



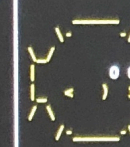
The OpenBSD hypervisor in the wild, a short story

Sorry...

load averages: 0.67, 1.06, 2.07
82 processes: 73 idle, 9 on processor
12 CPUs: 1.0% user, 0.0% nice, 12.0% sys, 24.0% spin, 0.0% intr, 60.9% idle
Memory: Real: 240/260 act/tot Free: 5300M Cache: 1154M Swap: 0K/130

server0.openbsd.amsterdam 16:02:57
up 13 days, 3:43

mischa@x270:~\$



mischa@x270
OS: OpenBSD 6.6 GENERIC.MP#313
Machine: ThinkPad X270 Intel Core i7-7500U CPU
Packages: pkg_info -mz: 105 | pkg_info -A: 365
Shell: ksh
WM: cwm
Terminal: xterm

mischa@x270:~\$

PID	USERNAME	PR	NICE	SIZE	RES	STATE	WAIT	TIME	CPU	COMMAND
17004	_vmd	42	0	1020K	703M	onproc/2	fsleep	45:24	20.50%	vmd: vm35
60061	_vmd	20	0	510K	430M	onproc/11	fsleep	30:30	10.94%	vmd: vm30
47975	_vmd	20	0	4103K	2115M	idle	fsleep	62:30	13.67%	vmd: vm30
25536	_vmd	34	0	823K	730M	idle	fsleep	17:00	12.50%	vmd: vm22
50007	_vmd	20	0	517K	322M	idle	fsleep	22:25	12.10%	vmd: vm23
36717	_vmd	32	0	517K	302M	idle	fsleep	24:30	11.23%	vmd: vm04
31457	_vmd	20	0	510K	372M	idle	fsleep	40:30	11.23%	vmd: vm30
30429	_vmd	20	0	1020K	440M	idle	fsleep	40:30	10.99%	vmd: vm30
57309	_vmd	20	0	510K	400M	idle	fsleep	35:30	10.99%	vmd: vm15
33583	_vmd	22	0	517K	352M	onproc/3	fsleep	307:32	10.94%	vmd: vm13
10025	_vmd	20	0	510K	302M	idle	fsleep	51:40	10.80%	vmd: vm30
95151	_vmd	20	0	517K	350M	onproc/0	fsleep	47:40	10.80%	vmd: vm20
45490	_vmd	33	0	1332K	824M	idle	fsleep	17:00	10.04%	vmd: vm14
10784	_vmd	20	0	510K	302M	onproc/0	fsleep	40:20	10.70%	vmd: vm34
51252	_vmd	20	0	1027K	400M	idle	fsleep	47:30	10.00%	vmd: vm01
7274	_vmd	20	0	517K	300M	idle	fsleep	30:40	10.53%	vmd: vm31
23005	_vmd	20	0	517K	370M	onproc/3	fsleep	40:30	10.50%	vmd: vm30
42910	_vmd	20	0	515K	470M	idle	fsleep	34:30	10.43%	vmd: vm00
30447	_vmd	20	0	515K	300M	idle	fsleep	40:40	10.53%	vmd: vm35
35003	_vmd	20	0	1027K	400M	idle	fsleep	40:30	10.50%	vmd: vm00
17553	_vmd	20	0	510K	372M	idle	fsleep	52:30	10.25%	vmd: vm17
11303	_vmd	33	0	1020K	430M	idle	fsleep	45:20	10.21%	vmd: vm12
70500	_vmd	20	0	1020K	400M	idle	fsleep	52:00	10.50%	vmd: vm30
