

# Training Machines to be Open Source Contributors

Stef Walter  
Red Hat



# Cyborg Teams

**[We] ate all the low-hanging fruit  
of modern history ...**

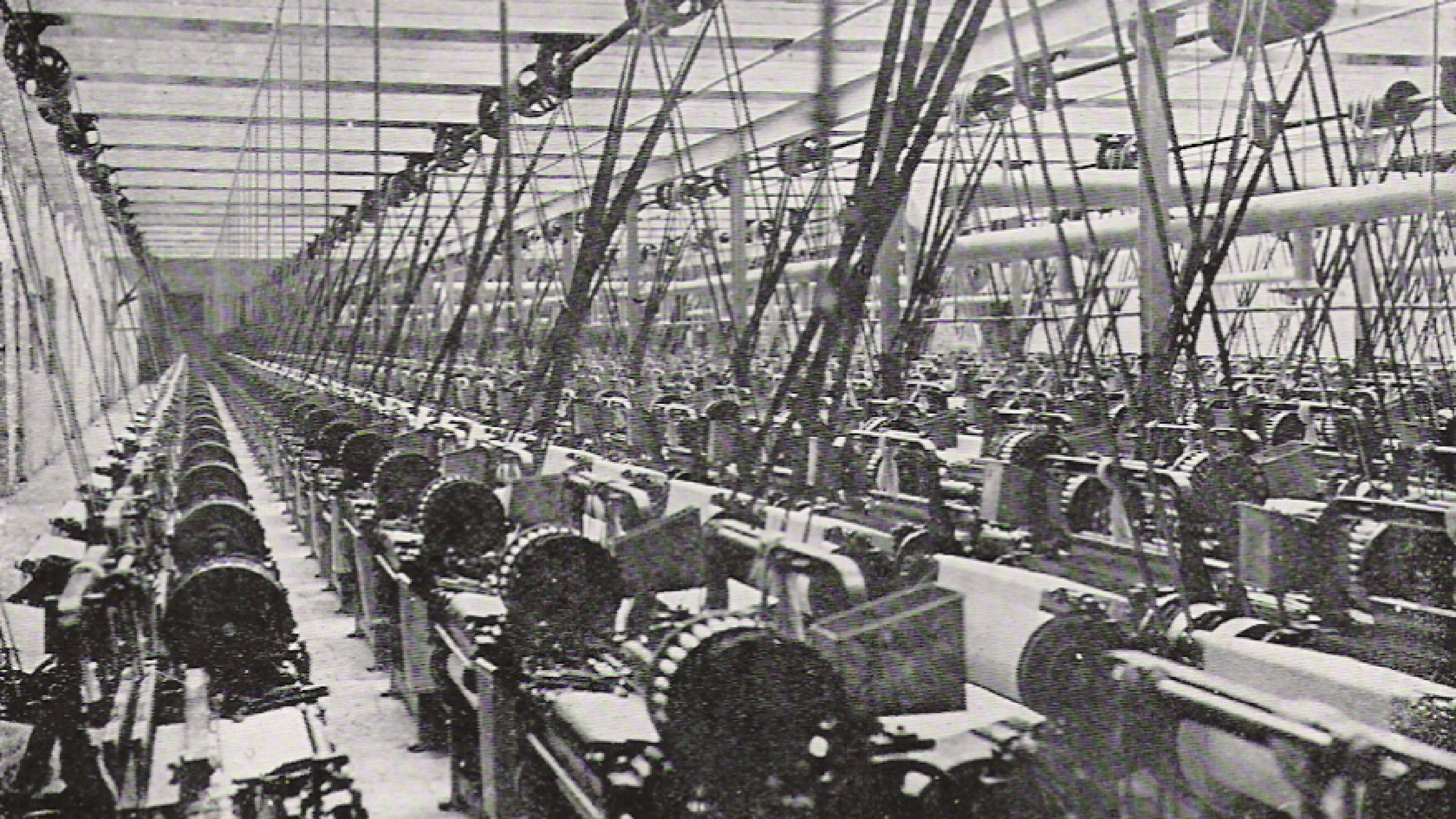
— Tyler Cowen



**You see the computer age everywhere  
but in the productivity statistics.**

— Robert Solow

**"But we use machines!"**



# Cyborg Teams

A team that is part human, part machine





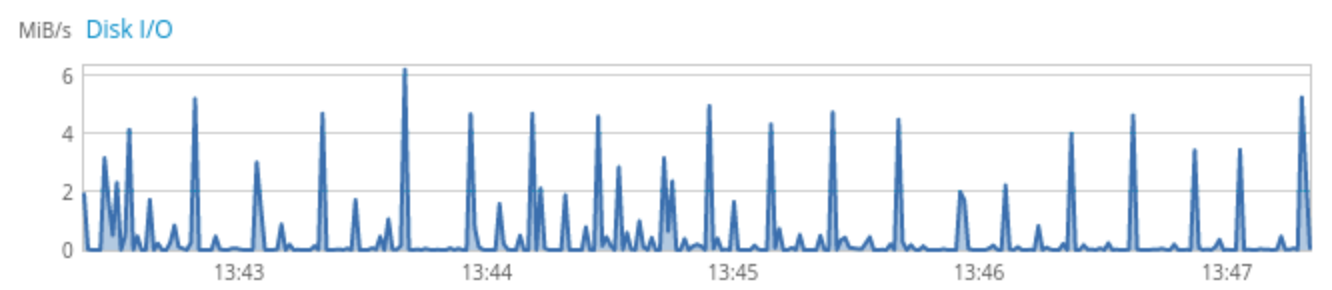
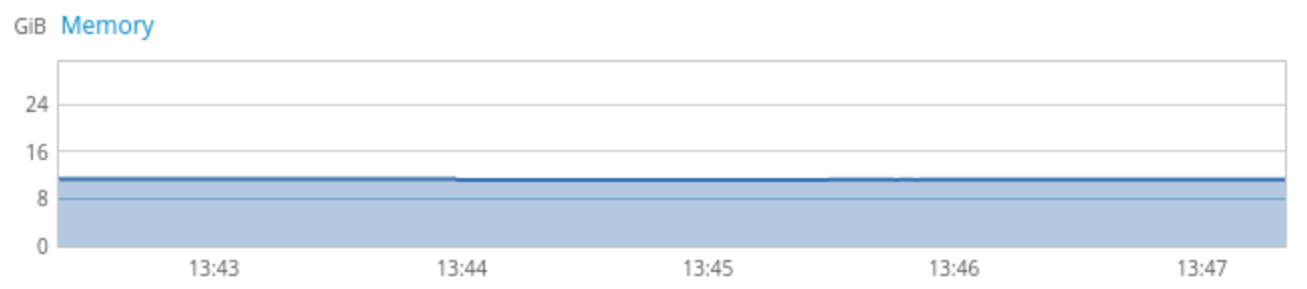


