# Using Docker in Cloud Networks

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cohesiveFT

the original cloud networking company

#### Agenda

Docker Overview
Dockerfile and DevOps
Docker in Cloud Networks
Some Trip Hazards
My Docker Wish List

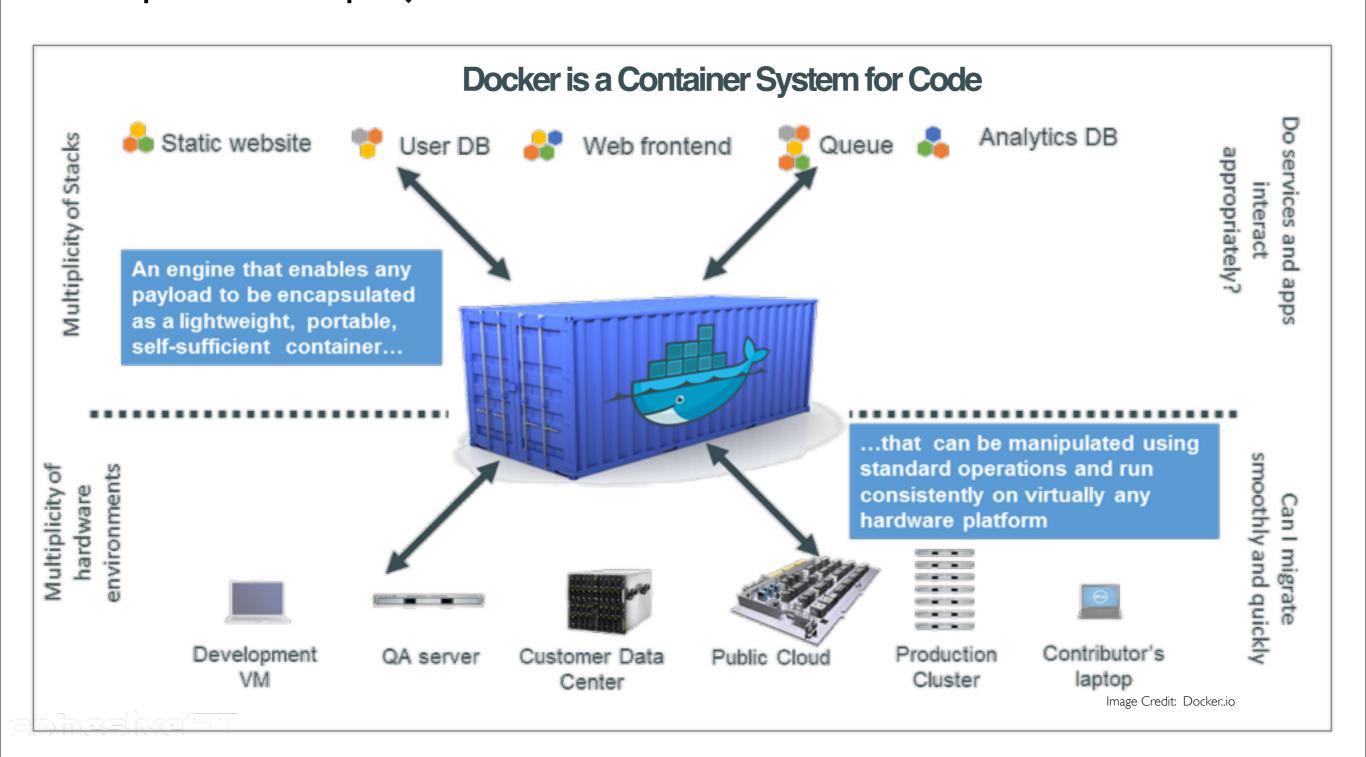


#### Docker overview

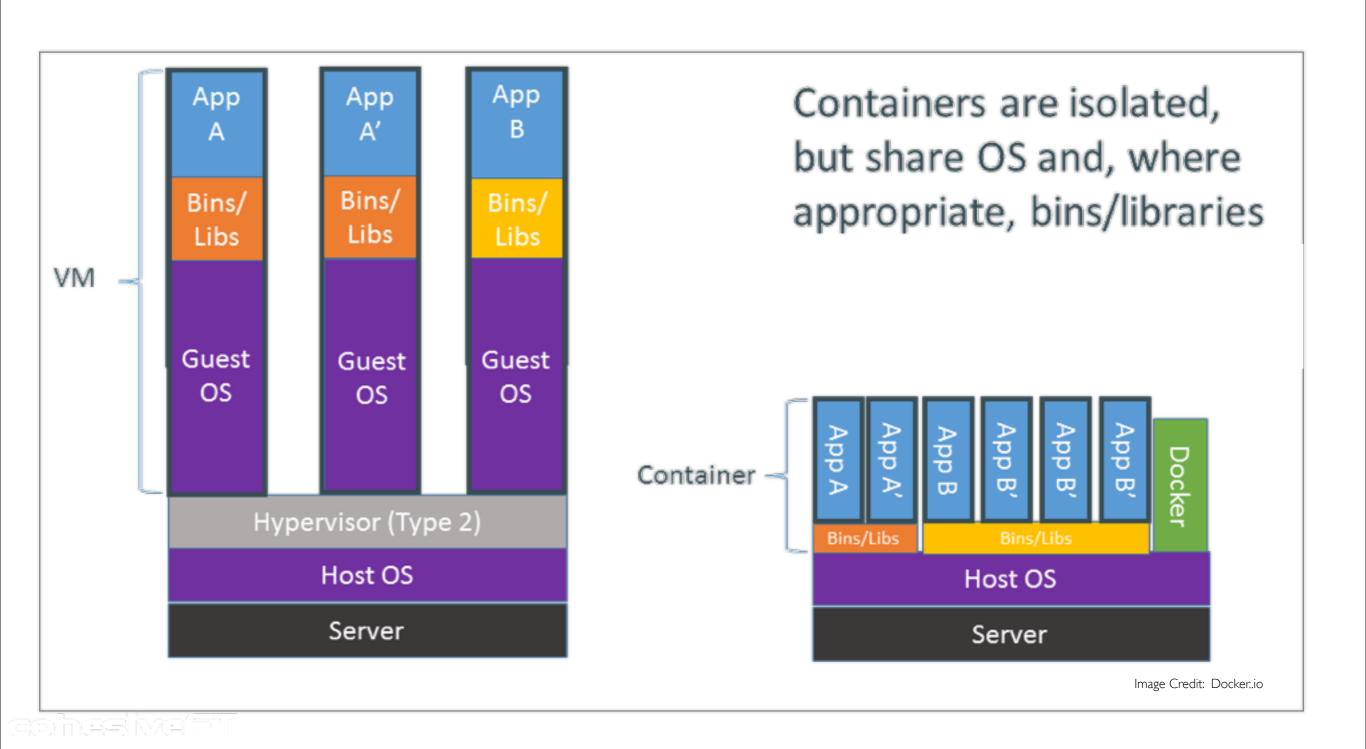




#### Open source project released in March 2013



### A different granularity of virtualisation



# Continuing the container analogy

	Physical Containers	Docker
Content Agnostic	The same container can hold almost any kind of cargo	Can encapsulate any payload and its dependencies
Hardware Agnostic	Standard shape and interface allow same container to move from ship to train to semi-truck to warehouse to crane without being modified or opened	Using operating system primitives (e.g. LXC) can run consistently on virtually any hardware - VMs, bare metal, openstack, public IAAS, etc without modification
Content Isolation and Interaction	No worry about anvils crushing bananas. Containers can be stacked and shipped together	Resource, network, and content isolation.  Avoids dependency hell
Automation	Standard interfaces make it easy to automate loading, unloading, moving, etc.	Standard operations to run, start, stop, commit, search, etc. Perfect for devops: CI, CD, autoscaling, hybrid clouds
Highly efficient	No opening or modification, quick to move between waypoints	Lightweight, virtually no perf or start-up penalty, quick to move and manipulate
Separation of duties	Shipper worries about inside of box, carrier worries about outside of box	Developer worries about code, Ops worries about infrastructure.

