-staging-sysbench 2 days 0 hr (#12) N/A 11 min

looks something like this

Free Software

other solutions are often not

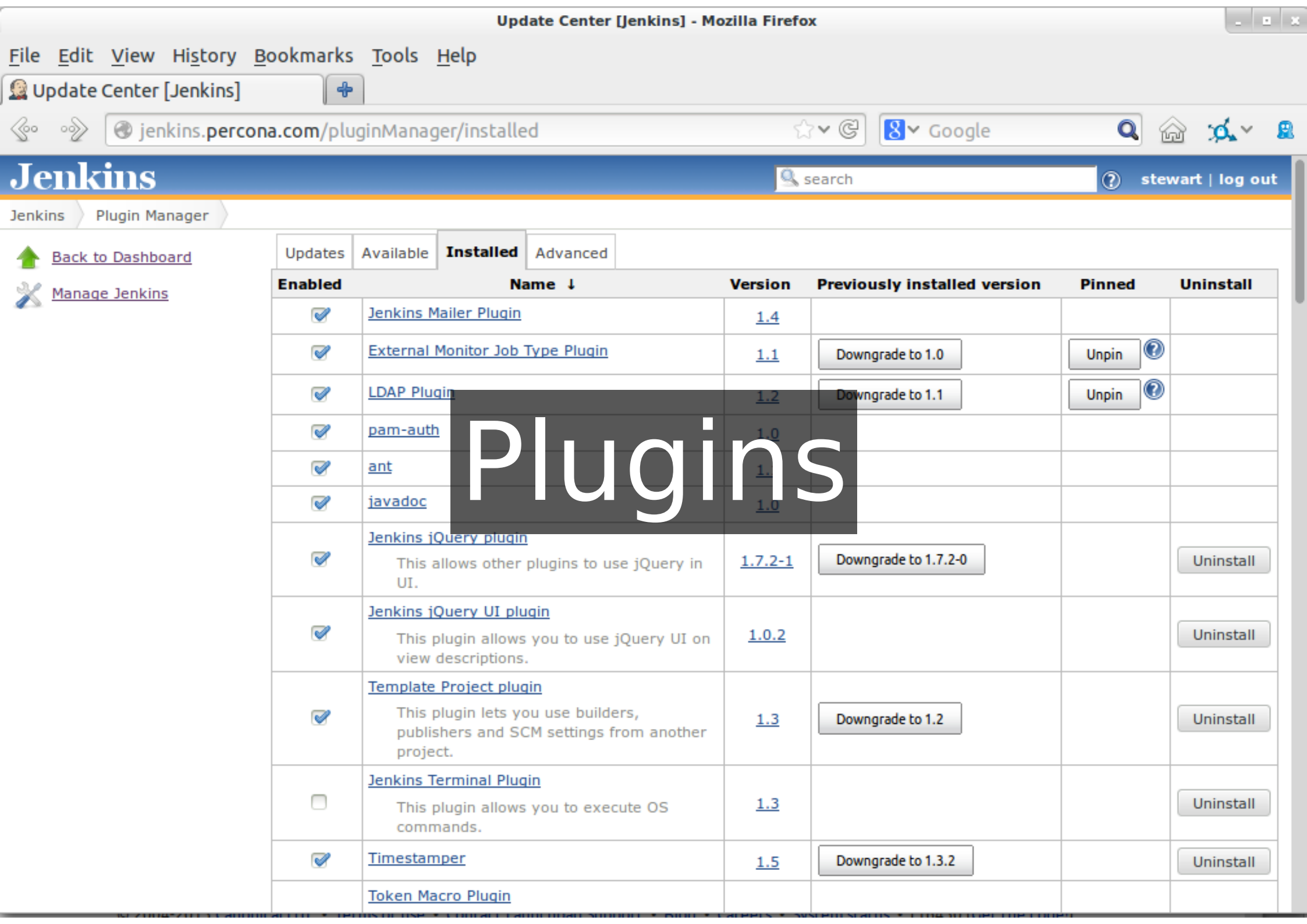


Flexible Web UI