RED HAT ENTERPRISE LINUX SERVER

- Falcon
- System
- Logs
- Storage
- Networking
- Containers
- oVirt Machines
- Accounts
- Services
- Applications
- Diagnostic Reports
- Kernel Dump
- SELinux
- Software Updates
- Subscriptions
- Terminal

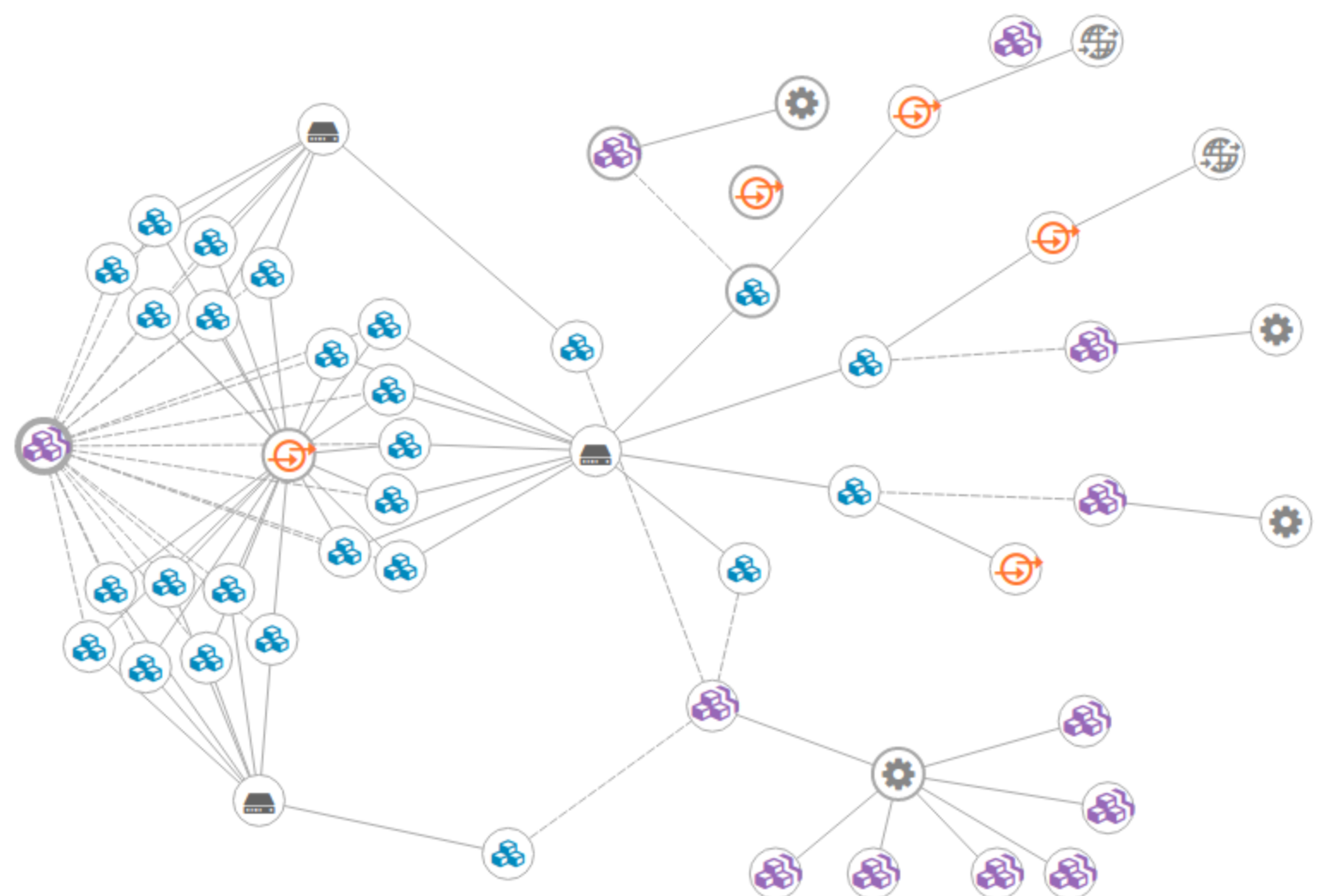
Dashboard Cluster Image Registry

Hardware TAROX Basic 7000BD  
 Asset Tag 1437471  
 Machine ID a20c82e128524937ad8...  
 Operating System Employee SKU  
 Secure Shell Keys [Show fingerprints](#)  
 Host Name Falcon (falcon.thewalter...)  
 Domain [Join Domain](#)  
 System Time 2017-10-17 13:47 ⓘ  
 Power Options  ▾  
 Performance Profile none ⓘ  
 Store Performance Data



- Overview
- Nodes
- Containers
- Topology
- Details
- Volumes
- Images
- Projects

All Projects



### ReplicationController

**Name** cockpit-tasks  
**Namespace** verify  
**Created** Sep 20, 2017 10:42:49 AM  
**Replicas** 20

### Selector

**infra** cockpit-tasks

### Pod Template

**Restart policy** Always  
**DNS policy** ClusterFirst  
**Service acco...** cockpituous

### Containers

**Name** cockpit-tasks  
**Image** docker.io/cockpit/tests  
**Ports** none  
**Env vars** TEST\_JOBS=8  
 TEST\_PUBLISH=sink

**Name** cockpit-images  
**Image** docker.io/cockpit/images  
**Ports** 80/TCP

Services

Containers

Logs

Storage

Networking

Asset Tag 1437471

BIOS American Megatrends Inc. 2001 (06/16/2014)

Operating System Fedora 23 (Workstation Edition)

Host Name Falcon (falcon.thewalter.lan)

Domain [Join Domain](#)



Elements

Console

Sources

Network

Timeline

Profiles

Resources



<top frame>



Preserve log

```
> zz = cockpit.spawn
```



Services

Asset Tag 1437471

Containers

BIOS American Megatrends Inc. 2001 (06/16/2014)

Logs

Operating System Fedora 23 (Workstation Edition)