Image Credit: Docker..io

#### What's outside the box?

#### Linux containers (LXC)

Similar to Solaris zones, FreeBSD jails, IBM LPAR etc.

- > chroot
- < any hardware (VT) protected hypervisor

#### A union file system (e.g. AUFS)

Containers are made up out of layers

May also use ZFS or BTRFS

Docker command line tool to manage lifecycle of containers run, start, stop, ps, import, export etc.

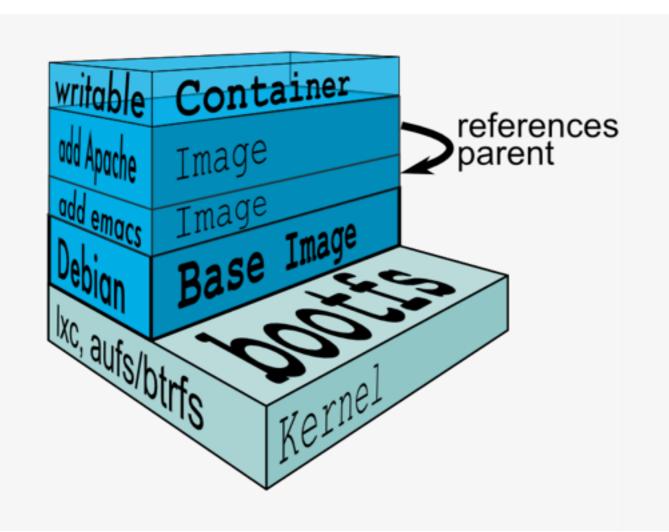
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# Going inside the box - Hello World

```
chris@docker: ~
chris@docker:~$ sudo docker run -i -t ubuntu:12.04 /bin/bash
root@31a1070a0887:/# echo 'Hello World'
Hello World
root@31a1070a0887:/#
```

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# Stacking containers



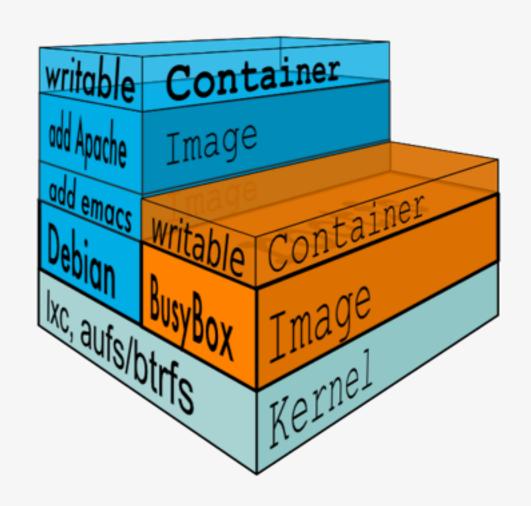


Image Credit: Docker..io

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# Containers and Images

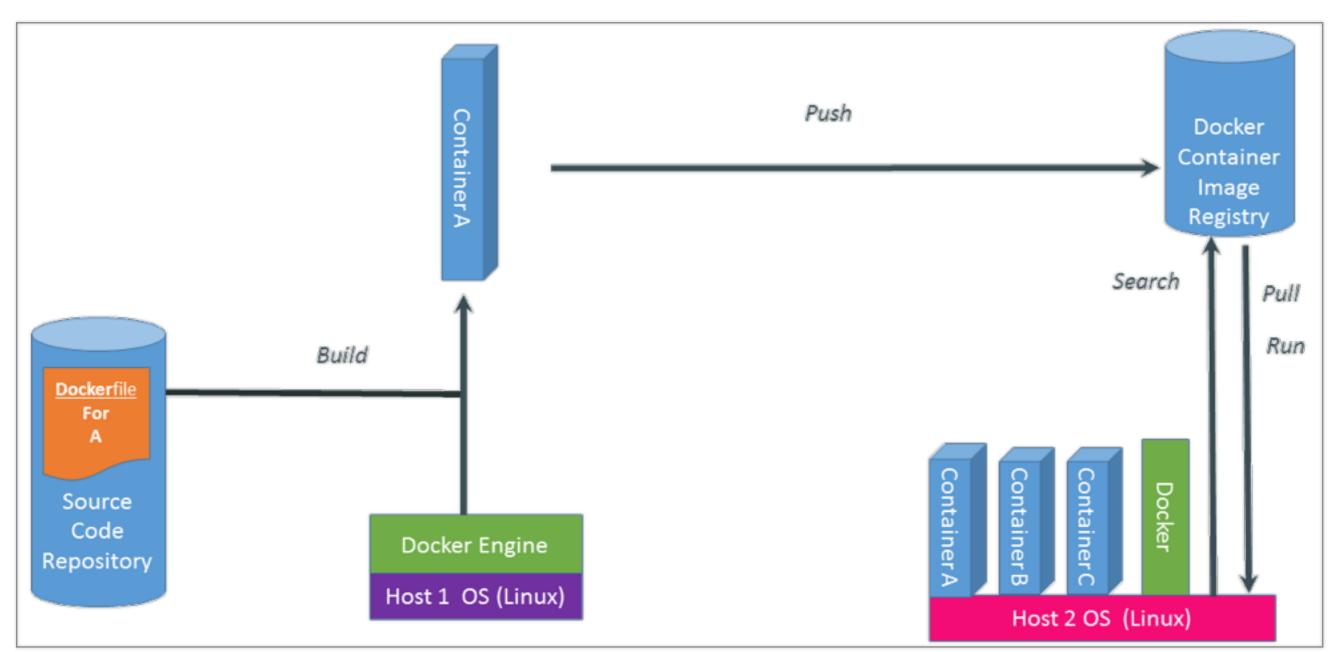
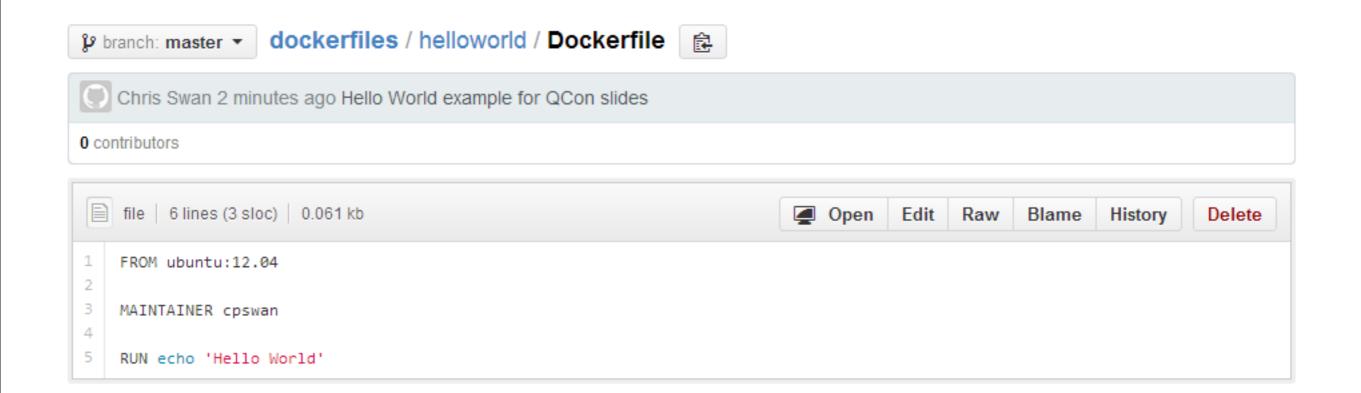