32000	_vmd	20	0	515K	400M	idle	fsleep	40:40	10.11%	vmd: vm30
10410	_vmd	20	0	510K	302M	idle	fsleep	30:20	10.00%	vmd: vm30
43144	_vmd	34	0	517K	333M	onproc/0	fsleep	315:40	10.00%	vmd: vm02
10722	_vmd	20	0	1027K	422M	idle	fsleep	52:30	10.03%	vmd: vm11
32040	_vmd	20	0	1020K	420M	idle	fsleep	40:40	10.03%	vmd: vm00
45310	_vmd	20	0	510K	302M	idle	fsleep	40:00	10.03%	vmd: vm21
57078	_vmd	33	0	822K	422M	idle	fsleep	15:13	10.03%	vmd: vm22
8052	_vmd	20	0	517K	372M	idle	fsleep	30:00	9.93%	vmd: vm04
34111	_vmd	20	0	1020K	430M	idle	fsleep	40:30	9.83%	vmd: vm07
54150	_vmd	20	0	517K	302M	idle	fsleep	43:00	9.77%	vmd: vm00
12005	_vmd	30	0	1020K	430M	idle	fsleep	35:00	9.67%	vmd: vm25
70100	_vmd	20	0	517K	302M	idle	fsleep	40:00	9.57%	vmd: vm00
5010	_vmd	34	0	1020K	401M	idle	fsleep	330:42	9.52%	vmd: vm00
00200	_vmd	20	0	515K	302M	idle	fsleep	40:30	9.33%	vmd: vm07
43003	_vmd	20	0	510K	300M	onproc/0	fsleep	40:00	9.33%	vmd: vm30
34500	_vmd	20	0	1020K	430M	idle	fsleep	52:00	0.00%	vmd: vm27
23401	_snmpd	2	0	1072K	3300K	sleep/0	hsleep	5:23	0.00%	snmpd: snmpd
47101	_pflogd	4	0	804K	500K	sleep/0	hsf	2:40	0.00%	pflogd: [running] -s 300 -i pflogd -f /var/log/pfl
40440	_ntp	2	-20	932K	2500K	sleep/0	poll	1:24	0.00%	ntpd: ntp engine
61150	_slacsd	2	0	800K	752K	sleep/0	hsleep	1:11	0.00%	slacsd: frontend
63240	root	10	0	304K	852K	sleep/0	nanosleep	0:44	0.00%	/usr/sbin/cnssocsd
04407	root	20	0	1530K	3720K	onproc/0	-	0:20	0.00%	top -C
02517	_vmd	2	0	3004K	4504K	idle	hsleep	0:21	0.00%	vmd: vmm
72003	root	2	0	1304K	1400K	idle	select	0:13	0.00%	/usr/sbin/schd
47829	www	2	0	3500K	7040K	idle	hsleep	0:12	0.00%	httpd: server
77747	root	2	0	800K	1300K	idle	poll	0:00	0.00%	/usr/sbin/cron
04503	_syslogd	2	0	1100K	1350K	sleep/2	hsleep	0:00	0.00%	/usr/sbin/syslogd
41072	www	2	0	700K	2000K	idle	hsleep	0:04	0.00%	httpd: logger
00000	_smtpd	2	0	1400K	3002K	idle	hsleep	0:02	0.00%	smtpd: scheduler
05277	mischa	2	0	1340K	2020K	sleep/0	select	0:02	0.00%	schd: mischa@tty0
01704	_smtpd	2	0	1032K	4704K	idle	hsleep	0:02	0.00%	smtpd: lookup
30034	root	2	0	4250K	2270K	idle	hsleep	0:02	0.00%	/usr/sbin/vmd