Storage

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Networking

Domain Join Domain



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<top frame>



Preserve log





## 90+ APIs: File, Command, REST, DBus, Socket

abrt	AppStream	apt-get	atomic	Candlepin /candlepin/
chpasswd	CloudForms	cryptsetup	curl	dbus-daemon
device-mapper	docker-storage-setup	docker	e2fsprogs	etcd
/etc/kdump.conf	/etc/passwd	firewalld	FreeIPA	GnuTLS
GSSAPI	hostnamed	ipa-client	ipa-client	iproute
iptables	iscsi-tools	journalctl	kdump	klist
krb5	Kubernetes /api/	lastlog	libvirt	loginctl
lvm	mdadm	NetworkManager	NetworkManager-te...	oddjob
Openshift /oapi/	Openshift OAuth2	openssl	ostree	oVirt /api/
PackageKit	passwd	PCP	PolicyKit	/proc/meminfo...
/proc/mounts	/proc/net/dev...	procps-ng	/proc/stat	pwquality
qemu	realmd	rm ...	rpmostreed	rpm
selinux-policy-target...	selinux-utils	setenforce	Setroubleshootd	shadow-utils
shutdown	sosreport	ssh-agent	sshd	ssh-keygen
ssh	sssd	storaged	subscription-manager	sudo
/sys/fs/cgroup	/sys/kernel	/sys/power	systemd	timedated
Tuned	udev	UDisks2	/usr/bin/kubectl	/usr/bin/timedatectl
/usr/bin/virt-install	/var/log/wtmp	/var/run/utmp	virsh	who/w
xfspgms	yum			



## 15+ Linuxes and Products

---

CentOS (7.x, Atomic)

---

Fedora (25, 26, 27, Atomic)

---

Ubuntu (stable, 16.04)

---

RHEL (7.x, 7.4, Extras, Atomic)

---

Debian (stable, testing)

---

Openshift

---

RHEV Hypervisor

## 5+ maintained branches

---

master

---

rhel-7.4

---

rhel-7.3.x

---

i386

---

s390x

## 3+ browsers

---

Google Chrome

---

Internet Explorer

---

Firefox




$$92 \times 15 \times 5 \times 3 \times 50$$

The effort of a solely human team **does not scale**  
past a certain complexity point

# Cyborg Teams

Machines as team members







Bots own **mundane work**



Pair programming with bots



Humans train the bots



Bots learn from humans



Bots ship Cockpit



Bots own **mundane work**

<> Code

🔔 Issues 424

🔗 Pull requests 34

📁 Projects 0

📖 Wiki

📊 Insights

⚙️ Settings

## Update translations from Fedora Zanata #7906

🔔 **Open** cockpituous opened this issue just now · 0 comments



cockpituous commented just now

Member



Update translations from Fedora Zanata

po-refresh



cockpituous added the **bot** label just now

# WIP: cockpit-tasks-jrsf1: Update translations from Fedora Zanata #7906

 **Open** cockpituous opened this issue 44 seconds ago · 1 comment



cockpituous commented just now

Member



Update translations from Fedora Zanata

po-refresh



cockpituous added the **bot** label just now

```
$ make po/cockpit.pot  
  
$ make upload-pot  
$ make download-po  
$ git add po/  
$ git checkout -b po-refresh-xxx  
$ git commit -m "po: Update from Fedora Zanata"  
$ git push cockpitous po-refresh-xxx
```

# Update translations from Fedora Zanata #7906

🔗 Open cockpituous wants to merge 1 commit into `cockpit-project:master` from `cockpituous:po-refresh-20171018`

💬 Conversation 2 📄 Commits 1 📄 Files changed 19



cockpituous commented 31 seconds ago • edited

Member + 😊 ✎

Update translations from Fedora Zanata

po-refresh

🏷️ cockpituous added the `bot` label 4 minutes ago



cockpituous commented 3 minutes ago

Member + 😊 ✎ ✕

po-refresh in progress on cockpit-tasks-jrsf1.

Log: <http://fedorapeople.org/groups/cockpit/logs/po-refresh-7906-20171018-192929/>

✎ cockpituous changed the title from **Update translations from Fedora Zanata** to **WIP: cockpit-tasks-jrsf1: Update translations from Fedora Zanata** 3 minutes ago



cockpituous commented 31 seconds ago

Member + 😊 ✎ ✕


















po-refresh done: <https://github.com/cockpituous/cockpit/commits/po-refresh-20171018-193232>



## Some checks haven't completed yet

[Hide all checks](#)