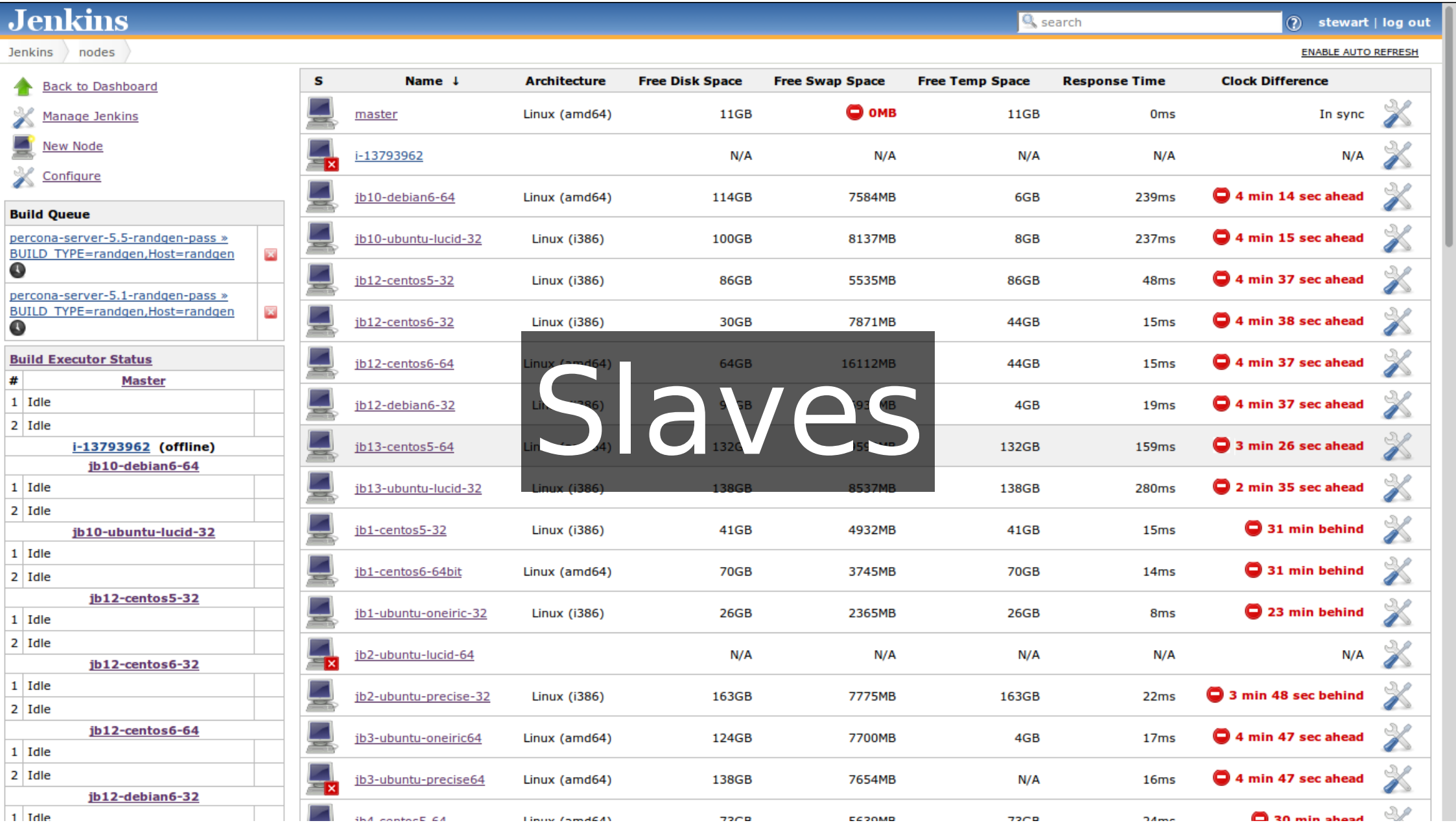
Buildbot = text config
Mostly text file config
great if you're a hacker
not if you want docs & QA & mgmt easy use
Web config is a *plus*
Easy to get going
no special syntax