~\$
sw nlix smtpd www0 webcam on smtp2 s1 s2 s3 s4 s5 s6 s7 s8 ops nix cons runbsd ksh Mon 16 Sep 16:02 ksh

90% Mon 16 Sep 16:02

Lenovo

X270

Who dis

- Began at XS4ALL (ISP) in 1995
- Working for \$vendor since 1998
- Started with FreeBSD in 1998
- Hosting / Co-Location since 1999



What about you?

- who is using **OpenBSD**?
- who is using **vmm(4)/vmd(8)**?
- who is on **OpenBSD Amsterdam**? ;)

How it all began

Always on the lookout for *easy* segmentation and virtualisation

- Started with and still using `jails(8)`
- Used `bhyve(8)`
- Using `vmm(4)/vmd(8)`

How it all began

- Spare rackspace
- Spare hardware
- Spare IP space
- Domain with something BSD
- Contributing back to the community
- How far can we take this
- Let's go!

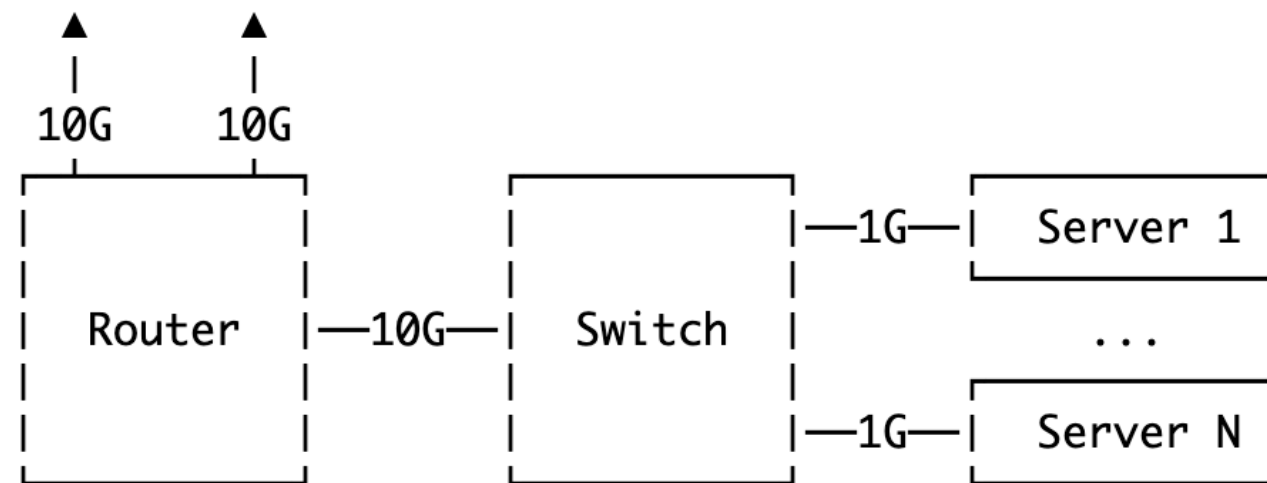


Something BSD

```
mischa@x270:~ $ whois openbsd.amsterdam
Domain Name: openbsd.amsterdam
Registry Domain ID: DNM_139668-SIDN
Registrar WHOIS Server: whois.rrpproxy.net
Registrar URL: http://www.key-systems.net/tld/amsterdam
Updated Date: 2019-05-30T00:15:03Z
Creation Date: 2018-05-30T17:40:38Z
Registry Expiry Date: 2020-05-30T17:40:38Z
Registrar: Key-Systems LLC
Registrar IANA ID: 1345
Registrar Abuse Contact Email: abuse@key-systems.net
Registrar Abuse Contact Phone: +49.68949396850
Domain Status: clientTransferProhibited https://icann.org/epp#clientTransferProhibited
Registry Registrant ID: Redacted for privacy
Registrant Name: Redacted for privacy
Registrant Organization: M Peters
Registrant Street: Redacted for privacy
Registrant City: Redacted for privacy
Registrant State/Province:
Registrant Postal Code: Redacted for privacy
Registrant Country: NL
Registrant Phone: Redacted for privacy
Registrant Phone Ext:
Registrant Fax: Redacted for privacy
Registrant Fax Ext:
```


Where is it?

- Amsterdam!
- XS4ALL (KPN) Datacenter
- Dell R610 -> Foundry FLS448 -> Foundry MLX-4



Started on Twitter



^{s1} Xeon(R) CPU E3-1220 V2 @ 3.10GHz w/ 8G RAM

What are people willing to pay



Proper machine online

 **OpenBSD Amsterdam**
@OpenBSDAms

Following

For all the people wh voted, server #2 is ready!! **#announcement #OpenBSD #RUNBSD**

openbsd.amsterdam/server2.html

Start contributing to **#OpenBSD** while running a VPS!

OpenBSD Amsterdam @OpenBSDAms
How much are you willing to pay for a OpenBSD VM in Amsterdam with 512MB/50G/v4+v6
[Show this thread](#)

7:59 AM - 1 Jul 2018

3 Retweets 4 Likes



^{s2} Intel(R) Xeon(R) CPU E5-2620 v3 @ 2.40GHz w/ 32G RAM

First donation

 **OpenBSD Amsterdam**
@OpenBSDAms

Following

Donated to the OpenBSD Foundation! Thank you all for making this possible!
#OpenBSD #RUNBSD



You've donated 400,00 EUR to The OpenBSD Foundation

My Account



8:46 PM - 27 Jul 2018

5 Retweets 31 Likes



Statistics

- Latest donation €370
- 2018 €1850 (6 months)
- 2019 €1700 (YTD)
- Total: €3550
- Active Hosts: 8
- Active VMs: 280

We just donated €370 to the [#OpenBSD](#) Foundation, totaling €3550 so far.

In August 16 new VMs were added and 14 VMs were renewed.

Thank you all!

[#OpenBSD](#) [#RUNBSD](#)



You've donated 370,00 EUR to
The OpenBSD Foundation

[My Account](#)



3:16 PM · Sep 5, 2019 · [TweetDeck](#)

[View Tweet activity](#)

15 Retweets 46 Likes

What do you get?