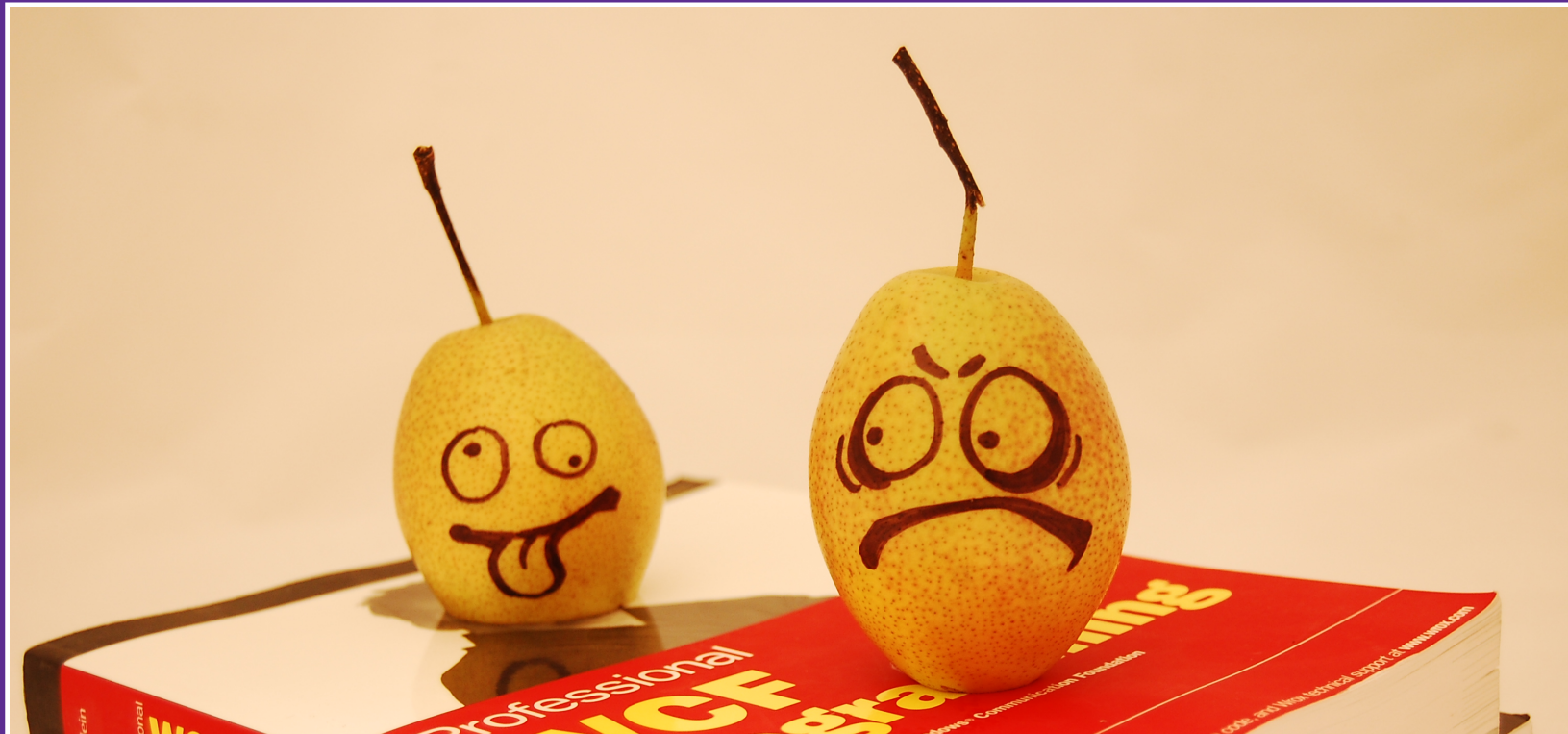
17 pending checks

-  **avocado/fedora-25** — Testing in progress [verifymachine5] [Details](#)
-  **container/kubernetes** — Not yet tested
-  **selenium/chrome** — Testing in progress [cockpit-tasks-bcf7n] [Details](#)
-  **selenium/explorer** — Testing in progress [cockpit-tasks-x2zt2] [Details](#)
-  **selenium/firefox** — Testing in progress [cockpit-tasks-jrsf1] [Details](#)
-  **semaphoreci** — The build is pending on Semaphore. [Details](#)
-  **verify/centos-7** — Testing in progress [cockpit-tasks-c861x] [Details](#)
-  **verify/debian-stable** — Not yet tested
-  **verify/debian-testing** — Testing in progress [cockpit-tasks-3991c] [Details](#)
-  **verify/fedora-27** — Testing in progress [cockpit-tasks-bq6gb] [Details](#)
-  **verify/fedora-atomic** — Testing in progress [cockpit-tasks-flr95] [Details](#)
-  **verify/fedora-l386** — Testing in progress [cockpit-tasks-4sfnk] [Details](#)
-  **verify/rhel-7** — Testing in progress [cockpit-tasks-qzh35] [Details](#)
-  **verify/rhel-7-4** — Testing in progress [cockpit-tasks-jsngc] [Details](#)
-  **verify/rhel-atomic** — Testing in progress [cockpit-tasks-wx97l] [Details](#)
-  **verify/ubuntu-1604** — Testing in progress [cockpit-tasks-xh4pv] [Details](#)
-  **verify/ubuntu-stable** — Testing in progress [cockpit-tasks-lm1b] [Details](#)