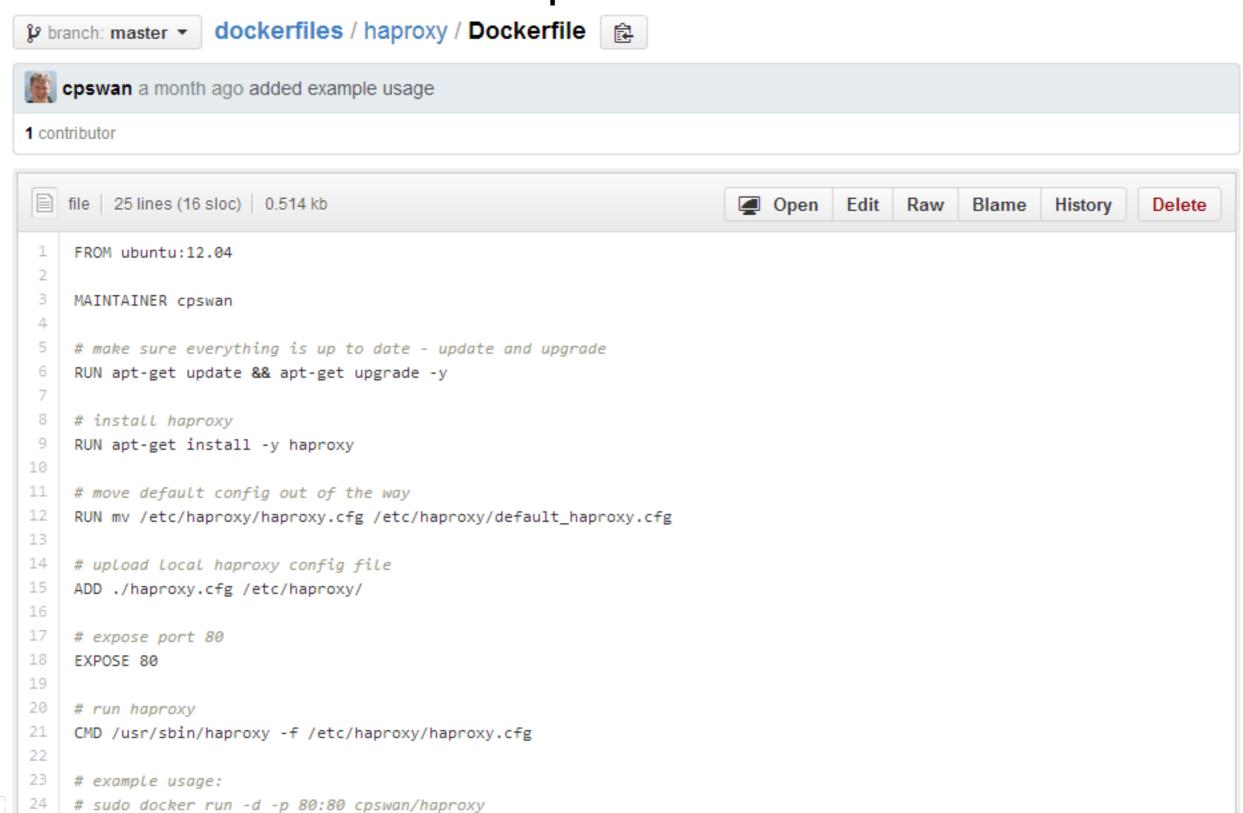
Image Credit: Docker..io

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#### Hello World from Dockerfile



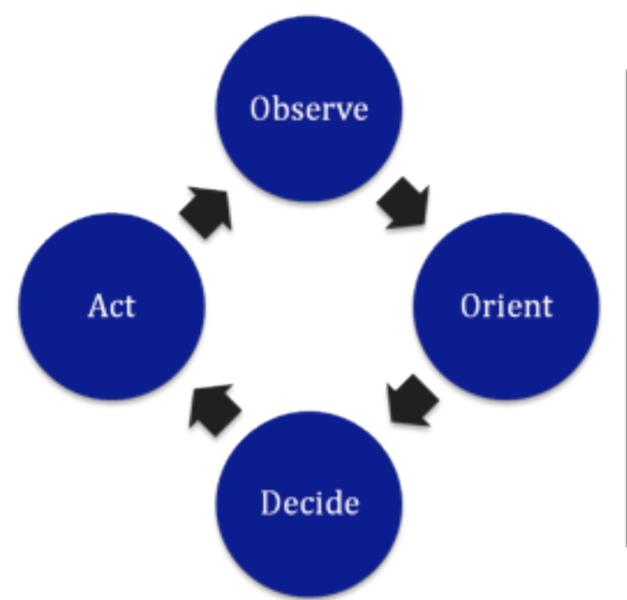
#### A real example of Dockerfile



#### Dockerfile and DevOps

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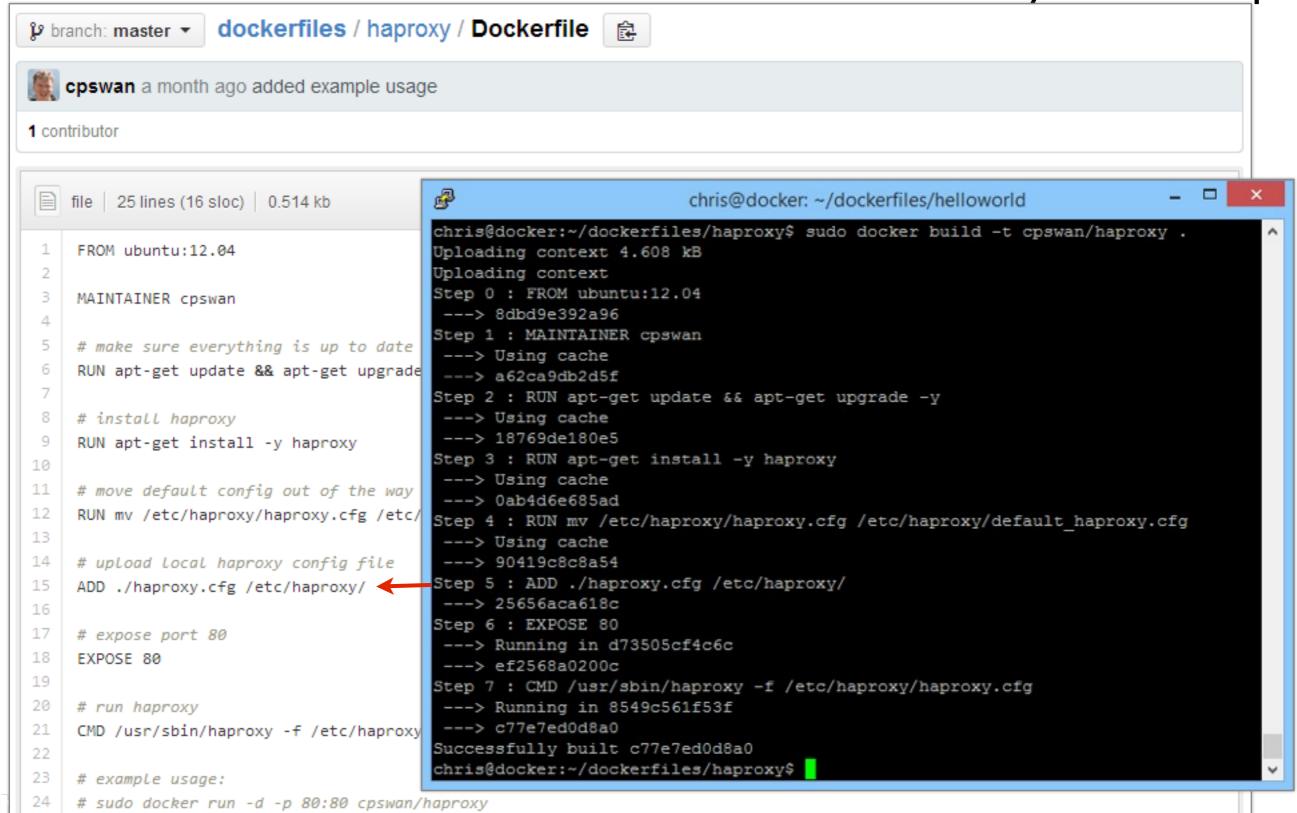
# John Boyd's OODA loop