- Opinionated VM

What do you get?

- Opinionated VM
- 512M RAM
- 50G Disk
- IPv4 assigned via DHCP
- IPv6 statically assigned (/56 is assigned to a host)
 - Host is gateway for each VM

Setup

BASE

Everything we use is in base



BASE

Everything we use is in base

- perl(1)
- vmm(4)/vmd(8)
- dhcpcd(8)
- autoinstall(8)
- siteXX.tgz
- httpd(8)
- sensorsd(8)
- vi(1)



perl(1)

- /etc/vm.conf
- /etc/dhcpd.conf
- /var/www/htdocs/install/<MAC>-install.conf
- /etc/doas.conf
- user creation
- vm image creation

vm.conf(5)

```
socket owner :_vmdusers
```

```
switch "uplink_vlan931" {  
    interface bridge931  
}
```

```
vm "vm13" {  
    disable  
    owner alice  
    disk "/var/vmm/vm13.qcow2"  
    interface tap {  
        switch "uplink_vlan931"  
        lladdr fe:e1:bb:f1:c8:01  
    }  
}
```

dhcpcd.conf(5)

```
option domain-name "openbsd.amsterdam";
option domain-name-servers 46.23.80.26;

subnet 46.23.93.0 netmask 255.255.255.0 {
    option routers 46.23.93.1;
    server-name "server8.openbsd.amsterdam";

    host vm13 {
        hardware ethernet fe:e1:bb:f1:c8:13;
        fixed-address 46.23.93.13;
        filename "auto_install";
        option host-name "puffy.openbsd.amsterdam";
    }
}
```

autoinstall(8)

/var/www/htdocs/autoinstall/fe:e1:bb:f1:c8:13-install.conf

```
# vm13-install.conf
System hostname = puffy.openbsd.amsterdam
Password for root = [password]
Which speed should com0 = 115200
Network interfaces = vio0
IPv4 address for vio0 = dhcp
IPv6 address for vio0 = 2a03:6000:6f64:613::13
IPv6 default router = 2a03:6000:6f64:613::1
Setup a user = alice
Password for user = [password]
Public ssh key for user = ssh-ed25519 AAAAC3N...U7KKt alice@domain.tld [password]
Which disk is the root disk = sd0
What timezone are you in = Europe/Amsterdam
Location of sets = http
Server = server8.openbsd.amsterdam
Set name(s) = -x* +xb* +xf* +site*
Continue anyway = yes
Continue without verification = yes
```

siteXX.tgz

- `installurl(5)`:

`https://cdn.openbsd.org/pub/OpenBSD`

- `sysctl.conf(5)`:

`kern.timecounter.hardware=tsc`

- `rc.conf.local(8)`:

`ntpd_flags="-s"`

`sndiod_flags=N0`

httpd(8)

/etc/httpd.conf

```
server "default" {  
    listen on * port 80  
    root "/htdocs/autoinstall"  
    location "/pub/OpenBSD/6.5/amd64/*" {  
        root "/htdocs/6.5"  
        request strip 4  
        directory { auto index }  
    }  
}
```

sensorsd(8)

/etc/sensorsd.conf

```
drive:command=/etc/sensorsd/drive %t %n %2 %s
```

```
#!/bin/sh
#
#      %t      The type of sensor.
#      %n      The sensor number.
#      %2      The sensor's current value.
#      %s      The sensor status.
#
#drive:command=/etc/sensorsd/drive %t %n %2 %s
#Subject: Sensor drive0 changed
#Raid state: drive0 online OK
echo "Current raid state: ${1}${2} ${3} ${4}" | mail -s "${hostname} ${1}${2} ${4}" -r noreply@domain.tld mischa@domain.tld
```

Deploying!



```
server8:~ # cat _deploy.conf
# Server config for <MAC>-install.conf
SERVER="server8"
DOMAIN="openbsd.amsterdam"
# IP / MAC config
IP_PREFIX="46.23.93"
IP_START=100
IPV6_PREFIX="2a03:6000:6f64"
IPV6_START=600
MAC_PREFIX="fe:e1:bb:f1:c8"
# .conf locations
VMS="/home/mischa/vms"
ETC="/etc"
IMAGES="/var/vmm"
HTDOCS="/var/www/htdocs/default"
# vm.conf
MEMORY="512M"
DISKSIZE="50G"
FORMAT="qcow2"
VMDUSERS="_vmdusers"
SWITCH="uplink_vlan931"
INTERFACE="bridge931"
# dhcpd.conf
ROUTER="46.23.93.1"
DNS="46.23.80.26"
SUBNET="46.23.93.0"
NETMASK="255.255.255.0"
```


Deploy-flow

- form > email > file
- run deploy.pl on the host
- restart dhcpd
- reload vmd
- start vm
- run installer - Hit (A)

Form

Type-in your name *

Alice

email *

alice@example.com

and your SSH public key *

ssh-ed25519 FRhkxldn1...sDZUdP

hostname *

example

username *

alice

RAM

Standard 512M

HDD

Standard 50G

disk format

qcow2

referral code

OBSD-XXXX-XXXX

note?