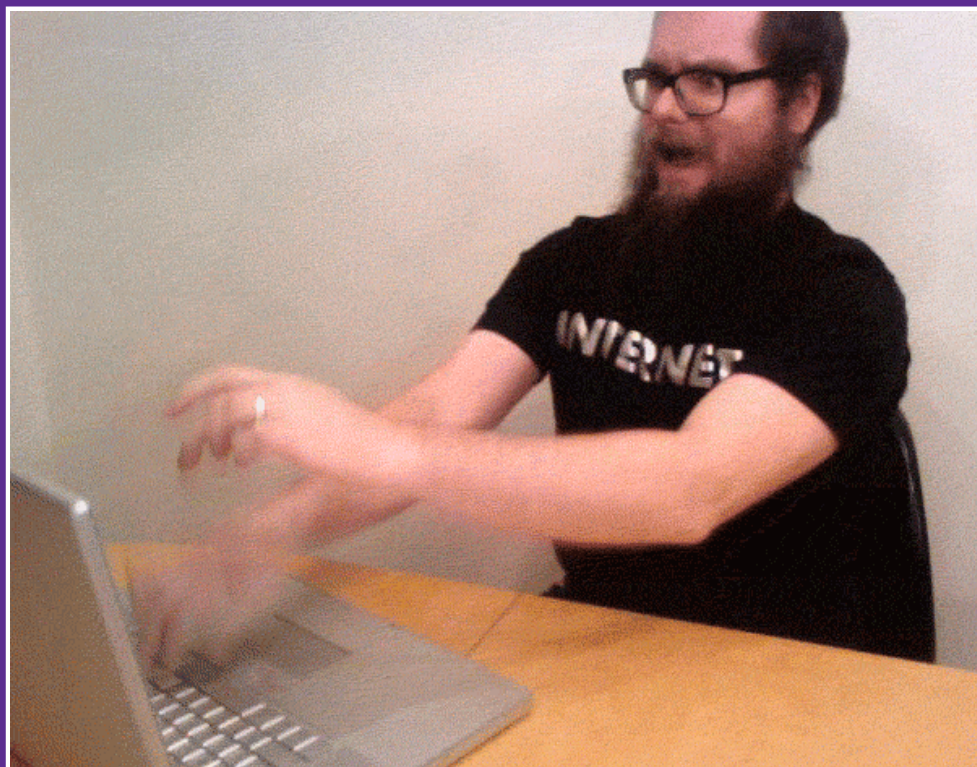
Pair programming with bots







Humans train the bots



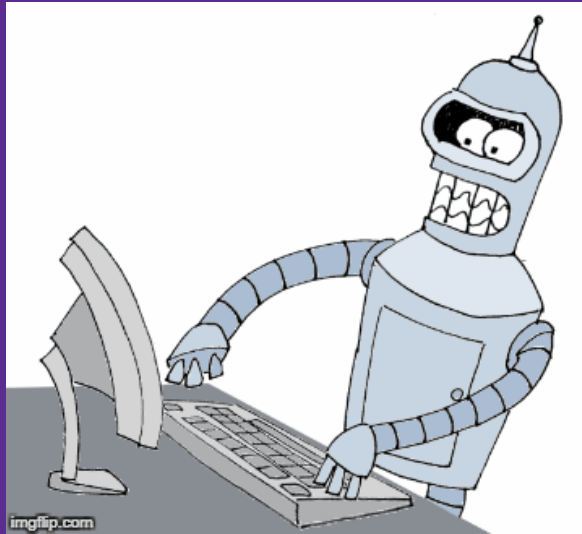
```
$ git shortlog --summary -- bots/ test/ | sort -nr
1140 Stef Walter
 707 Marius Vollmer
 278 Dominik Perpeet
 239 Peter Volpe

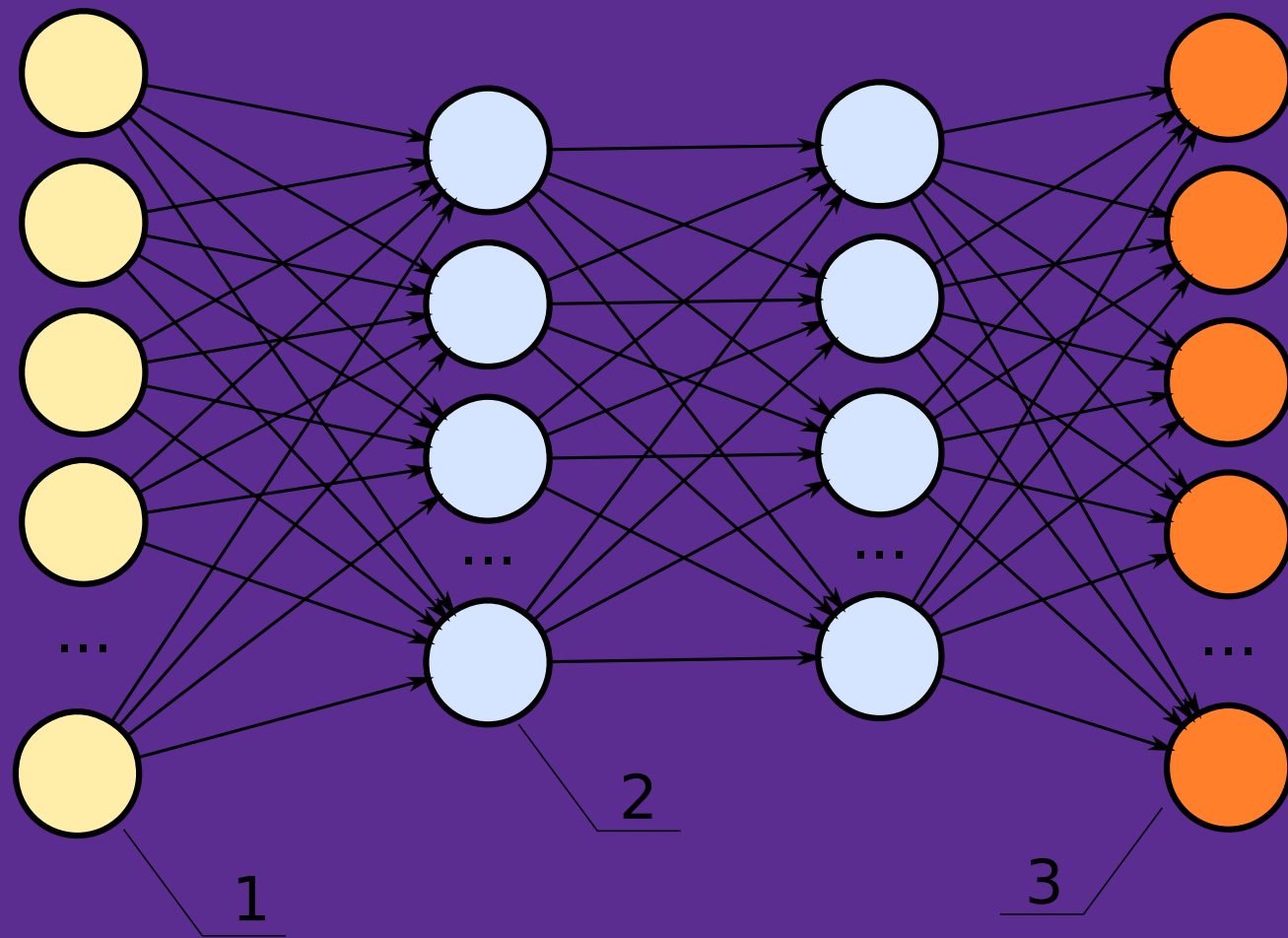
 214 Martin Pitt
  32 Jan Scotka
  13 Lars Karlitski
  12 Subin M
  10 Marek Libra
   6 Andreas Nilsson
   5 Matej Marusak
   4 Stephen Gallagher

...
```



Bots learn from humans







Bots ship Cockpit



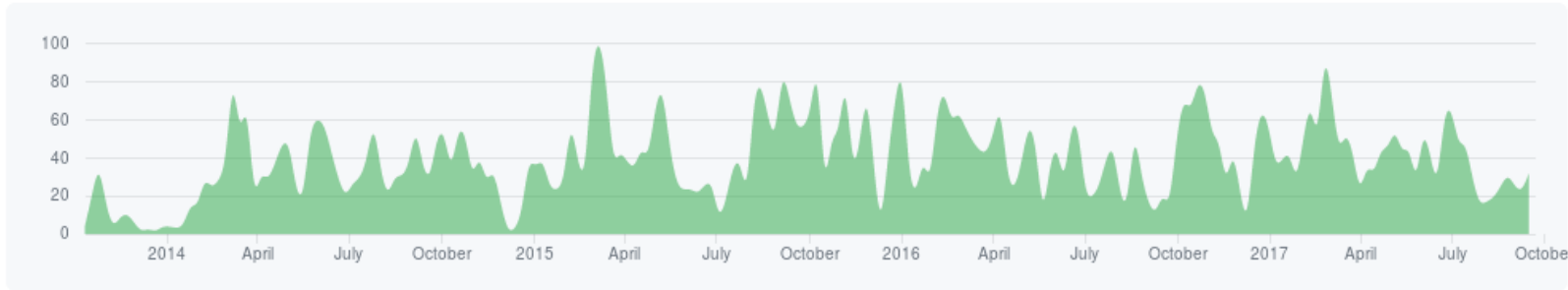
# Human signs a tag in git

## Bots scurry about

- Make **tarballs and patches**
- Update RPM spec files and Debian control files
- **Release** preview builds
- Update and push **Fedora** packages
- Upload packages into **Ubuntu**
- Upload packages into **Debian**
- Upload **tarballs**
- Container rebuilds on **Docker Hub**
- Online documentation update



Bots as committers



**stefwalter**

#1

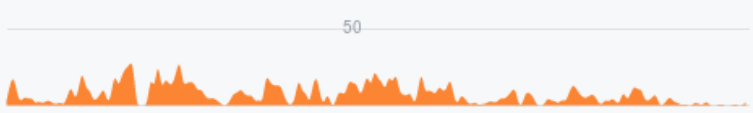
3,965 commits / 1,294,287 ++ / 1,173,543 --



**mvollmer**

#2

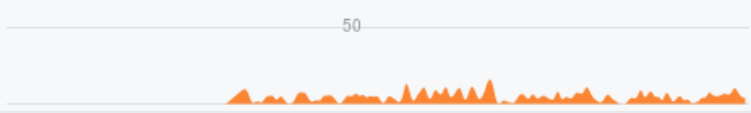
1,483 commits / 117,023 ++ / 92,855 --



**petervo**

#3

686 commits / 142,876 ++ / 105,312 --



**cockpituous**

#4

510 commits / 251,871 ++ / 123,461 --



**dperpeet**

#5

478 commits / 24,263 ++ / 17,764 --



**martinpitt**

#6

361 commits / 9,040 ++ / 3,589 --



```
$ $ git shortlog -ns | head -n10 | cut -c8-30 | nl
 1 Stef Walter
 2 Marius Vollmer

 3 Peter Volpe
 4 Cockpituous
 5 Dominik Perpeet
 6 Martin Pitt
 7 Andreas Nilsson
 8 Lars Karlitski
 9 Philip Donlon
10 Jan Scotka
```



Team stops without bots



# Laws of Cyborg Teams

- 1** Teaching a machine must be as easy as teaching a human
- 2** Machines must produce feedback into the team's workflow
- 3** A human should be able to impersonate a machine, and

# Tests: The Soul of a Robot

Teaching machines right and wrong, good and evil





# *Techniques*



Organic and distributed bots



Self validating bots



Self aware bots



Containerize your bots, yo!