Easy to install

war file
apt-get install


Update Center [Jenkins] - Mozilla Firefox
File Edit View History Bookmarks Tools Help
Update Center [Jenkins]
jenkins.percona.com/pluginManager/installed
Google
Jenkins
search
stewart | log out
Jenkins
Plugin Manager
Back to Dashboard
Manage Jenkins
Updates
Available
Installed
Advanced
Enabled
Name ↓
Version
Previously installed version
Pinned
Uninstall
Jenkins Mailer Plugin
1.4
External Monitor Job Type Plugin
1.1
Downgrade to 1.0
Unpin
LDAP Plugin
1.2
Downgrade to 1.1
Unpin
pam-auth
1.0
ant
1.
javadoc
1.0
Plugins
Jenkins jQuery plugin
This allows other plugins to use jQuery in UI.
1.7.2-1
Downgrade to 1.7.2-0
Uninstall
Jenkins jQuery UI plugin
This plugin allows you to use jQuery UI on view descriptions.
1.0.2
Uninstall
Template Project plugin
This plugin lets you use builders, publishers and SCM settings from another project.
1.3
Downgrade to 1.2
Uninstall
Jenkins Terminal Plugin
This plugin allows you to execute OS commands.
1.3
Uninstall
Timestamper
1.5
Downgrade to 1.3.2
Uninstall
Token Macro Plugin

BZR
SSH Slave
cloud slaves (on demand!)


Jenkins
search
stewart | log out
Jenkins
nodes
ENABLE AUTO REFRESH
Back to Dashboard
Manage Jenkins
New Node
Configure
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
jb12-centos5-32
1 Idle
2 Idle
jb12-centos6-32
1 Idle
2 Idle
jb12-centos6-64
1 Idle
2 Idle
jb12-debian6-32
1 Idle
S
Name ↓
Architecture
Free Disk Space
Free Swap Space
Free Temp Space
Response Time
Clock Difference
master Linux (amd64) 11GB 0MB 11GB 0ms In sync
i-13793962 N/A N/A N/A N/A N/A
jb10-debian6-64 Linux (amd64) 114GB 7584MB 6GB 239ms 4 min 14 sec ahead
jb10-ubuntu-lucid-32 Linux (i386) 100GB 8137MB 8GB 237ms 4 min 15 sec ahead
jb12-centos5-32 Linux (i386) 86GB 5535MB 86GB 48ms 4 min 37 sec ahead
jb12-centos6-32 Linux (i386) 30GB 7871MB 44GB 15ms 4 min 38 sec ahead
jb12-centos6-64 64GB 16112MB 44GB 15ms 4 min 37 sec ahead
jb12-debian6-32 4GB 19ms 4 min 37 sec ahead
jb13-centos5-64 132GB 159ms 3 min 26 sec ahead
jb13-ubuntu-lucid-32 Linux (i386) 138GB 8537MB 138GB 280ms 2 min 35 sec ahead
jb1-centos5-32 Linux (i386) 41GB 4932MB 41GB 15ms 31 min behind
jb1-centos6-64bit Linux (amd64) 70GB 3745MB 70GB 14ms 31 min behind
jb1-ubuntu-oneiric-32 Linux (i386) 26GB 2365MB 26GB 8ms 23 min behind
jb2-ubuntu-lucid-64 N/A N/A N/A N/A N/A
jb2-ubuntu-precise-32 Linux (i386) 163GB 7775MB 163GB 22ms 3 min 48 sec behind
jb3-ubuntu-oneiric64 Linux (amd64) 124GB 7700MB 4GB 17ms 4 min 47 sec ahead
jb3-ubuntu-precise64 Linux (amd64) 138GB 7654MB N/A 16ms 4 min 47 sec ahead
Slaves