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#### Dockerfile makes mistakes very cheap



### Docker and networking

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#### When the Docker daemon starts

Creates a docker0 bridge if not present

Other bridges can be manually configured

Searches for an IP address range which doesn't overlap with an existing route

Default is 172.17.0.0/16

Picks an IP in the selected range and assigns it to the docker0 bridge

**Default is** 172.17.42.1

Containers get a virtual interface that's bonded to the docker0 bridge

Starting with 172.17.0.2

### Port mapping

```
Map a random host port to a container port sudo docker run -d -p 1234 \ cpswan/demoapp
```

Map a specific host port to a container port sudo docker run -d -p 1234:1234 \ cpswan/demoapp

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#### Container linking

#### Docker takes named links to other containers to populate env variables:

```
# start the database
sudo docker run -d -p 3306:3306 -name todomvc_db \
-v /data/mysql:/var/lib/mysql cpswan/todomvc.mysql

# start the app server
sudo docker run -d -p 4567:4567 -name todomvc_app \
-link todomvc_db:db cpswan/todomvc.sinatra

# start the web server
sudo docker run -d -p 443:443 -name todomvc_ssl \
-link todomvc app:app cpswan/todomvc.ssl
```

#### Use the env variable in the app server:

```
dburl = 'mysql://root:pa55Word@' +
ENV['DB_PORT_3306_TCP_ADDR'] + '/todomvc'
DataMapper.setup(:default, dburl)
```

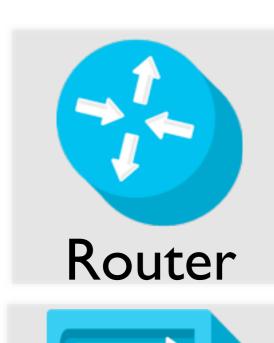
#### Docker in cloud networks



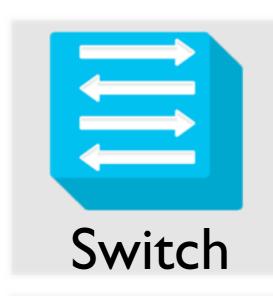
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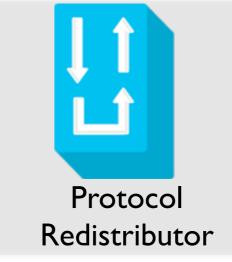
#### Before Docker

VNS3 is a virtual appliance Swiss Army Knife for networking









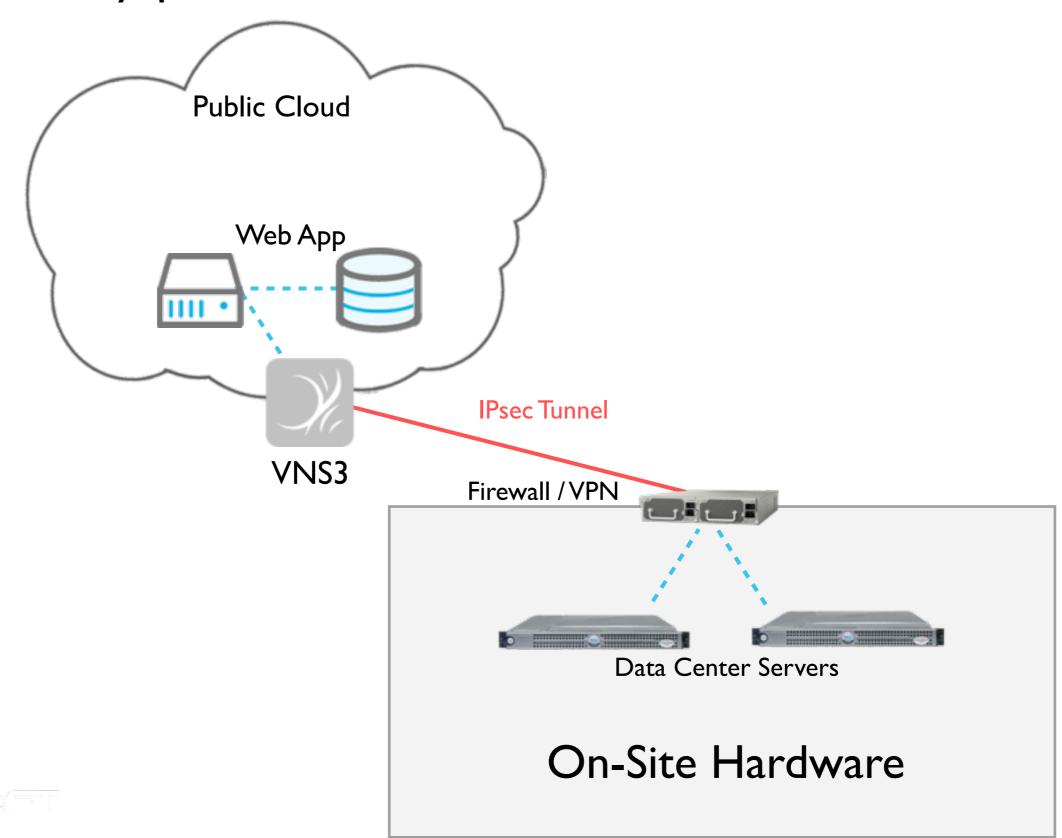






Tool for building secure networks in virtual infrastructures, private & public cloud