Don't assume bots can't



Organic and distributed bots

## Cockpit Task Bots

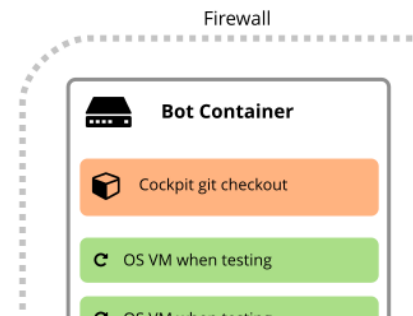
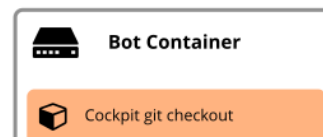
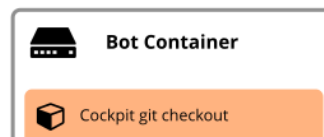
Task system is distributed with GitHub as the single point of failure



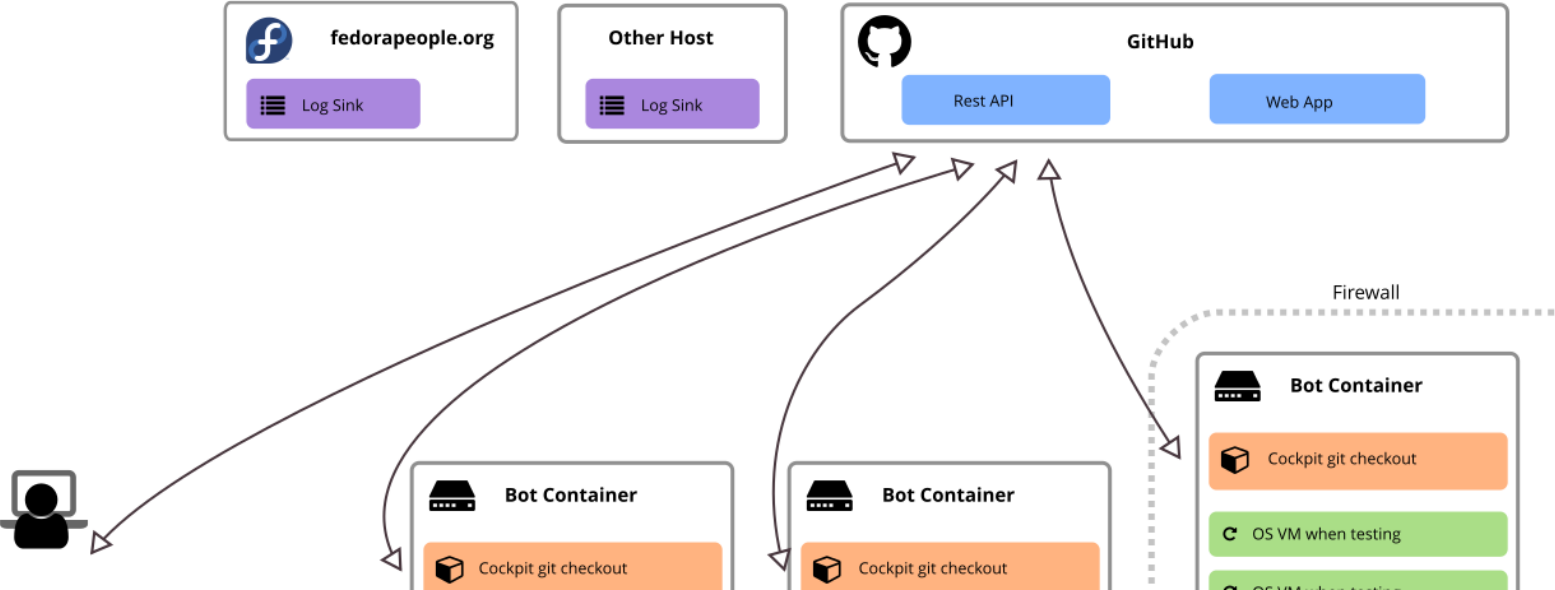
Every pull request is booted 100's of times in Atomic, Debian, Fedora, RHEL, before it hits master.