I like VMs

Book it

Email > ~/vms/vm13.txt

date="2019/09/21"

payment=""

donated=""

name="Alice"

email="alice@domain.tld"

sshkey="ssh-ed25519 AAAAC3N...U7KKt alice@domain.tld"

hostname="puffy"

username="alice"

note=""

memory="512M"

disk2=""

format="qcow2"

referral=""

deploy.pl

```
server8:~ # deploy.pl
autoinstall(8) files:
            vm13 /var/www/htdocs/default/fe:e1:bb:f1:c8:13-install.conf created
useradd(8) creation:
            alice
vmm(4)/vmd(8) files:
            vm13 /var/vmm/vm13.qcow2 created (size 50G)
```



```
server8:~ # vmctl reload
server8:~ # rcctl restart dhcpd
dhcpd(ok)
dhcpd(ok)
server8:~ # vmctl start -c vm13
Connected to /dev/ttyph (speed 115200)
Copyright (c) 1982, 1986, 1989, 1991, 1993
    The Regents of the University of California.  All rights reserved.
Copyright (c) 1995-2019 OpenBSD. All rights reserved. https://www.OpenBSD.org
OpenBSD 6.5 (RAMDISK_CD) #3: Sat Apr 13 14:55:38 MDT 2019
    deraadt@amd64.openbsd.org:/usr/src/sys/arch/amd64/compile/RAMDISK_CD
real mem = 520093696 (496MB)
avail mem = 500412416 (477MB)
mainbus0 at root
bios0 at mainbus0
acpi at bios0 not configured
cpu0 at mainbus0: (uniprocessor)
cpu0: Intel(R) Xeon(R) CPU E5-2620 v3 @ 2.40GHz, 2401.04 MHz, 06-3f-02
...
sd0 at scsibus0 targ 0 lun 0: <VirtIO, Block Device, > SCSI3 0/direct fixed
sd0: 51200MB, 512 bytes/sector, 104857600 sectors
...
root on rd0a swap on rd0b dump on rd0b
erase ^?, werase ^W, kill ^U, intr ^C, status ^T

Welcome to the OpenBSD/amd64 6.5 installation program.
(I)nstall, (U)pgrade, (A)utoinstall or (S)hell? a
```

What did we find

socket owner



OpenBSD src Changes

@OpenBSD_src

Following



reyk@ modified usr.sbin/vmd: Add "socket owner" to allow changing the owner of the vmd control socket. This allows to open vmctl control or console access to other users that are not in group wheel. Access for non-root users still defaults to read-only actions unless you chang...

12:25 PM - 26 Jun 2018

5 Retweets 9 Likes



↻ 5

♥ 9



```
socket owner :group
```

```
Set the control socket owner to the specified group.
```

socket <https://marc.info/?l=openbsd-cvs&m=153003284400760&w=2>

tap(4) interfaces

```
$ cd /dev
$ ls -al tap*
crw----- 1 root wheel 93, 0 Apr 25 09:28 tap0
crw----- 1 root wheel 93, 1 Apr 25 09:28 tap1
crw----- 1 root wheel 93, 2 Apr 25 09:28 tap2
crw----- 1 root wheel 93, 3 Apr 25 09:28 tap3

$ for i in $(jot 50 4 50); do doas sh MAKEDEV tap$i; done
```

share password??

```
jot -rcs ' ' 20 33 126
```

-r Generate random data. By default, jot generates sequential data

-c This is an abbreviation for -w %c.

-w word Print word with the generated data appended to it. Octal, hexadecimal, exponential, ASCII, zero-padded, and right-adjusted representations are possible by using the appropriate printf(3) conversion specification inside word, in which case the data is inserted rather than appended.