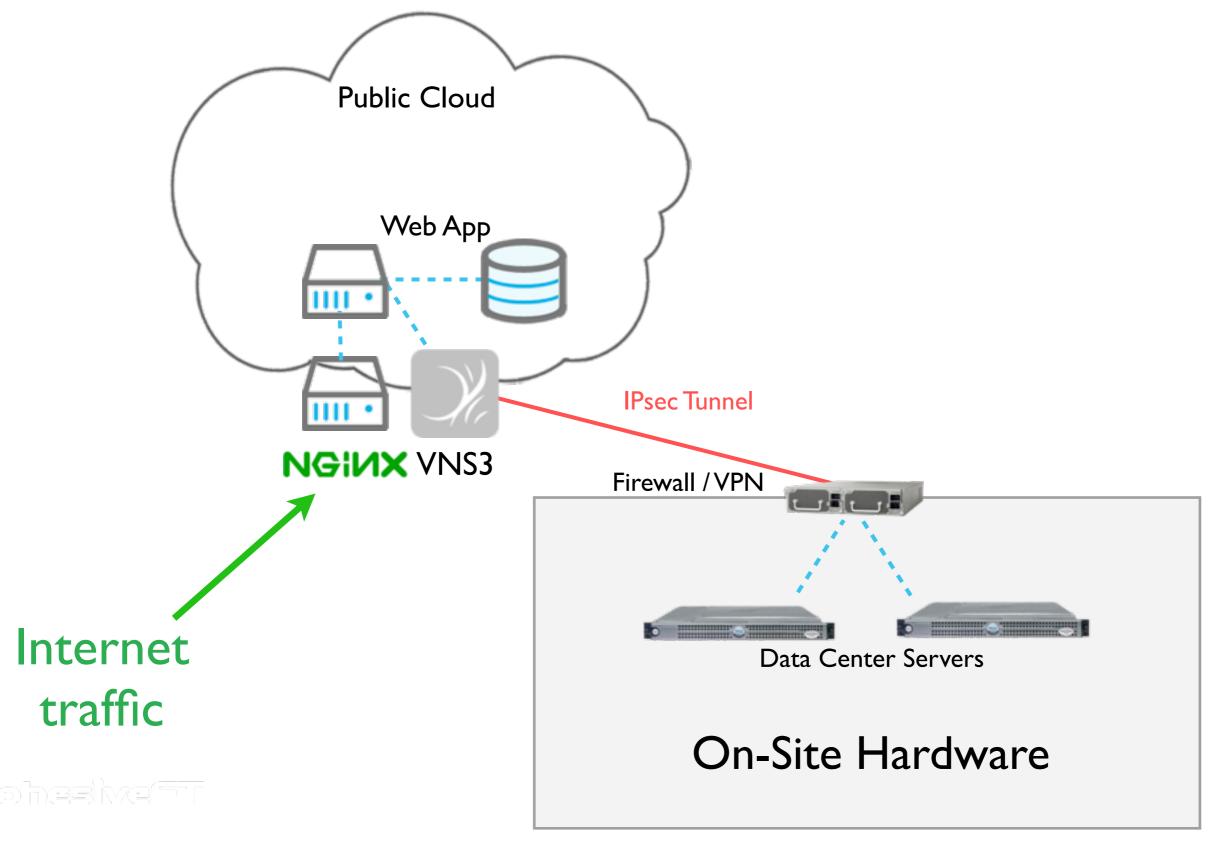
#### A typical customer use case



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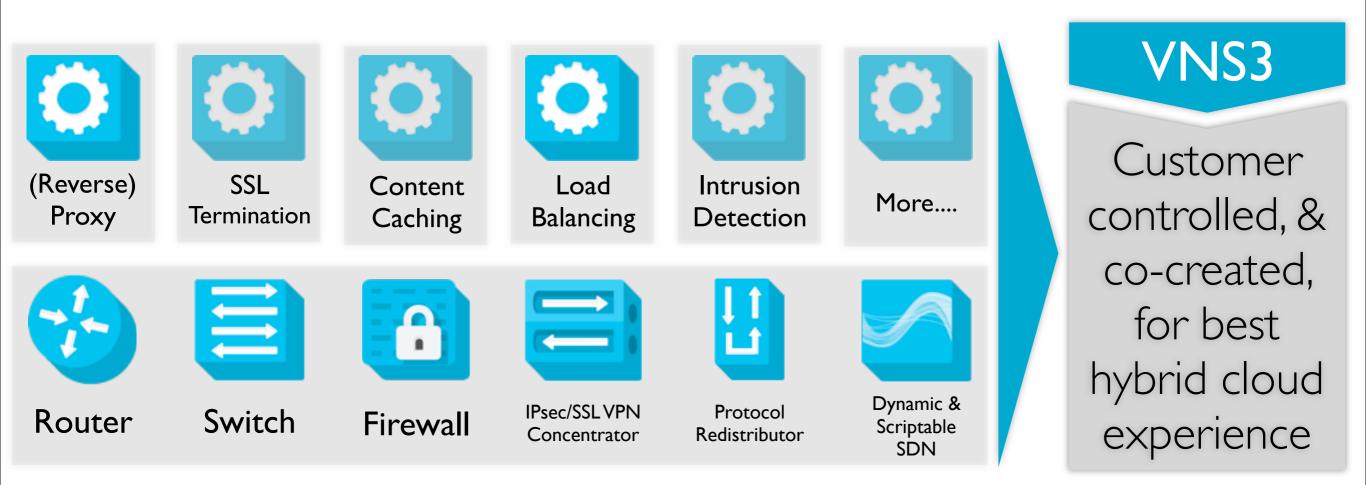
22

# That annoying extra VM



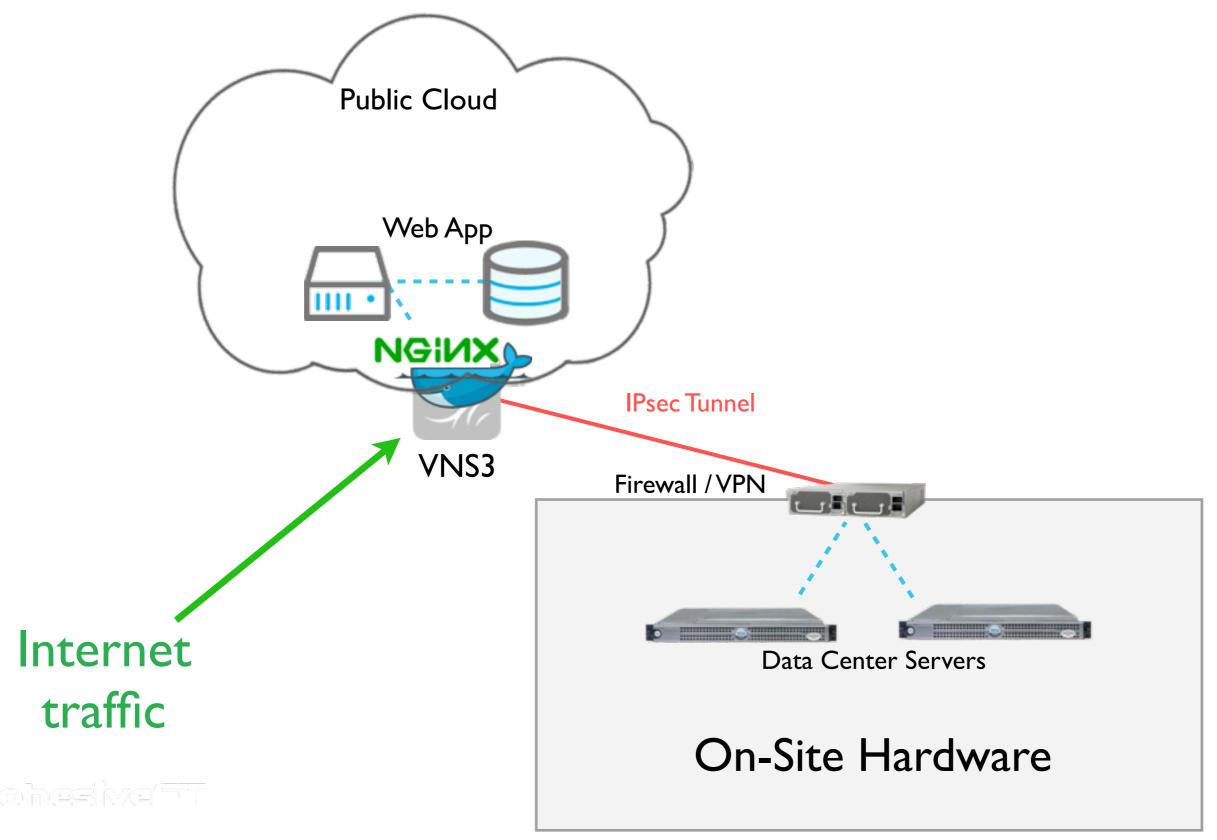
#### With Docker

VNS3 3.5 allows customers to embed features and functions provided by other vendors - or developed in house, safely and securely into their Cloud Network.