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

Buil and test the main Percona XtraBackup 2.0 branch

edit description

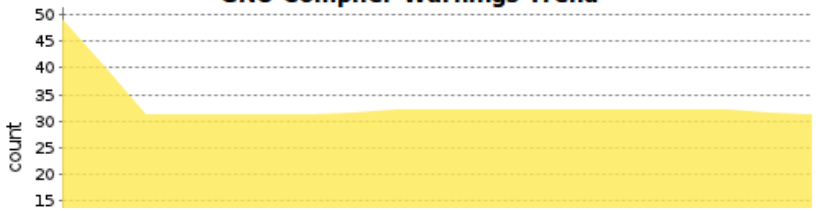
Disable Project

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

GNU Compiler Warnings Trend



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
You'd be surprised at how big your test matrix is.
"Didn't we test this before release?"
Add it up for people, automate it.

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.
We live in hope.

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.

If we didn't make mistakes compilers wouldn't give errors, or warnings.

1 Stupid mistake per person per year.

1 not-so-stupid mistake per person per year

1 interesting mistake per person per year

1 regression per person per year.

1-2 days to fix each one

naturally you check these in at the end of a workday
notice halfway through the next one, check in "fix"
before leaving.

Team of 12,
your tree is CONSTANTLY broken.

and nobody will run trunk
because it's broken

or develop against it.
or beleive a test failure is their fault.