-s string Print data separated by string. Normally, newlines separate data.

added to ~/.ssh/authorized_keys

ascii <http://www.asciitable.com/>



Reyk Flöter
@reykfloeter

Replying to @blakkheim @NicoSchottelius and @datacenterlight

Better? Login is puffy@, cloud-agent can now generate a random password and write it as a comment into .ssh/authorized_keys - I shamelessly stole the idea from @OpenBSDAms.

```
$ ssh puffy@2a0a:e5c0:2:2:0:c8ff:fe68:bf16
Last login: Wed Jun  5 22:05:52 2019 from 2001:8e0:2002:8913:2eaa:c7ca:253c:d589
OpenBSD 6.5 (GENERIC.MP) #0: Wed Apr 24 23:38:54 CEST 2019

Welcome to OpenBSD: The proactively secure Unix-like operating system.

Please use the sendbug(1) utility to report bugs in the system.
Before reporting a bug, please try to reproduce it with the latest
version of the code. With bug reports, please try to ensure that
enough information to reproduce the problem is enclosed, and if a
known fix for it exists, include that as well.

vm0200c868bf16$ head -1 .ssh/authorized_keys
# XXXXXXXXXXXXXXXXXXXX
vm0200c868bf16$ doas -s
doas (puffy@vm0200c868bf16) password: XXXXXXXXXXXXXXXXXXXX
vm0200c868bf16#
```

10:39 PM · Jun 5, 2019 · Twitter for iPhone

stopping VMs

Used to do this with:

```
$ vmctl show | for i in $(awk '!/ID| - / {print $1}'); do doas vmctl stop $i; sleep 30; done
```

Now there is:

```
$ doas vmctl stop -aw
```

^{-a} <https://marc.info/?l=openbsd-cvs&m=153806854327569&w=2>

starting VMs

```
$ vmctl show | for i in $(awk '!/ID/ {print $1}'); do doas vmctl start $i; sleep 30; done
```

Or

```
$ vmctl show | for i in $(awk '!/ID/ {print $1}'); do doas vmctl start $i; sleep 90; done
```

arpq

```
$ sysctl net.inet.ip.arpq.drops
```

```
net.inet.ip.arpq.drops=524
```

```
$ sysctl net.inet.ip.arpq.maxlen
```

```
net.inet.ip.arpq.maxlen=50
```

```
$ doas sysctl net.inet.ip.arpq.maxlen=1024
```

What users experience

Clock drift

Clock drifts, sometimes more severe.

```
# Sync clock every 15 minutes  
*/15 * * * * /usr/sbin/rdate -s pool.ntp.org
```

clock <https://openbsd.amsterdam/clock.html>

High CPU interrupts

VMs have a constant high intr CPU state:

CPU states: 0.0% user, 0.0% nice, 0.1% sys, 0.0% spin, 98.0% intr, 1.9% idle

intr <https://marc.info/?l=openbsd-misc&m=154834783313341&w=2>

Connectivity drops

Cron

```
*/5 * * * * /sbin/ping -c3 <gateway> > /dev/null
```

Cron + tmux

```
@reboot /usr/bin/tmux new -d 'while true; do ping -i5 <gateway>; done' \;
```

Unresponsive VM

When `vmctl stop -f <vm-name>` doesn't work.^{6.5}

`/etc/doas.conf`

```
permit nopass <vm-owner> as root cmd pkill args -9 -f <vm-name>
```

User runs:

```
$ doas pkill -9 -f vm13
```

^{6.5} `vmctl stop <vm-name> -f` (<https://marc.info/?l=openbsd-cvs&m=155916557307145&w=2>)

Wishlist / Future

- iPXE
- no/less clock drift
- using `switch(4)` / L3?
- automate more
- deploy 300 VMs!

Couldn't be possible without!

Mike Larkin ([@mlarkin2012](#))

Reyk Flöter ([@reykfloeter](#))

Carlos Cardenas ([@cobracmdr](#))

Stefan Kempf

Claudio Jeker

Jasper Lievisse Adriaanse ([@jasper_la](#))

Ori Bernstein ([@oribernstein](#))

Roman Zolotarev ([@romanzolotarev](#))

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Thank you!

More information <https://openbsd.amsterdam>

Deploy script <https://git.high5.nl/deploy.pl>

Twitter <https://twitter.com/OpenBSDAms>

Mastodon <https://bsd.network/@OpenBSDAms>

Just URLs

More information <https://openbsd.amsterdam>

Deploy script <https://git.high5.nl/deploy.pl>

Twitter <https://twitter.com/OpenBSDAms>

Mastodon <https://bsd.network/@OpenBSDAms>