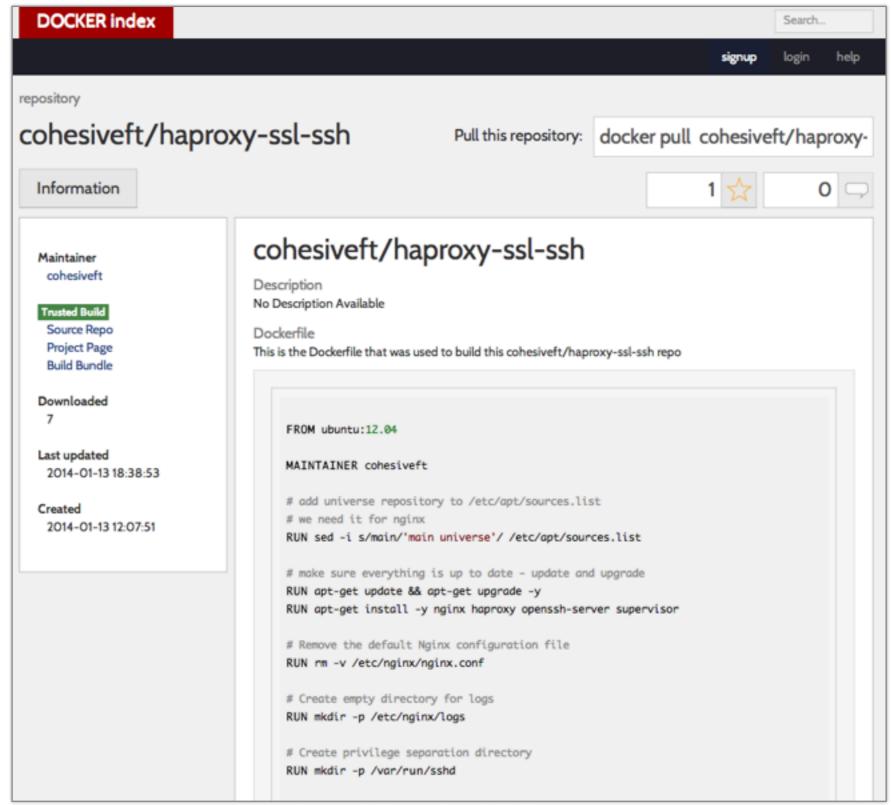


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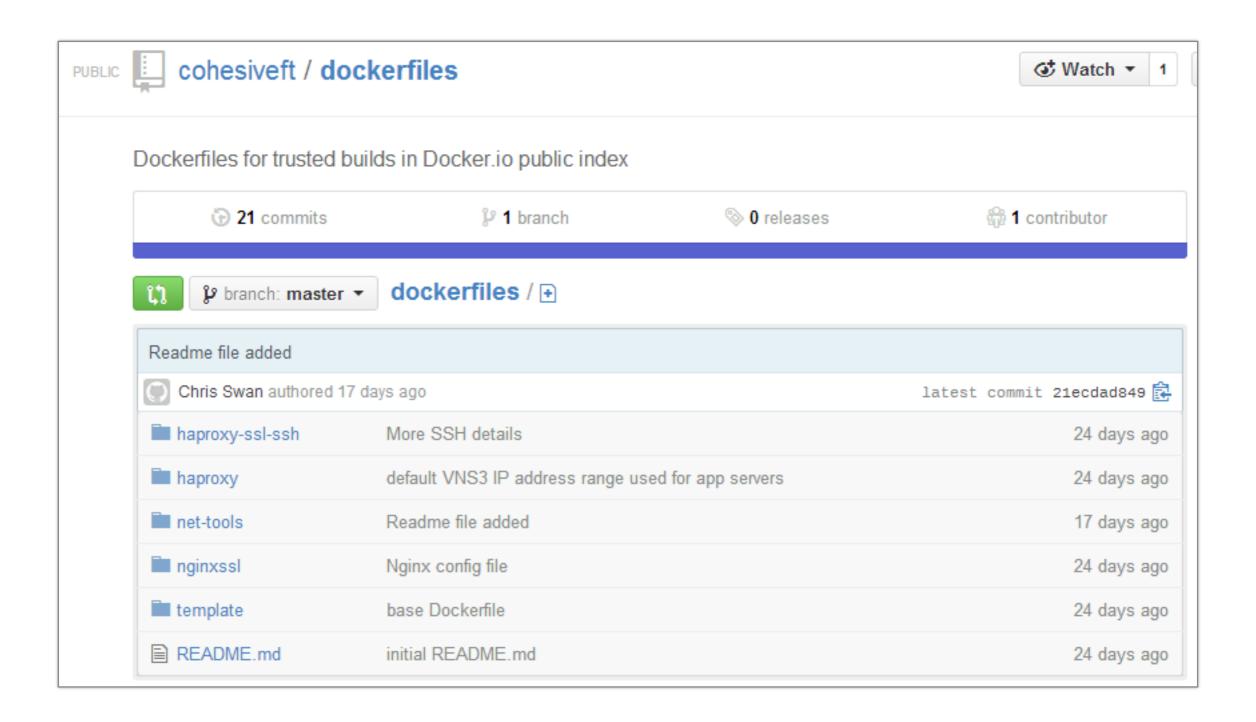
# Getting rid of that annoying extra VM



# Seeding the ecosystem



# and on github

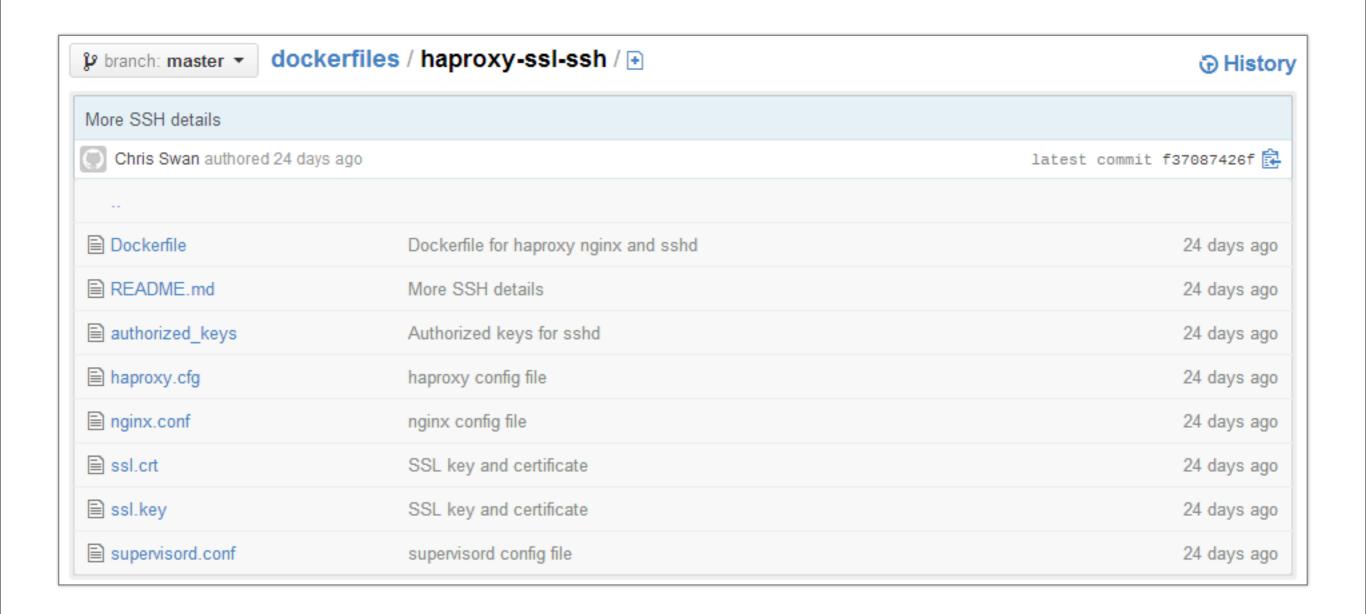




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27

#### as Dockerfile doesn't stand alone





# Some trip hazards

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# Inconsistent package repos

```
chris@docker:~$ sudo docker run -i -t ubuntu:12.04 /bin/bash root@64c16b26fe13:/# cat /etc/apt/sources.list deb http://archive.ubuntu.com/ubuntu precise main root@64c16b26fe13:/#
```

```
chris@docker:~$ sudo docker run -i -t ubuntu:12.10 /bin/bash
root@1376937d2b0e:/# cat /etc/apt/sources.list
deb http://archive.ubuntu.com/ubuntu quantal main universe multiverse
root@1376937d2b0e:/#
```

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### Beware apt-get upgrade

Not a problem in the official Docker.io images

But... if you're using images from somewhere else then it's not good when they try to build an initramfs



#### Non deterministic actions

apt-get install whatever -y

You want this to be cached in the short term

You might not want it to be cached long term (I'm not going to wade into the security tar pit right now)