Containers that start 1,000 - 10,000 test VMs a day

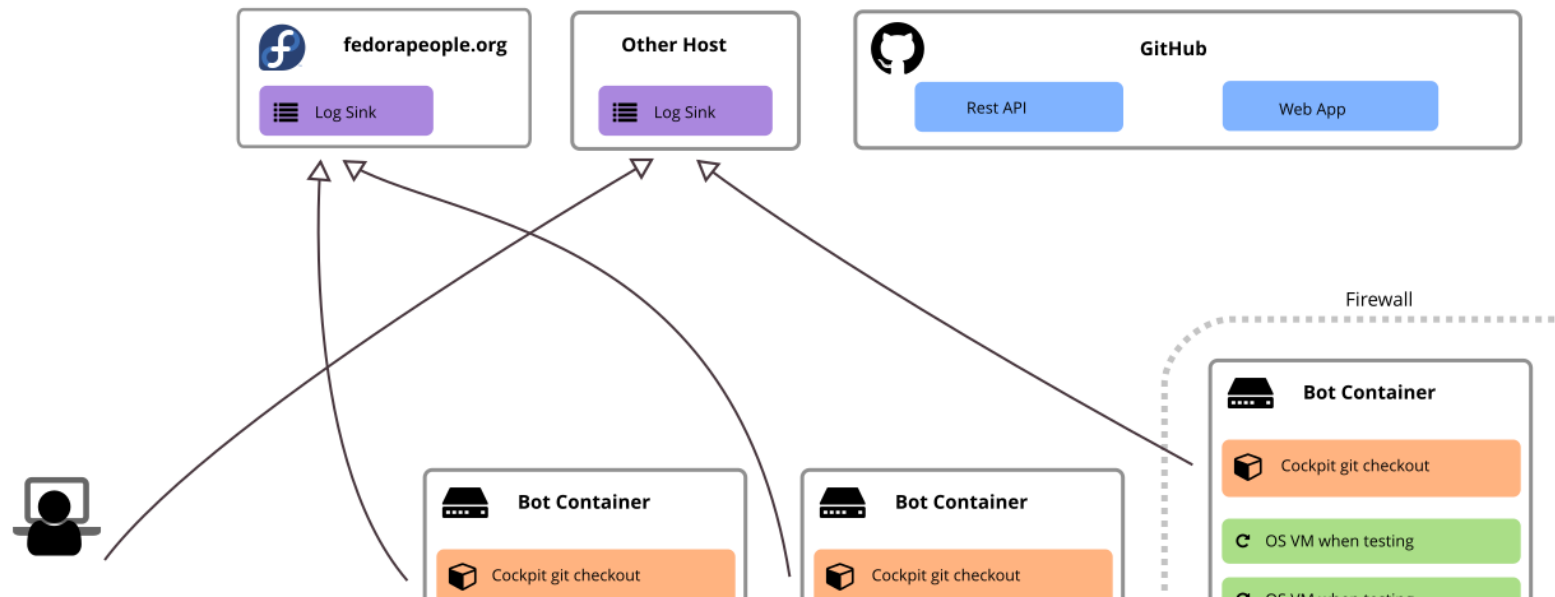
These containers can run anywhere



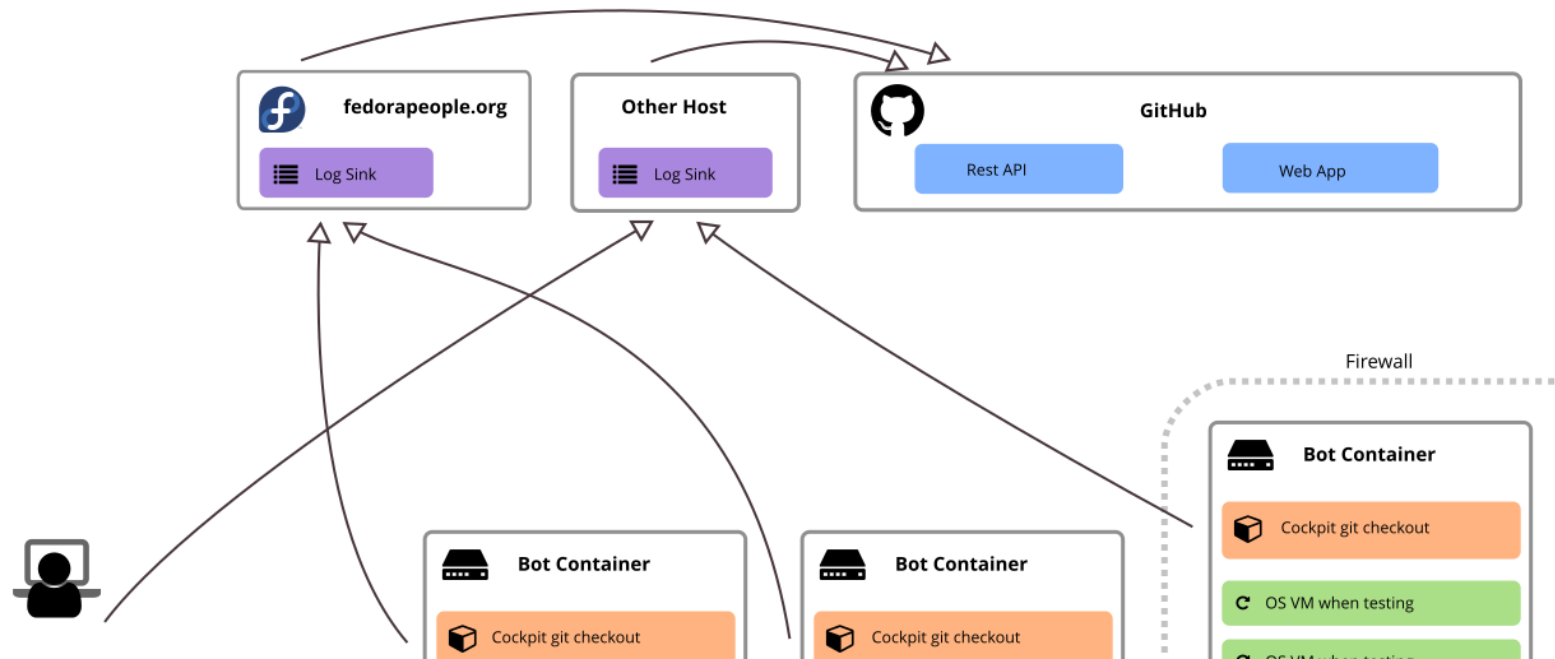
# Looking for Tasks



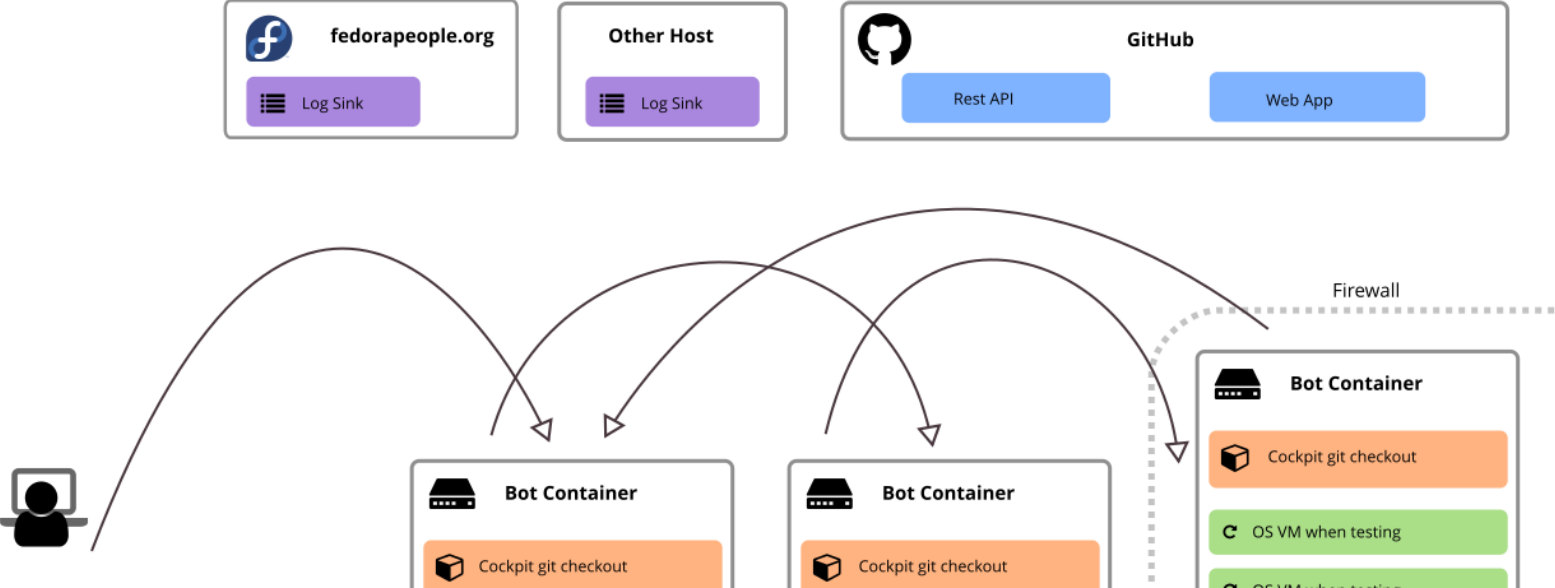
## Post logs, attachments and publicly



## Status updates to Pull Requests



# Bots share state







Self validating bots



Self aware bots

```
kvm = os.access("/dev/kvm", os.R_OK | os.W_OK)

try:
    urllib.urlopen(REDHAT_PING).read()
    redhat = os.path.exists(os.path.expanduser(REDHAT_CREDS))
except IOError:
    redhat = False
```



Containerize your bots, yo!

Testing **containers**  
in **Virtual Machines**  
in **container** bots  
running on **virtual machines**  
on **turtles**

Yo Dawg...  
v



Don't assume bots can't

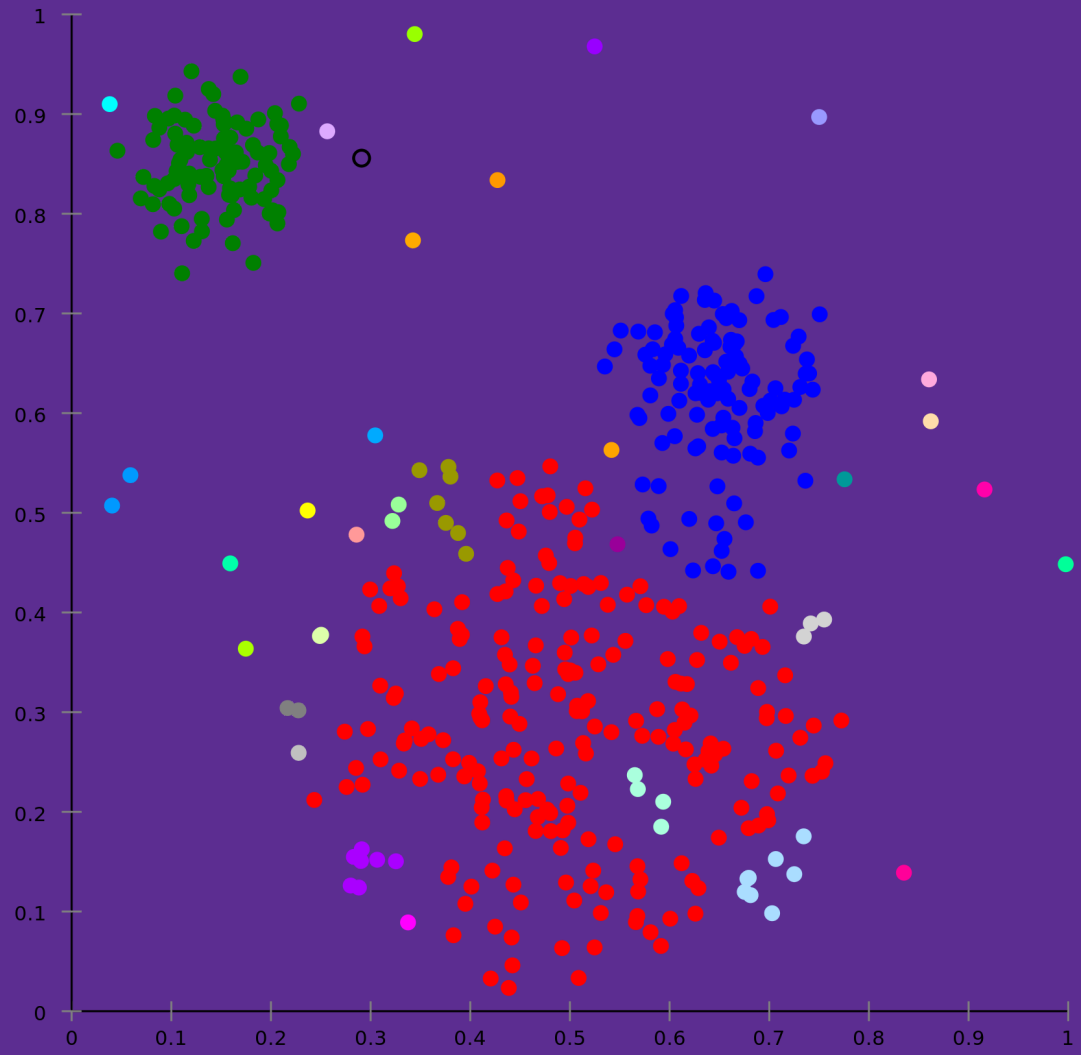


Don't rework process (yet)





**Flakes are just mutations**



! 35: testTeam (check\_networking\_team.TestNetworking), duration: 145s 📷 screenshot 📖 journal 📖 journal

```
# testTeam (check_networking_team.TestNetworking)
```

```
#
```