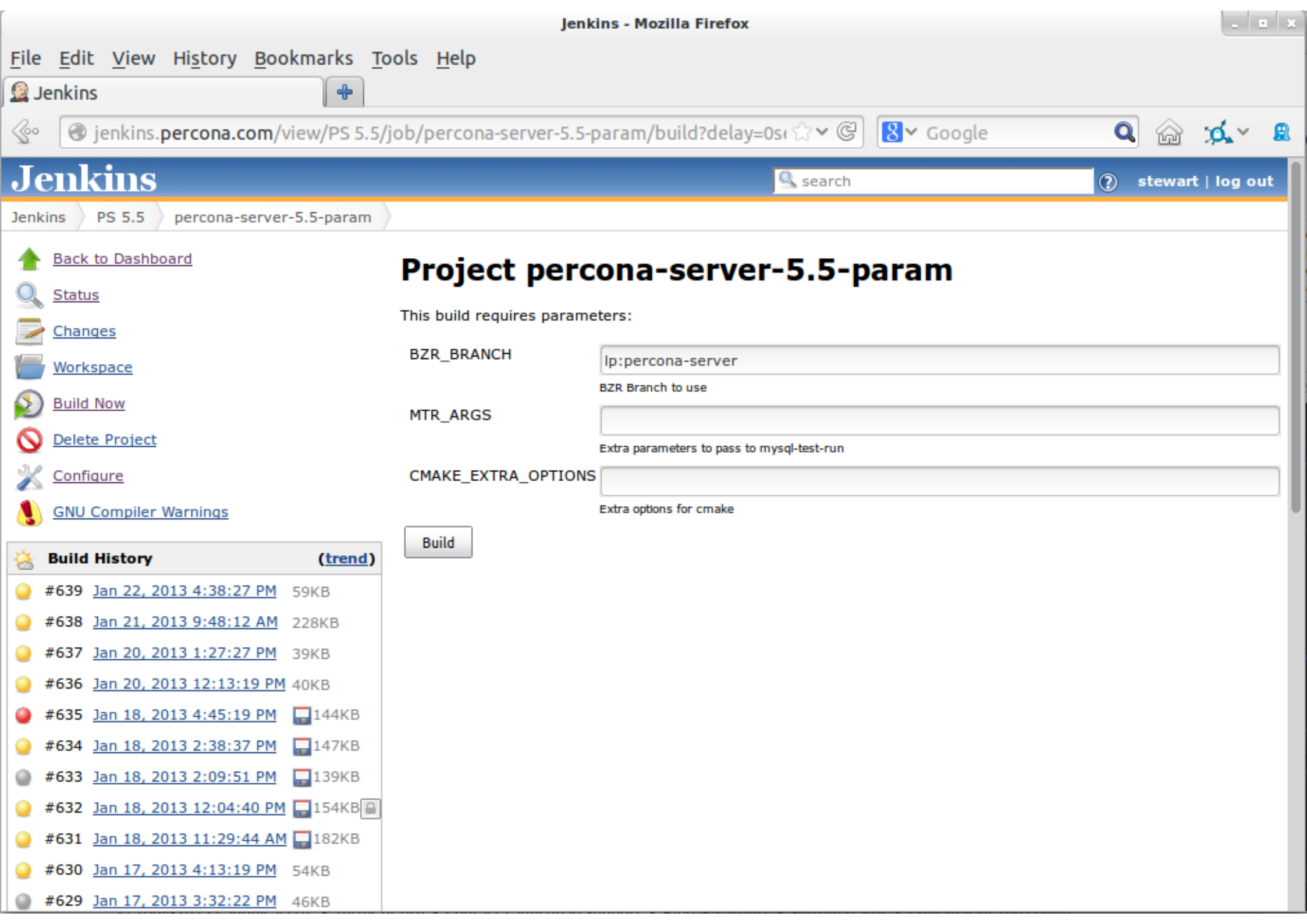
Make breaking trunk **HARD**

Always releaseable trunk

mad rush to release is no more
you can release at any time
and be confident.

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


Jenkins - Mozilla Firefox
File Edit View History Bookmarks Tools Help
Jenkins
jenkins.percona.com/view/PS 5.5/job/percona-server-5.5-param/build?delay=0s
Google
Jenkins
search
stewart | log out
Jenkins
PS 5.5
percona-server-5.5-param
Back to Dashboard
Status
Changes
Workspace
Build Now
Delete Project
Configure
GNU Compiler Warnings
Build History (trend)
#639 Jan 22, 2013 4:38:27 PM 59KB
#638 Jan 21, 2013 9:48:12 AM 228KB
#637 Jan 20, 2013 1:27:27 PM 39KB
#636 Jan 20, 2013 12:13:19 PM 40KB
#635 Jan 18, 2013 4:45:19 PM 144KB
#634 Jan 18, 2013 2:38:37 PM 147KB
#633 Jan 18, 2013 2:09:51 PM 139KB
#632 Jan 18, 2013 12:04:40 PM 154KB
#631 Jan 18, 2013 11:29:44 AM 182KB
#630 Jan 17, 2013 4:13:19 PM 54KB
#629 Jan 17, 2013 3:32:22 PM 46KB
Project percona-server-5.5-param
This build requires parameters:
BZR_BRANCH
lp:percona-server
BZR Branch to use
MTR_ARGS
Extra parameters to pass to mysql-test-run
CMAKE_EXTRA_OPTIONS
Extra options for cmake
Build

for PS 5.5
branch, test run options (e.g. --valgrind), inject build options

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

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 clreate_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
Easy code review: don't accept if build fails :)

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
So you can learn from any mistakes.

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
daily builds
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
google spreadsheets are powerful.

Has all this helped?

XB releases: 2010=2, 2011=4, 2012=11, 2013=12
PS releases: sooner, fewer bugs.
Sense of improvement
More developers