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#### Local vs Global image namespace

sudo docker build -t cpswan/haproxy . sudo docker run -d cpswan/haproxy

!=

sudo docker run -d cpswan/haproxy

Nothing there to make you pull before you push

Global namespace is managed, local namespace isn't

Intermediate/private repositories for extra fun :-0

#### This can happen 'docker ps':

```
_ _
                                  chris@docker: ~
chris@docker:~$ sudo docker ps
                                                         COMMAND
CONTAINER ID
                    IMAGE
REATED
                   STATUS
                                                                          NAMES
                                       PORTS
da4360eb5160
                    ubuntu:12.04
                                                         /bin/bash
                   Up 6 days
days ago
                                                                          stoic c
urie
3ac56072def9
                   cohesiveft/varnish-ssh:latest
                                                        /bin/sh -c /usr/bin/
 days ago
                   Up 11 days
                                       22/tcp, 80/tcp
                                                                          distrac
ted wright2
a5a6cc98701c
                   ubuntu:12.04
                                                        /bin/bash
days ago
                   Up 11 days
                                                                          kickass
pike
f0fb7378b356
                   cpswan/haproxy:latest
                                                        /bin/sh -c /usr/sbin
days ago
                   Up 11 days
                                       0.0.0.0:1234->1234/tcp, 80/tcp
bardeen
f103b527b5a8
                   cpswan/haproxy:latest
                                                        /bin/sh -c /usr/sbin
1 days ago
                   Up 11 days
                                       0.0.0.0:49154->1234/tcp, 80/tcp
                                                                          elegant
hawking
9f223c5c4ad6
                   ubuntu:12.04
                                                        /bin/bash
weeks ago
                   Up 11 days
                                                                          thirsty
turing
e89fc8b5c980
                   ubuntu:12.04
                                                        /bin/bash
weeks ago
                  Up 11 days
                                                                          sleepy
wright
ec32ec9a3ff4
                   cohesiveft/vns3client-ssh:latest
                                                        /bin/sh -c /usr/bin/
                                       0.0.0.0:2222->22/tcp
weeks ago
                   Ghost
                                                                          tender
wozniak
53274356a750
                   cohesiveft/haproxy-ssl-ssh:latest /bin/sh -c /usr/bin/
weeks ago
                   Ghost
                                       22/tcp, 443/tcp, 80/tcp
                                                                          evil pt
olemy
acff30a8b284
                   cpswan/todomvc sinatra:latest
                                                        /bin/sh -c /usr/bin/
weeks ago
                   Ghost
                                       0.0.0.0:4567->4567/tcp
                                                                          todomvc
app, todomvc ssl/app
2dc1649cf602
                   cpswan/todomvc mysql:latest
                                                        /bin/sh -c /bin/bash
weeks ago
                   Ghost
                                       0.0.0.0:3306->3306/tcp
                                                                          todomyc
app/db, todomvc db, todomvc ssl/app/db
9241db281ca4
                    cpswan/node-red-0.5.0t:latest
                                                        /usr/bin/node /opt/n
                                       0.0.0.0:1880->1880/tcp
weeks ago
                   Ghost
                                                                          berserk
mccarthy
hris@docker:~$
```

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#### and also this 'docker ps --all':