NAME	UUID	TYPE	DEVICE
System eth0	5fb06bd0-0bb0-7ffb-45f1-d6edd65f3e03	802-3-ethernet	eth0
virbr0	24919ce5-8197-48f5-a08a-581f8274f04c	bridge	virbr0
System eth1	9c92fad9-6ecb-3e6c-eb4d-8a47c6f50c04	802-3-ethernet	--

```
52:54:01:00:00:03 -> eth2
```

```
52:54:01:00:00:03 -> eth2
```

```
52:54:01:00:00:04 -> eth3
```

```
52:54:01:00:00:04 -> eth3
```

```
Unexpected journal message '/usr/libexec/cockpit-pcp: bridge was killed: 11'
```

```
Core dumps downloaded to /build/cockpit/TestNetworking-testTeam-rhel-7-4-127.0.0.2-2601-FAIL.core
```

```
Traceback (most recent call last):
```

```
File "/build/cockpit/test/common/testlib.py", line 602, in tearDown
```

```
    self.check_journal_messages()
```

```
File "/build/cockpit/test/common/testlib.py", line 773, in check_journal_messages
```

# Cyborg Teams

Happy humans, tired machines

# Questions?

[cockpit-project.org](http://cockpit-project.org)

[#cockpit on FreeNode](https://twitter.com/cockpitorg)

## Credits:

Machines: tt2times on Flickr

Pear Programming: mendhak on Flickr

Clusters: Chire on Wikipedia