2586 Jobs

including matrix jobs


36,049 builds

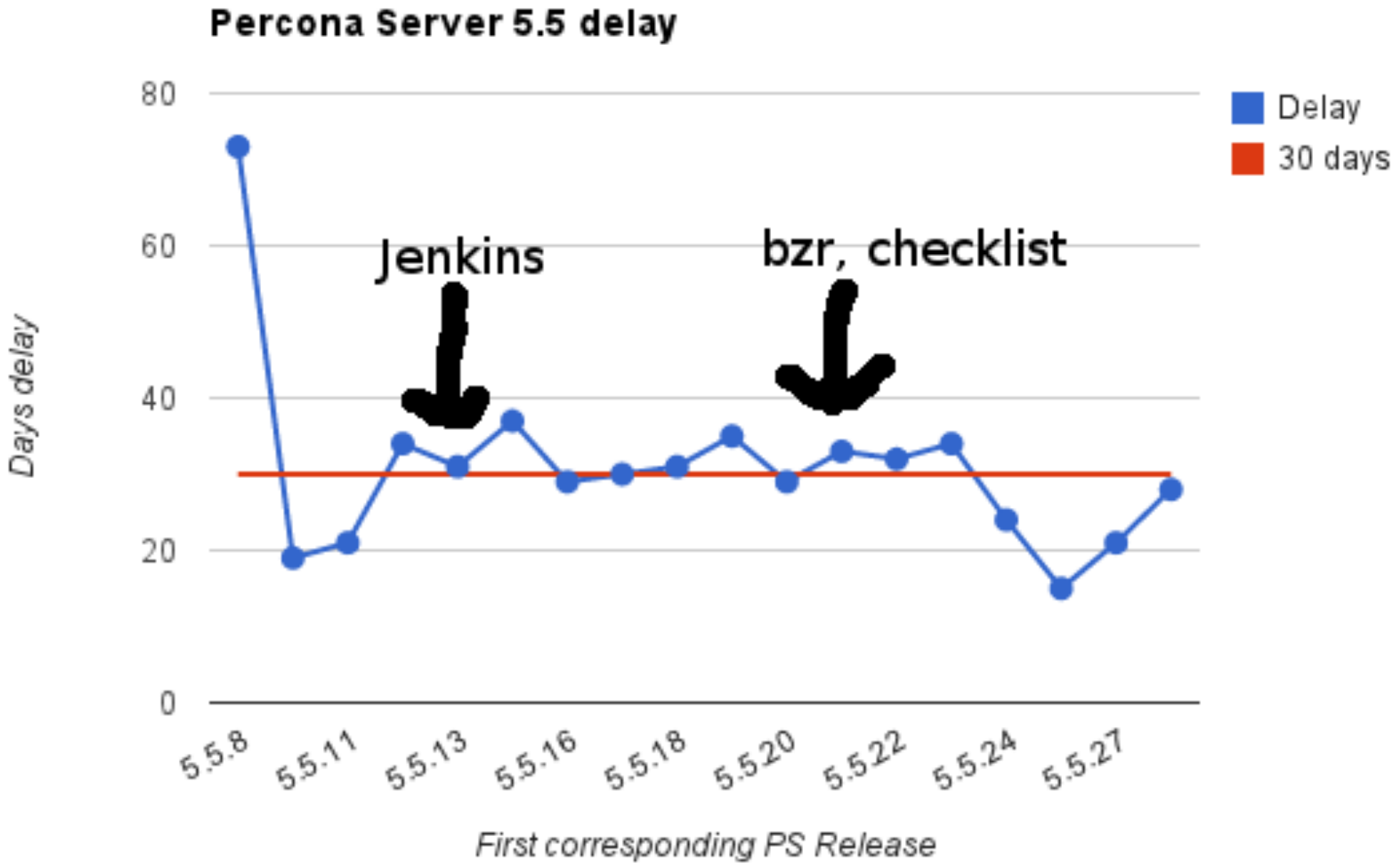
we expire most builds

3.7GB java process

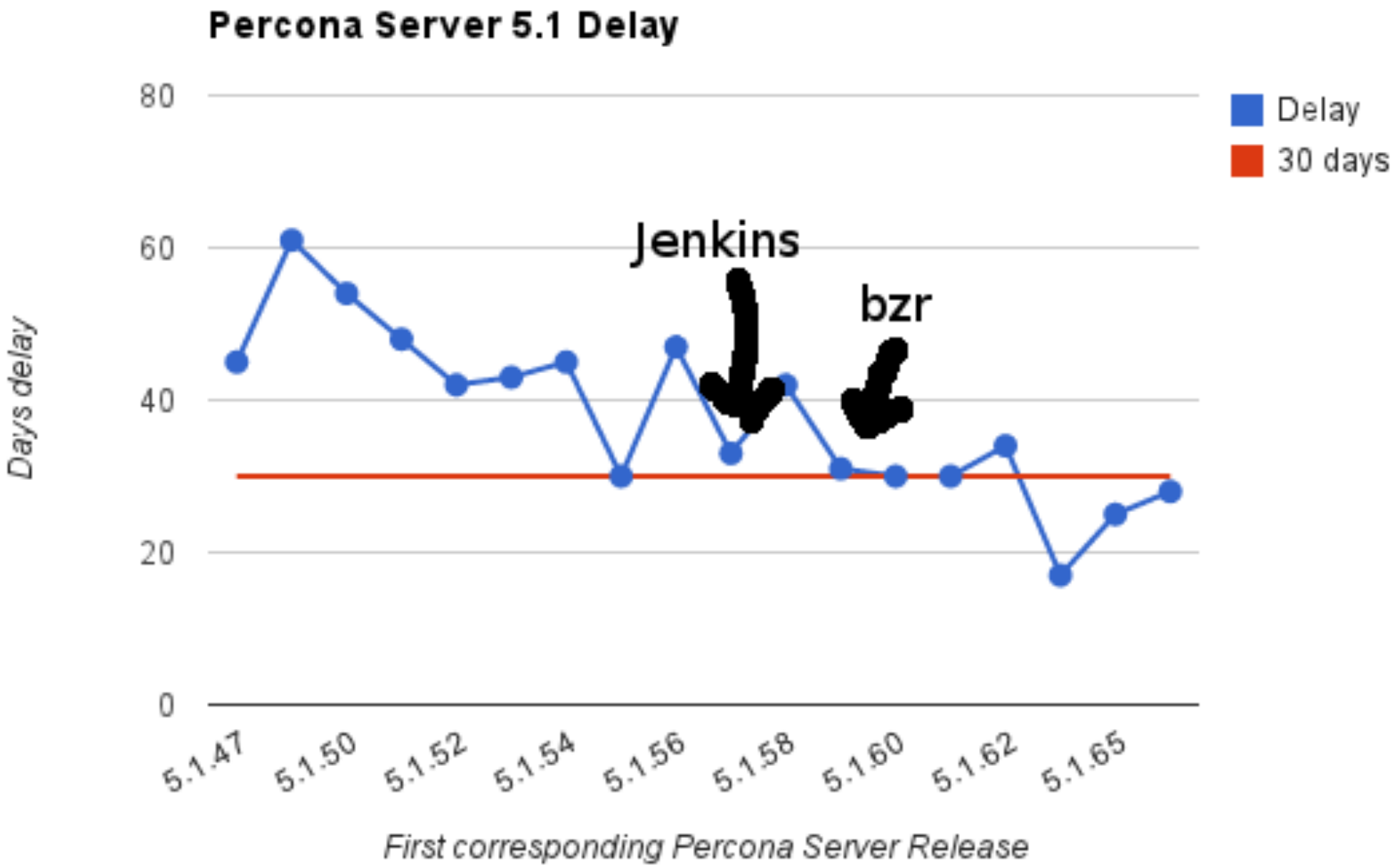
which is easy

Jenkins does scale

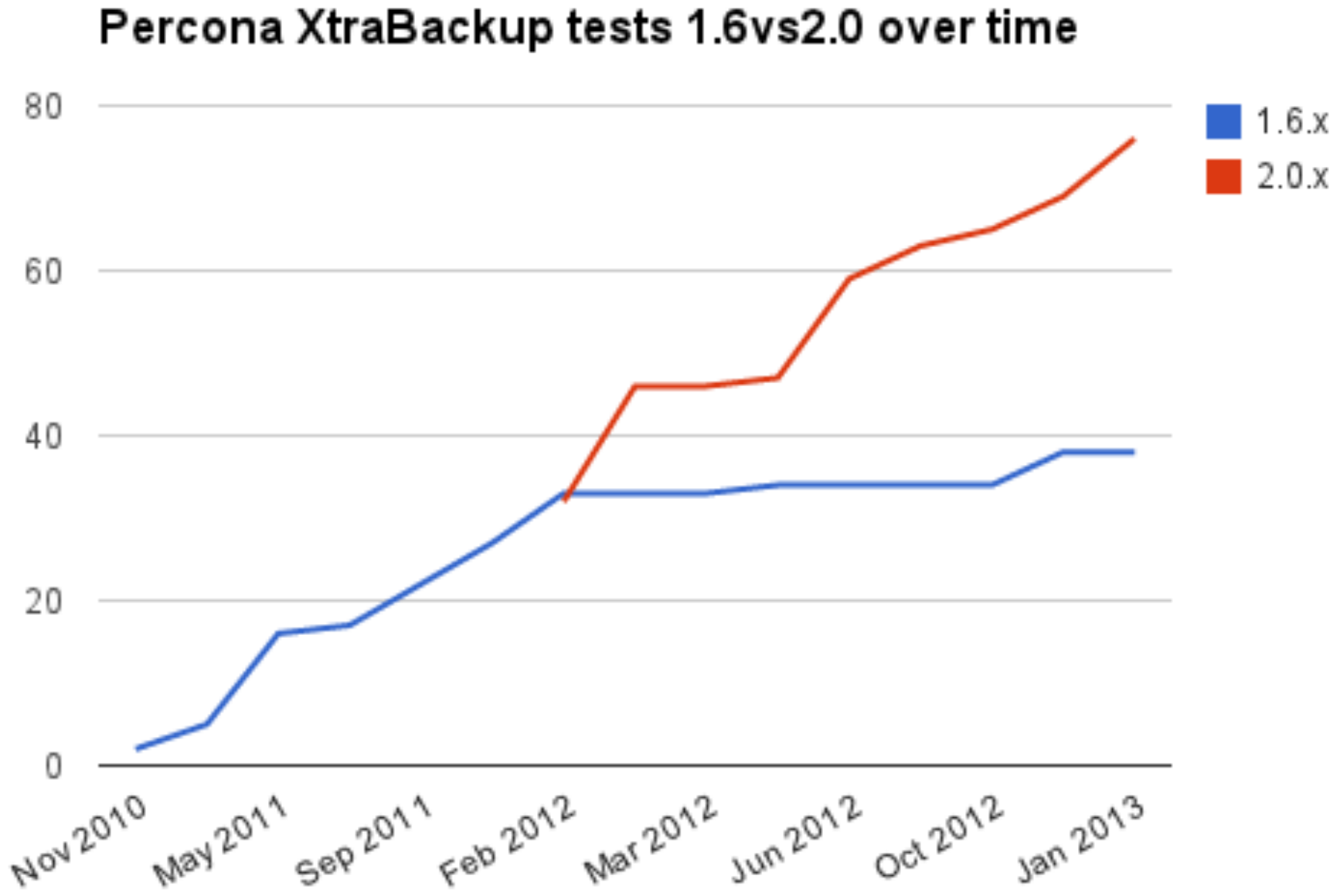
at least until you start hiring dev automation people


Percona Server 5.5 delay
80
60
40
20
0
Days delay
Jenkins
bzr, checklist
Delay
30 days
5.5.8
5.5.11
5.5.13
5.5.16
5.5.18
5.5.20
5.5.22
5.5.24
5.5.27
First corresponding PS Release

has helped, at same time improving quality


Percona Server 5.1 Delay
80
60
40
20
0
Days delay
Delay
30 days
Jenkins
bzr
5.1.47
5.1.50
5.1.52
5.1.54
5.1.56
5.1.58
5.1.60
5.1.62
5.1.65
First corresponding Percona Server Release

much more visible with 5.1 version (longer history)


Percona XtraBackup tests 1.6vs2.0 over time
80
60
40
20
0
Nov 2010
May 2011
Sep 2011
Feb 2012
Mar 2012
Jun 2012
Oct 2012
Jan 2013
1.6.x
2.0.x

from zero to hero.
people file bugs now.

Yes, it helps.
WHERE COUNT(devs) > 0

FIN