				chris@docker: ~		- 0
12283254c	61694f758fcc	/bin/sh -c apt-get u	5 weeks ago	Exit 0	romantic morse	
54bdfbb17	a75a8ede2566	/bin/sh -c add-apt-r	5 weeks ago	Exit 0	drunk_wright	
94ea£7500	370e8a314eb0	/bin/sh -c apt-get i	5 weeks ago	Exis 0	desperate_hawkings	
1274477ec	a240a8539dd7	/bin/sh -c apt-get u		Exit 0	condescending_pike	
Led033ab	fc23c30e9423	/bin/sh -c sed -i s/		Exit 0	elegant_heisenberg	
006695be	ubuntu:12.04	/bin/sh -e #(nep) MA	5 weeks ago	Exit 0	#EGLO_MOESE	
10-0093805	ae93ea04e770	/bin/sh -c rm 0.5.0.	5 weeks ago	Exic 0	condescending_turing	
6a2241e7e	39cffele2ff0	/bin/sh -c od /opt/n		Exit 0	grave_helsenberg	
9Ea87068E	bc3220651694	/bin/sh -c unsip 0.5		Exit 0	hopeful_wozniak	
94ef6b8c2	3023595d1e12	/bin/sh -c wget http	5 weeks ago	Exic O	agitated shookley	
b948ff4de 5f6c6324b	ab7d00a77a8e 8b93da91040c	/bin/sh -c apt-get 1 /bin/sh -c apt-get u	5 weeks ago	Exit 0 Exit 0	silly_torvalds	
ec2eb054c	8b93da91040c	/bin/sh -c apt-get i	5 weeks ago	Exit 100	happy_turing? boring_curie	
eseff78c5	c7665087047e	/bin/sh -c sed -1 s/	5 weeks ago	Exit 0	insane albattani	
Off7aa6c2	0f2m76104f10	/bin/sh -c apt-get 1	5 weeks ago	Exit 100	furious wright	
34469d9ba	957af1305b2d	/bin/sh -c sed -1 s/	5 weeks ago	Exit 0	suspicious_pasteur	
2da3fe6ac	957af1305b26	/bin/sh -c sed -i /m		Exis 1	dreamy ritchie	
9e7e3f6b1	957af1305b2d	/bin/sh -c apt-get i	5 weeks ago	Exit 100	prickly_bohr	
a16c18c84	c7665087047e	/bin/sh -c apt-get u	5 weeks ago	Exit 0	distracted torvalds	
651a2e5fa	7604b3658ea2	/bin/sh -c add-apt-r	5 weeks ago	Exit 0	sharp_engelbart	
082934abb	ubuntu:12.10	/bin/bash	5 weeks ago	Exis 0	distracted darvin	
od8f51f00	4ec42d6a2487	/bin/sh -c apt-get i	5 weeks ago	Exit 0	mad brown	
odb372c8e	97db4bdbd49b	/bin/sh -c apt-get u	5 weeks ago	Exit 0	happy bardeen	
121e074d8	ubuntu:12.04	/bin/sh -c apt-get u	5 weeks ago	Exit 0	berserk_shockley	
114851509	ubuntu:12.04	/bin/bash	5 weeks ago	Exit 100	insene_darwin	
a3b22e6eb	f17c6c0feff0	/bin/sh -c apt-get u	5 weeks ago	Exit 100	trusting_turing	
63e226db6	stackbrew/ubuntu:12.04	/bin/sh -c #(nop) MA	5 weeks ago	Exit 0	dreamy morse	
102546ab48	stackbrev/ubuntu:13.10	/bin/bash	5 weeks ago	Exit 0	sleepy wozniak	
5e36d1f7b	stackbrew/ubuntu:13.04	/bin/bash	5 weeks ago	Exit 0	trusting_engelbart	
55e5246ba	stackbrew/ubuntu:12.10	/bin/bash	5 weeks ago	Exit 0	cocky_hawkings	
10e904Eb03	stackbrew/ubuntu:12.04	/bin/bash	5 weeks ago	Exac 0	suspicious_bohr	
eb27226e9	ubuntu:12.10	/bin/bash	5 weeks ago	Ex15 130	compassionate_wornlak	
40a043dc5	ubuntu:12.04	/bin/bash	5 weeks ago	Exit 0	berserk_bell	
1874c844b2	ubuntu:12.04	/bin/bash	5 weeks ago	Exit 0	insane_wright	
E4928983b	ubuntu:12.04	/bin/bash	5 weeks ago	EXES 0	insane_einstein	
6c6ba3e81	cpswan/node-red-0.5.0:latest	/bin/bash	6 weeks ago	Exit 1	trusting_shockley	
0e8820d9e	23466foc74fl	/bin/sh -c rm 0.5.0.	6 weeks ago	Exit 0	thirsty_bohr	
126379d82e	23466Ecc74El	/usr/bin/node /opt/n	6 weeks ago	Ex16 143	distracted_tesla	
7ef94d9d0	148169021836	/bin/sh -e od /opt/h	6 weeks ago	Exic 0	jolly_moree	
31091c305	41d72eb3370a	/bin/sh -c unzip 0.5	6 weeks ago	Exit 0	mad_nobel	
197d97527d	8a32408d47b6		6 weeks ago	Exit 0	determined morse	
11e90840b0	8a32408d47b6	/bin/sh -e ed /ept	6 weeks ago	Exis 0	sleepy_euclide	
80b4cdca4	5b342f26eeao	/bin/sh -c agt-get 1	6 weeks ago	Exit 0	elegant_morse	
ice3ee5bla	c97cd15465d4	/bin/sh -c apt-get u	6 weeks ago	Exit 0	distracted_bardeen	
odbc03dfbf	e93bc7287a4f	/bin/sh -c add-apt-r		Exit 0	nostalgic_galileo	
1084101849	8c3ee86d6759	/bin/sh -c apt-get i		Exit 0	kickass_nobel	
mae03070e	idifcia?9eia	/bin/sh -c apt-get u	6 weeks ago	Exit 0	distracted_bohr	
055ebab13	ubuntu:12.10	/bin/sh -c apt-get u	6 weeks ago	Exit 0	backstabbing_thompson	
355686286	ubuntu:12.10	/bin/besh	6 weeks ago	Exit 0	suspicious_ritchie	
88985aea9 416ca64d9	ubuntu:12.10	/bin/bash /bin/bash	6 weeks ago 6 weeks ago	Exit 0 Exit 1	pensive_turing	
	ubuntu:12.10				jovial_mccarthy	
994437063 269516ab8	cpswan/nodered:latest	/usz/bin/node /opt/n	6 weeks ago 6 weeks ago	Exit 163 Exit 163	romantic franklin	
	cpswan/nodered:latest	/usz/bin/node /opi/n /bin/bash			naughty_brattain	
5e5253e05 5bb85b£d6	cpswan/nodered:latest cpswan/nodered:latest		6 weeks ago	Exit 130	angry_testa	
7aca12648	cpswan/nodered:latest	/usz/bin/forever sta /bin/bash	6 weeks ago	Exit 0 Exit 130	focused_torvalds nostalgic_ptolemy	
E2174E130	cpswan/hodered:Latest	/usr/bin/forever sta	6 weeks ago	Exis 0	goofy_pike	
950dda0ba	cpswan/nodered:latest	/bin/bash	6 weeks ago	Exit 0	evil bell	
9490£301c	cpswan/nodered:latest	/opt/node-red-0.5.0/	6 weeks ago	Exit 127	insane lovelace	
69697641a	cpswan/sshd:latest	/bin/bash	6 weeks ago	Exit 0	lowing davinci	
fflbaa5f8	cpsvan/nodered:latest	/bin/bash	6 weeks ago	Exit 0	silly_davinci	
cee927215	cpswan/nodered:latest	/bin/bash	6 weeks ago	Exit 0	condescending pare	
139890359	cpswan/nodered:latest	/bin/bash -D	6 weeks ago	Exit 0	hopeful_galileo	
73e40c012	cpswan/ssbd:latest	/bin/bash	6 weeks ago	Exis 0	stoic pike	
0c6cb2677	cpswan/nodered:latest	-0	6 weeks ago	Exic 127	nostalgio albattani	
05d3f668c	cpswan/nodered:latest	/bin/bash	6 weeks ago	Exit 0	backstabbing bell	
a9438427e	cpswan/nodered:latest	/bin/bash -D	6 weeks ago	Exit 0	stupefied morse	
57booe0d4	opewan/nodered:latest	-0	6 weeks ago	Exis 127	sick torvalds	
d849b8de4	ubuntu:12.10	/bin/bash	6 weeks ago	Exit 130	determined nobel	
5a4e37c97	ubuntu:12.04	/bin/bash	6 weeks ago	Exit 100	prickly babbage	
6667a89b9	ubuntu:12.10	/bin/bash	6 weeks ago	Exit 0	stoic_darwin	
655a64a1a	socoby_snacks:latest	/bin/bash	6 weeks ago	Exit 127	evil turing	
a10221e13	scooby_snacks:latest	/bin/bas	6 weeks ago	Exit 127	naughty davinci	
5665a5204	ubuntu:12.04	/bin/sh -c touch sco		Exit 0	clever_nobel	
48800162a	ubuntu:12.04	/bin/bash	6 weeks ago	Exit 100	prickly_wright	
69bcbdfd3	cpswan/sshd:latest	/usz/sbin/sshd -D	9 weeks ago	Exit 0	hungry archimede	
	6e76e678772e	/bin/bash	9 weeks ago	Exit 0	romantic euclide	
145774698	2ea2614f1af7	/usz/sbin/ssbi -D	9 weeks ago	Ex15 255	dreamy_euclide	
	2ea2614f1af7	d- bdee/gade/sep/	9 weeks ago	Exit 255	sed_wright	
cessorsar			9 weeks ago	Exit 0	clever curie	
14577669e  ce460E63E  a2e31dc9b  49dcb7e56	ubuntu:12.04	/bin/bash				
ce460E63E  a2e31dc9b	ubuntu:12.04	/bin/sh -c while tru	9 weeks ago	Exit 137	stupefied_turing	
ce460E63E WaZe31dc9b H9dcb7e56 Bx8d19cd42 H8Z9071eb						
ce460f63f la2e31dc9b l49dcb7e56 bdd19cd42	ubuntu:12.04	/bin/sh -c while tru	9 weeks ago	Exit 137	stupefied_turing	

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# My Docker wish list



# If only it would...

**Docker CLI** 

Disk quotas

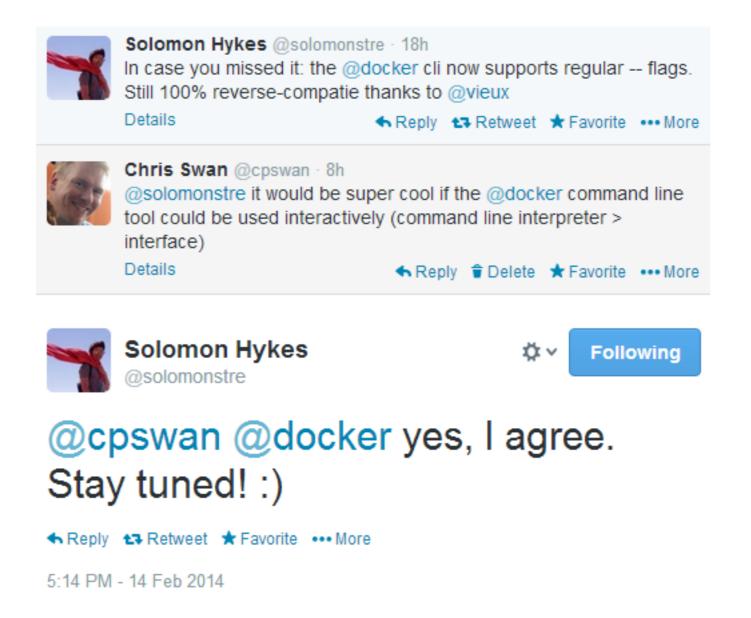
Route propagation

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37

#### At least one of those wishes might be granted...



# Summary

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#### Summary

Docker provides a 'shipping container' for apps

Dockerfile tightens the DevOps OODA loop

Docker has given us a way to move from closed platform to open platform (and be part of an ecosystem)

It's not perfect yet, but it's not finished yet (and software rarely is anyway)

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#### Questions?

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